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## Providing for the Common Defense

### MEETING AN OBLIGATION

THE Constitution of the United States gives as one of the reasons for the formation of our Government the providing for the common defense. Provision for the common defense cannot be accomplished in this day and age merely by accepting the doctrine as a good one, and then waiting for some one to attack us before we gather our hosts and the material for defending ourselves. Preparation for war in time of peace is necessary. President Coolidge so aptly advised in a recent important address that national defense requires more than merely talking about it, it requires that something be done about it.

The people of the United States, having decided that provision for national defense is a wise and sane proposition, leave to their representatives in Congress the extent to which their will shall be carried out. Congress appropriates the money wherewith we can maintain the necessary personnel and materials to safeguard our great, wealthy and prosperous nation.

There are many people in this country who do not desire any form of national insurance for guaranteeing the preservation of the liberties, rights and privileges which we now enjoy. It is seemingly preposterous, yet these peace-at-any-price, ultra-pacifistic sentimentalists, and the anarchistic and irresponsible elements are organized into societies for the purpose of spreading damnable doctrines to undermine our Government and to leave us unprepared to defend ourselves:

A large number of people propose that war be abolished. On the basis of their hope, forlorn as it is, they are willing to risk America's security by eliminating our armed forces. They are a set of harebrained theorists who are dangerous to the nation. The history of mankind, the generally unsettled condition in the world today, and the existence of major wars on several continents at the present time all should be convincing of the impracticability of that idea.

Then there are a great number of people who see no reason for preparation until war becomes imminent. To them, military and naval establishments are too heavy a burden to bear in time of peace. They are the people who wish that war organization and materiel may be improvised hurriedly when it is needed. They favor cutting and reducing the Army and the Navy whenever some politician advocates it, with a selfish attitude that someone else in the future should bear their share of the expense.

The keenest people in this country for the avoidance of war are those who know war, who study its causes and effects and who have experienced its horrors and blighting influence. These are the people who realize the needs of preparation in time of peace; these are the people who know that military forces with proper equipment, capable of combatting a foe of modern times, do not spring forth without careful planning and training.

#### MATERIAL NEEDS FOR DEFENSE

A *material* form of insurance against loss of life, liberty and our national existence is essential. In the National Defense Act of 1920 we have the plan for a structure which, if followed through, will afford adequate protection against any storm which may threaten the nation. The mere fact that the structure exists will do more to insure peace than can any substitute that has yet been offered from any source. This Act represents the combination of the best thought in Congress and the widest experience in the World War. It was a joint task. It has been tested from every angle. It has successfully resisted every attack upon its soundness of principle.

In the National Defense Act there is provision for an Army of the United States, which is made up of three components: the Regular Army, the National Guard and the Organized Reserves. Roughly these components are in the proportion of 1, 2 and 3 in numbers illustrating at once the dependence which is placed upon the citizen elements. It is truly an army of the people.

The National Defense Act is a beautiful plan, but it requires money to execute it. Congress, as we know, is harrassed from every side for more appropriations for this, that and the other activity. Every executive branch of the Government fights for its own needs and naturally believes them the most urgent of the moment. Political exigencies cannot be ignored. And so we find the Army of the United States holding its breath and wondering what its fate will be.

A rather curious situation exists as to appropriations for the support of the Federal Departments which must be kept in mind. Under our budget system, each department in the preparation of its

estimates each year for the coming fiscal year is given a limiting figure by the budget officer, representing the President, beyond which it cannot go. Regardless of the actual needs, the estimates must be cut and adjusted to meet this figure. These estimates are then presented to Congress in accordance with approved procedure and Congress can and does fall back upon the true statement and argument, "We gave you what you asked for."

### THE REGULAR ARMY

*In order to fulfill its missions to the country, the Regular Army must not only have its various functioning parts organized systematically, economically and in correlation, but, in addition, it must be provided with financial means in sufficient quantity to enable these parts to operate efficiently along their respective lines of activity. Otherwise, the entire Army structure is doomed to failure, so far as it is concerned in making effective the only military policy the Government has ever had.*

Based on the appropriations by Congress for the past few years, the Regular Army has been reduced in numbers in both officers and enlisted men; its organization and distribution have undergone considerable modification in order to enable it still to perform, in a restricted manner, the duties imposed by Congress and custom.

These duties may be stated, briefly, as follows:

1. To provide adequate personnel for the development and training of the National Guard and the Organized Reserves, and for furnishing a trained stiffening component for the organization of higher units for battle service, as well as to furnish the instructors for the Reserve Officers' Training Corps and the Civilian Military Training Camps.

2. To provide the necessary personnel for the overhead of the Army of the United States, wherein the duties are necessarily of a continuing nature.

3. To provide an adequate, organized, balanced and effective domestic force, which shall be available for emergencies within the continental limits of the United States, or elsewhere, and which will serve as model for the organization, discipline and training for the National Guard and the Organized Reserves.

4. To provide adequate peace garrisons for the coast defenses within the continental limits of the United States.

5. To provide adequate garrisons in peace and war for our overseas possessions.

The peace strength of the Regular Army, as fixed by the National Defense Act, as amended and approved June 4, 1920, for per-

forming the above missions was limited to 280,000 enlisted men, including Philippine Scouts. The Regular Army has been reduced from time to time by subsequent acts until it stands now at about 115,000 enlisted men, exclusive of Philippine Scouts. The effect of this succession of reductions has been to check materially the progress of Army reconstruction following the World War, and its application to its new functions in connection with the development of the National Guard and the Organized Reserves.

Repeated and careful studies by officers of the Army best qualified by experience and training to answer this question have shown that the present strength is inadequate, that in its attempt to fulfill its assigned missions with insufficient personnel, the Regular Army is slowly but unquestionably being wrecked.

In the gradual reductions of the Regular Army to its present size of 115,000, the following changes have been forced upon it:

1. Many units from practically every branch of the Army have been made inactive, that is, they have been cancelled from the active units.

2. The Regular Army personnel necessary for the development and training of the National Guard and Organized Reserves has been reduced to such an extent as seriously to jeopardize their value as ready and effective components in our military policy.

3. The overseas garrisons have been reduced to one-half the numbers believed necessary for their proper protection.

4. The activities as well as the output of our excellent military school system have been materially reduced.

In the entire United States Army there is now but one place where a combat element may be seen at normal fighting strength, and that is at Fort Benning, Georgia, where there is stationed for demonstration purposes in connection with the Infantry School a war-strength Infantry regiment, and that is even depleted by 4 of its 12 companies.

It is only here that the officers and noncommissioned officers who are fortunate enough to be assigned to duty as students from the Regular Army, the National Guard and the Organized Reserves, are privileged to see and train with companies and battalions of Infantry of the size and composition they would handle in time of war.

#### INEFFECTIVENESS FOR COMBAT SERVICE

One of the most important elements of the mobile forces of the national defense plan, the Air Service, is now in that critical stage of development in our country, when failure to progress will seriously, if not decisively, imperil the safety of the country.

In comparison with foreign nations, it is manifest that our Air Service, which has been reduced to 8,750 enlisted, has been placed under serious handicaps by the lack of personnel. It has been necessary to reduce the Air Service to a dangerously low point in the overseas possessions, to eliminate all Air Service units operating with the coast defenses to provide air observation for the Coast Artillery; to reduce the tactical combat units to only one of each kind, viz., one pursuit group, one bombardment group, one attack group; to curtail materially the personnel at all Air Service schools; and to cut the observation squadrons assigned to work with Infantry divisions to 55 per cent of active service requirements.

By the most economical distribution possible we have been forced, in the face of strenuous and persistent opposition on the part of the people locally, to reduce many of our coast defense stations to small caretaking detachments, relying on organized units of Coast Artillery National Guard to man the batteries in case of war.

To be effective, the Regular Army must be properly organized and must comprise all of the arms, including air service, and other special troops, necessary to constitute an efficient and balanced fighting force. To be quickly available for domestic use, this force must be suitably distributed to cover the three million square miles of the United States. Successive reductions in appropriations have forced reductions both in the numbers of important combat units, and in the strength of the remaining units to an extent that has resulted not only in an imperfectly balanced fighting force, but one below effective strength for any combat purpose.

#### TRAINING DUTIES OF REGULAR ARMY

The present restricted enlisted strength of the Regular Army not only prevents the organization of an effective combat force, but precludes the possibility of providing active units in sufficient peace strength to insure the complete practical training of the commissioned personnel.

It is generally recognized that the primary function of the Regular Army, as defined in the Act of June 4, 1920, is to lead in the development and training of the National Guard and Organized Reserves. Accordingly, it is all the more essential that the Regular Army endeavor to employ its organizations so that a sufficient number of units of all arms will be available to furnish an opportunity for the commissioned personnel to acquire the practical training with troops that will make it an expert personnel. Otherwise the

time would soon come when Regular officers will be only partly trained, and in consequence unacceptable as instructors and advisers for the civilian components.

Now what is wanted for the Regular Army? The War Department has asked repeatedly for a force of 13,000 officers and 150,000 enlisted men, and in addition the officers and men necessary for the increase of the Air Service. With this force—very small as compared to the armies of other great powers—the Regular Army will be enabled to furnish the necessary protection for the Panama Canal, Hawaii, Philippine Islands and other foreign possessions, to maintain three complete Infantry divisions and one complete Cavalry division within the continental limits of the United States, to provide sufficient personnel for the proper training and administration of the citizen components, and to be able to give a reasonable protection of our coast line.

#### THE NATIONAL GUARD

The National Guard, too, has been having its troubles because of lack of appropriations. According to the program specified by Congress in the National Defense Act the strength of the National Guard should now be over 400,000. It is less than half of that, about 177,000.

Official requests have been made for a gradual increase of the National Guard, extending over a period of several years, for an ultimate objective of 250,000 men, but little heed was taken of them.

Reduced appropriations prevented the Federal recognition of many newly organized units, which meant that not only was the development of the National Guard stopped, but in addition a portion of the work already accomplished was undone.

The program for the National Guard consists of individual training during the armory period, supplemented with target practice where local facilities exist, in preparation for the field training period of fifteen days, during which target practice is to be completed and tactical problems for small units conducted. Reduced appropriations forced the National Guard to reduce its activities of training and hindered its development so that it will be handicapped when called upon to take its assigned place in the line of defense at the outbreak of war.

#### THE ORGANIZED RESERVES

The Organized Reserves consist of the Officers' Reserve Corps and the Enlisted Reserve Corps. The Reserve officers are our main dependence for building an army for a major effort in an emergency.

The requirement of Reserve officers totals approximately 150,000. There are now on the rolls about 91,000. This means nothing, though, unless these officers can be given some small amount of training to keep them in touch with their military duties. It has been conservatively estimated that the strength of the O. R. C. in peace time can be stabilized at 75,000 if the means of training and maintaining their interest can be provided. For the past two years the appropriations permitted of giving fifteen days' training to about 15,000 annually, but to keep the interest of these Reserve officers at least one-third of the total number should be afforded training annually, either in camps in summer, with Regular Army units during the year or in our service schools. If the funds were made available for payment of salaries, mileage and incidental expenses, with present facilities a larger number could be given this short training course annually.

As to the enlisted reservists, these will also naturally require some training. This feature is not yet developed, however. The enlisted reservists now number but 3,500. Eventually this force should reach 100,000. Its cost of maintenance will be nominal; its value to the country will be incalculable.

Appropriations adequate for training a lesser number of the Organized Reserves than provided for this year will not only arrest development but will imperil the entire Reserve project. As the officers with World War experience become nonavailable for actual service in an emergency by reason of physical defects, increased age or casualties, it becomes more necessary that provision for training of personnel be made. Within five years the casualties among World War veterans will make a serious impress on the character of the Reserve officer personnel, and therefore it is important that gradual progress should be made toward the objective. An appearance of nonsupport by the government, as evidenced by inadequate appropriations naturally brings discouragement to the Reserve personnel, which at the present time represents the flower of our manhood.

What is desired and needed for the Officers' Reserve Corps are sufficient funds to permit training for fifteen days each year, one-third of the officers therein; and for the Enlisted Reserve Corps, funds to permit the gradual development of this body to a force of 100,000 members.

#### THE R. O. T. C. AND THE C. M. T. C.

As part of the National Defense project there is injected a method of replacing in the Organized Reserve those officers who

leave that body by deaths, resignations, and retirements. The plan is to train young men for these positions in the various schools of the country by imparting military instruction at the same time that they are acquiring their academic education. These bodies in the various so-called military schools constitute the Reserve Officers' Training Corps.

The government assists materially in this training process by making provision for equipment, clothing, and also pay for such boys while in the annual summer camps and by furnishing officers and noncommissioned officers of the Regular Army for duty as instructors. A graduate receives a Reserve commission and is normally assigned to a Reserve unit in his own locality. He becomes a part of the Army of the United States.

Lack of funds has prohibited the full development of this plan. Many schools are asking for this assistance and it cannot be given. Yet the life and effectiveness of our entire reserve system and citizen army depends on the R. O. T. C.

The present annual output is about 4,000 officers. Conservatively, 6,000 are needed to meet the yearly requirements.

The Civilian Military Training Camps have become a part of our military system. At these camps is imparted military instruction to the young men of the country who are not so fortunate as to receive this instruction while attending schools or colleges. These camps are extremely popular. They furnish a means for voluntary training in lieu of a system of universal training.

In another sense this plan involves physical betterment of the youth of our country. The experience of the World War proved to us that our population included a surprisingly great percentage of physical defectives. Many of these defectives were cases that could easily have been prevented or cured by a systematic plan for physical exercise and development. The present plan contemplates giving training to as many young men as possible and it is believed that their physical improvement will prove a great gain not only through the direct results, but indirectly as providing a stimulus to the general undertaking of physical training. The advantage to our population would alone seem to justify the expense of military training for young men.

In the summer of 1924 over 33,000, and in 1925, 35,000 young men at an average age of nineteen years, attended the camps. The number was limited only by the available appropriations. Applications for the camps the past summer reached over 50,000.

It is essential that this activity be allowed to take its natural growth until it reaches between 50,000 and 100,000 to be trained

each summer. These camps are now and should be perpetuated as a national institution of great value. They are the greatest schools in the country for the development of good citizenship and the manly virtues.

#### AS A BUSINESS PROPOSITION

In one sense this national defense plan is purely a business proposition. It is a national insurance policy in which by the judicious annual expenditure of a comparatively small sum the nation is guaranteed protection not only against heavy financial losses to itself and personal injuries and disabilities to its nationals, but it goes further and guarantees protection against death itself to thousands who otherwise would be called upon to make the supreme sacrifice. It is very cheap insurance. It carries an extremely low premium for the risks covered.

There is a point in all business enterprises below which maintenance personnel and maintenance costs can not fall without injury to the safety of the enterprise, a point which marks the dividing line between success and failure. Our experience of the past year indicates clearly that we have reached that point in our national defense enterprise. Twelve thousand commissioned officers of the Regular Army are not sufficient to perform the duties with which they are charged by law and custom. One hundred and twenty-five thousand enlisted men are not sufficient to fulfill the missions assigned the Regular Army.

The status of the components of the Army of the United States as to size, distribution and activities should, under no circumstances, be permitted to fall below the present level. More than that, the financial situation of the government makes it reasonable that we should revert to a steady and uniform plan of development of the defense project as contained in the National Defense Act.

It would, on the face of it, seem to be a wise measure of economy to spend a little more to get an adequate result rather than rest content with a result which is now shown to be clearly inadequate.

Satisfactory progress has generally been made in putting into effect the plans for developing the National Guard, and Organized Reserves, and for fostering the R. O. T. C. and C. M. T. C.; but it must be appreciated that the success of this policy is dependent upon the attitude of the public and the support that will be afforded by Congress. The untiring efforts of the limited number of officers of the Regular Army alone engaged in this work will not be sufficient to insure success. The World War veterans who are now

contributing the greatest influence will, in time, disappear and unless the public be brought to realize that military service is one of the obligations of citizenship, and that military organization and training, prior to the call to arms, are essential to national defense, we shall not succeed with the organization adopted.

The effects of the continually reduced appropriations upon the combat branches of the Army, based upon the experience of the past four years, threatens to wreck the entire scheme of national defense. Every enforced curtailment made in the plans for the development of the Army of the United States tends to tear down what has already been carefully built up at great expense of time and money and seriously imperils the whole structure of national defense upon which the Nation must depend for its continued existence.

**One of our first duties is military training. The opportunity hereafter for the youth of the nation to receive instruction in the science of national defense should be universal. The great problem which our present experience has brought is the development of man power.—President Coolidge, at Boston, November 2, 1918. --- --- ---**

# Antiaircraft Firing

By 1ST LIEUT. C. E. BRAND, 11th C. A.

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## *First Prize Target Practice Essay Competition*

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THIS target practice was of particular interest in that it was approached without that intuitive guidance which has apparently attended much of our antiaircraft development, but simply in the light of another artillery problem. The guns being fixed mounts and the officers coast artillerymen, the concrete foundation was accepted and built upon without a qualm.

The mission adopted was to train the battery to fire upon aerial targets with the same relative accuracy and rapidity that characterized our service of coast artillery proper.

We were equipped with the 3-inch antiaircraft gun, model of 1917, on the fixed mount. The range instruments included the standard altimeters, the antiaircraft telescope (wind computer), and the R. A. Corrector.

In the early stages of training it was observed that there were certain rather essential requisites not explicitly covered by the training pamphlets available. The range section needed, in the first place, a target to track in drill. The gun sections shared this need. The gun sections also needed fuses to cut in drill, the process of simulating the fuse cutting with a smooth pointed drill cartridge being painfully unlike the actual process of cutting a fuse.

— This latter problem was attacked by having the ordnance machinist unload some service fuses and fit them on the points of the drill cartridges. These fuses could actually be cut to any desired setting. There was next discovered the utter futility of attempting to cut fuses for antiaircraft fire with the hand fuse setters with which the battery was equipped on account of the prohibitive amount of time required for one man to set the fuse setter and then cut the fuse for each shot. This was corrected by procuring bracket fuse setters, the hand fuse setters being temporarily mounted as such until the latter arrived. Fuse cutting and loading drill now went forward smoothly for about one day when

it was further discovered that the service fuses, which had been designed to be cut once or perhaps twice, would not stand the wear and tear of being cut repeatedly for hours of drill, the lugs becoming so badly bent and deformed after the first few hours that the fuses could not be properly cut. The ordnance machinist connected this by equipping the drill fuses with larger (thicker), tougher lugs which would stand the stress of repeated use. Thereafter the fuse was always actually and accurately cut in drill, the setting being checked after each round had been unloaded.

Targets were provided for gun and range sections by constructing miniature aerial ranges. Some high trees and telephone poles in the vicinity of the battery supplied the chief requisites for these ranges, wires being strung from one to another of these, and the miniature targets, constructed to a scale relative to the distances used, made to ride on these wires on small pulleys, propelled by a stout cord passing over other pulleys at the ends of its course and wound on a windlass at the end from which operated. The difficulty encountered in the operation of these ranges was the matter of causing the target to move at a *uniform* speed. This was solved by using a windlass with a very small drum and a quite long handle. The operator could then by counting the quarter-turns of his handle at a slow monotonous rate move the target at a rate which would give fairly constant or constantly increasing or decreasing readings on the goniometers of the R. A. Corrector—approximately the usual fluctuations in the angular speed of a plane in flight.

The altimeters were set up at such a distance apart as to give convenient readings for drill—the correct distance relative to the scale of reduction of the entire range, as a fact. That is, if the actual altitude of the miniature target varied from 20 to 30 feet and it was desired to have this represent altitudes of from 2000 to 3000 yards it was necessary to set the baseline length on the B' altimeter the actual baseline length *in feet*. (i. e. scale of reduction = 1 foot/100 yards). If it were desired that this same target represent altitudes of from 4000 to 6000 yards, the baseline length was set in half feet (i. e., scale of reduction =  $\frac{1}{2}$  foot/100 yards), and so on. The tracking of these targets provided drill in all essential respects identical with the tracking of an actual airplane. This drill had the advantage that the targets were always available and flew at whatever speed or variations in speed that might be desired.

At times gun drill was held for the benefit of the gun pointers and the traversing and elevating details in which a small bullseye target was suspended in place of the miniature airplane and actual firing conducted upon it with subcaliber ammunition (.30 caliber).

This proved to be of very great value in causing these numbers to acquire real facility in the operation of the guns.

Real he-men of around 200 pounds avoirdupois were selected as loaders; for this is a real man's job. This procedure had the disadvantage of being rather hard on the rims of the drill cartridges, but it gave the drill a snap like a whip and the sections an unbounded confidence in their ability to manipulate the guns.

While snap and precision characterized the gun section drill, smoothness and regularity were worked for in the range section. A sense of rhythm was developed in the fuse range reader in order that it might be imparted to the firing of the guns at the regular 4-second intervals, in this manner insuring that the same dead time was realized, as allowed for, on every shot. Since the goniometers click half-seconds this was readily done by requiring the fuse range reader to count to himself six clicks and send out his reading on the seventh and eighth clicks, thus (one, two, three, four, five, six)—*six—three*; (one, two, three, four, five, six)—*seven—flat*; (one, two, three, four, five, six)—*seven—one*; etc., the italicised numbers (which are the only ones he calls aloud) in each case being a fuse range in seconds and fifths ( $6 \frac{3}{5}$ ;  $7$ ;  $7 \frac{1}{5}$ ; etc.).

The smoothness and smartness of the drill were soon all that could be reasonably desired. It is really remarkable how quickly an anti-aircraft battery may become trained to a creditably high state of proficiency. And the miniature range facilities of this battery, both for tracking and for subcaliber firing, and the actual fuse cutting practiced in daily drill added a great amount to the certainty of the state of training reached as well as to the speed and facility with which the training was acquired.

But the question now arose: how about the *accuracy*? That question is easily and positively answered in the Coast Artillery proper—*Records!* The same answer was naturally suggested in this case. "But — blankety blank!", says someone, "Records are just what we want to get away from—and do some shooting!"

Bravely said! And after the shooting we might exclaim "So much fun! So much powder burned up!!—not to mention the noise!" Do we mean to imply that records are a *hindrance*?—a special kind of handicap which regulations have seen fit to impose upon us? No one who has ever trained a coast artillery battery to do really accurate work has any doubt whatever that it is through the records which form the basis of the daily analysis of drill that real accuracy is acquired—though the elimination of errors. And the records which a man keeps have the steadying effect of a flywheel on his functioning as a part of the battery machine.

It will not appear surprising, then, that a complete set of records was devised for this battery; to cover *everything*, so that the whole drill might later be checked through in detail, and to cause no delay whatever in the transmission and use of the firing data computed. For example, the B'' altimeter reader simply recorded each angle which he called off, as he called it. The B' altimeter was furnished an extra recorder who recorded the angle repeated by the B' reader to the B'' reader, the corresponding altitude which the B' reader called off, and the angle indicated on the B' plate at the instant the altitude was read. It was then possible, in analyzing the drill, to check the angle called off by B' against the angle recorded by B'' as having been read by him; to set the B' plate at an angle at which it had been set when the altitude was read, and then by carefully setting the pointer on the curve indicating the B'' angle, to check that altitude read upon the altitude scale. This was done immediately after the drill after verifying but not changing in any way the orientation of the B' plate, including the base line setting. This analysis showed exactly the degree of accuracy which had been realized in the work of the altimeter sections in computing the altitude. Even the pointing of the observers' telescopes could be checked for consistency on the course of the miniature target by drawing it again along its course and pointing the telescopes carefully upon it at different positions.

The same thoroughness of check of the work of the R. A. Cor-rector was possible through the use of two extra recorders: one for the fuse ranges read and the altitudes set, the other for the settings of the dead time and complementary term cylinders and the correction settings on the goniometers. All other data on the R. A. Cor-rector could be recorded by its regular operators without interfering with their duties. The necessary records will be obvious to anyone familiar with this instrument, and will not be gone over in detail here.

Three recorders were required for each gun to check the data set on the gun and the fuse setter. A check sheet was drawn up containing all the data and upon which, at any time later, the individual records might be checked from one to another to show errors in transmission and net errors.

In the matter of synchronizing the several records there was necessarily some difference from the standard artillery usage because of the lack of T. I. bells. Fuse ranges were read regularly every four seconds. But other data were read only so often as there were changes, or at quite irregular intervals. The plan adopted was

to synchronize records by making a check mark, in a convenient column provided upon each record form, for each volley fired. By this means it was an easy matter to fit the records together.

In this connection it will be noted that volleys are not planned as such, but simply work out that way just as the bows of a symphony orchestra move in unison—i. e., through each being so meticulously correct. In order that a uniform dead time be observed it is necessary for the fuse to be cut and the gun fired immediately after each fuse range has been called off. The reading of the fuse range is then the "Ready,—Go!" signal for each gun to begin cutting fuse, loading, and firing. The process will be finished by well drilled sections in very approximately the same time so that a volley results. When the guns were not actually firing the checks were made on the records when "Fire!" was called out at the guns, which was done in a loud voice.

In connection with the drill on airplane targets, at a convenient time before any service firing was undertaken a plane from the local flying field was procured to fly altitude checking courses. A plane with an accurate barograph or altimeter, calibrated for the level of our base line, flew constant altitude courses, first at 3000 yards, then at 2000 yards, and finally at 1000 yards. Each course was tracked carefully and with complete records so that thereafter the baseline adjustment could be made to cause the computed altitudes to check with the actual altitudes at which the plane flew. For a baseline which is difficult to measure this is a very ready and effective means of determining it if a plane with an accurate barograph or altimeter is available. It is a check worth while for any baseline.

Firing a well trained battery is simply a repetition of the daily drill. This battery was no exception to that rule. The trial shot method of fire adjustment was used, a trajectory chart with a fine thread pivoted at its origin and a very direct and abbreviated variation of the prescribed form for the formal solution of the trial shot problem supplying the necessary corrections to be applied within some three to five minutes at most after the last shot was fired. The velocity and direction of the wind at several altitudes, including that of the trial shots, were taken by tracking bursts with the speed computer. In this manner the ballistic wind and trial shot data were computed within ten minutes immediately preceding the firing.

At the conclusion of this firing it was possible to say not only that so many hits per gun per minute were secured—a matter of chance in any case for a small number of rounds fired—but also that

*no personnel errors were made*, which is a matter of capital importance.

