

THE COAST ARTILLERY JOURNAL

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

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VOL. 60 No. 4

APRIL, 1924

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Published monthly under supervision of the Commandant, Coast Artillery School, by direction of the Chief of Coast Artillery, for the instruction of the Coast Artillery Corps, Reserve Officers and the 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	\$8.00
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.

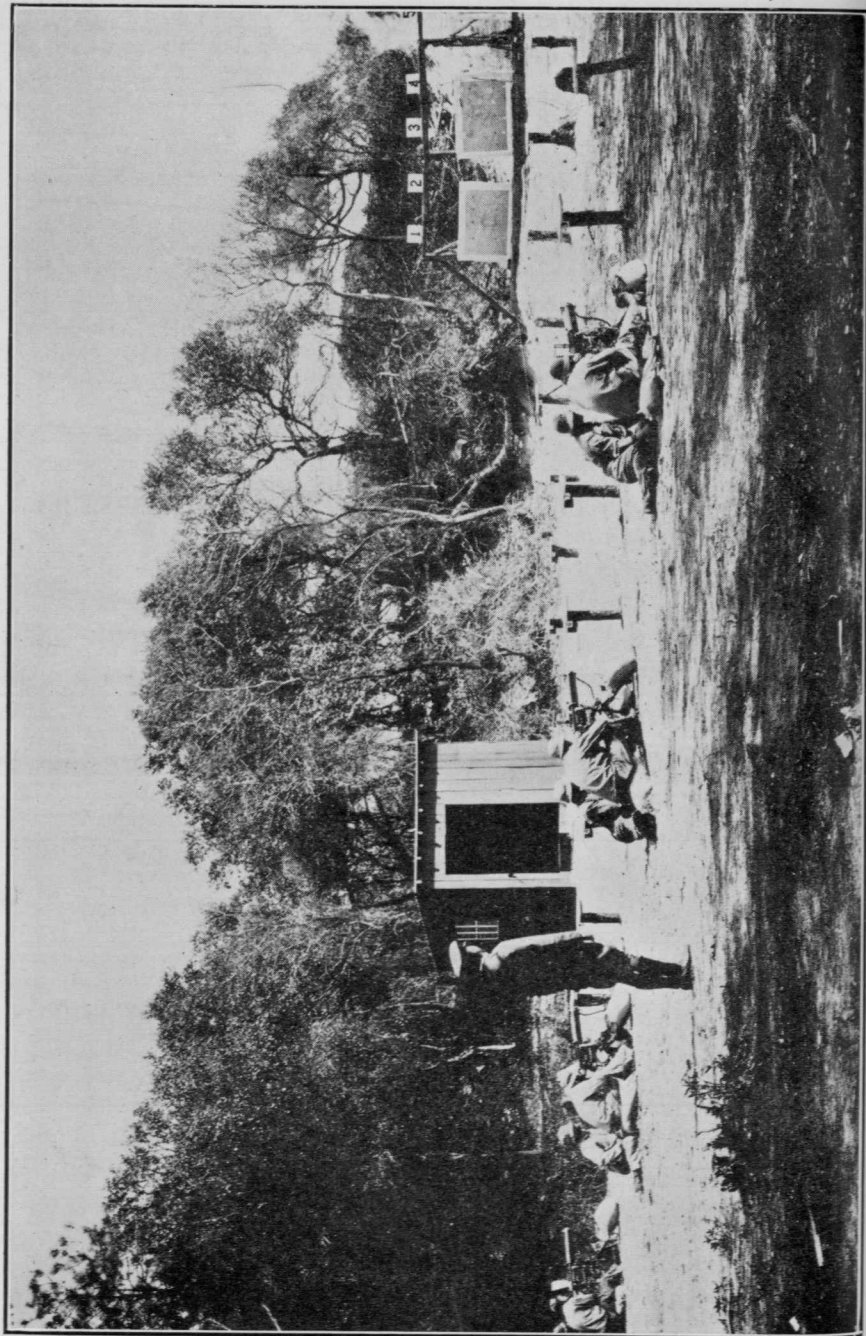
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Printed by HOUSTON PRINTING AND PUBLISHING HOUSE, Hampton, Va.

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 APR 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 4, April 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 School,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 Same as Report (SAR)	18. NUMBER OF PAGES 96	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



PRELIMINARY MACHINE GUN Firing ON 1000-YARD RANGE. BATTERY C, 61ST ARTILLERY BATTALION (A.A.), 1ST LIEUT. F. W. CRISP, C.A.A. COMMANDING.

The Coast Artillery Journal

Vol. 60 No. 4

APRIL, 1924

Whole No. 212

Present and Prospective Development of Antiaircraft Artillery

AND

Its Probable Effect Upon Airplane Bombing Operations

By LIEUTENANT-COLONEL H. C. BARNES, C. A. C.

NUMEROUS articles have appeared during the past two or three years in various newspapers and periodicals, bearing upon the subject of the Air Service bombing operations and the possible or probable effect they may have upon the future policies of the United States as to the building of battleships, coast fortifications, etc.

The apparent intent of these articles is to assist in creating a public sentiment which will demand the placing of our Air Service on a status commensurate with the requirements of a reasonable state of preparedness for the defense of our country. With this intent, one can take no issue. Any one familiar with existing conditions must realize how deplorably lacking we are in this respect, and the writer is heartily in favor of taking any and every opportunity to set forth existing conditions in a reasonable and proper way, to the end that improvement of these conditions may be brought about.

In the opinion of the writer, however, it is evident that those who have written or inspired the articles above referred to have erred in two particulars, viz: first, they have drawn erroneous conclusions from the bombing tests so far held and made public; and

second, they are apparently uninformed regarding the developments which have taken place, since the World War, in antiaircraft materiel, and the probable effect thereof on bombing operations.

The experiments made in the bombing of the *Ostfriesland* and other German ships took place about 100 miles off the Chesapeake Capes some two years ago. The ships being bombed were anchored. They were, of course, provided with no means of defense against aircraft. The bombs were all dropped from planes which, at the moment of releasing the bombs, were not to exceed 2,000 feet above the target, the pilot's mind in each case being free from the thought of danger to himself or to his plane. The situation was similar to one where an old man—90 years of age—is tied hand and foot to a tree in a dense forest with no means whatever of defending himself. Another man, young and vigorous, is given a blunderbuss of such weight that he can with difficulty carry it. He is started from the edge of the forest to seek out the old man, put him out of his misery and return to the edge of the forest. He starts out, finds the old man, takes a position at a distance of ten feet, blazes away and then shoulders his blunderbuss and returns to the edge of the forest. There is no question in the mind of any one that the shot will hit the mark nor of the result on the old man tied to the tree. The only thing which has been proven is that the youngster can carry the blunderbuss into the forest, find his quarry, fire his shot and return. The rest was all known before. Similarly, the experiments against the German ships. These experiments proved that bombing planes could carry their bombs one hundred miles to sea, find an anchored ship, drop their bombs, and return to shore. The rest was known before—that they could hit the mark from the altitudes employed and that, if properly placed, the bombs would sink the ship.

The more recent bombing operations against the battleships *New Jersey* and *Virginia*, off Cape Hatteras, while conducted at greater altitudes than any heretofore witnessed by the writer, do not change his opinions in the least. While some bombs were dropped from an altitude between 7,500 and 10,000 feet, those which did the most effective work and resulted in sinking the ships, were dropped from approximately 3,000 feet. The sinking of these two anchored and unprotected battleships occupied the services of about twenty-four bombing planes for approximately eight hours.

A conservative estimate of the time during which one or more of these planes were within effective range of antiaircraft guns, if the *New Jersey* and *Virginia* had been equipped with them, would be two hours. This brings us to a consideration of the present-day possibilities regarding antiaircraft gun defense, the development

concerning which the authors of the articles referred to appear to be uninformed.

The writer does not desire to make any extravagant claims as to what has been accomplished in the development of anti-aircraft guns or in the control of their fire, but he wishes to submit a few facts in this connection which would appear to constitute food for thought both as to the possibilities of anti-aircraft gun fire and as to the necessity for the Air Service to attain accuracy in bomb dropping *from altitudes which they may reasonably expect to maintain for this purpose and live to tell the tale*, against targets of a proper size and maneuvering in somewhat the same manner as such targets would maneuver, if attacked from the air in time of war.

There are four new types of anti-aircraft guns now in process of development. The first of the new guns is the .50-caliber machine gun with a horizontal range of about 27,000 feet, a straight up range of 9,000 to 12,000 feet and a rate of fire of about 500 shots a minute. Fire control is to be maintained with this gun through new tracer ammunition, visible by night up to 7,500 feet and by day up to 6,000 feet. The .50-caliber gun *is under manufacture* for issue as a substitute for the .30-caliber weapon, now used, which latter is a relic of war days.

The second gun under development is a 37-mm. machine gun, firing high explosive shells with fuses so delicately adjusted that the shells, while safe to handle before firing, explode on contact with balloon fabric once they have been discharged from the gun. A rate of fire of 100 to 120 shots a minute is expected with this weapon, as is also a straight up range of about 14,000 feet and tracer ammunition visible up to 10,000 feet, making possible accurate firing up to that point. It may be said that, at this time, this is a future prospect. This is true, but the handwriting on the wall says for the Air Service to give serious consideration to the subject of bomb dropping at these and still greater altitudes. It is planned to install these weapons in batteries of four operating with a single telescopic sight control and to be trained and fired by a single gunner.

The third new gun in the group is a 3-inch weapon on a mobile mount with a rate of fire of fifteen shots a minute, effective at altitudes up to 21,000 feet, and with full 360-degree traverse to enable the gunner to follow his target in any direction. It can be fired at an elevation of 80 degrees and has a horizontal range of more than 38,000 feet with projectiles weighing fifteen pounds and containing a heavy bursting charge. *Guns and mounts of this type are now under test at army proving grounds.* (Look out! you bombing planes, we're going up.)

Gun No. 4 in the anti-aircraft list is the 4.7-inch, firing a forty-five pound shell to an effective altitude of about 30,000 feet. It is to be mounted on a mobile carriage with full traverse and equipped for power loading and with an automatic breech block to speed up firing. This gun also can be fired at an elevation of 80 degrees or within ten degrees of straight over the gunner's head.

As a supplement to these new weapons, the experts are working out a system of indirect aiming, experiments having shown that central control firing is greatly superior to the old wartime systems. Two types of central stations are under development, either of which will obviate the necessity for altimeter stations and baseline readings and materially speed up aiming and firing, although requiring less personnel in operation than the old control method.

It will be seen from the characteristics of the anti-aircraft guns that the object sought is to drive bombing airplanes high into the air, thus minimizing the possibilities of accurate bomb dropping. The four guns described provide for effective firing in four different levels, which is expected to make the air *untenable for bombing planes up to 10,000 feet* and dangerous up to 30,000 feet. The anti-aircraft experts believe therefore that the plans they have matured will afford a very definite check to bombing operations, even without the support of combat planes to drive off the raiders.

Now, as stated before, the writer is fully cognizant of the deplorable condition regarding the Air Service—its present lack of personnel and materiel and, more important, the lack of any provision which will insure our having available an adequate personnel and materiel at the outbreak of any war into which this country may be forced. Furthermore, the above remarks setting forth the writer's views as to the conditions which must be met and the difficulties which must be overcome to attain reasonable accuracy in bomb dropping are in no way intended as an argument against the taking of measures to correct this condition regarding the Air Service. However, in our efforts to bring about this very desirable result, do let us be honest with ourselves and with the public, and not try to picture the conditions as being any worse than they really are. They are bad enough at the best.

It is a well known principle that the best defensive is the offensive-defensive. Under this principle, it is clearly seen that the best defense against enemy aircraft is found in the offensive action of our own aircraft directed against them. Careful thought on this subject can but lead to the conclusion that the *primary* mission of our Air Service is an offensive mission—to seek out enemy airplanes and destroy them. In this respect they

are exactly the counterpart in the air of the Navy on the water. And, as our coast fortifications, manned by the Coast Artillery Corps, are built to relieve the Navy of the responsibility of defending our harbors, thus freeing it to assume its offensive role against the enemy's fleet; so the anti-aircraft guns, served by the Coast Artillery Corps, are intended to relieve the Air Service of any defensive role and free it to assume the offensive—to seek out and destroy the enemy air forces.

They (the Air Service) may have several *secondary* missions, one of which, if you like, is to bomb enemy ships and other permissible things, provided their accomplishments in this direction are commensurate with the consequent loss of life and materiel, which latter includes not only the planes lost but the amount of explosive expended. The writer maintains, however, that we have not yet reached such a state of development—either in bomb dropping by the Air Service, or in anti-aircraft fire by the Coast Artillery Corps or Naval gunners—to permit us to arrive at a true judgment as to the possibilities along this line. And he further maintains that, until we do reach that state of development, it is idle for the advocates of either side of the question to burst forth into extravagant headlines in the daily papers on the subject.

The setting forth in a reasonable way of the requirements to permit the Air Service to carry out its legitimate missions should be sufficient to convince Congress and the public of the necessity for immediate and adequate provision for this branch of our country's defense. It would also seem that a complete knowledge on the part of those same Congressmen and that same public of the developments in the anti-aircraft branch of the Coast Artillery Corps and of the relatively small handful of anti-aircraft artillerymen now provided for this important branch of our country's defense would result in some immediate steps being taken to make proper provision for *this* service.

There has happened nothing in the way of technical invention to upset the age-old principle that warfare, either defensive or offensive, can best be waged by loyal teamwork among all fighting elements. The tendency to accentuate the value of a particular element has the same disruptive effect as the occasional "star-worship" on the football field. The American public, to be informed of their needs, should pay heed to the advice of the older services as well as to the younger and more spectacular branch which fights in the air.

Normalcy Is Here!

By MAJOR ROBERT R. WELSHMER, C. A. C.

IT IS to be hoped that General Hagood's discussion on "Spotting for Coast Artillery," appearing in the February COAST ARTILLERY JOURNAL, will tend to center the thought of the Coast Artillery on the fact that fire on moving targets is an especial problem demanding a system of fire control applicable to its particular conditions. Under the guidance of Colonel Henry J. Hatch, Coast Artillery Corps, certain Coast Artillery Board studies of the past two years have emphasized these particular conditions. It is believed, as a consequence of these Coast Artillery Board studies, that methods and devices making possible satisfactory regulation of fire on moving marine targets have been developed and are available to the service; that the methods and devices are capable of giving a better solution than was possible under the regulations prohibiting any corrections based on observation of fire; and that the Coast Artilleryman who swallows General Hagood's article whole would deprive himself of a better available solution. It is in view of these beliefs, backed up by very satisfactory application of the methods and devices in actual firings, and in the hope of giving additional emphasis to the particular problem of *Coast* Artillery firing, that I venture to comment on the General's article.

In discussions of this nature, it is necessary to visualize service conditions, remembering particularly that the conditions existing during a target practice series are after all a poor substitute for the conditions which will exist during fire in action. The target practice series usually offers better chances for observation, but on the other hand the number of rounds is too limited ordinarily to permit proper application of the results of observation of fire. The student of Coast Artillery Board projects, published monthly in the COAST ARTILLERY JOURNAL, knows that the trend of action by the Coast Artillery Board for the past two years has been toward a solution for the Regulation of Fire on naval targets—a solution which is open neither to the objections resulting from an attempt to apply methods of adjustment used in firing on fixed targets, nor yet to the objection of using prepared fire without being able to apply any corrections based upon observation, even though such corrections

are founded on sufficient evidence to justify a great probability that, if applied, they would result in more effective fire.

