

THE COAST ARTILLERY JOURNAL

(PUBLISHED AS THE JOURNAL UNITED STATES ARTILLERY FROM 1892 TO JUNE, 1922)

Copyrighted Monthly by The Coast Artillery Journal

TABLE OF CONTENTS

FOR

WHOLE No. 213

MAY, 1924

VOL. 60 No. 5

FIELD OFFICERS' CLASS, C. A. S., 1924.....	(Frontispiece)
ADJUSTMENT OF FIRE.....	349
<i>By BRIGADIER GENERAL R. E. CALLAN, U. S. A.</i>	
THE PROGRESS OF THE NATIONAL GUARD.....	362
<i>By MAJOR GENERAL G. C. RICKARDS, U. S. A.</i>	
PISTOLS AND PISTOL SHOOTING.....	368
<i>By MAJOR W. D. FRAZIER, C. A. C.</i>	
COASTAL OPERATIONS.....	379
<i>By MAJOR MEADE WILDRICK, C. A. C.</i>	
EDITORIAL:	
The Term "Fixed Defenses" Is Taboo.....	403
The Importance of Fire Adjustment.....	405
Asleep at the Switch.....	406
COAST ARTILLERY BOARD NOTES.....	407
BULLETIN BOARD.....	417
PROFESSIONAL NOTES.....	427
BOOK REVIEWS.....	437

Published monthly under the supervision of the Commandant, Coast Artillery School, by direction of the Chief of Coast Artillery, for the information of the Coast Artillery personnel of the Regular Army, Organized Reserve and National Guard.

Entered at the Post Office at Fortress Monroe, Va., as second class matter. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized May 8, 1920. All subscriptions payable in advance.

Subscription rates:

Yearly Domestic.....	\$3.00
Canada.....	3.25
Countries in the postal union.....	3.50
Single numbers.....	
Domestic.....	0.50
Foreign.....	0.60

Remittances, articles intended for publication, and communications relating to the management should be addressed COAST ARTILLERY JOURNAL, Fort Monroe, Virginia.

Authors alone are responsible for statements in contributed articles.
It is earnestly requested that prompt information be given of changes of address, or failure to receive the JOURNAL. Both old and new addresses should be given.

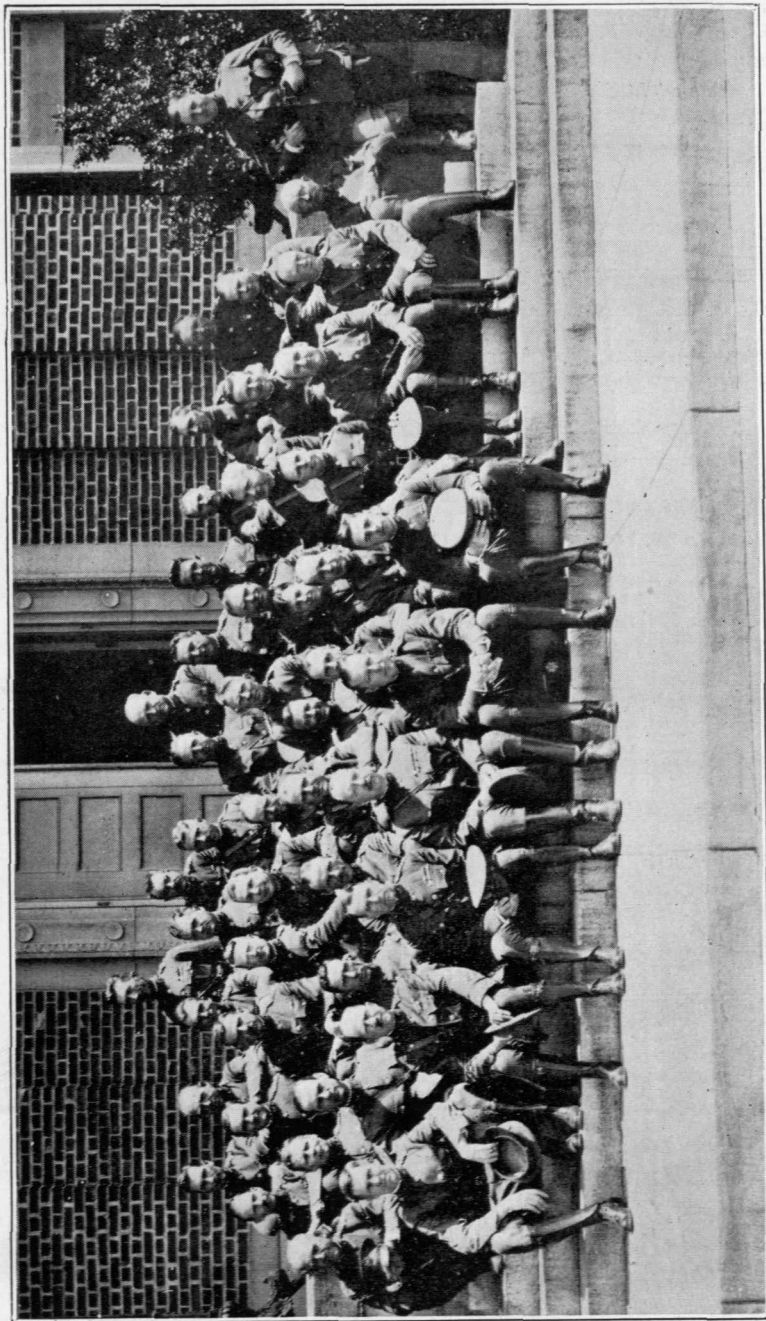
MAJOR J. A. GREEN, C. A. C., Manager and Editor.
CAPTAIN D. L. DUTTON, C. A. C., Assistant Editor.

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE MAY 1924	2. REPORT TYPE	3. DATES COVERED 00-00-1924 to 00-00-1924			
4. TITLE AND SUBTITLE The Coast Artillery Journal. Volume 60, Number 5, May 1924		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Coast Artillery Training Center, Coast Artillery Journal, Fort Monroe, VA, 23651		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified	Same as Report (SAR)	96	



THE FIELD OFFICERS' CLASS, COAST ARTILLERY SCHOOL, 1924.

FIRST ROW (reader's left to right)—INSTRUCTORS: Majors F. H. Smith, C. E. Wheatley, Lieut. Cols. W. S. Bouché, W. H. Wilson, Majors H. K. Loughry, C. F. McKinney, SECOND ROW—Majors P. J. Horton, W. C. Knight, F. A. Price, E. L. Kelly, P. S. Gage, E. W. Patney, F. M. Green, C. M. Thelle, A. G. Strong, E. Biscoe, E. P. Noyes, A. L. Loustalot, E. J. Cullen, A. G. Fendleton, H. DeF. Burdick, THIRD ROW—Majors J. H. French, W. Shippam, Francis P. Hardaway, E. K. Smith, E. Bennett, J. H. Cunningham, O. L. Spitzer, J. S. Dusenbury, F. L. Singler, B. H. Laret, L. P. Horsfall, FOURTH ROW—Capt. J. F. Kahle, Major G. E. Meyer, Capt. C. W. Eundy, Major O. G. Thompson, F. S. Clark, P. D. Bunker, R. H. Fenner, E. H. Thompson, O. G. S. Giffon, W. D. Frazer, FIFTH ROW—Majors R. Arthur, F. S. Clark, P. D. Bunker.

The Coast Artillery Journal

.....
Vol. 60 No. 5

MAY, 1924

Whole No. 213
.....

Adjustment of Fire

By BRIGADIER GENERAL R. E. CALLAN, U. S. ARMY

I HAVE read with much interest the article in the February number of the *COAST ARTILLERY JOURNAL* on "Spotting for the Coast Artillery" by General Hagood, and while in agreement with him on certain fundamentals there are others on which I hold such contrary views that we reach different conclusions; however, I feel these differences are largely due to developments in Coast Artillery methods in the last few years which, in my opinion, have greatly strengthened the contention that dependence solely upon ballistic methods does not give the best results in Coast Artillery firing. We are in accord on the question of using sound ballistic methods as far as possible; furthermore, I agree that any method of adjusting fire which slights ballistic methods is basically unsound. I will attempt to point out, however, that the weak spot in the straight ballistic methods is the failure, in so many cases, to determine before firing the law of retardation that the projectile encounters as the target changes its position; that adjustment of fire is therefore necessary to place and keep the center of impact on the moving target; and that the only means available for obtaining adjustment data is to obtain in some manner the deviations of shots or salvos. Normally the only means we now have available for this purpose are terrestrial stations and airplanes. Before taking up the questions upon which General Hagood and I appear to diverge I think it might be of

interest to state my point of view on the question of sound ballistic methods and in developing the subject to run over the principal changes in artillery firing methods that have taken place since the days when he and I "struck the line of metal" as classmates in the old mortar battery at West Point.

I regret that I have not access to some old records in an attempt to outline certain phases through which Coast Artillery firing has passed since that time. However, at the risk of some inaccuracies I will give what I can recollect of certain outstanding features of these changes. As a second lieutenant my first experience in artillery firing was at Fort Hamilton, New York, with the 8-inch converted rifles, and the 15-inch smooth bores for which we strapped on the sabots to the spherical projectiles. The firing was at fixed targets, at what we would now consider ridiculously close ranges, and in our regiment it was a sore captain who had to fire first for no one knew what muzzle velocity the brown prismatic powder would develop. It was the business of the lieutenants of other batteries to snoop around and find the elevation used by the unfortunate battery that fired first, and we were unwelcome guests indeed when we got as close to the battery firing as possible without inviting a polite request to get out of the way. The trouble was the foot batteries were rated in the regiment on their firing, and the captains naturally wanted those firing later to be as much in the dark as they were on the subject of the muzzle velocity. What were then truly called modern batteries were being emplaced, but it was not until the conclusion of the Spanish-American War that the artillery generally began to serve them. A remarkable period of experimental activity then took place in what was soon called the Coast Artillery. Officers made all sorts of gadgets to assist in the determination of firing data and artillery enthusiasm was unbounded. Firing at moving targets could not be confined to guns; and the 12-inch mortars, designed and emplaced to cover "forbidden anchorages," took the added role that guns were playing and, in spite of the difficulties encountered, soon showed their small and rather constant probable error in firing at moving targets. The question of using reduced charges with the guns was fought out and decided in the negative. The Coast Artillery did not want anything so far from service conditions. In time, about twenty years ago, the best firing methods developed asserted themselves and were generally used. The experimental and inventive drive slowed down; instruments and methods were becoming rather standardized; conditions became ripe for competition; and a strong influence on target practice was the rather praiseworthy one of seeking a high figure of

merit with the perfectly natural but unfortunate result of causing many battery commanders to jockey for such conditions of range, course of target, time of opening fire, etc., as would work to their advantage in this matter of the figure of merit. Short range target practices at targets moving slowly on rather straight courses did not present gunnery problems of any great difficulty.

But even under those rather easy conditions of target practice there was felt that something was not altogether right in using the straight ballistic methods; the center of impact often did not get on the target. Clearly some variable was entering the problem. The result was that attention was concentrated on the powder. This resulted in the firing of trial shots and "determining" thereby the muzzle velocity. No matter whether the best lot of powder that the Ordnance Department ever furnished was being used; no matter whether a most careful determination of its velocity had just been made at Sandy Hook; still the Coast Artilleryman fired his trial shots and converted his mean deviation into a "velocity" correction, set the pointer accordingly on his Pratt Range Correction Board and was ready for his target practice. The result of this procedure was that a variety of "muzzle velocities" went into the records that eventually found their way to the Ordnance Department. Parts of the same lots of powder often appeared to have far greater variations in velocity than was expected. Subsequent firings of these powders through the velocity screens at Sandy Hook did not bear out the records of the Coast Artillery firings in this matter. The discrepancies do not seem ever to have been thoroughly investigated. It seems clear to me that the powder was being improperly charged with a variation that did not belong to it. The powder certainly was not changing in any such fickle manner as those trial shot velocities indicated; what was changing was the conditions of the moment, the net effect of which was to cause variations in the retardation that the projectile met in its travel through the air. Although, in my opinion, the real cause of the variations remained unknown, it is only fair to the able officers engaged in these practices to say that the conditions under which they fired did not lend themselves to inducing a study of the retardations caused by the conditions of the moment. The fact that velocity curves on the range correction board are concave towards the normal and retardation curves are convex towards the normal did not strike them because it made little difference at the ranges used for both trial shots and target practice which ones were taken for correcting the mean deviation of the trial shots. The conditions of target practice today are vastly different; the varying retardations seriously engage the

attention of Coast Artillery officers who seek not only the correction required by the conditions of the moment, but also the law of variation of this disturbing quantity throughout a practice. Nevertheless, I regret to say we still find artillery officers who believe in firing trial shots and in throwing the mean deviation that results into a velocity correction.

The results of shooting under the conditions which I think I have fairly stated were very good. There was, however, an idea that some adjustment of fire was needed and this when attempted was done almost generally in the crude manner described by General Hagood. Analysis of such practices clearly showed that more records were injured than improved by the excited captain standing on a rather low site parapet and ordering 500 yards up or down. There was some instrumental observation of fire; and a crude method of adjustment based thereon was carried on. When Admiral Sims tried through President Roosevelt to force on the Coast Artillery the method of "spotting by the slick," General Murray who was the Chief of Coast Artillery, and the assistants in his office, were fed up on any guess method of determining the deviation of shots and a further guess method of adjustment of fire. The records did prove that straight ballistic shooting with preliminary trial shots, would have been far better than the guess methods so many officers had used in an endeavor to improve their fire. The result was that instrumental observation was favored by the Chief of Coast Artillery and guesswork based on the captain's looking through his field glasses was frowned upon. A few years later when General Weaver was Chief of Coast Artillery the writer told him of a practice he had just witnessed at Fort Terry. Instrumental observation made from Fort H. G. Wright, perpendicular to the line of fire gave so many yards over, and the captain discarded this information because his own field glasses led him to believe it was about the same distance short; the result was that the practice was thrown away. In vain did I contend that this instrument merely demonstrated the superior value of instrumental observation from a station over the field glass method. General Weaver, however, had seen so many cases of poor corrections based on field glass observation, that he felt the incident would be many times repeated. He then ordered all firing to be ballistic and forbade any form of adjustment of fire after the trial shots. I must confess that though I felt he had gone too far, he had excellent reason for taking such drastic action.

When General Weaver became Chief of Coast Artillery, Case II was generally used for major caliber guns. The plotting board was used only for plotting the course of the target at short observing

intervals; predictions were made on the range correction board by a system of strings and the method of such predictions, when analyzed mathematically, was essentially that of secant predictions, which of course was never correct when the curvature of the course of the target was appreciable. The time-range relation, so necessary in getting the maximum advantage from Case II, was kept in a sort of way by a board at the emplacement; the merits of this board were lost by the lack of attention paid to its operation. Some twelve years ago I accompanied General Weaver on an inspection trip from Portland, Maine, to include the Delaware Defenses. He was impressed by the fact that the time-range relation was being utterly neglected. The question of prediction methods preoccupied his mind at that time, and he asked many searching questions in the plotting rooms. I have actually heard officers attempt to impart to that fine artilleryman the startling bit of information that "you don't predict with guns; you predict only with mortars." It was manifest that many officers could not analyze the operations of their fire control apparatus. Of course, as always, there were plenty of outstanding exceptions. However, the result was that General Weaver ordered the predictions to be made on the plotting board and that a graphic time-range relation be kept in a specified way on a blackboard at the battery. The additional work of predicting on the plotting board increased the plotting interval which displeased many officers; the hard and fast requirements in the type, location and method of use of the time-range board had a like effect. The system thus became rigid; there was no play for experiments or possible improvements. The officers chafed and grumbled; and by the summer of 1915 these grumbles had reached the ears of a powerful Department Commander, who sent General Weaver word that he intended to attack the system in his annual report. General Weaver's prompt request of the Chief of Staff that a board of officers be appointed to meet at Fort Totten, to study the system and recommend changes, if found necessary, was approved. I happened to be President of the Coast Artillery Board at that time and was made a member. Previous to the meeting of the Fort Totten board, General Weaver had acceded to the insistent recommendation of the Coast Artillery Board that the time-range relation was so valuable that it should be kept in the plotting room, and on cross section paper if desired. The only serious fault that the Fort Totten board could find with the firing methods was the ban against adjustment of fire. Its principal recommendation, therefore, was that "whenever, during the firing of seacoast guns and mortars, instrumental observations from shore stations or from air or water

craft shows that the use of ballistic methods has failed to place the center of impact near the target, adjustment of fire based on such instrumental observation is authorized." This was approved and embodied in Changes C. A. D. R. No. 2, August 28, 1915.

This change officially introduced adjustment of fire based on instrumental observation and excluded the wild guess made by the battery commander standing on the parapet. However, the methods of using the data determined by the instrumental observation of the deviations remained generally crude. The war taught us the European methods of adjustment in field firing; and after the war when the Coast Artilleryman was returning to his seacoast cannon, he was in many cases filled with the idea that adjustment of fire was the whole thing. Many of the captains had little previous Coast Artillery training so they naturally tried to apply Field Artillery methods of adjustment to the more difficult problem of firing at moving targets in water areas. They also neglected their ballistics and the result was that some very poor target practices were held. If we pause at this stage of the development of seacoast firing it is quite natural to form the opinions expressed by General Hagood on the adjustment of fire based on any method of observation; however, it is probable that at this stage by reason of other duty he ceased his intimate touch with the Coast Artillery.

Based upon a rather close relation with Coast Artillery developments in the Panama Coast Artillery District during the past two years, I will make some observations on the problem of Coast Artillery firing down here. First of all I desire to emphasize the necessity that all of our important batteries should be calibrated in the most scientific manner, and to point out that it cannot be done as a by-product of target practice. I remember so clearly that years ago a coast defense commander asked to use his whole target practice allowance for one year in calibration firing; his request found little favor and was disapproved. I doubt if anyone today would lightly regard a commander's displaying great anxiety to get his batteries calibrated. With batteries calibrated, the next thing needed is to know the characteristics of the powder; principally its velocity, its pressure, and the time laws of change of these two principal characteristics. The pressure law is needed for safety purposes. The velocity law is needed so that a practice or action may start with this quantity determined and not to be made variable by throwing into it varying retardations that obey different laws of change. To meet this in Panama we have started firing the target practice powder through velocity screens before the practice begins; taking also the pressures and ranges. With the velocity data and pure pressure

functions of previous years there can thus be determined the best available data for:

- a. Passing on the safety of the powder.
- b. Determining the velocity which is to stand during the practice or action.

Case III is the method used for long range gun firing, and the records of the past two years prove the value of the method. The system permits, however, the change back and forth between Cases III and II as the uncorrected time-range relation, showing the law of change, and the corrected time-range relation are both kept graphically in the plotting room. The time-azimuth relations are similarly handled. Instead of the old method of determining the wind, we have commenced taking the ballistic wind before practices, by plotting the movement of free hydrogen balloons. The predictions are made on the plotting board where the graph of the target's course has none of the distortions that come with changing the polar coordinates of range and time-azimuth into any rectangular coordinates such as time and distance on a time-range board. Furthermore, it is pertinent to observe here that no mechanical instruments can possibly be devised that will grind out predictions equal in accuracy to those obtained from the graph of the target's course. It is true that where points of inflection in the course of the target are going to be met, poor predictions will follow for a while; they cannot be avoided, but keen observation from the primary and secondary stations may reduce their number. To the plotting board set forward point data are applied the ballistic corrections, the record being shown on the corrected time-range and time-azimuth graphs. The firing data if then sent to the guns would be the best ballistic data that, in my observation, could be sent.

Experience has shown that a flow of such data will not ordinarily place the center of impact on the target. Why? Because our ballistic methods do not correct exactly for the retardation of the medium fired through. The conditions of the moment are not fully known when we make our ballistic corrections; furthermore, in firing at moving targets they are very likely to change as the target changes. Too often the artillery officer is taught that the fall of his shots will obey the law of accidental errors. This is not true for moving targets; the deviations will be due to accidental errors and to something else. This something else is largely due to the varying retardation caused by the changing conditions of the moment. If in the case of a practice in which ballistic methods only are followed the range deviations be plotted as ordinates along a time axis it will be apparent at a glance whether or not the axis of the graph of the

plotted deviations is maintaining a general parallelism with the time axis. When adjustment of fire is used the following modification will show the facts. Place, say, a blue-headed pin to mark the over or short of each shot on an ordinate erected on the proper time abscissa; strip the adjustment correction used for each shot from its range deviation and put in a corresponding red pin to mark the ballistic deviation. The blue pins naturally show the progress of the shoot with reference to the target; the red pins represent the ballistic shoot just as in the case where ballistic methods only are used, and if they maintain a sort of general parallelism with the time axis, the retardation due to the conditions of the moment is practically constant. If they move away from or towards the time axis, the retardation is changing and its law of change is fairly well indicated by the axis of the graph of the red pin positions.

These retardation deviations do not follow the law of error; they may follow some other law that is quite apparent; again their law of variation may not at all be clear. Normally every practice has both accidental errors and varying retardations producing deviations. These two causes enter into the problem of correction of fire to different degrees. Generally speaking, in mortar practices the varying retardations are of vastly more consequence than the accidental errors; that is why the salvo center of impact method of adjustment is so fitting. Often in gun practices the accidental errors outweigh the retardation variations; in such cases the rule of successive approximation, based on accidental errors, then gives and maintains a satisfactory adjustment. There are, however, cases in gun fire where the retardation variations either outweigh the accidental errors or are of such magnitude comparatively, that adjustment methods must consider the law of change of the variation. At this point I sum the case as follows: *In a practice using only ballistic methods, where the retardation is varying and no means exists to predetermine its law and thus correct it ballistically through the shoot, the fire cannot possibly stay in adjustment even if trial shots had started it with center of impact on the target. Furthermore, under such conditions of varying retardation no method of adjustment based on considering deviations as accidental errors will get and keep the center of impact on the target.* Whether or not we are generally working with a varying retardation in our fire at moving targets is a matter that can be investigated in the Coast Artillery target practice records. I can say that in this District during the past two years the answer is distinctly yes, we are. *If the answer in the Coast Artillery generally is yes in the majority of cases, we certainly need the deviations of the shots or salvos in*

order to get and keep the center of impact on the target. If we can get only the sense of the deviations, well and good; if we can get the magnitude also, so much the better.

In this District it is clear that we need the deviations of the shots or salvos; the terrestrial observation stations and the observers in our air force give them to us, well within our developed probable errors. With these deviations the range officer in the plotting room solves his problem of fire adjustment and introduces the corrections into the time-range and time-azimuth relations. The firing data then goes to the emplacements. The results have been most gratifying and I feel sure the Chief of Coast Artillery would let any officer interested look over the target practice records of this District for the past two years. In them will be found graphical analyses of the target practices which show the results of adjustment of fire, the variations in the retardations as affecting the ballistic shoots, and the graphs of the corrections used.

Tables I and II summarize the 1922 and 1923 target practices. *They show that varying retardation is a serious question in firing in this District; they indicate that in the majority of shoots the law of varying retardation is quite clear and also show that the shoots have been improved in the great majority of cases by adjustment of fire.* As a matter of fact the value of adjustment of fire is far greater than such records would indicate; for in many cases what I considered unsuitable methods of adjustment were used and the records show that suitable methods of adjustment would have brought the center of impact much nearer the target. In the cases mentioned no advantage was taken of the very clear law of retardation that the graph of the red pins indicated; sometimes this came about by determining, before the practice, the method to be followed and then sticking to it regardless of its gradually disclosed unsuitability. If my main thesis in this paper is sound, the battery firing should never be required to follow blindly one particular method of adjustment; it would be less irritating to the battery officers if permitted to select the most suitable of several sound methods, and to change to another if retardation conditions show it to be advisable.

I hesitate to generalize as a result of our local experience, the subject is too serious. Certainly the summation of considerable experience on the part of officers at other Coast Artillery stations would be most valuable in arriving at general conclusions on the subject. When I first came here I was strongly of the opinion that varying retardations were normally met in mortar fire but rather doubted this being so with big gunfire. I felt that the variation in

TABLE I.

TARGET PRACTICE YEAR OF 1922

<i>Armament</i>	<i>Battery</i>	<i>Distance from Target of C. of I. Stripped of Adjustment Corrections</i>	<i>Distance from Target of C. of I. as a result of Adjustment of Fire</i>	<i>Remarks</i>
12-inch M	Merritt	+481.0	+ 4.3	Retardation practically constant
12-inch M	Merritt	+144.1	+ 44.1	Varying retardation, law clear.
12-inch M	Carr	+451.5	- 40.2	Varying retardation, law clear.
12-inch M	Carr	+214.2	+ 71.5	Varying retardation, law clear.
12-inch M	Tidball	+ 23.2	+ 39.7	Varying retardation, law clear.
12-inch M	Tidball	-309.1	- 52.4	Varying retardation, law clear.
12-inch M	Howard	+ 68.8	- 27.2	Varying retardation, law clear.
12-inch M	Howard	-212.0	- 26.2	Varying retardation, law clear.
14-inch G	Warren	-----	-----	Battery not fired in year 1922.
14-inch G	Warren	-----	-----	Battery not fired in year 1922.
14-inch G	Burnside	+244.2	- 65.8	Data obscure
14-inch G	Burnside	+142.8	+ 2.4	Varying retardation, law clear.
14-inch G	Webb	+335.2	+ 37.4	Varying retardation, law clear.
14-inch G	Webb	+ 22.0	+ 72.0	Sharply decreasing retardations, law clear. Successive approximation used.
14-inch G	Stanley	-126.2	- 72.9	Varying retardation, law not clear. Range setter set data on incorrect range scale. Adjustment of fire, however, made last two shots hits for range.
14-inch G	Stanley	- 13.6	- 19.4	Varying retardation, law clear. Practice was begun with the gun arm in the wrong socket. Corrected after first shot.
14-inch G	Buell	+330.8	+ 46.2	Varying retardation, law not clear.
14-inch G	Buell	-237.0	- 40.0	Varying retardation, law clear.
				<i>Average Developed Probable Error. (Range)</i>
				12-in. Mortar 117 shots 52 yds.
				14-in. Gun 40 shots 98 yds.