Some principal features of the training and firing of this battery:

*Based upon Coast Artillery Experience;*

*Use of dummy fuses which could be set; drill in fuse cutting;*

*Miniature aerial range for drill;*

*Subcaliber aerial range;*

*Records, and analysis of drill;*

*Use of trajectory chart and abbreviated trial shot problem;*

*Use of speed computer and bursts to determine ballistic wind;*

*Altimetric check of baseline.*

No nation, however desirous of peace, can hope to escape occasional collisions with other powers, and the soundest dictates of policy require that we should place ourselves in a position to assert our rights if a resort to force should ever become necessary. \* \* \* We shall more certainly preserve peace when it is well understood that we are prepared for war.—*Andrew Jackson, Message to Congress, March 4, 1837.*

# Notes on Public Speaking

*By* LIEUT. COLONEL W. H. WILSON, C. A. C.

**P**RIOR to the World War it was an accepted fact that the Army officer was not a public speaker. Many officers sought—and still seek—refuge behind this tradition. Since the war, this treasured myth has been examined, tested, found unfit for further service, and has been duly retired.

It is quite evident that a person trained to be a leader of men must have worth while knowledge on many subjects; it follows therefore that, knowing what to say, there remains but to learn how to say it to produce the real public speaker. The adjective “real” is used advisedly because it is desired to differentiate between the two men who can speak in public—the “real” speaker who says something and the wind-bag who succeeds in saying nothing.

Henry Howard Roberts, in his *Public Speaker*, says in part, “As a public speaker you should have perfect command of thought, of word, and of utterance; you must have ideas and emotions which you desire to express; you must have the power to choose the best words with which to clothe these ideas and emotions; and you must possess the ability to utter those words in the manner that will convey your ideas and emotions the most effectively to the minds of your hearers.” Mr. Roberts might have added, “and then you sit down.”

Mankind today, to a great extent, is civilized and lives in somewhat highly organized communities where the exchange of ideas is essential to progress and preservation. The human being possesses the powers of reason and speech, and upon the intelligent use of these priceless gifts depends the future of the race. It is our duty as members of these communities to be prepared to take up our share of the work, and to do this best we must be trained to express our thoughts and ideas clearly and logically whenever and wherever we may be called upon to do so—and sometimes when the invitation is lacking.

Thoughts and ideas, good and bad, come as the result of concentration and observation, assisted by the imagination. Concentration is necessary to secure coordinated ideas worthy of expression, and the keen observer with a fertile imagination is already well equipped for the mental struggle before him when he attempts or

undertakes to secure the ability to concentrate on the work in hand. A few men sometime fall short of success by permitting themselves to dwell too much upon non-essential details; thereby leaving the highway for the byway and becoming lost or at least delayed; they seldom reach a decision. The ability to concentrate and to observe may be acquired or improved to a remarkable degree by practice, and persons desiring to become public speakers should develop these qualities to the maximum. One does not always speak upon subjects of one's own choice, and therefore the ability to study and analyse an unknown or hitherto disagreeable subject depends largely upon one's power of concentration.

Mr. Roberts says in his book:

Language is the medium by which thoughts and ideas are expressed. It is clear then that if you wish your ideas and thoughts to be expressed accurately and completely your language must be well chosen so that there can be no doubt in the minds of your hearers of what you really mean. You will not be slow to understand that your thoughts may be expressed grammatically and yet not completely or even accurately.

The power and use of words involve clearness, precision, propriety, brevity, simplicity, and euphony of expression. We frequently use words and synonyms without knowing their exact meanings; this is not good practice, and constant reference to a standard dictionary is necessary to enable us to employ not only such words as will express exactly what we intend but also in such manner that there will be no doubt that our hearers will grasp the meaning we wish to convey whether they will or not. This requires diligent practice to accomplish, but it is necessary if our efforts are to be crowned with success.

Clearness is essential to a proper and full understanding of what is intended, and obviously the selection of those words that will convey the thought in a precise and concise manner is the only way this may be accomplished. Words that are appropriate, simple, and short are to be preferred over those which are unusual or "flowery." The sentences, as finally written or spoken should be euphonic and free from tautology; and it requires great care to avoid the repetition of sound even when different words are used. Language that is suitable for one audience may be entirely out of place before another, even when the subject is the same; this teaches us to dress our thoughts in simple, plain, and yet forceful words that will insure understanding whatever might be the character of our hearers.

The vocabulary of the average man is limited and is usually influenced by his occupation and environment. We should enlarge and improve our command of language by intelligent reading, fre-

quent and regular recourse to a standard dictionary, and by conversation with prominent and recognized scholars in the community. The successful public speaker will not only have a good command of standard English but will, from time to time, enlarge his store of vocational and colloquial terms. An understanding of slang is desirable although its use by a public speaker is very infrequent and, like humor, dangerous except in small doses and upon those occasions recognizable only by the seasoned orator.

Ordinarily the subject of one's speech is of his own choice; but it sometimes happens that the subject of the talk is assigned. In the latter case, the topic may or may not be entirely acceptable to the speaker; it may be a new and unfamiliar subject or it may be one that is disagreeable or distasteful. In the last case a real effort is required to put the speaker in a proper mental attitude to enable him to prepare his speech—and to deliver it.

Regardless of the manner in which the topic of the speech was decided upon, the first problem confronting the speaker is his estimate of the situation. The factors entering into this study are the mission to be accomplished, the psychology of the situation, involving the best means of approaching the audience—whether by direct or indirect attack or appeal.

There are no rules to guide us in this first step; we must rely upon our judgment and common sense, and, in so doing, the average educated men can not go far astray. The decision made and the method of approach or attack determined upon, the speaker is ready to undertake the preparation of his address. The mental processes of man differ widely, but, in general, it may be stated that the steps required at this time are: first, a full and careful analysis and study of the subject to resolve it into its principal parts; second, the collection and collation of all available pertinent data; third, the arrangement and study of these data; fourth, the rearrangement of all data to show facts and opinions in a logical manner; fifth, to proceed to the preparation of the manuscript or notes to secure clearness, force, and brevity; and finally,—a step sometimes omitted to the ultimate embarrassment of the speaker—the examination of the completed work in anticipation of possible questions and the preparation of answers or replies to the same. It should not be possible to heckle or confuse a speaker who has prepared *himself* in the manner outlined above.

Whether one writes out his speech in full or merely outlines it, remember that the application of the principles of logic are necessary to a thorough understanding and presentation of any subject. These principles enable us to analyze and study important facts and

opinions, to test their correctness, to discover their weaknesses, and to build up arguments that are not only sound, but so clearly stated that misunderstanding is eliminated or at least minimized. Errors in reasoning—fallacies—may occur at any step; we may misinterpret our perceptions or classify things wrongly or work out bad definitions or confuse ideas or draw invalid conclusions from premises. The risk of misjudgment is constantly present, and we must therefore be always on the alert. If one will study and prepare oneself to apply the elementary rules of the syllogism he should have little difficulty in building sound arguments or analysing those of others. These rules are very well set forth and explained on pages 117-126, of Mr. Robert's book, "The Public Speaker." Remember, however, that the syllogism is only a part of the process of reasoning. The impromptu speaker is as rare as he is envied, and often is not as extemporaneous as appears at first sight.

After-dinner speaking is different from the formal classification of oratory above considered, and, although susceptible to similar rules and treatment, it emphasizes the qualities of ingratiating and pleasing humor. The subjects on these occasions are of lighter vein because the guests desire amusement rather than knowledge or enlightenment after a hearty meal. Careful and considerate study is therefore important.

Following the preparation of the address is its presentation. The usual sub-divisions are: First, appearance; second, utterance; third, delivery; and last, feeling. Appearance includes dress and mannerisms, and any exaggeration in either detracts from the speech—dress well but quietly and be natural in your pose and gestures. Good utterance requires diligent practice in articulation, enunciation, accentuation, and pronunciation. In the delivery, pitch, inflection and modulation of the voice should be accommodated to the size of the audience and to the acoustic conditions; do not speak too rapidly or too loudly—talk to the back row. With practice, your delivery will improve as you learn how and when to emphasize, to pause, and to gesture. Make your delivery without notes if possible, or if you must refer to notes do so quietly; never read a speech or repeat one from memory. Experience has taught us that to be effective the orator must be sincere, serious, and sympathetic; humor, as well as irony, has its place, but each should be used sparingly and in good taste, and not at all by the novice. Do not seek applause, nor let its absence annoy or distract you; it will come, if deserved, whether you will or not.

There are a number of errors and faults commonly associated with the young public speaker, and although it is not my intention

to point them out at this time, I must mention one which should be studiously avoided by all public speakers, and that is apologizing for one's speech. The audience will soon find out whether you can speak—there is no need to tell them—and it is indeed difficult to think of an occasion which would justify an apology on the part of the speaker.

Senator Beveridge, in his excellent little book entitled "The Art of Public Speaking," gives two summaries, both of which are apropos and well worthy of consideration.

(a) Matter:

Speak only when you have something to say.

Speak only what you believe to be true.

Prepare thoroughly; be clear; stick to your subject; be fair; be brief.

(b) Delivery:

Speak quietly and naturally.

Be serene and never pompous.

Enunciate distinctly.

Control emotion, never get excited.

Dress well, neither negligently nor with ostentation.

Suppress craving for applause; stop when you are through.

**We are not a military nation. Our Army is so small as to present an almost absurd contrast to our size, and is properly treated as little more than a nucleus for organization in case of serious war. Yet we are a rich Nation, and undefended wealth invites aggression. — Theodore Roosevelt, Message to Congress, April 4, 1908.**

# ANIMADVERSIONS OF WARRE;

OR,

A. MILITARIE MAGAZINE OF  
THE TRVEST RVLES, AND ABLEST  
INSTRVCTIONS, FOR THE MA-  
NAGING OF WARRE.

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Choice Experiments that these late *Netherlandish*, and  
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Sundry Collections taken out of the most approved Authors, ancient  
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*English.*

In two Bookes.

By ROBERT WARD, Gentleman and Comrander

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L I P S. Pol. Lib. 5.

*Nunquam bonos fortisq; milites habebis, nisi haec duo, velut instrumenta adhibeas,  
delectum & disciplinam.*

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LONDON,

Printed by *Iohn Dawson*, and are to be sold by *Francis Eglesfield*  
at the signe of the Marigold in *Pauls Church-yard*. 1639.



# HOW TO PROVIDE IN PEACE FOR WARRE.

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## S E C T. II.

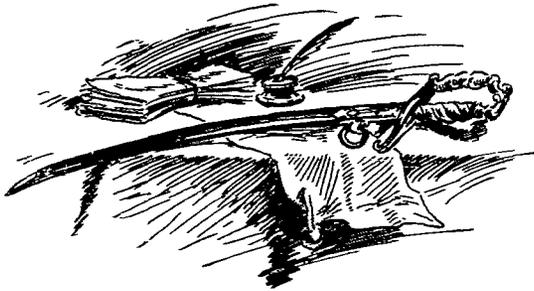
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### CHAP. VI.

*It is good in time of Peace, to provide for Warre.*

*HE that will goe to Sea, must before-hand provide himselfe of Bisket; and that Kingdome that cannot avoyd Warre, must before hand be provided of meanes to withstand it: for nothing can be more unseasonable, than to be about provision, at such time as we should be in action. A wise State (like HANIBALL) will in prosperitie provide for adversitie, as well as in adversitie, hope for prosperitie; if they doe otherwise, peradventure they may have their heads broken, before they betake themselves to their bucklers: As may appeare, by the example of KATHERINE Queene of Navarre, and JOHN of Albert her Husband; whose want of timely preparation, gave occasion to FERDINAND the Catholike King, not only to invade their Kingdoms, but also after invasion, easily to subdue it. Had this Queene and her husband, beene in time provided, FERDINAND would eyther have desisted from enterprising any thing against them, or else he would have capitulated with them concerning a peace, in which they might have had the better conditions, being provided for warre: for the best treating for peace, is with the sword in hand. Or if he would have beene so hardy, as to have given them battell, they being provided, sure might have expected farre better successe than they found: but they were found unfurnished, and that was the losse of their Kingdome. And the same, may be the losse of any other. For how hard and difficult will it be, for any Nation, to resist an Enemie invading, if they prevent not his arrivall by their provisions. People are discouraged, by the suddainnesse of danger, and rather studie how by flight to shift for their particular safetie, than by making head, to preserue their Countrie from the Enemie.*

But, if any be so vertuously minded as to make resistance, how difficult will it be for them to draw together, in such a Kingdome as ours, where we have no fortified Townes, to hold the enemy play? The enemy shall no sooner heare of any assembly, but presently he will be upon them with his horse, to sever them before they can be able to make head against him: unlesse they will flye to the utmost limits of the Kingdome, there to make up an Army in haste; suffering in the meane time, the Enemy to enrich himselfe with the spoyle of the Country; and when such an Armie is composed, what good can be expected from it, seeing it must needs consist of raw, and untrained people, hastily gathered together, and altogether unskilfull in the use of Armes? When CÆSAR came against POMPEY the Great into Italy, POMPEY and the Senate, being unable to make resistance for want of timely provision; they were glad to forsake, not onely the other parts of Italy, but Rome itselfe, and flye into Greece, before they could draw any competent numbers together, to give the Enemy Battell. Let POMPEYS carelesness be condemned, and let wise Estates imitate AUGUSTUS CÆSAR; who at the first brute of ANTHONIES stirring, provided himselfe, and crossed over from Brundisium, to give Warre the meeting; thinking it more safe so to doe, than to receive it within the limits and borders of his owne Italy: By these precedent relations, I hope any man may see; THAT IT IS GOOD IN TIME OF PEACE, TO PROVIDE FOR WARRE.



# Antiaircraft

By MAJ. C. G. METTLER, *Ord. Dept.*

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SITTING here in the Ordnance Department, where we pass on guns and ammunition for both the aircraft and the antiaircraft forces, it is impossible to enter the literary arguments of the press concerning their effective power on one side without disregarding a pile of papers in the "In" basket which support the other. As we see our job, we must pass the most effective designs for procurement to each service and let them shoot it out for better, for worse. However, we have our own opinions on both sides and expect to express hereafter our desk opinion of the antiaircraft problem.

Let us look for a moment at this task from the standpoint of the hunter. What kind of a bird shall we load for? What dogs shall we take? So far as we have noted and so far as antiaircraft is concerned, this bird, the airman, is not flushed from a clump of bushes as we steal upon his cover, guided by sharp-nosed setters. He does not circle down to swim among a flock of decoys before our well camouflaged shooting box. He is rather an eagle or a hawk coming from a far off, protected nest, sailing high in the atmosphere, with a definite mission to destroy his enemies and sustain his friends. Can we here on the ground, protecting from his hungry talons the chickens we have raised with so much care through the damp spring days, divert him from his purpose? Can we make those pretty wings fail to suspend him in his chosen element and see him tumble end over end into the clover field, a sinister trophy to be hung aloft as a warning to his brethren? Again he is an owl flying high in the darkness, knowing from the reflected starlight in the streams and lakes how to find his way, and he swoops at the proper moment swiftly, surely down upon our guarded treasure, strikes and is away. Can we see him to aim our weapon, fire it to frighten or to destroy, or even blind him with our candle power? 'Tis true, he is still a noisy bird, telling the high heavens and all beneath that he is in the air, but he will learn to be more silent. And he is fast. Sometimes, three miles per minute, over two hundred and sixty feet per second, is his terrific speed. Sound travels only one thousand feet per second. If he be a mile away, five seconds must pass before we hear his humming

drone at any point. And when we hear it, he is not there, but a quarter mile ahead.

Even with our best guns and gunnery, he may make us stand armed at the hennery day and night by his very presence in the sky. He may hide behind clouds to await his chance, may even fly low across the fields behind the woodlands and hills, yet when his chance comes, when our eyes are weary, he may mount high and come upon an unobstructed, straight-line path direct to his destination.



ROCK ISLAND ARSENAL

*Note the bridges, power dam, shops, and storehouses of an important Government plant which may require antiaircraft defense in time of war. The target is beautifully outlined by water, easy to identify, and readily put out of action by bombing*

But even with his swiftness and cunning, if we merely stand on guard, however gun shy and fearful, we are to him a potential menace. If he comes at all before our scarecrow presence, he comes nervously, casting one eye in our direction and with his other getting one-eyed results from his journey. If we fight with vigor and confidence and scatter shell fragments and shrapnel balls about his rigging, his mind and hands forget their mission in the fear of annihilation and turn him upward and away.

Suppose we have only a little flock to care for, it may be concealed from his observation; but chickens, like soldiers, are very hard to keep under cover. And besides, the chicken stealer has other sources of information than his sight alone. He comes more often

with an exact knowledge of the location of our hennery, notes its condition and protection each time he passes overhead, and in his own time gets what he may from its contents.

On the other hand, confident of our marksmanship, we may expose our flock to tempt the flyer within our gun range, hiding ourselves and arms along his line of descent. With good fortune and enough trickery, we might some day nail his propellers on the hennery.

When one thinks of it broadly, there is a lot of individuality to such game hunting, just as we find individuality in the duck or partridge. I have seen many game birds fly directly behind a tree all the dangerous part of their escaping flight. I am sure they must have figured out this cunning safety code. Some have flown along a curved path until beyond my range, have dropped and risen, turned and twisted, changed their speeds. Just so, some aviators are born dodgers in the air, think quickly, dive for shrapnel bursts, turn and flatten off at the right time to avoid defeat and disaster. Others, less brilliant, come sailing directly, unhesitatingly into the field of fire and through it, often emerging, by reason of good fortune, not good judgment, without a scratch upon their fuselage. Really, it's a great game, if our heart's tenderness will permit us in these quiet hours of peace to think of it in such a light. When bombs fall on our churches, our factories and homes, killing our friends and kin, we shall have worse thoughts than these. It will be too late then to learn hawk hunting.

Let us drop the hunter for the moment and ride with the military aviators over the fields and cities of our enemy, over his marching armies and the trench lines of the battlefields on a trip of exploration to discover what he may find to attack. Perhaps here we may learn how we may defend our country and army against the hostile airman.

Below are machine shops turning out shell and shrapnel for the hostile guns. Beyond are magazines, indicated by spreading railroad tracks, storing his explosives and ammunition. There are his wharves, receiving from laden ships his overseas support. They are all fine targets for a bomb or two.

Turning to the open country, we see his supply trains running from the bases and depots to the railheads across viaducts and light bridges whose destruction would delay him many days along the battle line. Beyond the railheads are crawling solid lines of trucks onward to the distributing centers near the battle lines. Turning over a few trucks with a bomb on the highway would give him hours of trouble.

Back of the lines are bivouacked the tired troops recovering their strength and spirits for new efforts on the line. Our machine guns might strain their shattered nerves beyond the breaking point. On beyond there are marching columns of artillery and cavalry, whose horses might be frightened or destroyed with well-placed fire or some fragmentation bombs. On the lines are groups of men, hidden behind obstacles awaiting the signal to advance. Breaking their formation would delay their attack. Here are lines of men



*A familiar sight behind the firing line—easily and disastrously damageable by aircraft bombers*

going forward to the attack, supported by the fire of their field batteries. How would their courage stand a swooping attack with our machine guns along their backs? How would their batteries sustain them with barrage if we attack their positions with bombs and gun fire? We find infantry, cavalry, and artillery on the march easy targets for machine-gun fire unless they are prepared to resist our attack.

Let us go home from this reconnaissance to think over the protection of our own ground troops from the attacks we might have made.

First and foremost, we must consider our own air forces. They must prevent the enemy from coming over, or, finding him already over, must drive him back or bring him down. That is the desirable

thing. But the air is so big. The radius of planes and ships is so large. No nation could build ships and train men to fill the air. Ships grouped for fighting must leave some places unprotected. Should we not concentrate our aircraft for attack instead of dividing it for defense over wide areas? If so, we must defend locally the individual units, the lines of communication, the dumps, railheads, storehouses, magazines, factories, wharves, and cities. This is the function of anti-aircraft armament and troops. It has been done and it must be done again!



WASHINGTON, D. C.

*Anti-aircraft defense should be arranged for the adequate protection of the central offices of our Government*

Perhaps the greatest and most effective defense ever carried out against aircraft was the defense of Paris during the World War, especially during the latter part of it in the summer of 1918. Some twenty to fifty miles away from Paris were located watchers who warned the central station of the approach of the enemy, and on beyond these were the firing lines who gave information of aircraft going over toward Paris. Around the outskirts of Paris, was located a network of guns which could cover almost all the sky area. On account of their considerable range, they were not so very close together after all. I am informed that there were two hundred and eight anti-aircraft guns, handling the anti-aircraft gun defense, and some one hundred and thirteen machine guns. Somewhere around

this network, and in advance of it, were located listening posts with large listening horns which would indicate the path and altitude of the approaching enemy, and also around this area were located some seventy searchlights which were directed by the listeners upon the part of the sky where the enemy was approaching. On the landing fields near Paris were located fifty-eight airplanes which could be sent into the air in ample time to meet the oncoming enemy and attempt to drive him away. In each center, arrangements were made to divide the fire of the anti-aircraft battery so that each enemy



WILSON DAM, MUSCLE SHOALS, ALA.

*Here stands a monument of construction which adds over 200,000 h. p. to the strength of the United States. It requires protection against aircraft bombing*

plane was subjected to some sort of harassing attack. Around the city and beyond its limits were constructed various devices to fool the approaching enemy as to his objective. Lights were placed on spots which he might bomb without effect. Machines were set up to produce smoke clouds and alter the appearance of the city to prevent him from locating important areas. Balloons were sent up, between Paris and the enemy, with dangling cables into which he might fly and with machine guns to fire at him and telescopes to observe him. A central command was established which controlled all the defense within one well-protected room. From here the attack was directed and the population warned in the areas which were threatened.

Let us see what the effects of this preparation amounted to. The French reports indicate that some twelve Zeppelins in all attempted to make air raids on Paris on three different occasions. Of these, six were destroyed and only four succeeded in passing over the city. The Zeppelins were made a failure by the antiaircraft defense and practically no attempts were made after October, 1917.

In all, some five hundred planes attempted at different times to fly over the city of Paris, and, according to Paris reports, less than fifty succeeded in accomplishing their mission; that is, less than ten per cent.

Most of the attacks were made at night, especially in the latter part of the war, and at this time no airplanes were used to combat them. Some fifteen planes were brought down by the antiaircraft defense, and the German prisoners testified that many planes were hit, turned back, and regained their lines before coming down.

At one time, the Germans sent over by airplane twenty-two thousand kilograms of loaded bombs to be dropped on Paris. Only one thousand and sixty kilograms of them were dropped on the city and the destruction caused by these was repaired in a few days. Over twenty thousand kilograms were turned back and wasted. An aviator does not land with bombs on his plane. They are too sensitive to bumps. If he cannot drop them on his objective, he drops them somewhere else, no matter what effect they may produce at the place of dropping.

Several books have been written on antiaircraft defense. An excellent one has recently described the defense of London. One may readily compare this defense with that of Paris. The results were mediocre. Poor types of guns were assigned to this duty. Many of the troops conducting this work were rejected for field service. Yet the very presence of the armament and men in action served to turn back many riding planes, to break up formation, and to divert well-organized attacks from their objectives.

The strongest German antiaircraft defense was located around Leverkusen and Schlebusch, where the explosive and ammunition plants were located. No bombs were ever dropped in the vicinity of these plants, although attempts were made to bomb the bridges at Cologne nearby. The antiaircraft defense prevented any considerable damage. Here, one plane from the Allied Forces wound up a suspended cable in its propellers and fell at Diedenhofen in January, 1918. The Germans reported that they dropped seventeen Allied planes along the Somme and the Ayre with antiaircraft guns in one day, August 8, 1916.

In its protection of the troops at the front from observation, from attack by machine guns, and from bombing of their treasures of ammunition and supplies, anti-aircraft defense often did remarkable work. In the early part of the war, the British found that they had brought down one plane for 8000 shots. At a later period they brought down one plane for 4550 shots, but in some areas toward the latter part of the war they accounted for a plane with every fifteen hundred shots. Firing at the rate of fifteen shots per minute with ten guns, this was ten minutes of fire per plane.



NEW YORK CITY

*A pearl of great price—the business mecca of the world and an ideal target for the bomber*

In our own service, five anti-aircraft batteries which saw service at the front in France in 1918, fired 10,275 rounds at airplanes, and in these firings brought to the ground seventeen planes, an average per plane of 605 shots. Considering all the anti-aircraft batteries in the United States Army area, the average per plane was about a thousand shots or six minutes of fire with ten guns. Two of our anti-aircraft machine-gun battalions in 1918, from September until the Armistice, brought down forty-one planes with an average of 5500 shots per plane. At the present time, our gunners are hitting at the rate of one hit per hundred shots, but all hits do not drop a plane as indicated by recent tests at Aberdeen.

Aviators have inherited the knowledge of the anti-aircraft defense on the ground, and, coupled with the anti-aircraft defense in the air, there is quite a bit to worry about when the order arrives to go over and attack some well defended place.

Since the World War, a great many improvements have been made in aircraft. Greater speeds have been accomplished; greater bomb carrying capacity has been attained and even greater protection to the plane itself. The aviators themselves have learned much from the fighting in the World War, have gotten up schemes to maneuver and better aiming devices. They are handling themselves better in the air than they did before, and even know more about the problems of anti-aircraft gunnery. They have learned more about the problem of attacking enemy planes; have learned to fly at night; have better methods of landing in the darkness; are perhaps better trained in finding their way about and know more about the identification of objects which they are sent to locate. They have been furnished better cameras, better schemes for printing and reading photographs, and can make a map of an area from an almost invisible height.

In the meantime, the anti-aircraft forces have not been asleep, although their advance has not been so marked nor so widely heralded. They have, however, been able to fire at longer ranges, to fire higher, to burst their fuses more accurately, to supply their projectiles with better tracers to indicate their trajectories in the air, to fire their guns more rapidly, to lead their target more quickly, to conceal themselves more securely, and, finally, to produce more effect with their bursting shell.

They have developed better listening devices to indicate the approach and path of the hostile airplane, to determine the altitude at which he is flying, to make more accurate corrections for wind, atmosphere and powder. They have learned visually to measure the rate of the airplane, both horizontally and vertically, and to plot where he will be when the projectile reaches that vicinity. They have learned more about airplanes and their flight, can identify types and predict their behavior; they know where an aviator must be in order to drop his bomb effectively on a known target, the direction he must take, and the altitude at which he can fly with the load which he is carrying. They are using the radio, the long range camera, the moving picture machine, and every modern improvement to enhance the value of their fire.

The Army has not yet covered the whole field of the work for anti-aircraft. No definite decision has established just how our Infantry, Cavalry, Artillery, Engineer, and Supply columns will pro-

tect themselves on the march from aircraft attack. No field organizations have attempted—except in a few instances—to get a solution for their problem. The protection of important areas has not been solved beyond tentative plans based upon the defenses of Paris and London. We are still driving away at the fundamentals of the problem, whether the airplane can be hit and the aviator diverted from his mission by any armament and control instruments so far produced. We know part of the solution. We have data to make better guns, better mounts, better ammunition, better fire control.