General Hagood gives two equations indicating conditions applicable to the case of a fixed target and a moving target. It does not seem to me that the equations are general unless they include a term equal to the error between the actual and the map or computed range in the case of a fixed target, and equal to the error between the range of the setforward point and the actual range to the target in the case of a moving target. While the omission is of no consequence in considering his main theme, and is of no practical importance in the case of a fixed target, it is of real importance in the case of a moving target. Important not so much because in certain cases there is a considerable error between the setforward point and the target position, but because in moving target firing too many Coast Artillerymen lose sight of the fact that the gun is laid to fire on the *setforward* point and that this point, while it may coincide with the position of the target at the end of the time of flight, does not necessarily do so. My friend, Major Colton, points out the error in his article "Errors in Coast Artillery Range Finding," Volume 51, *Journal of the U. S. Artillery*.

Before venturing comment on what seems to be the principal thought, *No Correction of Fire*, in General Hagood's article, let us first briefly consider a few basic principles concerning observation and preparation of fire. We should not be in a state of helplessness if aeroplane and terrestrial observation are not available. Either or both of these contingencies are likely to occur, and we are not helpless because we can rely with considerable confidence on prepared fire, conducted without observation. The fact that we can do this, and probably in action very frequently will do it, does not eliminate the desirability of utilizing observation provided application of its results offers a reasonable chance for improving effectiveness of fire. Observation of fire by airplane should be regarded as a utility to be furnished whenever possible for ranges beyond 20,000 yards, and as a utility to be available for short ranges only in exceptional cases. Terrestrial observation should be regarded as a utility to be used at all ranges within the limits of vision, whenever conditions of the moment permit its use. If the target can be tracked it usually should be possible to observe the fall of some shots, especially shorts, and this without the necessity of pole climbing or of any particularly complicated organization or spotting system. A spotting system and organization adequate for observation of service firing is justified anyway, for properly observing and recording trial shots, since it is advisable to relieve the position finding details of this duty. All

observation should be carried on independently of operations concerned with preparation of fire, and should be carried on whether resulting corrections are applied or not. In a target practice series it will be a rare case when the observation of impacts gives sufficient evidence to warrant their application as corrections. Any results of any kind of observation of fire, whether based on continuous observation or intermittent observations, resulting from the attendant conditions of a particular firing, should be applied according to sound ballistic principles with due regard to the number of shots fired, the number observed, and the relative reliability of observed shots, together with the accuracy thereof, as well as the accuracy of the prepared firing data.

Time and accuracy (hits per gun per minute) are the elements which *command* in the case of firing at moving targets, and the results of observation should be regarded merely as incidental influences to be weighed and then used or cast aside. The ideal fire control system should furnish accurate ballistic data to a gun as rapidly as that gun can be served, laid, and fired. Our present mechanical devices in the general case closely approximate this ideal. They furnish accurate data in a minimum of time. The same elements of time and accuracy dictate that observation of fire must be made without interference with the preparation of fire, must be applied according to sound principles, and not helter-skelter—certainly without delaying the fire. To a large extent persistent interpretations of prescribed regulations for adjustment (regulation) of fire have resulted in an erroneous estimate of the situation by many Coast Artillerymen, so that observation of fire has been a bugbear resulting in a general condition truly reflected in General Hagood's article. Nevertheless, the results of observation of fire have been satisfactorily obtained and applied by the fire control system now available, and the procedure is a common sense medium between the extremes represented by the pre-war regulations, and the views reflected by General Hagood's "Progressive Bloc of Imitation Field Artillerymen."

The firing problem boils down to this—"Prepare your fire as if you would have no observation and observe your fire as if you had no preparation." Common sense then dictates that the results of observation be applied according to sound gunnery principles and only when there is sufficient evidence that they may increase the effectiveness of fire—*hits per gun per minute*. Also, common sense dictates that in fire at moving targets every precaution should be taken at the guns, in the fire control stations, in training, and in execution of fire, to insure accurately prepared fire, for in action

main reliance must be placed on such fire, because observation at best will be intermittent even though means exist to apply properly and without loss of time the information obtained from such observation.

My contention in these matters can be illustrated by a single example—one which might well be included in the "Memory Books" of many battery commanders. Captain A opens fire on Battleship X, immediately after having fired four well observed trial shots at the approximate range and azimuth of X. Battery calibrated, guns, and all fire control instruments adjusted, personnel well trained. Captain A has terrestrial observing stations manned. No aeroplanes available. Approximate range to X is 15,000 yards. When fire is opened, using carefully prepared firing data, secured by means of standard devices, it becomes evident that only a few of the shots can be observed. Being a good *Coast Artilleryman*, Captain A knows that at 15,000 yards he can expect, say, 20% of hits on this particular type of ship. An inspection of the record of his observers shows that out of twelve shots fired they have been able to see and identify only five shots, all of which were *short*. The conditions of the moment are such that Captain A may reasonably assume that had more shots been short they would have been identified. Immediately Captain A is justified in believing his prepared fire is as effective as can be expected and he makes no correction, for if he can expect 20% hits, then he must expect 80% misses of which one half or 4.8 should be short. It is evident that his battery is doing the best that can be expected. If in the series of twelve shots or any other series his observations show clearly that he is not getting his expectancy of hits, or if all or a fair proportion of the shots have been observed accurately and their center of impact determined to be a definite amount, say 200 yards, short or over, is there any excuse for not making a correction based upon such reasonable evidence that his prepared fire could be improved? If the spotting system be properly organized, and the conditions of the moment permit determining the sense of the deviations, it will also usually be possible to determine their magnitude. Surely, then, the best procedure would be to apply a correction based upon the available evidence of previous shots, without delaying fire, through the mechanical devices, either as a percentage or velocity correction. Such procedure has actually been followed successfully in several firings at Fort Eustis using the system of fire control comprehensively discussed in *Coast Artillery Board Project No. 114*, published in full in the August, 1923, *COAST ARTILLERY JOURNAL*. The discussion accentuates the undesirability of applying certain terms, such as

"bracketing", "improvement fire", etc., to the Regulation of Fire at moving targets; it exposes the fallacy of the so-called "Bracketing Method" in connection with fire at naval targets with guns of any caliber; and it offers convincing proof that the System for Regulation of Fire advocated for major caliber guns is also applicable, and perhaps better suited, to Regulation of Fire for rapid fire guns.

It seems to me that the System of Fire Control advocated in Coast Artillery Board Project No. 114, "Preparation and Adjustment of Fire Against Naval Targets",* reverts as far toward pre-war extremes as is sound, and that entirely to prohibit corrections due to observations would be a mistake, in that we would fail to take advantage of an available means for gaining in effectiveness of fire, if corrections based upon observation are properly applied. 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. In this connection it may well be noted that it is *only since* the War, *not before* or during it, that text books, as well as Coast Artillery Memoranda, have been susceptible to interpretations which apparently encouraged the methods of adjustment and the application of corrections in fire at *naval targets* which are applicable only to fire at fixed targets.

If we go back to the day of no corrections and our shots land in the wrong pew we would have no means of getting them out with even a chance of placing them in the right church—in other words, if you are wrong you can't get right; if you are off you can't get on. Surely such procedure is not the best obtainable. It would be just as extreme in one direction as adjustment using fixed target methods, where the time element is not so vital, is in the other. Between these two extremes lies the right procedure. As indicated above, that procedure is prepared fire, using observation corrections justified by sufficient evidence as to their value and applied so as not to increase the time of a series of shots. Our Coast Artillery fire control system makes this possible, and surely is satisfactory in the regulation of fire based upon these principles. However, it is important that all Coast Artillerymen appreciate thoroughly the fact that while Coast Artillery technique in the preparation of fire at moving marine targets is readily adaptable to the case of preparation of

*The title could have been more properly "Preparation and Regulation of Fire Against Naval Targets." Since the actual range to a fixed target is constant, the process of determining a corrected range to place the center of impact of a series of shots on the target properly may be conceived and designated Adjustment. Since in the case of a moving marine target the center of impact of a series is brought to the target, having a varying range, by applying corrections which should vary continuously and approximately as the range to the target varies, it appears that the term *Regulation* is a designation more properly applicable than *Adjustment*.

fire at fixed land targets, nevertheless the system for *Regulation* of fire at naval targets requires a procedure quite distinct from those methods for *adjustment* of fire which may be used properly by the Coast or Field Artillery, in firing at fixed land targets.

The Coast Artillery Corps mans fixed and mobile artillery, other than antiaircraft, for the primary purpose of destroying naval targets. It should not be necessary to mention this fact. However, the state of mind of many Coast Artillerymen is such that there is need in our texts and regulations for emphasizing the primary mission of these units, which for effective accomplishment merits the first consideration in training not only in the Regular Service, but in the National Guard, and the Organized Reserves.

It must be quite apparent that it has become politically fashionable not merely to decry warfare, but to assert that it is for us impossible, unthinkable. It would be unjust and presumptuous to assert doubt of the good faith of those who take that position. The deep significance of the expression of such views is that there is a militant public opinion that war may be outlawed and thus prevented. That opinion seems to me to be unenlightened and sentimental, based on wishes, not on knowledge or experience or history. Such doctrine is dangerous because it is likely to lead to lack of preparation for a conflict with some state or combination of states actuated by aims quite different from the altruistic ones that we boast. How can men and women be blind to the innumerable wars, international and intra-national, that have taken place; to the several armed revolutions now in being? How can they think that the nature of mankind or of any considerable part of it has been changed overnight or will be? To the balanced mind, that sees things as they are, it is not opinion, belief or faith, but certainty that there will be more wars. To such a mind specific prophecy is repugnant, but it can see general causes and conditions existing today that are potential sources of war.—Gen. E. F. McGlachlin, to graduating class, Army War College, 1923.

Fire Effect On Naval Targets and Coast Artillery Forts

First Prize Journal Essay Competition, 1923.

By 1ST LIEUTENANT C. E. BRAND, C. A. C.

THE Coast Artillery Corps, as a part of the Army of the United States, has certain definite prescribed missions, as laid down in the pamphlet "Joint Army and Navy Action in Coast Defense" and in paragraph 15 of the basic Training Regulations (10-5) of the Army. These missions are summarized in the latter as (1) . . . "keeping the area in reach of its guns clear of hostile vessels", and (2) "preventing a run-by." The latter is obviously a secondary mission which becomes of primary importance in case of failure in carrying out the primary mission. It is then chiefly, or largely, a mission of the submarine mine defense.

The primary weapons of the Coast Artillery are (1) the cannon, (2) the antiaircraft gun, and (3) the submarine mine. The submarine mine is chiefly concerned in the second mission mentioned above, and it is intended to discuss it only to the extent of keeping the mine field itself clear of hostile vessels, which is obviously an important aspect of the first mission. The antiaircraft gun also has a special and secondary role which will not be discussed. Its mission is entirely separate from the mission of the coast defense gun. Both the submarine mine and the antiaircraft gun are minor, though important weapons of the Coast Artillery defense. "Its essential characteristic is fire power", its essential weapon the cannon.

The pitting of naval forces against coast defenses presents an anomalous situation upon which there exists the greatest diversity of opinion on the part of military and naval officers. There are good Coast Artillerymen who contend in good faith that the stone bastioned fort now discarded half a century ago, armed with smooth bore cannon, is sufficient to prevent the occupation of a harbor by any hostile fleet—though naturally not to protect its utilities. There are more of our leading artillerymen, who are perhaps actuated by pride in their profession as much as by their candid estimate of the tactical requirements of the situation, who desire to have our coast fortifications equipped with ultra-modern guns of the longest

range and in great number. This, in turn, requires highly improved position finding, searchlight, and spotting service, which it is the pride of the inventive and scientific genius of the corps to develop and perfect.

According to the naval formula the seacoast fort is in an entirely different category from the battleship, whose fighting strength is the product of its hitting power—its gun fire—by its *life under fire*. Applying the same formula to the coast artillery fort, even the most inferior of which have a *practically infinite* life, it is obviously, in the long run, a hopeless proposition for the battleship. It is in fact considered so by naval men, and history has amply verified their position. The Dardanelles affair, undertaken contrary to the advice of naval experts, is the most colossal example in recent times. The highly qualified success at Zeebrugge and Ostend after the elaborate planning and timing of every detail, several months special training, and the building of special auxiliary types, all of which required much time and preparation, is only slightly more encouraging from the naval point of view.

Other examples of the practical invulnerability of coast fortifications, drawn from all times since the invention of firearms, are numerous and convincing. And the enormously increased range and indirect fire of modern guns have rendered their immunity from material damage practically complete. A few elemental considerations will explain this immunity: (a) A direct hit on the gun is required to cause any material damage. (b) A single gun is almost an infinitesimal target at, for example, 20,000 yards range. A vertical error of 15 seconds of arc on the part of the ship's guns at that range will cause a miss, assuming an average target that would be presented. And a roll of 15 seconds is scarcely perceptible on the ship. As a target for aircraft a gun may be considered about 12 yards in diameter. A bomber flying at 90 miles an hour would fly that distance in about $\frac{1}{4}$ second. In other words, if the plane flies directly over the battery an error of $\frac{1}{4}$ second in dropping the bomb will cause a miss, as will also any variation in wind force during its descent. This assumes, further, that the deflections computed by the bomber were perfect at the instant. It will be remembered, in addition, that the bomber does not get a second shot. (c) A shore battery is a most unsatisfactory aiming point at best, and at present ranges an almost impossible one. The sharp lines of a battleship form a most striking contrast.

As examples of the practical invulnerability of seacoast batteries during the World War, the following engagements may be

noted in passing. A closer examination of some of these will follow later:

At Zeebrugge during the action with the *Vindictive* while the blocking attack was in progress no guns were put out of action on the mole, though this was the *Vindictive's* objective, and the range was *less than 500 yards*.*

Concerning the bombardment of the outer forts at the Dardanelles it is recorded in the diary of H. M. S. *Queen Elizabeth*: "This bombardment made us realize that to put a fort out of action, it was necessary to get direct hits on the guns. The Turks fought their guns most gallantly, and from time to time we all thought that they would be abandoned as each succeeding shell fell in the emplacement; but the guns, which were on disappearing mountings,† invariably reappeared and replied to our fire." The individual guns of these forts, which were old and comparatively ineffective, were finally shot down at pointblank range by old battleships.

Later the *Queen Elizabeth* shelled Fort 13 at Kilid Bahr, using reduced charges and indirect fire at 12,500 yards, with seaplane spotting. Although 20 of the 33 shots fired were hits, no damage was done to the fort. A few comparatively small caliber howitzers then drove the *Queen Elizabeth* out to 22,000 yards, where her fire was wholly ineffective.

On October 29, 1914, during the bombardment and capture of Tsingtao by combined Japanese and British forces, 10 large shells (10-inch) from H. M. S. *Triumph* were observed to burst inside Fort Itlis. No guns were damaged.

Against the 153 German guns emplaced along the 40 miles of Belgian coast in the neighborhood of Zeebrugge-Ostend, no less than 40 attacks were made by British ships during the war. Yet not one gun, mounting, nor magazine of these numerous batteries was ever hit. Most of the batteries were emplaced for indirect fire. The engagements varied in kind from long range bombardments by monitors to pointblank engagements such as that referred to at Zeebrugge.

Other examples would be superfluous, though there might be added the numerous German raids and bombardments on the British coast from Hartlepool to Yarmouth which occurred during the early part of the war. The results were identical, and in some cases the wholesome dread felt by such ships as battle cruisers for even a single coast defense gun of small caliber was amply demonstrated.

*See description following.

†This will be of particular interest to artillerymen who have condemned the disappearing carriage as a complicated piece of mechanism easily put out of order.

These, then, are the different aspects of the naval-coast defense combat: in the army, varying from the viewpoint of the smooth bore advocate to that of the rather common type of artilleryman who is alarmed at the idea that his guns may be somewhat outranged; in the navy, practically unanimous admission that it is by nature impossible, and with voluminous and convincing evidence to sustain the admission.