TABLE II.
TARGET PRACTICE YEAR OF 1923

<i>Armament</i>	<i>Battery</i>	<i>D. stance from Target of C. of I. Stripped of Adjustment Corrections</i>	<i>Distance from Target of C. of I. as a result of Adjustment of Fire</i>	<i>Remarks</i>
12-inch M	Merritt	+185.5	+ 8.8	Varying retardation, law clear.
12-inch M	Merritt	+187.5	+ 32.0	Varying retardation, law clear.
12-inch M	Carr	+486.0	+ 60.7	Varying retardation, law clear.
12-inch M	Carr	+219.6	+ 10.2	Varying retardation, law clear.
12-inch M	Tidball	+287.2	+ 35.2	Varying retardation, law fairly clear.
12-inch M	Tidball	+269.0	+ 21.7	Varying retardation, law clear.
12-inch M	Howard	+356.6	+ 25.8	Varying retardation, law clear.
12-inch M	Howard	+241.7	+ 63.5	Varying retardation, law not clear.
14-inch G	Warren	+ 32.2	- 40.0	Varying retardation, law not clear. Powder exposed for 24 hours.
14-inch G	Warren	+409.6	+ 85.6	Varying retardation, law clear.
14-inch G	Burnside	+244.0	+ 70.0	Retardation constant.
14-inch G	Burnside	+191.4	+ 97.4	Varying retardation, law not clear.
14-inch G	Webb	+ 63.6	- 11.6	Varying retardation, law clear.
14-inch G	Webb	+ 10.5	- 99.5	Varying retardation, law clear. Terrestrial station reported incorrect deviation on first shot. Battery commander used this deviation in making his correction for next shot. Airplane spot was correct.
14-inch G	Stanley	+452.4	+ 17.6	Retardation constant.
14-inch G	Stanley	+213.4	+127.5	Varying retardation, law not clear.
14-inch G	Buell	-----	-----	Battery not fired in year 1923.
14-inch G	Buell	-----	-----	Battery not fired in year 1923.
<i>Average Developed Probable Error (Range)</i>				
12-in. Mortar 132 shots 37 yds.				
14-in. Guns 40 shots 108 yds.				

the accidental errors practically always outweighed the variations in the retardation and therefore I was strongly in favor of the method of successive approximations. I had some very interesting arguments with Major Quinn Gray on the subject; he held the view that the retardation in gunfire varied more than I believed it to vary. It is pertinent to note that his view was based on the study of many target practice records when he was President of the Coast Artillery Board. He and I would take a ballistic shoot, obtained by stripping the deviations of their adjustment corrections, and play the shoot over by different methods of correction. It is now quite clear to my mind that he and the officers associated with him who got up the adjustment methods in the Heavy Artillery Materiel, C. A. C., Part IV, were really modifying the method of successive approximations just to fit the case of the varying retardation. It is now also clear that they did not carry their appreciation of the value of the stripped, or ballistic deviations to the logical conclusion, for on page 82 it is stated that "subsequently, in analysis or in studying the effects of the correction applied *it might be interesting* to plot the points, *e, f, g, etc.*, representing the ballistic ranges developed by the salvos." The truth is they need to be plotted *during the shoot* for they are immediately valuable in giving the general law of variation of the retardation. My study of the part quoted led me to the latter conclusion and consequent introduction of it into our range and azimuth adjustment boards in the District.

Would it not be well to determine as much as possible of the law of retardation before the practice commences and introduce corrections ballistically? The answer is yes, we are now looking for a means to anticipate its effect and correct for at least part of it, to avoid facing it in the adjustment of fire. There is much promise of success by the experiments already made in determining the ballistic wind by the free hydrogen balloons. A few more years of continual experiments in Panama will show how much of this varying retardation can be laid to the wind. Personally I would be delighted if the Coast Artillery officer's difficulties in firing could be reduced by finding that his measured ballistic wind, used properly for the different altitudes, and resolved into range and azimuth components, would take out much of the varying retardation he now confronts. But, as matters now stand, we are absolutely dependent upon observation of fire, and I am glad that General Hagood's experience bears out my own in testifying to the efficiency of our Air Service in observation of fire. Within certain limits their work is nearly as good as that of our terrestrial observing stations; farther out, the Air Service excels; and beyond the limit of our own observation

stations, the question of long range Coast Artillery seems hopeless without the aid of the Air Service. That we must be prepared to do our best without adjustment of fire after an action commences goes without saying, and that requires exactly what General Hagood so strongly emphasizes—we must build on sound ballistic methods. This is emphasized in this District; but what is also emphasized is that the finished artillery officer in addition must thoroughly understand the problems entering into adjustment of fire and practice their solutions so that if opportunities come to use them they will present no such difficulties as beginners would meet. By knowing all the various possible methods of improving the efficiency of fire of his cannon, the Coast Artillery officer is better prepared to meet any conditions of firing. It is quite unlikely that our most important defenses will be caught without an air force sufficient to provide aerial observation for our long range cannon. Should this condition ever appear probable, the Coast Artillery should be the first branch to make every effort to get the Air Service brought up to a proper strength.

In conclusion, I summarize our needs for efficient conduct of fire as follows:

a. At least the most important batteries should be calibrated in the most scientific manner.

b. The velocity of the powder should be determined before the shoot commences.

c. The best ballistic methods must be followed in preparing the firing data.

d. The ballistic wind should be taken and the variations in the retardation reduced as much as possible.

e. Terrestrial observing stations and Air Service observation must be provided.

f. Sound methods of adjusting fire, based on both observed deviations and sensing must be learned and practiced. The difference between accidental errors, systematic errors, and errors caused by some law of retardation must be understood so clearly that an improper adjustment method will never be followed.

The Progress of the National Guard

By MAJOR GENERAL G. C. RICKARDS

U. S. Army, Chief of Militia Bureau

(Reprinted through the courtesy of the author and The Military Engineer.)

TO AN observer of the progress made in the military defenses of the United States, the growth of the National Guard since 1919 stands as a most encouraging feature. Perhaps no other event, aside from the establishment of the Army of the United States itself, brings to the American citizen interested in military matters the sense of security inspired by what the National Guard has accomplished within the past five years.

Following the demobilization of 1919, the National Guard service was faced with the problem of a complete reorganization. On July 1, 1919, the Guard carried an aggregate enrollment of 37,746, a force in which twenty states and the District of Columbia were represented. This aggregate, small as it was included 14,000 men carried as National Guard in Texas, which existed largely on paper.

On July 1, 1923, four years later, the enrollment of the Guard stood at 160,598, including 9,675 officers. By January 1, 1924, this figure had increased to 164,187, of which 10,030 were commissioned. In this force every state in the Union, except Nevada, as well as the District of Columbia, Porto Rico and the Territory of Hawaii, are represented. Such a showing in the short space of four and a half years is justifiably encouraging, particularly when one reflects that the military training of the National Guard is being supervised by a group of competent Regular Army officers and that the cost of this force is being held down to approximately thirty million dollars a year.

Under the Dick Bill of January 21, 1903, National Guard service was given federal "recognition" for the first time. Prior to that date, the central government had disbursed federal money on the "Organized Militia," but it was not considered, in any sense, a federal force and it lacked federal supervision. Since the passage of

the Dick Bill, the aggregate strength enrolled by the Guard at the end of each fiscal year has been as follows:

1903	116,547	1910	119,660
1904	115,110	1911	117,988
1905	111,057	1912	121,852
1906	105,693	1913	120,802
1907	105,213	1914	128,043
1908	110,941	1915	129,398
1909	118,926	1916	132,194

As is well known, the National Guard was called on for Mexican Border duty during 1916 and during the first quarter of 1917. Heavy enlistments, due to the prospect for World War service, greatly expanded the force during the first half of 1917.

On April 1, 1917, there were 76,713 Guardsmen in federal service and 97,295 in the state service; on June 30 of the same year, the corresponding figures were 93,006 and 135,119; a month later the force had increased to a total of 303,581 men, of whom 111,962 had been called into federal service. On August 5, 1917, 379,323 National Guardsmen, including 12,100 officers, were drafted into the service of the country.

So much for the past. To those who are not familiar with the requirements of the complete National Guard project, it may be interesting to outline briefly what is expected of this service.

The National Defense Act provides for a National Guard to consist of a minimum of 800 men for each member of Congress. The present membership of the House and Senate, 531, therefore, fixes this minimum at 424,800. To this total, the law provides that certain quotas may be added to cover the National Guard allotments of the District of Columbia, Porto Rico, Alaska and Hawaii. The War Department has allotted 2,400 to the District of Columbia; 2,400 to Hawaii; 5,600 to Porto Rico, and 600 to Alaska—fixing 435,800 as the minimum strength.

Under the general allotment of troops to make up the Army of the United States, the National Guard was originally allotted 18 Infantry divisions (2 for each Corps Area); 4 Cavalry divisions (one for each Army Area and one distributed over the United States), and certain Corps, Army and G. H. Q. organizations, all of which combined would enroll a peace strength of approximately 370,000. The difference between 370,000 and 435,800 indicates the allotment of troops that should still be added to bring it up to its legally authorized minimum.

It is clear, therefore, that the present National Guard project contemplates raising and maintaining, in time of peace, as large a

force as the volunteer National Guard provided for war duty in 1917. In the original law it is stipulated that this force be organized in five annual increments during the period, 1920-1925. Due to various causes, it soon developed that this project could not be carried out within the time limit contemplated under the law. Additional armories had to be secured in those states where the available buildings were inadequate for housing the state's quota; state legislatures, and behind them the taxpayers, had to be acquainted with the new and increased responsibilities devolving upon the National Guard and had to be brought to realize the necessity for maintaining the organization. In brief, a new conception of the meaning and importance of the National Guard service had to be established in the minds of the American people, and this required more time than originally allowed.

Influenced by these reasons, the Secretary of War approved on January 23, 1923, a program covering the organization by June 30, 1926, of a National Guard enrolling at least 250,000 drawn from the original allotments. This program is the one under which the Militia Bureau is now working. Under it there are included, at *peace* strength, 18 Infantry divisions, 12 Infantry regiments with no divisional assignments, and 130 Coast Artillery Corps batteries (recently authorized to adopt a regimental and battalion organization). There are also included at "maintenance" strength (explained below), 18 regiments of 155-mm. Field Artillery and a miscellaneous list of Corps, Army and G. H. Q. organizations, the formation of which had been begun when the modified program was adopted.

If all the units contributing to the 164,000 aggregate of January 1, 1924, were recruited to peace strength, the Guard's total enlisted enrollment would be approximately 210,000 men. It is not at all likely, however, that such an enrollment will be attained since the great bulk of National Guard organizations are kept on the level of their authorized "maintenance" strengths. Due to normal increases in the number of National Guard units (as more armories and larger appropriations become available), the Militia Bureau is counting on a National Guard enrollment of 180,000 by June 30, 1924; 220,000 by the same date in 1925, and 250,000 by June 30, 1926.

The National Defense Act likewise authorized the acceptance, by the federal government, of National Guard companies with "recognition" strengths of 50 enlisted men regardless of the peace strength prescribed by the Regular Army tables of organizations. The Militia Bureau has also issued tables under which company units

with peace strengths in excess of 65 enlisted men are authorized for maintenance at that figure. The number of officers authorized for both recognition and maintenance strengths is the same as that prescribed by the Regular Army peace strength tables, except in a few instances where one additional officer has been authorized for certain units with insufficient commissioned personnel.

This policy has the effect of skeletonizing the National Guard to a certain extent, for it is clear that a 65-man company of Infantry must expand more than a 93-man company in going from peace to war strength. This drawback, however, is offset by the fact that the 65-man unit provides a very convenient organization for armory training purposes and also makes it possible to maintain, for the same amount of money, a larger number of company units than prescribed peace strength.

The handicap imposed by small company strengths is not restricted to the National Guard. If present conditions continue, it is evident that in any national emergency requiring the immediate use of troops, the United States will be forced to do as England did in 1914 with the first expeditionary force, i. e., use all available organizations with small company strengths, keeping these units built up while on the line, and forming, as fast as possible, in rear of that line, a war time army. A remedy for this situation, so far as it involves the National Guard, has been suggested in having fewer and larger company organizations. But this is not practicable for great numbers of Guard company units are situated in single-company stations. Abolishing a company at one station could not make more men available for duty at another.

While on the subject of the distribution of the National Guard it may be interesting to point out that there are 2,715 company and detachment Guard units located throughout the United States, Porto Rico and Hawaii, at 1,311 different stations. The garrisons of these stations range all the way in size from small detachments of a dozen men to the force of 14,000 stationed in New York City and vicinity.

The National Guard has a dual obligation—to the state and to the nation. Therein lies both its weakness and its strength. The weakness results from the fact that the National Guard service is dependent for financial and moral support on the state legislatures, as well as on Congress. Two legislative bodies instead of one must be convinced of the worthiness of this service before the funds for its maintenance are forthcoming. The strength results from the fact that the Guard's obligation to the state enables it to prove its indispensability for all kinds of emergency duty in peace as well as war.

This indispensability is slowly but surely coming to be appreciated. In 24 different states during the past fiscal year, the National Guard was called upon for emergency duty covering such assignments as fighting forest fires, protecting prisoners from violence, rescuing and relieving flood refugees—in brief, any duty that a military organization may be called upon to perform toward maintaining peace, upholding law or protecting life and property.

As the value of the National Guard service has come to be more fully appreciated throughout the country we may expect more liberal support from the taxpayers, without whose backing the organization could not exist. In numbers of towns and cities the local Chambers of Commerce and commercial clubs have recently gone on record as favoring National Guard service for their employees, and promising that such employees shall not be required to make any financial or professional sacrifices because of their National Guard duty. One outstanding example of such concerted action on the part of local business men was noted last summer in St. Paul, when 100 of the leading firms in the city united in a pledge supporting the National Guard plan and indorsing service therein for their employees.

The National Guard is proud of its affiliation with the Regular Army of the United States. The 10,000 Guard officers enrolled fully appreciate the fact that the increasing efficiency of their service is due, in a large measure, to the efforts of the 440 officers and 507 non-commissioned officers of the permanent establishment now on duty as instructors. It is a great gratification to the Militia Bureau to note the mutual esteem constantly growing between Guard organizations and their Regular Army supervisors.

Reference has been made to the 10,000 National Guard officers now enrolled. One of the problems now being considered in the Militia Bureau concerns the procurement of the 9,000 additional officers required in transferring the National Guard from a peace to a war status. There is an overwhelming weight of opinion throughout National Guard circles that the great bulk of these additional officers can and should be secured from that Service. It is no more than natural that the men who are acquainted with the National Guard system and traditions should be preferred. The Militia Bureau's present policy contemplates the selection of at least two non-commissioned officers in each National Guard company to be prepared for carrying an officer's responsibilities in time of emergency. This grooming is to be achieved through a special course of instruction and the successful non-commissioned officers are to be issued "certificates of capacity."

There are many other questions affecting the National Guard which cannot be discussed in an article of this length and character. The problems of mobilization and subsequent training before taking the field; the cost of the Guard as compared to the value of the training imparted; the extent to which this training can be carried in the 60 armory drills and the 15 days of field training prescribed for each year—these points and many others must remain untouched.

It may be said, however, that so far as the difficulties facing the Guard are concerned, time should remedy all of these. Time is required to establish it in communities not yet reached; time may bring about more cordiality toward this service throughout the membership of organized labor; time should also serve to quiet the apprehension of the anti-militarists once they learn that service in this force, as stated by the Governor of Wisconsin, has nothing to do with the causes of war.

But whatever time may unfold, the main thing has been accomplished. The National Guard has been given a recognized federal status; it has been assured of support from the national treasury; it has been accepted and approved by the people of the United States at large and, best of all, it is being organized under a system that guarantees to both state and nation a dependable military asset. To quote from an editorial in the *Philadelphia Public Ledger*: "Looking backward, there is inspiration in the Guard's war record. Looking forward, there should be security in it. By taking it as an everyday matter, most of us are complacent about the Guard to the verge of indifference. Its members get too little credit for the sacrifice of time for their regular drilling and of vacations for the annual encampment. They work hard for the privilege of serving their country."

We want no more competitive armaments. We want no more war. But we want no weakness that invites imposition. A people who neglect their national defense are putting in jeopardy their national honor.—President Coolidge.

Pistols and Pistol Shooting

By MAJOR W. D. FRAZER, C. A. C.

EDITOR'S NOTE: This is the first of two articles by Major Frazer on Pistols and Pistol Shooting. The second will appear in a later issue of the JOURNAL and will discuss the technique of pistol shooting and suitable methods of instruction. The author is a distinguished pistol shot and is an authority today on the art of pistol shooting. He has been coach and shooting member of the Coast Artillery Pistol Team for the past three years. In 1922 at Camp Perry he won the National All Around Shooting Championship.

SINCE that critical day on Lexington green when the first shot of the Revolutionary War was fired from a pistol we find, if we study the records found in the works of authors of history and historical fiction, that this weapon and its contemporary, the revolver, have played an eventful part in the growth and development of our country.

American literature is interwoven with interesting tales of travel, adventure and romance, in which the skillful use of weapons is exploited and it would lose much of its appeal to Americans of all ages were these stories omitted from our available books and magazines. Skill at arms and in athletics has always had a strong appeal for every normal red-blooded American boy and in our early days the use of weapons was a part of the education of our young men as was the use of tools and implements.

In our colonial days the rifle was as much a part of the pioneer's equipment as was the axe and the plow. It provided food and protection for the settler while he labored to clear his land and establish his homestead among the aboriginal owners of the soil, who constantly disputed his claim to these possessions. It was also largely instrumental in the winning of national freedom from the mother country. We have been frequently reminded of the tradition which has been handed down to us from Colonial days to the effect that at one time we were a "nation of riflemen." However true this may be, we do know that through American skill, inventive ingenuity and the circumstances surrounding the establishment of our social code in our western states, there was invented, perfected and abundantly manufactured a distinctly American weapon which is known as our national arm. The revolver is undisputedly an American invention, and the developments in its use and manufacture have been as re-

markable as those of many other notable articles of trade and commerce originating in this country.

To every officer of our army, the history of the pistol, revolver and automatic hand gun should be of interest, as it is these weapons that have been, and still are, the sidearms of our commissioned personnel and on which chief reliance must be placed in military emergencies when hand-to-hand conflict is imminent. A thorough knowledge of the mechanism, limitations and capabilities of the pistol with its advantages and disadvantages is of considerable professional value to an officer. Combine such knowledge with a practical experience which has developed a high degree of skill and the value of such an officer to the army through his interest and ability to quickly, thoroughly and efficiently train enlisted personnel in pistol shooting is just as important as any work of instruction prerequisite to the turning out of a properly trained soldier.

Research of Ordnance Department records, and the works of authorities on the subject of small arms reveals the fact that certain crude forms of hand guns were in evidence from the time of the invention of gunpowder. However, the first weapons which came under the category of pistols were crude, cumbersome matchlocks invented about the beginning of the sixteenth century.

The invention of the pistol is credited to an Italian, Caminello Vitelli of Pistoria, Italy, in the year 1540. However, there seems no doubt of its use elsewhere previous to that date. This weapon was supposed to have been named either after its reputed birthplace or from the fact that the first weapons were of the same caliber as that of the coin of that period called a "pistole."

Passing over the period of the matchlock we find that it was succeeded by the wheellock, which did away with the inconvenient glowing match for igniting the priming charge, and substituted instead a lock so constructed that by means of releasing a tightly wound spring a notched steel disc or wheel was revolved at high speed against a stationary flint producing a stream of sparks in the flash pan of the weapon.

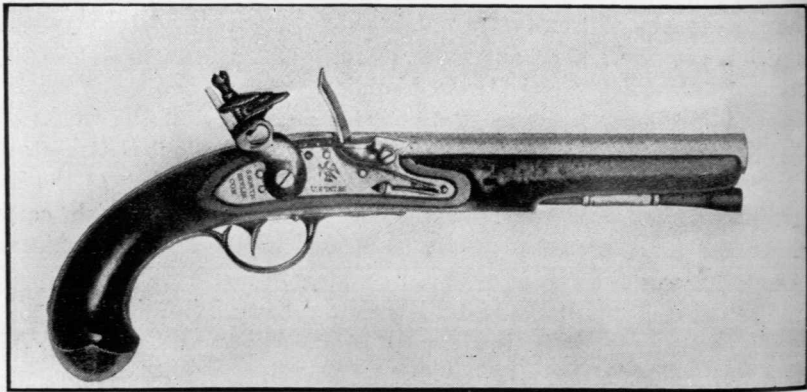
About 1630 the first real flint locks made their appearance. This type remained in use for over two centuries, and is too well known to need an explanation here.

Pistols in use from the time of their invention until the end of the eighteenth century were classified as (1) horse or holster pistols which included all large military or naval pistols; (2) duelling pistols; and (3) pocket pistols.

Considering these weapons from a military viewpoint, we find that pistols were first used for military purposes by the German cav-

alry at the battle of Renty in 1544. They were adopted by the French cavalry in 1550, and have always been primarily a weapon for mounted men.

The next development, the invention of the percussion cap, was a far-reaching one, as it revolutionized the making of pistols and gave great impetus to the work of inventors and gunsmiths. This means of ignition was invented about 1807 and in spite of its recognized advantages it was not accepted as heartily as it deserved due perhaps to the early, crude and uncertain acting caps used. These gradually gave way to the cylindrical copper cap containing a fulminating explosive. Due to conservatism perhaps, we find that the



HORSE PISTOL; MODEL 1799-1800. CALIBER .69. FIRST MODEL MADE BY SIMEON NORTH

use of this system on military weapons, both rifle and pistol, was delayed for many years while our army continued to use the flintlock. Both flintlock and percussion cap pistols were in use at the battle of Waterloo in 1815.

Up to the beginning of the 19th century many attempts had been made to design a multishot pistol and many crude weapons were in use about this period, but it was due to the perseverance, energy and mechanical skill of an American that the first *successful* revolver was invented.

Colonel Samuel Colt patented his first muzzle loading revolver in 1835 and since that date the name of Colt has become famous throughout the world. Colt not only invented and perfected revolvers, but he established a plant for their manufacture on a large scale. This establishment, the largest of its kind in the world, still actively exists as a monument to his memory.

In tracing the history of the use of pistols in our army we find that on March 9, 1799, Simeon North of Berlin, Conn., received the

first United States government contract for 500 horse pistols, and he is recognized as the first official pistol maker for our government. From 1799 until 1828 North made over fifty thousand pistols for the United States army and navy. These weapons were smooth bore, single shot, muzzle loading, flintlock pistols, caliber .69. The government armory at Harpers Ferry, Va., began the manufacture of pistols in 1807 and Springfield armory in 1818.

In 1838 Colt put on the market his first revolver called the "Texas Pistol," caliber .34, and followed it at once by the one known as the "Walker Pistol," caliber .44. Both of these weapons were used by our officers in the Seminole Indian war 1838-42.



THE PEACEMAKER, MOST FAMOUS OF ALL COLT REVOLVERS. SINGLE ACTION, SIX SHOTS, CALIBER .45. MODEL 1872

In 1847 during the Mexican War the first regulation army revolver was adopted. This was the Colt Dragoon or Holster revolver, model 1847. It was improved slightly in 1848. These pistols were issued in pairs to the men in the mounted service and carried in holsters on the saddle. They were .44-caliber, had good penetration, and accuracy sufficient to place the six shots in an eight-inch circle at fifty yards. From the date of their first adoption Colt's pistols have retained the title of official sidearm of the United States Army.

During the Civil War in addition to over 318,000 new model Army .44-caliber pistols made by Colt for the army and navy, it was necessary for the government to purchase additional pistols from other arms companies to supplement the Colt. These included weapons from Remington, Joslyn, Starr, Savage, Allen, Wheelock, Lefancheux, Whitney, Adams and Trantor.

In 1873 after the invention of the metallic cartridge, the Colt *Breech Loading Single Action Army Revolver* .45-caliber was adopted. This weapon was probably the most famous of all the

Colt arms and was known as the *Peacemaker*. This arm was also made to take the .44-caliber rifle cartridge and in such caliber was known as the *Frontier* model. This model is still made and has great popularity in certain parts of the country.

The next change in the army pistol was the adoption by the War Department of the Colt model 1892 double action revolver, caliber .38. This was a very radical change in policy for up to this time the army had depended on a weapon of .44 or .45-caliber. This change occurred at a time when the advocates of smaller bore military weapons were succeeding in their efforts to have such arms adopted. While the smaller caliber military rifle with its greater ballistic advantages of range, accuracy and striking energy at long range has proved a success, the smaller caliber revolver was a failure because of its lack of shocking power, and after a short trial in the Philippines by our army the War Department provided the New Service Colt revolver, caliber .45, for the use of troops serving there.

The greatest modern development in the design of pistols was the automatic principle, which was first applied to the machine gun and later to sidearms. Several foreign automatics appeared between 1893 and 1898, among them were the Borchardt, later known as the Luger-Parabellum, the Bergmann, Mauser and Mannlicher. In 1898 John Browning, another celebrated American inventor, patented an automatic system which proved so successful that it has been applied to pistols, machine guns, automatic rifles and shotguns. The Browning patents for pistols were adopted by the Colt's Patent Fire Arms Co., and in recent years this firm has put on the market many models of this type ranging from .22-caliber to that of the Service pistol.

The Colt Automatic pistol, caliber .45, model 1911, was adopted by the U. S. Ordnance Department as the result of a most exhaustive test of the automatic weapons in use at that time. At the time of its adoption (1911) there was considerable controversy over the action taken, as many believed that it was not a suitable weapon for hard military service, especially mounted service, in places such as our Mexican border, because of the difficulty of preventing it from becoming clogged with fine sand and dust and consequently failing to function until cleaned. However, the ease and speed with which it can be taken apart and reassembled combined with the advantages inherent to it of rapid loading and firing more than offset its disadvantages. Now after over ten years of service including the World War, the .45 automatic pistol has proved its worth as has the automatic system for pistols, and it is only a matter of a short time before the revolver will be obsolete as a military

weapon. During the World War because of the difficulties in manufacturing the .45 automatic the official sidearm was supplemented by two .45-caliber revolvers constructed to take the same ammunition. These were made by the Colt and Smith and Wesson firms.

During the so-called frontier days when the west was being settled there was little or no law to depend on. The so-called wild west was the great gathering place of the more adventurous spirits of the land. The numerous mining camps, railroad construction jobs and the rapidly increasing cattle ranches were the magnets that drew to the west the young man seeking a fortune in much the same spirit as the followers of Sir Francis Drake sailed the Spanish Main in search of treasure and adventure. Combined with the establishment of our social code in the West was the problem of making a livelihood among the warlike tribes that roamed the plains. All of these factors combined to develop the use of revolvers and pistols and the tales that spread throughout the world of the wonderful shooting skill of the cowpuncher and western gunman were even more remarkable and astonishing than were the accomplishments of J. Fenimore Cooper's hero of the leatherstocking tales. Pistol shooting in those days developed into a game of quick drawing and snap shooting at very close range. Shooting from the hip and gun pointing rather than aiming were the main requisites to success. The accuracy of the gunman of those days is not to be compared with the accuracy of the modern pistol shot, as far as ability to group shots on a target is concerned.

Whether due to the interest created by tales of the wonderful skill of the Westerner with the pistol or due to the inherent natural love that every normal boy has for shooting, there has always existed in this country a fraternity who followed the pistol shooting game because of a genuine love for the sport, that once developed never dies. This group is increasing yearly and there was never a time in the history of the country when there were so many young men interested in the shooting game. Our World War army of over four millions more or less trained in the use of arms is largely responsible for this condition. Give a young man the facilities and opportunity to indulge in this sport without too much inconvenience and expense and we will soon see that "the love of weapons is deep-rooted in the hearts of manly men."