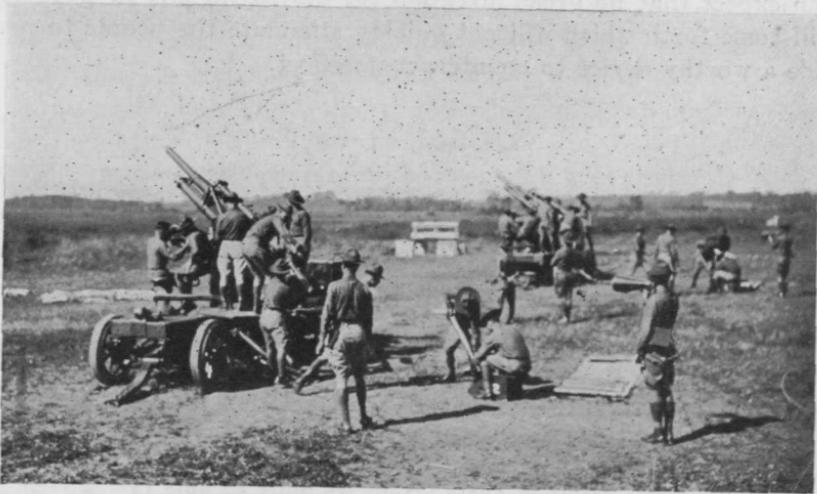
PARIS

*The Etoile, center of Paris, from which aviators locate its important facilities. After all, little importance can be attached to the bombing done by the Germans due to the vigilance and effectiveness of antiaircraft defenses of Paris*

A thorough plan for coordinating the various weapons, the locating and position finding instruments, and the transmission systems into one harmonious defense is demanded. Then what we need to know is the organization for using the armament and its accessories, the assignment of fighting units to a definite defense, the actual solution of that defense to indicate its deficiencies; and then to have a recheck of our developments to determine what else will be needed, in what quantities all the variety of equipment will be required, and the completion of plans for its procurement, issue, and maintenance. In order to work out these features, we need above all else the whole-

hearted, enthusiastic, mutual support of our antiaircraft forces and our Air Service. It is the problem of the Air Service to relieve itself from defensive work by the best development of antiaircraft and to find its greatest work in the mass attack of our enemies in the air and on the ground.

We are convinced of the necessity for antiaircraft and know many of its limitations. We know that it takes many rounds from any gun to score a hit upon an airplane. We know also that tons and tons of bombs from airplanes cannot win wars or entirely destroy our cities and homes. No one has ever determined the quantity of high explosive that was fired into Verdun, but it did not fall.



*3-inch antiaircraft guns in action against aerial targets. They are not yet scoring quite so consistently as an expert wing shot but they are getting better and better. This sort of shooting requires the best firearm that can be made and no guessing*

It is still there and still French. It takes thousands of rounds of ammunition to kill one man on the battlefield.

But with all the data we have, both aircraft and antiaircraft are still in infancy. Standardization has not set in. Their progress will not have reached the stage of quantity production for several years. Neither can clearly state its full war possibilities or war probabilities, and each will counter the other in war as armor and armament have done in the past.

Aircraft has the advantage of peace-time usefulness and has grown a little faster through commercial progress. Antiaircraft has no other peace-time usefulness than as a training tool for war. It has the disadvantage of depending upon its rival even for this

usefulness; that is, in the handling of its real target at which it may fire. Antiaircraft needs a maximum army effort to prepare itself adequately for its war-time task. It needs a large share of army money to develop suitable tools in adequate quantity.

Antiaircraft will never be one hundred per cent effective, nor will it ever be omnipresent to resist aircraft attack. But in its field, it has great value and must not be neglected. It is a function of our armies to learn what kind of armament can best perform the duties required, what instruments can best direct and discharge this armament, and what training must be done to use the armament and its directing instruments.

Human ingenuity is just as alert in defense as in offense. We can expect that no great invention for destroying life or property will come forth which will not quickly stimulate the people to provide a worthy device to counteract its effect.

There is a rank due to the United States among nations which will be withheld, if not absolutely lost, by the reputation of weakness. If we desire to avoid insult, we must be able to repel it; if we desire to secure peace, one of the most powerful instruments of our rising prosperity, it must be known that we are at all times ready for war.—*George Washington.*

# The Past and Future of Defense Against Aircraft

By CAPTAIN BENJAMIN F. HARMON, C. A. C.

*(Concluded from the November number)*

THE one in one million hypothesis presupposes that the aviator will protect himself in all directions. In point of fact he will not change altitude greatly unless driven to it. He cannot climb very far in 20 seconds at high altitudes, and he is averse to losing altitude which is extremely valuable to him in case of attack or injury to his machine. Furthermore, if he is photographing the terrain or regulating artillery fire he must maintain a more or less even flight (in the first case exactly horizontal flight); thus the first fire-control assumption and the first principle of fire are evolved; namely, "Flight will be at constant altitude," and "The altitude is the most important element of the firing data." If it be assumed that his variations in altitude during the period of 20 seconds will not exceed 200 yards, then the mathematical probability of hitting becomes one in about one hundred thousand. This is still extremely high compared to actual results, and those results prove the correctness of the second fire-control assumption; namely, "Straight line flight." The instruments, then, are based on rectilinear flight. Those who have observed airplanes in flight know that such flight is not altogether in a straight line, but when an aviator is flying a mission in time of war, he must reach a certain point, fly over a certain area in a straight line for photographic purposes, or patrol back and forth over a given territory. The quickest and easiest flight for that aviator is in a straight line, and such flight will be changed generally when he reaches his objective, accomplishes his mission, arrives at the end of his patrol, or when he comes under fire. Therefore, the second principle of fire is stated: "Prepare the fire carefully—the first burst is the best" because when he comes under fire dodging is to be expected. It is noted here, however, that dodging in a formation is extremely limited unless that formation be broken up—an objective decidedly to the advantage of friendly planes. If aviators are compelled, by anti-aircraft fire, to dodge actual and expected projectiles at all times, their efficiency will be greatly reduced; they will be unable to accomplish their missions.

Let us examine one method of making the prediction for rectilinear flight as developed during the the World War. Suppose a plane be approaching on a straight line toward the battery and at a constant altitude. At a given instant its angular elevation would be 800 mils and 20 seconds later this angle would be 900 mils; thus though his altitude be constant, there is a vertical deflection of 100 mils that must be allowed for, and in this case, with the plane flying toward the battery, no lateral deflection during the time of flight of the projectile. Should his flight be other than directly toward the battery both a lateral and a vertical deflection must be determined so that the future position of the target, that is, the point he will occupy assuming rectilinear flight, will be known.

Consider first a "double sight" so constructed that the two glasses turn together in azimuth (laterally) by means of a crank operated by one observer and vertically by means of a crank operated by another. If the two observers keep the cross-hairs of their telescopes on the target, the rate at which they must turn their operation cranks to do so will be proportional, evidently, to the rate of angular travel of the target, both vertically and laterally. To each crank is connected a small generator so that the r. p. m. imparted to these generators is similarly proportional to the rate of angular travel. Inasmuch as these generators have a constant field, the voltage output will also be directly proportional to this angular rate of travel, and voltmeters could be calibrated to read directly that rate in degrees per second, mils per second, or in whatever angular units were desired.

The desired result, however, is not mils per second but total mils deflection. If the rate of angular travel is ten mils per second and the time of flight twenty seconds, then the total travel of the target during that time of flight will be two hundred mils. This result is accomplished by inserting into the vertical and lateral circuits a resistance proportional to the time of flight, thus, in effect, multiplying the rate by the time, and reading from the calibrated voltmeters total mils deflection. It can be seen that the present azimuth plus the lateral deflection will determine the vertical plane in which the target will be and the present angular height plus the vertical deflection will determine a line in that plane along which it will be also. It remains only to apply the altitude, which has been determined and assumed constant, and the exact future point the target will occupy will be determined. All the necessary elements for firing can be obtained mechanically and electrically and the gun fired at that future point. In the instance under discussion the future or predicted

point would be a thousand yards from the actual position of the plane when the gun is fired.

The problem is by no means as simple as the preceding discussion would indicate. As described herein the present rate of angular travel was multiplied by the present time of flight. This process is correct only when the plane is flying in a circle about the gun as a center, in which case the rate of angular travel and time of flight are constant. Actually, the approximate deflection read from the voltmeters must be corrected for rectilinear flight by a separate instrument that solves mechanically the intricate formulæ for this correction.

Even artillerymen do not realize the difficulties of antiaircraft fire. The field artilleryman fires, observes the distance between shot and target, and corrects. To the antiaircraft artilleryman such correction is impossible. Neglect, for the moment, the fact that two or three batteries are firing at the same time, or that the target will change its course, and assume that one gun is firing at a plane moving in a straight line at right angles to the plane of fire. One shot is fired, and the battery commander waits to observe it. It bursts ten mils behind the target—should he increase his deflection by ten mils? To take one of many similar conditions showing why this correction cannot be sensibly applied, we shall assume that the shot was perfectly predicted. The projectile passes the plane at the predicted point but the fuse burns too long. The projectile and plane each continues on its way and the burst occurs *beyond* the plane. To the observer at the gun this burst beyond appears solely *behind* and the correction of ten mils would be valueless—in fact, it would be detrimental for it would prevent hitting by a fuse properly set.

The A. E. F. took its searchlight lessons from the British, its gunnery lessons from the French—but it showed them all what an effective weapon the machine gun could be. Two American machine-gun battalions, manning a total of ninety-six guns, had elements in line from August 1, 1918, to November 11, 1918, and were officially credited with forty-one hostile airplanes. Some fifteen hundred other machine guns distributed among artillery and infantry units are officially credited with two planes. The explanation of the contrasting results is specialization, training, and correct tactical distribution.

The destruction of hostile airplanes was the one mission of our antiaircraft machine gunners, and in this respect they were thoroughly and competently trained. Then they were placed where the low-flying planes were to be found—as close to the first line trenches as possible—and soon made for themselves this unsurpassed record.

The delivery of effective machine-gun fire against aerial targets with their high speed, while not as difficult as artillery fire, still calls for careful development and systematic training. It is by no means the simple problem of playing a stream of water from a hose. The range to the target must be estimated, the target correctly located in the sighting mechanism, and the results carefully watched. The A. E. F. principle of fire was "fire a short burst and correct," and the results they achieved would seem to favor that method over the method of long burst of "hose" firing. Note here that the machine gun or bullet is not heard by the aviator and therefore has no moral effect. It must hit and destroy to have any defensive power—and they did hit and destroy.

Not the least important phase in anti-aircraft training, both guns and machine guns, is in identification of aircraft. A trained observer should be able to give the nationality and type of any plane by listening to its motor. This is a matter of concentration and study, and does not require a genius, as some believe. The identification is then verified by the physical characteristics of the plane or, in darkness, by a challenge from ground lights and a Very pistol reply of prearranged color from the plane. Any plane identified as hostile, any plane not identified as friendly (our Air Service must report in advance new type planes to be flown over the defenses), any plane not answering a challenge, or any plane adopting offensive tactics is engaged immediately. While the instances of the enemy flying captured planes are rare, that, and the appearance of unknown types of hostile planes, must be guarded against.

We have heretofore concerned ourselves with the past of anti-aircraft defense. To the records of that past we point with a justifiable measure of pride. The enemy attacking planes were not invariably destroyed or even forbidden the zone of our troops, but, on the other hand, they were not permitted to operate with impunity. Between these two limits of perfect protection and absolute failure, the anti-aircraft troops, operating against the most difficult target conceivable, overcame the almost insurmountable difficulties incident to the development of materiel and technique of fire against those targets and gave to their comrades in the Armies a measure of protection that reflects great credit on those responsible for the development and training. The defense of Paris by night stands as one of the remarkable achievements of the World War, and the firing of the anti-aircraft machine gunners and artillerymen of the A. E. F. established for them an enviable and unequalled record.

What of the future? To sit by in smug complacency, satisfied to let the past be the future also, is inaction. "There is but one

ignominious thing in war and that is inaction." This quotation is equally applicable to the preparations we should make in time of peace for the war that may be thrust upon us against our national desires for peace.

One of the tremendous assets of our country is the inventive genius of its people. Many of those who have this creative attribute have interested themselves in military and naval requirements and not a few in anti-aircraft questions in particular, attracted thereto, no doubt, by its difficulty and by the picturesqueness which surrounds combat between ground and air, serious though it be. Some of the solutions offered have failed because of their conflict with other military requisites, in other words, because of a lack of military knowledge by the inventor; but the records show innumerable valuable contributions to Military Art by non-military men. That the inventive genius of our people should be utilized to improve all conditions of our individual and national life is incontrovertible. It is equally apparent that by the excellence and power of our defensive means we guarantee the continued smooth national existence so desirable to our people—by preventing encroachment through the aggressive war of a stronger power. They should turn to military and naval problems also.

The creation of new passive means of defense is limited only by the practicability, efficacy, and relative cost thereof. An example of the development of new means of defense is contained in recently published news items which aver that it is now possible to interrupt an airplane ignition system by means of radio. Immediately thereafter follows the anticipated corollary that it is now possible to insulate the ignition system against radio interference. This radio attack strikes one by its tremendous possibilities, particularly those who have engaged hostile airplanes from the ground, if, indeed, it can be developed. This would be a humane defense when one considers that a dead engine does not by any means entail the destruction of plane and aviator, whereas artillery and machine-gun fire have that destructive intent and have no other *raison d'être*.

The desired improvements in our present artillery system of defense will be considered under the two heads of fire control and gun power. In some considerations the two are inseparable.

There are numerous objections to the systems of altitude determination that require a base line of three thousand yards or thereabouts, opposed to the single attribute of accuracy. Gunfire and accidental causes interrupt communications between the two ends of the base line and disrupt the determination of altitude. The observers at the two stations sight on different targets and thus

introduce inaccuracy. The time required for surveying the base line offers the principal objection when we are considering mobile forces. We are too prone to consider conditions of siege warfare as they existed in France as being determining, where time is not so vital a factor. On the contrary the antiaircraft guns must be prepared to function immediately for the protection of the mobile forces and they can go into action immediately and accurately only with a self-contained or short-base fire control system. The perfection of a coincidence on stereoscopic altimeter of requisite accuracy holds promise for a solution of this feature.

The prediction system must be compact, accurate, and rugged. However complicated the electrical or mechanical processes within the instrument, the manual operation must be easy, simple, and limited to not more than three men. In other words, the operations must be automatic and not require the setting of dials and indices by a number of operators, since the latter case introduces too great a probability of personnel error. The term "rugged" used in describing the necessary characteristics must be taken in a relative sense. The concussion of gunfire and jar of motor transportation must not impair the instrument, and naturally it must not be susceptible to breakage or derangement by its normal operation. The instrument will be operated not by scientists in a laboratory but by soldiers in the field.

Weight, *per se*, is not a limiting factor inasmuch as the instrument certainly would not weigh more than the guns it accompanies, but light weight is greatly to be desired.

Nor is there any prescribed method of prediction; naturally, the sole prerequisite is *results*. The method of prediction is interconnected with rate of fire, however. We may, for example, select a point in the sky which the target is approaching and measure back along the estimated course with great exactitude, and thus arrive at a set-back point a distance from the selected point equal to the plane's travel during the time of flight of the projectile. When the target arrives at the set-back point the gun is fired at the selected point. The fire thus controlled is intermittent and entirely too slow for engaging a target whose total exposure to fire is measured by minutes and seconds. The best solution will permit the rapidity with which the gun can be operated to be the limiting factor. Thus, if the limiting rate of fire of a 6-inch antiaircraft gun (assuming such an antiaircraft weapon to be a fact) is twenty seconds, the set-back method of prediction or intermittent fire prediction is entirely satisfactory for this gun if its predictions can be effected within that

limit of time. For the 3-inch gun with a rate of fire of four seconds satisfactory set-back prediction is not now conceivable.

If the horizontal projection of the aviator's path be tracked, rather than making a three-dimensional track of his actual course, it is probable that the machinery therefore would be less complicated. Having arrived at the predicted horizontal projection of the plane's position, an automatic table can be entered with horizontal range and altitude as arguments and all firing data to the gun determined.

There has been some consideration given the question of differentiating the plane's flight to the fourth differential. From a highly theoretical consideration this prediction is correct inasmuch as it enables any regular path to be predicted. Practically, it introduces undesirable complications that are not warranted by facts because there is only one regular path the aviator will maintain during the time of flight of the projectile, and that is the straight line. When he deviates from straight-line flight he does so for some vital reason, and if that impelling reason be our fire his resultant path will be indeterminate. Our best hope, then, for a hit is by the rapidity and dispersion of our fire. Note, however, that if we force such irregular flight on him we have imposed our will on him and taken from him the ability to perform a mission during his dodging flight. Note further that while irregular flight is possible in formation flying the magnitude and time of such flight are extremely limited unless the formation breaks. Generally the second limit is the limit of utility and practicability.

We are more and more inclined to the theory of indirect fire, that is, fire in which the guns are "blind." The computing instrument determines an angular direction (azimuth), an angular elevation, and a range. These three values permit the operation of the gun without sights.

The probability of hitting an airplane varies with the time it requires to deliver a predicted shot or, more properly speaking, with the cube or higher power of that time. There is only one way we can control the enemy's will and that is to culminate our action in less time than his will and the abilities of his plane enable him to change his flight. The time concerned is divided into two parts: the first, the time of flight of the projectile which fire control cannot alter; and the other, the service time or dead time of the piece. During this dead time the range must be transmitted to the ammunition detail, the fuse set at that range, the gun loaded and fired. In practice it is considered as being eight seconds. For an average firing

condition where the time of flight is sixteen seconds this dead time is one-third of the total time between prediction of range and burst of projectile. If our estimation at the beginning of this paragraph is correct, the elimination of dead time would result in twenty-seven times the present probability of securing a hit. Manifestly, even though the estimated ratio be not exact, the elimination of dead time is a vital step in securing more effective fire.

Elimination of the dead time may be accomplished in two ways. In the first place, the time fuse may be eliminated and a super-sensitive fuse substituted that will detonate upon contact with any part of the plane. The chance of obtaining the direct hit necessary to detonate such a projectile is so small compared to the chance of a hit by shell fragments as to eliminate this consideration in guns of 3-inch or higher caliber. For a solution of the difficulty it seems necessary to set the fuse while the projectile is being loaded or after it is in the gun. A mechanism to accomplish this is difficult to imagine, but there are very few things impossible in this world.

The fuses which we use at present are operated by varying the length of a powder train which is fired by the inertia of a plunger when the gun is discharged. The time of burning of this train is not a direct function of its length when the projectile passes through the varying atmospheric conditions between ground and airplane, with resultant changes in rate of burning of the train composition. This introduces undesirable complications in the fire control system which would be eliminated by a fuse whose time ratio would be unaffected by variations in atmospheric conditions. Clock and watch manufacturers are now attempting the design of a clock-work fuse that would function under the high rotative speed of modern projectiles.

It is in gun power that the most valuable improvements may be made. Gun power is not measured by the caliber of the gun; in fact, the caliber of the gun is limited by factors of mobility, expense, utility, and power per minute. The mobility and expense factors are readily comprehended. It is futile to spend the money for a 12-inch gun where one less expensive would suffice, and more futile to consider a 12-inch gun in connection with the mobility required by anti-aircraft tactics. In point of utility we have about reached our limit in a 4.7-inch gun which has a range equal to the maximum range at which airplanes will ordinarily be visible. Any additional range would be of no value and the guns consequently inefficient. In point of power per minute the 3-inch gun would probably be equal to the 12-inch gun, if such an anti-aircraft weapon be imagined, since the high rate of fire of the former will more than compensate for the

larger destructive radius of the latter. Bear in mind that penetrating qualities are not necessary beyond those obtainable in a small-caliber gun. We are not firing against twelve inches of Krupp armor. To reverse the old saying,—“Never send a man out to do a boy’s work.” If we balance carefully the factors gun power per minute, maximum desirable range, mobility, expense, maneuverability, ammunition space, and weight, we shall arrive at the conclusion that the ideal anti-aircraft caliber is about 4 to 5 inches. The recognized 4.7-inch caliber in our service seems to meet all requirements.

Having accepted the caliber, the power of that caliber may be increased by an increase in the muzzle velocity or in the destructive radius of burst of the projectile. We cannot reasonably expect a very great increase in the latter case, but to the former we look for the final solution of the artillery problem. The Utopian gun for this type of fire is one in which we may fire point blank and thus culminate our action before the will of the aviator can take him from the burst of the projectile. To do this the muzzle velocity must be practically infinite so that the time of flight would be very nearly zero (actually about one-half second). Manifestly this limit can never be reached but it can be approached. We hope for an anti-aircraft gun of almost twice the present muzzle velocity (2600 f. s.). Muzzle velocities of around 4000 foot seconds are not unheard of or difficult of attainment; but bear in mind that there must be a permanency to our defense. We cannot guarantee such permanency should our guns wear out in a half day’s fire, which eventually would be true as high velocity guns (4000 f. s.) are now constructed. Some students of this undoubtedly difficult question anticipate that the smooth bore gun will come into its own and solve the anti-aircraft difficulty. When a projectile has been designed that will “feather” or hold a true course when fired from a smooth bore gun we shall be approaching that Utopian gun previously mentioned.

The gun has always been considered the backbone of the defense because of the great altitudes at which planes usually flew—altitudes unattainable to a machine gun. More consideration is given the artillery technique than the machine gun because of the greater difficulties in, and importance of, the delivering of accurate fire therefrom. In no event should the extreme importance and efficacy of the machine gun be overlooked in our interest to solve the more difficult problem. When the attacking plane comes within machine-gun range the artillery is more or less unable to engage it because of the difficulty of maneuvering a gun at the great angular speed then necessary. The machine gun is fully capable of bearing this burden unaided.

It is highly probable that the Air Service tactics of the future will be more bold than in the past; in fact, the development of the armored attack plane proves the contention. Swarms of attack planes will engage infantry and artillery; and aerial activity within machine gun range will be intensified. The importance of the machine gun has increased in proportion.

The .30-caliber machine gun did its work efficiently. It has been stated that the French developed the artillery, the British the searchlight, but that the Americans achieved the highest results with the machine gun. In view of the advent of armor on planes and in consideration of the necessity of increasing machine-gun radius of activity, the .50-caliber machine gun has been developed and is an assured success. The 37-mm. automatic gun promises to be. One need have no fear of the results here. The aviator who comes within range of a well-trained battery of these super-machine guns is in for a long, hard winter.

Antiaircraft searchlight requirements differ from ordinary searchlight requirements principally by virtue of the mobility required (hence, light weight), the requisite rapidity of maneuvering, and the necessity for 90° elevation. The open type or "dishpan" light more than satisfied the requirements of mobility through its light weight; but the attendant decrease in illuminating ability has turned searchlight engineers toward the barrel type light once more. The design of such a type within the weight requirements of mobility will be perfected shortly; in fact, it seems assured now.

A plane is seen or it is not seen in the searchlight beam, according to whether the contrast between its brightness and that of the beam through which we look is sufficient. When standing at the searchlight looking toward the end of the beam we look through its entire length, and it has, to us, a maximum brightness. There is not sufficient contrast between this brightness and that of a plane in the beam (unless it be very close indeed) to enable that plane to be seen. As we move off to the flank of the light, the length of beam through which we look, and hence the brightness, becomes less and we are able to see the plane farther away. Present pipe searchlight controls enable the operator to be twelve feet from the beam—in some cases less. This is not sufficient. Maximum visibility conditions consistent with other concurrent requisites will be reached about one hundred to three hundred feet from the beam. Here we must station the observer and he must operate the light by remote control. The design of a remote control system which will be light, rugged, and permit the rapid maneuvering of the light necessary to following a target traveling at high speed offers an interesting problem for solution.

The searchlight beam is a minute pencil of light in comparison to the immensity of the volume to be searched. That volume is considerably decreased by locating the plane from its sound by the unaided ear; but the unaided ear is not sufficient. In the general discussion of the method of "fire by sound" herein, mention has been made of various apparatus designed to locate an aerial source of sound. In none of these has a satisfactory solution been attained. A sound location system must be perfected whereby—

(a) The azimuth and elevation of the source of sound may be determined instantaneously and continuously.

(b) The location should be positive—not requiring an oscillation of the apparatus either side of the normal to the source of sound.

(c) The system must be selective. The operation thereof must not be interfered with by gun fire, terrestrial sounds, or airplane motors other than the one being tracked.

(d) The method of determination should be preferably ocular rather than auricular, that is, the sound waves should be transformed to some form of energy (for example, electrical energy), that is easily measurable. The results will then be visible and will not depend upon the uncertain ability of the human ear to sense an exact maximum or an exact phase.

(e) Naturally the system should correct quickly for lag and refraction of sound.

(f) While mobility is a prerequisite for the antiaircraft troops protecting the combat armies in the field, the defense of cities and fixed utilities requires no ability to move from point to point rapidly. It is in this type of defense that the sound apparatus becomes of such vital importance. Therefore, while a field apparatus (mobile) would be required for mobile troops, lack of mobility and necessity for more-or-less laboratory methods would not necessarily bar a system for use in defending our fixed sensitive areas.

The perfection of the sound-locating system along the preceding lines will permit the immediate illumination of hostile planes within visual range. At the same time it will enable the gunners to overcome in a large measure the difficulties incident to darkness, fog, mist, and clouds in repelling attackers by the method of fire by sound.

Results have been achieved by antiaircraft troops that are unbelievable when compared to the mathematical probability that an airplane will not be destroyed. Even so, such results are not sufficient. With those results in mind we have heretofore said to the Air Service: "Your pursuit planes are the best defense against hostile planes by day. We will support you at all times and act alone in

your absence." In the future, as development progresses, we intend to substitute for that statement of cooperation another: "Yours is an offensive arm and should be conserved for offensive roles. We are now prepared to assume the entire defensive burden within our territory that you may devote all your power, personnel, and materiel to offense, which is the essence of victory." The time when that statement may be made with confidence is coming surely and is coming quickly. Antiaircraft defense is now an essential in warfare, and its value will increase as through study, invention, and training its destructive power is augmented until it stands to aircraft in the relation that seacoast guns now have to vessels of war—absolutely debarring them from the areas protected.