In spite of this admission, however, there is a coast defense problem. More accurately, there are a number of separate problems according to the places to be defended—that is, according to the missions of the defense. The summarized primary mission referred to above is further analyzed by the pamphlet “Joint Army and Navy Action in Coast Defense”, as follows: (1) To deny the use of the harbor and its utilities to the enemy; (2) to secure the use of the harbor and its utilities for ourselves, and (3) to cover the debouchment of our fleet from the harbor, and its deployment for battle. When only (1) is required the stone fort would doubtless be somewhat effective defense, if not sufficient. When (2) is required, however, it is patent that the guns of the defense must be far enough ahead or with sufficient range to keep the enemy out of effective bombardment range of the utilities to be protected.* And when (3) is to be accomplished the guns of the defense, which in this case act offensively, must have either a longer effective range than the enemy battleships or at least equal effective range and advanced situations (on islands or projecting promontories) in the vicinity of which our fleet may deploy. In addition it must not be forgotten that submarine mine fields, especially at points where a run-by might be profitable to the enemy, must be protected by gun fire of secondary armament against small surface craft. We shall not at present complicate our problem by the consideration of defense against submarines, the use of automobile torpedoes, and naval auxiliaries. These considerations do not materially affect “our essential characteristic, . . . fire power.”

The above basic considerations are more or less self-evident. The *amount* and *quality* of gun fire required to accomplish (1), (2), or (3) of our primary mission, as analyzed above, is not at all self-evident, nor easily arrived at, particularly because of the utter dissimilarity of a battleship and a coast artillery fort. The one thing which they possess in common is gun fire—hitting power. Their greatest dissimilarities lie in the utter immobility and comparative invulnerability of the fort. The hitting power of the battleship,

*It must be noted that while the guns of the defense will not be seriously damaged, if at all, by medium range bombardment, harbor utilities may be rendered useless or destroyed.

from guns of a comparatively low accuracy life, is, as mentioned above, largely futile against the fort so far as material damage is concerned. Every hit which the battleship receives, however, lessens its necessarily short life until, if it continues the action long enough, in spite of its superior gun power, it is ultimately sunk and destroyed. When it is within range of coast fortifications there is the constant menace of a few lucky hits and the certainty of its ultimate destruction which give even a single coast defense gun the power of "keeping the area within its range clear of hostile vessels", except while such vessels are actively engaged in carrying out an important mission which justifies the risk. The opportunity to "T" a debouching column of our fleet and destroy its leading elements by concentrated fire—the first principle of naval tactics—would amply justify a large risk. The opportunity of destroying harbor or canal utilities of great military importance to us would justify taking a chance. There is a lower limit of defense which a naval commander would attempt to force in order to secure a harbor for his own use. And moreover civilian chiefs of bureaus and departments will in the future as they have done in the past, demand determined assaults upon comparatively well fortified defenses. A real test of our ability to accomplish submission (1) is therefore not impossible in any coast defense, though it is highly improbable in all of them which have any adequate defense.

FIRE EFFECT ON NAVAL TARGETS

The question of how much defense is adequate for the accomplishment of (2) and (3) and even of (1) is one to which the answer must be revised from time to time as naval armor and armament are improved. Since our primary rôle is purely defensive it is necessary for all considerations to know our possible enemy in every conceivable detail and prepare our defense purely in that light. We can have no offensive tactics. We can have no strategic doctrine as to the means and method of "imposing our will upon the enemy." He will in every case plan the battle as he sees fit. We can but await his action and counter it. Therefore, we must know him, particularly his material and its capabilities, as we know nothing else save our own material and how to use it. And the one feature of both which is most obscure and at the same time of paramount importance is the most likely effect of that intangible "fire power" which is our "essential characteristic", as well as one of his.

Warships are divided into rather well-known classes—battleships, battle cruisers, cruisers, destroyers, submarines, monitors,

etc.—the characteristics of which are well-known to every coast artilleryman. These may be roughly divided into four classes (modern types) as follows: (1) Battleship (BB)—30,000 tons displacement, twelve 14-inch and sixteen 6-inch guns, 21 knot speed, life of twenty 14-inch hits; (2) Battle cruiser (CC)—30,000 tons displacement, eight 14-inch and twelve 6-inch guns, 30 knot speed, life of eleven 14-inch hits; (3) Cruisers (CL, CA, etc.)—5000-15,000 tons displacement, six to twelve 6-inch guns, 30 knot speed, life of thirty to fifty 6-inch hits, or one to five 14-inch hits; (4) Other vessels, with special missions—aircraft carriers, destroyers, submarines, monitors, etc.: small gun power, relatively high speed (except monitor), small or no armor protection, various sizes and missions. Of these (1) and (2), and sometimes (3), carry airplanes and in some cases captive balloons for reconnaissance and spotting. Torpedo offense and defense are omitted from the discussion since they do not affect the coast defense problem.

It is not necessary, however, to know our possible enemies simply as classes and types. The world's ships of war are not so numerous but that we can know each and all of them individually by name, appearance, characteristics, armor and armament—by nationality and running mates. And indeed we do know in such detail the world's capital ships and most of its smaller craft. It is one of the simplest details of our profession. Jane's *Fighting Ships*, revised from year to year, has made that possible.

There are at the present time some fifty-six capital fighting ships in the world besides our own which will be retained under the provisions of the arms limitation conference: twenty-two British, ten Japanese, six French, five Italian, five Russian, three Spanish, two Brazilian, two Argentinian and one Chilean. Of these twenty may be considered completely modern:* thirteen British, six Japanese, one Chilean. All the above are BBs excepting four British, four Japanese, and four Russian CCs. Of the modern warships all are BBs excepting three British CCs, the *Hood* and the *Repulse* and *Renown*, which are the most modern ships in the British navy. The remaining modern British BBs include the five *Royal Sovereigns* and the five *Queen Elizabeths*, most of which had their *baptisme de feu* at Jutland. The six modern Japanese BBs include the *Nagato* and *Mutsu*, the *Ise* and *Hiuga*, and the *Fuso* and *Yamashiro*. The modern British ships enumerated are all armed with 15-inch guns—eight each except the *Repulse* and *Renown*, which have six each. The *Nagato* and *Mutsu* have eight 16-inch guns each (similar to our

*This division is somewhat arbitrary, but includes as "modern" the newer ships with 14-inch guns and larger. Superior deck, interior, and torpedo protection and high angle fire are characteristics.

Maryland class) and the remaining four Japanese BBs have ten to twelve 14-inch guns each (corresponding to our *Tennessee* to *Nevada* classes). All of these BBs have over 30,000 tons displacement, 21-23 knot speed, a maximum protection of 12-inch-13½-inch belt armor, and the latest modern deck and interior protection and torpedo bulges (or nets, in case of Japanese). The *Repulse* and *Renown* correspond in power to the *Royal Sovereigns* and *Queen Elizabeths*.* The *Hood* is a super CC with actual fighting strength of a *Queen Elizabeth* (eight 15-inch guns, 12-inch belt armor) in addition to its 31 knot speed and other CC characteristics. The Chilean *Almirante Latorre* (ten 14-inch guns) mentioned as the 20th modern warship, is of British construction and was in British service during the World War.† It corresponds to our *Texas* class.

As noted above, nearly half of the twenty modern warships (most of the *Royal Sovereigns* and *Queen Elizabeths*) together with a variety of older types were actually put through the test of modern battle at Jutland. And the *Queen Elizabeth* herself participated in the attack on the Dardanelles. Besides there were a number of other engagements of more or less importance during the war which involved warships of various kinds and coast fortifications. It is therefore possible to get authentic and reliable information on two important points: (1) how these ships and the older types stand up under modern gun fire, and (2) the effect of naval gun fire from vessels of modern special mission types on superior, average and inferior coast fortifications.

The number of major caliber hits received by each ship in the Jutland battle have been carefully collated and their detailed effect on the ship as carefully analyzed, weighed and classified by experts on naval construction as a basis for future designs. Rear Admiral David Watson Taylor, Chief of Construction of our Navy, has given us a digest of this study with conclusions reached.‡ The figures showing the actual fire effect on the different ships engaged is particularly illuminating. Of the *Queen Elizabeth* type the *Warspite* received the most severe punishment. Due to an unfortunate accident to its steering gear during the action which made it appear disabled and turn out of line, it became the target of a heavy volume of concentrated fire, during which it received in all between twenty and twenty-five major caliber hits. The total vital damage consisted in the disability of one gun by a direct hit on the turret. Although her

*As noted above, the type CC has two-thirds the gun power and about one-half the life of the type BB—i.e., one-third the fighting strength—this is the price of its superior speed.

†Its sister ship *Almirante Cochrane* was retained by the British and converted into the aircraft carrier *Eagle*.

‡See reprint in JOURNAL OF THE U. S. ARTILLERY, April, 1921.

upperworks were riddled and communications were somewhat impaired, the ship was in action as soon as the steering gear could be adjusted. Another individual example of severe punishment from gun fire was that of the German CC *Lutzw* (Hipper's flagship) which received seventeen major caliber hits and one torpedo before she was finally disabled. She was then sunk some six hours later by a friendly torpedo after the Germans had found it impossible or impracticable to save her.

Excepting the three British CCs which were each sunk by a single explosion (apparently of their own magazines, and which is generally conceded to have been caused by faulty construction and careless handling of additional powder charges in the turrets) the dozen modern capital ships which bore the brunt of the Jutland battle received a total of 140-150 hits, or an average of about twelve each. None were disabled other than those referred to above. Moreover, the battle cruisers were in the forefront of the fight and gave and took the lion's share of the hitting.§

Equally noticeable with the stamina of the modern types at Jutland was the lack of it in the older types there and elsewhere. Without exception they fell an easy prey to modern gun power, mines and torpedoes, a single explosion usually doing the work. A total of twenty-one pre-dreadnought battleships and twenty-seven armored cruisers were lost in this manner during the war.* Three of the old battleships were sunk and four others disabled by the defenses of the Dardanelles.

The two observations on the Jutland analysis referred to, which are verified by practically every other naval and naval-coast defense engagement during the war, may be summarized as follows:

(1) A modern warship will stand a great amount of punishment by modern gun fire, or torpedoes, or mines. The Naval War College adopts for its problems twenty hits of 14-inch caliber or four torpedo or mine explosions as the life of a BB; and similarly eleven gun fire hits, or three torpedo or mine explosions as the life of a CC. These figures appear at least small enough.†

(2) An old warship can be destroyed if it ventures within the range of modern guns or into our mine fields. A single mine, or a mortar shell through its deck would probably finish it.‡

§Hence the *Hood* and our *Constellation* class and Japanese *Amagi* which were building prior to the arms limitation conference.

*See numerous references and some more or less detailed accounts following.

†"Tactical Employment of Heavy Artillery", a provisional publication of the Coast Artillery Board, gives the life of a modern capital ship as five hits. The basis for this is not known.

‡See Notes on Firing against old *Massachusetts* at Pensacola, Fla., in December, 1920, reprinted in JOURNAL OF THE U. S. ARTILLERY, July 1921.

Corollary to these observations, it is fairly certain that (1) new ships for replacements allowed under the limitation of arms conference, though within the 35,000 ton and other limitations imposed, will be *modern* in every respect, especially with regard to heavy armor and armament, internal, deck and torpedo protection, and high angle fire. (2) Old ships will be discarded and scrapped as soon as possible. This will be especially true since the retention of the old ship, under the conference limitations, prevents building the new. In that connection warships are obsolete long before they are twenty years old, which is the age limit placed by the conference. A twenty-year-old battleship is a relic. However, a ship accidentally lost may apparently be replaced at any time. Thus the French will probably replace the *France*, their oldest battleship, which was accidentally sunk during the past year. Also there is no prohibition from modernizing old ships to some extent. And this work and the building of non-capital types has been undertaken in new proportions in our own and other navies. (3) Aircraft carriers will be built to the limit allowed.

It seems fairly safe to assume, then, that naval ships of war which may be our enemies in the future will be modern ships and that they will have a large factor of resistance—not to be overcome by a few hits with A. P. shot or shell, nor by a single mine, as we have been led to believe in the past.

Though secondary armament has been mentioned only incidentally, it must not be presumed to have only incidental functions against warships. It must be remembered that the largest guns of von Spee's squadron which terrorized the commerce of the southern oceans and sent Admiral Cradock's flag down in the Pacific at Coronel—with a slow battleship supporting out of supporting distance—were of 8.2-inch caliber. And it was not until the British CCs were dispatched to the Falklands that the *Gneisenau* and *Scharnhörs*t and a few lighter cruisers could be stopped from their depredations. A fast cruiser armed with 6-inch guns is a powerful vessel. The reason such a ship cannot do battle with a BB or a CC is not so much that she lacks gun power, though comparatively of course she does, but because of the certainty that a single 14-inch shell would finish her—not her guns, which would go down in action, but her vulnerable hull which keeps the guns afloat. The same guns emplaced in a seacoast battery could drive the BB or CC out of their range and inflict very serious damage, especially to the personnel, while so doing. Such actually happened in the Hartlepool action, for example, where three 6-inch guns drove away one CC and two

CLs with severe losses to the ships and practically none to the shore batteries.*

The particular power of these guns lies in their rapid fire—from four to six shots per minute, as compared with one shot per minute from the primary armament. Also while they cannot penetrate heavy armor, their destructive effect is really terrific. For example, one 6-inch shell from the Zeebrugge mole battery wiped out an entire company of fifty-six British marines who were about to charge up a gangway, killing forty-nine and wounding seven. According to the Naval War College figures, eight 6-inch hits should sink or entirely disable the type destroyer, and thirty such hits similarly disable the type CL. The only reason the *Vindictive* was not sunk alongside the mole at Zeebrugge was that in the excitement at pointblank range the Germans fired into her upperworks instead of at her water line.

Their rapid rate of fire, great accuracy in direct fire at short range, and powerful destructive effect against all non-capital types, make these guns practically indispensable to seacoast fortifications for two important purposes: (1) to protect the submarine mine fields or other obstructions from raids by surface craft, and (2) in harbors where a blocking attack would be profitable, to sink or entirely disable the block ships before they could reach their positions. For both these purposes they must be assisted by searchlights (the most important function of the searchlight), for such operations will rarely be undertaken except at night. It may be mentioned that the joint army and navy maneuvers in Long Island Sound in 1913 seemed to indicate that our coast defense mines can be swept only with the greatest difficulty, if at all. Destroyers, in those maneuvers, were given the location of the fields and opportunity to work on them, and were unable to do even the slightest damage to mines, cables, or distribution boxes. Trawlers with proper equipment and in more favorable water, however, would doubtless have more success. And the importance of the mine field to the defense does not warrant its neglect. For instance, in those same maneuvers the entire Atlantic fleet effected a "run-by" at night under a smoke screen without even detection, much less any damage done by the shore batteries. The coast defense commander, however, claimed that five of the BBs would have been sunk by mines which the destroyers had been unable to sweep.

Although blocking attacks are beset with many difficulties and can only be made at all on relatively few harbors, there are nevertheless a few harbors upon which a successful blocking attack under

*See description of action following.

conditions which might easily arise would be most disastrous—for instance, Balboa harbor under almost any condition, but especially before the fleets were joined. The accepted effective defense against such an attack is some form of obstacle, a protected mine field being the best, and powerful secondary batteries to be used against the block ships. The weakness of the Zeebrugge defense was that the secondary batteries which commanded the situation were emplaced to cover the area outside the mole. The British offense was based on that weakness. When the block ships had succeeded in passing the mole they experienced comparatively little difficulty in reaching their objectives—except the *Thetis* which was caught and grounded by the net obstruction. Had the *Intrepid* and *Iphigenia*, which followed, been subjected to the fire which riddled the *Vindictive*, blew up her conning tower, and carried away her controls as she approached her objective at Ostend a month later, there is no reason to suppose that they would have been any more successful than the *Vindictive* was.