Our high schools, colleges and universities are adding shooting to their sports and many of them now recognize it on the same plane as other sports and give collegiate athletic awards to members of their shooting teams. One of our large western universities includes rifle and pistol shooting as one of the optional courses for young

women taking physical education. I might add that in this institution over three hundred young women have been given a good course in small arms firing since the classes were first organized.

Due to the crime waves that have swept our cities during the last few years, consisting of every crime from burglary and highway robbery to murder, the police forces of our cities are emphasizing pistol shooting in their training, for it is realized more than ever before that the only answer to this problem is a highly trained, well armed, straight shooting police force and the psychological effect on the criminal element of such a police force is inestimable. Officers of the military establishment are needed as instructors for these forces.

To illustrate my point: In 1920 as the result of an unusual crime wave which struck one of the largest Pacific coast cities, culminating in the murder of two police detectives on one of the main streets during the busy hours of the day, the city council appropriated \$5,000 for the construction of a nine-target indoor pistol range, which was built from plans furnished by an army officer on duty in that city. On completion of the range the entire police force was required to attend lectures on pistol shooting, a group of eight of the best qualified shots were given daily instruction and practice for one month under the same army officer and they in turn were assigned the job of instructing the remainder of the force. At present the police force of this city is required to maintain a certain qualification with the pistol and the range is in use daily and work thereon directed by a qualified police instructor. The effect of this kind of training has been very noticeable and results decidedly gratifying.

The National Rifle Association and United States Revolver Association, the two organizations that control and supervise organized rifle and pistol shooting throughout the country, have more than tripled their membership since the war. As a result of the government support given rifle shooting through the Board for the Promotion of Rifle Practice, this form of shooting has become more popular than pistol practice, but this is largely due to the fact that civilian marksmen can get free issues of ammunition and rifles in addition to the use of army ranges whereon to practice. The present individual membership of the National Rifle Association has grown from 3800 in 1920 to 13,000 in 1923. That of the U. S. Revolver Association from a few hundred to about 5,000. Consider also that in addition to the actual individual memberships in these organizations there are affiliated with them numerous rifle and pistol clubs varying in size from a few men to several hundred, and it can readily be seen that the total actual membership of American citi-

zens participating in rifle and pistol shooting is in the neighborhood of 150,000. From these figures we can judge to what extent interest in shooting is developing.

* * * * *

Having briefly noted the increasing interest in pistol shooting among civilians, let us see how the changing conditions are affecting the army. In the last three years this country has sent three pistol teams into international competition against the best European teams; these teams with the exception of that of last year being badly defeated. No European teams competed in the International Pistol Team Match held in this country last year and our victory was an empty one. In these three years the army has been represented by two men only, most of the team being civilians. In the Olympic Pistol Matches this year you can expect to again see a civilian team represent the nation. In an effort to analyse the causes and try to find the remedy for this condition which should not exist, the following conclusions have been reached: First, we must realize a national characteristic, namely, that the average American will not maintain interest long in a sport or pastime that he cannot become proficient in without too much effort and in a comparatively short time. In other words, if the game is too hard or discouraging to American beginners only the real enthusiasts will stick to it. That is one reason why rifle shooting appeals at first more strongly than pistol shooting, for any one with average intelligence and physical make-up can soon learn to shoot the rifle well. This is not true with the pistol for it is the most difficult of all small arms to learn to shoot well and partakes much more of the nature of an art than does rifle or shotgun shooting.

Again it is my belief that we do not present the game to a young officer or soldier in the proper way. In other words, our methods of teaching pistol shooting are fundamentally wrong in one main essential, wrong to such an extent that we discourage rather than encourage a new man in a sport that usually appeals to him and which would fascinate him were he able to progress satisfactorily.

For years we have believed that to make a successful range shot with the rifle out of a novice it is first necessary to give him a thorough preliminary course in the principles of shooting, followed by a course with the gallery rifle. The better the preliminary instruction the better the results when the man goes on the rifle range with the service rifle. One of the men who made our international rifle team two years ago had specialized almost exclusively in .22-caliber target shooting and had done very little service rifle shooting. Yet he was

able with a little practice to make a place on a team that won the World's Championship.

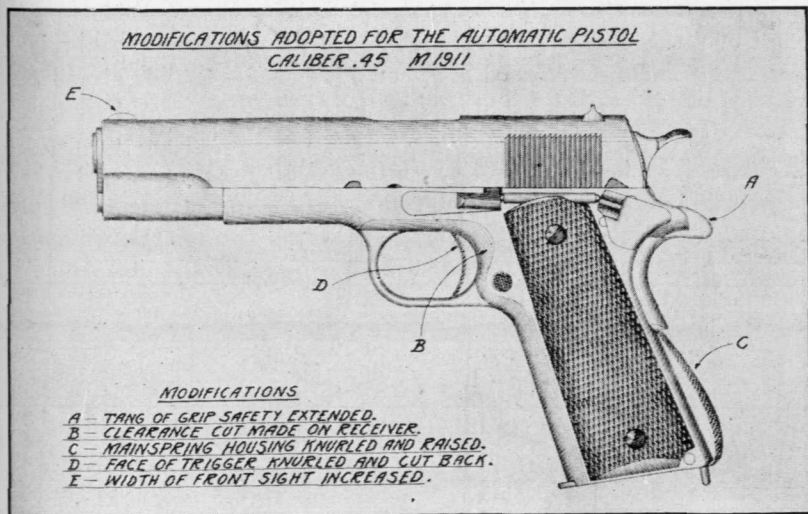
How have we gone about teaching the pistol? We have only within the last few years or since the adoption of "Pistol Marksmanship" attempted any worthwhile preliminary training in the principles of pistol shooting, such as aiming, holding, squeezing, and calling the shot and proper coaching, but instead of then following this with a thorough course with a .22-caliber pistol we hand a man a heavy, powerful, nerve-racking handgun and expect him to qualify with it after a short preliminary practice. What are the results? The reaction of the nervous system to the vibrations set up in the muscles of the hand by the recoil mechanism, and the ear-splitting report so unnerve the average beginner that by the time he has fired a score of five or seven shots he is trembling like a leaf, blinking his eyes, jerking his trigger, and flinching so badly that his shots form a zone of dispersion resembling that of a shrapnel. The result of procedure of this kind is the discouragement of the novice or recruit and many hours of painstaking coaching and practice are required before he can overcome flinching, the greatest of all obstacles to successful pistol shooting.

On the other hand if the novice shot the .22-caliber pistol until he became confident of his ability to make a good score, then when the service pistol was placed in his hands he would undertake its use forearmed with confidence, the greatest of all assets to success. Had the army adopted the .22-caliber pistol years ago as it did a .22-caliber rifle, it not only would have meant a great saving in cost of ammunition, but an increased allowance with which to train men and above everything else a much better qualified pistol shooting personnel. In France one saw day after day infantry officers and men who were armed with the pistol going into action with several extra magazine pockets on their belts. Then one realized more than ever before how much the ability to shoot well meant to them and when we hear the accounts of men dropping their bayonets and depending on pistols in hand-to-hand conflict during raids or in the final assault we realize still more how we have failed in our duty to train men in this important means of defense.

Considering further the causes of lack of interest in pistol shooting among military men we must remember that to create and maintain interest in any sport we must make that sport not only worth while because of the skill, energy and perseverance required to master it, but also attractive and enjoyable and it must of itself be mentally and physically beneficial. Pistol shooting possesses all these attributes except that if indulged in with a weapon and ammuni-

dition that is not a pleasure to shoot, and which instead causes discomfort and discouragement, the recreational value is lost. Furthermore, if the facilities for practice are inconvenient or too limited as regards location, targets, availability of range at convenient hours, or restricted by unnecessary or unreasonable range regulations, the chances will be that the sport will not be worth the effort to carry it on.

If the R. O. T. C. units in our high schools, colleges and universities can afford to install indoor rifle and pistol ranges at their respective institutions and maintain them so successfully that they



THIS IMPROVED PISTOL WILL BE ISSUED TO PISTOL TEAMS PARTICIPATING IN THE 1924
NATIONAL MATCHES

not only furnish excellent facilities for instruction in small bore shooting, but also are in constant demand for team and recreational shooting, we might logically decide that the army could learn something beneficial from these facts.

If a small fraction of the money spent on post gymnasiums and athletic equipment were used to build modern, properly equipped and lighted indoor ranges in connection with our gymnasiums the benefits to the military establishment and nation would be of inestimable value and our commissioned personnel could then conveniently and pleasantly indulge in pistol shooting as do our civilian brothers who are today representing our country in international matches.

Were it necessary to convince anyone that it is desirable for an army officer to be a good pistol shot, we might ask such person if he believes the following: first, that it is necessary and advantageous for persons working continually about deep water to know how to swim well; second, that it is equally advisable that police officers, railway mail clerks, and express messengers, and all persons on whom the responsibility for protection of life, property and treasure rests, be efficient in the use of the pistol; third, in teaching subjects such as drawing, architecture, and other arts in which demonstration is the chief duty of the instructor, it is absolutely necessary that he be qualified to do this work with skill and conclusiveness; fourth, that it is necessary for every normal well-balanced man to have some form of recreation for a hobby that will give him necessary relaxation and healthful physical aid through exercise that is stimulating and beneficial yet not so strenuous as to be detrimental to him in later years; fifth, that it is a criterion of a man's professional efficiency that he be able to perform well all duties for which he is responsible. If he believes any or all of these statements then he must agree that an army officer's general and professional education as well as his physical and mental development will not suffer by time devoted to the Art of Pistol Shooting.

It is essential that a company officer of the Coast Artillery Corps be a good pistol shot, for if he is lacking in the knowledge of the theory and practice of shooting he cannot hope properly to instruct his command and his influence and prestige will suffer accordingly. The advice of a poor shot carries little weight.

The Citizens' Military Training Camps were established by the act of June 4, 1920. The first camp was held in the summer of 1921. Forty thousand young men applied for admission, but only 10,000 men attended because of the limited appropriations. The next year appropriations were increased and 22,000 were given training, and in the following year, 1923, 24,500 were enrolled in the camps. President Harding expressed on several occasions the hope that there might be established during his administration a "comprehensive system for voluntary military training for at least 100,000 men each year." Attendance at Citizens' Military Training Camps is voluntary, and admission is accomplished by application to the headquarters of the corps area in which the applicant resides.—*The Work of the War Department.*

Coastal Operations

By MAJOR MEADE WILDRICK, C. A. C.

EDITOR'S NOTE: *This paper tied for second place in THE JOURNAL'S 1923 Essay Competition.*

WE ARE all familiar with the theories that obtain at present for the tactical employment of fixed, railway, heavy tractor-drawn, and anti-aircraft artillery. In the case of fixed armament the current conceptions were developed by our own service prior to the World War, while those which concern the other three types of armament were evolved during the operations in France. Unfortunately we have little to go on in determining our future policies for employment of these latter types in strictly Coastal operations. The best available examples upon which to base a study of this question are Gallipoli, the German Fortifications along the Belgian Coast, and the Japanese reduction of the forts at Tsing Tao. None of the above, however, parallels strictly the conditions affecting the Coast Defense problem that faces us today in regard to our own country. Because a solution of this last question represents to a large degree our "raison d'être," we will discuss certain aspects of it in the following pages.

In the first place our pre-war conception of Coast Defense no longer holds, for with the adoption of the positive system of Coast Defense, the other branches of the army, particularly the Air Service, Infantry and Field Artillery, bear this great responsibility with the Coast Artillery. As Coast Artillerymen we have had an opportunity in the past to study and consider Coast Defense to a greater extent than the other branches of the service. As a result we can foresee more readily the demands that are placed upon the army in the solution of this problem. The purpose of this article will be to attempt to point out the great service that can be rendered the army at large by Coast Artillery in Coastal Operations and to outline the important missions that should be assigned to Coast Artillery armament.

OUTLINE OF THE PROBLEM

In studying the Coast Defense problem we find the following possible theaters of operations:

First—The Atlantic, Gulf and Pacific Coasts of Continental United States.

Second—The shores and adjacent water areas of our overseas possessions.

Third—The shores and adjacent water areas of any advanced bases that would be required by a joint Army and Navy expeditionary force.

The principles of Coast Defense as discussed below apply equally to all three of the possible theaters of operations and the proportion of the various arms of the service engaged should be determined by the local terrain and troops and type of armament available in each case. In considering this problem let us visualize the Western Front and assume that the shore line represents our "front line trench" and that the adjacent water area is "no man's land." This assumption opens up a wealth of tactical and strategical problems right at our front door which can be solved not only theoretically in our General and Special Service Schools, but practically on the very ground in the Corps Areas, Departments, and Coast Artillery Districts embracing the possible theaters of Coast Defense Operations as previously outlined. Fortunately, the strategical and tactical principles as developed by our Army, both prior to and during the World War, and as taught in the service schools at the present time, fit in well with the solution of the problem as assumed above.

CONSIDERATIONS AFFECTING THE ENEMY

In other than a purely naval attack or air raid upon an important strategic point the enemy will be forced to meet our land forces at the beach. This is the situation that we will consider in this article. In preparing our shore positions for this phase of the problem and in developing our war plans therefor, the following points with regard to the enemy should be kept in mind:

First—In selecting the area for attack, the enemy will be governed by strategical considerations. In developing his attack within the area or areas selected he will be influenced by the tactical requirements, which in turn will be largely dependent upon the local terrain. The World War clearly demonstrated the fact that an enemy will be unable to disembark and supply successfully a large expeditionary force such as would be necessary against our country, unless he has temporary control of the sea, and possesses some sheltered harbor having adequate terminal facilities. For this reason it is highly probable that one of his first objectives will be the capture of one or more of our important seaports. It is not likely that he will risk his battle fleet against the harbor defenses nor attempt a landing under their guns. To accomplish his mission he will be forced to initiate his landing operations well to the flank of these "Strong

Points" in our present positive coast defense system. Having once effected a landing he will attempt to take the prospective base, with its harbor, docking facilities, and defenses, from the rear.

Second—In developing the naval phase of his attack, it is extremely unlikely that he will expose his first line battleships or battle cruisers to the fire of our shore batteries or the bombs of our air forces, unless special conditions require it. This for the reasons that these ships are limited in numbers by the terms of the Washington Conference, if destroyed it would be practically impossible to replace them, and they are designed to fight similar ships and not land fortifications. The types of warships he will employ will be his predreadnought type battleships, should this type of ship be available, his cruisers and his destroyers. The predreadnought type of ship has guns of approximately 12-inch caliber and while these units are more or less obsolete from a naval standpoint, yet they would be of material assistance in covering his landing operations, and in fighting our primary seacoast armament.

Third—The third fact to bear in mind is that we will face a better organized and equipped force than that which attempted the reduction of Gallipoli. We must prepare our plans on the assumption that the enemy will use specially designed small boats for disembarking troops from transports. These boats will be armored in all probability against small arms fire, will be equipped with machine guns and landing ramps, and will be power driven. Small boats of this type will permit an enemy to disembark large numbers of troops in a relatively short period of time.

Fourth—In the next place we must remember that there will be great enemy air activity. This will include reconnaissance, bombing, and machine gunning of our shore positions and bases.

Fifth—Again, we must bear in mind that the enemy will make clever use of smoke screens in covering his operations. These screens may be formed by ships, aircraft, artillery fire, or by aeroplane bombs.

Sixth—We must recognize the fact that large quantities of gas will be employed against our shore positions and bases.

Seventh—And, finally, we must expect that any hostile attack will be made in all probability at night or in the early morning. In this case the enemy may attempt to illuminate our shore positions by use of searchlights, star shells, or aeroplane flares.

CONSIDERATIONS AFFECTING OUR TROOPS

Having considered briefly what the enemy will do, let us now examine our side of the problem.

First—Due to the great length of coast line to be covered, our shore line positions must be lightly held, except at vulnerable points, until the enemy commits himself to a certain theater of operations. During this phase our dispositions must be elastic enough to permit us to reinforce quickly any threatened area. This can be accomplished best by developing the liaison between the Navy and our own air forces to such a point that we will have sufficient advance information to permit us to meet the enemy in force at the shore line while he is still in the act of disembarking his troops. He will be at the greatest disadvantage at this period of his attack and this is the time at which we must be prepared to inflict upon him the greatest possible punishment. In view of the fact that in many cases, our front line positions must be lightly held if we delay the enemy even a few hours, it will be of inestimable value to us, because the respite will permit us to throw in reinforcements which will have a marked effect on ensuing military operations.

Second—In selecting our positions it should be kept constantly in mind that the troops are not holding a defensive sector, but are occupying a position in readiness for attack, and are prepared to close with the enemy as soon as he attempts a landing in force.

We have outlined above the general aspect of the Coast Defense problem as it affects the Army as a whole. Let us now consider the employment of the Coast Artillery in relation to the other branches of the service.

THE RELATION OF THE COAST ARTILLERY TO THE OTHER BRANCHES OF THE ARMY

The relation of the Coast Artillery in Coastal Operations, with its fixed, railway, heavy tractor and anti-aircraft armament, to the other branches of the army is shown graphically in Fig. 1. With adequate forces available, and with a proper distribution, it will be seen that the enemy will meet an increasingly heavy resistance as he approaches the beach. During this phase the targets of the Coast Artillery, other than transports, will be hostile warships. These ships may be classed as capital ships, non-capital ships and submarines. Capital ships ordinarily include battleships of the dreadnought and predreadnought types and battle-cruisers. Non-capital ships comprise armored cruisers, light cruisers, destroyers, gun boats, etc. The general characteristics of the above types as given in Tactical Employment of Heavy Artillery, Coast Artillery Board, are as follows:

Capital ships are those provided with heavy armament and heavy armor. They vary in length from 350 to 850 feet, and in

beam from 70 to 100 feet. Their maximum speeds vary from 18 to 35 knots per hour, i.e., from 600 to 1200 yards per minute. Their armor is from 9 to 12 inches, and in a few cases as much as 14 inches, on the vertical surface protecting the vital parts of the ship. Their deck protection consists of from 2 to 7 inches of armor arranged in three or more decks, and in future ships this may be materially increased.

The primary armament of the latest capital ships consists of from 8 to 12 guns of calibers varying from 12 to 16 inches, and the secondary armament embraces from 16 to 24 guns of calibers varying from 5.5 to 7 inches. The armament of earlier ships of this class includes 4 guns of approximately 12-inch caliber, from 12 to 16

DIAGRAM SHOWING NORMAL ZONES OF ATTACK AND TARGETS

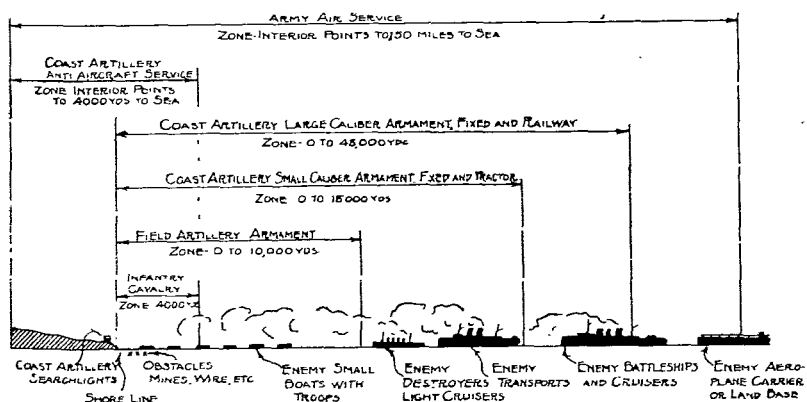


FIGURE 1

guns of 5-inch to 10-inch caliber, and a number of 3-inch guns. All capital ships have torpedo tubes and most of them now have anti-aircraft guns as well.

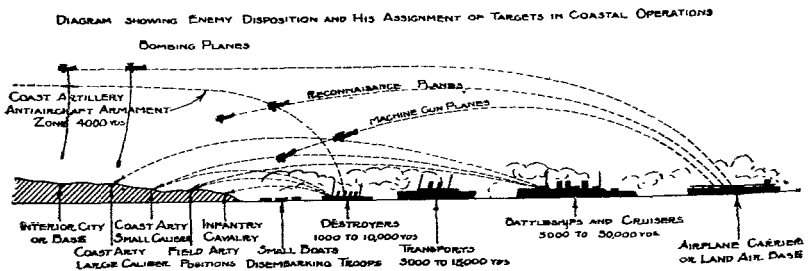
The range of the primary armament now mounted on most existing capital ships is limited by the angles of elevation permitted by their mounts. No guns are now mounted so as to fire at ranges much in excess of 30,000 yards. In fact, few guns are now mounted so as to fire at ranges in excess of 25,000 yards, and many of the earlier capital ships mount guns that have a maximum range materially less than this. Future capital ships probably will have their guns mounted so as to fire at ranges of 25,000 yards or more.

The secondary armament as mounted on the later ships has a maximum range of approximately 15,000 yards, and on many of the earlier capital ships these guns are so mounted as to confine their fire within even closer bounds.

Non-capital ships are of the very greatest variety. Many such ships have little or no armor, and speeds of less than 25 knots per hour. Armored cruisers may have armor from 6 to 9 inches thick. Destroyers may have speed even in excess of 35 knots per hour. These ships may be divided into armored and unarmored ships.

The armored non-capital ships may have armament that includes 10-inch guns and a relatively large number of smaller guns. Destroyers are usually unarmored and carry from one to four guns of approximately 6-inch caliber. Other unarmored ships may have several 6-inch or smaller guns.

The maximum range of the guns mounted on non-capital ships can be taken as 15,000 yards. These craft are limited either by the type of gun or mount, or by their facilities for observation, to ranges of from 8,000 to 10,000 yards.



Submarines of the earlier types were limited in speed and cruising radius. Guns, when mounted at all, were few and of small caliber. The latest submarines have maximum speed of 20 knots or more per hour on the surface and of 12 knots or more per hour submerged. They are of large size and have a cruising radius of from 3000 to 5000 miles. They mount one or two guns as large as 6 inches in caliber. A submarine mounting a 12-inch gun has been constructed. Greater size and speed, larger guns and probably some armor protection are to be expected in future designs.

This consideration of the characteristics of enemy warships brings us to the discussion of the employment of these vessels in coastal operations.

The formation taken by the enemy in disembarking his troops and in covering his landing will vary with local conditions, but in general it will be as indicated in Fig. 2. He will attempt first to gain control of the air by means of his fighting planes operating from an aeroplane carrier or nearby land base. His bombing planes will attack our cities, shore positions, and bases with demolition and gas bombs. His reconnaissance planes will attempt to locate our

shore positions and will spot his artillery fire directed at these positions. Low flying planes armed with machine guns will attack our Infantry and Artillery positions. His battleships and large cruisers will cover his landing operations with their primary and secondary armament and will concentrate their fire on our main artillery positions. His destroyers and light cruisers will make smoke screens to cover the landing of his small boats, in addition to using their guns to attack our infantry and artillery positions. His small boats, armored against our small arms fire, and armed with machine guns will carry his troops to shore.

It will be seen that, in a well organized operation such as we must expect, and with the advantage of quick water transportation at his disposal, the enemy will be able to concentrate his forces, both

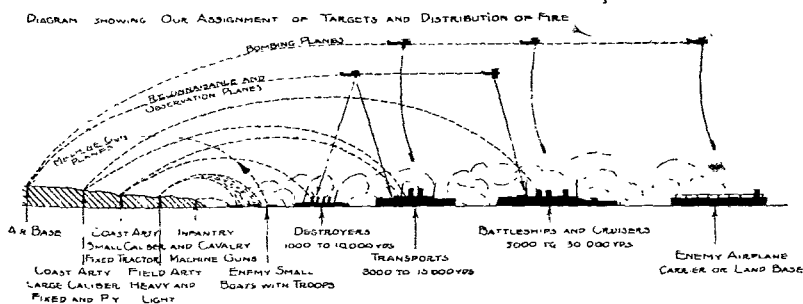


FIGURE 3

in personnel and materiel, at his selected points of attack with extreme rapidity. Unless we are equally well organized and use the personnel and armament available to us to its maximum capacity, our chances of crushing him at the beach are questionable. This stage of the operations represents the critical point in the Coast Defense problem and it is here that the Coast Artillery is capable of turning the tide of battle in our favor provided adequate Coast Artillery personnel and armament is available and is prepared to perform its proper mission.

MISSIONS OF THE VARIOUS BRANCHES

In general, the missions of the various branches in Coastal Operations are as indicated in Fig. 3.

Air Service. The function of the Air Service is to gain and maintain control of the air; to keep our troops informed of the enemy movements in close liaison with our Naval forces; to bomb enemy warships, transports and supply ships; to attack with machine gun fire hostile troops in small boats or on the beaches; to

spot the fire of our Artillery; to furnish firing data for our guns when terrestrial observation is not available; and to illuminate hostile targets at night with flares.

Coast Artillery. The mission of the Coast Artillery is to destroy or drive off with large caliber fixed and railway artillery, battleships and armored cruisers covering enemy landing operations; to destroy or drive off hostile light cruisers, destroyers, submarines, transports and supply ships by means of fire from small caliber fixed, railway and heavy tractor artillery; to destroy or drive off hostile air forces with anti-aircraft artillery; to destroy enemy ships entering mined waters; to illuminate hostile targets at night with searchlights and star shells; and to locate enemy ships at night or under poor visibility conditions by sub-aqueous sound ranging apparatus.

Field Artillery. The business of the Field Artillery is to support our Infantry; to destroy enemy forces in small boats and on the beaches; to lay down barrages which are particularly effective near the beaches and upon narrow water channels of approach through which the enemy must pass in his landing operations; and to illuminate hostile targets at night with star shells.

Infantry. The duty of the Infantry is to destroy enemy forces in small boats and on the beach. The fire of machine guns, automatic rifles, and 37-mm. guns will prove very effective in this work. The proposed .50-caliber machine gun appears to be specially suited for this mission. Further, the Infantry must prepare lines of obstacles at the beach in conjunction with engineer troops.

Cavalry. The errand of the cavalry is the same as that of Infantry for terrain adapted to employment of mounted troops.

Engineers. The function of the Engineers is to lay out trenches and beach obstacles, and to supervise construction of roads, railroads, bridges, camouflage operations, etc.

Signal Corps. The Signal Corps is charged with laying out and maintaining prescribed means of communication, including radio, telephone, telegraph, pigeons, message centers, etc.; and with coordinating and controlling the operation and maintenance of means of communication in the hands of line troops. In this connection the radio net in itself represents a most important and critical problem.

Chemical Warfare. The Chemical Warfare must supervise the employment of gas by line troops, both offensively and defensively; must attack hostile troops within range with weapons assigned to Chemical Warfare troops; and should supervise the employment of smoke for the purpose of camouflaging our positions.

The Ordnance, Quartermaster, Medical and other supply services would function in their normal capacity.

Our Coast Defense submarines will be most effective weapons during this phase of the enemy operations, provided they are not neutralized by hostile naval activity.