Nothing can be more inconsistent with true public economy than withholding the means necessary to accomplish the objects entrusted by the Constitution to the National Legislature. One of these objects which is of paramount importance, is declared by our fundamental law to be the provision for "common defense."—*Chester A. Arthur, Message to Congress, December 6, 1881.*

# Annual Report of Chief of Coast Artillery

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*Extracts from the Annual Report of the Chief of Coast Artillery,  
(Major General F. W. Coe) to the Secretary of War  
Fiscal Year Ending June 30, 1925*

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**D**URING the past year the efforts of this branch have been directed towards: The maintenance of the foreign garrisons; The training of the officer personnel in the United States to insure the maximum professional advancement; The instruction of the National Guard and the Organized Reserves; The training of prospective Reserve Officers in the R. O. T. C. Units and in the C. M. T. Camps; The development of materiel and of training methods; The preservation of materiel and protection of property at stations not fully garrisoned; The distribution of the personnel and the training methods followed to accomplish the above are set forth in the succeeding paragraphs.

As an incident to the above activities, there has been maintained a limited power for meeting an attack directed against our coasts.

It cannot be assumed, however, that an effective defense could be made of our important harbors and naval bases with a Regular Army enlisted strength of approximately 3400 and a National Guard strength of approximately 7300 when there would be required 46,730 enlisted men for a complete manning of the fixed armament in war. The Regular Army and National Guard strength assigned to railway, tractor and antiaircraft artillery is fully as far below a reasonable minimum.

Since 1913 the term "Coast Defense" has been used to designate a command of one or more forts provided for the defense of a harbor or point of the coast. The use of this term was based upon the theory that an adequate defense of the coast as a whole was assured by the defense of important seaports and naval bases.

The World War has modified this conception and an adequate defense now contemplates denying an enemy access to any landing place where he could quickly establish himself in force.

In consequence, it has become increasingly difficult to restrict the use of the term "Coast Defense" to the narrow limits indicated above, since it so adequately expresses the broader mission.

The term "Harbor Defense" has therefore been substituted for "Coast Defense" without change in the organization of the commands to which applied. \* \* \*

Under the provisions of A. R. 265-10 representatives of this office have made training inspections of all the regular regiments of Coast Artillery located in the continental limits of the United States. These inspections have indicated that training programs now in effect are too crowded and that, in consequence of this, regimental commanders are finding it difficult to maintain a high state of morale in their commands.

Reports of target practice show improvement in fire against simulated naval targets during the year. There has been an increase in the number of hits per gun per minute, and in the firing ranges, and a decrease in the times of making adjustments from observation of fire by battery commanders.

During one target practice in each Coast Artillery district battery personnel has been subjected to a gas attack. These firings have emphasized the need for gas masks suitable for the personnel operating telephone and optical instruments. This has been brought to the attention of the War Department and the development of a suitable mask is in progress.

Under War Department instructions of April 18, 1925, exhaustive antiaircraft service training is now being conducted by the 62d Coast Artillery (A. A.) at Fort Tilden, New York, in conjunction with the Air Service personnel located at Mitchel Field, L. I., with a view to determining the degree of efficiency which may be expected from antiaircraft gun and machine-gun fire against air targets and the ability of searchlights, directed on data furnished by listening devices to place their beams upon aircraft and to illuminate continuously a target while it remains within range.

These firings as well as those held during the year by other Coast Artillery antiaircraft regiments have demonstrated that this form of fire is more effective upon bombing planes than that of other classes of artillery against their normal targets. \* \* \*

*Coast Artillery Organized Reserve Training:* The predominant features of the training of Organized Reserves during this year have been the training of organizations as units, the more intimate supervision over active and inactive training by unit executives, the increased interest taken in the Army Correspondence Courses, the inauguration of periodical conferences on artillery subjects in certain centers containing a number of Coast Artillery officers, and the training of officers for wartime duty in this office and at the Coast Artillery School.

Up to this time it has not been possible to train properly in antiaircraft methods the personnel of the seventeen antiaircraft artillery regiments located in the central part of the United States, owing to there being no regular Coast Artillery antiaircraft regiment to form a training center for these units of the Organized Reserves. Funds have been available to send only a few of the officers of these regiments to any of the three regular antiaircraft regiments located on the seacoast. Arrangements have been made to train this personnel with National Guard Antiaircraft regiments at Fort Sill, Oklahoma, and Camp Sparta, Wisconsin. To assist in this training, regular Coast Artillery teams have been sent from the nearest antiaircraft regiments. This arrangement is not satisfactory, and proper training can be given to these units and the three National Guard regiments similarly situated only by organizing and stationing a regular antiaircraft regiment at some point in that region.\* \* \*

In my last annual report attention was called to the fact that a definite advance had been made toward providing adequate fire control systems for the long-range guns already installed through the approval by the War Department of a project for the completion of these systems within a certain number of years. The results expected have not materialized. The fire control projects for the United States were approved for completion on an eight-year basis. The appropriation made available for this purpose for the fiscal year 1926 will, if continued, provide for completion of these projects in not less than thirty-five years. \* \* \*

The .50-caliber machine gun has been adopted as the standard machine gun for antiaircraft defense. A new tripod has recently been developed for this gun which gives increased stability in firing. An experimental sight has been designed, manufactured and issued for service test that is expected to give good results. As soon as funds can be made available, .50-caliber machine guns should be supplied to all Coast Artillery units for antiaircraft defense in replacement of the .30-caliber machine guns and automatic rifles still in service.

The new 3-inch antiaircraft gun, Model 1923-E, on mobile trailer mount, is now undergoing test at Fort Monroe, Virginia, and preliminary reports indicate that both gun and carriage will be satisfactory as soon as minor defects have been corrected. This gun embodies many improvements and, when it is finally approved for manufacture, immediate steps should be taken to provide for the replacement of the 3-inch antiaircraft gun, Model 1918, on auto trailer mount now being used by our antiaircraft organizations.\* \* \*

The urgent need for sound locating devices for detecting and tracking airplanes at night with a view to their illumination by searchlights has been met by the design, manufacture and issue by the Ordnance Department of experimental instruments. This development work is considered of great importance and will be pushed to completion as rapidly as funds permit.

The open type 60-inch searchlight was a wartime development and is not entirely satisfactory. A redesign has been completed. The new type is an inclosed light of greater power without increase of weight. Nine of these new lights, with improved control apparatus, have been ordered and are under manufacture. \* \* \*

In addition to my suggestions made throughout this report and to my recommendations of former years, referred to in the second paragraph above, I wish especially to urge at this time the necessity for increased activity in the development of our anti-aircraft service.

Other Coast Artillery developments are either reinforcements or extensions of well-tried-out ideas.

The anti-aircraft service is, however, at a point where original investigations and extended trials of new designs and methods are imperative.

Every assistance should, therefore, be given this new service both by supplying the organizations assigned thereto with the latest developed equipment and by affording them the maximum opportunity for perfecting themselves in its use.

It is only in this way that a true estimate may be had of the value of a service which bears such an important relation to the national defense.

**The battle is not to the strong alone; it is to the vigilant, the active, the brave. — Patrick Henry, in the Virginia Convention, March 20, 1775.**

# EDITORIALS

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## Economy

**WHAT** is economy? In its application to military affairs, the United States has not always been able correctly to answer the question; and at the moment of writing there appears again a tendency to choose the wrong answer.

The Army of today is the product of a gradual process of evolution. It started from nothing. Its origin was largely influenced by the old Anglo-Saxon prejudice against standing armies as dangerous to our liberties,—a prejudice which is still with us and which has had much to do with shaping the course and controlling the destinies of the Army. Our Army has therefore always been built to suit the needs of the immediate present. Consequently its career is represented by alternating periods of expansion and contraction—rapid expansion upon the outbreak of war and almost equally sudden contraction upon the conclusion thereof.

As a result, our national existence has ever depended primarily upon the untrained citizenry of the country,—a body which has on many occasions rendered valuable service after training, but which has never proven its worth for general military purposes while still untrained. This lack of suitable, economical preparation, this use of untrained troops has prolonged all our wars and has rendered them appallingly and unnecessarily costly, both in lives and money.

Our histories do not bring this to our attention. Our histories record only our triumphs and lead us to the logical conclusion that we can dispense with a regular army. Our histories seize upon the Battle of Bunker Hill as an example of the use of untrained troops and neglect to note that the troops fought not only behind breastworks but also under trained officers, veterans of the French and Indian Wars.

In the Revolutionary War, by enrolling 396,000 men, by allowing seven years of time, and with the assistance of a foreign ally, we defeated an enemy whose numbers never exceeded 42,000. In the War of 1812, we enrolled 528,000 men to defeat an enemy who never numbered more than 16,000 or 17,000; and we suffered the humiliation of Hull's failure at Detroit, Hopkin's fruitless expedition, Harrison's experience, the failure of the militia under Solomon Van Renssalaer, and the abandonment of the National Capital to the enemy after a loss of eight killed and eleven wounded. In the seven

years of the Florida War we enlisted 41,000 men with whom to combat five or six thousand Indians, and then we failed to effect the forcible emigration of the Indians which was the sole cause of the war.

The Mexican War was fought with trained and disciplined troops, but it was lengthened that troops might be trained and disciplined. In the Civil War untrained army met untrained army. In 1898 an unprepared army met greater incompetence. In the World War we required a year before we could put trained troops in the field.

The obvious solution is to provide trained men, and this is the purpose of the National Defense Act. But the National Defense Act becomes inoperative when neither trained instructors nor necessary funds are made available to provide the training prescribed therein. In the past we have suffered much in the name of economy, but we have paid—we have paid through our pocket books and through our life's blood. Are we going to go through it all again? Are we going to forget that a false economy is no economy at all? Are we going to invite other nations to trample upon us at will?

World peace is not yet with us, nor are we yet ready for it. There has been no world peace in the past fifteen years. In the United States every generation of our existence has participated in war. We have had one year of war for every three years of peace. Neglecting minor Indian campaigns, the average length of peace in this country has been no greater than nineteen years. How, then, can we argue that our sons will not in their turn have to go to war and therefore need no training?

It has been said that "Every war ends in peace," but is it not equally true that every peace ends in war? Let us retain our inherited prejudice against a large standing army if we must, but let us not forget that our citizenry, to be of value in war, must be trained. Let us pray that the youth of our nation may never have to go to war, but let us at the same time put our country on a sound defensive basis that thē future may be saved the expenditures and the sacrifices of the past. Let us exert every effort to promote and perpetuate peace between nations, but let us also consider our children and our children's children and forget not that they too may hear *Our Country's Call*:

Lay down the axe; fling by the spade;  
 Leave in its track the toiling plow;  
 The rifle and the bayonet-blade  
 For arms like yours were fitter now;  
 And let the hands that ply the pen  
 Quit the light task, and learn to wield  
 The horseman's crooked brand, and rein  
 The charger on the battlefield.

## Pensions for Widows and Children

A recent article in one of the country's most widely circulated daily papers states that the widows of present day officers and soldiers dying in line of duty or as a result of injuries or illness originating in line of duty would not receive any pension.

The statement was evidently based upon the World War Veterans Act, as amended and approved June 7, 1924, which stops the payment of compensation to widows, orphans and other dependents by the Veterans Bureau, unless the officer or soldier was wounded or injured or contracted illness, prior to July 2, 1921, which eventually caused his death. However, coincident with the passage of the above act the pension laws which do not apply for World War Service and which are administered by the Pension Bureau again became effective.

The following is an official synopsis of the law:

The widow of an officer whose death resulted from disability incurred while on active duty may be entitled to a pension from the date of his death, regardless of the date of her marriage to him or her financial condition. The rate of pension ranges from \$15 to \$30 per month, depending upon the rank of the officer, with \$2 per month for each of his children under the age of sixteen years.

The pension for widows are as follows:

	<i>Per month</i>
Lieutenant Colonel and all officers of higher rank.....	\$30.00
Major .....	25.00
Captain .....	20.00
First Lieutenant .....	17.00
Second Lieutenant and Warrant Officer.....	15.00
All enlisted men .....	8.00

Where the widow's husband served during the Spanish American War, Philippine Insurrection or Boxer Rebellion Pensions of \$20 per month are paid if pension is not claimed under the Act in preceding paragraph.

The Secretary of the Army Mutual Aid Association reports that during the past three years the widow of every member who has died during that period has been granted either pension or compensation with two exceptions, and in those cases the officers died from disease developed after separation from the service and not incident thereto.

The Army Mutual Aid Association recommends that all officers report all illnesses suffered by them to the surgeon and even if on d. s., or leave, that written report of illnesses or a statement from

civilian physician be filed officially. The Pension Bureau bases all grants of pension upon the sick and service records kept by the War Department. Statements of members of one's own family are of practically no help.

The Army Mutual further advises that all officers should keep a church or court copy of marriage certificate and birth certificates of minor children for possible use by the family to establish Pension Claim and members of the Association may file such papers in its office for future possible use.

Of all government claims which a widow makes, the pension claim is most trying to handle because of the numerous formal and technical proofs that must be submitted in exact compliance with the law and Bureau regulations. Married officers and enlisted men should do everything possible to obviate the numerous obstructions and delays which can be made to prevent or delay the granting of Pension Claims. Members of the Army Mutual Aid Association should comply with its request for marriage certificates and birth certificates of minor or invalid children. Those who are not members should arrange for the presentation of their claims by a good pension attorney or trust company.

Many widows who are legally entitled to pensions have never been granted claims because they were not cognizant of their own rights and had no friends able to care for their interests.

### Coast Artillery Designations

Recently, in a study of one of the publications of the General Service Schools, there was noted a frequent reference to the Corps regiment of antiaircraft artillery as the "205th Artillery (antiaircraft)." In the August number of the COAST ARTILLERY JOURNAL the same designation is employed by a Coast Artillery graduate of these schools. Such a designation is, of course, a violation of the provisions of General Orders No. 5, War Department, 1925.

The Antiaircraft regiments of corps and armies in the field are Coast Artillery regiments and should be referred to as such. A proper designation, conforming to G. O. 5, would therefore be "105th Coast Artillery (A. A.)."

Though we should not, we may occasionally be inaccurate in naming organizations of other branches, and we can, perhaps, forgive members of other branches of the service should they, by any chance, be inaccurate in naming our units; but we certainly should insist that we ourselves be exact in designating our own organizations. When we mention Coast Artillery units, let us call them "Coast Artillery."

## The President on National Defense

[Reprinted from the *Chicago Tribune*]

It is to be inferred from the President's remarks at Omaha that he feels we are in danger of spending too much money on national defense. There is nothing less likely. The militarism to which he refers is in this country a bit of jargon with about as much likelihood of becoming a reality as a conversion of the American people to Mormonism. There is nowhere in the world a people more disposed than ours to save money on a military establishment or to put an extreme reliance upon international treaties and understanding for the preservation of peace. At this time especially, as no one has more reason than Mr. Coolidge to be aware, the nation is all for reduction in public expenditures or at any rate in taxation, and as the state of the great powers is such as virtually to suspend the possibility of attack upon us for some years, an argument that this is the time when we can safely retrench on national defense seems well nigh unanswerable. The President was never so little in danger of contradiction as when he declared that "our people have had all the war, all the taxation and all the military service they want."

But that is no new situation for us. As a matter of fact, we are passing through a period like that which followed the Civil War. Then the American people were serenely certain they would never fight another war. The Army disappeared. The Navy disappeared. The Army became a constabulary devoted at first to chasing Indians and later to cutting grass. The Navy was reduced to the minimum and made no progress worth speaking of. In the eighties William C. Whitney, Grover Cleveland's Secretary of the Navy, began to modernize the fleet. Mr. Cleveland once threatened Great Britain with war, but he had nothing to fight it with if the threat had been called. In 1898 the nation, and especially the seaboard states, were glad the Navy had been modernized, not excepting Mr. Coolidge's home town. It was not till 1916 that a real step was taken toward modernizing the Army as a military organization expected to fight under modern conditions.

These are not historical reminders intended to justify inordinate expenditures upon the Army or Navy, but they illustrate our opinion that if the President has a fear that mysterious forces will take possession of congress and induce it to spend a dollar more than it has to on the Army or Navy, he would be well advised to dismiss it. We agree with the President that, except during war, our defenses are as good as they ever were. But they have never been good in peace time, though thus far we have escaped from paying as disastrous a penalty for this gambling with safety as we shall have

to pay some day if we keep it up. Our plain duty, with respect to national defense, is to induce adequate expenditure, just as one keeps up insurance year in and year out.

We do not understand the reference to "any organization of men in military service bent on inflaming the public mind for the purpose of forcing government," but we suggest there is a good deal more organization in this country bent on filling the public mind with pacifist fallacies and obstructing proper provision for the adequate defense than of the organization to which he refers, whether it be the fiery Col. Mitchell and his ardent supporters, or the Regular Army or Navy, or the National Guard, the Navy League, or all combined.

The airplane and the submarine and lethal gases have to be studied and energetically developed, while safety demands the continued maintenance of the older basic elements of military and naval strength. There is no danger that we shall expand this strength unduly.

There is war in several quarters of the globe right now and more is threatened. While it is well to strive for the demobilization of racial antagonisms, fears, hatreds, and suspicions, and to try to create an attitude of toleration in the public mind of the peoples of the earth, that is, we submit, a long job, and in the meantime, though we do not maintain a huge armament, as a sword hanging over other nations, we want what sword we have, small though it is, to be always sharp and ready for our defense.

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[Reprinted from the *Chicago News*]

"I am for defense," says President Coolidge. But there can be no adequate defense without an adequate body of regular army officers trained to maintain the provisions of the National Defense Act. The number of officers now on the rolls is less than that provisioned by the act in question.

### Victims of Pacifism

[Reprinted from the *Portland Oregonian*]

Just what preparedness for war means is told, in a manner that should impress every American, in the dispatches of James O'Donnell Bennett from a reserve officers' training camp. The incidents related of the World War proved that unpreparedness brings death to men who fight against militarism. Ignorance caused officers to fire shells that did not explode because they had no fuses. Those shells were fired to enable infantry to advance without heavy loss of life. Many lives must have been lost because they gave no

protection. Unpreparedness in that case was actual aid to militarism, yet those who profess most fervent hatred of militarism insist that we shall not train our men to resist it.

Men take training because they want to be prepared for what may come and do their part well. Patriotism would impel them to serve in defense of their country and they undergo training in order that they may win, that they may be equipped to defend themselves and that their lives may not be uselessly sacrificed. Those who have experienced war want no more of it; have a horror of it. Yet their desire to be ready in the event that it should come again is misconstrued as betraying love of fighting.

By thus interpreting the motive of young men who go to training camps every summer, pacifists slander the best of our citizens and oppose the formation of a body of men that would shield them from harm if war should come. The worst delusion prevalent is that by opposing preparedness pacifism prevents war and saves life. By fostering the opinion that peace-loving nations like this could not and would not fight, it encouraged the militarist nations to make war. It sent Britain to war with a small army, ill provided with artillery, and it delayed for two years formation of a large army trained and equipped to take the offensive. During those two years the allies suffered terrible defeats and lost hosts of men, all victims of pacifism. After the United States intervened fourteen months elapsed before American troops took the offensive, and during that period the allies suffered immense losses of men, victims of pacifism. In the Argonne battle the American Army was inadequately trained and was short of artillery and aircraft, and lost thousands of men whose lives could have been saved without reducing the extent of the victory. They were victims of pacifism. The men who take military training are determined that, if the call should come to them to defend their country, they shall not fall victims to that delusion.

## Pacifism and Preparedness

[Reprinted from the Portland *Oregonian*]

\*\*\* The correspondent, who, in a letter printed elsewhere \*\*\*, denies the necessity for prudent preparedness for war under present conditions is guilty of the usual evasion of responsibility for the consequences of their acts which marks the contentions of the pacifist-idealists. \*\*\*

The writer holds that "pacifism did not prevail" in our attitude toward the late war, but curiously places the blame for conditions which brought "death to the men who fight against militarism" on

the shoulders of those "who accepted the way of war—hesitatingly—and who did not carry their point of view to its logical conclusion—preparedness." In other words, if there had been preparedness, there might have been less sacrifice of life, as the matter turned out. This is probably true. It is unessential to prove whether organized pacifism or the feeble patriotism which sometimes passed for pacifism resulted in what is conceded to have been an unfortunate situation. The result was expensive and disastrous, in any event. That there may as a matter of fact have been no organized pacifism is beside the question. There was pacifism, in whatever guise, and to the extent that it was responsible for unpreparedness for that which is now known to have been an unavoidable conflict, it cannot escape blame for its acts. \* \* \*

Surely the spirit of justice within our own boundaries does not rest on so slight a foundation that it can be endangered by preparedness for defense.

**Armies and navies are necessary for security, as police and criminal courts, and bolts and bars are necessary. They are adjuncts of peace. \* \* \* Mankind has not yet, cannot yet, discard the use of these forces.—Calvin Coolidge, at Washington, D. C., September 24, 1923.**

# PROFESSIONAL NOTES

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## Seacoast Artillery Firing

[COAST ARTILLERY BOARD PROJECT NO. 220]

EDITOR'S NOTE: *Coast Artillery Board Project No. 220 is one of the most important and most interesting projects ever undertaken by the Board. The JOURNAL regrets that the length of the project is such that it can not be given in full in these pages. However, the project with omissions reduced to a minimum, has been secured from the Coast Artillery Board for publication in three parts, of which this is the third. The action of the Chief of Coast Artillery on all parts of the project published appears herein.*

22. *Time-Range (Elevation) and Time-Azimuth Devices.* Prediction oftener than once in thirty seconds cannot be accomplished on manual plotting boards at present in use or adopted. However, it is desirable to provide a means for subdividing the range and azimuth predictions in order that accurate firing data may be available at the guns whenever they are ready to be fired. No thoroughly satisfactory means for subdividing these predictions has been prescribed. For fixed guns the time-range relation board has been used for the interpolation of firing ranges together with "creeping" on the range drum of the gun. There is no serious objection to creeping, but the operations between procurement of a corrected range to the setforward point and the receipt of fire data by the range setters at the gun always have been cumbersome. It has been customary to plot the time-range and time-azimuth curve on the time-range board and time-azimuth board and then interpolate for the intermediate intervals. It is believed that a more satisfactory means for handling the time-range and time-azimuth relation can be devised, and the Coast Artillery Board is studying this question in Coast Artillery Board Project No. 222, *Time-Range and Time-Azimuth Interpolating Devices*. The Time-Range and Time-Azimuth Spirals described in Coast Artillery Board Project No. 75, *Fire Control System for 155-mm. G. P. F. Guns*, and the use of proportional dividers in connection with the elevation board (Percentage Corrector) and the Deflection Board as described in Coast Artillery Board Project No. 117, *Fire Control Methods for Mortars*, are both satisfactory. It is believed, however, that it may be feasible to develop means whereby the time-range relation may be taken directly from the Percentage Corrector (Elevation Board) and the time-azimuth relation directly from the deflection board.

23. *Spotting Devices for Use in Terrestrial Spotting.* a. Within the last two or three years the Coast Artillery Board has studied, tested and reported on a large number of spotting devices. The need for a standard spotting device is recognized. Opinions differ as to whether it could function in engagements between shore guns and ships, but the Coast Artillery Board is convinced that all seacoast artillery batteries should be so equipped and trained in time of peace that they could correct their fire in action whenever observation of splashes is possible.

b. The spotting organization and equipment should be used during trial fire and all other fire in order that the location and prediction of the target's positions may continue uninterruptedly on the plotting board. When trial shots are fired it is desirable that the data from them be made available immediately upon the conclusion of such fire. These considerations indicate that a standard spotting device should be suitable for use during trial fire as well as fire for effect, and that it should be suitable for use when azimuths of splashes are reported as well as when deviations from a finite or hypothetical point are reported.

c. (1) It is quite generally agreed that adjustment of fire should be based on deviations of splashes from the setforward point. Spotters may report angular deviations of the splashes as right or left of the target; the position of the target at the instant of splash might not coincide with its predicted position as shown upon the plotting board; some of the observed deviations may be due to normal deviations of the ballistic correction due to range changes and other considerations; but these considerations should be weighed by the officer concerned so as to adjust the fire upon the point of expected impact.

(2) Practically every artillery officer has seen splashes at target practice with the unaided eye and then has heard an observer nearby report the splashes as "lost," simply because he did not see the splash in the field of view of the instrument to which his eye was placed. In such target practices as have been held using a sinuous hypothetical course, splashes have deviated widely from the point of expected impact at the instant of splash. The point of expected impact (setforward point) has in many instances been distant from the position of the hypothetical target. These considerations indicate that spotters should be trained to observe splashes either in azimuth or in angular deviation from a known point or target as conditions may dictate.

(3) It is a generally recognized principle in the location of stations for observing seaward fire that the locations should be such as will serve the battery best under varied conditions of visibility. \* \* \* Attempts have been made in many localities to furnish as complete terrestrial visual observation systems as geographical conditions will permit. In some localities it is impossible to provide terrestrial visual observing stations which will permit fire at the maximum range of the cannon to be observed. In other localities it is possible to provide for position finding and observation by locating stations far in advance of, or far to the flank of the target, so that position finding and observation of fire usually will be satisfactory to the maximum range of the cannon to be served. Under conditions of poor visibility, identification of both splash and target may be difficult and identification of the splash only should be sufficient. It follows that standard spotting methods must be limited neither to axial observation nor to measurement of angular deviations from targets.

d. The above discussion sets forth in a general way the primary conditions which a suitable spotting device must meet. Further, a suitable spotting device should be simple in theory or construction and operation; it should furnish accurate results quickly and be reasonably inexpensive; it should be adaptable to bilateral observation of fire and to unilateral observation of fire; it should be suitable for use by fixed as well as mobile seacoast artillery, for use by seacoast cannon of any caliber, and should meet land warfare requirements as well as those in seaward fire.

e. All of the devices tested by the Coast Artillery Board possessed considerable merit and, with certain limitations, offered workable solutions. None of them have been found sufficiently superior to the others to warrant a recommendation for adoption as a standard article of equipment for manufacture and issue. Included among the devices tested were spotting charts. It appears feasible to overcome the chief disadvantages of the spotting chart and to modify it into a device which can meet the requirements stated above to a satisfactory degree. A description of the spotting chart and the proposed modification was described in the September, 1923, *COAST ARTILLERY JOURNAL*. A satisfactory trial of the ideas expressed in that article cannot be had without the expenditure of some funds for printer's plates and paper. The Coast Artillery Board still has the spotting chart under consideration. Some spotting device should be included in Tables of Basic Allowances, but until a suitable device is developed and adopted as standard, battery commanders may be expected to improvise a device good enough for particular local conditions.