Having observed the fire effect on naval targets of different types of armament, let us now turn to the armament with which our coast fortifications are actually equipped. To begin with the primary armament, we find that the majority of this armament in the majority of the defenses consists of 12-inch guns and disappearing carriages, and 12-inch mortars, most of them designed and emplaced about or shortly after 1900. There are over two hundred of these mortars in all, and nearly one hundred guns. The latter have been modified recently to increase their range somewhat over 17,000 yards. Up to that range these guns are perhaps slightly less effective against armored vessels than the primary German armament at Jutland, due to the lower muzzle velocity of the seacoast guns, though many of the German guns were of only 11-inch caliber. Instead of the 12-inch guns several of our more important harbors have been more recently equipped with 14-inch guns similarly mounted which, with recent modifications have a range of 23,000-25,000 yards. These guns have not more than 2350 feet per second muzzle velocity, but their power of attack against armored vessels is perhaps equal to that of any ship at Jutland except the *Royal Sovereigns* and *Queen Elizabeths*, which were only slightly superior. In this connection it must be borne in mind that while the naval guns have a higher muzzle velocity than corresponding coast defense guns, they also employ a lighter projectile, the combination giving them the desired flat trajectory, but less destructive effect in case of an effective hit. The above comparisons can therefore not be considered

hard and fast, especially at long ranges. Also, equal destructive effect in case of an effective hit does not imply equal hitting power per gun on account of the much greater accuracy of the fixed sea-coast gun. A coast defense Fire Command of four 14-inch guns has a hitting power that can be compared approximately and roughly with the hitting power of the type BB.* Comparison of percentages of hits expected at various ranges taken from coast artillery and navy tables roughly indicate about this preponderance in favor of the fixed gun. Comparisons indicated above must therefore be understood not as between individual guns, but as between types and calibers, an equal number of correctly placed impacts from each type being assumed.

At about the beginning of the World War the introduction of extremely long ranges (20,000-40,000 yards) brought about a number of changes in the mounting of seacoast artillery, the most notable of which was the replacement of the disappearing carriage by the barbette mount. The reasons for this were complementary, the unprotected barbette mounting being the necessary and sufficient solution of the new problem presented upon two considerations: (1) the disappearing carriage is not a practical mount for high angle fire which is necessary for long ranges, and (2) the material protection afforded by the disappearing carriage is not necessary at long ranges, as has been amply demonstrated. The first of the barbette guns were of 12-inch caliber with 28,000 yards range (since increased to over 30,000). Thirty-two of these guns were emplaced in important harbors. They do not differ materially from the 12-inch guns discussed above in fire power except that their long range and high angle of fall permits them to attack the decks of ships effectively at long range.

The demand for heavy artillery in Europe during the war caused the mounting of many coast artillery guns and mortars on railway and other mobile mounts. There remain on hand at present about two hundred of these, ranging in caliber from 7-inch to 16-inch. All of these were mounted for high angle fire on their mobile mounts so that their range (excepting the 91 mortars) is increased to 22,000 yards and up. About thirty of the guns are of primary caliber, in addition to the mortars. These guns have fire power similar to the 12-inch barbette guns referred to above, except that they are greatly inferior in accuracy and flexibility—this being the price of their mobility. It is to be doubted whether the mobility is worth it for coast defense purposes.

*Note that this is not a comparison of *fighting strength*, which is the product of the hitting power by the life of each opponent.

The turret guns only (main battery) of the BB are considered.

The new guns which are being built—the post-war product—are of 14-inch and 16-inch caliber and are designed to have the greatest possible flexibility. This includes 360-degree traverse, elevation from 65 degrees to -5 degrees, mobility by ordinary railroad, and semi-permanent or permanent fixed emplacements in which they can be installed within a few hours as firing positions. While simple in design and presenting as small as possible a target, these guns are to be operated electrically in order to give a rapid rate of fire (one shot per 40 seconds is claimed) and are to be emplaced in irregularly echeloned groups of four or eight pieces for long range work. They are to have high muzzle velocity (equal to naval guns), and provision is made for zoning in order to enable them to attack the decks of ships at long and medium or even short ranges, and to increase the accuracy life of the gun when the high muzzle velocity is not needed. These guns will be superior in power in every way to any naval guns now in service, and greatly superior to any guns that were engaged at Jutland.

Our secondary armament consists in the main of 3-inch and 6-inch batteries which were emplaced before the war. The 3-inch guns are now recognized as primarily useful only for anti-aircraft work and may, for present purposes, be passed over. Many of the 6-inch guns are mounted on disappearing carriages. It is true that these are the only seacoast guns which need any material protection from direct fire. But the evidence of numerous examples already cited, and several to be mentioned later, would indicate that they do not need it at the sacrifice of half their rate of fire, which the disappearing carriage necessitates. These guns are, in other words, about half effective. The 6-inch seacoast guns are practically identical, with regard to fire power, with naval guns of the same caliber, except for the rate of fire of those mounted on disappearing carriages as noted. Extremely rapid, powerful and accurate fire at short ranges characterizes these guns. The rate of fire of any 6-inch gun should be at least from four to six shots per minute, which is the normal rate for naval and barbette coast defense guns of that caliber. The coast defense gun should have some advantage in rapidity of fire, and does have a marked advantage in accuracy.

In addition to the 6-inch guns on fixed mounts there are also on hand some seventy-eight guns ranging in caliber from 7-inch to 10-inch which were placed on mobile mounts during the war, to which reference has already been made. Those guns have about the same power as the batteries of the *Gneisenau* and *Scharnhorst* mentioned above, and probably no greater accuracy and even less flexibility on their mobile mounts. They have no marked superiority over the

6-inch gun, probably losing in rapidity of fire what they gain in destructive power. They are not capable of successfully attacking the armor of capital ships.

Another weapon which has been added to the secondary armament of the coast defenses recently is the 155-mm. gun. About twenty of these guns have been assigned to each of several important harbor fortifications. They are mounted on mobile tractor-drawn mounts and have the disadvantages inherent in mobile mounts—in particular, loss of accuracy, and loss of flexibility occasioned by the comparatively small arc through which they can be fired. Of course all mobile artillery has a strategic flexibility which fixed guns entirely lack. This is very important from a strategic viewpoint and may very likely necessitate the mobile mounting of many guns assigned to the coast artillery, who would thereby be enabled to use them in other coast defenses or in field operations in the event of war. But this is another matter and quite apart from the tactical consideration of the fire power of such a gun on this particular type of mounting on which it would go into action. And it is a fact that once the mobile gun has been set up in firing position its fire power is rather narrowly limited both in arc of fire and in accuracy, especially against naval targets moving at high speed; and the gun itself is very unwieldy as compared with the ordinary barbette 6-inch gun which can be turned with one hand and within a very few seconds to any point of the compass, fired however rapidly without disturbing its level or any of its nice adjustments, and served with the greatest convenience by its crew. These 155-mm. guns, however, greatly augment our secondary armament, and if emplaced so as to cover the mine fields and the entrance to channels which might be blocked, may be of very great value. In fire power they may be considered identical with 6-inch guns (except for the mounting). And by increasing the volume of secondary fire they may be depended upon, where emplaced in numbers, preferably in groups which could employ some form of director fire (in direction—"follow the pointer" in range also), to speedily drive away or destroy any vessel coming within, say, 15,000 yards, unless such vessel be itself delivering a tremendous volume of neutralizing fire, and even in that case the examples of the past indicate that the action must ultimately break in favor of the shore batteries.

FIRE EFFECT ON COAST FORTIFICATIONS

In addition to the effect of gunfire which the coast defenses can deliver on warships, there must be considered in addition in more

detail the effect of the gunfire of the ships on coast fortifications. This might be traced through several centuries with the same result. The verdict of history is practically unanimous. An elaborate "Study of Attacks Upon Fortified Harbors"* was prepared by Lieutenant Commander W. L. Rodgers, U. S. N., after the Spanish-American war, covering twelve such attacks from the first capture of Cartagena by Sir Francis Drake in 1586 to and including the capture of Santiago de Cuba in 1898. This study is by no means obsolete. The past twenty years have hardly changed it. Since modern examples are more impressive and are not lacking, these comparatively ancient actions will not be reviewed in detail. However, the general conclusions of Commander Rodgers are obvious and demonstrated observations upon the study, and are enumerated in the following summary form as basic:

(1) A determined attack upon a fortified harbor will be undertaken only when the enemy's *communications* justify and demand it.

(2) When undertaken, such an attack is primarily the mission of an *army*, the function of the enemy fleet being to maintain the communications of its army and, secondarily, to support the attack of the army by long range bombardment not endangering the fleet.

(3) A run-by, such as Farragut made in the Mississippi and at Mobile Bay, is very exceptional and hazardous and can be made only where the country is already invested and communication can be established by the invader past the point of run-by. Gunfire alone cannot ordinarily prevent a run-by, if determined upon. Submarine mines and other obstructions protected by gunfire constitute the proper defense.

(4) Even when a determined attack is made upon harbor fortifications, which are thereby subjected to heavy gunfire, the material damage suffered by such fortifications will be small, although their personnel may be driven away from the guns and their fire may be temporarily smothered.

(5) The recent development of the powerful defensive qualities of the submarine will cause attacking vessels to approach fortified harbors even more warily in the future than they have in the past.

The following attacks on fortified harbors during the World War furnish ample modern test of the above conclusions and further exemplify other observations which have been made above and conclusions which will be reached below:

(1) The Dardanelles Campaign (1915).

(2) The Blocking Attacks upon Zeebrugge and Ostend (1918).

(3) The Bombardment of the Hartlepoons (1914).

*Artillery School Press.

These examples are selected to include on the one extreme the stupendous Dardanelles Campaign which lasted nearly a year and involved a quarter of a million casualties, and on the other extreme the rather insignificant raid by three German cruisers upon an English port defended by three 6-inch guns. In magnitude and purpose and conditions of combat the naval-coast defense actions of the war varied between these extremes. However, their main characteristics and net results will be found strikingly similar.

THE DARDANELLES CAMPAIGN

This campaign was obvious from the first of the war as a likely course of action, and received early consideration. Possession of the Dardanelles by the Allies would mean (1) communications with Russia in the Black Sea established, with the great concomitant and ensuing military advantages which such communications would imply, and (2) breaking the communications and with them the military strength of the Turks, as well as occupying their capital. The importance of this campaign was accordingly too obvious to be overlooked by either side.

There was a brief bombardment of the Dardanelles by the British as early as November 3, 1914—within a month after the declaration of war with Turkey. But it was not until after the first of 1915 that an appeal for help by Russia brought the project into immediate serious consideration. The great importance of the objective was most obvious. But the possibility of forcing the passage, even against the supposedly inferior Turk, was quite doubtful. High naval officers were reluctant or opposed to the scheme, and Lord Fisher, the First Sea Lord, was first more interested in a Baltic campaign, and later entirely disapproved of the Dardanelles affair. But Vice-Admiral Carden, the local naval commander, proposed a progressive attack on the defenses (purely naval) which he believed practical, and the First Lord, Mr. Winston Churchill, waxed enthusiastic over it, picturing the forts falling in succession before the *Queen Elizabeth's* guns much as the Belgian forts at Leige and Namur had fallen before the German howitzers. The plan was accordingly adopted.

The force assigned to the task consisted of the *Queen Elizabeth* and a heterogenous collection of old British and French battleships. Here it may be noted that (a) the undertaking was purely *naval*; (b) had the fleet alone succeeded in passing the Dardanelles it could not have accomplished its mission without an army to invest Constantinople and the defenses; (c) there was no detailed and careful

planning and training for the attack as, for example, preceded the later attack on Zeebrugge. These considerations are most directly connected with the results of the campaign.

The naval actions at the Dardanelles for the month following, February 19, 1915, have been gone over too often to bear a detailed repetition. The comparatively weak outer Kumkale and Sedd el Bahr forts were subjected to much ineffectual bombardment, and finally the guns were shot down individually at pointblank range and the batteries thereby silenced. The Kilid Bahr and Chanak forts at the Narrows were next attacked. But this was a different matter. These forts mounted at least nine 14-inch guns and more than a score of effective intermediate caliber guns. They were shelled without effect from the strait and across the Gallipoli peninsula. The effect of the *Queen Elizabeth's* fire, though at favorable range, indirect—so as to give the proper angle of fall—and perfectly spotted, was most disappointingly unlike that of the German howitzers in Belgium. She was finally driven beyond her own effective range by comparatively small mobile howitzers. Then came on March 18 the grand final attack by the entire force of old battleships. It was over in a few hours and was a great killing for the Turks. Three of the battleships were sunk and four others disabled, most of the damage being done by mines. There was now no further doubt about the project. It was a failure, and was abandoned.

It was now realized that an army to work in conjunction with the fleet was necessary for the further pursuance of the campaign. Accordingly, after long delay, Sir Ian Hamilton was placed in command of an army which landed on Gallipoli Peninsula and operated under great difficulties for some eight months. But the Turks and Germans had by this time greatly developed their defense, and this campaign, too, was finally abandoned in January, 1916. The quitting of the Gallipoli peninsula was the most brilliant as well as the most worthy achievement of the immense and altogether disastrous campaign. Its losses had been 130,000 casualties, its gains practically nothing.

A great many explanations of this failure have been given (mostly by people who believed that it *should* have succeeded), including as reasons the climate, the weather, the time and place of attack and a great many other details of minor importance. But all history, the experience of the immediate and the more remote past, points strongly to the basic considerations affecting the enterprise: (1) The undertaking, though with a most worthy objective, was in its nature most exceedingly difficult and merited the greatest possible effort if success were to be even hoped for. (2) It was in

fact undertaken by naval forces alone, at the only time when it could have succeeded, and most of the material was at best second rate. (3) There was no careful planning and coordination of the elements of the forces used in order to deliver the maximum concentrated and properly directed effort of the entire command.

The entire campaign was based upon an extravagant hypothesis of the fire power of the *Queen Elizabeth*. This hypothesis was not justified by history and was not true. The campaign in fact collapsed about that demonstrated error when on March 15 the *Queen Elizabeth*, after registering twenty futile hits on a fort that a half dozen shots were supposed to have demolished, was driven out of range and forced to recognize her impotence. That was really the end.

BLOCKING ATTACKS ON ZEEBRUGGE AND OSTEND

(April 22-23 and May 9-10, 1918)

Bruges was an important German submarine base, only sixty miles from Dover Straits. It is situated inland and communicates with the sea by canals which exit at Zeebrugge and Ostend. This base was a powerful asset to the Germans in their submarine warfare, which threatened to be their death grip on allied shipping, the vital and only communication of the British and Americans between their home resources and the theatre of operations in Europe. To destroy that line of communication would be to destroy British and American military strength in France. The forty miles of coast line which protected this veritable submarine battery accordingly fairly bristled with guns for its defense: 153 in all, ranging in caliber from 4-inch to 15-inch, and a number of them having range over 40,000 yards.

From the Allied viewpoint the destruction of this base would greatly lengthen the German line of communications to his submarine base, which was already beset with numerous obstacles. To force German submarines to operate from Helgoland Bight would relieve the Dover patrol of its awful responsibility, would save thousands of tons of shipping, and would fairly remove the actual menace of submarine warfare for the time being at least.

British monitors had been highly developed for use against the Belgian coast, and had exercised themselves extensively with ineffectual bombardments of its fortifications. Any engagement of ships with the guns on the Belgian coast as a serious undertaking was worse than hopeless. It was impossible. There was one form of attack suggested by the narrow canal exits at Zeebrugge and Ostend,

however, that was at least possible, and that was the blocking attack. To be sure such an attack had never been successful in the past, though they had been tried, notably at Santiago, and thrice repeated at Port Arthur. But the nearness from which the attack could be made and the possibility of more finely organizing and training for the attack then had ever been done before augured in its favor, as did also the immense importance of its success.