CHARACTERISTICS OF COAST ARTILLERY ARMAMENT

We have outlined above the missions of the various branches of the Army in Coastal operations. Let us now see what types of armament are available to the Coast Artillery for performing their missions. It will be noted in Figures 1, 2 and 3, that Coast Artillery armament has been classified as large caliber and small caliber. For the purpose of this discussion let us assume that everything 12-inch in caliber and above is large caliber or primary armament and that everything below that figure is small caliber or secondary armament. It will be noted further in Fig. 1 and 3, that battleships and large armored cruisers are the normal targets for large caliber Coast Artillery weapons, both fixed and railway, while transports, destroyers, light cruisers, and submarines are normally assigned as targets to small caliber guns both fixed, tractor and railway. However, a transport loaded with troops would be a most vulnerable target for the large caliber guns provided they were not assigned at the time to large armored ships.

The following general types of Coast Artillery armament are available. The fixed guns ordinarily are found in our coast defenses as now organized and form the strong points in our positive system of Coast Defense, while the railway and tractor armament is available primarily for Coastal operations, but may be employed to reinforce the fixed guns if needed.

PRIMARY ARMAMENT

<i>Armament</i>	<i>Type</i>	<i>Traverse</i>	<i>Range</i>
12-inch gun on disappearing carriage	Fixed	170°	17,000 yds.
12-inch mortar	Fixed	360°	15,000 yds.
12-inch gun on Barbette carriage, model 1917	Fixed	360°	27,000 yds.
14-inch gun on disappearing carriage	Fixed	170°	22,500 yds.
16-inch Howitzer on Barbette carriage	Fixed	360°	25,000 yds.
16-inch gun on Barbette carriage	Fixed	360°	45,000 yds.
12-inch mortar	Railway	360°	15,000 yds.
12-inch gun on Batignolles mount with racer	Railway	360°	30,000 yds.
14-inch gun	Railway	360°	42,000 yds.

Of the foregoing types of gun carriages for primary armament, the most deficient in numbers and design from a coastal operations viewpoint, are the railway mounts. This deficiency represents one of our greatest artillery weaknesses at the present time. There is great need for a quantity of railway mounts, having the same general characteristics as the 12-inch barbette mount, model 1917, or the Batignolles mount. The carriages for railway guns should be mounted on a previously prepared base of simple and inexpensive design, which should have a racer of sufficient size to insure the same accuracy and rate of fire against moving water targets as is now obtained with similar fixed armament. Such a weapon, having a range of approximately 30,000 yards, would meet the requirements of the Coast Artillery Service for many years to come, due to the fact that this approximates the gun range of battleships authorized under the Washington Conference and it is questionable if we can develop a satisfactory mechanical fire control system which will permit mobile artillery to fire effectively at greater ranges.

Similarly the general characteristics of the small caliber or secondary armament available for performing the mission of Coast Artillery troops as outlined above are given below. Of the types enumerated, the 155-mm. G. P. F. gun and 8-inch railway gun are the best adapted for the requirements of the Coast Artillery Service from a coastal operations standpoint. It appears, however, that the 240-mm. Howitzer can be so adapted as to become a most effective Coast Artillery weapon. There is a considerable quantity of the last mentioned types of cannon on hand, particularly 155-mm. G. P. F. guns, which is available for assignment to Regular, National Guard and Reserve units.

SECONDARY ARMAMENT

<i>Armament</i>	<i>Type</i>	<i>Traverse</i>	<i>Range</i>
3-inch gun	fixed	360°	2,000 yds.
6-inch gun	fixed	170°-360°	14,500 yds.
10-inch gun	fixed	170°	14,500 yds.
8-inch gun	railway	360°	24,000 yds.
155-mm. G. P. F. gun	tractor	60°	17,500 yds.
8-inch howitzer	tractor	60°	12,000 yds.
9.2-inch howitzer	tractor	60°	13,000 yds.
240-mm. howitzer	tractor	20°	18,000 yds.

In general, all primary armament is supplied with armor-piercing shot designed to penetrate the heaviest armor carried by modern warships. In addition, all pieces that are mobile are supplied with common steel shell for land warfare. The secondary

armament is supplied with common steel shell only. This shell will penetrate the plates of lightly armored vessels and is the standard type of projectile for land warfare.

EFFECTIVENESS OF COAST ARTILLERY ARMAMENT

Let us next consider the effectiveness of this armament. A brief resume of the data given in Tactical Employment of Heavy Artillery, Coast Artillery Board, gives the following information:

It will require an average of five hits from large or primary caliber armament to put a capital ship, such as a battleship or large cruiser, out of action or to sink it. This is based on a consideration of the vulnerable points of a capital ship, the angles of incidence that will be obtained and the armor that will be encountered. However, one or two hits from any cannon of primary armament will put a non-capital or unarmored ship out of action and, in a majority of cases, sink it while a considerable number of hits from guns of approximately 6-inch caliber will be required to put a destroyer out of action or to sink it.

The probability of hitting a capital ship for primary armament is as follows: from point blank range to 15,000 yards, from 100 percent to 10 percent, decreasing as the range increases; from 15,000 to 25,000 yards from 10 percent to 5 percent; and from 25,000 yards to 50,000 yards, from 5 percent to 1 percent. Similarly, the probabilities of hitting a destroyer with a 155-mm. G.P.F. gun are estimated as follows: from point blank range to 5000 yards, from 100 percent to 35 percent; from 5000 to 10,000 yards, from 35 percent to 10 percent; and from 10,000 yards to 15,000 yards from 10 percent to 3 percent. Against large targets, such as transports, the above percentages will be increased and this increase will be in a general way proportional to the increase in the size of the target.

The hits per gun per minute will be dependent largely on the rate and accuracy of the fire delivered. This brings out strongly the importance of having well trained, properly equipped, and intelligently handled Coast Artillery organizations, so that the maximum fire effect of the armament served can be obtained during the time the target is within the field of fire. It should be kept in mind that this period will ordinarily be of short duration, due to the great speed of the targets in question. With well trained troops and properly designed material the rate of fire should be one shot per gun per minute for large caliber armament, and three shots per gun per minute for small caliber armament. However, this rate of

fire cannot in general be attained with equipment now on hand, except with certain types of secondary armament.

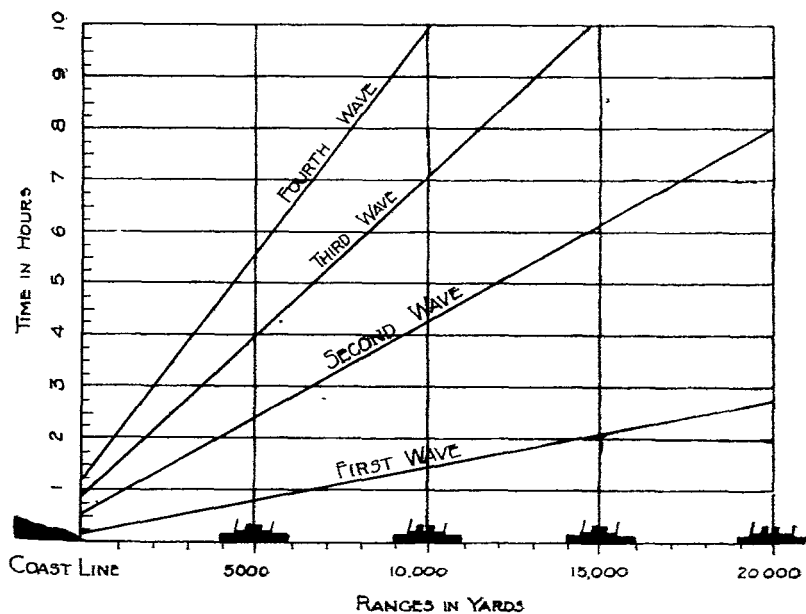
Having considered the general characteristics of water targets and the effectiveness of Coast Artillery armament available to combat these targets, let us now discuss the policies we should follow in preparing our war plans with special reference to the employment of Coast Artillery personnel, using as the basis of our discussion the forces used by Great Britain and France in the operations at Gallipoli. These forces, with the exception of the air armament employed, may be taken as a representative combined military and naval expeditionary force, such as we may expect to encounter. While the following discussion will be limited to Coast Artillery armament, the same general process of reasoning can be applied to preparation of war plans for the other branches of the Service.

According to Navinson's "The Dardanelles Campaign," twelve battleships were actively employed in covering the landing of the troops at Gallipoli. These ships carried a total of about 48 guns, 12 inches and above in caliber, and 146 guns 6 inches and above in caliber. In many cases, these ships and the accompanying warships and transports approached within a few thousand yards of shore with impunity, due to the fact that the battleships had previously silenced the Turkish fixed batteries in the forts near the entrance to the Dardanelles and the Turks had no mobile coast artillery armament available to cover the landing beaches selected, or to drive the covering warships and transports out. This permitted a short range concentration of fire from a large number of guns of both primary and secondary armament on the Turkish Infantry and Field Artillery positions, and cut down the time required to transport the troops ashore. In this connection it should be noted that the Turks had a larger force of troops in position than we could reasonably expect to have in a similar situation, yet in spite of this fact they were unable to prevent the landing. The above example clearly shows the absolute necessity of our having adequate primary and secondary mobile seacoast armament available to cover the many vulnerable landing beaches along our coasts. If the Turks had had such armament the Allied forces without doubt would have been crushed at the beach.

In general it can be accepted as a principle that the more effective the fire of the Coast Artillery armament, the farther from shore the enemy will have to put his troops in small boats, the more vulnerable will be these forces to the fire of the infantry, field artillery and air forces contesting the landing, and the greater will be the time required to put a given number of enemy troops ashore.

The advantage in regard to time can be shown best by a graph, as indicated in Fig. 4. For example, assume that the hostile transports were forced to stay 20,000 yards off shore. The time required to put the first wave of troops ashore would be two and three-quarters hours. During the same period of time three waves could be put ashore if these same transports were allowed to come in to 3000 yards from shore. It is evident, in this case, that by having adequate coast artillery preparation, the effectiveness of the enemy's

DIAGRAM SHOWING TIME REQUIRED TO LAND TROOPS ON SHORE FROM TRANSPORTS AT VARYING RANGES



NOTE: - ASSUMED SPEED OF SMALL-BOATS 4-KNOTS OR 8000 YDS. PER HOUR. ASSUMED TIME FOR EMBARKING AND DISEMBARKING TROOPS 10 MINUTES.

FIGURE 4

attack, on a basis of time, has been reduced by 66 per cent, not to mention his losses due to the increased vulnerability of his troops during the period of time in question.

Let us now discuss the type and number of guns that will be required to cope successfully with a situation similar to that which the Turkish forces faced at Gallipoli.

Primary Armament. We will assume that twelve battleships are covering a landing at an average range from the primary caliber guns on shore of 15,000 yards. Our probability of hitting at this range is approximately 10 per cent. Also, as previously stated, it

takes an average of five hits to put one battleship out of action. It would require, therefore, a total of 60 hits to completely destroy the fleet in question, or a total expenditure of 600 rounds. Assuming, under adverse field conditions, a rate of fire of one round per gun every two minutes, we would have a total elapsed time of 1200 gun minutes. Now allowing for such delays as adjustment of fire, poor visibility conditions, hostile air attack on our gun positions, etc., we will assume that the targets are under effective fire of our batteries for a total period of sixty minutes during the critical stages of the operation. Based on this assumption, we would require a total of 20 primary caliber guns to put the fleet out of action. It is believed, however, that if we destroy 33 per cent of the ships, the others would withdraw and our mission, insofar as the primary Coast Artillery armament is concerned, would be accomplished. In this assumption we would require about seven guns, or allowing for casualties to our armament, a total of eight guns. In other words, in preparing our war plans for coastal operations, we should cover important sectors with at least the equivalent of two battalions of primary armament.

Secondary Armament. The number of French and British troops available during the first phase of the landing operations at Gallipoli was about 70,000. In general, this force approximates the size of an initial contingent or a local concentration of a large expeditionary force such as we must expect to combat in coastal operations. Assuming six tons per man, this would require a total of 420,000 tons of shipping for transporting and supplying the command in question. Allowing 6000 tons as the size of the average ships employed, this would require a total fleet of 70 transports and supply ships. During the actual landing operations these troops would have to be trans-shipped and at the most, probably only about 20 transports would be brought under the fire of our shore batteries at one time. In general, the following covering ships, other than battleships or armored cruisers may be assumed to be employed: eight light cruisers and 12 destroyers; or a total of 40 targets vulnerable to attack by our secondary Coast Artillery armament.

Now presuming that these ships were attacked at an average range of 10,000 yards from our secondary gun positions, we may expect a probability of hitting 10 per cent. Again assuming that it takes an average of 10 shots to destroy or put out of action one of those ships, it would take a total of 400 hits to completely destroy the targets in question, or a total of 4000 rounds, based upon the probability given above.

Similarly, allowing for an average rate of fire under adverse field conditions of one round per gun per minute, the elapsed gun time would be 4000 gun minutes. As in the case of the primary armament, assuming these ships were under an effective fire for a total time of 60 minutes during the critical stages of the operation, considering poor visibility conditions, etc., we would need a total of 66 guns to destroy the ships in question. Again as in the case of the primary armament, it is believed that if we inflict 33 per cent casualties the hostile operation would be unsuccessful and the mission of the Coast Artillery secondary armament would be accomplished. Under this assumption we would need 22 guns of secondary armament, or, allowing for casualties, about 24 guns, which is the equivalent of three battalions of eight guns each.

Field Artillery and Infantry Targets. According to Navin-son's "The Dardanelles Campaign," the following landing formations were employed at the various beaches during the initial landing operations and offered targets particularly vulnerable to Field Artillery and Infantry fire:

- S-Beach—4 tows, consisting of a trawler and 6 boats each, the Battleship *Lord Nelson* acting as a covering ship
- River Clyde—A large collier filled with troops beached between S and V beaches
- V-Beach—6 tows, consisting of a pinnace and 4 cutters each, the Battleship *Albion* acting as covering ship
- W-Beach—8 tows, consisting of a picket boat and 4 cutters each, the Cruiser *Euryalus* acting as covering ship
- X-Beach—4 tows, the Battleship *Implacable* acting as covering ship
- Y-Beach—Trawlers with 4 tows, the Battleship *Goliath* and the Cruisers *Sapphire* and *Amethyst* acting as covering ships
- Z-Beach—12 tows, consisting of a pinnace and 4 cutters each, the Battleships *Triumph* and *Majestic*, and the Cruiser *Bacchante* acting as covering ships.

Each tow carried about 125 men, the total number of small boats used being about 176. The initial wave, augmented by small naval contingents and the force on the River Clyde, was, therefore, in the vicinity of 7000 men.

The small boats used were mostly of standard naval type and were not designed for this kind of work. The type of small boats we must expect to encounter in the future will probably have twice the troop capacity, and as previously pointed out, will be armored against small arms fire, will be equipped with machine guns and landing ramps, and will be power driven. With such special equipment we should plan on a possible total of 12,000 troops being put ashore per hour.

General Conclusions. Based on the figures arrived at above and figuring the distance from X Beach to Z Beach as about 36,000 yards, we arrive at the following conclusions with respect to Coast Artillery: Coast Artillery Primary Armament—For 36,000 yards of coast line, eight guns are required, or one seacoast gun of primary caliber for each 4500 yards of vulnerable coast line. Coast Artillery Secondary Armament—For 36,000 yards of coast line, 24 secondary guns are required, or one seacoast gun of secondary caliber for each 1500 yards of vulnerable coast line.

The number of Field Artillery and Infantry targets to be expected under the above assumption would be as follows: for 36,000 yards of coast line, 176 small boats, or one small boat per hour for each 200 yards of front. Another way of considering this problem is that the enemy by landing 12,000 men on this front per hour would be able to disembark troops at the rate of one man per hour for each three yards of front. Similarly, the number of hostile aircraft to be expected can be estimated by knowing the capacity of the enemy aeroplane carriers, and allowing for any nearby land bases available to the enemy and for the storage of surplus planes on accompanying supply ships. The figures so determined can be used as a basis in planning our antiaircraft gun defense and in allotting our own air forces to the various corps areas and departments.

Taking the above figures as a basis let us apply them to concrete problems of coast defense which face us today in the various Corps Areas and Departments which have a coastal frontier. As the purpose of this article is to consider only the Coast Artillery phase of the problem involved, we will now discuss this part of the question in more detail.

THE COAST ARTILLERY DISTRICT

One of the primary functions of each Coast Artillery District is to prepare the war plans for the employment of Coast Artillery troops within the corps area or department of which the district is a part. This involves not only the determination of the number of regular troops required, but also the number and National Guard and Reserve units that will be needed to fulfill the mission assigned to the Coast Artillery Corps. It is believed that this problem can be solved best by considering it under the following heads—operations and training, materiel and personnel.

Operations and Training. The foundation of all war plans involving coastal operations is based on the determination of the beaches in each Corps Area and Department that an enemy would probably select for his landing operations. This requires a thorough

study of the whole coast line from a strategical point of view. After the areas which are vulnerable from a strategic standpoint have been determined, they in turn should be studied from a tactical standpoint in order to locate the actual landing beaches and channels, which, by reason of reefs, sand bars, swamps, cliffs, etc., an enemy would be forced to use, in the successful accomplishment of his mission. These studies unquestionably have been made and are available in the files of the headquarters of each Corps Area or Department concerned.

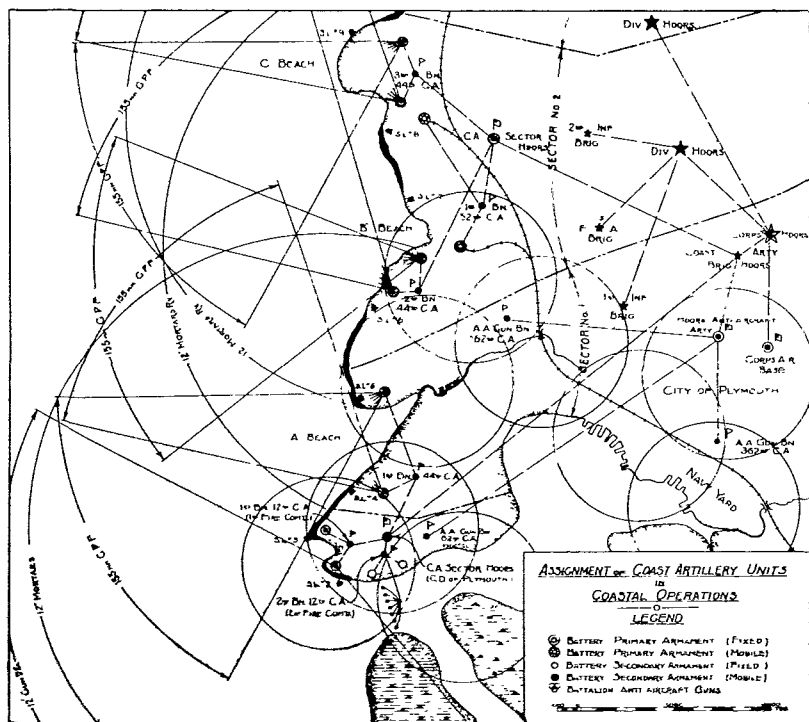


FIGURE 5

For the purpose of illustration, let us assume that Fig. 5 represents a selected area with three vulnerable landing beaches, A, B and C. The extent of the coast line involved is about the same as that at Gallipoli and includes a Coast Defense or "strong point," protecting a harbor which contains extensive docking facilities and a naval base. The armament of the Coast Defenses is all fixed and represents in a general way that now found in many of our seacoast forts. The primary armament includes a 12-inch gun battery, mounted on disappearing carriages, and a 12-inch mortar battery.

In addition, there are two fixed secondary batteries and a mine field. These are assumed to be organized into two battalions or fire commands of the 12th Coast Artillery as indicated. The area in question is assigned to a Division and is divided into two sectors, with one Infantry Brigade allotted to each sector. The Field Artillery Brigade is assigned to the Division Front. There is another Division in the adjacent sector and both Divisions operate under a Corps Headquarters as shown.

The mobile Seacoast Artillery units are assigned as follows: One battalion of G.P.F. guns, as secondary armament, to the First Sector, and two battalions to the Second Sector, all from the 44th Coast Artillery. In addition, the First Battalion, 52nd Coast Artillery, manning primary armament of 12-inch Railway Mortars, is allotted to the Second Sector. All Coast Artillery Seacoast units, including searchlights, in each Sector are grouped in Sector or Coast Artillery Group Commands, which in turn are under a Coast Artillery Brigade or District Commander on the Corps Staff.

Each Sector should be subdivided into sub-sectors as are required to fit the local terrain and each sub-sector should be given a name. This is for the purpose of assignment and identification of targets as now practised in the case of water areas adjacent to our existing Coast Defenses.

The Antiaircraft Coast Artillery units are divided into three groups, but the positions of the gun battalions only are indicated. One group, consisting of the 62nd Coast Artillery (Regular Army) covers the Fixed Defenses and aeroplane approaches along the harbor entrance to the City and Naval Base. The second group, shown as the 162nd C. A. (National Guard) covers the aeroplane approaches to the City along the river and railway lines. The third group, represented by the 362nd C. A. (Reserve), covers the city proper and its valuable military utilities. All these three groups are organized under an Antiaircraft Artillery Headquarters located near the Corps Air Base for liaison purposes, and under command of the Coast Artillery Brigade or District Commander on the Corps Staff.

The channels of command, as outlined above, follow, in a general way, the peace time organization of the Army. It is believed, however, in actual operations, that the sector commander should command all units operating in his sector, excepting perhaps those units whose field of fire or activity is capable of covering targets in other sectors. The senior line officer on duty with troops in each sector should command it, and he should be provided with an adequate staff and with proper communication facilities. This

emphasizes the necessity for all line officers to be familiar with the proper functions and limitations of all arms of the service, so as to insure that the maximum effectiveness of the troops be obtained.

Having determined the number of seacoast and anti-aircraft guns needed to cover the various vulnerable landing beaches in each corps area and having located the battery positions and command posts required as outlined above, the next step is to reconnoiter and occupy the positions in turn and to tabulate the orientation and other data for file in each Coast Artillery District Headquarters. The work of selecting the positions should be done in close liaison with the Corps Area and the Department Staff concerned, so as to make it fit in with the plans for the employment of the Divisional troops which are to cover the beaches in question. The following form is given as an example for tabulating this data, See Fig 6.

In order to insure that this work is done in an intelligent manner in the various Coast Artillery Districts, there should be assigned to each District at least one battalion of railway, heavy tractor, and anti-aircraft artillery. These units, in addition to being essential from an artillery intelligence service viewpoint, will be required for training the National Guard and Reserve units in the Corps Area concerned. The positions thus located should be classified as initial positions and eventual positions. The initial positions should be those that would be immediately occupied upon outbreak of war and the eventual positions should be those that would be occupied by reinforcing units which would come into the various sectors in case the coastal area in question is attacked in force. Field orders should be prepared and kept on file for the occupation of the initial positions, so as to insure that the Corps Area concerned will pass from a peace to a war basis in a minimum period of time.

Maneuvers should be held periodically to test the adequacy of the war plans developed as outlined above. In these exercises the Navy should take the role of the hostile expeditionary force, and service conditions should be reproduced in every possible way. It is believed that as a result of such maneuvers, it will be found advisable to have sufficient Coast Artillery Armament available in each Corps Area to permit all initial positions to be occupied at once. This for the reason that, if these batteries are not actually in position and ready to fire as soon as the enemy comes within range, the advantage of time as shown graphically in Fig. 4, and the resulting vulnerability of enemy forces, will be lost and thus our chances of defeating the enemy at the beach will be materially decreased.

In time of peace the school system should be coordinated with the operations project in each Corps Area. The officers' schools

REPORT ON FIRING POSITION _____ No. _____

Date _____ Organization _____ Armament _____

- (1) Co-ord. Regimental P.C. X _____ Y _____
 " " Battalion P.C's. (1) X _____ Y _____ (2) X _____ Y _____
 " " " (3) X _____ Y _____
 " " Dressing Stations X _____ Y _____

(2) Battery Co-ordinates

	X	Y	Elevation	Directrix

(3) Observation Posts

	X	Y	Elevation
#1			
#2			
#3			
#4			

(4) Defilade _____

(5) Camouflage (available or necessary) _____

(6) Camp Sites.

(a) Location, brief description, and capacity of camp sites _____

(b) Fuel available (if any) _____

(c) Water, distance to, source and purity of supply _____

(7) Ammunition and supplies, amount and location of dumps _____

(8) Approach roads, brief statement on condition _____

(9) Property owners concerned (peace time exercises) _____

(10) Field of fire - attach section 1/62,500 map showing field of fire outlined black; dead areas outlined red; field of view from each observation post outlined blue; invisible areas outlined blue OP#1, yellow OP#2, green OP #3 and brown OP#4.

(11) Communication and orientation nets - attach section 1/62,500 map showing communication net red, properly labeled; orientation net black, label necessary data.

NOTES: If space is insufficient, enter remark "See attached Sheet". Write data on separate sheet for each item and attach in proper sequence as given above. This form to be top sheet of report.

This report will be made in duplicate, original copy forwarded to District Headquarters and carbon copy retained by organization.

FIGURE *

should include courses covering the combined employment of the various arms in coastal operations, so as to insure a thorough knowledge by all officers of the functions and limitations of each branch of the Service. Practical problems based on the local situation should be included whenever possible. Similarly, the post schools for the enlisted personnel should be based on the tactical and administrative requirements of the organizations concerned. For Coast Artillery units, there should be an automotive course for tractor units, an electrical course for training telephone, radio, searchlight and power plant electricians, and a clerical course for training battery and headquarters clerks.

Materiel. Having determined the number and types of Coast Artillery weapons required from an operations standpoint in each Coast Artillery District as outlined above, the next step is to obtain from the War Department the physical allotment of this Coast Artillery armament based on these requirements.

In this connection, it should be borne in mind that if this equipment is not actually on hand in the Corps Areas concerned, in time of peace it is doubtful if it will ever be available in sufficient time to be of much value in case of war. A thorough plan should be made for stowing this equipment, selecting sites as near as possible to the points at which it is planned to be used. It is believed that in many cases our Coast Artillery forts will be found to be suitable sites for this storage of war reserve. The forts and other points selected should be made into great supply depots along the same lines as employed by the French in developing the Fortress of Verdun prior to the World War. Every item of supply and equipment that will be needed by the military and other units included in the operations project should be included in this study.

The most important items in this study from a Coast Artillery point of view, are *cannon, ammunition and fire control equipment.* The number and type of cannon selected should be based on the numbers and types available in the War Department Reserve, the available transportation facilities to the positions to be occupied, and the requirements of caliber, range and traverse as determined by the operations study.

Having provided the cannon requirements the next step is to procure an adequate ammunition supply. It is believed an initial allowance for three days of fire would be adequate. Care should be taken, however, to see that this supply is complete, and that it includes the proper proportion and types of powder charges, projectiles, fuses and primers to fit the requirements of the local

problem. Sites for advance dumps should be selected keeping in mind the transportation facilities available and the probable zones of enemy operations.