24. *Spotting Devices for Use in Aerial Spotting.* a. In connection with Coast Artillery Board Project No. 281, *Test of Spotting Instrument (F. A.)*, 1923, the Coast Artillery Board is considering various methods of observation of fire from aircraft. The spotting instrument under test permits obtaining deviations from the target as an origin measured in azimuths from the magnetic north. It is contemplated that deviations be reported by the "Clock code." A simple device for relocating the impacts with reference to the battery-target line has been developed and will be tested in conjunction with the spotting instrument. The data for operating this device are the azimuth of the setforward point, the deviations reported by the observer, and the variations of the compass, that is, the deviations due to local attraction and the declination for the particular locality for which used. For each firing the deviation of the compass is determined by the observer and furnished to the battery firing. Thereafter, both the spotting instrument and the spotting device are operated simply and quickly. It is believed that the spotting instrument will improve the accuracy of spotting from aircraft and that the spotting device will make the deviations from the battery-target line quickly available to the battery commanders. The device for determining the values of deviations with respect to battery-target line is operated by one man, is universal, and is more simple than any spotting device yet developed for use in terrestrial spotting.

b. At the same time that the aerial spotting instrument is being tested it is also intended to test various methods of aerial spotting when the observer does not have the spotting instrument. In these tests, impacts will be estimated and reported with reference to the battery-target line, with reference to the course of the target, or possibly with reference to the magnetic North. Aerial spotting by estimation with reference to the battery-target line in moving target firing offers considerable difficulty to the observer but, considering the difficulty, has been generally satisfactory. It may be said that the good results have been obtained in spite of the difficulties. Aerial spotting by estimation with reference to the target's course, that is, the axis of the ship prolonged by its wake, should eliminate some of the observer's difficulties and probably will give increased accuracy in spotting. A device at the battery will be required for converting deviations to the battery-target line as a reference. A device for accomplishing this is under consideration, but it is difficult to develop a satisfactory method of obtaining the necessary data as to the course of the target without introducing such additional operations on the plotting board as to interfere seriously with

the operations essential to position finding. If it proves practicable to estimate deviations from magnetic North without the special spotting instrument mentioned in 24 *a* above, then the device at the battery for converting deviations to the battery-target line can be the same as that developed for use in connection with the special spotting instrument. This procedure appears feasible. If so, it means that, at the battery, conversion of deviations to the battery-target line can be made quickly without interfering with the plotting operations.

25. *Wind Component Indicator.* The wind component indicator now issued to fixed batteries is not suitable for furnishing wind reference numbers when the direction of the wind is given in mils from the north point, as contemplated by the approved form of meteorological message. A simple modification of present wind component indicators was suggested in Coast Artillery Board Project No. 248. The modification will permit wind reference numbers to be obtained directly from the wind component indicator when the direction of the wind is furnished a battery in mils and the plane of fire is measured from the South point in degrees. The Coast Artillery Board will submit recommendation for the design of a wind component indicator suitable for mobile seacoast artillery, such that proper wind reference numbers for use on the Range Correction and Deflection Boards will be obtained when the direction of the wind is indicated in mils measured from the North and the plane of fire is measured in degrees either from the South or North.

26. *Sights.* Mobile seacoast artillery is not at present equipped with sights suitable for moving target firing. It is believed to be very important that this condition be corrected at the earliest possible date. A Model E 1922 Panoramic sight has been manufactured at Frankford Arsenal for use with 14-inch railway guns. One of these sights is under service test at Fort Eustis. This sight appears to be suitable for moving target firing. It is so constructed that when laid on an aiming point it can be adjusted to read the azimuth of the plane of fire. Thereafter, since the sight is graduated so that the readings decrease as the line of sight is turned clock-wise, it is evident that when a particular reading is set on the sight and the gun is traversed until the line of sight is on the aiming point the gun will be laid on the azimuth corresponding to the reading indicated on the sight. In Coast Artillery Board Project No. 131, *Panoramic Sights for Mobile Artillery*, the Coast Artillery Board recommended that Model E 1922 Panoramic Sights be furnished all railway seacoast artillery and that similar sights be furnished for mobile seacoast artillery; also that all mobile seacoast artillery be equipped with telescopic sights suitable for Case II firing, and that sights for tractor artillery be suitable for Case I firing. Since the sights recommended are for seacoast artillery, it is expected that they will be graduated in degrees and hundredths of degrees, so that one unit of measure for horizontal angles will be used in the Coast Artillery service in operation of the deflection board and pointing of seacoast cannon in direction. Recommendations have also been made that the telescopic sight for mobile artillery be adapted to mounting on an aiming rule, and that aiming rules be issued all such batteries. It is believed that the need for suitable sights for mobile seacoast artillery is a pressing one.

27. *Summary of Fire Control Developments and Their Effect on Training and Supply.* *a.* Summarizing paragraphs 13 to 29 above, it will be noted that seacoast artillery fire control system has been developed as follows:

- (1) Terrestrial visual position finding using horizontal base system in connection with multiple base-end stations, multiple vertical base-end stations, and self-contained range finders.

(2) Aerial position finding using the gun as a range finder in conjunction with ballistic firing and observation of impacts with reference to the target.

(3) Position finding and location of impacts by sub-aqueous sound ranging, which is under development.

(4) A flexible communication system to serve multiple base-end stations. It is considerably less vulnerable than formerly.

(5) An improved and less vulnerable time interval system.

(6) A plotting board adaptable for use with multiple base-end stations, for use with aerial position finding, and for use as a relocating board.

(7) Prediction devices—several acceptable ones, but none completely satisfactory. Still under investigation.

(8) Improved meteorological equipment for furnishing speed and direction of wind aloft, ballistic density and temperature, so as to be readily available for use by battery commanders. Still under investigation and development with indications that improvement is to be expected.

(9) Range correction board suitable for all types of seacoast artillery, which is operated deliberately to give a ballistic correction without reference to the time interval system.

(10) A ballistic correction which takes into consideration: height of site (including tide); ballistic wind; atmospheric density; earth's rotation; atmospheric elasticity; projectile weight; and muzzle velocity.

(11) A percentage corrector, which applies a ballistic correction, varying directly with the range, to the actual range to obtain corrected ranges or elevations, furnishes a means for applying corrections due to observation of fire so the corrections vary directly as the range varies, and furnishes a simple method of caring for the range-range relation problem where gun batteries have the range-drum graduated for a standard projectile but are firing a projectile different from standard. Use is authorized but not required.

(12) A range adjustment board for determining the range adjustment correction, showing on what shots based and when applied. It may be used advantageously with any of the prescribed methods of fire adjustment but is particularly adapted to the method which appears most logical to the Coast Artillery Board, viz: A correction at any period based on the mean of the deviations of such number of previous shots or salvos as, after consideration of elapsed time and changing conditions, seems to indicate the most probable deviations of the next succeeding shots, if uncorrected. Use is authorized but not required.

(13) Time-range (elevation) and time-azimuth devices, which permit interpolation of corrected ranges and azimuths at 10- or 15-second intervals. Usable devices are developed but problem is still under investigation with view to improvement. Indications are that satisfactory interpolations ultimately may be taken from percentage corrector and deflection board. Use is authorized but not required.

(14) Spotting devices—usable devices for both terrestrial and aerial spotting have been developed, but none of them are sufficiently superior to justify adoption of any as standard. Still under investigation and, pending adoption of standard, a suitable device must be improved locally.

(15) Sights for mobile seacoast artillery now under manufacture are so designed as to permit laying the gun in azimuth using data furnished by a deflection board, which will be similar to the standard for fixed seacoast artillery.

(16) Deflection Board adapted to use of all types of seacoast artillery, fixed and mobile, is under development. Sufficient progress has been made to justify the statement that one deflection board can be developed for all types of seacoast artillery for Case I, Case II, and Case III firing.

b. A fire control system composed of the elements listed above is applicable to all types of seacoast artillery, fixed and mobile, for firing on moving or fixed targets. If four-gun railway batteries are retained, it may be necessary to make slight changes in some of the apparatus, but the system reduces to a minimum the need for slightly different devices designed for accomplishing the same purpose at different classes of seacoast artillery batteries. Manufacture and supply will be simplified.

c. A system of fire control applicable to all classes of major-caliber seacoast artillery simplifies training, since fire control sections trained for one class of artillery may function with another class without the necessity of mastering the operation of different apparatus. This is of great importance when it is considered that many Coast Artillery organizations have primary assignments to one class of artillery and secondary assignments to another. For example, a fire control section assigned to fixed mortar batteries could, without any change of training methods, use the fire control apparatus of the mortar battery and perform as a fire control section of a 155-mm. G. P. F. organization. By changing range correction and deflection board charts it could in fact use the mortar fire control apparatus with the 155-mm. battery. These conditions make possible a common training doctrine and methods for all seacoast artillery units. This fire control apparatus can be used in fixed target firing and will minimize figuring firing data.

d. In Coast Artillery Board Project No. 116, *Fire Control for National Guard*, the possibilities of extending the system to National Guard and R. O. T. C. units is shown. Apparatus used by such units in training can be taken with them in the field and used with whatever artillery assigned. One of the chief missions of regular officers and troops is the instruction of National Guard, Organized Reserves, and R. O. T. C. units. It is of considerable importance that the training of these units be coordinated. Wide differences of viewpoint among experienced artillerymen cannot fail to result in confusion in the minds of beginners.

e. The fire control system developed provides the "tools" for uniform methods in preparation of fire. If these tools are used to the best advantage in conducting fire, uniformly good results will be obtained. A method of conducting fire with G. P. F. batteries was discussed in Coast Artillery Board Project No. 75, *Fire Control System for 155-mm. G. P. F. Guns*. An application of the same system in firing 12-inch fixed mortars was discussed in Coast Artillery Board Project No. 117. Both of these discussions show that the proposed system will furnish accurate ballistic firing data to a battery as rapidly as the guns can be loaded, laid and fired. The conduct of fire must always be dependent upon the methods and judgment of a particular battery commander, but if conducted according to sound principles the system is capable of fulfilling all the requirements outlined in paragraph 9 c above as being desirable and meets the ideas of the Board of Officers, mentioned in paragraph 9 c above, that desirable features of improved fire control methods should be (1) provision for use of multiple bases, and (2) correction of fire based on instrumental observation of fire.

28. *Preparation and Adjustment of Fire.* a. In the last few years there has been very considerable improvement in the conduct of fire at moving targets. It is believed that there is at present considerably less tendency in the service

to apply methods of adjustment which are solely applicable to fixed targets to the problem of moving target firing. There are, and can be, no hard and fast rules of procedure in the methods of adjustment of fire against moving targets. There is no easy road to efficiency in this matter, but there are certain principles applicable to moving target fire which must be mastered by a Coast Artillery officer and applied according to the circumstances existing during each particular firing.

*b.* Fire control and position finding methods in moving target firing should be such that the obtainable rate of fire is dependent only on the time necessary for the mechanical operation of loading and pointing. Such of the fire control and position finding operations as are performed prior to each shot or salvo must be completed and information delivered to the gun in time to avoid waiting for firing data. In other words the rate of aimed fire should not be appreciably slower than would be required for the same gun using unaimed fire. The rate of fire should in no way affect the accuracy of fire, and this condition is believed to be possible if the fire control apparatus listed in paragraph 30 *a* above is used. Preferably, the fire control operations for adjustment of fire should conform to the following requirements:

(1) Ballistic corrections applied for every commensurable influence which affects the flight of the projectile.

(2) Arbitrary corrections determined from observations of impacts applied in such manner that they will vary for the changing ranges approximately at the same rate as the ballistic correction varies, arbitrary corrections being regarded as adjustments on changes in the ballistic correction. This procedure will result in an ultimate adjustment of the total correction to conform approximately to changes in ranges.

*c.* Thorough preparation of fire should consist of:

(1) Calibration which should be accomplished at a convenient time by special calibration firings. The importance of calibration cannot be overestimated.

(2) The organization and training of the battery personnel, orientation of gun sights, azimuth instruments, plotting boards and other devices, orientation of guns, checking of range drums by clinometer, and procurement of the essential meteorological and ballistic data.

(3) The determination of the ballistic range and deflection corrections for the range and azimuth at which trial or ranging shots may be fired, using an assumed muzzle velocity, that is, a muzzle velocity based upon history of powder and its temperature at time of firing.

(4) The firing of the trial phase, preferably by trial or ranging shots. (Although usually considered as a phase of adjustment, this is inserted here to simplify the discussion.)

(5) The alteration of the ballistic correction by the amount which may be justified as a result of trial fire, that is, ordinarily, by the mean of the deviations of the trial or ranging shots. In this connection the following discussion is pertinent.

(*a*) The ballistic correction requires slight adjustment when the initial velocity and atmospheric conditions are measured under Proving Ground conditions. Improved meteorological equipment permits increased accuracy in determining atmospheric conditions, but since devices for measuring muzzle velocity have not been perfected for issue to batteries, the estimate of this element of the ballistic correction is based on very uncertain data. The

practice of ascribing the difference between the observed ranges and the expected range of a group of trial shots as due chiefly to the difference between the assumed velocity and the actual muzzle velocity is warranted on the assumption that errors and omissions in determining the factors which affect retardation are fewer and of less amount than those which affect muzzle velocity.

(b) Trial shots should be used whenever visibility conditions in the vicinity of the target from any cause are such that shots directed at the target probably cannot be observed, providing a registration or trial shot point can be selected such that deviations can be determined. Three or more trial shots should be fired ordinarily from the same gun with the same laying, without reference to the time interval indicators, and as rapidly as possible consistent with precise laying. If, because of lack of information concerning the powder or for other reasons, wide deviations are anticipated, the second and successive shots, as may be desirable, may be delayed for the observation of the preceding shot or shots in order that correction designed to bring the range of the center of impact nearer to the expected range may be applied. Ordinarily, however, such delays during trial fire should be unnecessary and are undesirable. When the series is completed and the mean of range and azimuth deviations determined, fire should be shifted promptly to the target. The interval between the conclusion of trial shot firing and shifting fire to the target should not greatly exceed one minute plus time of flight in the case of 12-inch mortars and should be less with more rapid firing armament. Trial shots are favored for the trial phase of night firing, whether smoke screens are employed by the enemy or not, since splashes are more likely to fall within the searchlight beam when the light is stationary than when following a moving target. The trial shot procedure is satisfactory whenever it can be used. Errors in laying are less likely and determination of deviations probably more certain and accurate when all trial shots are fired with the same elevations and azimuth. They offer the quickest and most accurate means of determining a probably true adjustment correction of the ballistic correction. The trial shot point preferably should be on the predicted course of an enemy target at the approximate range at which it is expected to open fire, and enough in advance of it so that the trial phase (registration) can be completed a very short time before the target arrives within the field of fire. Whenever it is necessary to open fire at once upon the target and not delay for trial shots, and it is possible to observe impacts, resort should be had to ranging shots, which are, in effect, trial shots fired at the moving target. If the target is preceded by destroyers laying down smoke screens the trial shot point should be at a sufficient distance ahead of them to avoid obscuration of impacts from spotting stations for registration. When employed in target practice, the same principles apply except that safety to the towing vessel should have prior consideration over the advantage gained by selecting a point dangerously near the range and azimuth at which fire at the target will be opened.

(c) Ranging shots, that is, trial shots fired at the target, by single piece, alternate pieces, or battery salvo, may be used when deviations of impacts in the vicinity of the target can be determined. Ranging shots have the advantage of avoiding the delay of shifting fire and of offering a possibility of hits during the process of adjustment. Ranging fire should be continuous, that is, there should ordinarily be no delays for observations of impacts. Corrections may be by successive approximations or be based upon the mean

of the deviations of three or more shots. In the former case, the correction based on the deviation of the first shot might not be applied earlier than the fourth shot, but as a rule should be incorporated in the third shot; that for the second shot on the fourth shot, etc. After three or four shots have been observed and corrected for, additional corrections should be based on the mean of the deviations *from the expected range* of not less than three or four of the most recent shots or salvos, whether adjustment fire be conducted, or battery fire for effect opened.

(d) A thorough comprehension of the mechanics and technique of fire control is a necessary attribute of an efficient Coast Artilleryman, whose principal mission is effective fire on moving naval targets. If the procedure outlined above for preparation of fire be accomplished properly and thoroughly, then properly adjusted fire at an enemy ship may be expected. Under those conditions of visibility which we may reasonably anticipate, whether the splashes of any shots fired at enemy ships can be identified and the deviation measured, is problematic. That some impacts may be observed and identified is probable, especially those impacts which may be short. If impacts can be identified and observed and the target can be tracked by the position finding observers, then in general, the deviations of observed splashes can be obtained. The probability that intensive fire on enemy vessels may be susceptible to observation is sufficient justification in itself for both terrestrial and aerial spotting installations, in order that we may overlook no opportunity to deliver the maximum of effective fire in engagements with naval vessels.

g. In the case in which the magnitude of range deviations cannot be determined owing to failure of communication with a flank observer or for other cause, but visibility is such that the determination of deviations of ranging shots may be determined, the most probable position of the center of impact with respect to the target may be determined by observing the relative frequency of shorts and overs and applying a correction which will equalize the number of shorts and overs.

h. Observation of fire is an important aid to accuracy of fire but reasonably effective fire is possible without it. Observation of fire from both terrestrial stations and from the air should be provided in target practice and every effort made to perfect training of terrestrial units and to secure coordination and training in conjunction with the Air Service. In long range firing, both for observation of fire and for position finding, the Air Service is the main dependence of the Coast Artillery, and no efforts should be spared which may tend to build up a proper understanding of combined Coast Artillery and Air Service problems. Proper equipment and well organized and properly instructed spotting sections can furnish information of the magnitude of deviations of those impacts which can be observed, with the required accuracy and within a few seconds after the splash. Ordinarily, when sensing of shots is possible, measurement of deviations should be possible also. How frequent in action either will be possible is a matter of conjecture, but it certainly is reasonable to expect that ships before, or in attempting to pass, fortifications would protect themselves with smoke screens which would obscure practically all splashes, either short or over, except perhaps the abnormally short shots. For example, assume a fleet attempting to gain an entrance to Chesapeake Bay. A successful run-by would enable it to get beyond the range of the fixed defenses. Smoke screens would partially screen its movements and wholly prevent its observation of fire from Fort Story. The masts and

parts of the upper works may be visible above smoke screens sufficiently to permit fairly satisfactory tracking. It is true that the smoke screen hampers the fire of the ship it protects, but under conditions similar to those at the entrance of Chesapeake Bay, it is probable that a fleet would accept that handicap since it could not hope to damage the fortification seriously during the short period the fleet would expect to be under fire. The fleet commander would rely for security on the speed of his ships and the protection of smoke screens, rather than on his own fire. Haze or low lying fog will produce similar conditions, but if observing and spotting stations are well advanced into the field of fire the adverse effect of these conditions, as pointed out in Par. 13 *h* above, will be minimized. No method of conduct of fire is sound which is solely dependent on continuous or even frequent observations of splashes, and consequently on the absence of smoke screens or fog. Preparation of fire and trial shots offer the surest means of conducting a reasonably effective fire when observation of impacts is not continuous or is impossible.

i. The setforward point or the point aimed at in the case of a ship following a zigzag or sinuous course may be located considerably off the course actually taken by the target. This may occur also due to inaccuracies in plotting. Corrections due to observation of fire, therefore, should be based on deviations from the range and azimuth of the setforward point. If range deviations are observed from the target, deviations in the range of the setforward point of expected range may be determined by requiring the plotter to call out the range deviations of the setforward point from the plot of the course of the target. These deviations are then combined with proper signs with the deviations of the splash from the target as determined by the spotting section. This method has been used successfully and compares favorably in speed and accuracy with spotting methods which determine the deviations from the setforward point directly.

j. The fire of minor-caliber armament (including antiaircraft artillery firing on moving naval targets) may be regulated by the same principles and methods as the larger calibers. It is probable that targets will be more numerous and will maneuver more rapidly, which will increase the uncertainty of identifying them by distant spotting stations. Usually, ranges can be determined at frequent intervals from self-contained range finders located near the battery, and the range correction applied through a percentage range correction device with or without a Pratt Range Board. *A varying correction which adjusts automatically the range correction to the rapidly varying ranges is of equal or greater importance than for batteries of the primary armament.* Such a correction is approximately compensating over wide variations in range, whereas a flat correction is not. The procedure may be as follows:

(1) Registration as a point on the predicted course of the target at the approximate range at which it is desired to open fire.

(2) Application of the range correction as a percentage correction by means of the percentage corrector mentioned in Par. 19, above.

(3) Adjustment of the correction by observation of fire when satisfactory observation is possible. Such changes in adjustment should be conservative. The trial shot correction should be regarded as more reliable than a correction based on either sensed or observed deviations equal to or fewer in number than the trial shots, unless considerable time has elapsed since trial shots were fired.

k. The preceding paragraphs describe range adjustment. Azimuth (deflection) adjustments do not offer the complications that range adjustments do,

and generally speaking are accomplished more simply. Deflection adjustments are carried on simultaneously but independently of range adjustments. Except in firing at ranges beyond 15,000 yards, or at elevations above  $30^\circ$ , or where observed deviations in direction are greater than  $0.50^\circ$  (9 mils) adjustment may be made by correcting by an angle equal to the mean of the lateral deviations of trial or ranging shots. With successive approximation and salvo center of impact methods, the deflection correction may be applied directly as the total of the angular deviation in direction of the last shot or mean of latest shots. Under these conditions, when firing by Cases I and II, correction is sometimes applied directly by the gun pointer, as indicated in Par. 7 *g*, T. R. 435-221. This method, sometimes called "jumping the splash," is advisable only with guns of less than twelve inches in caliber. Under the conditions stated, these methods usually give azimuth (deflection) adjustment in a few shots. Beyond the limiting range or elevations of observed deviations given above, the amount of the correction should be determined by the same method as in the range correction, using always the method of adjustment being used for range. The correction is expressed in angular measure, its linear value is always proportioned to the range, and it may be applied directly to the ballistic azimuth or deflection correction.

*l.* (1) The difficulty in holding an established adjustment in range and deflection whenever the powder charge is changed has not been mentioned in this paper. A change from one charge to another changes the trajectory and corresponding ballistic corrections enormously. The following table shows the effect on the maximum ordinate of changing charges with the 16-inch gun for the 2340-lb. projectile:

<i>Range, yds.</i>	<i>Charge</i>	<i>Max. Ord. yds.</i>	<i>Charge</i>	<i>Max. Ord. yds.</i>
32,400	$\frac{3}{4}$	9,000	$\frac{7}{8}$	18,000
39,300	$\frac{7}{8}$	12,000	Full	23,000

To show the meaning of this table, consider the case where a target was moving out and the battery was shooting at the deck of the target. For 25,500 yards to 32,400 yards range, the  $\frac{3}{4}$  charge would give maximum penetration of the deck. At 32,400 yards the maximum range for the  $\frac{3}{4}$  charge would be reached and a change would be made to the  $\frac{7}{8}$  charge. In making this change, the maximum ordinate at this range would change from 9000 yards for the  $\frac{3}{4}$  charge to 18,000 yards for the  $\frac{7}{8}$  charge. Such a sudden change in trajectories would probably destroy previous adjustment.

(2) Where velocity curves for adjacent zones have been connected with each other in accordance with the ratios of the normal velocities of the adjacent zones, the velocity corrections from zone to zone appeared to vary properly in all practices. However, the Ordnance Department has been requested to study and report as to the most suitable method for carrying velocity corrections from one zone to another.

(3) Present fire control methods contemplate deflection corrections for ballistic wind for changing azimuths of the plane of fire and for varying maximum ordinates. The method of application of cross-wind effects contemplates the use of a family of combined cross-wind and drift curves plotted for each zone. The zone elevation and wind reference number are used as arguments in entering the chart. Provisions for arbitrary cor-

rections still will be necessary, but study and experiment are necessary as to the proper way to apply such corrections at different elevations in different zones. For guns, an arbitrary correction in angular measure for lateral deviations should suffice and can be cared for on a simple adjustable scale of angular units. The linear magnitude of such a correction then should vary with the range. For mortars, such a scale and such a range should be satisfactory in all zones (with the same projectile) for the elevation at which the lateral angular deviation was determined. Within any zone at elevation different from the elevation for which the correction is suitable, an error in azimuth should be anticipated. This error is of secondary order and its magnitude may be negligible, but as noted above, study and experiment are necessary before expressing definite conclusions on this point. The question of applied deflection corrections within a particular zone in high angle fire, and when passing from zone to zone, is under investigation.

#### CONCLUSIONS

29. Those parts of this project believed to require action are summarized in the following conclusions:

a. That a comprehensive doctrine relative to seacoast artillery in coast defense operations should be published and distributed to the entire service in the same way the Field Service Regulations are given general distribution. [Par. 3 *d*.]

b. That the future importance and effectiveness of prewar primary armament is sufficient to justify keeping it equipped with a fire control system ready for service, which is equally as effective as that provided for post-war primary armament. [Par. 6 *b* (3).]

c. That an armor piercing projectile should be developed and made available for 155-mm. GPF guns for use in coast defense. [Par. 6 *c* (2).]

d. That steps be taken to obtain increased ranges from the present 7-inch and 8-inch guns so that they may outrange medium-caliber guns on the types of light cruisers now building. If 7-inch and 8-inch guns cannot be given sufficiently increased ranges to outrange the guns of light cruisers, that consideration be given to making another medium-caliber type available for this purpose. This armament should be provided with A. P. projectiles. [Par. 6 *d* (2).]

\* \* \* \* \*

f. That in localities where the terrain permits, some terrestrial observing stations should be advanced sufficiently into the field of fire to give position finding data throughout the limits of the possible range of a battery. [Par. 13 *h*.]

\* \* \* \* \*

h. That two observing stations per battery are not sufficient. Permanent multiple stations should be provided when possible and where not provided they should be improvised. [Par. 13 *j*.]

i. That the tactical situation may require both concentration and distribution of fire; that a single high-powered gun frequently will be a suitable assignment to a single enemy target; and that the fire control and position finding systems for batteries of more than one high-powered gun should be such as to permit fire on one target or on as many targets as there are guns in the battery. [Pars. 14 *a* to *f*.]

j. That for coast defense missions, one 14-inch or larger-caliber railway cannon, with personnel therefor, should constitute a battery, and that Tables of Organization and Training Regulations 435-225, *Battery of Railway Artillery*, should be amended accordingly. That if such one-gun batteries for coast defense missions are not approved, then a complete fire control and position finding system for each railway gun of 14-inch or greater caliber should be provided. [Par. 14 *g*.]

*k.* That it is impracticable for a single fire control and position finding system for railway artillery to furnish data for more than two directing points. That all railway artillery, if less than 14-inch caliber, should have only two guns for coast defense missions, and that Tables of Organization and Training Regulations 435-225, *Battery of Railway Artillery*, should be amended accordingly. [Par. 14 *g* (2).]