It was therefore definitely determined upon early in 1918 and the most careful and detailed plans were made. The defense of Zeebrugge, besides the numerous big guns near by, consisted in the main of batteries and works on a mole which formed a kind of crescent circling in front of the canal entrance at less than 1000 yards and connected with the shore on the left side of the canal by a viaduct. The batteries on the mole (three 6-inch and six 4-inch), were naturally emplaced to fire *outward* from it, as were also batteries of four 6-inch and two 4-inch guns some 750 yards to the left of the mole viaduct. There was still the *Goeben* battery of four 8.2-inch guns about 1000 yards to the right of the canal. Now the plan was to approach the mole to pointblank range at midnight under a dense smoke screen (thus leaving the big guns out of the action) and to deliver a powerful diverting attack upon it for the purpose of actually destroying its defenses, in addition to detracting attention from the block ships which should at this time round the mole and approach their positions in the mouth of the canal with only the *Goeben* battery and the net obstruction opposing them. They were likely to be opposition enough.

Accordingly, more than three months were consumed in preparing the *Vindictive* and two ferry boats for the attack on the mole, manufacturing the special smoke apparatus, preparing the block ships—in fact manufacturing or remodeling all the material for the task, and lastly and perhaps most important, training the entire personnel of the enterprise in the exact timed performance of their several functions, and in the closest coordination of every detail. The *Vindictive* was given in addition to her ten 6-inch guns special equipment of one 11-inch howitzer, two 7.5-inch howitzers, sixteen Stokes mortars, flame throwers, sixteen Lewis guns, and four 11½-inch pompoms. Every movement of the action was planned to the minute. And although several details slightly miscarried for different reasons—the most important being the change in the wind from on shore to off shore at the critical moment of attack—the entire plan was carried out most remarkably on schedule. After the preparatory bombardment by the monitors the motor boats with their smoke boxes led the forces to the attack. The *Vindictive's*

party engaged the mole at pointblank range and came alongside at one minute past twelve, while a submarine charged with five and one-half tons of amatol ran into the viaduct and blew it up. The action on the mole now became a very real diversion for all concerned. Due to a heavy swell it was very difficult for the attack ships to lie alongside. And in several instances high ranking officers leaped upon the mole from derricks or any point of vantage as the ships came near to make fast their grapnels—only to be shot away immediately by withering machine gunfire from the “fortified” zone of the mole—and in one instance a single 6-inch shell entirely wiped out a company of marines about to charge up a gangway. The fire at such range was deadly, and the fighting unsurpassed in furious intrepidity. But by such fighting the mole was occupied for an hour while the block ships, as was planned, passed around it, away from its fire, and succeeded in weathering the *Goeben* battery’s fire, breaking through the net obstruction, and reaching their positions in the canal—excepting the *Thetis* which broke the net, and, fouling both her propellers, was grounded and blown up some three hundred feet from the pier. The *Intrepid* and *Iphegenia* were both placed effectively and stopped the canal except for about sixty feet of shallow water at the *Iphegenia*’s stern. The canal was out of commission for the present, and only the smallest submarines could be warped in and out of it after perhaps a month’s dredging.

Meanwhile the simultaneous attack upon Ostend had not gone so well. Due to a heavy fog, the change in the wind at 11:50 referred to which blew their smoke back upon them, and the unfortunate fact that the Germans had tampered with aids to navigation to the extent of moving the Stroom Bank buoy, which marked the channel entrance about a mile east of its normal position, of which the British were not notified, the block ships went aground and had to be blown up about that distance east of Ostend. On the night of May 9-10 the attempt was repeated by the *Vindictive*. This time the British furnished their own aids to navigation, placing a calcium flare in the old position of the Stroom Bank buoy. But again a heavy fog set in, and it was necessary to delay, and finally to light a million candle flare in order to find the channel. Although the entrance was then only two hundred yards off and the *Vindictive* headed straight for it, the guns got on her at once, and their work was deadly. The after control was demolished, the bridge swept, and her commander killed by a heavy shell that struck her conning tower. She succeeded in entering the canal, but immediately grounded fast alongside the pier at about 25 degrees to the canal, and had to be blown up there. The width of the canal was reduced

to about three hundred feet (about half its former width) but was not closed. This attack was therefore a failure.

These attacks, which must be grouped into one enterprise, were doubtless worth while to the British. They cost 637 casualties, but no less than nine V.C.s were awarded and the lasting name won by all who took part in them was a breath of inspiration to the entire navy, which had long been inactive. Moreover, the attack on Zeebrugge was a model of careful planning and close cooperation, and merited the degree of success which it attained. But the enterprise, as a whole, weakened by its dual nature, was, from a viewpoint of military advantage gained, but a partial success at most. The *Vindictive* was but an inconvenience at Ostend, and, as has been noted, it is probable that within a month submarines could be warped in and out at Zeebrugge at high water.

BOMBARDMENT OF THE HARTLEPOOLS

(December 16, 1914)

This was one of a number of raids or "tip and run" bombardments carried out by the Germans against the southern part of the British coast during the early part of the war. The raiding vessels in this case were the *von der Tann* (CC) and the *Seydlitz* and *Blücher* (CLs), having a total of 108 guns and probably 1800 to 2000 men. The defenses of Hartlepool consisted in two batteries mounting a total of three 6-inch guns and manned by eleven officers and one hundred fifty-five men.

Word was received at about midnight that hostile vessels were near and that an attack might be expected. At daylight a heavy fog had closed in to about 4000 yards. At about 8:00 A. M. vessels were seen emerging from the fog flying the British White Ensign and Union Jack. At 8:10 they ran up the German flag and opened fire at 4150 yards. The first shell from the *von der Tann* demolished all telephone communications, but the action continued uninterrupted on that account, since the range was practically pointblank and the direction of fire was conducted through indoctrination according to prearranged plan.

During the bombardment of the batteries, which lasted about fifteen minutes, the range was shortened in some instances to 2000 yards. The *von der Tann* and *Seydlitz* passed by the batteries, moved off to the north and turned their attention to the bombardment of West Hartlepool Works and Shipyard, while the *Blücher* remained and engaged the batteries. Hits were numerous on the defenses, four 11-inch shells bursting within fifty yards of the F.C.

station, and the fire of the batteries was frequently stopped by the smoke of bursting shells on the rocks in front of them. After the first fifteen minutes the action continued in an intermittent and desultory manner for a total of forty-two minutes, the ships in turn delivering their final broadsides against the batteries and disappearing into the fog again at 8:52.

According to the available Dutch and German press reports the ships lost ninety men killed and two hundred twenty wounded. In addition the *Blücher* had two of her 6-inch guns dismounted by fire. The shore batteries fired one hundred twenty-three rounds and lost two men killed. The small loss of the defense was largely due to the naval delayed action fuses which the ships used.

Raids such as this were possible along the Hartlepool-Yarmouth coast because of the fact that the Grand Fleet was based at Scapa—in order that it might cover the north exits of the North Sea. The Dover Patrol and the Harwich Force closed the southern entrance at the Straits of Dover, thus enforcing the complete blockade. Even with the comparatively great distance to Scapa, however, these raids were undertaken at a certain hazard. So long as the raid could be kept secret until it was delivered all was safe from interference. But this was not always or even usually the case. In the instance described above, as referred to, the British had hours of warning, and the German cruisers found Beatty's battle cruisers and a battle squadron from Scapa interposed between them and their bases on the morning of the 16th. Luckily the poor visibility enabled them to escape. But this luck could not continue indefinitely. And when on January 23, 1915, a similar raid by a considerable force of battle cruisers and cruisers was launched against British light forces at Dogger Bank, it found Jellicoe and Beatty already on the ground and prepared for it. The *Blücher* was sunk, and the German losses would have been much heavier except for the fact that the *Lion* (Beatty's flagship) suffered serious damage, and the pursuing force faltered for want of a commander. After this, raids on the English coast were undertaken rarely and with great caution.

SPECIAL TYPES OF WAR VESSELS

In addition to the naval craft used in offensive operations against harbor fortifications which have already been discussed, there are two types which merit somewhat extended consideration. These are the monitor and the submarine.

The monitor is of course an old type, but was greatly developed during the war for long range bombardment purposes, especially by

the British, in their operations against the Belgian coast. The *Erebus* and *Terror*, the "crack" monitors of the Dover Patrol, are still included on the effective list of the British navy. These modern monitors are small, light draught, slow speed vessels mounting two guns of large caliber (15-inch) in a turret. They are little more than practically unsinkable hulls with just enough power to move them around, a moderate amount of local protection in small guns and light armor, and the turreted guns well protected from fire. The monitor has the advantages of (1) small cost of construction, (2) mobility, (3) extremely long range (up to 40,000 yards) with major caliber guns, and (4) excellent protection on account of (a) the extremely small target it presents, (b) its ability to remain in very shallow water where large vessels and submarines cannot approach, (c) its unsinkable honeycomb construction, and (d) the great distance from which it conducts its bombardment. As an example of its comparative invulnerability, one of the British monitors (*Erebus*), which was struck full amidships by a heavily charged distance controlled boat was in service again in a fortnight. The disadvantages of the monitor are (1) its slow speed, (2) its inability to operate at any great distance from its base, and (3) its very low gun power, both in volume and accuracy. A moment's reflection comparing the small unstable monitor with the 30,000 ton battleship with its dozen guns and its excellent facilities for position finding will forcibly impress this fact. Yet we have observed the futility of the *Queen Elizabeth* at the Dardanelles. In matter of fact the British monitors, while useful in preparing an attack by bombardment, as at Zeebrugge, never did any material damage to the German fortifications on the Belgian coast, which was their primary mission. There is therefore little to be feared from the monitor, though its invulnerability and its fire power possibilities must be realized.

The submarine, as Commander Rodgers predicted twenty years ago, has developed into one of the navy's most powerful weapons of defense, and offense, within its scope of activity. It is the only vessel which can, with the exception of small closely guarded areas, go where it pleases if the water is deep enough to permit submerged operations. Since it carries torpedoes which can destroy any vessel it can therefore prevent any surface vessel from remaining in deep water unless under way at high speed. A division of submarines is therefore a very powerful asset to the defense of a harbor. It can positively prevent a close blockade of a port by surface vessels by forcing the blockading vessels to keep under way and zigzag at high speed. And it is a serious menace to any vessel of whatever size that seeks to attack it or comes near it. It must be understood, however,

that the submarine derives its power purely from the fact that it operates by stealth. It is very vulnerable if discovered, and further perfection in listening and sound locating devices may further restrict its powers. However, it can lie motionless on the bottom for hours, can remain at sea for months, maintaining its radio communications both when cruising on the surface and while submerged, and has high surface speed and power of offense against all classes of vessels which makes it a powerful factor in any form of naval operations, whether against the enemy's coasts, which could be patrolled and mined thousands of miles away, or against his ships which were operating on our own coasts or elsewhere. Most of these considerations, however, are purely naval and have only an indirect bearing on the fire power and effect of the opposing forces. They will therefore not be discussed in further detail.

CONCLUSIONS

Although naval operations against our coast defenses are quite unlikely in any form at most places, they are nevertheless possible anywhere and would be quite likely to occur in some form, even if only raids, at some places in case of a war of any magnitude.

Communications being a very vital matter to the operation of any large force away from its base, naval operations against our coast could not be more than raids until our fleet, which would menace the enemy's communications in such operations, were destroyed or effectively put out of action.

Raids or "tip and run" bombardments of seaports and their utilities are more or less unfortunate for the port bombarded, but a few secondary guns will suffice to drive off the raider, regardless of the type of ships he employs (which will be usually CLs or CCs), and the damage done will not be serious unless to morale, and even then would tend to stimulate recruiting. One or two major caliber guns would probably prevent such a raid.

Of supported attacks which might be made in case our fleet were put out of action, the following in which gunfire functions are possible: (a) bombardment of seaports and vessels in their harbors by naval vessels; (b) penetration into a harbor or water area by naval vessels; (c) blocking attacks on seaports; and (d) landing attacks.

(a) Bombardments will be made by the least valuable of *modern* capital ships, possibly but not probably accompanied by monitors. The range will be long and the damage to the ships small. It would require several hours for the ordinary defense to sink one of them by gunfire. But the certainty of this ultimate result will require the bombardment to be terminated after brief duration.

The damage to the defenses will be practically *nil*. Cities and harbor utilities will suffer somewhat according to circumstances. But such an action could in no event be decisive, and that fact in addition to the danger to the ships, especially if there are submarines with the defense, makes it an undesirable form of attack except for harassing purposes.

(b) Penetration into a harbor or water area by naval vessels (excepting submarines) is done at great hazard. It will be attempted only when it is *necessary* for the enemy to establish his communications through an area through which his ultimate objective requires him to operate. If it is a closely guarded area, as it will almost certainly be if it is of such importance, it will then merit and require the enemy's maximum combined effort of army and navy, and of the two the army is the more effective.

Having closed to medium or short range for decisive naval action the volume of fire from the enemy fleet will be overwhelming (ex. one hundred 14-inch and five hundred to six hundred 6-inch shells per minute from a force of 10 BBs). Though their accuracy and effectiveness will be greatly decreased, it is not likely that the individual guns of the defense will be put out of action by this fire, which will be fairly uniformly distributed over the entire vicinity of the batteries, if the crews are properly disciplined to stand by their guns. But it is most highly probable that all or at least many telephone communications, and with them the entire higher chain of command, will be eliminated even at medium range. And it is doubtful if any fire control installations will survive the first burst from the secondary batteries of the ships unless they be well protected. If the action be continued then by the defense it will be by "Battery Commander's Action" or "Gun Commander's Action". And if there is any coordination in the defense it will be by indoctrination in training prior to the action.

It is likely that individual guns will be from time to time entirely smothered out and their fire temporarily silenced by smoke, or possibly, though not probably, especially in the case of disappearing carriages, by unfortunately heavy casualties among the crew. But the guns will not be put out of action, and in an efficient command they will not be long silenced—nor often.

The ships will suffer considerable damage from gunfire, but will not be sunk in rapid succession by a half dozen hits each delivered with target practice precision, as happens in the war game. At least twenty effective major caliber hits will be required to totally disable a BB. As the ships pass on by the fortified area delivering a large volume of neutralizing fire at the batteries, it is likely that no coast defense gun will register more than a half dozen hits altogether. However, there are other weighty considerations: (1) the

submarine mine defense is much more deadly at the point of penetration than gunfire. It would almost certainly occasion serious damage—probably would sink several ships, though from two to four mines per ship, or even more, would be required. (2) Should the enemy pass the defenses, leaving them intact, his communications would be instantly cut behind him unless his army had already invested the country, in which case there would most likely be no necessity for such a sacrifice of ships. With his communications cut behind him there is but one thing that he could do—namely, come out again, doubling his losses and undoing what he had done.

Only an exceptional chain of circumstances entailing most important military consequences, therefore, such as obtained at the Dardanelles, for example, could constitute necessity for or warrant such an attack. It is to be doubted whether the Dardanelles campaign was warranted even under the circumstances. The capture of Riga and the Baltic Islands by the joint operations of the German land and naval forces (the army predominating) at Tagga Bay, however, is evidence that such an attack can succeed in modern times if undertaken by an army operating with secure communications and assisted where practicable by the fleet.