Similarly a careful survey should be made of the fire control requirements for all the Coast Artillery units. This should include the number and type of base and instruments needed and the communication and fire control nets required for both telephone and radio communication. Commercial telephone and telegraph lines should be used for long distance communication when available.

In addition to horizontal base equipment there should be provided for each battery a 9-foot self-contained base position finder, for use as both an auxiliary and emergency position finding system. Provision should be made with the Air Service whereby at least one aeroplane would be available for each battalion for observation and adjustment of fire. Radio call letters and wave lengths should be assigned by the Signal Corps so as to insure continuous two-way radio communication between the plane and firing battery.

Personnel. Let us now consider ways and means of providing personnel to man all the Coast Artillery armament and equipment mentioned above. It is believed that this can be accomplished best by making, in time of peace, an exhaustive analysis of the personnel requirements, based on War Department Tables of Organization and by tabulating the results obtained in some such form as indicated in Fig. 7.

As a result of this study, the local draft boards can be immediately informed of the number and kind of specialists needed to bring all organizations to war strength. This will eliminate a great deal of confusion and delay and will place draftees at once in positions for which they are specially qualified, due to their prior training in civil life. Regimental and Brigade Training Centers can be established if time is available, and, considering the difficulties to be overcome, all organizations will be ready for field service in a minimum period of time.

CONCLUSION

From the above discussion it can readily be seen that there lies before us a vast and intricate military problem, which, however, is susceptible of complete solution. An attempt has been made in the foregoing pages to outline the solution of that phase of the problem facing the Coast Artillery Corps today. The requirements of the other branches of the Army can be determined in a similar manner. In addition to the points previously noted, there are certain aspects

of this problem which are of great importance to the Army as a whole and which should be considered in relation to our military policy. Briefly they are as follows:

1. As a result of such a study as outlined in the preceding pages, the strength and organization of the component parts of an

PERSONNEL STUDY
TABLE OF OCCUPATIONAL NEEDS

1 OCCUPATIONAL SPECIALISTS	2 SYMBOL	3 # POSITIVE A J	4			5			6			7 TOTAL
			12 th COAST ARTY REG ARMY			112 th COAST ARTY NAT GUARD			312 th COAST ARTY RESERVE			
			PEACE	WAR	DIFF	PEACE	WAR	DIFF	PEACE	WAR	DIFF	
SUPPLY	18 S	A J										
CLERKS	38 G	A J										
SURVEYOR	30 G	A J										
DRAFTSMAN	29 M	A J										
COOKS	40 C	A J										
CHAUFFEUR	22 M	A J										
AUTO REPAIR GENERAL	24 G	A J										
MECHANICS GENERAL	6 O	A J										
TELEPHONE OPERATOR	33 C	A J										
TELEPHONE TROUBLE LIXEMM	33 TC	A J										
RADIO	31 W	A J										
ELECTRICIAN	10 G	A J										
CARPENTERS	8 G	A J										
TAILORS	28 T	A J										
GAS ENGINEMEN	25 S	A J										
ETC.		A J										
TOTAL CLASSIFIED												
TOTAL UNCLASSIFIED												
AGGREGATE												

NOTE:- SEE W. D. Doc. 774 A. G. O AND C. C. P. FORM 465 A. G. O.

FIGURE 7

Army which would insure to the people of the United States protection against any hostile overseas expeditionary force can be determined. In other words, the minimum establishment which would permit the Army to carry out the primary mission assigned to it by the Constitution of the United States can be definitely fixed. In this connection it should be borne in mind that the problem of

Coastal Defense is of primary importance in the case of our country, due to the great length of coast line involved.

2. Having determined the strength and organization necessary to carry out this mission the figures so obtained would be valuable in determining our national policy with respect to the size of the Army. They would provide the military establishment with a more or less permanent foundation upon which to base the preparation of its war plans.

3. Assuming that Congress would authorize the Army sufficient strength with which to fulfill its mission as outlined in paragraphs 1 and 2 above, this force should be sufficient to provide a nucleus for an Army which could fulfill any other mission that might be assigned to it.

4. The necessity for, and the mission of the Army would at once become apparent to the average citizen, and would place the military establishment in its proper light before the country at large. The taxpayer would consider the protection received in the same way that a business man looks at his insurance policies.

5. By assigning local units to the defense of home areas, the people would begin to take greater interest in the military service and would have a more sympathetic understanding of its needs. Local and community pride would be stimulated and the result would be greatly increased morale on the part of the troops.

6. Finally, to successfully carry out the great mission assigned the Army of the United States, the Regular, National Guard and Reserve Forces must be welded together in one great fighting machine in which each branch of the service supports the other and plays its individual part as does each member of a well trained football team. The impulse necessary to attain this spirit of cooperation must come from the Regular Army. To furnish this impetus will require the highest order of leadership and unselfish service on the part of this force. This teamwork must be developed in time of peace as well as under the stress of war if we are to fulfill the great trust placed upon us by our Country.

EDITORIAL

The Importance of Fire Adjustment

THE COAST ARTILLERY JOURNAL is doubly indebted to General Johnson Hagood, first for the very fine article entitled "Spotting for the Coast Artillery" that appeared in the February issue of THE JOURNAL, and second because this article brought forth replies from such able Artillerymen as Brigadier General R. E. Callan, Colonel Henry J. Hatch and Major Robert Welshmer. And this is not all, for other officers have indicated their intention of expressing their opinions on the subject matter of the General's article. Some officers hold that if we cannot depend upon airplanes for recording the location of the target and the fall of shots, we will, in this day of smoke screens, be very much out of luck, for it is possible for enemy planes to lay such a screen a mile long directly in front of our batteries in less than a minute. Articles being prepared by Lieutenant Colonel C. E. Brigham of the Chemical Warfare Service, and Major Oscar Westover of the Air Service should be of especial interest in this connection.

It is doubtful whether THE JOURNAL ever before has been able to present such fine thought to its readers on questions of such vital importance to Coast Artillerymen as those appearing in the articles by General Hagood, Colonel Hatch, Major Welshmer and in the present issue, by General Callan. These papers express the opinions of sound-thinking and practical artillerymen on the vital questions of the advisability of fire adjustment against a moving target and the methods of fire preparation. A perusal of these papers by a Coast Artillery officer of experience will prove a wonderful refresher course, and to the younger officer a liberal education on the science of firing large guns against moving targets.

General Hagood indicates in his paper that he doubts the advisability of adjustment of fire conducted against a moving target, backing his statement by the record of four years' firings which show clearly that in the large majority of cases, those who corrected for observation of fire failed to get as good results as those who made no corrections. He doubts too the usefulness of airplanes in

fire against a moving target. To quote: "But I have yet to see a single instance where adjustment of fire by either aerial or terrestrial observation has been of any value to the Coast Artillery firing at moving water targets. I think it can be summed up by saying: if the target is visible from the shore stations then aerial observation is of no necessity; if the target is not visible from the shore stations then aerial observation is of no value." And to quote again: "When we come right down to it Coast Artillery fire is like a counter preparation or a barrage. It must be worked out in advance and then let fly. There is no time to adjust fire after it starts."

The officers whose articles have already appeared in *THE JOURNAL* express their gratitude to General Hagood for having sounded a timely warning against a present day tendency on the part of many officers to slur over the niceties of fire preparation, depending upon adjustment to get on the target. They are agreed that during battle, conditions will often be such that no adjustment of fire will be possible, and that most careful preparation is a necessity. All are agreed that artillery fire must be based upon sound ballistic methods and accurate and painstaking preparation. But none of the officers already heard from agree with General Hagood that there should be no correction of fire. To quote from the article by Colonel Hatch in the March issue of *THE JOURNAL*, "It has not been demonstrated that arrangements to provide continuous and precise information concerning the fall of our shots are without value when observation is practicable, as is conceivable it may be, under certain conditions."

As Commanding General of the Panama Coast Artillery District, General Callan has had available for study the records of firings in that District during the past two years. From a consideration of these records he shows clearly in tabulated form that in the vast majority of cases the firings have been improved because of the adjustments made. While the conclusions arrived at by General Callan are diametrically opposite to those quoted by General Hagood from a consideration of four years' firing records throughout the realm of the Coast Artillery Corps, the explanation may be found in the fact that the records referred to by General Hagood probably are of firings conducted prior to 1917, while those referred to by General Callan were carried on during 1922 and 1923, and that more advanced methods of adjustment were used during these last two years than were used during the period referred to by General Hagood. It is a recognized principle today that the regulation of fire at moving targets must be conducted by methods very distinct from those normally used in fire against fixed targets. It is

doubtful that this principle was so well recognized prior to 1917. To quote from the article by Major Welshmer in the April JOURNAL, "It is believed that when there have been deplorable results in attempting to regulate fire on naval targets, such results have been due largely to a wide misapplication of sound principles rather than to a rigid application of erroneous principles."

The Term "Fixed Defenses" is Taboo

The editor recently received a letter from the Executive to the Chief of Coast Artillery which reads as follows:

"For some time past, members of the Coast Artillery Corps have been in the habit of using the term 'Fixed Defenses' to designate the armament provided for the defense of a fortified harbor. In fact, the term used in this sense is to be found even in official War Department publications and correspondence.

"It is possible that the use of this term was technically correct before the World War, when we were practically without heavy mobile, and entirely without antiaircraft, artillery weapons.

"To my mind, however, the use of this term has always been unfortunate from a psychological point of view, if from no other.

"Since the introduction of heavy mobile and antiaircraft artillery into our service, the term is not even correctly descriptive of the armament provided to protect a fortified harbor. That armament now consists of heavy mobile artillery (railway and tractor drawn), antiaircraft artillery, the submarine mine defense, and the fixed batteries.

"If we Coast Artillerymen persist in speaking and writing of our primary mission as the care and operation of the *Fixed Defenses*, we have only ourselves to blame when the rest of the Army looks upon us as *Fixed Artillerymen*, incapable of understanding or participating in war of movement.

"Let us, therefore, discard this term 'Fixed Defenses,' and resolve that it shall from now on be taboo. Let us adopt in its stead the term '*Harbor Defenses*.' We will find it almost, if not quite, necessary to use the term 'Fixed Batteries,' but this term is descriptive and is not subject to the same objection as is the all-inclusive term 'Fixed Defenses.'"

It is believed that all Coast Artillery officers will appreciate the importance of and will welcome this change. The term "Fixed Defenses" gives to the officers of the other branches of the service, many of whom are unacquainted with our variety of arms, a mental picture of fixed armament only, and in consequence adds strength to

the impression so often held that Coast Artillerymen are neither trained nor qualified for service with armies in the field, an impression known to be without foundation by those acquainted with our many types of cannon, our methods of training, and our school teachings.

Asleep at the Switch

(Reprinted from the San Francisco Chronicle.)

It is time that our people understood that our Pacific Coast ports are defenseless against a sudden attack by naval ships which might be brought against us, except as airships and submarines might be available.

That is the report of General Henry D. Todd, commanding the 9th Coast Artillery District. That branch of the service has to do with land defenses which, by reason of the solidity and stability of foundations, can support guns with a longer range than can be mounted on any ship.

That was our situation up to within a few years. This and other Pacific ports were defended by guns designed in 1895—nearly thirty years ago—with a range of about 17,000 yards, which was defense against any ships then afloat.

Now both Great Britain and Japan have several ships with guns having a range of 22,000 yards. So far as land defenses are concerned, both these countries have ships which could lay outside and bombard any Pacific port, regardless of any resistance which our land defenses could make. Of course our airplanes and submarines would not be idle, but the land defenses have always been the main reliance of ports for safety.

We have no ships which are a match for the latest foreign ships. We had some building, which are being scrapped in pursuance of the treaty of Washington. And there is a dispute as to our right, under that treaty, to elevate the guns on some ships that we have so as to give them the range possessed by foreign ships of the same class.

We are not contemplating or expecting war with any nation. But it takes years to design, construct and install modern guns of the caliber now required for the effective defense of seaports against the most powerful modern battleships. And not only are our shore defenses inadequate but we maintain in the forts mere squads of artillerymen, hardly enough to keep the rust off the guns and giving no opportunity for training. Without trained men to operate big guns we might almost as well mount wooden guns and not worry.

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.—H. J. HATCH, President Coast Artillery Board.

Work of the Board for the Month of March

A. NEW PROJECTS INITIATED DURING THE MONTH OF MARCH

Project No. 213, Methods for Adapting Plotting Boards of the Present Size to Long Range Plotting.—On February 2nd, 1924, the Coast Artillery Board received from Staff Sergeant Charles A. Ross, C. A. C., notes and sketches which describe two methods for adapting plotting boards of the present dimensions to plotting when the target is at ranges in excess of those which may be accommodated by the usual scale of the board.

1. *Consideration:* The first method submitted is a proposal to bisect on the plotting board the base line and the line Primary Observing Station-Directing Point. At the first point of bisection an auxiliary secondary arm is to be mounted and at the other point of bisection an auxiliary gun arm. In effect, this procedure decreases by half the scale of the board. Obviously the scale of the board may be increased or decreased in any desired ratio by similar means, and, auxiliary arms graduated for the scale to be used, together with couplers of appropriate length, provided for each change in the scale of the board. The proposal is in effect a restatement of how the change in scale is accomplished on Whistler-Hearn and 110-degree plotting boards. It possesses no material advantages over the present methods for changing the scale of plotting.

2. *a.* The second method submitted proposes the use of a difference chart for long range plotting. A slide rule for obtaining the angle at the target by subtracting the azimuths from base end stations is required. Only one arm is to be used for plotting, and the gun arm is to be used for relocation.

b. The proposal is not without merit. An accurate location of the target and an accurate relocation for a gun position can be had by this means if the difference chart be carefully made and oriented on the plotting board, and, if sufficient pains be taken in interpolating between curves for the difference (angle at target) obtained from the slide rule. The procedure in plotting and relocation will be objectionably slow, however. Instead of setting azimuths from observing stations by the primary and secondary arms (operations usually completed as soon as the reader completes calling these azimuths) the difference between the azimuths must be obtained, and, the plotter must hear this difference called after it is determined and then identify the curve to which the difference pertains, or interpolate between adjacent curves for the location of the target. It should be noted that interpolation between adjacent curves will be the usual procedure in

plotting and for this reason coupled with the large scale of the chart there can be little or no gain in accuracy over that obtained by changing the scale of plotting by the methods now in vogue.

c. A disadvantage of the proposal is that for each base line a new difference chart must be made. This is somewhat laborious. When base lines are to be changed a new chart must be available and the process of changing charts involves a considerable delay.

3. A more detailed description of either of the proposals described above may be obtained by application to the Coast Artillery Board. Neither method was recommended to be adopted, but their merits are appreciated and Sergeant Ross has been commended for his professional zeal.

Project No. 214, Proposed Lubrication Chart for the 10-Ton Artillery Tractor, Model 1917.—This chart was constructed in the office of the Chief of Ordnance to show how, where and when the 10-ton tractor should be lubricated. After careful inspection and conference with the Motor Transport Officer of the Coast Artillery School, several minor additions and changes in the chart were recommended.

Project No. 215, Antiaircraft Target Practice Reports.—The Board is engaged in a study of the data to be contained in reports of A. A. Target Practices.

Project No. 216.—A study based on an essay, "Adjustment of Fire on a Moving Target," by Captain H. H. Blackwell, C. A. C. The essay will be published in the COAST ARTILLERY JOURNAL.

Project No. 217, Variation in Velocity Correction from Zone to Zone for 12-inch Mortars.—This study originated with the Coast Artillery Board for the purpose of deciding on the most suitable method of varying the range adjustment correction with the muzzle velocity in the case of 12-inch mortars.

Project No. 218, Additions to Antiaircraft Range Tables.—

1. *Discussion:* Trial shots are important in antiaircraft fire because of the impracticability of correction of fire from observed deviations.

2. In two respects the present range tables are deficient with reference to the solution of trial shot problems:

a. The deviations of the trial bursts above or below the inclined plane of sight must be converted to range, that is, to corrector divisions, in order that the burst may be placed in the inclined plane of sight. Therefore, a table showing the change in corrector setting for one mil change in angular height is a necessary adjunct to the antiaircraft range tables.

b. Having changed the range by a number of corrector divisions as indicated above, the theoretical time of flight to the new point of burst may be computed from a knowledge of the corrector-time of flight relation. Therefore, a table showing change in time of flight for change of one division in corrector setting should be included in antiaircraft range tables.

3. *Recommendations:* It was recommended that two tables be incorporated in all antiaircraft range tables in the future, viz: a. Change in corrector setting for one mil change in angular height; b. Change in time of flight for change of one division in corrector setting.

4. It was further recommended that tables showing the above changes be published by the Ordnance Department and distributed to all antiaircraft organizations and coast defenses in which antiaircraft guns are emplaced.

Project No. 219, The Stereoscopic Telemeter (*Societe Optique et Precision de Lavallois*).—This is a self-contained altimeter which operates on the stereoscopic principle. It is designed for use by anti-aircraft organizations. The instrument has been built in France and is being shipped to this country for test.

B. PROJECTS COMPLETED DURING THE MONTH

Project No. 4, Test of Light Ray Filters.—1. In the latter part of 1917 the Coast Artillery Board conducted tests on a pair of color attachments for use in field glasses. These attachments were developed by the Research Division of the Bureau of Aircraft Production. They contained a dense yellow filter for haze cutting, a magenta colored filter for enhancing contrast, a denser color similar to the preceding to make contrast more pronounced, and a blue filter to assist in following an airplane against a blue sky. As a result the Coast Artillery Board recommended that the number of filters for Coast Artillery work be reduced to two and that the dense yellow and the blue filters be adopted. The dense yellow was used to great advantage as a protection against the excessive glare caused by the sun over water area. The property of eliminating certain kinds of mists, especially a light mist or haze in the mornings of clear days, was also a noticeable feature of this color. The blue filter was used to advantage in observing aircraft against clear blue sky, or bright white clouds.

2. Later, April 28, 1921, the Coast Artillery Board conducted tests on two classes of filters in conjunction with tests on observation telescopes. One class of filters was designed to eliminate interference of glare and consisted of five selected filters. The other class was designed to increase visibility through fog or haze and consisted of six selected filters. The action taken following this test was to select provisionally an amber filter to temper glare and to recommend that filters used by the Navy as haze cutters and additional filters of neutral smoked glass to temper glare be procured for further test.

3. Again in 1921, the Board undertook a thorough investigation of filters. Information on this subject was obtained from several authorities. The filters considered were those previously tested and a number of others secured from several sources. The purpose was to determine the best types of haze cutting, glare tempering, and glare eliminating filters for use against naval targets, and to recommend for adoption the minimum number required.

4. During the tests of anti-aircraft self-contained base range finders, Coast Artillery Board Project No. 47, and tests of the 30-foot self-contained base range finder, Coast Artillery Board Project No. 5, the relative merits of the filters on the different instruments were considered. No distinguishing characteristic was noted in any smoked filter, but the amber filter on the Goerz 4-meter coincidence instrument appeared to be superior to the amber filters on the other instruments.

5. As a result of the information gained from previous tests and from certain authorities on the subject of ray filters the Coast Artillery Board classified filters for service use into four groups, as follows. In making this classification 52 glass filters of different colors and combinations of colors were considered:

a. Special Contrast Filters—These filters are for special purposes and, due to their selective action on the spectrum, enhance the contrast of objects to be identified and background. The selective action of these filters is not used primarily to eliminate the diffused and hazy effect of blue rays over a long atmospheric path, but rather to bring out contrast in brightness, hue, or saturation between target and background by destroying the natural spectral composition.

b. Haze Cutter Filters—These filters are intended, primarily by their selective action, to eliminate or cut haze due to diffused blue light. For observation of naval targets at long range over the water the selection of the best filter can be determined only by experiment, owing to the many variables that enter such a problem. A fine balance must be established so that the amount of light lost through the filter is more than compensated for by the contrast effected between target and background and the extent to which the blue rays are absorbed. It is interesting in this connection to note that the background of distant naval targets (haze, clouds and sky) assumes the same color as the filter used while the target itself appears black or gray. Where fog, clouds, smoke and mist are dense they cannot be penetrated by the use of a filter as they obscure the target, preventing rays of light from reaching the filter.

c. Glare Tempering Filters—These filters are used for the purpose of reducing the intensity of illumination and thereby lessening the eye fatigue. The detrimental effects due to glare may be obviated by the use of either selective colored filters or of neutral smoke glasses; in the latter case the intensity of illumination is reduced but the original spectral composition is approximately preserved; in the former the colored glass reduces the intensity in some portion of the spectrum to a greater extent than in other portions thereby enhancing contrast. It was noted that when a combination of glare and haze was present that a haze cutting filter served both purposes.

d. Glare Eliminating Filters—These filters are essential to silhouette the target against an extremely brilliant glare such as low sun. The other groups of filters described above are usually not dense enough for this purpose. However, two dense red filters are included in the list of glare eliminating filters under test as they serve also to enhance contrast and eliminate any haze that may be present.

6. *General*—Advantages expected of a yellow filter over a red filter for long distance observations, with equal thickness and densities:

a. The total percentage of light absorbed is less and only blue rays are absorbed with yellow glass.

b. At low illumination the light producing effect of visible rays of shorter wave-length is not decreased as much as that of the longer wave-lengths. (Luckiesch, p. 11, *Color and Its Application*). Hence absorption of the blue rays should be limited to the blue to the extent necessary to cut haze and no more. At low illumination at practically the threshold of vision the green light gives the maximum light producing effect upon the eye. A red filter would absorb these rays. Moreover experiments indicate that artificial fogs are most transparent to green light.

c. Orange and yellow glasses are recommended on p. 11, *Technologic Papers, Bureau of Standards, No. 148, issued Nov. 19, 1920, to eliminate haze, improve visibility and protect the eyes from ultra-violet.*

d. Luckiesch has demonstrated that the defining power of monochromatic yellow light is superior to that of other monochromatic lights of equal brightness (see p. 135 of *Color and Its Applications*) also on p. 137 *idem*, experiments are reported on the legibility of colored advertisements for reading at a considerable distance, the most legible point being black on a yellow background. The customary black on white is sixth on the list. It should be remembered that the color of sky and cloud, the background of a distant naval target, assumes the same color as the filter used (*yellow*) and that the target itself appears without color (*gray or black*). Even if the target be gaudily colored, these colors disappear over a long atmospheric path.

e. A valuable yellow filter for long distance observation through dust, smoke, fog and haze may likewise be used effectively for night work on targets illuminated by a searchlight (see p. 152 Luckiesch Color and Its Application). On page 160 (idem) "In using field glasses distant vision can be improved sometimes by the use of a light yellow screen which eliminates the blue haze from the visual image."

NOTE: In test of filters to cut haze, a direct comparison is obtained for definition which is not influenced to any great extent by eye fatigue or accommodation, whereas the measure of acuity of vision is taken as the criterion in the elimination of glare and this acuity of vision is affected by eye fatigue and accommodation. When a combination of glare and haze exists a haze cutting filter serves both purposes.

7. *Conclusions*: From the investigation of previous reports and tests conducted to date, the Board concludes that filters for use in observing marine targets can be reduced to two colors—a yellow filter and a red filter. While the yellow filter has some advantages over the red filter, it is thought advisable to carry on further tests with these two colors employing the most suitable shades of each.

8. *Recommendations*: It was recommended that a telescope with 5-inch or 6-inch objective with moderate power eye pieces (5, 10, 20), be obtained and furnished the Coast Artillery Board for test with deep red and deep yellow filters to determine the advantage of this combination for observation of naval targets over a long atmospheric path through haze. In this connection the observation telescope with astigmatic lenses recommended for manufacture in report dated August 27, 1921, would be suitable. Spectral transmission and thickness of filters used in future tests should be determined.

9. It was further recommended that specifications based on spectral transmission and thickness be drawn up by the Ordnance Department to cover filters already adopted and in use in service optical instruments.

10. It was further recommended that the spectral transmission and thickness of the amber filter on the Goerz 4-meter folding type range finder be determined by the Ordnance Department and a sample of this filter furnished the Coast Artillery Board with filters indicated in Par. 1, above.

Project No. 116, Fire Control System For National Guard.—The President of the Coast Artillery Board suggested to a representative of the Militia Bureau that the Coast Artillery Board would cooperate in drawing up plans for an improvised fire control system for the armories of National Guard organizations which have no equipment at present. The Chief of the Militia Board requested the recommendations of the Coast Artillery Board as to:

"An improvised fire control system applicable to a mobile 155-mm. G. P. F. Coast Defense Battery, setting forth all of the apparatus and materiel required, in such detail as to admit of the preparation of requisitions."

1. *Discussion*: A fire control system for Coast Artillery National Guard units should consist where practicable of standard equipment not only to decrease the cost of supplying this materiel in quantities but also to provide a reserve of serviceable equipment as well suited to war conditions as to armory requirements.

2. It is becoming more and more evident that, in the common mission of Coast Artillery armament, fixed or mobile, to-wit, the destruction of naval targets, a common fire control system, methods and materiel, are not only desirable in the interests of uniformity and standardization, but are necessary to the successful accomplishment of that mission. This may be restated as follows: The

fire control methods and equipment, except communications, which have been developed for fixed batteries are not only adaptable to firing mobile batteries, but are eminently well suited to those batteries. On account of the mobility of tractor drawn and railway artillery, their communication systems will be less elaborate. The only difficulty of any importance encountered in adapting fixed artillery fire control methods to mobile artillery has been that due to the practice of using a panoramic sight and aiming point or aiming rule in laying mobile cannon in direction. This difficulty has been overcome and attention is invited to the report on Coast Artillery Board Project No. 131, Panoramic Sights for Mobile Artillery, for a discussion of the remedies for this difficulty.

3. The mission of mobile seacoast artillery for the destruction of fixed targets, such as would be encountered in land warfare with field armies, or in the landward defense of seacoast fortifications, is not overlooked in this prescription of common methods for fire control, since a battery which has been trained to deliver effective fire on moving targets may be expected to deliver effective fire on fixed targets as well. The converse does not follow. Mobile Coast Artillery armament must be capable of fulfilling both of these missions, and therefore the equipment suitable for fire on naval targets cannot be classified as unnecessary impedimenta because most of the equipment can be used to advantage in fire on fixed targets also. The equipment must be sufficient to care for the more important role of mobile seacoast artillery, which is coast defense.

4. The preceding discussion is intended to lead up to a consideration of the suitability of the 155-mm. G. P. F. in the training of National Guard units. It is understood that a large number of these weapons are available. They are especially well suited for use in training Coast Artillery National Guard units which are located at points remote from the seaboard because, as noted above, the fire control methods and materiel needed for firing these guns at naval targets are nearly identical with the methods and materiel needed for firing any other coast artillery weapon at naval targets. Regardless of whether a Coast Artillery National Guard unit be assigned to 155-mm. guns, 12-inch mortars, 12-inch, 14-inch or 16-inch rifles, or any other seacoast weapon, this unit can be given thoroughly satisfactory training in control of fire of the armament to which assigned if it be equipped for training purposes with 155-mm. guns and the fire control equipment which is recommended in Coast Artillery Board Project No. 75 as necessary to enable them to fire effectively at naval targets.