*l.* (1) That the determination and use of the predicted point be not required, provided a suitable check-back system be used, and that T. R. 435-221 be amended accordingly. [Par. 15 *h*.]

(2) That no definite predicting interval or frequency of predictions be prescribed, and that T. R. 435-221 be amended accordingly. That the prediction interval should be as small and the frequency of predictions as great as the flow of position finding data and state of training will permit. [Par. 15 *i*.]

*m.* That consideration be given to furnishing ballistic density in the meteorological message in tenths of a per cent by adding one figure to the present message. [Par. 16 *c*.]

*n.* That the efficiency of the present meteorological service in various coast defenses be investigated with a view to determining whether the service is functioning properly and what use is made of meteorological data furnished. [Par. 16 *e*.]

\* \* \* \* \*

*p.* That the fire control apparatus listed in Par. 27 should be given sufficient service tests to determine its suitability for the purposes for which designed, and if found suitable, should be prescribed as standard for National Guard, Reserve, and R. O. T. C. units and for the use of Regular troops in training all such units. [Pars. 27 *a* to *e*.]

RECOMMENDATIONS

30. It is recommended:

*a.* That necessary action be taken in conformity with "Conclusions," Pars. 29, *a* to *p*, inclusive.

*b.* That no part of this project be published in the *COAST ARTILLERY JOURNAL* unless the Chief of Coast Artillery so directs.

ACTION BY THE CHIEF OF COAST ARTILLERY

War Department, O. C. C. A., April 8, 1925—To President, Coast Artillery Board (through Commanding General, Third Coast Artillery District), Ft. Monroe, Virginia.

1. This project has been given very careful consideration in this office and, with the following exceptions, and those of Par. 2, this indorsement, it meets with the approval of the Chief of Coast Artillery:

\* \* \* \* \*

Page 10, *c* (3). New sights for the 155-mm. gun and for railroad guns are under development and, to meet immediate requirements, the present sights are to be modified along the lines suggested by the Coast Artillery Board. Fire control equipment for 155-mm. gun batteries as recommended by the Coast Artillery Board is now being subjected to further service tests and probably will be adopted if the reports are satisfactory.

\* \* \* \* \*

Page 10, Par. *d* (1). The number of 14-inch railway guns will be increased as rapidly as funds can be secured for that purpose.

\* \* \* \* \*

Page 30, Par. 15 *h*. The matter of discontinuing the predicted point is still under investigation by the Office of the Chief of Coast Artillery.

\* \* \* \* \*

Page 33, Par. 17 *e*. Range Boards, Model 1923-E, will be provided as rapidly as funds become available for that purpose but with the limited appropriations for "development and manufacture" it will be some time before these boards can be supplied in any quantity.

Page 42, Par. 26. New sights for mobile seacoast artillery are being developed by the Ordnance Department along the lines suggested by the Coast Artillery Board. Due to shortage of funds it is probable that it will be some time before this development can be completed but modifications are being made to present sights to meet immediate requirements.

2. This office concurs in the conclusions of the Coast Artillery Board as given in Section III with the following exceptions and modifications:—

*a*. The Commandant, Coast Artillery School, has been requested to prepare a study on "Doctrines of Seacoast Defense by the Coast Artillery Corps."

*b*. Approved in so far as funds available now or in the future will permit. In this connection information is furnished that at the present rate of appropriations it would take approximately thirty-five years to complete the fire control systems for the modern long range batteries now installed.

*c*. A new point fuse for the 155-mm. shell is being developed by the Ordnance Department which will considerably increase its ability to penetrate steel plate. No effort is being made at the present time to secure armor piercing shell. It is possible that some gun will have to be provided to meet the lightly armored cruisers of the 10,000-ton class but if so it is probable that an 8-inch railroad gun will be the answer. An 8-inch railroad gun which is under development by the Ordnance Department is expected to have a range of approximately 35,000 yards.

*d*. The elevation of the 7-inch railway guns on hand can not be increased without structural changes that would be too expensive in view of the fact that these guns have already seen considerable service. A 45-caliber 8-inch Navy gun is now being mounted on the 12-inch howitzer railway carriage and is expected to give a range of approximately 35,000 yards.

\* \* \* \* \*

*i*. It is believed that with long-range, high-powered guns a maximum of two guns per battery gives only sufficient gun power to insure a reasonable chance of putting a ship out of action in the minimum required time. Therefore, it is not believed to be desirable to incur the expense of a separate position finding system for each gun in two-gun batteries.

*j*. See remarks under *i*.

*l*. (1) and (2). No decision on this point can be given until a report is received from Panama on Coast Artillery Board Project No. 117 in which the system does away with the predicted point for each setting of the mortar.

*m*. The Ordnance Department is being consulted in this matter.

*n*. This matter is being investigated during training inspections.

\* \* \* \* \*

*p*. It is expected that during the coming target practice season regular army Coast Artillery commands will utilize the fire control appliances listed in Par. 27 and a careful study of target practice reports of the batteries so equipped will be made in this office. Whether such apparatus will be adopted for National Guard, Organized Reserve, and R. O. T. C. units will depend upon the status of funds available for the purchase of the necessary equipment.

3. The necessary action will be taken to carry out the conclusions of the Coast Artillery Board as mentioned in Par. 29 as indicated in Par. 2 of this indorsement. The Chief of Coast Artillery has no objection to the publication of this project in the COAST ARTILLERY JOURNAL so long as the action indicated in this indorsement on the project is published also.

\* \* \* \* \*

### Artillery Observers in Martin Bombers

It has been usual for an artillery observer, while observing artillery fire from Martin Bombers, to take position on the upper deck of the bomb-bay, where he may either sit up or lie down, as shown in Figs. 1 to 4. No particular safety precautions to keep the observer from being blown from the airplane have been taken, since it was considered that the four upright struts with the crossed wire braces between them would afford ample protection.



FIG. 1. POSITION OF OBSERVER ON BOMB-BAY AS SEEN FROM THE NOSE OF THE AIRPLANE  
*Note records on arm*

As can readily be seen from the illustrations, the observer finds himself in awkward and inconvenient positions while engaged in work calling for accuracy in estimates and nicety in judgment. By strapping his records to his left arm (see Fig. 1) and by bracing himself against the struts and wires, he leaves his hands free to use the instruments with which he is provided and which he must be careful not to lose. By changing his position frequently, moving from one side of the bomb-bay to the other, he keeps the target in sight as the airplane dips and circles in the air.

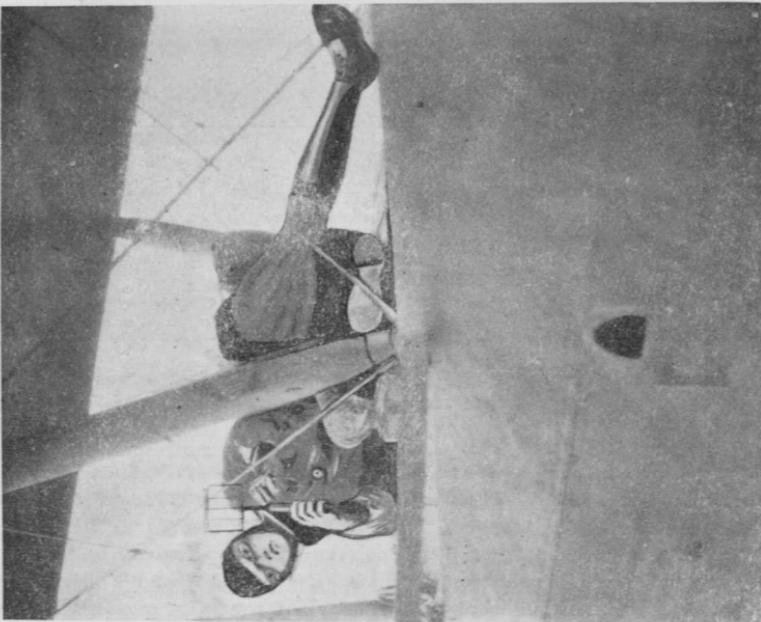


FIG. 2. POSITION OF OBSERVER ON BOMB-BAY AS SEEN FROM THE REAR OF THE PLANE



FIG. 3. POSITION OF OBSERVER SITTING ON BOMB-BAY AS SEEN FROM THE NOSE OF THE PLANE

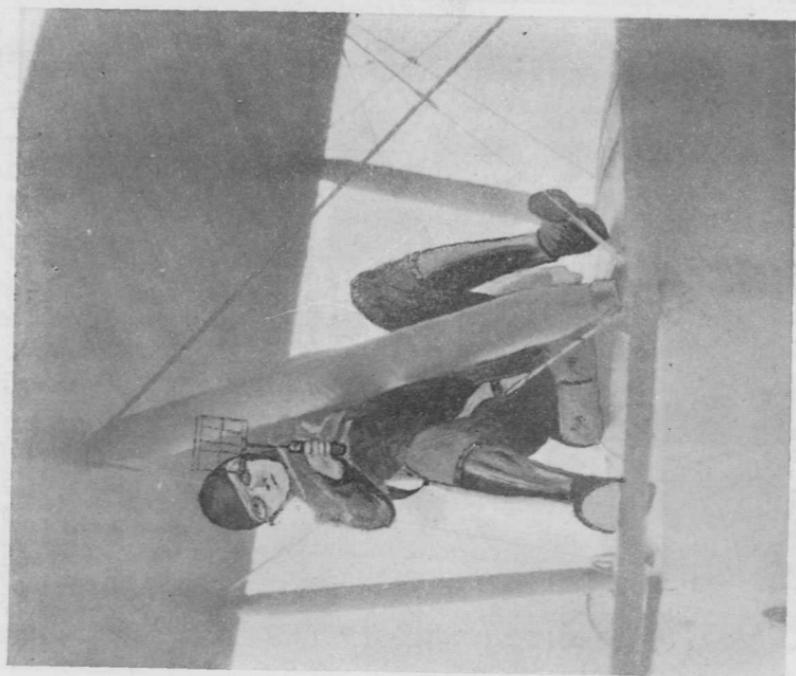


FIG. 4. POSITION OF OBSERVER SITTING ON BOMB-BAY AS SEEN FROM THE REAR OF THE PLANE

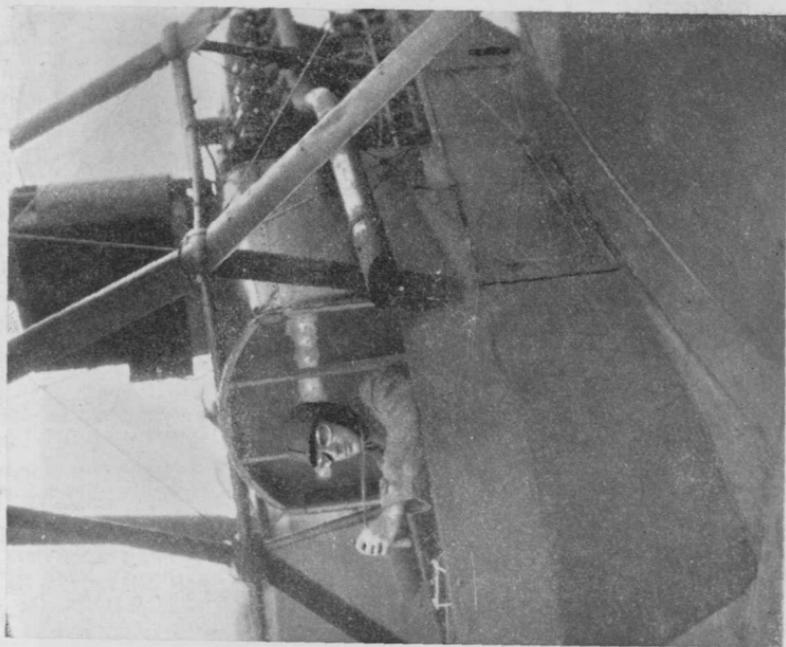


FIG. 5. POSITION OF OBSERVER IN NACELLE AS SEEN FROM THE RIGHT REAR OF THE PLANE

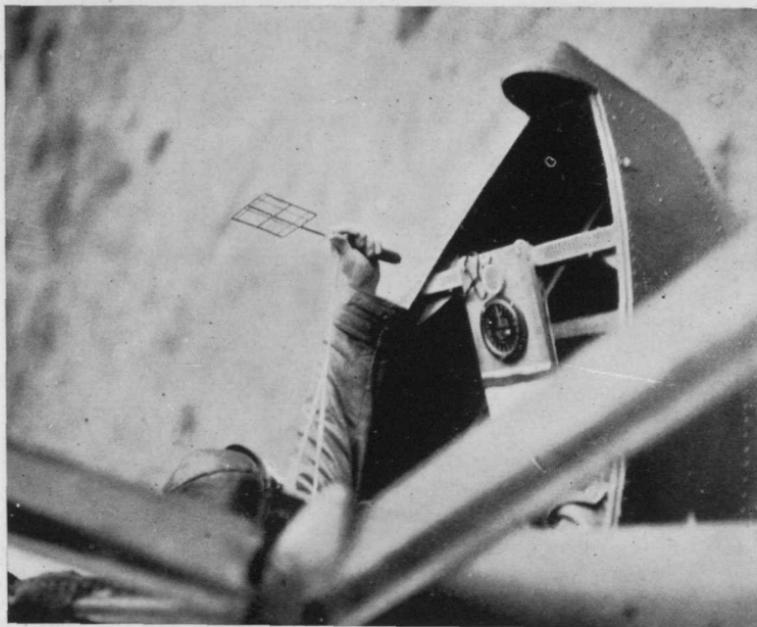


FIG. 7. POSITION OF OBSERVER IN NACELLE AS SEEN FROM THE BOMB-BAY



FIG. 6. POSITION OF OBSERVER IN NACELLE AS SEEN FROM THE RADIO COCKPIT. NOTE THE BOARD FOR ALTIMETER, WATCH, AND RECORDS

Despite its inconveniences and the element of danger involved, the position, since it appeared to be the best place for observation, was continued in use until a near-accident during the joint Antiaircraft-Air Service tests of the past summer indicated the desirability of a safer and more convenient location for the observer.

During a night-observing mission in the latter part of August, the rip-cord sheathing became detached from the canvas covering of the parachute in such a manner that the parachute could be opened in case it were pulled in any way. This occurred when the observer changed his position from one side of the bomb-bay to the other. The pilot chute of the parachute was at once pulled out to the rear. The observer averted disaster by rolling over on his back and gathering the silk under him. With the assistance of the radio officer, he released himself from the parachute, which was then disentangled and stowed in the rear cock-pit.

Attention having been brought sharply to the danger of a position on the bomb-bay, a better place was sought. After some investigation, it was decided that, for efficiency of observation, safety, and comfort, a location in the nacelle behind the engine was superior to any other. The turtle-back of the nacelle is removed and the observer sits in the lower half of the nacelle. One or two kapock cushions on the floor brings the observer's head to the right height. Figures 5, 6, and 7 show the observer in this location. A board for records and altimeter is attached to the cross braces of the nacelle, as shown in Figs. 6 and 7. The target is in full view of the observer at all times from this position.

One possible danger exists, as can be seen from Fig. 5, in that the exhaust pipes discharge the exhaust gases in close proximity to the observer. When the turtle-back is removed, the stream line in rear of the engine is broken, and it was at first feared that the partial vacuum thus created would tend to suck in enough gas to be harmful to the observer. Actual trial does not show this to be the case. The position has been occupied on missions lasting from two to three hours, and the observers report no ill effects from carbon monoxide. The change should result not only in greater safety to the observer but also in greater accuracy in his work because of his more comfortable location.

## Summer Encampment of the 250th Coast Artillery

*By 1st LIEUT. S. R. Dows, 250th C. A.*

Last year California boasted only one Coast Artillery Regiment. Through the efforts of the Adjutant General, R. E. Mittelstaedt, a second regiment was authorized. The old 250th Coast Artillery was split, those batteries in the south forming the nucleus for the 251st C. A. (Harbor Defense), while the seven batteries in San Francisco expanded to form the present 250th C.A. (Heavy Tractor).

Requisitioning of supplies and equipment and the perfecting of the organization required a considerable portion of the year. The arrival of the materiel was delayed—many of the fire control and orientation instruments arriving only in time for reshipment direct to camp in the original packing. The tractors and guns arrived late in May allowing only four instruction periods prior to the July Fourth parade in which the eighteen tractor-drawn guns appeared.

The order for the encampment and maneuvers divided the period from August 1 to 15 into three phases: (a) The transportation of the Regiment to Santa Cruz, the emplacing of the guns, establishing of lines of communication, survey of base lines, and the installation of base end and spotting stations; (b) The

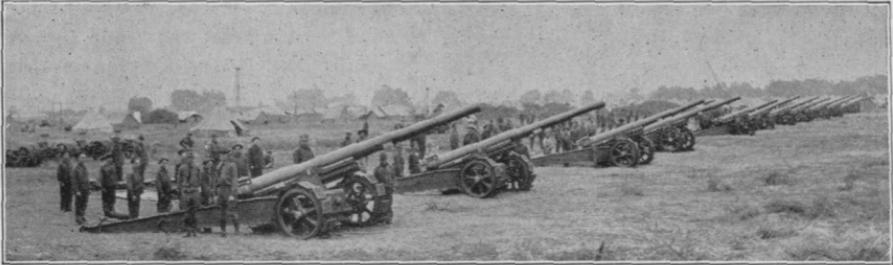
perfection of base lines and communications and intensive artillery drill; and (c) The calibration of and target practice with two guns per battery at fixed sea targets. Obviously the first phase required that the return trip to San Francisco be taken into consideration.



ON THE SANTA CRUZ GRADE

Of the three phases, the first was perhaps the one in which the regiment was most vitally concerned. To fire the guns was no more of a task than had been accomplished in past years. True there were many new devices which made it a bit more difficult for the officers, but the big question from the start was transportation,—the moving of the guns with the tractors. A march graph, showing

for any minute of the trip where any organization would be, was prepared to accompany the march orders. The greatest divergence from this schedule was four miles, which is quite remarkable considering the limited experience on which to base the graph. The regiment was divided into two columns. The tractor-drawn guns with a truck and rolling kitchen, two motor cycles, and a Dodge touring car comprised the Heavy Train. The Light Train consisted of trucks for the personnel and light baggage, with rolling kitchens and a Cadillac and Dodge touring car. The two columns made the trip in three and two days, respectively.



GUN PARK NEAR THE HIGHWAY

Naturally enough the interests of all were centered in the Heavy Column. Among the tractors, one burned out a main bearing about twenty miles from San Francisco and was replaced by one brought from the Armory. A second tractor burned out a main bearing at Alma, a distance of fifty-five miles from San Francisco. A Liberty class B truck was detailed to drag the gun over the grade into camp and no further trouble was experienced from that source. The failure of these two bearings is attributed to a stoppage in the oil line or to foreign matter in the oil which stopped up the strainer. A different grade of oil was used on the return trip and other precautions taken so no trouble was had with bearings.



EN ROUTE TO SANTA CRUZ



IN THE SANTA CRUZ MOUNTAINS

The trip to Santa Cruz is eighty-one miles and required for the tractors some twelve hundred gallons of gasoline. For the nine hundred and seventy tractor miles the fuel consumption was about one and one fourth gallons per mile. This mileage attainment indicates very efficient handling of the tractors. The weather was particularly warm and the grade over the Santa Cruz mountains rises from sea level to 1577 feet at the summit. Despite the fact that the Light Column was on the grade during the heaviest of the Sunday traffic, there were no accidents. All possible precautions were taken to insure safety and

comfort to civilian machines. The traffic police aided in warning motorists and keeping machines on the move. By running the trucks at hundred-yard intervals, the regular Sunday traffic was able to pass the column with ease. Among the trucks there were no serious difficulties encountered.

While at Santa Cruz, all trucks and tractors were overhauled and, as a result, the trip home was made without serious trouble. The tractor which had been left at Alma on the down trip was put into service at that point, and the tractor from Belmont which had been the first to fail, was put in action at Palo Alto.

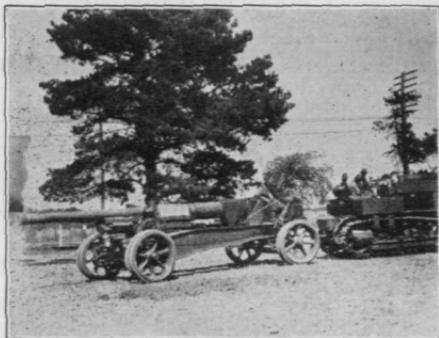


ON THE PALO ALTO ROAD

due to the expertness of the maintenance crew that the trip was possible in such fine manner.

CAMP SANTA CRUZ, CALIFORNIA.—Reference to any good military map of the Pacific Coast might well lead to the selection of Monterey Bay as the logical point of attack for landing parties. From there into San Francisco, the travel over good roads would be comparatively easy and the approach to the bay region would be most strategic. The shore line at Santa Cruz is especially adaptable to the needs of a landing party. It is quite appropriate therefore that Santa Cruz should have been selected for the 1925 Maneuvers and Summer Encampment of the 250th Regiment.

The site chosen for the camp is a flat tidal plane along the beautiful Sea Cliff Drive. A quite conventional design was followed in the pitching of the canvas, and just west of the camp proper the guns were emplaced to cover the field of fire which was to be used. Climatic conditions were all that could have been hoped for. During the training period a fog hung over the coast which made work more comfortable and interfered practically none with the visibility. The fog dispersed very obligingly during the two days of firing leaving almost ideal weather. Practically no interference was experienced from shipping.



AT PALO ALTO

Upon arrival in camp, an orientation detail from each of the three battalions ran the necessary traverses and triangulation surveys for the establishment of base lines. These three surveys were based on three points which had been located from a civilian survey. Three sets of base end stations were installed and the base lines tied in with the battalion directing points. A detail under the regimental orientation officer located the spotting station on the left flank of the regiment for unilateral spotting.

**RANGE FINDING SYSTEM.**—Each of the three battalions had an independent range finding system consisting of horizontal base end stations, plotting and spotting stations. Each battalion system served its two batteries, there being one directing point midway between the two batteries of each battalion. The three systems were interconnected through the regimental switch board and to the regimental radio station. Headquarters battery established and operated a station for obtaining surface meteorological data which was furnished for all stations every half hour. Azimuth instruments were used in the base end stations—some of them graduated in mils and some in degrees. Except for the Cloke plotting board and the Pratt range board, all the instruments in the plotting room were improvised or built by the organization. All were approved devices as described in T. R. 435-221 or Coast Artillery Board projects but not yet issued to the ser-



FIRING FOR RECORD

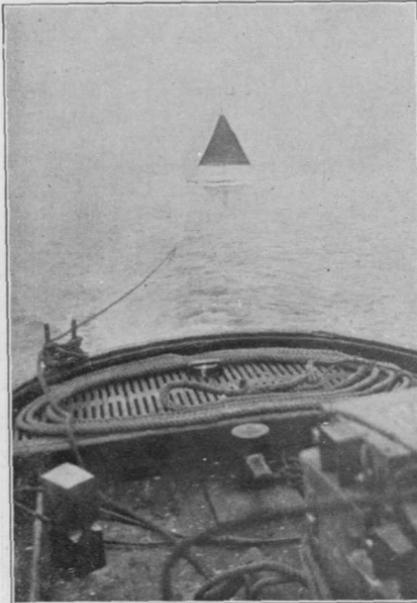
vice. These instruments were set up in a 12'x 12' wall tent which very comfortably accommodated the personnel.

**COMMUNICATIONS.**—The communication system installed was that described in Coast Artillery Board Project No. 315, "Communication System for Mobile Seacoast Artillery for Firing on Moving Naval Targets," (*COAST ARTILLERY JOURNAL*, February, 1925). The installation was complete except for regimental and battalion posts which were not deemed necessary. The working of the system was very satisfactory, with no more trouble than usually occurs during the firing at fixed defenses.

**CONDUCT OF FIRING.**—The preparation for target practice included the checking and adjustment of all instruments and boards, cleaning of projectiles, testing of primers and firing mechanism, and the coordination of plans for spotting. The schedule called for the firing to be completed in three days. A day and a half was allowed for the six calibration problems and a similar period for the adjustment problems. To indicate at once in a general way how well the firings

were conducted it may be stated that the firings were completed in two days. On August 11 the six batteries each conducted a calibration shoot using a fixed target at about mid range. A complete set of data was taken for the purpose of calibrating all twelve guns so that in the future any combination of these guns can be effected.

On August 12 the adjustment problems were fired, each battery having an ammunition allowance of twenty shots. In past years the trial shot method had been used almost entirely so the bracketing and successive approximations methods were selected for this firing. One battery of each battalion used bracket-



BEFORE



AFTER

ing and the other used successive approximations. All problems required adjustment of fire on a fixed target, using unilateral spotting. Range corrections were applied in the plotting room while deflection deviations were taken care of by the gun pointers. The battery commander was left free to supervise any phase of the firing which might call for his attention. The impact board was used by the range officer in making the corrections which were applied as a percentage on the proper scale of the percentage corrector. During the adjustment firing all batteries scored hits. Two pyramidal targets were completely demolished. The materiel functioned without interruption or accident. For all batteries firing, the average developed probable error was 73 yards as compared with the proving ground value of 45 yards. The average of the probable errors from the calibration firing was 54 yards. The best firing was done in seven minutes and twenty-two seconds, securing four very good hits. The regiment as a whole scored better than ten per cent of hits.

The entire maneuvers were unanimously declared successful and excellently conducted. To Colonel R. E. Mittelstaedt the 250th Coast Artillery owes a sincere vote of appreciation. It was his initiative which organized the regiment and

commanded it through the test. To Major T. C. Cook, C. A. C., the entire regiment is unanimous in its words of gratitude. Others there were whose loyalty to the regiment was of inestimable value but, space limits further acknowledgment. The guns were taken to Santa Cruz in record time. They were emplaced, oriented, and fired in a true military manner and returned to the home station without mishap. Thus it was that the 250th C. A., a regiment whose enviable record dates back to 1854 and the Civil War, added another chapter to its history. Into that chapter must be written the highest praises from those who officially and unofficially visited the most extensive maneuvers ever held by Coast Artillery troops on the Pacific Coast.

## I Wish That I Knew But I Don't

By MAJOR CLAIR W. BAIRD, C. A. C.