(c) A blocking attack has never yet been successful. Even the model attack upon Zeebrugge was not a complete success. Greater perfection could hardly be hoped for, yet the unexpected might happen, and the possibility cannot be ignored. In that connection a blocking attack must not be thought of as in the one form of sinking an old ship loaded with cement and rubble across a narrow channel. A lock canal could be as effectively blocked by blowing up submarines or other vessels loaded with amatol or T.N.T. against the locks, or destroying them by gunfire or otherwise. Thus there can be conceived a blocking attack by force against the Panama Canal in which a strong enemy fleet should force an entrance past the coast defenses of Balboa at the terrific cost referred to above, or attempt to run the gauntlet through the mine fields under heavy smoke, for the purpose of destroying the Miraflores and Pedro Miguel locks and Miraflores dam by gunfire at short range. This would certainly be a bold and most hazardous undertaking—perhaps impossible if there were submarines in the harbor. But if undertaken at an opportune time to strand a major portion of our battle fleet in Gatun Lake would certainly be most eminently worth while.

The defense against a blocking attack is a strong mine field and powerful secondary batteries. It is too unlikely to warrant special provision for except at most important channels. There the provision should be adequate.

(d) The landing attack is the only practicable means by which our coast can be attacked with any prospect of success. And this is a problem for the mobile army in which the enemy is heavily handicapped. Such an attack will not be undertaken under the guns of the coast defenses.

The fixed coast defense gun thus accomplishes its mission in most instances simply through virtue of its existence as a powerful and invulnerable instrument of destruction that none dare attack.

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(The above is not intended as a complete bibliography of the subject by any means, but is simply a list of references used.)

A Regimental Organization for the Coast Artillery Corps

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EDITOR'S NOTE: *Although this paper was prepared for release to the newspapers throughout the country and has been published by many of them in whole or in part, it is here reproduced because of the general interest of the subject to Coast Artillery Officers.*

ON FEBRUARY 27, 1924, the War Department issued a General Order effecting a reorganization of the Coast Artillery Corps. Before 1901, the Artillery of the United States Army was organized into regiments, each regiment consisting of twelve heavy batteries and two light batteries. The heavy batteries corresponded to those organizations which now man the heavy guns located in our harbor defenses; the light batteries, to the present day Field Artillery batteries.

At the close of the Philippine Insurrection in 1901, the Army was increased in size and was given a general reorganization. At that time, the Artillery consisted of seven regiments. These regiments were designated the 1st to the 7th Artillery, inclusive. In the reorganization of 1901, the Artillery became a Corps consisting of a number of separate companies of Coast Artillery, and a number of separate batteries of Field Artillery, these separate companies and batteries not being grouped into battalions, regiments, or any higher organizations.

In 1907, the Artillery was again increased and the Coast and Field Artillery were separated. The Field Artillery was then organized into regiments and has retained that organization up to the present time. The Coast Artillery, however, continued its Corps organization and has, since 1901, never been organized into higher units than a company, except for the regiments which were organized during the World War, and for such provisional battalions and regiments as have from time to time been temporarily organized for specific purposes. These temporary organizations, in all cases, when the specific purpose for which they were formed has been accomplished, have been disbanded and their identity has been lost. Thus, the esprit, which throughout the history of military organiza-

tions, has always attached to regiments of whatever arm of the service—Infantry, Cavalry, Field Artillery, or whatnot—and which is such an important factor in building up the morale of military forces, has been almost wholly lacking in the Coast Artillery Corps, although all other combat arms of our Army have benefited by its effects.

The governing reason for eliminating the regimental and battalion organizations from the Coast Artillery Corps seems to have been that such an organization, consisting of units of uniform strength and personnel composition, did not fit the requirements of the armament emplaced in our harbor defenses, varying so widely as does the latter in different localities. While it has always been recognized by Coast Artillerymen that such an organization was not conducive to a high degree of esprit, it was adopted and has been continued because of these considerations concerning the harbor defenses which it was the mission of the Coast Artillery Corps to man and operate.

• In 1917, when the United States entered the World War, there was a demand in Europe for personnel to man heavy artillery on movable mounts—railway and tractor drawn. There was also a demand for units of antiaircraft and trench mortar artillery. The War Department decided to draw this personnel from the Coast Artillery Corps, the troops of which were probably best fitted for these tasks and, under the existing conditions, were not required in our harbor defenses. For the accomplishment of these missions, it was necessary to organize battalions and regiments, utilizing the existing separate companies to effect such organizations. This was done and the Coast Artillery Corps regiments, which were thus formed, rendered valuable services in the operations of both the French and American armies. However, the path of those responsible for creating these organizations was beset with many and great difficulties.

At the conclusion of the World War, the responsibility for the future development and operation of railway, antiaircraft, and trench mortar artillery, and of the heavy tractor artillery designed for use in coast fortifications, was definitely placed upon the Coast Artillery Corps, and certain units which had served during the war with these various activities, were continued in existence. The final result, from an organizational standpoint, was that the Coast Artillery had now developed into a Corps, consisting of a number of separate companies assigned to the duty of manning the armament in the harbor defenses, a regiment and three battalions of antiair-

craft artillery, a regiment and a battalion of railway artillery, and three regiments of heavy tractor artillery. Such a mixture of organizations was most undesirable. Furthermore, it was very noticeable that esprit was being developed in the battalions and regiments to a much higher degree than in the separate companies, and, as time went on, these differences became more and more noticeable. It was necessary to take some action to remedy this condition.

A regimental organization for all units of the Coast Artillery Corps was most desirable for the following reasons: First, to promote esprit uniformly throughout the Corps. Second, to avoid any necessity in future for the hasty organization of regiments such as confronted the Coast Artillery Corps authorities in 1917.

The great difficulty in the way of effecting this organization, lay in its being made to fit the varying conditions in our harbor defenses.

After long study of this problem by various officers on duty in the Office of the Chief of Coast Artillery, a plan was evolved by which this purpose could be accomplished in a most satisfactory manner. This plan is embodied in the General Order, above mentioned as effecting this most important organization.

The order provides, in addition to the battalions and regiments of Coast Artillery already in existence, for sixteen regiments composed of Americans, and two regiments composed of Filipinos, for duty in the harbor defenses, and one additional regiment of antiaircraft artillery for duty in the Panama Canal Department.

The designation of companies of the Coast Artillery Corps by serial numbers is abolished, and all units of the Coast Artillery Corps, heretofore designated as companies, will hereafter be called batteries.

All regiments of the Coast Artillery are hereafter to be designated as "1st Coast Artillery", "55th Coast Artillery", etc. Existing battalions are to be expanded into regiments, the additional units so provided in each regiment to remain for the present, inactive. Existing regiments, and those regiments expanded from existing battalions, are to retain their present numerical designations.

The sixteen new regiments of American Coast Artillerymen are given numbers from 1st to 16th inclusive. The new antiaircraft regiment for duty in the Panama Canal Department is to be designated the 65th Coast Artillery. The two Filipino regiments are to be designated the 91st and 92nd Coast Artillery (P. S.)

Each of the regiments formed in the harbor defenses in the Continental United States is organized into a headquarters battery, and either seven or ten lettered batteries (A, B, C, etc.) In those

regiments having seven lettered batteries, Batteries A and B will constitute the 1st battalion, C and D the 2nd, and E, F and G the 3rd. In those regiments having ten lettered batteries, Batteries A, B and C will constitute the 1st battalion, D, E and F the 2nd, and G, H, I and K the 3rd.

These regiments have been given this organization so as to facilitate their conversion from harbor defense regiments into railway and either heavy tractor or antiaircraft regiments, should another war present requirements similar to those which confronted Coast Artillery authorities in 1917. In that event, as the Coast Artillery will be organized under this order, if railway artillery be needed for duty with the field armies, any harbor defense regiment, which is composed of a headquarters battery and seven lettered batteries, can be converted readily into a railway regiment, which latter consists of a headquarters battery, a service battery, and six firing batteries. Similarly, any harbor defense regiment, which is composed of a headquarters battery and ten lettered batteries, can be converted with facility into a heavy tractor or an antiaircraft regiment, since both of these latter consist of eleven units. Thus is this organization made use of to eliminate in future, any difficulties in organizations such as those which confronted the Coast Artillery Corps authorities in 1917.

One of the most desirable features of this reorganization, from the standpoint of esprit, is the reconstitution of the old artillery regiments, which were done away with in 1901, when the Artillery was first organized as a Corps. The regiments provided in this order and designated as the 1st to 7th Coast Artillery, inclusive, are each made up of units which were formerly batteries in the regiments having similar designations prior to 1901. For instance, the 1st Coast Artillery will be composed of a headquarters battery and seven lettered batteries (A, B, C, etc.) The present day companies of the Coast Artillery Corps which will compose this regiment are the 2nd, 3rd, 4th, 5th, 7th, 8th, 10th and 11th. These companies were formerly (prior to 1901), batteries B, C, D, F, H, I, M and N, respectively, of the 1st Artillery. Thus, while some of the batteries will have to be given lettered designations different from those they formerly had in the old regiment, the regiment as a whole will be reconstituted by having certain of its original constituent elements again brought together in a regiment bearing the same number as formerly, and its personnel can, therefore, claim as their own, the past history of that regiment. In some cases the histories of these regiments go as far back as 1812, and include participation in

battles of practically all wars in which American troops have participated since that date.

In effecting the reconstitution of these old regiments, it has been necessary to transfer from one coast defense command to another, eighty-eight of the present day companies of the Coast Artillery Corps. These transfers, however, are effected in all cases without any movement of personnel or materiel except for the transfer of organization records.

The problem of fitting the organization of these regiments to the requirements of the harbor defenses, as finally solved, was quite simple. The War Department allots certain personnel of the various grades and ratings to each Coast Defense Command in the Continental United States. The size and composition of the various batteries of a regiment is not fixed definitely, but, as has been done for a number of years in the case of the separate companies of the Coast Artillery Corps, is determined by the Coast Defense Commander, who will, by sub-allotment of the strength allotted by the War Department to his command, make the strength of each battery such as to fit the requirements of its individual assignment. Each battery, which is assigned to man a specific element of the defense—such as a gun or mortar battery, or an element of the mine defense, will consist of the personnel, of the various grades and ratings, required to man that element of the defense, plus the battery administrative personnel—1st sergeant, mess sergeant, supply sergeant, cooks, etc. All other personnel allotted by the War Department to a coast defense command, will be assigned by the coast defense commander to what will become a General Utility Battery. This personnel will consist of the non-commissioned staff, the band, if a band be provided, and all other miscellaneous personnel not assigned to other batteries. In a coast defense command to which is assigned a regimental headquarters battery, that battery will become the General Utility Battery. In a coast defense command to which no regimental headquarters battery is assigned, one of the lettered batteries will be utilized for this purpose, but will retain its letter designation. The allotment of personnel to the foreign garrisons will be made by the War Department in bulk, and it might be said, to each Department. The Department Commander will then sub-allot this personnel to the various Coast Artillery Corps regiments and coast defense commands in his department and, in the case of the harbor defense regiments, the Coast Defense Commander will again sub-allot and organize his personnel as is done in Coast Defense commands in the United States.

Regiments are assigned by the War Department to man and care for the armament in one or more coast defense commands, as required.

The Commanding officer of a coast defense command, to which the headquarters of a regiment is assigned in the War Department order, becomes the regimental commander and, on June 30, 1924, the date the order becomes effective, assumes command of the regiment and effects its organization.

The new regiments are assigned in the War Department order to departments, on foreign service, and to coast defense commands in the United States as follows:

1ST COAST ARTILLERY	To the Panama Canal Department.
2D COAST ARTILLERY	To the Panama Canal Department.
3D COAST ARTILLERY	To coast defenses as follows: Regimental headquarters and headquarters battery and 2 batteries in the Coast Defenses of Los Angeles; 2 batteries in the Coast Defenses of San Diego, and 3 batteries in the Coast Defenses of the Columbia; the individual batteries in each case to be designated by the regimental commander. One battery in each of the Coast Defenses of San Diego and the Columbia, will be kept on an active status as a caretaking detachment.
4TH COAST ARTILLERY	To the Panama Canal Department.
5TH COAST ARTILLERY	To the Coast Defenses of Southern New York, regimental headquarters at Fort Hamilton, N. Y.
6TH COAST ARTILLERY	To the Coast Defenses of San Francisco, regimental headquarters at Fort Winfield Scott, California.
7TH COAST ARTILLERY	To the Coast Defenses of Sandy Hook, regimental headquarters at Fort Hancock, N. J., with three batteries, to be designated by the regimental commander, in the Coast Defenses of the Delaware, one of which will be maintained on an active status as a caretaking detachment.
8TH COAST ARTILLERY	To the Coast Defenses of Portland, regimental headquarters at Fort Preble, Me., with one battery, to be designated by the regimental commander, in the Coast Defenses of Portsmouth, as a caretaking detachment.
9TH COAST ARTILLERY	To the Coast Defenses of Boston, regimental headquarters at Fort Banks, Mass.
10TH COAST ARTILLERY	To the Coast Defenses of Narragansett Bay, regimental headquarters at Fort Adams, R. I., with one battery, to be designated by the regimental commander, in the Coast Defenses of New Bedford, as a caretaking detachment.
11TH COAST ARTILLERY	To the Coast Defenses of Long Island Sound, regimental headquarters at Fort H. G. Wright, N. Y.

12TH COAST ARTILLERY	To the Coast Defenses of Chesapeake Bay, regimental headquarters at Fort Monroe, Va.
13TH COAST ARTILLERY	To coast defenses as follows: Regimental headquarters and headquarters battery and 3 batteries in the Coast Defenses of Pensacola; 2 batteries in the Coast Defenses of Charleston; 2 batteries in the Coast Defenses of Key West; and 3 batteries in the Coast Defenses of Galveston; the individual batteries in each case to be designated by the regimental commander. One battery in each of the Coast Defenses of Charleston, Key West and Galveston, will be kept on an active status as a caretaking detachment.
14TH COAST ARTILLERY	To the Coast Defenses of Puget Sound, regimental headquarters at Fort Worden, Washington.
15TH COAST ARTILLERY	To the Hawaiian Department.
16TH COAST ARTILLERY	To the Hawaiian Department.
65TH COAST ARTILLERY	To the Panama Canal Department.

The War Department has already, some months ago, authorized a regimental organization for the Coast Artillery of the National Guard. The order just issued provides for the organization of the Organized Reserve Coast Artillery in the same manner as for the National Guard Coast Artillery. This organization differs slightly from that provided for the regiments of the regular Coast Artillery Corps, in that provision is made for the organization of battalions, consisting of any number of batteries from two to four, and of regiments, consisting of any number of batteries from five to twelve. This diversity in the number of units in a battalion or regiment is necessary because the allocation by the War Department of National Guard Coast Artillery to the various States, and of the Organized Reserve Coast Artillery to the various Corps Areas, cannot be made uniform as to the numbers of batteries. The necessity for the organization of the batteries into higher units—battalions and regiments—is recognized, however, and provided for in the War Department order. This organization into higher units is also provided in such manner as to facilitate the assignment of these units to elements of the harbor defenses and their utilization under these assignments in time of war.

Major General F. W. Coe, Chief of Coast Artillery, believes this reorganization to be a matter of supreme importance to the Coast Artillery Corps, and anticipates that the beneficial effects to be derived therefrom will be far reaching.

Foch and Ludendorff as Military Strategists

By HERMANN JOSEPH VON KUHLMANN

German General; Chief of the General Staff of the First (von Kluck's) Army and subsequently of the army group commanded by the Crown Prince Rupprecht of Bavaria; author of several books on the war.

A COMPARISON OF THE TWO GREAT MILITARY MINDS OF THE WAR—LUDENDORFF'S BRILLIANT ACHIEVEMENTS—HIS HANDICAPS WHEN AT LAST PITTED AGAINST FOCH IN 1918—FOCH'S QUALITIES AND SHORTCOMINGS

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TWO of the most striking personalities that stand out among the military leaders of the World War are General Ludendorff and Marshal Foch. During the first two years they operated in widely divergent fields, one fighting in Russia, the other in France. It was not until after Marshal Foch was appointed Commander-in-Chief of the Allied Armies, in the Spring of 1918, that these two great adversaries crossed swords. From that time on they faced each other as leaders of the gigantic conflict until Germany was overwhelmed by the final catastrophe.