5. For all National Guard units except those assigned to anti-aircraft defense the following list of equipment is suggested:

NOTE: With some items reasons are given for the particular selection, together with references to Coast Artillery Board reports in which are contained pertinent data for the information of the Militia Bureau, National Guard Officers, and instructors. Descriptions of all of them are contained in Training Regulations No. 435-221, Fire Control and Position Finding.

a. Copies of various approved training regulations including Service of the Piece, Gunnery, Fire Control and Position Finding.

b. A range table for the 155-mm. guns and a range table for the weapon to which the organization is assigned.

c. Cloke Plotting and Relocating Board. Plotting boards of this type are now in production at Frankford Arsenal. Much pertinent information is contained in the reports on Coast Artillery Board Projects Nos. 74, 146 and 178. In this connection it is suggested that the Whistler-Hearn Plotting Boards now at some armories, or at some abandoned Coast Defenses, be shipped to Frankford

Arsenal, converted into Cloke Boards, and distributed to the Armories. Probably fixed platens as well as the Universal platen should be made for each board so that the organization can be trained thoroughly in the capabilities of the plotting board for fixed as well as mobile artillery usage.

d. Two azimuth instruments Model 1918 (complete). This model is specified because there is understood to be a large number available for issue. Other models may be used. Conversion from degrees and hundredths to mills, or vice versa, may be effected on the plotting board which is designed to accomplish this.

e. A range percentage corrector. A description of the construction and operation of this device is contained in the report on Coast Artillery Board Projects Nos. 152 and 170 (combined).

f. A range correction board, Model E 1923, equipped with charts containing curves for the 155-mm. gun and with charts containing curves for the other weapons, if any, to which the organization is assigned. While it is probable that tractor artillery organizations may be equipped with a circular range corrector of the type reported on in Coast Artillery Board Project No. 174, the provision of this range correction board supplies National Guard units with a standard piece of apparatus which is adaptable to all seacoast weapons and which furnishes a desirable basis for training. Information concerning the board is contained in the report on Coast Artillery Board Projects No. 152 and 170 (combined).

g. A pantograph predictor. In this connection see the report on Coast Artillery Board Project No. 93, Prediction Devices. Other prediction devices such as a setforward ruler and prediction scale may be substituted.

h. A time interval apparatus of the type reported on in Coast Artillery Board Project No. 56 should be suitable for army use. It is suggested that the office of the Chief of the Militia Bureau confer with the office of the Chief Signal Officer as to the practicability of obtaining a simple time interval system developed from existing apparatus such as the time interval clocks, etc., understood to be on hand.

i. Communications equipment such as field telephones, headsets, telephone wire, field switchboard and dry cells or storage batteries, in sufficient quantity to meet local conditions and conform to principles prescribed in training regulations.

j. Several stop watches.

k. A deflection board. In this connection an experimental deflection board is now under construction at Frankford Arsenal. It is expected that this board will prove to be a satisfactory device for general use by both fixed and mobile batteries.

l. A spotting device. There is no standard spotting device for the Coast Artillery. A number of suitable spotting devices have been described in various issues of the COAST ARTILLERY JOURNAL during 1923.

m. An impact board. There is some confusion at this date as to the name for this device, which was developed recently. A complete description of it is contained in the report on Coast Artillery Board Projects No. 132 and 210, Range Adjustment Board. The device is simple and can be constructed easily.

n. Two spotting instruments. These may be Model 1910 or Model 1918 azimuth instruments.

o. Subcaliber tubes and subcaliber ammunition. Attention is invited to the report on Coast Artillery Board Project No. 151. This report recommends the adoption of the 37-mm. gun for subcaliber purposes. Where local conditions will permit subcaliber practices, this item should be included.

p. A suitable range finder. Attention is invited to the reports on Coast Artillery Board Project No. 5. A range finder should be included in the equip-

ment of all batteries, fixed or mobile, or antiaircraft. The importance of training men in the care and use of these instruments is becoming more and more apparent. When funds permit, they should be included in the equipment of National Guard units. Priority in purchase and training should be given to a horizontal base position finding system.

6. The items above are listed in order of priority. It is expected that lack of funds will make the provision of a complete set of equipment impossible for many units. Of the items listed above *a* to *k* are deemed essential as initial equipment; the others are desirable for complete training of the units and priority in their issue should be as indicated. The list indicates the basic equipment with which all batteries should be equipped eventually, and as rapidly as funds become available, and it should furnish a satisfactory basis for the preparation of requisitions. Until funds can be procured it is suggested that some of the items can be improvised satisfactorily by National Guard officers under the supervision of the instructors. The Coast Artillery Board will be glad to cooperate in this matter or in any other matters concerning the training of these units. The items which may be improvised easily include a prediction scale and setforward ruler, a range percentage corrector, a deflection board, a spotting device, and an impact board. General instructions and the necessary scales and charts for the purpose may be had on application to the Coast Artillery Board.

7. *Recommendations:* The Coast Artillery Board recommended:

a. The announcement by the Secretary of War that the primary mission of all Coast Artillery National Guard organizations assigned to fixed, railway, or tractor artillery (except antiaircraft) is the destruction of naval targets, and that in all such units priority shall be given to the training necessary for the accomplishment of this mission.

b. The formulation of a policy by the Chief of Coast Artillery and the Chief of the Militia Bureau for the distribution of 155-mm. G. P. F.'s to selected Coast Artillery National Guard Units for the purpose of training these units in the technique of Coast Artillery Fire Control; further, that this distribution be not limited to those units primarily assigned to tractor artillery, but that it include units possessing any coast artillery assignment other than antiaircraft.

c. The adoption of the items listed in Par. 5, in the order of priority given therein, as the basic equipment for all Coast Artillery National Guard units except antiaircraft artillery.

d. If the preceding recommendations be approved, the distribution of mimeographed copies of this report as a training memorandum to all Coast Artillery National Guard units.

NOTE: The Coast Artillery Board projects mentioned in the foregoing report may be found in issues of the COAST ARTILLERY JOURNAL as indicated below:

- Project No. 5. Test of 30-foot Coincidence Range Finder, April, 1924.
- Project No. 56. T. I. Apparatus for Mobile Artillery Units, March, 1923.
- Project No. 74. Cloke Plotting Board.
- Project No. 146. Modification of Whistler-Hearn Plotting Boards to Cloke Plotting and Relocating Boards.
- Project No. 178. Description and Sketch of Cloke Plotting Board for incorporation in T. R. 435-220.
- Project No. 75. Fire Control Equipment for 155-mm. Guns, not yet published.
- Project No. 181. Panoramic Sights for Mobile Artillery, not yet published.
- Project No. 182. Fire Adjustment Device, December, 1923.
- Project No. 151. Subcaliber Guns for 155-mm. G. P. F., December, 1923.
- Projects No. 152 and 170 (combined), Range Correction Board Model E 1923 and 1921 Range Board, December, 1923.
- Project No. 174. Range Correction Computer. Deflection Correction Computer and Wind Component Indicator, December, 1923.
- Project No. 210. Name and Description of Device reported in Project No. 132, for incorporation in T. R. 435-221, April, 1924.

Project No. 175, Communications Material for Antiaircraft Artillery.

—The Board has completed its study on this project. The report is too long for publication in this issue of the JOURNAL.

Project No. 199, Test of Portable Battery Charging Set.—The portable battery charging set which was the subject of this report was received from the Signal Corps on or about February 1, 1924, with the request that it be tested by the Board.

1. *Procedure:* In view of the fact that a unit similar to the one shipped to Fort Monroe had been given a thorough operating test in the Signal Corps Laboratories, no extensive tests of the charging set were made at Fort Monroe. The unit was set up in the Coast Artillery School Laboratory and operated a sufficient number of times to determine its characteristics.

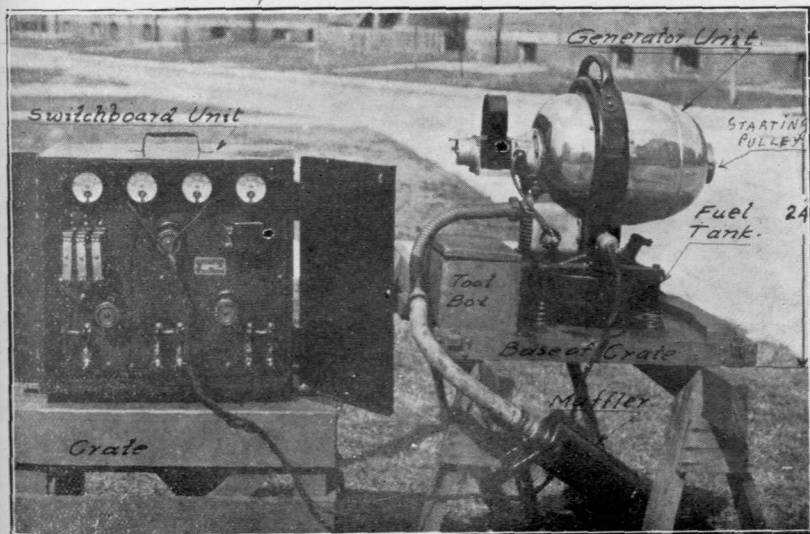


FIGURE 1.

2. *Discussion:* This charging set consists of a generator unit and a switchboard unit. It is shown in Figure 1.

a. The generator unit is a standard commercial 500-watt, 32-volt, gasoline-electric power plant, manufactured by the Simms Magneto Company, and marketed under the trade name "Homelight." The generator is driven by a one-cylinder, air-cooled, two-cycle gasoline engine. Magneto ignition is employed. Lubrication of the engine is effected by introducing lubricating oil into the gasoline. The engine starts easily, even in cold weather, and requires practically no attention while running. Under average load its fuel consumption is one quart of gasoline per hour. The unit is supported on four coiled springs, which absorb most of the vibration and effectively prevent the unit from creeping when the engine is running.

b. The generator unit has been made readily portable for field use by means of a special removable crate. The crate and the generator unit together weigh 174 pounds.

c. The switchboard unit comprises the switchboard proper and a steel cabinet in which the switchboard itself is mounted. The switchboard was built especially for the charging set by the Ward-Leonard Company, according to Signal Corps specifications. It provides three separate charging circuits, each with an ammeter and a rheostat, and carries two automatic switches to open the generator circuit in case the generator voltage should drop below that of the batteries being charged. Under ordinary field conditions the switchboard unit requires no crating for transportation. It weighs, uncrated, 56 pounds.

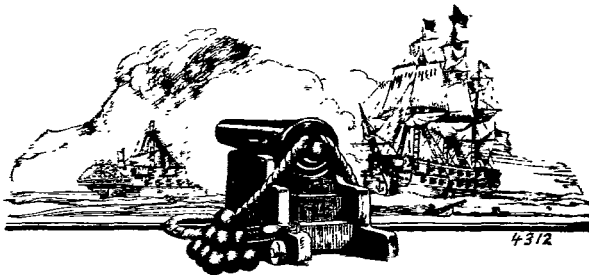
d. At one time during the tests the spring holding the cover of the timer unit was broken off in placing the crate over the generator unit. This was due to the unit not having been placed properly on the crate base. Repairs were made locally. Means should be provided for obviating the danger of this and similar damage being done in the field. It is believed that a canvas cover for the generator unit will be necessary in the field.

e. Throughout the tests at Fort Monroe the charging set gave entirely satisfactory performances. In operation it is reliable and steady, and it has the capacity requisite for charging portable storage batteries.

f. On the generator unit tested by the Board there are no means of regulating the voltage. It is noted, however, that the Signal Corps plans to provide some means of voltage regulation should the set be adopted for field use.

3. *Conclusions:* The Board is of the opinion that the battery charging set tested by the Board is suitable for field use where a small charging unit for storage batteries is desired.

4. *Recommendations:* In view of the fact that the charging set is to be shipped to Panama Canal Department, presumably for further test in the field, it was recommended that no definite action be taken as to its adoption or rejection until such time as a report on the field tests shall have been made.



BULLETIN BOARD

Personnel Situation in the Coast Artillery Corps

By MAJOR CLIFFORD JONES, C. A. C.

Personnel Officer in the Office of the Chief of Coast Artillery.

Among the questions which we hear most frequently asked in the service are: why aren't there more officers present with the organization; where are all of the officers; and why can't I go where and when I want to? Much of this information may be available in the archives of post headquarters or in announced policies of the War Department. To the average officer, however, this has only come in fragmentary form so that when we know there are about 174 more lieutenant colonels and majors of Coast Artillery than are required for duty with the branch, it is hard to understand why there should be vacancies in these grades in Coast Artillery organizations in the United States. The following tabulation will help to answer the above questions and will probably be of general interest to Coast Artillery officers:

DISTRIBUTION COAST ARTILLERY CORPS COMMISSIONED PERSONNEL AS PROVIDED IN TABLES OF ORGANIZATION AND EXISTING ON FEBRUARY 29, 1924.

	Cols.	Lt. Cols.	Majs.	Cpts.	Lts.	Totals
2 Harbor Defenses, U. S.	11	20	78	91	200	
3 62nd Regiment A. A.	1	3	10	13	27	
4 61st and 63rd Battalions A. A.	---	2	10	14	26	
5 52nd Regiment Ry.	1	2	8	12	23	
6 51st Regiment Tractor	---	2	7	8	17	
7 Sound Ranging Co.	---	---	1	2	3	
8 Office Chief of Coast Artillery	5	5	---	---	10	
9 Artillery Board	---	---	---	---	---	
10 Headquarters Fort Eustis	2	5	3	---	10	
11 Torpedo Depot	---	---	---	---	---	
12 Coast Artillery School, Faculty	1	13	11	1	26	
13 Coast Artillery School, Students	---	40	30	10	80	
14 T. O. Br. Reg. in U. S. (Total 2-13)	21	92	158	151	422	
15 T. O. Br. Reg. on F. S.	10	32	87	151	280	
16 Total T. O. Br. Reg.	31	124	245	302	702	
17 Ideal strength all purposes	67	67	199	330	371	
18 Strength Feb. 29, 1924	44	60	237	286	366	
19 Detailed away from Branch	22	40	139	64	265	
20 For duty with Br.	26	20	98	222	312	
21 Short for Br. Assignment U. S.	5	6	23	10	24	

NOTES:

- (13) Includes students at civilian institutions.
- (15) Philippine Department 103. Hawaiian Department 107. Panama Canal Dept. 70.
- (17) Estimated, based on branch requirement and total numbers in grades authorized by law.
- (18) Includes officers detailed with the branch.
- (19) Includes:
 - 54 at C. and G. S. S. and W. Col.
 - 27 at U. S. Military Academy.
 - 43 on R. O. T. C. Duty.
 - 31 on National Guard Duty.
 - 51 on Organized Reserves Duty.
 - 25 on General Staff.
 - 7 with I. D. Department.
 - 6 with Ordnance Department.
 - 6 with Signal Corps.

The above table down to include item 16 is based on existing Tables of Organization reduced so as to bring the total commissioned strength of the Army

within the 12,000 at present authorized by law. Items 18 to 21 inclusive are based on the distribution of February 29, 1924.

The surplus of lieutenants shown under item 21 is really not a surplus with the organizations as a whole, but is more than absorbed in the number concentrated in the Coast Defenses of Chesapeake Bay for instruction and the total shortage shown under this item has to be borne entirely by the troops in the United States. This shortage has been accentuated by a well developed tendency among officers to avail themselves of accumulated leave on being assigned to duty with troops. The reason for this is that on many of the duties to which officers are assigned it is either inconvenient or undesirable for them to take leave. Among these assignments are foreign service, duty at the Military Academy and R. O. T. C. institutions and to a lesser degree with the Organized Reserves and National Guard. The accumulated leave of the relatively large number of officers included in the above is thus imposed upon the relatively small assignment with tactical organizations. As an offset to the additional burden imposed due to the abnormal amount of absence from duty on account of leaves, travel and sickness, the War Department has been requested to grant a small increase of officers available for branch assignment duty. Whether this request can be granted depends upon the general availability of officers other than those commissioned in the Coast Artillery.

An impression has been general that the Coast Artillery has a large surplus of field officers. Under item 17, it appears that the ideal strength of lieutenant colonels and majors is 266 officers. We actually have 297 officers in these two grades, giving us an excess of only 31 over the ideal strength. This on the other hand is offset by our having a deficiency of 19 colonels and 44 captains. Any tendency to make any excessive details away from the branch should therefore be checked.

With our educational program well underway, it is now apparent that we may reduce the total number of officers annually sent through the Coast Artillery School and the War Department has agreed that the drains put upon our personnel in the past have been heavier than we should have been required to carry, so that it is hoped that in future there will be available for assignment to tactical organizations the full complement of officers authorized. It may be necessary to assign some field officers to staff positions which would normally be held by captains, and to place lieutenants in command of organizations which captains would normally command. It is expected, however, that the total number of officers available will be equal to that authorized.

Certain data has been extracted from the above table and is set forth graphically on chart 1. On this we note the relative amount of duty of various kinds which officers of different grades may look forward to. The most striking comparisons are those having to do with foreign service.

This bears particularly heavily upon the colonels, captains and lieutenants. In the case of colonels a small decrease in those on foreign service will serve to materially change the proportion. The lieutenants are afforded relief due to there being a constant increase in this grade from outside sources and to the present policy of assigning a large part of the newly commissioned officers to foreign service at once. It is proposed to reduce the number of captains on foreign service by sending a limited number of majors where the Tables of Organizations call for captains. These field officers will not be placed in command of companies, but will be for various staff assignments which are normally filled by captains.

The relative number of officers on a rental allowance basis is given since it is felt that this is a matter which has probably not been fully appreciated in the past. Before the war we considered a rental allowance status as the exception to

Distribution of Coast Artillery Officers

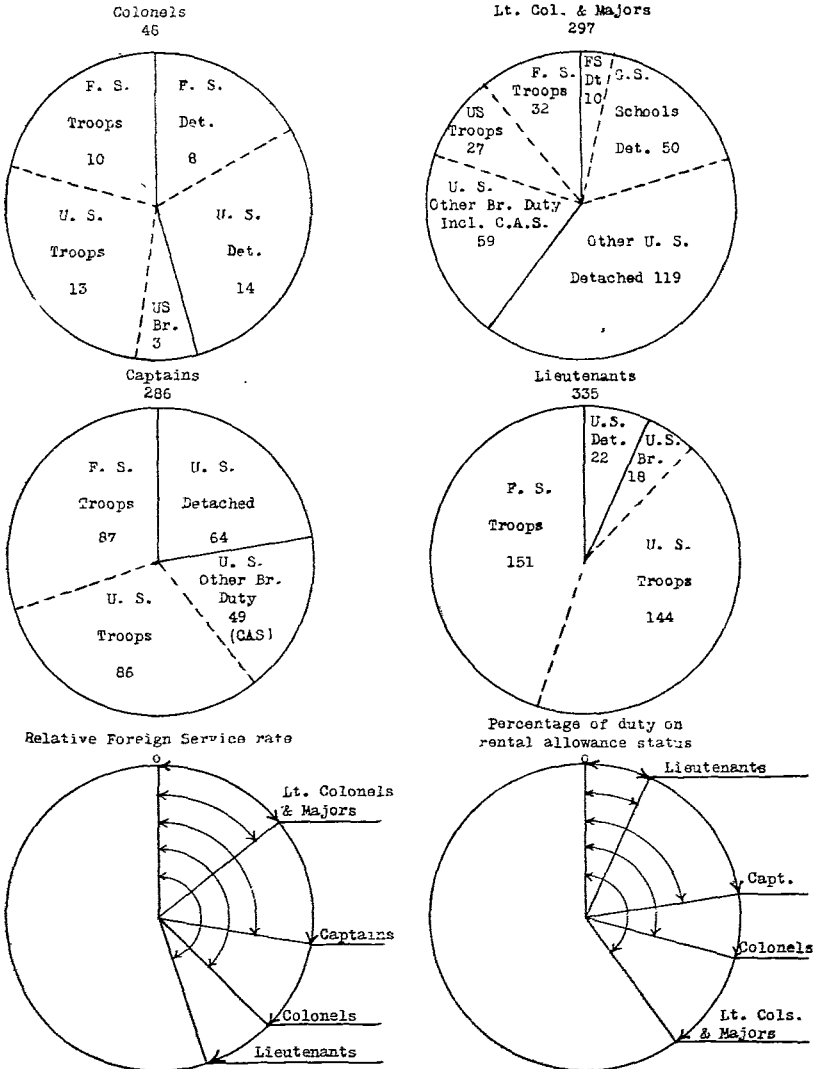


CHART No. 1

the general rule. In certain grades it is now apparent that it is almost the other way around. Officers of field grade must look forward to a large portion of their service in the United States being on various duties which require them to live away from army posts. This change in the general character of our service must result in a revision of our ideas as to the living conditions which we are to face.

The outlook as to schools is shown on chart 2. It is considered desirable to eventually reach the point where junior majors will form the larger part of Field Officers Class and lieutenants of from five to eight years' service the larger part of the Battery Officers class. It appears from these charts that the first will be accomplished in about five years if an average of 36 officers per year be sent through the Field Officers class and that the captains will also be exhausted in about five years if 36 officers per year be sent through the Battery Officers class. It is hoped to maintain the Battery Officers class at a strength in excess of this number so that the age limit will gradually approach that considered desirable for officers taking this course.

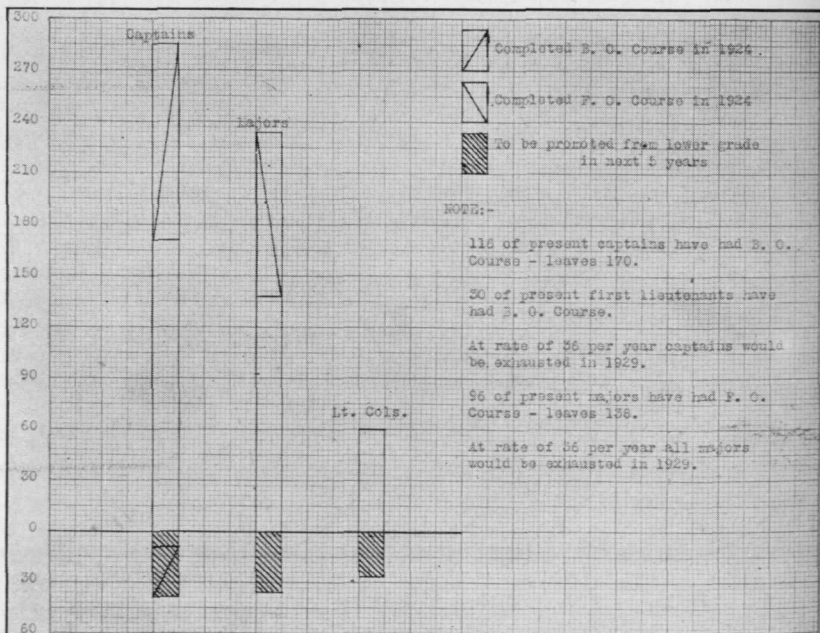


CHART No. 2

The normal expected rate of promotion is also indicated on this chart. This is based on an estimate given by the Adjutant General's office and is of interest principally as showing that we may expect at the end of that period to find about the same relative number of officers in the various grades as obtains at the present time, so that the conditions which we are now facing in personnel are not of a temporary nature, but should be considered as the normal order.

Now a word as to the limitations under which the Personnel Office of the Office of the Chief of Coast Artillery operates. These limitations are in the form of War Department policies. The policies of most general application are as follows:

a. *Foreign Service Roster.* Officers are selected for foreign service by taking from each grade the officer who has had the least amount of foreign service. There are certain exceptions to this such as officers who become due during an academic year either when they are students or instructors in the Service Schools

or at R. O. T. C. units, or officers who for any reason become due for a change of station and who apparently will be due for foreign service within a year may be sent when due for a move. During the year of 1924, it is expected that officers with the following foreign service will be at the top of their respective rosters:

Lieutenant Colonels, 2 years, 9 months.

Majors, 1 year, 1 month.

Captains, 1 year, 8 months.

First Lieutenants, 2 years, 4 months.

b. Command Roster. This applies to colonels only and provides that all colonels will be given actual command of appropriate units for a period of two years, those having the least amount being assigned first.

c. Command duty for officers being relieved from General Staff. The National Defense Act requires that officers to remain detailed on the General Staff must have at least two out of the previous six years in actual command of appropriate units. As a means of providing General Staff officers available under this law, the War Department requires that upon relief from the General Staff, any officer borne on the General Staff eligibility list shall be assigned to command duty for two years.

d. Service with troops. The National Defense Act requires all officers to serve at least one out of each five consecutive years with troops. Certain duty is considered under this law as constructive duty with troops such as students in either the general or special service schools, duty, with the National Guard or Organized Reserves.

e. No officer shall be moved unless he has served at least two years in the assignment from which he is being relieved. The exceptions to this are for school duty, foreign service, or when the Chief of Branch states that no other officer is available and suitable for the duty to which the officer under consideration is to be assigned.

f. The decreasing age limit at the Command and General Staff School necessitates selecting certain officers for that course before they pass beyond the limits prescribed.

The above rather rigid policies, taken in connection with the varying demands of the service and the preferences of individuals, make the course to be followed in the assignments anything but the easy task it apparently should be. This accounts for the reserve with which any advance information is generally given out, there are too many things that may change the slate, however it is hoped that a perusal of the above may help each one to answer in a general way the questions that are of great personal importance to each of us, i.e., where am I to live next year and with whom am I to be associated?

Inspection of Fourth Coast Artillery District

Brigadier General William H. Johnston, commanding the 4th Coast Artillery District, recently inspected the Coast Defenses of Charleston, Savannah and Pensacola. His inspection included, besides inspection of personnel and materiel, a solution of a problem by each coast defense commander, showing all the steps to be taken and reports to be made on receipt of telegram announcing M-Day in case of actual emergency. The troops at each coast defense were actually formed as cadres for the inactive units, Regular Army, assigned to each coast defense, and personal equipment, insofar as it was on hand, inspected. The written reports of coast defense commanders showed careful study by them of the prob-

lems confronting them in case of an actual emergency. They not only showed assignment to defensive elements of the troops, Regular Army, but proposed assignment of Coast Artillery National Guard and Organized Reserves units assigned to their respective coast defenses in case of mobilization. It was necessary for each coast defense commander to visualize an actual condition of war. This involved recall of all officers and enlisted men on leave or furlough; checking records of inactive companies to be rehabilitated; actual division of existing active units so as to provide cadres for inactive units of each coast defense; intensive recruiting in order to fill the ranks of Regular Army units; assignment of Reserve Officers to Regular Army units not completely furnished commissioned strength; placing in commission such defensive elements as possible with limited personnel; establishment of a system of security for each coast defense; calling upon Army, Navy, or civilian air forces for scouting off the coast; provision of shelter for all units; submission of requisitions for subsistence, personal equipment, and other supplies required; preparation of mine materiel, and readiness to establish mine project on or about D-Day; establishment of a system of counter espionage; training of all personnel received through enlistment; and, at Pensacola, establishment of a Harbor Defense Replacement Center for the Fourth Corps Area.