*Captain, Coast Artillery Rifle Team*

*EDITOR'S NOTE: As noted in the November JOURNAL, the Coast Artillery Rifle Team won seventh place in the National Matches at Camp Perry, Ohio. One is apt to gather from the following article that the Team Captain feels that a bit of an apology is due from the team for not attaining a greater success. In this the JOURNAL disagrees. The Coast Artillery was represented by a worthy team under an efficient Team Captain and an excellent Team Coach. When one considers the limited facilities for small-arms target practice existing at most Coast Artillery stations, one must admit that our team made an excellent showing. Seventh place unquestionably represents a lot of hard work, some details of which appear on another page. Other teams in the past have stood higher, but that does not necessarily mean that they were any more proficient nor that they worked any harder. The JOURNAL believes that Coast Artillery participation in the National Matches is of great importance, and it confidently expects to find our team at Camp Perry next year, backed by the entire Corps, exerting every effort to win and conceding place to none until the last shot is fired.*

After the Wakefield daily bulletins showed that we had the hardest hitting squad in the history of the Coast Artillery Rifle Team, many officers of the Corps must be curious as to why we couldn't do better than seventh in the National Rifle Team Match in 1925.

My answer is the heading to this article.

Theories or alibis or whatever you want to call them, I have a plenty, but—

It is believed, however, that could the squad have been kept going on its regular schedule of practice there would have been a different story. The grind at Wakefield was steady and strenuous. When the squad arrived at Camp Perry the Small Arms School was in session and few, if any, practice targets were to be had at any price. One was fortunate indeed if more than one firing point was available in a day and then for but a short period of time. Then that particular firing point would not be seen again for nearly a week. Such haphazard training after a systematic daily grind was detrimental not only to physical training but to morale as well. Naturally the "come back" to that is, "The other teams were in the same boat, weren't they?" Maybe yes and maybe no. Yes, as far as getting targets was concerned, but I have my doubts as to whether any other team followed the same steady grind that our team did. I wouldn't do it again knowing what I do now.

And another thing—with the exception of six or seven men the squad was composed of men who had never attended a tryout or a National Match before. Major Fulton's policy was never to put a man on the team his first year if it could be avoided. It is a sound policy but could not be followed this year. It is no small thing to require a new man to shoot on a team his first year. Everything is strange. He is worried about his time allowance; range officers, slow targets, and poor marking "get his goat," and he is almost sure to get the "buck."

It is realized that many officers are opposed to the Coast Artillery having a rifle team on the grounds that it takes officers away from other duties, that no benefit is to be derived therefrom and that the whole thing is a "joy ride" for all concerned.

The rifle team does take officers away from other duties, but so do training camps and a hundred other activities. The question seems to boil itself down as to whether any material benefit accrues not only to the Corps but the country as a whole. I claim that it does. We spend millions of dollars and utilize hundreds of officers on training camps each year and yet we object to sending a few officers or men to Camp Perry, which is nothing more or less than an immense training camp and one which is educating the nation in preparedness on a scale such as no other camp in the country is doing. There are but six service teams and yet in the National Rifle Team Match nearly one hundred teams competed. During the period of the camp there were some twenty-five hundred men who took part in the matches. These men are learning to *shoot* and learning how to teach others to shoot. A little of it won't hurt the Coast Artillery.

Any officer who has a whit of *esprit de corps* will agree that having a rifle team in the National Matches is not only desirable but beneficial. It gives the Corps a standing and recognition among the other services, among the National Guard, and civilians from every state of the Union that it would be impossible to attain in any other way.

In this connection a Coast Artillery officer was sent to Camp Perry this year to act as a chief range officer. It was his first visit. When he left he said that heretofore he had had no idea of the magnitude of the National Matches, of the benefits that were to be derived therefrom nor of the great interest taken in them. He further stated that he was proud to have the Coast Artillery Corps represented, and added "I'm for this thing from now on, and anything I can do to help it along I'll be glad to do."

I wish more officers could visit Camp Perry.

As to it being a joy ride—the following schedule speaks for itself. I wonder how many officers in harbor defenses worked as hard.

Up at 6:00 A. M.  
 1 mile walk  
 Breakfast, 7:00 A. M.  
 Commenced firing, 8:00 A. M.  
 Ceased firing, 11:45 A. M.  
 Dinner, 12:00 NOON.  
 Commenced firing, 1:00 P. M.  
 Ceased firing, 4:30 P. M.  
 2 miles run.  
 Supper, 5:30 P. M.  
 2 miles walk.  
 Bed, 10:30 P. M.

And they were ready for bed!

Once in a while, when things were not going just right, when the temperature was 90° or better in the shade, and when I particularly needed an excellent shot who "couldn't be spared," I have wished that some of the "objecting" commanding officers could be down on the firing lines. Had they been, there would be more boosting and less objecting to a Coast Artillery Rifle Team.

## Standing of Coast Artillery Members in National Matches, 1925

Entrants	Members' Match	Navy Match	N.R.A. Any Rifle 600-yard	N.R.A. Rapid Fire 400-yard	N.R.A. Rapid Fire 200-yard	N.R.A. Rapid Fire Championship	Wright Memorial	Scott Match	Crowell Match	Individual Palma Match	Camp Perry In- structors' Match	Leach Cup Match	Chemical Warfare Trophy Match	Marine Corps Cup Match	Wimbledon Cup Match	N.R.A. Any Rifle 200 yard	President's Match	N.R.A. Individual Pistol Championship	Any Rifle Championship	N.R.A. Grand Aggregate	National Individ- ual Match
Baird, Clair W., Major C.A.C.	964	768	848	777	824	507	494	494	494	494	247	1022	186	1084	988	847	1192	153	118	99	
Barnes, Harry C., Jr., 1st Lt., 4th C.A.	88				18	85	10	55	16					127	182		112			62	
Brown, James D., Capt., 14th C.A.	144		64		129	18	40	76	64	28	26	14	23	2	19		28	9		8	
Burson, Thomas D., Sgt., 3d C.A.	210			212	129	125	22					213			207		100				
Catchlow, Robert W., Jr., 1st Lt., 9th C.A.					280	116					31			74	62		251	26	29		
Crolick, John, Cpl., 52d C.A.			74	122	280	116					33	189			40				9		
Kraeger, William D., Major, C.A.C.		87	42	62	196	75															
Goode, Homer A., Sgt., 52d C.A.	168															75					
Goode, Edward W., 1st Lt., 66d C.A.C.	129					22										78					
Harkrider, Robert, Sgt., 4th C.A.	189						122							227			213		28		
Hawthorn, John F., Sgt., 63th C.A.						9				111					66		249				
Lawton, William S., 2d Lt., 10th C.A.	93					20	87			118				116	210		137				
Lathner, John M., Cpl., 51st C.A.	201		45												194						
Lorren, John M., Cpl., 51st C.A.	5		34														237				
Loucks, Charles E., Capt., 51st C.A.				122			56	79									56				
Luce, Denn, 1st Lt., 64th C.A.	121		81	15	129	17	120	98	118	86				190	245	59	169		25		
McCullough, Samuel, 1st Lt., 51st C.A.					2	20								189							
McCarthy, Riley B., 1st Lt., C.A.C.		175			129										82	74					
McFarland, Murrell, Cpl., 14th C.A.																		7			
Murphy, Willard D., 1st Lt., 68d C.A.						54															
Nichols, George F., 1st Lt., 10th C.A.				17				102													
Shimmons, Norman B., 2d Lt., 11th C.A.	235					99															
Simpson, John W., Cpl., 68d C.A.									12												
Vuokselius, Howard J., 2d Lt., 14th C.A.	218				236		104														
Weeks, John A., 1st Lt., 9th C.A.	168																				
Wilson, Charles F., 1st Lt., C.A.C.	48				59	91		42				137		87		42	6	18	11	10	

### STANDING OF COAST ARTILLERY TEAMS

Matches	Place
Falshold Men's Team Match	5
A. E. F. Roumanian Trophy Match	8
N. R. A. 600-yard Two-Man Team Match	7
N. R. A. 1000-yard Two-Man Team Match	7
The Herrick Trophy Match	5
National Pistol Team Match	5
The National Rifle Team Match	7

Note: The Canadian - United States Long-Range Match and the Palma Team Match were won by the United States Team. Sergeant J. F. Howarth, C. A. C., represented the Coast Artillery Corps of the United States Team.

Arkansas National Guard



FIG. 1. 206TH COAST ARTILLERY (A. A.) AT FORT SILL, OKLAHOMA



FIG. 2. 206TH COAST ARTILLERY (A. A.) AT FORT SILL, OKLAHOMA

# 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.—R. S. ABERNETHY, Colonel, U. S. A., President Coast Artillery Board.*

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## New Projects Initiated During the Month of October

**Project No. 395, Sleeve Target for Antiaircraft Practice.**—The Adjutant General requested that studies be made on recent antiaircraft artillery target practices with a view to recommendations regarding the practical size and design to insure visibility and the operation of sleeve targets for use in antiaircraft artillery target practice. This communication was referred to the Coast Artillery Board by the Commanding General, Third Coast Artillery District, for recommendation.

**Project No. 396, 155-mm. Gun Carriage Limber, Draw Bar Eye.**—Reports were received from the Ordnance Officer, Hawaiian Department, that the draw bar eyes for 155-mm. gun carriage limber, model 1918, which have been reforged to change the diameter of the eyes of the lunette from 90 mm. to 4.75 inches are proving unsatisfactory in service in the 55th Coast Artillery, and that apparently smaller sizes of lunette eyes should be provided. The Coast Artillery Board was requested to report any trouble which may have come to its attention due to locking of the lunette eye and the pintle during maneuvers of 155-mm. gun materiel by means of 10-ton artillery tractor. The Board reported that no such trouble had come to its attention.

**Project No. 397, Effectiveness of Fire.**—This investigation was undertaken primarily for the purpose of deciding the method of manipulating the various 16-inch gun powder charges—three-quarters, seven-eighths, and full—which would give the best results in firing at the proper target of a 16-inch gun, a first-class battleship. In order to accomplish this satisfactorily, it has been found desirable to devise a method of analysis which is somewhat novel. It is believed that the method may lead to a positive means for choosing satisfactory types of armament and also to a simple basis for comparison of the effect of fire from any one of a group of Coast Artillery batteries of various calibers.

**Project No. 398, Fire Control Equipment to be Carried With a Battery of two 14-inch Railway Guns.**—This project was taken up by the Board in accordance with the following extract of letter from the Chief of Coast Artillery:

1. In order that proper action may be taken on estimates now under consideration in this office, it is desired that the Coast Artillery Board study the fire control equipment necessary for a battery of two 14-inch railway guns and prepare three separate tables giving the following information subdivided by supply branches:

(1) Fire control equipment required to be carried with a battery of two 14-inch railway guns for *general service*.

(2) Fire control equipment required to be carried with a battery of two 14-inch railway guns for *service outside of harbor defenses*.

(3) Fire control equipment required to be carried with a battery of two 14-inch railway guns for *service with field army in land warfare*.

**Project No. 399, Musham Triangle Diagram.**—A description of the Musham Triangle Diagram, a graphic method of solving triangles, was turned over to the Coast Artillery Board by the Commandant, Coast Artillery School, to determine its value as a check in computation of firing data. In the opinion of the Board this diagram cannot be advantageously used by the Coast Artillery, because it is neither quick enough in operation for fire against moving targets, nor accurate enough for fire against heavy artillery fixed targets.

## Completed Projects

### Project No. 392, Operation of Range Percentage Corrector.—

#### I—HISTORY OF THE PROJECT.

1. It has come to the attention of the Coast Artillery Board that there exists a misunderstanding as to the operation of the Percentage Corrector.

#### II—DISCUSSION.

2. Specifically, the question has arisen as to whether, when making corrections based upon observation of fire, the deviation should be determined in terms of percentage of the actual range or of percentage of the *corrected* range (actual range plus ballistic correction).

3. As regards the determination of deviation in terms of percentage of range by means of the impact board, lines 20-23, page 65, T. R. 435-221, are as follows:

If the sliding piece be set so that the arrow points to the *range for which the piece is laid*, the deviation in terms of percentage of the range may be read opposite the deviation as announced in yards.

It was the intention of the Coast Artillery Board, when the Percentage Corrector was designed, that deviations would be determined in terms of percentage of the actual range, and the corresponding correction, in terms of percentage of actual range, be applied to percentage corrector by means of a slide "E," pointer "F" and scale "D" (see Fig. 10, opposite page 58, T. R. 435-221). The words, "range for which the piece is laid," were, and are, interpreted as meaning actual range. Certain officers have construed these words as meaning corrected range (which, is in fact the expression for elevation). In the illustrative example, subparagraph e, page 65, T. R. 435-221, deviations are determined in terms of percentage of the actual ranges.

4. In one instance a battery commander found, when analyzing his target practice, that the correction which had been applied to correct for a certain deviation, was not equal in yards to the deviation. The deviation had been applied properly to the percentage corrector in terms of percentage of actual range. An investigation showed that the correction given by the percentage corrector was the same percentage of the corrected range (actual range + ballistic correction) as was the deviation of the actual range. This relation between correction and deviation may be expressed thus:

$$\frac{\text{CORRECTION}}{\text{DEVIATION}} = \frac{\text{CORRECTED RANGE}}{\text{ACTUAL RANGE}}$$

In the instance considered, there was a very large ballistic correction.

5. Consider the following example:

From a series of trial shots fired at an actual range of 10,000 yards the ballistic correction was determined as *up* 15%, making the corrected range 11,500 yards.

With this corrected range of 11,500 yards, several shots were fired at a target the actual range of which was 10,000 yards. The deviation of the center of impact was OVER 500 yards. It is desired to correct for the entire deviation. Will a correction of DOWN 500 yards be the proper correction?

It seems reasonable to suppose that a change of elevation corresponding under normal conditions to a change of range of 500 yards will not result under the conditions considered (actual range, 10,000 yards; corrected range, 11,500 yards) in a change of range of 500 yards; but that it will result in a change of range something less than 500 yards.

It seems reasonable to suppose that, if an elevation corresponding to 11,500 yards be necessary to reach an actual range of 10,000 yards, in order to change the fall of the projectile by 500 yards, the elevation must be changed by an amount corresponding to something greater than the elevation change corresponding to 500 yards R at 10,000 yards.

It is believed that a close approximation to the proper correction will be obtained by assuming:

$$\frac{\text{CORRECTION}}{\text{DEVIATION}} = \frac{\text{CORRECTED RANGE}}{\text{ACTUAL RANGE}}$$

$$\frac{X}{500} = \frac{11,500}{10,000}$$

$$X = 575 \text{ yards.}$$

The same result will be obtained if the deviation be converted into percentage of the actual range, and this percentage of the corrected range be taken as the correction.

$$500 = 5\% \text{ of } 10,000 \text{ yards.}$$

$$5\% \text{ of } 11,500 \text{ yards} = 575 \text{ yards.}$$

In operating the Percentage Corrector, a correction based upon observation of fire is applied to the Percentage Corrector as a percentage of the actual range, such as to express the deviation (or that fraction of the deviation for which it is desired to correct) in terms of percentage of actual range. The total correction will be affected by this same percentage of the corrected range. (Deviation = x% of actual range. Corresponding correction = x% of corrected range. Total correction = ballistic correction + x% of corrected range.)

From theoretical considerations a closer approximation to the proper value of the correction than that given by the Percentage Corrector is given by the formula:

$$\frac{\text{CORRECTION}}{\text{DEVIATION}} = \frac{\text{CORRECTED RANGE} - \frac{1}{2} \text{ DEVIATION}}{\text{ACTUAL RANGE}}$$

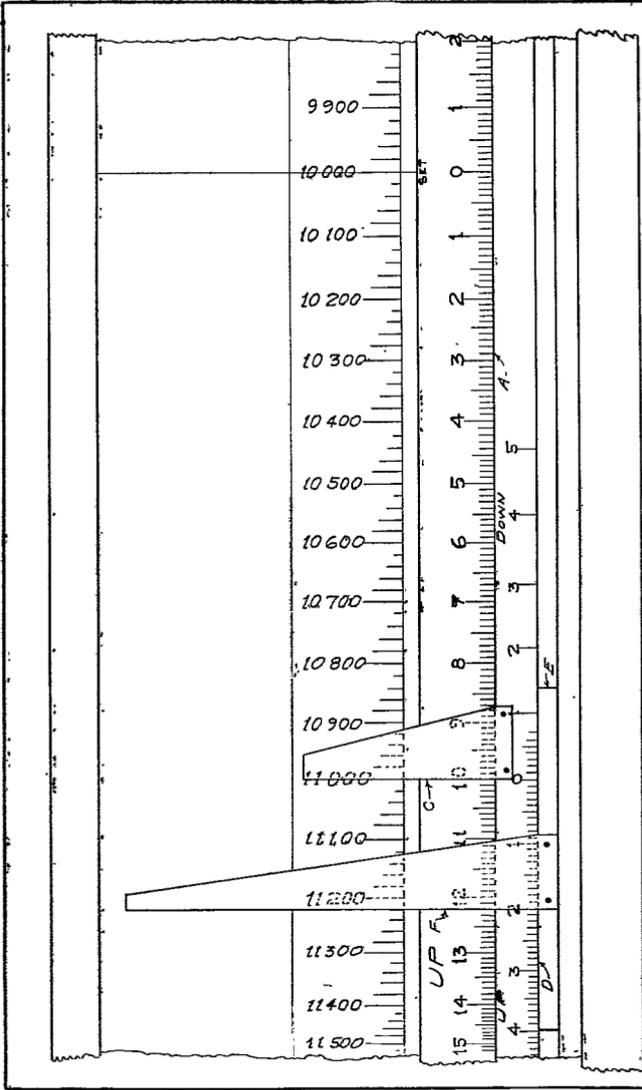
$$\frac{X}{500} = \frac{11,500 - 250}{10,000}$$

$$X = 562.5 \text{ yards}$$

Had it been desired to correct for a deviation of SHORT 500 yards the correction given by this formulæ would be 587.5 yards.

The value of the correction given by the Percentage Corrector, 575 yards, is closer to the theoretically correct value in correcting for a deviation either OVER or SHORT than is a flat correction of 500 yards.

6. The accuracy of the Range Percentage Corrector has been questioned because of the fact that the intersection of the pointer "F" with scale "A" is not



COAST ARTILLERY BOARD  
POST OFFICE, VA

**EXHIBIT A**

OPERATION OF PERCENTAGE CORRECTOR  
(PROJECT NO 392)

DESIGNED BY J.H.	CHECKED BY J.H.	DATE OCT 4, 1925	FILE NO C-821
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the algebraic sum of the setting of the pointer "C" on scale "A" and the setting of pointer "F" on scale "D" (see Fig. 10, opposite page 58, T. R. 435-221). The difference between the values of the range scale appearing opposite the zero of scale "A" and pointer "C" will be the percentage of the range scale value appearing opposite the zero of scale "A" indicated by setting of pointer "C" on scale "A." That is, the scale "A" measures on the range scale percentage of the value appearing opposite its zero. Inasmuch as the actual range is set opposite the zero of scale "A," that scale measures percentage of the actual range. The difference between the values of the range scale appearing opposite pointer "C" and pointer "F" will be the percentage indicated by the setting of pointer "F" on scale "D" of the range scale value appearing opposite the zero of scale "D." Inasmuch as the zero of scale "D" (coincident with pointer "C") is set at the corrected range (actual range plus ballistic correction), scale "D" measures percentages of the corrected range.

Assume: Actual range = 10,000 yards. Ballistic correction = up 10%.

Correction based upon observation of fire = up 2%. (Deviation was short 200 yards and it is desired to correct for the entire deviation.)

Then 10,000 on the range scale will be opposite the zero of scale "A." Pointer "C" will be set at up 10% on scale "A" and will be over the value of 11,000 on the range scale. Pointer "F" will be set at up 2% on scale "D" and will be over the value 11,220 on the range scale.

Thus the total correction will be equal to 10% of the actual range + 2% of the corrected range. Diagram illustrating this condition is appended hereto and marked "Exhibit A." It is obvious that 10% of the actual range + 2% of the corrected range cannot be equal to 12% of the actual range, except when actual range and corrected range are equal.

### III—CONCLUSIONS.

7. *a.* The Coast Artillery Board believes that converting the deviation (or that fraction of the deviation for which it is desired to correct) into terms of percentage of the actual range and then taking the same percentage of the corrected range as the correction is a closer approximation to the proper correction than is the practice of assuming the correction as equal to the deviation (or that fraction of the deviation for which it is desired to correct) regardless of the relation existing between the uncorrected and corrected ranges.

*b.* The Coast Artillery Board believes that the characteristics of the Range Percentage Corrector herein discussed should be taken into consideration in the analysis of target practice.

8. Whether or not it is always true that the method of reading the deviation as a percentage of the actual range and correcting by the corresponding percentage of the corrected range will give more accurate results than reading the deviation and making the correction as percentages of the same quantity, it would appear that there will result no substantial error from correcting by the most convenient method with the fire control instruments available.

*a.* Because the large corrections early in adjustment based on observation of fire are not, and cannot be, very accurately determined.

*b.* Because the corrections made late in the process of adjustment are so small that the difference in methods will not appreciably affect the result.

(NOTE.—This question came up not because of its effect on the adjustment but because of its appearance in an analysis of practice.)

## IV—RECOMMENDATIONS.

9. The Coast Artillery Board recommends:
  - a. That T. R. 435-221 be amended as follows:

Insert the word "actual" in parentheses in line 21, page 65, after the word "range."
  - b. That this project be published in the COAST ARTILLERY JOURNAL.

## V—ACTION BY CHIEF OF COAST ARTILLERY.

*1st Ind.*

War Department, O. C. C. A., October 23, 1925.—To President, Coast Artillery Board (*Thru* Commandant, Coast Artillery School), Fort Monroe, Va.

1. The enclosed proceedings of the Coast Artillery Board No. 392, "Operation of Range Percentage Corrector" are approved.
2. Steps will be taken by the President, Coast Artillery Board, to have the entire proceedings published in an early number of the COAST ARTILLERY JOURNAL.
3. Training Regulations 435-221 will be amended as recommended in the Board's proceedings at the earliest date possible. In the meantime a letter will be written to all Coast Artillery District Commanders notifying them of the proposed change in this training regulation.

**Nothing short of the power of repelling aggression will secure to our country a national prospect of escaping the calamities of war or national degradation. — John Adams, Message to Congress, December 3, 1799.**

# COAST ARTILLERY SCHOOL LIBRARY

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## BOOKS CATALOGUED

Unless marked thus "\*" these books may be obtained by any Coast Artillery Officer; Warrant Officer, A. M. P. S.; or Noncommissioned Officer (Grades 1-3), C. A. C., upon request to the Librarian, C. A. S. Library.

- Adam, E. *Behind the Shoji*. 1910. 306 pp.
- Alexander, W. De W. *A Brief History of the Hawaiian People*. 1899. 357 pp.
- American Institute of Electrical Engineers. *Transactions*. Vol. 43. 1924.
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- Ball, W. W. R. *Mathematical Recreations and Problems of Past and Present Times*. 3d ed. 1896. 276 pp.
- Beale, G. W. *A Lieutenant of Cavalry in Lee's Army*. 1918. 231 pp.
- Bennett, E. C. *Musket and Sword, or The Camp, March, and Firing Line in the Army of the Potomac*. 1900. 344 pp.
- Bliokh, I. S. *The Future of War in Its Technical, Economic, and Political Relations*. 1899. 380 pp.
- \**Brooklyn Daily Eagle Almanac*. 1925.
- Burnaby, F. G. *A Ride to Khiva*. 1885. 403 pp.
- Cannaerts, E. *A History of Belgium from the Roman Invasion to the Present Day*. 1921. 357 pp.
- Channing, E. *Guide to the Study of American History*. 1896. 471 pp.
- Coast and Geodetic Survey. *United States Coast Pilot. Alaska, Part I. Dixon Entrance to Yakutat Bay*. 6th ed. 1917. 257 pp.
- Cushing, L. S. *Manual of Parliamentary Practice*. 1925. 318 pp.
- Dalzell, J. M. *Private Dalzell, His Autobiography*. 1888. 242 pp.
- Deeping, W. *Uther and Igraine*. 1903. 385 pp.
- Dickinson, A. E. *What Answer?* 1868. 301 pp.
- Dodd, I. S. *The Song of the Rappahannock*. 1898. 254 pp.
- Dunaway, W. F. *Reminiscences of a Rebel*. 1913. 133 pp.
- Edmunds, S. E. E. *Nurse and Spy in the Union Army*. 1865. 384 pp.
- Einstein, A. *Relativity*. 1921. 168 pp.
- Ewart, J. S. *The Roots and Causes of the Wars (1914-1918)*. 1925. 2 v.
- Faguet, E. *The Dread of Responsibility*. 1914. 221 pp.
- Ferguson, J. *Life-Struggles in Rebel Prisons*. 1865. 206 pp.
- Figg, R. W. *Where Men Only Dare to Go! or, The Story of a Boy Company, (C. S. A.)* 1885. 263 pp.
- Gallatin, A. E. *Art and the Great War*. 1919. 228 pp.
- Gayarré, C. E. A. *Romance of the History of Louisiana*. 1848. 265 pp.
- Geer, J. J. *Beyond the Lines*. 1864. 285 pp.

- Gibbs, P. H. *The Soul of the War*. 1918. 371 pp.
- Giles, H. A. *China and the Manchus*. 1912. 148 pp.
- Glazier, W. *The Capture, The Prison Pen, and the Escape*. 1870. 446 pp.
- Gregg, J. C. *Life in the Army*. 1866. 271 pp.
- Grimshaw, W. *History of the United States*. 1856. 424 pp.
- Higginson, T. W. *English History for American Readers*. 1893. 334 pp.
- Hill, F. T. *Washington, the Man of Action*. 1914. 329 pp.
- Hills, A. C. *Macpherson, the Confederate Philosopher*. 1864. 209 pp.
- James, G. W. *In and Around the Grand Canyon*. 1903. 341 pp.
- Jeffrey, W. H. *Richmond Prisons, 1861-1862*. 1893. 271 pp.
- Jones, J. B. *Border War*. 1859. 502 pp.
- Kemble, F. A. *Journal of a Residence on a Georgian Plantation in 1838-1839*. 1863. 337 pp.
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- Livermore, A. A. *The War with Mexico Reviewed*. 1850. 310 pp.
- Lyle, W. W. *Lights and Shadows of Army Life*. 1865. 403 pp.
- McCarthy, J. *Portraits of the Sixties*. 1903. 339 pp.
- MacDonald, G. W. *Historical Papers on Modern Explosives*. 1912. 192 pp.
- Machiavelli, N. *Le Istorie Fiorentine di Niccolò Machiavelli*. 1906. 377 pp.
- McClure, A. K. *Abraham Lincoln and Men of War-Times*. 4th ed. 1892. 476 pp.
- McSherry, R. *El Puchero, or, a Mixed Dish from Mexico, Embracing General Scott's Campaign*. 1850. 247 pp.
- Maltby, I. *The Elements of War*. 2d ed. 1813.
- Mason, E. T. *Humorous Masterpieces from American Literature*. 1886-88. 3 v.
- Minot, G. R. *Continuation of the History of the Province of Massachusetts Bay, from the Year 1748 to 1765*. 1803. Vol. 2.
- Mitchell, P. *The American Relief Clearing House, Its Work in the Great War*. 1922. 174 pp.
- Moedebeck, H. W. L. *Pocket-book of Aeronautics*. 1907. 496 pp.
- Moore, J. *The Life and Letters of Sir John Moore*. 1923. 296 pp.
- Newlin, W. H. *An Account of the Escape of Six Federal Soldiers from Prison at Danville, Va.* 1889. 136 pp.
- New York (State) Comptroller's Office. *New York in the Revolution as Colony and State*. 1897. 261 pp.
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- Peixotto, E. C. *A Revolutionary Pilgrimage*. 1917. 369 pp.
- Petre, F. L. *Napoleon's Campaign in Poland*. 1901. 339 pp.
- Plunket, J. B. *Isabel of Castile and the Making of the Spanish Nation*. 1915. 432 pp.
- Poland, W. *The Laws of Thought; or, Formal Logic*. 1921. 110 pp.
- Pollard, E. A. *Southern History of the War*. 1866. 363 pp.