The Germans look upon Ludendorff as a super-man of powerful will; he was the victor at Tannenberg in 1914, on the Somme and the Aisne in 1918, in Rumania and Italy.

France glorifies Marshal Foch because his name is synonymous with final victory. Nations are right in praising their leaders, but it is unfair to humble the defeated and by invidious comparison exalt the victorious.

Marshal Foch is said to have expressed himself repeatedly about Ludendorff in a way that, if he was correctly reported, does not do justice to the achievements of his adversary. Such criticism warrants us in investigating the military achievements of the Marshal. We may well leave it to history to pronounce judgment on both men. History will be just to the under dog and will establish, above all else, the responsibilities of the German chiefs. The superiority of our adversary, considerable from the start, increased from year to year as Italy, Rumania and finally the United States joined the ranks of our enemies. How small previous wars appear when

compared with the World War, which spread itself to the Ukraine, to the Caucasus, to Finland and to Palestine! The war in Bohemia in 1868 and the war in 1871 were primarily military; the World War, however, developed into an economic struggle, with the establishment of the hunger blockade which cut at the very roots of the German nation's life and finally proved decisive in bringing the war to a close.

Germany's geographical position caused her the greatest difficulties. There was no opportunity for brilliant manoeuvres as at Königgratz, Metz and Sedan. Germany was practically a beleaguered fortress. The industry and technique of the entire world were at the disposition of the enemies of Germany. Their numerical superiority was annihilating and grew in proportion as the forces of blockaded Germany became paralyzed.

In making a comparative study of two great army leaders, such circumstances should be considered. Let us first examine the activities of Marshal Foch in the first year of the war, while his later opponent was fighting in the East.

At the beginning of the war General Foch was commander of the Twentieth Army Corps, which was part of the Second Army of General Castelnau. By the latter's friends Foch is charged with having caused the defeat of his men at the battle of Sarrebourg on August 2. Historical investigation has not yet cleared up this point. General Foch disputed the contention. In his denial he declares: "The Twentieth Army Corps does not retreat except when ordered expressly to do so." High-sounding words are Foch's favorites, yet after August 20 he retreated without "special orders." The same thing occurred at the battle of the Marne on September 8-9, when Foch was commander of the Ninth Army.

A legend was created concerning the conduct of Foch during these days. When Marshal Foch was received as a member of the French Academy, Poincaré, who made the reception speech, thus described the threatened position of the Ninth Army: "One more effort and the gap was opened. At this moment the Forty-second Division, which by an ingenious stroke Foch diverted from his left wing to the threatened right wing, changed defeat into victory." It is not known that Foch ever contradicted this contention. It is also reported that on September 9, when his situation was critical, he thus addressed General Joffre: "My right wing is dangerously threatened; my centre is giving way; it is impossible for me to move; the situation is excellent; I attack."

Whether these words are historical remains to be proved, but they are similar in character to previous expressions of General

Foch. What was the situation in reality? Conscientious French investigation has long since arrived at justice and truth. The beautiful picture of the Forty-second Division marching behind the Ninth Army from the left to the right wing with flags fluttering, ready to attack, vanishes into nothingness.

After a long march the division arrived, exhausted, in the evening, and, being unfit to lead an attack, went into encampment. In the meantime, owing to an unjustified decision of the commander of the Second German Army, the German troops voluntarily withdrew. This decision had nothing to do with the dispositions taken by General Foch, but was due to conditions prevailing on the German right wing at an altogether different place on the battlefield.

There is no gainsaying the fact that Foch suffered a heavy defeat on September 8 and 9. His headquarters had to be abandoned in haste. The beaten right wing of his army was in full retreat. The next day it was an agreeable surprise for him to find the Germans had left. On this occasion Foch showed that characteristic quality of his, an unalterable optimism which never left him in the most trying circumstances. He displayed that same quality in the following months of October and November, 1914, in the march to the sea. Foch was charged by Joffre to unify the operations of the French, Belgians and English on the left wing between the Oise and the sea. Through his personal intervention, Foch prevailed over the Belgians, who had wished to retreat upon the Calais-Havre line, to make a stand on the Yser, and later he kept Marshal French from retreating, as he had planned.

Foch is credited with having prevented the Germans from encircling the left wings of the Allies, otherwise the Channel Zone would have been in the possession of the Germans. After this Foch was left at times quite isolated. We may therefore pass over this period.

LUDENDORFF'S RECORD IN THE EAST

It was not until March, 1918, that Foch's star rose on the horizon. Let us see what General von Ludendorff accomplished in the meantime. To his personal heroic courage was due the capture of Liège in the first days of the war. This event opened the way to the forward march from both sides of the army's right wing. Soon afterward Ludendorff was appointed Chief of Staff to General von Hindenburg and transferred to the east. Here he won one of the most brilliant victories of the World War—the battle of Tannenberg. With one stroke the unfavorable position of the Germans was changed and East Prussia was delivered from the enemy.

The army of General Rennenkampf, coming from the Nieman, had invaded East Prussia, while the army of General Samsonov was advancing from the Nareva in the south toward Allenstein. The Commander-in-Chief of the German Army, whose mission it was to defend East Prussia, saw himself surrounded on both sides by superior forces. He adopted a most audacious resolution. Deciding to leave against Rennenkampf but a very weak force of cavalry and to concentrate all his troops to turn the army of Samsonov, he succeeded in winning a victory comparable to Hannibal's victory at Cannae by surrounding both wings of the enemy army and destroying them.

But few such battles are recorded in the world's history. The Russian Army of the Nareva was smashed to pieces and 92,000 prisoners fell into the hands of the victors. After this the German Army was led against the Nieman army of Rennenkampf, whose position was behind the German lines in the Mazurian marshes. Only a quick retreat saved Rennenkampf's army from destruction.

General Buat, Chief of the French General Staff, calls the battle of Tannenberg a masterpiece and the operations of Ludendorff in the Mazurian marshes a classic. Just as brilliant as the battle of Tannenberg, won in November, 1914, were the operations of Ludendorff in the first battle of the Mazurian marshes.

In October, after the campaign in South Poland, the Germans had to leave the Vistula to return to Silesia owing to far superior forces led by Grand Duke Nikolai Nikolaievitch. The road to Germany was seemingly open to the Russian "steamroller."

The German Commander-in-Chief then ventured to shift the few army corps at his disposal and on November 10 he led a surprise attack against the right flank of the main forces of the Russian Army, who were advancing in the direction of Silesia. Thus he succeeded in stopping the attacks of the enemy, and by so doing saved Germany from invasion. The German commander had still a higher aim, and that was to gather up, so to speak, the entire Russian front. But the reinforcements sent by the higher command of the west did not arrive in time, and Ludendorff could not wait for them, otherwise his operations would have been among the most brilliant in the World War and would greatly have influenced the course of events.

Let me now recall the campaigns in Rumania in 1916, and in Italy in 1917. On August 29, 1916, a change occurred in the high command when Hindenburg and Ludendorff took the place of Falkenhayn in the eastern operations. The Central Powers were then facing a grave crisis, Rumania having declared war on Austria

on August 27, while the battle of the Somme on the western front had inflicted heavy losses on the German forces. But in a few months a change took place. At the end of November Rumania was beaten in a brilliant campaign. A practically identical defeat met the Italians a year later. Again was Austria in need of help from her allies. It was doubtful if she could further resist the Italian attacks on the Isonzo. It was a daring act to send German forces to the Italian front at this time, when for months the English had been attempting to pierce the German front in Flanders. Yet Ludendorff took the chance.

In a few weeks the Italians were thrown behind the Piave. French and English divisions, dispatched in all haste, arrived and stopped the onslaught. The Italian Army, however, never recovered from the blows inflicted there.

CROSSING SWORDS WITH FOCH IN 1918

We have now arrived at the eve of the great German offensive in 1918, when Foch and Ludendorff faced each other as adversaries. In this year, particularly, the two leaders were subjected to comparison by the military critics. On both sides it was admitted that in 1918 a decisive result would be obtained. But the two chiefs fought under altogether different conditions.

During 1918 the Commander-in-Chief of the German armies had to take into consideration the strong American reinforcements coming to the Allies. While the Allies were being reinforced with fresh troops it looked doubtful whether Germany and her allies could command enough men to continue the war. The standing of the Bulgarians was not considered secure. The economical conditions of Austria became more and more discouraging. The strength of Turkey was coming to an end. All the allies of Germany were supported by the belief and the hope of German success in the west. The results of the "U" boat warfare were not such as to make for a change to the advantage of Germany. The "U" boats alone could not do that. The state of the German armies and conditions in the Fatherland were such as to make the immediate ending of the war imperative. After four long years of fighting the reserves were exhausted. It was evident that a crisis requiring new reserves would take place in the Summer. The impossibility of providing such reserves led to quick negotiations.

At home in Germany economical needs due to the blockade fell heavily upon the people. The resistance of a nation without strength, which had courageously borne the heaviest sufferings for many years, began to give way. This fact decided the German com-

manders to attack in the Spring of 1918. After the crumpling of Russia all available forces could be used for this purpose. It did not give a marked superiority, but the attack could be calculated with full knowledge. A serious question was the one relative to the mobility of the army for such large operations. There was a great lack of horses due to the scarcity of fodder, and other needed material for transportation was not available. Only a certain number of divisions were partially equipped, and this at the expense of other divisions, whose mobility was correspondingly impaired.

In France and in England the opinion prevailed at the beginning of 1918 that after the Russian defeat the Germans would attack in the west with the divisions drawn from the eastern front before the Americans were able to participate actively in the attack. The Entente decided to remain on the defensive, but was in a more advantageous position to attack than was Germany. The Supreme War Council, at a meeting at Versailles, was of the opinion that the Allied armies were ready to resist the German attack. The Commander-in-Chief of the French Army, General Pétain, held that the attack should be made only after numerical superiority was attained by the arrival of sufficient American troops. The trump card in the hands of the Allies was the attack by Americans. Until then the forces must be economized in the expectation of an offensive to be undertaken in proper time. At the same time, war material, such as airplanes and tanks, must be increased while the Germans were wasting their forces.

On March 21 took place the great attack between Arras and La Fere, which virtually wiped out the entire English Army. General Foch is not to blame for the mistakes of the allied groups which caused this defeat. It was at one of the most distressing moments when defeat faced the Allies that all eyes were turned upon Foch. It was an eventful day, the turning point in the war—that 26th day of March, when in the Supreme Council held in Doullens Foch was entrusted with the task of unifying the operations of the Allies on the western front. This mission was further extended in April by the appointment of Foch as Commander-in-Chief of the allied armies. Thus was achieved the unity of interallied command and of interallied activity.

BRILLIANT OFFENSIVES IN FRANCE

Foch succeeded in opposing stiff resistance at Amiens and in preventing the breaking through of the Germans. The divergent interests of the French, who, above all, thought of protecting Paris, and of the English who wanted to escape through the Channel ports,

were made to conform to the war plans of the chief commander. No one will refuse the credit due to General Foch, but every one should acknowledge the extraordinary results of General Ludendorff's offensive. In eight days the Germans had pierced the enemy's lines to a width of seventy-five kilometers and a depth of sixty kilometers, while the English and French in the Summer of 1916 at the battle of the Somme had succeeded in five months' time only in piercing through twelve kilometers, and in 1917, in the battle of Flanders, in four months' time penetrated only eight kilometers.

The strength of General Foch as demonstrated by him up to that day had lain in his optimism, his coolness, his energy and will power, qualities of character which General Ludendorff possessed to the same degree. From April, 1918, however, the new commander of the Allies had the opportunity to show whether, as had been stated, he was a superior strategist. After the German offensive in Flanders near the Armentieres a lengthy interval occurred. The principal duty of the chief commander of the Allies was to place his reserves in the right spot. After the Somme and Lys Foch shifted them to his left wing, apparently against the advice of Pétain. It so happened that the German attack near Soissons and Rheims on May 27 took the French by surprise and resulted in a brilliant German victory. For the second time during the war the Germans won on the Marne, and again a catastrophe threatened France. Clemenceau was questioned in the Chamber of Deputies and had a hard time. Demands were made for a new Commander-in-Chief in place of the much-praised Foch. It was not Foch's military science that saved the situation, but the American help, for which the French looked anxiously and which finally arrived.

At the beginning of June, after the conference of the Supreme War Council, an appeal was made to the President of the United States. The war would be lost if great numbers of American troops did not arrive. Transportation of American troops was so hastened that by July, 1918, a million men had landed, and by the following November two million men were on French soil. In May and June American troops took part in the fighting and American divisions fought strenuously to hold back the German attack in July. The Frenchman Pierrefeu gives a vivid description of the arrival of American troops. The appearance of the Americans as they marched through the streets of Coulommiers and Meaux in the midst of a jubilant crowd, their healthy looks, their new equipment, worked wonders.

New life was injected into the bloodless bodies of the French. Lack of space prevents a more detailed account of the important

part played by the Americans in the French counter-offensive of July 18, but from then on in the battles fought during the Summer and Fall months, though they were somewhat lacking in respect to training and leadership, their work was effective, owing to their numbers, their unused strength and their vigorous methods of attack against an exhausted and depleted German Army.

The United States did not only contribute huge sums of money and formidable material; it was in a position to oppose to a weary and hungry enemy an inexhaustible reserve of men. France poses as the victor of the World War and does not like to be reminded that it was only through foreign help that she was saved from collapsing. The historically proved fact remains that it was not the superior strategy of General Foch that finally brought his adversary Ludendorff low.

On July 15 occurred the last great German offensive from Rheims. The result was not successful; the attempts to surprise the enemy miscarried, and the German forces had to give way. Foch had accurately calculated the direction of the attack and, it must be acknowledged, had well taken his precautions. His reserves were at their place this time. He had drawn about eight divisions of French troops from Flanders and had had them transferred to the French front. Field Marshal Haig, moreover, had reluctantly given the French front four divisions and had increased by four other divisions his right wing. This enabled Foch to transfer four more divisions from his left wing to his centre. These shiftings were completed before July 15. The German attacking forces were exhausted with this last offensive.

The counter-attack of Foch south of Soissons followed on July 18. This was Foch's great day, the day when his reputation was made. From that day began the turning point of the war. What credit is due Foch for this change must be established. "Pétain as well as Foch had agreed that, beginning in July, the time had come for an offensive. At last the long wait was at an end. The Americans in great number were behind us, the artillery and the tanks had been put in shape and increased, the road was free for the long deferred offensive." The above is quoted from statements by a staff officer of General Pétain's headquarters. The decision to attack was not taken suddenly, but was a result of mature consideration. The conditions upon which depended the decision had now been met. The numerical strength and the superiority of material had been assured.

The decision to attack was in the air. As far as we can learn from French sources, Pétain as early as the middle of June had

made preparations for an offensive on the vicinity of Soissons, which was to be more of a local character. General Mangin, commander of the Tenth Army, was to extend the offensive by a surprise attack against the entire German position. Whoever made the suggestion of a flank attack by Soissons, the fact remains that the energetic and successful execution of this idea is to be credited to Foch, and it led to his promotion as Marshal of France on Aug. 7. In the execution of this offensive the personality of Pétain was forced into the background. Pétain hesitated and was confronted with the German offensive from Rheims on July 15. But Foch was not deceived, he continued his preparations to begin his offensive on July 18. The result of this surprise attack, aided by numerous tanks coming from Villers-Cotterets, was great. Again Pétain came in the way; he did not think that the forces at his disposal would warrant more than a small result. But Foch was without doubt the motive power, and no one can take from him the credit due him for the advance of July 18.