The Colors and Mess Silver of the 1st to 7th Regiments

Under General Order No. 8, War Department, c.s., the separate companies of the Coast Artillery Corps assigned to duty in the harbor defenses will be organized into regiments. Seven of these regiments (1st to 7th Coast Artillery, inclusive) will be organized by the assignment to them of companies whose continuity of record makes them the direct heirs of the old artillery regiments of the same numerical designations which were in existence before 1901.

When these old regiments lost their identity in the Artillery Corps in 1901, they were in possession of certain articles, consisting of colors, mess silver, and other relics, which, while probably of little remaining intrinsic value at this time, would be of great historical and sentimental value to these new regiments.

The Chief of Coast Artillery has requested that the COAST ARTILLERY JOURNAL give publicity to the above and has further requested that anyone having a knowledge of the whereabouts of such articles as those mentioned above, transmit such information to the Chief of Coast Artillery.

West Point Dinner

Approximately 200 graduates of the United States Military Academy, now stationed in Hawaii, gathered at the Moana Hotel, Waikiki, on March 22nd, for the annual alumni dinner which is held the country over to celebrate the founding of the Academy. The meeting in Honolulu was probably the second largest in the country, exceeded only by New York. Forty-seven years of academy life were represented, from Brigadier General Granger Adams, retired, who is a member of the Class of 1876, to Second Lieut. S. T. Keane, of the Class of 1923.

Colonel William Kelly, Jr., was toastmaster, and toasts as follows were given: "The Service," Brigadier General Richmond P. Davis, '87; "The Army," Major General C. T. Menoher, '86; "Civil Life," O. N. Tyler, '93; "The Academy Fifty Years Ago," General Adams, with response by Lieut. Keane; "The Ladies," Colonel A. S. Cowan, '99; "The Corps," Major General C. P. Summerall.

The Deputy Chief of Staff and the Chief of Coast Artillery Visit Fort Monroe

Major General John L. Hines, Deputy Chief of Staff, United States Army, visited the Coast Artillery School and the Coast Defenses of Chesapeake Bay at Fort Monroe on April 11th, 1924. He was accompanied by Major General Frank W. Coe, the Chief of Coast Artillery. They arrived from Washington by boat and were met by Brigadier General William R. Smith, commanding the Third Coast Artillery District and Commandant of the Coast Artillery School, and Colonel James F. Howell, commanding the Coast Defenses of Chesapeake Bay. The 4th Coast Artillery Band and a battalion from the fixed defenses, under command of Major W. T. Blood, acted as an escort.

In the morning General Hines, after a review of the fixed defenses and the 61st Antiaircraft Battalion, inspected the defenses and school. In the afternoon



FRONT ROW (LEFT TO RIGHT)—MAJOR GENERAL JOHN L. HINES, MAJOR GENERAL FRANK W. COE, BRIGADIER GENERAL WILLIAM R. SMITH, COLONEL JAMES F. HOWELL. SECOND ROW—LIEUT. COLONEL WILLIAM H. WILSON, LIEUT. COLONEL FRANCIS J. BEHR.

the 61st Antiaircraft Battalion, commanded by Major W. E. Shedd, C. A. C., fired a target practice with machine guns at free balloons and with 3-inch guns at a sleeve target towed by an airplane from Langley Field. The firing was very successful. An examination of sleeve target showed a hit by a shrapnel. In the evening a dinner was tendered to General Hines and General Coe by General and Mrs. Smith. This was followed by a reception and dance given by the officers and ladies of Fort Monroe.

On Saturday a visit was made to Fort Eustis where the 51st Artillery (tractor), firing at a moving target, and the 52nd Artillery (railway), firing at a fixed target, held a target practice. The 51st Artillery was part of the artillery of the 8th Corps in France which was commanded by General Hines. A brigade review preceded the firing. The provisional brigade being made up of the 34th Infantry, 51st Artillery, 52nd Artillery, First Sound Ranging Battery, and the bands of the 34th Infantry and 52nd Artillery.

In the afternoon a visit was made to Langley Field, where a flight of thirty-six planes was made. General Hines then made an inspection of Langley Field and Fort Monroe from the "air." He expressed himself as being pleased with the state of training and general conditions of the three army posts on the peninsula.

Amundsen's Plan

The plans of the Norwegian, Raold Amundsen for a North Pole flight are taking shape. His aide will be an American, Lieutenant Ralph E. Davison, detailed for this duty by the U. S. Naval Air Service. Recently married, Mrs. Davison begged her husband that she be allowed to accompany him on a novel honeymoon. By a fortunate compromise, she will go with him to Pisa, Italy, where Amundsen's planes are under construction by Dornier, famed German designer, and from there to Spitzbergen, Norway. The expedition (set for July) plans to explore the territory between Spitzbergen, Norway and Point Barrow, Alaska. Apart from collecting data for scientific aeronautics, Amundsen and Davison will explore 1,000,000 square miles of territory, and gather information as to the possibilities of commercial flying across the Polar regions—which may ultimately furnish the shortest route between the three continents of America, Europe and Asia. The Dornier plane has a radius of action of 1,300 miles; Spitzbergen is 500 miles from the Pole, but over 1,700 miles from Point Barrow. The explorers will therefore, make several seven-hour trips from Norway to the Pole, and make a cache there of fuel and supplies. for the last dash across the frozen top of the earth.

The Salute

"Have you ever stopped to think what the salute means? Some ignorant people think it is a sign of servility. No! It is a sign of equality, the act of courtesy between comrades. Do you remember the tale told of Washington, who lifted his hat in return to the salutation of a negro slave? When asked why he had done so, he replied: 'I will let no negro outdo me in courtesy.' Don't let any man outdo you in courtesy. Take pride in the manner of your salute. Hold up your head and look your man in the eye and give a smart salute. It is the mutual recognition of comrades. To be sure, it is required because courtesy is indispensable to discipline, required because many who know no better would pass without recognition, which would be a bad state to exist between disciplined comrades."—*Brigadier General John M. Jenkins to the officers and men of the 13th Cavalry.*

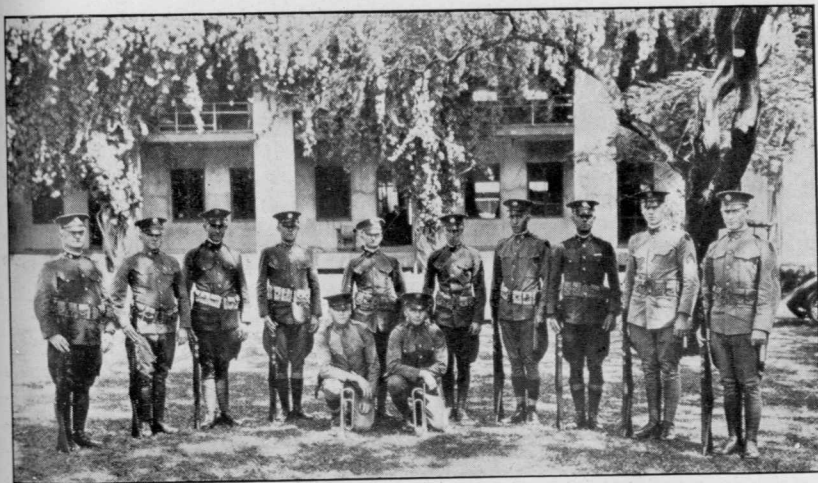
If at First You Don't Succeed--

Recruiters who fear that they may lose prospects by overloading them with correspondence and other forms of attention may take heart from a study of the operations of Dr. Cook, of North Pole fame. The January issue of *Associated Advertising*, in analysing Dr. Cook's most successful oil campaign, found that his file of publicity matter per prospect weighed approximately 11 pounds, and represented 91 mailings. One hundred and twenty-five envelopes, 13 one-page letters, 20 two-page letters, 6 three-page letters, 2 four-page letters, 52 faked newspapers of 4 or more pages, 36 pieces of highly lurid prospectus material, 34 return post cards, and 72 subscription blanks, were included therein. The cost of the paper, illustrations and printing matter used is estimated at \$29.26, and the postage cost per prospect \$1.89. These figures do not include the labor attached to getting out the material.

The magazine *Postage*, taking into consideration Dr. Cook's remarkable success in peddling what was at best a most dubious quantity, thinks that he is to be thanked for a final answer to the question, "How often should a prospect be followed up?"

Guard Competition in Hawaii

For the third time since the inauguration of the guard competition in the Hawaiian Coast Artillery District, Honolulu, Fort Ruger has carried away the honors. A pennant of blue and white, bearing the legend, "H. C. A. D. BEST GUARD," now flies for the seventh month over the Fort Ruger guard house. The competitions are held quarterly.



NON-COMMISSIONED OFFICERS OF THE OLD AND NEW GUARDS THAT WON FOR FORT RUGER THE GUARD PENNANT OF THE HAWAIIAN COAST ARTILLERY DISTRICT IN COMPETITION WITH FOUR OTHER POSTS. THESE MEN RECEIVED THE HIGHEST COMMENDATIONS FROM THEIR IMMEDIATE COMMANDING OFFICER AND SHOWED THEMSELVES TO BE CAPABLE IN EVERY RESPECT OF PERFORMING THE DUTIES OF NON-COMMISSIONED OFFICERS.—Photo by U. S. Signal Corps.

The following is the basis for the examination and rating, and shows the maximum number of points possible under each heading and the number attained by the Fort Ruger guard:

	<i>Max. Points Possible [Percent]</i>	<i>Points by Fort Ruger [Percent]</i>
Guard mounting	13.0	12.0
Guard orders	4.0	3.9
Officer of the Day	3.0	3.0
Sergeant of the Guard	15.0	14.2
Corporal of the Guard	10.0	8.5
Musician of the Guard	2.0	2.0
Orderly	1.0	1.0
Privates of the Guard	33.0	30.3
Guard House	15.0	14.1
Records	4.0	3.8
	100.0	92.7

This percentage is considered a remarkably fine rating, and proof of the degree of efficiency reached by Fort Ruger in the matter of guard duty. The Fort Ruger Guard was composite and made up of members from all the organizations in the post. As such, it may be considered an average guard, a fair sample of the guards mounted daily. The board of officers which judged and rated the various guards did not communicate its intention to examine the guard of any particular post on any particular day. While it was generally understood that the board would make an examination some time, neither the day nor the hour was known. The arrival of the board was in the nature of a surprise.

It is not surprising that the enlisted personnel at Fort Ruger should have won this guard competition, for conspicuously posted in the guardhouse where every man can read is the highly commendatory and inspiring statement of Major General Charles P. Summerall, commanding the Hawaiian Department, concerning the Fort Ruger guardhouse, placed there at the instance of the commanding officer, Fort Ruger, it reads:

"In the report of his annual inspection of the Hawaiian Coast Artillery District for 1923, the Department Commander said *the Guardhouses are average except Fort Ruger, where the Guardhouse is in a superior condition and may be taken as a model*. Every man who goes on guard at Fort Ruger takes special pride in what the Department Commander says about our guardhouse. The only way to maintain the guardhouse in superior condition is for every member of the guard to feel that he is personally responsible for its condition."

The pennant was presented on March 6 at the regular parade by Brigadier General John D. Barrette, commanding the Hawaiian Coast Artillery District. The old and new guards of February 28 were assembled on the parade ground in front of the entire command, which was drawn up to do them honor and receive the General with appropriate ceremony.

Service Headquarters Established at St. Louis, Missouri

At a joint meeting of all Regular Army, Navy and Marine Corps officers, both active and retired, of St. Louis, Missouri, it was decided to establish a "Service Headquarters" at the Headquarters of the 102d Division, U. S. Army, located at 408 Old Custom House, St. Louis, where all officers of the different services, ordered there for duty or passing through the city, may apply for information.

How Insignificant is Man

Man inhabits a tiny planet that revolves around one of the inferior suns. His little earth is invisible from Alpha Cenauri, the nearest star, and even his diminutive sun, from which he receives heat and light, cannot be seen from Arcturus, the brightest star in the northern hemisphere. Until quite recently he believed his planet to be the center of the cosmos, the most important body in the universe, and he considered himself to be the final cause of creation. Astronomy now reveals to him a hundred million suns and discloses the existence of thousands of millions of non-luminous masses in space—myriads of dead suns. While he has no positive proof that there are planets outside his solar system, he has many reasons to believe that there are multitudes of heavenly bodies upon which life exists; and he now asks himself most seriously whether there are limits to the starry regions. Light travels nearly two hundred thousand miles in a second; the fainter nebulae are at a distance of a million light years from the earth; and the untold depths of starry space contain myriads of galaxies that would make the midnight sky a blaze of light were it not for absorption of light by the ether. Every improvement in astronomical instruments and methods serves only to reveal the utter insignificance of man's little planet in the universe and of man himself. What is he that thou art mindful of him?—*From Colonel S. C. Vestal's "The Maintenance of Peace."*

PROFESSIONAL NOTES

The Present Status of Our Navy

By MAJOR P. S. GAGE, C. A. C.

The Coast Artillery, as such, is very closely related to the Navy. In too many instances, however, we become too engrossed in our own particular sphere to keep abreast of what our navy is doing, or what the navies of other nations are doing.

Within the last year, the whole of our naval forces afloat have been combined into what is known as "The United States Fleet." No longer do we have an Atlantic Fleet and a Pacific Fleet. This fleet is organized into four main subdivisions—the Battle Fleet, the Scouting Fleet, the Fleet Base Force, and the Control Forces. In addition there is a Service Squadron with headquarters in the Panama Canal Zone for Central American work, an Asiatic Fleet and an European Squadron. A Fleet Training Division has just been created in the office of Naval operations in Washington which is expected to add greatly to the efficiency of the fleet organization just noted.

In spite of all the claims of the proponents of aircraft, submarines and other forms of vessels for war at sea, the great nations of the world still base the measure of naval power in terms of first line battleships. As often the ABC's of a subject are passed over because everyone is supposed to know them, but actually does not, I shall venture to remind you that by a treaty signed February 6, 1922 between the United States, Great Britain, France, Italy and Japan, on the Limitation of Naval Armament, we now have 18 capital ships, with a total tonnage of 525,850. Great Britain has 20 capital ships with a total tonnage of 558,950. Japan has 10, with a tonnage of 301,320. France and Italy have tonnages which are too small in comparison to be considered in this connection. The naval treaty just mentioned is often referred to as the 5-5-3 treaty. The treaty is to remain in force until December 31, 1936 with a proviso for an extension beyond that time. By 1936, the United States will have 15 capital ships, Great Britain 15 and Japan 9—that, as you see, gives the ratio of 5-5-3. Since the signature of the treaty the United States has scrapped 15 completed battleships, and 13 battleships under construction—total, 28. We have left, as before mentioned, 18 battleships, and of these four were recently reported unfit for duty due to the poor condition of their boilers—the Utah, Arkansas, Florida and Wyoming. I don't know whether or not it is generally understood that the 5-5-3 ratio relates only to battleships. It was undoubtedly Secretary Hughes' purpose to extend the ratio from capital ships to cruisers and all other auxiliaries. However, in the treaty discussions, these proposals were ultimately dropped, and it is now optional with the parties to the treaty to build auxiliaries without limit, except that cruisers

cannot exceed 10,000 tons each, or carry guns of a caliber greater than 8-inch. All future treaty battleships are limited to 35,000 tons, and can carry no guns larger than 16-inch.

Let us see now how the United States stands in regard to its chief competitors in the cruiser line. Great Britain has now built or laid down 52, Japan 29, the United States 10. Assuming the 5-5-3 ratio to apply in regard to this type of craft (which it does not), we would have to build twenty 10,000-ton cruisers to get a tonnage equal to Great Britain's, or 22 to bring our cruiser strength to five-thirds of Japan's. But even aside from attaining our treaty status and proper relative strength, an efficient fleet needs vessels that can scout and gather information when opposed by enemy cruisers; vessels that can beat off destroyer attacks, and break through enemy destroyer screens; swift vessels that can protect convoys and maintain their speed in rough weather. The destroyers, of which the United States has a sufficient number, except for destroyer leaders, are incapable of such duties.

To somewhat counteract the rather gloomy outlook just indicated, I may add that Mr. Denby asked this year's Congress for funds for eight new light cruisers of 10,000 tons each. The ten cruisers now authorized by Congress are of 7500 tons with a speed of 33 knots. Six of these have recently been completed and the remaining four will be completed in the next half-year. On January 21, 1924, the first lord of the Admiralty said that Great Britain would have to replace her 52 cruisers in the next ten years. He stressed in his speech that the building of these would ease the unemployment situation in England materially, but that what is more important, it would enable the master shipbuilders of the realm to keep abreast of their trade, and forever progressive. We may well reflect on this phase of what he said. If many of our yards are allowed to remain idle in the matter of building the various classes of ships of war, when the time comes that we may wish to build them again, the first ships built will doubtless be about on a par with those built a number of years previously, while if the plants had "kept their hands in" they could hardly have helped but progress from one year to another. Great Britain and Japan are wholly mindful of this in methodically keeping their yards in continuous operation.

How do we stand in submarines? We have a deficiency of 49,000 tons as compared with Japan, but we are ahead of Great Britain in this respect. Japan heads the list with submarines, but her advantage over us is greater than the tonnage would seem to indicate. Not one of Japan's 74 submarines is under 689 tons, and 63 are over 900 tons. Only 36 of our boats are comparable with Japan's. Japan has 41 submarines now building or projected, 23 of which are over 1,000 tons. The United States has started *no* submarines since the treaty. Mr. Denby recently asked for three mine-laying submarines of 1,000 tons. In short, since the treaty, other nations have laid down 59 "treaty-exempt" ships; the United States, *none*.

It hardly needs mention to Coast Artillerymen that the treaty saddled on us the "status quo" in fortifications and naval bases in the Pacific Ocean. While the Armament Conference was in progress, Japan with feverish activity, was able to complete her fortifications in the Bonin Islands and Amami O'Shima, while we, as you know, did nothing anywhere in the Pacific while negotiations were in progress. Undoubtedly, the limitation of naval armament came as a Godsend to a tax-burdened and war-weary world. At present, instead of being equal in strength, our

navy is actually inferior to Great Britain's in man-power, gun-power, modern devices, equipment of all kinds and in the proportion between its component parts, while it is about the same strength as Japan's navy, instead of being five-thirds greater.

The present strength of the Navy in personnel is 86,000 enlisted and 6,000 officers. Mr. Denby stated that we should have 120,000 enlisted. In other words, we are 34,000 men under what we should have to adequately man our ships and naval establishments.

The navy is not at all in favor of a separate Air Force as distinct from the Army and Navy. This separate force has proven a distinct burden in Great Britain and it is believed that in the long run neither the best interests of the navy or of the army would be served by the creation of a separate arm. The navy is not trying to steal the army's job in the air—though, of course, now and then the navy will appear to be trespassing in the sphere of army aviation. What they are trying to develop is an air service that will serve primarily the needs of the fleet.

Four of our would-be battle cruisers, the *United States*, *Constitution*, *Constellation* and *Ranger*, are to be sold and scrapped. Two are left to us by the treaty to be converted into airplane carriers. These battle cruisers would have been the largest and swiftest capital ships in existence—length almost 900 feet, beam 100 feet, displacement 43,500 tons, speed 33 knots developed by electric drive turbine engines developing 180,000 horsepower. These airplane carriers will carry about sixty planes apiece. It is now contemplated, and plans are being perfected, whereby each battleship will, in the future, carry three planes (one scouting and two combat) with the necessary catapulting machinery. Each scout cruiser will carry two observation planes. Train ships, which probably will be converted merchantmen, will also carry planes.

An appropriation by the 67th Congress of \$6,500,000 enables us to increase the elevation of the turret guns of our thirteen "treaty" battleships. This will now be done so as to put our guns on a parity with those of Great Britain and Japan. Just at present, however, were we to engage the "treaty" ships of the British, over one-third of our vessels could not reach them, assuming the British remained at a range equal to their shortest ranged ships, 23,800 yards. Seven of our ships can fire only 20,000 yards. The limitation of armament treaty has made it necessary that we do our utmost to perfect and modernize the ships we have left. Congress has been asked for this purpose for appropriation of funds for (a) new deck sheathing as an additional defense against air attack, (b) torpedo blisters as an additional defense against submarine attack and (c) the conversion of six coal-burning battleships to oil-burning. Incidentally electric-drive for battleships has proven its worth and will probably be incorporated in all new battleship construction.

In conclusion, I shall state that the navy is most desirous of, and does assist in every way possible, the best interests of the Coast Artillery. For example, they feel in the Navy Department that the recent maneuvers in Panama have done more for the Coast Artillery than they have done for themselves in pointing out weaknesses in gun ranges ashore, etc. The navy is most anxious to see the Coast Artillery prosper, for the more efficient we are, the more strategic freedom they will enjoy. I had it from the lips of the former Secretary of the Navy, Mr. Denby, that the idea of the navy's ever attempting or wishing to take over the Coast Artillery is absurd. The navy is anxious to cooperate with us in every way possible and we should always be on the lookout to cooperate with them.

Studies of the Motion of Projectiles

By 2d LIEUT. PHILIP SCHWARTZ, O. D.

The mathematical theory of the motion of a modern elongated projectile considered as a particle is relatively simple, compared with the theory of the projectile considered as a rigid body. Several hundred years ago Newton was able to formulate a theory based on a particle projectile which is still very good for conditions of low muzzle velocity. Improvements have been made since then by obtaining a retardation law which is suitable for all velocities and which considers the shape of the projectile as a factor; and also in the methods of computation. However, it has only been since the past war that the United States and other governments have actually taken up the more difficult but complete problem of the projectile considered as a rigid body.

In the United States the work now being done by the Ordnance Department consists in following and improving the procedure which was begun by the British during the war. Mr. R. H. Kent (Captain, Ordnance Department, during the war) is carrying out both mathematical and experimental investigations at

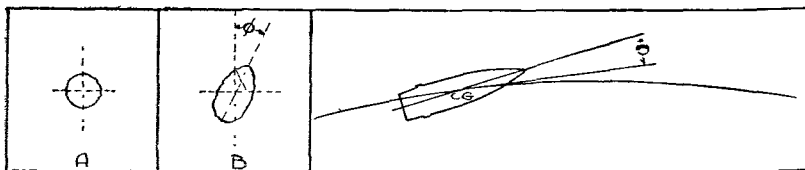


FIGURE 1.

Aberdeen Proving Ground. Experimentally, the process is to fire projectiles, whose longitudinal and transverse moment of inertia and position of center of gravity have been carefully measured, through cardboard screens placed at successive positions in front of the guns and along the expected path of the projectile. Examination of the holes made in the cardboards by the projectile, permits determining the direction in which the axis of the projectile was pointing and the angle which the axis was making with the path of the center of gravity of the projectile at the time when it went through each cardboard.

If the axis of the projectile is perpendicular to a cardboard screen a round hole is made as in A Fig. 1. If the axis is inclined at a small angle to the perpendicular an elliptical hole results, as in B Fig. 1; this is the usual condition. The length of the major axis of this elliptical hole increases with the angle of yaw δ , which is the angle which the axis of the projectile makes with the tangent to the trajectory or the path of the center of gravity as in C Fig. 1. The direction in which the major axis of the ellipse points in the plane of the cardboard gives the so-called angle of precession ϕ as in B Fig. 1. Examination of a set of cardboards for any round shows what the angles of yaw and precession were, at each point of the range where a cardboard screen was placed.

Based on the cardboard measurement of several rounds and on the mathematical theory developed by the English (see the *Aerodynamics of a Spinning Shell*, by Fowler, Gallop, Lock and Richmond, in the *Philosophical Transactions*

of the Royal Society of London) the path shown in Fig. 2 has been computed. It gives a graphical picture of the motion of every part of the shell for about 1200 feet from the muzzle.

This curve is very interesting as an example of the true motion of the nose of a projectile. Before the World War it was customary to teach in the United States that the nose of a projectile precessed around the tangent to the trajectory less than once in a whole trajectory. In the case chosen, the nose of the projectile has turned five times around the tangent in the first 1200 feet. Near the

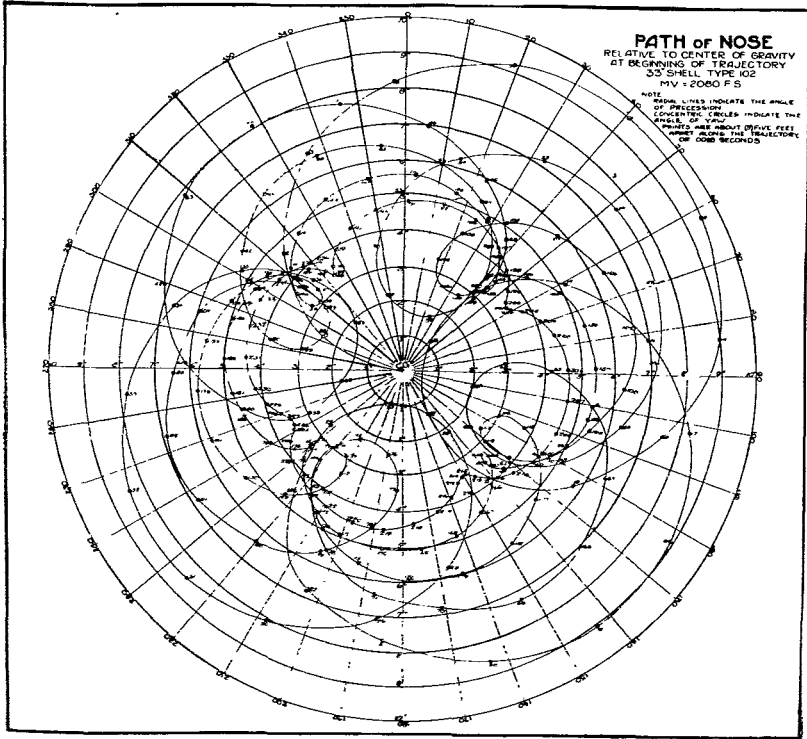
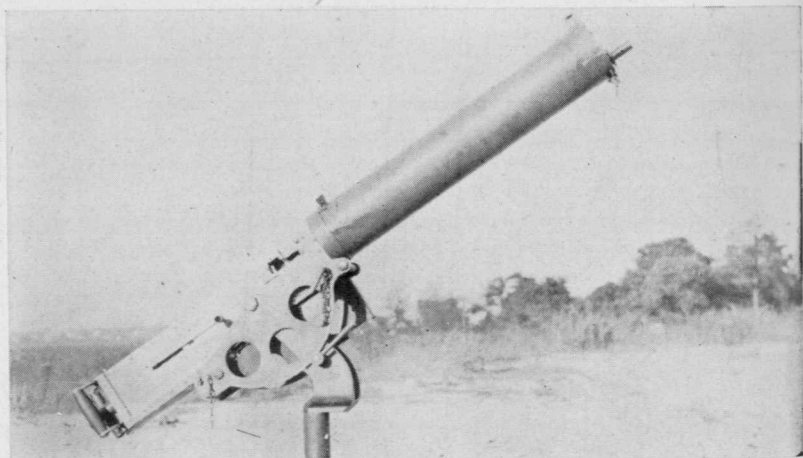


FIGURE 2.

muzzle the motion consists of both nutation and precession, but at 1200 feet the nutation has about died out; a short time later the nutation probably becomes negligible and the nose practically circles around the path of the center of gravity. The initial yaw of 10° , which corresponds to a distance of about two inches from the nose to the tangent, has been damped down to about 4° after 1200 feet. The period of the precession is about one-eighth of a second, and the period of the nutation about one-thirtieth of a second. The linear speed of the nose is greater, the greater the angle of yaw. Considerations such as these may give an explanation of the swishing sound which a projectile often makes as it leaves the gun. As discussed in the article on "Projectiles" by Major W. P. Boatwright, in the October 1920 number of the JOURNAL, these investigations are expected to lead to a rational basis for projectile design. They will also help in a large measure to determine an accurate retardation law.