- Portenar, A. J. *Organized Labor*. 1912. 134 pp.
- Preston, T. *The Theory of Heat*. 1894. 719 pp.
- Pyle, H. *Howard Pyle's book of the American Spirit*. 1923. 344 pp.
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- Riddle, A. G. *Recollections of War Times*. 1895. 380 pp.
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- Ross, E. A. *The Changing Chinese*. 1911. 356 pp.
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- Shanks, W. F. G. *Personal Recollections of Distinguished Generals*. 1866. 352 pp.
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- Spencer, B. Z. *Tried and True, or Love and Loyalty*. 1866. 394 pp.
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- Uncle Daniel's Story of "Tom" Anderson and Twenty Great Battles*. 1886. 435 pp.
- Van Dyke, H. *Fisherman's Luck*. 1900. 238 pp.
- Van Dyke, T. S. *Millionaires of a Day*. 1890. 208 pp.
- Willard, E. *Last Leaves of American History*. 1849. 230 pp.
- Williams, G. F. *Bullet and Shell*. 1882. 454 pp.
- Woodward, E. M. *Our Campaigns*. 1865. 362 pp.
- Woolsey, T. D. *Communism and Socialism in their History and Theory*. 1880. 309 pp.
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I have absolutely no sympathy with the claim that we were outgeneraled in that limitation of armaments treaty. The fact is that we got exactly what we proposed, and I am perfectly willing to accept the judgment of those who participated in that treaty that the battleship strength, at the conclusion of the treaty and of the scrapping, was substantially in the ratio stated in the treaty.—*Secretary Wilbur before the House Naval Committee.*

# BOOK REVIEWS

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## COLONEL MITCHELL'S "WINGED DEFENSE"

A REVIEW, *By Sidney Ballou*

*From The Bulletin (San Francisco) Magazine*

The ancient wish, "Oh, that mine enemy would write a book!" never found more generous response than when Colonel Mitchell took his pen in hand. As the outstanding critic of the existing order of all things military, the public was warranted in assuming that behind one fiery newspaper statement after another there was a background of military knowledge and military science commensurate with the high rank and hard fighting experience which the colonel brought from the World War. When, however, a published book calls for a detailed exposition of views, a coherent line of reasoning and an adequate support of a thesis, the reader who hopefully turns the pages is left with a sense of disappointment. The familiar claims are there, but beneath them, in place of a solid foundation, there is vacuum.

There are those who believe that aircraft will play an increasingly prominent part in land and naval warfare, and who are genuinely curious to know how their manifest limitations are to be overcome. They want to know what is the actual effective radius of action of bombing planes, from what kind of a base they must start, how such bases are to be supplied and protected, and above all how such bases are to be pushed to within a few hundred miles of our coasts and maintained there against any sort of land or naval attack. They want to know if aircraft are really capable of seizing and holding a position, or if future wars can be won without this hitherto indispensable element, they want to be shown how. Students of the late war are curious for an explanation of why the seventy-two German Zeppelins, with a radius of flight and bomb-carrying capacity far in excess of any airplane yet flown, never succeeded in interrupting for an hour the vital flow of men and munitions across the English Channel, within their easy reach. The man on the street today, listening to the claims of the air enthusiasts, is frankly puzzled to know why France and Spain, with their wealth of air equipment, cannot within twenty-four hours end their costly war against the Riffians, helpless under air attack.

No answer to these questions will be found between the covers of Colonel Mitchell's book. The aircraft of the author have no limitations. Radius of action ceases to exist on the second page:

As the air covers the whole world, aircraft are able to go anywhere on the planet. They are not dependent on the water as a means of sustentation nor on the land to keep them up. Mountains, deserts, oceans, rivers and forests offer no obstacles. In a trice, aircraft have set aside all ideas of frontiers. The whole country now becomes the frontier and, in case of war, one place is just as exposed to attack as another place.

It is on stuff like this that the author's ideas of military strategy are based. St. Louis and Denver are just as exposed to attack as New York and Boston. It is specifically stated that such interior cities may be bombed. Where the aviators slept the night before is not revealed. Probably safe in the interior of Siberia.

It is true that there is an occasional reference to airplanes having to come to the ground, but that is usually with reference to enemy planes. The colonel's own planes soar with his imagination and neither touches the earth again.

As air power can hit at a distance after it controls the air and vanquishes the opposing air power, it will be able to fly anywhere over the hostile country.

After all, why not? There are filling stations at every crossroads where white-coated attendants will not only fill up the enemy planes with gas, but will look at their oil and wipe their windshields. There are good hotels everywhere. Flying anywhere over a hostile country ought to be easy under these conditions. If there are any more complicated questions of supplies involved, the author apparently has never heard of them.

It is to the Navy, however, that Colonel Mitchell devotes most of his thunder. We are sufficiently familiar with the claim that aircraft have made all surface ships obsolete. It is something of a shock to find that the demonstration of this proposition begins and ends with the recital of the sinking, after two days' bombing of an old German battleship, anchored as a helpless target within easy reach of an air base.

It takes a great deal of ingenuity to make this exploit spell the final doom of all navies. This ingenuity is not lacking. First of all a huge straw man is set up by the repeated assertion that no one outside the air service believed that a battleship could be sunk under these conditions.

It is a pity that this statement is not accompanied by specifications. It is tolerably certain that given time enough and bombs enough, with a supply base within reach, the Pyramids themselves could be destroyed. Who it was that believed that continuous unopposed bombing would not ultimately sink any anchored hulk is not revealed, nor does a search of contemporary service journals reveal this state of mind. However, it is necessary for the picture.

"Many considered," continues the narrative, "that neither could a battleship be hit by an aerial bomb, and, if it were hit, could it be damaged to any great extent."

Yet, as afterward related, these same skeptics had made elaborate preparations for determining the injuries done by the impossible hits. The tests were held off the Virginia Capes because "the majority of naval officers were so sure that the air attacks would prove ineffectual that it was desired to show as many congressmen as possible how little could be done by the air force." Believe it or not, particularly as half the bombing was to be done by the navy itself, a fact to which the author makes no reference.

Even the targets are glorified. The old Ostfriesland, which the Navy was unable to make watertight before the tests began, becomes an "unsinkable" ship with scars of the Battle of Jutland not mentioned in any official history.

Having stuffed his straw man to bursting, the colonel demolishes him with an exultant whoop. From his own account of the beginning it is evident that he has no sympathy with the acquisition of technical knowledge, that he proposes to allow no time for the examination of the effects of bursts, but that his one endeavor, orders or no orders, is to sink the ships in the shortest time possible.

When, at the close of the second day's bombing, the Ostfriesland finally goes down skeptics stand agast, strong men weep, and the Air Service goes home to celebrate the demonstration that "for all time aircraft dominate seacraft."

That is all. No discussion of how this force is to be used at any distance from a home base. No discussion of possible defenses, either present or to be developed. No comprehension of the gripping force of sea power, whereby a force of heavy ships lying out of airplane range in Scapa Flow could deny the seven seas to the enemy, even to the uttermost ends of the earth. It is as if an advocate of the tomahawk over the rifle had strapped dummies to a plank, demonstrated his deadly skill at twenty paces and loudly proclaimed that infantry was obsolete.

To those familiar with the events described, the author's omissions are as significant as his statements. The operation with the Iowa, for example, is described as a search for a battleship which when found was to be bombed with sand-loaded bombs. The search is described, but not the bombing. As this was the only case where the target was moving and the bombers restricted to the moderate altitude of 4000 feet, the fact that eighty shots resulted in only two hits may be assumed to be of some importance. It was certainly important enough to be omitted entirely from Colonel Mitchell's narrative.

It is not only by omissions, however, that the gallant colonel trifles with the truth. Plain misstatements of fact are abundant. Prominent among these is the repetition of the assertion that the dropping of 180-pound bombs on a target submarine badly damaged the condenser system of the directing vessel a mile and a half away. Not only was this denied when it was first published in a magazine article, but the author's own description of subsequent events shows how ridiculous it is. In the later tests with much heavier bombs the battleships are described as grouped around, so close that when the cruiser Frankfurt was hit flying fragments of steel caused the observers to seek protection. No casualties, to condenser systems or otherwise, are recorded.

It is in connection with this incident of flying splinters that the author sapiently remarks:

It made one think what might happen in case of a real attack against naval vessels in war, whether the crews could be held to their posts in view of almost certain destruction.

One hardly knows whether to comment on the utter ignorance of naval history shown by this observation or on the danger of such twisted psychology in a high commanding officer. Anyone who makes war on the theory that the enemy can be scared into submission is apt to have a rude awakening.

As a matter of fact, however, the only form of major strategy which can be glimpsed in the pages of "Winged Defense" is founded on this very theory. It is by the bombing of cities that this new force apparently hopes to subdue a hostile country. It is in order to be free to carry out its own system of warfare, unhampered by armies fighting in the old-fashioned way, that Colonel Mitchell desires an independent air force. Under his inspiration a host of imaginative magazine writers are busy educating the American public in the belief that the proper way to win the next war is to fly in overwhelming force to the enemy's capital and drench it with poison gas.

We may leave aside the self-evident fact that this is contrary to the laws of civilized warfare and to half a dozen treaties to which this country has subscribed. Such considerations would only bring derisive smiles from the airmen. The point

to be emphasized is that this proceeding would neither win a war nor tend to win a war.

The only people who thought that the bombing of cities would help win a war were the Germans. Their theory was that it would cause an insistent clamor for peace from the civilian population. As applied to the British it had precisely the opposite effect. Yet we are now asked to adopt a theory not only discredited in practice but which brought its originators into conflict with the moral opinion and material force of half the world. Colonel Mitchell may have some ideas as to how force must actually be applied in order to end an enemy's capacity for fighting, but so far as the volume which he has offered to the public is concerned there is no suggestion that he has given the matter any consideration.

Even in the narrower domain of tactics the lack of consistent thought is such that one part of the book may be quoted against another almost *ad infinitum*. Thus, while discussing the establishment of airways, the author stresses the immense amount of preparation, including the assembling of supplies, which is necessary to make long distance flying practicable. When, however, the Pacific Coast is to be invaded by air from Asia, via the Aleutian Islands and Alaska, there is not a hint of any necessary preparation nor a suggestion of how such an expedition, without the aid of a navy, could be supplied en route.

The author relates, with pardonable pride, the success of his forces in blowing up ammunition dumps and otherwise harassing an important German center of supply. He continues:

Of course, the Germans might have done the same thing to us if we had had a place behind our lines that was as important to us as was Fere-en-Tardenois to them. There was no such a place, because our troops were being supplied on converging lines, while theirs were being supplied on diverging lines from Fere-en-Tardenois.

Which is to say, that the most important function claimed for bombing aircraft in connection with military operations can be defeated by the simple device of dispersion.

In that part of the book devoted to civil aviation the colonel is on somewhat firmer ground yet there are not wanting revealing glimpses of his mentality. In the Philippines locusts can be herded by airplanes, in Hawaii aircraft are often the only means of telling whether irrigation has reached the center of a great cane field, while on the mainland aerial photographic negatives often show, from the character of vegetation and the color of the ground, what the best crop to be grown on the land should be. The successful use of aircraft for making rain is detailed, and future possibilities may be quoted for comparison with future military possibilities as judged by the same intelligence.

Condensation of moisture is brought about by electrified particles of matter. Sand has been used so far, charged with a very high electric potential of an opposite kind from that found in the clouds. This sand is scattered around by aircraft in or over the clouds to produce the effect. The advocates of this method of producing moisture from the clouds have already laid plans for the watering of the arid regions, but instead of using sand they will use minute grass seeds which, after they produce the rain, will fall to earth and grow luxurious meadows where thousands of cattle can graze.

As a sporting proposition the Navy might agree to scrap their battleships when these cattle are ready for market. It is a positive relief when the author

goes on to assure us that the damages to the towns and bridges which will be washed away have been figured out and that this will be handled.

It is a truism that many a good cause suffers more from its fool friends than from its avowed enemies. So far as the need for an adequate air policy is concerned, with greatly augmented aircraft, both civil and military, few thinking men would disagree with Colonel Mitchell. It is the popular idea that the colonel, whatever his methods and eccentricities, is at least advancing this cause. When the question comes before Congress, however, where men demand to be convinced before appropriating the public moneys, it is doubtful whether the extravagant claims and unsound theories of Colonel Mitchell do not do the cause of sane and progressive aviation more harm than good.

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*Winged Defense.* By William Mitchell, former Assistant Chief of the Air Service, U. S. A. G. P. Putnam & Sons, New York. 1925. 6"x 8 $\frac{3}{4}$ ". 261 pp. Ill. \$2.50.

Colonel Mitchell has hastily gathered a number of his articles prepared for publication in the past few years and thrown them together with a few additional chapters into book form. According to the foreword:

The book is intended to serve several purposes. First, that of putting down in words what the air men think about the organization of an air force and what our national defense should be. Next, to give to the people in general a book which will set before them facts about aeronautical development. And third, a book to which our people in the services, in the executive departments and in Congress can refer for data on aviation which is modern and which is the result of actual experience.

The statement of the first purpose now requires modification since naval aviation personnel has indicated its lack of entire accord with the Colonel's program. With slight modification, however, the book can be said to have accomplished its first purpose. As to its second purpose, this work leaves a lot to be desired. The average reader will gain some information about aeronautical development, but in this field the work is far from comprehensive. As to its third purpose, the book is a failure. Even Colonel Mitchell's most ardent supporters can hardly recommend "Winged Defense" as a reference book. Rather the volume is primarily a brief for an increased air force. More specifically, it is a brief for a reorganization of our national defense along the lines which he has ably advertised already,—i. e., to consist of one Department of National Defense with sub-heads for the Air, Army, and the Navy.

His arguments are not always supported in a forceful or logical manner. Bold and startling statements predominate, and are often unsupported by facts or reasoning. The author has accepted the bombing tests against defenseless surface craft as conclusive evidence of the complete superiority of aircraft over seacraft. But with all of its imperfections the volume contains interesting reading matter. This feature, however, is marred in part by unnecessary repetition.

The redeeming feature of the book is the author's genuine enthusiasm. He sees future wars fought and decided thousands of feet above the surface of the earth. The air force is to be the main factor with a small army and a submarine force as auxiliaries. The battleship, cruiser, destroyer, and naval airplane carrier, to him, are relics of the past.—C. S. H.

*The Family and Early Life of Stonewall Jackson.* By Roy Bird Cook. Old Dominion Press, Inc., Richmond, Va. 1924. 6¼"x 9¼". 96 pp. \$2.00.

In the editor's preface Mr. Eckenrode says in part:

It is the merit of Mr. Cook's little book that all the evidence bearing on the early life of Stonewall Jackson has been carefully sifted, so that the reader may be sure that what he finds bears the stamp of authentic history. Much new matter, garnered here and there, has been added: the result is that by far the most complete account of the youth of the great general is to be found in these pages. The notes on the Jackson family are also new and a most important contribution to the genealogy of famous Americans; they will be of interest to the many branches of the Scotch-Irish clan from which Stonewall Jackson derived his source.

The work, covering ninety-six pages, has been divided into ten chapters as follows: Chronology, Ancestry and Descendants, The Jackson Homestead—Jackson's Mills, Childhood, The Boy at Jackson's Mills, The Constable, The Appointment at West Point, West Point, Mexico and the Virginia Military Institute, Opening of the Civil War.

Throughout the book are copies of letters both to and from Jackson, during different periods of his life, which assist materially in giving a clearer insight into the real man. Twelve illustrations add to the value of the book.

This work will be interesting to all who would learn the early life of one of America's greatest soldiers.—H. B. H.

*Warfare (A Study of Military Methods from the Earliest Times).* By Colonel Oliver J. Spaulding, Field Artillery; Hoffman Nickerson, formerly Captain, United States Army; and Colonel John W. Wright, Infantry. Harcourt, Brace & Co. 1925. 6"x 8¾". 601 pp. \$5.00.

The authors state the purpose and scope of their work as follows:

The idea of the book is to give a narrative thread upon which to hang studies in institutions and methods, but not to attempt the impossible task of compressing military history into tabloid form. Evidently, the beginning of such a study should be the beginning of recorded history; the terminal point was not so easy to fix. For several reasons Frederick the Great was selected. First, he closed an era; after him began the epoch of our modern tactical systems. Furthermore, it chanced that his wars coincide in time with the later American colonial wars, in which the reciprocal influence of Europe and America began to show itself. Just after him came the great French Revolution, in which the influence of the American Revolution was brought to Europe, not only in civil but in military fields.

A knowledge of the development of military art and science down to include Frederick, then, is necessary to anyone who would understand the wars since his time. But this knowledge, while it must be accurate, may be general. Study of later events and developments must be much more detailed, since it is study of an epoch in which we are still living. Hence this book does not go beyond him; it merely points out, in conclusion, the general tendencies of the times immediately following his death, and seeks to orient the student who wishes to go further.

In so far as practicable, the work is based upon contemporary authorities. The materiel, meagre for the earlier times, approaches the vanishing point for the Dark Ages, and then gradually grows more abundant and more precise as we approach our own days; for the later periods it has been possible to examine and compare the statements of responsible participants in the events described, in England, France, Germany, Spain, and Italy. The bibliographies attached make no claim to completeness. They include only a fraction of the number of books examined; but they contain a brief comment upon those found most useful, and may serve as a guide for further investigation.

In the preface General Bliss says in part:

In the remotest antiquity individual man discovered the basic principles in the science of war when he learned that in single combat his success depended, first, on his bringing to the contest his own body in the perfection of its physical powers, and, second, in bringing that body to bear against his adversary in such a way as to ensure his delivering a completely effective blow. In that are comprised both the art and the science of war. The art grew with the perfection of the means by which the larger and larger groups of men were best enabled to do what individual man had learned that he must do with his single body.

The process of evolution of every science, that is, of every great separate branch of knowledge the basis of which is demonstrated law, shows that as the arts upon which it depends become more perfected there are constant changes in methods but no change in principles.

A study of military methods covering a period of forty-eight hundred years in one volume must necessarily be limited in scope. The authors, however, have selected the wars and campaigns best suited to illustrate the development and progress in tactics, arms, and weapons. These they have treated in sufficient detail to give the student a good general idea of the points in question.

The book is most interesting and instructive. It shows that the authors have spent much time in research. The bibliographies, although making no claim to completeness, list numerous works on the periods covered with a comment on each one listed. The subject is treated in three sections, as follows:

*Ancient Warfare: to the death of Julius Cæsar,*  
*Warfare in the Roman Empire, the Dark and Middle Ages, to 1494 A.D., and*  
*Warfare in Modern Times: to the death of Frederick the Great.*

Thirty-six plates are inserted to illustrate the battles and campaigns considered.

It fulfills the purposes of the authors in every way and should be among the books of every student of tactics.—H. B. H.

*Braxton Bragg, General of the Confederacy.* By Don C. Seitz. The State Co., Columbia, S. C. 6½" x 9¾". 544 pp. \$5.00.

The campaigns and battles of the American Civil War, by their very nature, are tremendously interesting to readers both American and foreign, military and non-military. Time has detracted little from the fascination of this period of American history. Indeed, since the World War it has become almost a fad among military students to study the war between the states and make comparisons with the late studendous struggle. The story of the military career of Braxton Bragg, naturally devoted largely to the Civil War, is no exception in point of interest. Though quiet and retiring, Bragg was a strong character, courageous and capable. A much-hated general and one whose military efforts led to defeat, his career has not attracted wide attention. Military students will doubtless heartily greet this study of his life.

In the Mexican War, Captain Bragg showed his courage as a fighter and earned a nation-wide reputation as an Artillery commander under General Taylor at Buena Vista. Early in the Civil War he displayed ability to organize, supply, and conduct an army. In 1862 he was placed in command of the Confederate forces in Tennessee. He soon made a reputation as a stern disciplinarian. The fighting qualities of that army were due largely to his efforts and leadership. His main difficulty in that army was with his subordinates, for never was he able to arouse that loyal and enthusiastic support which marked Lee's campaigns. More than one of his generals frankly advised him that his replace-

ment would be beneficial to the army. Yet the army under Bragg fought, and fought skillfully, some of the hardest battles of the war. A brief study of Stone River or Chickamauga will establish that fact.

The author has quoted freely from Bragg's dispatches. While these papers show a tendency of the Confederate leader to criticize and find fault, they also show his ability to separate the essential from the non-essential in the preparation and conduct of war.

His career is worthy of study and the author has succeeded in giving us a narrative which is quite readable.—C. S. H.

*Mesopotamia, 1914-1915.* By Captain Henry Birch Reynardson. Andrew Melrose, Ltd., London. 1919. 5½" x 7¾". 272 pp. Ill. Price 9s.

In this interesting and rather chatty book Captain Reynardson describes the operations of the first expedition to Mesopotamia, carrying the account of operations to the close of the year 1915. Being a member of the expeditionary force, the author has recorded at first hand his impressions. As a result the book expresses a little geography, a little ancient history, a little polo and bird shooting, some transportation difficulties, and some description of the natives and their customs, as well as military operations.

The book is interesting and easy to read, and it covers some phases of the Mesopotamia Campaign concerning which not a great deal has been written. It is recommended as an introduction to a study of the defense at Kut-el-Amara and the subsequent operations in Mesopotamia.—R. A.

*A Political and Social History of the United States, 1492-1828.* By Professor Homer C. Hockett. The Macmillan Company, New York City. 6" x 8¾". 1925. 438 pp.

*A Political and Social History of the United States, 1492-1828.* By Professor Arthur M. Schlesinger. The Macmillan Company, New York City. 6" x 8¾". 1925. 576 pp.

These companion volumes form a continuous history of the United States from the beginning up to the present, clearly written, authoritative, and forward moving. Two features of this joint work attract at once the attention of the reader. The first is indicated in the title. The second is in accord with the modern expansion of our activities and interests.

The authors have attained a high degree of success in their attempt to portray vividly the actual living conditions and customs of our peoples in the successive stages of our national development. "Though the major emphasis rests upon the political development, political forces are regarded as constantly responsive to the changing phases of social, cultural, and economic conditions." And so we find such headings as "Provincial America," "Urban Life," "Relations between Frontier and Coast," "The Revolution in Manufacturing, Transportation, Mining, and Communication," "The Trend toward Large Scale Industry," and "The Rise of the Silver Movement."

The second feature is the effort made to tie in correctly American history with that of the world. "American history is pictured not as an isolated development but as part of the great world stream of events, being touched at many points by influences from abroad, both in times of war and peace."

This record of American development is well balanced and well written, authoritative as to facts recorded and fortunate in the interpretation of issues involved. It is admirably designed to correct erroneous impressions formed from

earlier study or readings. Unfortunately most of us have fallen into such incorrect impressions, impressions derived from the study or reading of histories written in an excessive vein of patriotism, or sometimes written in an effort to cater to local prejudices.

The work is intended primarily for use as a college text. However, it is couched in such language as to be clearly understood by students with less preparation. Its scope of subject matter and manner of presentation make it attractive also to the independent reader. They are fortunate, indeed, who find the opportunity to study and reflect upon the contents of these two volumes.—C. S. H.

*The Shadow of the Gloomy East.* By Ferdinand A. Ossendowski. E. P. Dutton & Son. 1925. 6"x 8½". 203 pp. \$3.00.

In this volume Dr. Ossendowski, a Pole who lived many years in Russia, has painted a word picture which will give the reader a very good understanding of the background of Bolshevism, Sovietism, and Communism. He pictures the true Russian of all classes, all of which—the upper (before the Revolution,) the middle, and the lower,—due either to ambition or ignorance, indulged in many forms of corruption and followed some perverted religion. Murder seemed to be a pastime. Witchcraft and other debased forms of spiritualism occurred in ordinary life as though in a story. He follows the so-called monk, Grishka Rasputin ("the former horse-thief, drunkard, and profligate"), through many of his schemes which show why "In Siberia, where Grishka was hated, today already, during the Bolshevik regime, people whisper: 'Rasputin was a dog, but a strong, supernatural man.'" Many other notorious characters are introduced.

The following chapter headings will give some idea of the story presented: The Masks, The Face Laid Bare, The Shadows of the Village, The Treasure Hunters, The Poisoners, Heathenism, Witchcraft, The Echo of the Dim Past, The Bold Industry, The Lords of the Sea, In the Dusk of the Palaces, Black Shadows, Phantoms of the Apocalypse, Ascetics versus Antichrist, Factories of Immorality, Woman and the Child, Death of the Romanovs and the Mystical Movement, Black Ravens, Old Gods in Christian Worship, The Simplest of All Gods, The Devil's Feast, Witte, Stolpin and Goremykin, The Last of the Mohicans, Fetishism of the Word, Chaos, Conclusion.

In the Conclusion the author says in part:

I perceive distinctly the danger threatening Christian civilization from the East, but not from the real East, which endures in its mystic reverie or its hallowed majesty, defending its culture and independence against the pernicious influences of the new-comers. I perceive the menace of the East, in whose vanguard marches the Russian multitude of Mongolian half-breeds, followed by swarming hosts of utterly despondent Asiatics, burning with hatred, demoralized and revolutionized by Soviet diplomatists, with the blood-stained gold taken from the murdered, broken off the sacred images and crosses, carried away from temples of learning.

Granting that Dr. Ossendowski may perhaps have exaggerated somewhat, his message is an important one and it has been presented in a most interesting manner.—H. B. H.

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