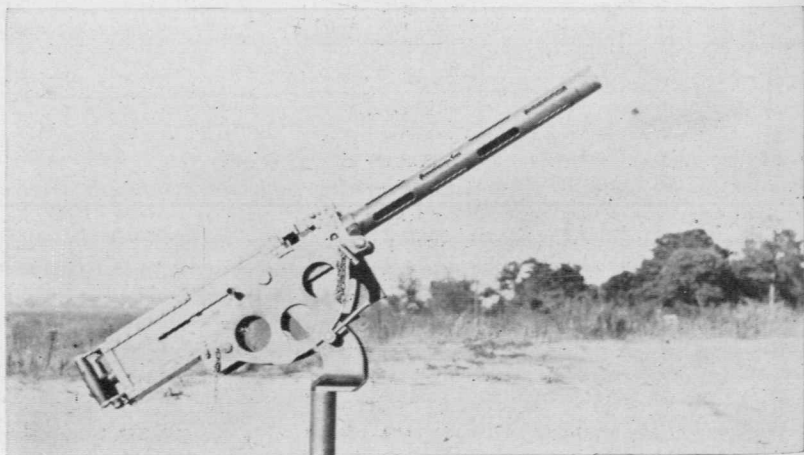
The .50-Caliber Machine Gun

The JOURNAL is indebted to 1st Lieutenant F. W. Crisp, 61st Artillery Battalion (A.A.) for the three photographs shown here and the following remarks regarding this new weapon for use against aircraft.



.50-CALIBER MACHINE GUN. WATER COOLED

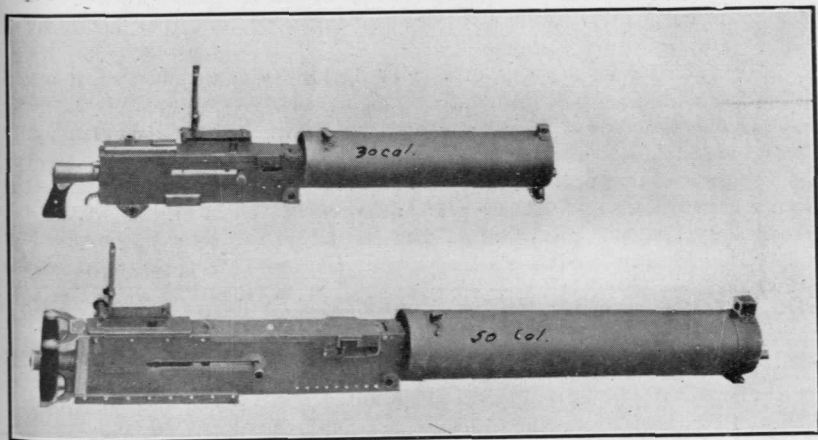
Three types of .50-caliber machine guns have been developed: (a) water cooled for use against aerial targets, ground targets, or tanks: (b) air-cooled for use mounted on airplanes for aerial combat: (c) air-cooled to be used mounted on tanks.



.50-CALIBER MACHINE GUN. AIR COOLED

The .50-caliber machine gun is belt-fed and recoil operated, built on the same principle as the .30-caliber Browning machine gun which proved its value as a weapon during the late war. Minor defects of the .30-caliber gun have been corrected in the heavier gun, while a number of improvements have been incorporated; such as a hydraulic buffer to absorb the energy of recoil during firing.

The types of ammunition for war time use in the .50-caliber gun are service, tracer, incendiary, armor-piercing, and explosive, the last named to be used against tanks and other materiel. The armor-piercing bullet has a penetration of 1-inch of armor at 100 yards. The tracer ammunition has a maximum range of 1500 yards as developed at the present time with prospects of greatly exceeding this.



While the .50-caliber machine gun has been adopted as a weapon for machine gun defense against aircraft, post-war automatic gun development has not stopped with this heavy machine gun. Antiaircraft units expect within a short time to be equipped with the new 37-mm. gun, which is a reality, to contest further the far reaching claims of aircraft. It is safe to assume that the last word of automatic gun development has not yet been spoken, and the successful application in the near future of the automatic principle to guns of heavier calibers,—possibly even to light field guns,—is predicted by many ordnance engineers.

Defenselessness of the Canal

The combined army and navy manoeuvres off Panama came to an astounding close when the attacking fleet outgunned the fortifications and landed troops, which in turn captured the forts. The great 16-inch guns of the battleship Maryland could have blown our supposedly superb forts from the map had it been desired. It is pointed out that, though the public has been given to understand that Panama is well protected from sea bombardment, there are practically no defenses there at all. It is proposed that the present Congress allow funds for the placing of the great 16-inch guns taken over from the navy at Panama, together with enough men to properly man the forts.—*Current History Magazine.*

Employment of Hertzian Waves For Stopping Airplanes in Flight

By MAJOR OF ENGINEERS MAURICE BERGER, *Belgian Army*

Translated from the Bulletin Belge des Sciences Militaires by Captain A. M. Jackson, C.A.C.

In a recent article the Bulletin Belge des Sciences Militaires gives echo to the news, reproduced by several dailies, of the discovery by the Germans of a process for stopping airplanes in flight by means of Hertzian waves.

Since the appearance of the article our curiosity has been captivated by the promise made us to demonstrate how that thing was possible. Up to the present time the interested services have not found the key to this reported invention.

If it is true that the marvelous properties of the Hertzian waves expose us to still further surprises, we do not think that in their form as now known to us they have ever stopped a single airplane.

Were it only from the point of view of the history of the question, it would be interesting to have several details of the accident of the Colorado Electric Light and Power Company. We might perhaps learn that *Tesla* was not really the author of that accident. It is even probable.

Tesla was equipped, it appears, with a power of 300 kilowatts and his laboratory was located several kilometers from the central station in question. There actually exist several stations that put into play outputs of 1000 to 1500 kilowatts and their dynamos, placed in the same station, or those in neighboring factories, do not burn out. However, they are not specially constructed to resist Hertzian waves. The delicate measuring and controlling devices which sometimes contain coils of wire of a diameter of several hundredths of a millimeter do not burn out either. Automobiles of all kinds circulate in the immediate neighborhood of the station without being disturbed in the least. In our aviation fields our airplanes go thru their evolutions without difficulty above powerful sending stations, and further still the greater part of the airplanes carry with them powerful transmitting sets.

The fact must not be lost sight of that if we can now transmit telegraphic or telephonic messages by means of Hertzian waves or even make them perform "telemechanics" such as directing from a distance a boat or airplane destitute of pilot, it is not done solely by the employment of a sending station but it is accomplished above all by a suitably arranged receiver. We say above all because it is principally the improvement of the receiving stations that has given to wireless telegraphy its greatest progress.

If the sending station has the property of creating disturbances in the special physical condition that the physicists called the ether, disturbances which propagate from place to place in the form of a variable electromagnetic field (and without the interference of the electrons of space), and if these disturbances have the power to generate induced currents in a given receiving apparatus, the latter must be placed in certain favorable conditions. In particular the receiving circuits must be tuned to the frequency of the variable field for the induced currents to have an appreciable value. Everyone who has tried to receive radio messages knows well the phenomenon of resonance which dominates all problems of radiotechnology.

A magneto circuit, a dynamo coil or an induction coil are far from being a favorable case in this respect; their self-induction is much too strong, and in general there must be special artifices in order for them to be in resonance with even very low frequencies.

Moreover it is not the induced current in the receiving apparatus which is amplified by the parts of the apparatus. The current in question is simply susceptible of liberating a new reserve of energy, notably owing to the employment of the three-electrode lamp. Hence we must look to a local source of energy which will be governed by the action of the current due to the exterior field. In the case of the apparatus with the three-electrode lamp, for example, the high tension battery which feeds the plate circuit can furnish a new quantity of energy to the system; the three-electrode lamp is limited to playing the part of a very sensitive relay, or to employ a simple expression, it constitutes a valve regulated by the current received in the first instance.

This shows us that in order for the sending station, such as we know it, to be able to act at a distance on a given apparatus, this latter must have been given special preparation, varying with the nature of the sending station considered.

What can be concluded in the present state of our knowledge?

1st. The Hertzian waves now employed in radio cannot give rise to the manifestations now under consideration, that is, the arresting from a distance of airplane and automobile motors, unless by a coincidence of favorable circumstance that can only be realized by hazard.

2nd. It would be imprudent not to note attentively the information which would lead us to believe that the Germans, notably, are studying the means to realize the performances reported; but this information should be capable of being checked and completed by all the means of investigation in our possession.

3rd. It appears to us premature to say that it is possible to create an electric curtain susceptible of denying a zone of territory or an entire country to enemy airplanes and automobiles.

The New American Airship

As the time approaches for the trial flights of the new air cruiser now being built for the United States at Freidrichshafen, in Germany, interest is beginning to be aroused in the quality of her projected performances. It is claimed for this great dirigible that she is the last word in technical perfection, in safety and even in luxury. Cigar-shaped, like all Zeppelins, she will be 600 feet long and 93 feet high, she will hold 2,400,000 cubic feet of gas, she will weigh 41 tons and she will be capable of carrying another 41 tons in fuel, crew, passengers and cargo. Her engines, of an entirely new type, are to be of 400 horse-power and capable of giving her an average estimated speed of 65 miles an hour.

One hopes that this giant of the air from which so much is expected both in actual performance and in encouragement of an incipient industry, will escape the disasters which have befallen the Dixmude and other predecessors; that she will make the transatlantic flight with safety and speed, and that after her arrival in this country, she will have a long and successful career, devoted entirely to the development of the arts of peace. —*Washington Post, March 18.*

Conservation of Helium

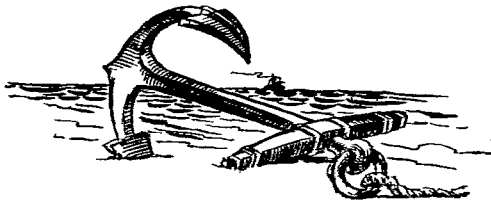
He would be a bold man who, in the present state of knowledge, should venture to predict to which two classes of flying machines now before the public the dominion of the air is destined to belong. Each has pressing claims of its own and each has its vociferous adherents. It does seem, however, that whether it will take first or second place, the dirigible airship, or lighter-than-air vessel, has

come to stay. It is also generally, though not universally, conceded that helium, on account of its non-inflammability and good lifting power, is the proper gas to use for inflating the dirigible.

Now, helium, is so far a rather scarce commodity, but even if it were fairly plentiful it would be a wise policy to set aside for national use in case of emergency or for necessary experimentation all of it that can be found. The President has therefore exercised sound judgment and shown a forward-looking spirit in designating by executive order 7,000 acres of land in Emery county, Utah, as Helium Reserve No. 1. Helium has been discovered there, and although the extent and value of the deposits are not yet definitely known, the withdrawal of the reserve from all forms of settlement, location, sale or entry makes certain that whatever amount exists there will be absolutely preserved for government purposes.—*Washington Post*.

Development of Antiaircraft Guns

Four new types of antiaircraft guns of remarkable efficiency have been developed. One is a .50-caliber machine gun capable of firing 500 aimed shots a minute. It has a horizontal range of about five miles and a straight-up range of from 8,000 to 12,000 feet. The second gun is a 1.4-inch machine gun, firing an explosive shell of approximately two pounds. The shells are so delicate they will explode upon touching the lightest fabric. At the same time they are entirely safe to handle and to load. The gun is capable of firing from 100 to 120 shots a minute, and has a straight-up range of 14,000 feet. The tracers of the shells are visible to an altitude of 10,000 feet. Third, is a three-inch gun mounted on a special carriage. The traverse arc of fire is no less than the full 360 degrees of a circle. The extreme elevation is eighty degrees. The shell weighs fifteen pounds, has a horizontal range of nearly seven miles and a straight-up range of nearly four miles. Finally comes a 4.7-inch weapon, regarding the details of which the ordnance officers are somewhat reticent. It is said to be the most effective of the lot. The shell weighs forty-five pounds and has a ceiling of about seven miles. The elevation is eighty degrees.—*Current History Magazine*.



BOOK REVIEWS

The New American Government and Its Works. By James T. Young. Macmillan, New York. 1923. 5½"x 8". 743 pp. Price \$3.00.

This is the second and revised edition of Professor Young's manual covering the practical features of present-day American government, including the varied features of National, State, and local administration and politics. The title is truly significant of the method of handling the encyclopedic scope of the book's contents. Professor Young clearly visualizes American institutions as dynamic rather than static; as constantly evolving and progressing instead of remaining a crystallized product of the founders of America.

The book is primarily intended as a text to be used in college and school class rooms, and in keeping with this intention the arrangement conforms to the customary system of concise paragraphs with boldface side headings, which facilitates synopsis and outline.

Each chapter is followed by a list of references and a collection of pertinent questions intended to stimulate the practical application of the text to the facts of life which are familiar in the experience of the student.

While the book is admirably adapted as a formal text it can heartily be recommended to the Army Officer or other mature professional man as a convenient reference manual covering the specific organization and procedure of American government. In addition to the treatment of the conventional agencies for the exercise of legislative, executive and judicial powers, so characteristic of American political organization, there are included numerous chapters on the modern development of administrative organization, such as the detailed description of the activities of the various cabinet departments, the Civil Service and the Federal Reserve System. Especially significant is the constant tying in of the influence of political expediency and party policy on the formal and theoretical organization of government.

Without argument in behalf of any point of view and with a minimum of speculation, the author clearly reveals the truth that American government today is a new and changing government. His treatment of existing conditions pertaining to capital, labor, education, Public Health, police power, finance, and the influence of public opinion, is concise but complete. The reviewer has seen no other book which sets forth as accurately the organization of the War Department and the methods of administration of the Army as does the work under consideration. If the facts concerning all other governmental activities and departments are as accurately set forth, the book is to be depended on as basic reference in its field.

The Great War on the Western Front. (La Grande Guerre sur le Front Occidental). By General Palat (Pierre Lehautcourt). Librairie Chapelot. Paris. 1922. $5\frac{1}{2}$ " x 9". Paper. 8 volumes with maps. Price of set, 8 francs.

Prices and contents of separate volumes are as follows:

- Vol. I —284 pp. Price 5 francs.
Underlying and immediate causes.
French and German war doctrines.
- Vol. II —244 pp. 3 maps. Price 5 francs.
Mobilization—Concentrations—Plans of Operation.
Liege—Operations in Alsace.
- Vol. III —368 pp. 8 maps. Price 7 francs. 50
Period: Aug. 6-25, 1914. Battles of the Ardennes and the Sambre.
British Army at Mons.
- Vol. IV —295 pp. 6 maps. Price 7 francs. 50
Battles in Lorraine (Aug. 23-Sept. 13, 1914).
Siege of Antwerp—Battle of Nancy—Defenses of Paris.
- Vol. V —444 pp. 8 maps. Price 12 francs.
Retreat to the Seine—Detailed Daily situations, Aug. 24-Sept. 4.
- Vol. VI —503 pp. 6 maps. Price 15 francs.
The Marne Victory (Sept. 5-13, 1914).
- Vol. VII —501 pp. 8 maps. Price 12 francs.
The Race for the Sea—Battles Sept. 17-Oct. 15.—Aisne—St. Mihiel—
Peronne—Arras—Antwerp (fall).
- Vol. VIII—387 pp. 5 maps. Price 12 francs.
Calais Drive (Oct. 15-Dec. 13)—Daily situations in Battles of Dix-
mude, Ypres and Soissons.

An outline of the World War naturally divides itself into three main periods: operations before trench warfare; trench warfare; and events which followed when the lines were shattered. This work covers the first epoch.

In presenting the history of these operations no attempt is made to distort the facts. Daily official communiques of both sides are carefully compared and copiously quoted.

At the end of each volume the author reserves a chapter for "Final Reflections" in which he boldly points out the skill, or lack of it, shown by opposing commanders. His enlightening comments upon France's unpreparedness, especially in trained commissioned personnel, heavy artillery and aviation and poor services of supply are of interest to the students of future preparedness. Among other important points discussed are General Joffre's lack of a plan, failure to conserve Sordet's cavalry, which could have made the Marne victory as decisive as Tena and avoided the stalemate of trench warfare which followed; too much dependence in Brialmont's Belgian defenses; permitting the center of the mass of the French Army to remain too far east which allowed the Germans to gain the Belgian Coast in their race for the sea, etc.

In brief, this is an excellent unabridged history of the first four months of the World War and a valuable "Source Book" for every military research or G-2 reference library. The profound military student will revel in the great detail with which these historical events are treated; the casual reader (of French) will enjoy the easy style of the author and his comments. Excellent maps cover each zone of operations.

Rome and the World Today. By Herbert S. Hadley. G. P. Putnam's Sons, New York. 1923. 5¾"x 9". 342 pp.

We find one fault with this book: the first half is too long, and the last too short. In a word, the book is unevenly balanced. The author could easily have condensed his resumé of early Roman history to a much smaller compass, thereby allowing himself more elbow room in dealing with the life and genius of Octavius. It is on the work of Octavius, the author wishes to focus our eye, yet, we receive little more than generalities. The reviewer could wish for more detailed word pictures of the first emperor.

But the last few chapters go far in offsetting any faults found in the earlier chapters. Here we have the author's own response to a depth of varied reading in the period of Roman history he loves. The one big idea he leaves with us is that the fall of the Roman Empire will be repeated here in our United States if we persist traveling that same Roman road of governmental interference to socialism.

Military Law. By Major F. G. Munson, J.A.G. Dept., The New Military Library, Annapolis, Md. 1923. 6¼"x 9½". 136 pp.

Quoting from the introduction of this book, "Little of the matter is original, the Manual for Courts-Martial, 1921, and Winthrop's "Military Law and Precedents," as hitherto, furnishing the foundation for most that is set forth here."

The work has been well done and the course is arranged in an excellent manner. In addition to the compiling of information contained in the above mentioned works, there are many quotations, which are referred to only in the Manual, and several welcome interpretations.

The last chapter of the work is devoted to "Rules of Land Warfare" which is mainly a compilation of the manual on this subject published by the War Department.

It is not thought that this course will be of any particular benefit to the average officer in the regular service, but it will be most useful and beneficial to those of the National Guard or Organized Reserve who haven't a copy of the Manual for Courts-Martial or do not desire to wade through its many pages. For those who may be detailed to instruct in Military Law, or for anyone who desires to obtain an excellent idea of Military Law with the minimum of study, and as a text for R.O.T.C. use, this course will prove most valuable.

Wars of the American Nation. By Lt. Col. P. S. Bond and Major Enoch B. Garey. The New Military Library, Annapolis, Maryland. 1923 6¼"x 9½". 207 pp.

By this volume, as is stated in the preface, the authors hoped "by the interest inherent in the truth, to tempt the college student and the busy man of affairs to read and to learn the lesson of inefficiency which has wasted tens of thousands of lives and billions of treasure." Keeping this purpose in mind while reading this history, it is apparent that the authors have told the story of our former lack of a military policy and its consequences in a startling and convincing manner.

It reviews in a concise but thorough manner the battles and campaigns from our earliest Colonial Wars to and including the World War. The book is profusely illustrated with maps. Any one interested in the Military History of this country will appreciate and enjoy this volume.

Our Solar System and the Stellar Universe. By Charles Whyte. J. B. Lippincott Co. Philadelphia. 1923. 6½" x 9". 223 pp. Price \$4.50.

This collection of popular lectures on the more recent discoveries of science in relation to stellar phenomena is intended for the lay mind. The volume is not a treatise on astronomy, but an effort to present in plain language the salient facts on such topics as the sun, moon and stars.

The author's exposition of the marvels of the stars and the solar system is truly fascinating. The scope of lectures is the range of "Our Solar System and the Stellar Universe," but the modern astronomical facts discussed are made sufficiently intelligible so that the popular mind may understand something of their wonderful significance.

The author, who is a minister of religion as well as a scientist, in discussing the relation of religion and science, writes: "The profoundest depths of man's nature have been moved by the glory and beauty of the stellar universe, and, while science has been sometimes accused of tearing the veil from the sanctities of the Divine Creation, here, at least, revelation has only added to the feeling of reverence and awe with which our forefathers gazed on the splendors of worlds other than their own. Science is, after all, but the handmaid of religion, and nowhere has she, within recent years, paid higher tribute to the majesty of the Divine creative power than in the realm of astronomy."

♦
Modern History. By Carlton J. H. Hayes and Parker T. Moon. The Macmillan Co., New York, 1923. 5½" x 7½". 856 pp. Price \$2.40.

In what respect does this text book on history differ from those of a generation ago? "Some historians, a few generations ago, tried to tell the story of how kings succeeded one another, how battles were won or lost, how laws were passed, and how nations rose or fell, without telling us anything about the common people. Such writers seemed to believe that history was a mere recital of the names of kings and the dates of battles. It was a very dull and very superficial kind of history." In the present volume the authors "tell us how the common people earned their living in the past, why they were willing for a long time to submit to the rule of the kings, and why they are no longer willing to obey monarchs and titled lords." The authors "deal with social, economic, and political history as parts of one story, not as separate stories." They are "concerned more with the new streams that have flowed into the river of civilization in modern times than with the distant sources of the river itself." But in their method of treatment, the authors "take a bird's-eye view of the progress of civilization in past ages," in order "that we may see the newer contributions in some perspective."

Does this text-book on Modern European History differ from its immediate predecessors? Of course it is essentially the same as the modern texts so far as the nature of the material it contains is concerned. But the entire text takes account of the new perspective for the old history which the World War furnishes. The whole text was prepared after the War. The authors had written no secondary-school text before War, so had not been tempted to utilize such a work now and bring it up to date by adding a chapter or two and changing a phrase here and there. So they "have been enabled and impelled, in the light of the Great War of the New Europe of today, to tell an entirely new story of the last four hundred years." For example, they have described the wars of

Louis XIV in the seventeenth century and those of Napoleon in the nineteenth with an eye to the campaigns of Marshal Foch in the twentieth; discussed the partition of Poland in the eighteenth century with their minds on its restoration in the twentieth; explained the work of Bismarck and Cavour with some thought of the recent undoing of the one and completion of the other.

The text is illustrated, and not only is there a complete index, but appended to each chapter are a set of questions for review, some pertinent special topics, additional references and a list of historical fiction. It is intended as a text for courses in Modern European History in secondary schools, but is invaluable to the student of modern history.

Bloxam's Chemistry. By C. L. Bloxam. Philadelphia. P. Blakiston's Sons and Co. 6½"x 10". 832 pp.

The eleventh edition of this work (first edition published in 1867) brings it up to date by the incorporation of the latest views of Physical Chemistry. While such subject matter is largely collected in a single chapter, throughout the book are found detailed explanations of the laws governing the action of the particular substance under discussion.

The source, method of preparation, and use in commerce, medicine, or warfare, of nearly every common inorganic or organic compound are given. This renders the book perhaps more valuable as an encyclopedia than as a text book, especially as the arrangement of the subject matter differs somewhat from that of the ordinary text, on account of the great scope of this book. It has been said that if a person were to possess only one book on Chemistry, he would do well to select Bloxam. The index of fifty-five pages is particularly valuable. (It may be mentioned that the fifth to eighth editions of this book were used as a text at the U. S. Military Academy from 1884 to 1896.)

The Inquisition, A Political and Military Study of its Establishment. By Hoffman Nickerson. Houghton Mifflin, Boston and New York. Maps. 6"x 9". 258 pp. Price \$4.00.

In a dedicatory letter the author reveals his reason for writing "The Inquisition," and that was the disgust aroused in him by the Prohibition lobbyists during a term spent by him in the New York State Legislature, when he sought to find an "historical precedent in the way of religio-political oppression."

The greater part of the work deals with the struggle of the Church to maintain the moral unity of medieval Christendom. To that end occurred the Albigensian Crusade—a Crusade against heresy—and from that struggle grew the Inquisition.

The account of the military efforts of Simon de Montfort with his army of Crusaders against the House of Toulouse is vigorously told with a romantic touch. The medieval catapult to an artilleryman becomes the G. P. F. and to this same artilleryman the fields of France are not unknown.

The author's argument is confined to the "Epilogue on Prohibition" where he shows the resemblances and divergences between Prohibition and the Inquisition.

It is to be regretted that, although vastly interesting and wholly logical, the book will be read by so few, other than scholars, that its effect on the lawmakers, even of New York State, will be nil. One feels sure, however that Mr. Nickerson has eased his spirit.

Automobile Blue Book. Chicago. Automobile Blue Book, Inc., 1924. 9½" x 5½".
770 pp. Price \$3.00.

This current volume covers all territory east of the Mississippi and south of the Ohio rivers and well up into New York State. It is one of four covering the continental limits of the United States.

Anyone who has had the pleasure of using the previous issues of this book will appreciate the fact that the publishers have left out nothing which was of value in previous editions, but have introduced some new departures which have materially increased its value and convenience. The general index and the section maps for states have been inclosed in the front of the book instead of the back. The miscellaneous information, ferry schedules and railroad and steamship costs are also conveniently placed before the routes. The large folded map, which in former issues was tipped-in in the back of the volume, is now attractively printed in colors and inclosed in a transparent faced holder, which permits its being placed in any part of the book as a bookmark, the map being folded so as to show the section through which one is traveling.

Comparison of several routes with the issue of 1923 leads to the belief that the book has been carefully edited and revised since the issue of the 1923 edition. Several of the city maps have been redrawn and blank pages for memoranda have been furnished.

An interesting and attractive addition is the inclusion of a \$1,000 automobile accident insurance policy that is furnished without cost to every purchaser of this year's edition. A coupon is bound in the book which is to be signed and returned to the publishers, and without cost the policy goes into force the day the application is received.

This protection can be increased to \$2,000 by subscribing to Motor Life on this same coupon, thereby obtaining what is called Regular Membership in the Automobile Touring Club of America. The ownership of the Blue Book entitles the owner to an associate membership only.

As in previous years the publishers furnish at a small extra cost the "Blue Book Holder," a large transparent faced container, into which the book may be slid, which permits its use, without injury, in strong winds or rains. The binding is in the same flexible blue fabrikoid and the necessity for this book, if even a short trip is contemplated, is second only to the car and the gas.