LUDENDORFF'S FINAL FAILURE EXPLAINED

The second part of the great struggle in 1918 then began. What General Ludendorff did not accomplish in his offensive, Marshal Foch, through alleged superior strategy, is said to have accomplished—the overthrow of his adversary. But was this really due to superior strategy or merely to the force of circumstances?

From the middle of July the Germans had been reduced to the defensive. The initiative had passed to the Allies. Marshal Haig in his war reports explains the change in the war situation thus:

“The German Army had brought its utmost power into play, and it was in a state of collapse. The highest point of its efficiency had been passed. The mass of reserves concentrated during the winter had given out. The allied situation respecting available troops, however, had greatly improved. The new reserves which had joined the armies at the end of Spring and the beginning of September were trained and organized. The British Army was ready to take the offensive, while the American Army was rapidly increasing and had given overwhelming proof of the fighting capacities of its soldiers.”

It is true that the German Army, after four years of war, was near exhaustion. The reserves were at an end. The gaps which had been made by continuous fighting could not be refilled. The troops were overworked. The allied tanks effectively thinned out the exhausted German troops. It was not possible for the Germans to create such military agencies in appreciable quantity at a moment's

notice. The English General Maurice, commenting on the continuous attacks against the German positions, says: "It is certain that neither the well-prepared measures taken by Foch nor the valor of our infantry, would have brought us victory, if we had depended solely on victory over the German defensive positions through encirclement." Of a later period, in the Fall of 1918, General Maurice says: "The German troops fought brilliantly, but our superiority in tanks, and the exhaustion of the German troops, made the situation hopeless."

Notwithstanding this, there are many English and French authors who attributed the result of the operations in the Summer and Fall of 1918 principally to the high strategic qualities of Marshal Foch. The Frenchman Tardieu expresses himself as follows: "French intelligence won over German intelligence." The superior method of Foch is compared to the "Ludendorff method" by such critics.

Marshal Foch, it is said, admitted that to break through was possible only if the enemy reserves were dispersed. "Through a succession of prepared fights the last attack was decisive. Ludendorff, on the other hand, meant to break through in March, and renewed the attacks until his forces became too weak. He waited, however, too long between attacks, instead of giving blow for blow, until the enemy's reserves were used up."

GERMAN TACTICS UNJUSTLY CRITICIZED

The chief spokesman for this criticism is the French General Buat. It is his view that any single attack, however powerful it may be, is bound to fail sooner or later. As soon as the enemy has taken cognizance of the point of attack, he must concentrate there his reserves. This, General Buat points out, was accomplished quite quickly in France, owing to the well-developed system of communications. To attempt therefore to break through the enemy front, before the hostile reserves were shattered or used up, was futile. This, however, was possible only through a series of preparatory attacks.

The chief mistake of General von Ludendorff, it was further pointed out, was a priori, the attempt to break through with a single even though large-scale offensive. His later attacks followed one another with such long periods between them that his adversary was able to recover and fill up his ranks. "Therein lay Ludendorff's greatest weakness."

This criticism is absolutely unjustified, as the German commander never considered the situation in the light of General Buat's.

The German forces were insufficient to fight the enemy reserves before the big blow to be dealt by a series of partial attacks. They were even insufficient to divert the main offensive of March to another position, as desirable as this would have been. As already stated, the German command was composed of but a limited number of divisions possessing the necessary horses and other material. The size of the attack depended also on available artillery. An extension over fifty kilometers was not feasible, even if all available forces could have been assembled. Had Ludendorff used his available forces on partial attacks, it is certain that when the time came for the principal attack his forces would have been used up. There was, therefore, nothing else to do but to get all available forces together and strike the big blow delivered March 21.

I have already pointed out how near the Germans then came to reaching their goal, though their effort to break through proved unsuccessful in the end. There was nothing else for Ludendorff to do, knowing that his forces were weakening, but to renew his offensive at other points, even though it diminished his chances. The reason why these attacks were delayed lies in the fact that Ludendorff, in order to carry through a new offensive, had to assemble the necessary forces from the former front and regroup them. He was obliged to give his divisions a short rest. The artillery, fliers, mine throwers, tanks, and so forth, had also to be taken into consideration. This could not be done without great loss of time. That this was undesirable, General von Ludendorff was very well aware, as General Buat later discovered, but the German commander was compelled by the force of circumstances to follow this course. It is, therefore, unjust to compare "Ludendorff's method" with that of Marshal Foch.

Marshal Foch did not have to contend with such troubles, when in the middle of July he began his offensive. He needed no method and had no occasion to apply any special method. He did not have to destroy the German reserves, as these were used up in their own offensive. Foch's forces cumulatively increased through the daily arrival of Americans while the exhaustion of the Germans kept on progressing.

A very competent French critic points out in the *Revue Militaire Générale* that Foch had enough fighting forces to make it unnecessary for him to wait, like Ludendorff had to, for one operation to be completed before starting another one; it is this that constituted his "superiority" over the adversary.

It is a fact that Foch ordered continuous large-scale operations in July, August, September and October; but all he had to do was to

take advantage of his ever-growing superiority in attack and repulse the enemy on the entire front. His object was to encircle the Germans widely and cut off the retreat of their left wing over the Rhine. But what did he accomplish? Nowhere was there encirclement, nowhere a breach, nowhere a Sedan or a Cannae, or a Tannenberg, but only front battles which repulsed the enemy slowly without destroying him. At the time the armistice was signed it had been planned to surround the Germans through Lorraine. One cannot tell if such an eventuality would have brought the desired result. Ludendorff can well measure up to such strategy. The final victory, as remarks Grouard, a French military writer, was due only to the exhaustion of the adversary.

After the war Foch remained a pitiless adversary. In the peace negotiations in 1919 he insisted stubbornly that the Rhine should be the military frontier of Germany. The territory on the left bank of the Rhine was to be torn from Germany. His attempt failed, owing to the attitude of the English Premier, who "did not want a new Alsace-Lorraine," and owing also to President Wilson, who refused to countenance the parcelling out of Germany. The reason alleged by Foch was that "the Rhine must remain the protector of the Western peoples of Europe and of world civilization." What France understands by such civilization is illustrated today in her harsh handling of a wholly defenseless population in the Ruhr territory.

According to newspaper reports Foch has on various occasions referred, since the war, to the strategy of Ludendorff. To an editor of the *Intransigent* he expressed himself as follows: "Ludendorff is a remarkable officer of the General Staff; no more, no less; one who knows his business from the very foundation. As a follower of the school of Frederick the Great he is superior in all that concerns the handling of an intricate army organization. On the other hand, he is completely ignorant of the essential nature of a war of peoples, in which the greatest interests, even the very existence of these peoples, are at stake, and in which moral forces play the leading part."

The basis for this last opinion is not apparent. Ludendorff's powerful will was concentrated in this war on using the collective strength of the German people in one vast unified effort, to keep up at the front, as well as at home, the will to victory. His confidence in the Fatherland was unlimited. He never despaired. His only thought, his only aim, was a German victory.

EDITORIAL

Reason to Rejoice

THE organization of the Coast Defense Commands of the Coast Artillery Corps into regiments is a cause for rejoicing in the hearts of all Coast Artillerymen. It is a change in policy that meets with universal approval within the Corps.

While the two biggest problems facing the Coast Artillery officer are how to hit a rapidly moving naval target, probably operating in the dark or behind a smoke screen, and how to hit an aerial target traveling from sixty to one hundred miles per hour, still he always has facing him the possibility and the probability that in time of war he must serve with artillery that is operating in the field. This problem has heretofore been aggravated because our organization was not adapted to field service. This condition and the delay incident to a reorganization that is suitable no longer confronts the Coast Artillery officer. The new organization admits of the ready withdrawal of regiments from the harbor defenses and their immediate reorganization into mobile regiments for use with field armies.

The reorganization does not change the designation of the COAST ARTILLERY CORPS, but it does away with the words company and separate battalion. After June 30 every unit of the Coast Artillery Corps normally commanded by a captain will be designated a *battery* and every one of these batteries except the Sound Ranging Battery will be a constituent part of a Coast Artillery regiment. At the present time, it is only by reference to the Army List and Directory that one learns that the 11th Company, for instance, is stationed in the Panama Canal Department, but no Coast Artillery officer will, in a few months' time, have to refer to the Directory in order to learn that Battery H, 1st Coast Artillery, is stationed there. The 11th Company, C. A. C., and every other Coast Artillery *company* is at the present time more or less an orphan. It stands alone—but when it becomes a *battery* of a *regiment* it at once affiliates itself with a large and prominent family and its importance increases accordingly. The effect on the morale and esprit of the enlisted personnel will be especially marked, for it is a certainty that

the regimental organization will meet with their instant approval. It will be easy to develop in them the same pride and affection for their regiment as for their battery. Organization commanders of the National Guard and Regular Service should not fail at this time to explain to their commands the new organization of the Coast Artillery Corps. Colonel Barnes' article, appearing elsewhere in this issue of the Journal, will furnish excellent material for such a talk.

The benefits, too, of the new order are extended to the Organized Reserves and after June 30 their companies will be designated batteries and will be organized into battalions and regiments. The regimental organization having already been adopted by the Coast Artillery National Guard, the new order effects a similarity in organization of all units in the Coast Artillery of the Regular Service, National Guard and Organized Reserve. This in itself will tend toward better understanding and better fellowship between these three components of the Army.

The new organization is of monumental importance to the Coast Artillery Corps. Before we had variety of service with our fixed guns, motorized artillery, railway artillery, antiaircraft artillery and mines, and a variety of excellent stations. With the new organization we have all this and in addition an organization for our Corps that permits of the development of an esprit and morale equal at least to that of any other branch of the service. After June 30, in the Regular Service alone, we will have sixteen regiments assigned to Harbor Artillery, six to Antiaircraft Artillery, three to Motorized Artillery and two to Railway Artillery—a just cause for increased pride in our chosen branch of the service.

The 1923 Essay Competition

The Committee of Award for the Journal's 1923 Essay Competition, consisting of Colonel Clint C. Hearn, C. A. C., Colonel Henry J. Hatch, C. A. C., and Colonel Edward Carpenter, C. A. C., has reached a decision resulting in the following awards:

First Prize. One Hundred and Twenty-five Dollars

To Lieutenant C. E. Brand, C. A. C., Fort Amador, Canal Zone, for an essay entitled "Fire Effect on Naval Targets and Coast Artillery Forts."

Second Prize. Seventy-five Dollars

To Major Meade Wildrick, C. A. C., Honolulu, Hawaii, for an essay entitled "Coastal Operations," and to Lieutenant C. E. Brand,

C. A. C., Fort Amador, Canal Zone, for an essay entitled "Antiaircraft Doctrine."

Honorable Mention

To Major E. L. Kelly, C. A. C., Fort Monroe, Virginia, for an essay entitled "Preparation and Adjustment of Fire," and to Captain H. H. Blackwell, Fort Amador, Canal Zone, for an essay entitled "Fire Adjustment on a Moving Target."

The First Prize Essay appears in this issue of the Journal. The others will be published in subsequent numbers.

The JOURNAL and its readers owe their sincere thanks to the Committee of Award for the thoughtful effort which was involved in the consideration of the papers submitted by the competitors and the attainment of a decision.

The custom of the JOURNAL to hold a Prize Essay Competition annually will be continued for the year 1924. Conditions for this Competition are to be found on the inside back cover of this issue. All JOURNAL readers, whether or not of the Regular Service, are urged to consider the opportunity presented by this Competition for the presentation of their ideas tending toward Coast Artillery progress.

Our Coast Defenses Are Weak

Reprinted from the San Francisco Chronicle.

It is a fact, not denied but conceded to be a fact, that in case of the absence of a very strong defensive force of battle ships, there are single battleships afloat in more than one foreign navy which could lie outside entirely beyond the range of any gun in our land defenses and, herself in perfect safety, not only destroy every work of defense on San Francisco bay, but obliterate San Francisco, Oakland, Alameda and Berkeley from the list of inhabited cities on earth.

Of course with decent notice such destruction could be prevented by assembling submarines, laying mines, a strong naval force and an effective air service, but it is not the custom of modern warfare for the enemy to send word where he is going to hit. The age of chivalry is past. War is no longer merely the conflict of armies. It has become organized wholesale murder of populations.

We on this Coast object to such neglect. We denounce the smug indifference of people safely ensconced behind the Rocky mountains as disloyalty to the Nation. We demand for our protection modern defenses against modern means of attack.

Moreover, it appears that there are available at least four naval 16-inch guns, not needed by the navy since the treaty of Washington, which could be immediately installed.

The Society of American Military Engineers has pointed out the danger and the effective protection which these available guns would give. Upon the showing of that society the Board of Supervisors has urged the immediate emplacement of those guns at this port and urged our entire State delegation in Congress to insist on the necessary appropriation. We must all unite to make this a Pacific Coast demand.

Stand Behind Your Team

The Coast Artillery Rifle and Pistol Teams need money to defray incidental expenses during the coming summer. The JOURNAL, having the approval of the Chief of Coast Artillery, is collecting such a fund, and it is hoped that the entire commissioned personnel of the Corps will contribute. Two years ago a fund was raised by solicitation within the Corps, and this was used by the 1922 and 1923 Teams for payment of additions to a mess that included many enlisted men during the try-out period, special equipment, membership fees, excess baggage charges, etc. This money however, has been expended, and unless in future these extras are to be paid from the pockets of the Team members, more must be raised.

In the history of the National Matches, the upward course of our Team is noteworthy. In 1919, the first year in which we competed, the Rifle Team finished in 34th place, but since that time has been constantly near the top, and has been a serious contender for the premier place. The letters C. A. C. have for the past four years been so near the top on the daily score boards at Camp Perry that the twelve to fifteen hundred contenders, many of them civilians, and the thousands of visitors have had impressed upon them the real meaning of these initials.

Every officer desires that his Teams shall not be handicapped because of lack of funds. It is estimated that if one dollar be contributed by each officer, a sufficient amount will be raised to permit the Teams to carry on in a manner conducive to securing the best results at Wakefield and later at Camp Perry. A letter requesting this amount has been sent to the various Coast Artillery Districts, Coast Defenses, Fort Eustis, and the Coast Artillery School. It is requested that officers on detached service send in their contributions direct to the JOURNAL.

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 February

A. NEW PROJECTS INITIATED DURING THE MONTH OF FEBRUARY

Project No. 202, Bixby Spotting Device; and Project No. 203, Modified Cole Spotting Board.—The study of these two devices has been included heretofore in the general project on Spotting Devices, No. 84. The general project has been discontinued, each device being given a separate number. Final reports will be made when tests and studies are completed.

Project No. 204.—The plan of a new Searchlight Training Mechanism was submitted to the Board by Master Sergeant Thornton A. Lemaster, C. A. C., of the Department of Enlisted Specialists of the Coast Artillery School at Fort Monroe. The plan has been submitted to the Searchlight Development section of the Engineer Corps for study and such action as consideration of its merits may warrant.

Project No. 205, Review of Training Regulations No. 435-175, C. A. C. Regiment of Railway Artillery including Headquarters and Headquarters Battery.—Study completed, certain minor changes recommended.

Project No. 206. Mirror Position Finders (Antiaircraft).—The JOURNAL OF THE U. S. ARTILLERY for December, 1920, contains an excellent article by Lieut. W. C. Granstein, Ordnance Section, O. R. C. on "Mirror and Window Position Finders." Another article on "The Use of Mirror Position Finders" appears in the April, 1921, JOURNAL OF THE U. S. ARTILLERY. Reference is made to these publications in order that anyone interested may receive a better understanding of the operation of the finders; no description of the instruments or their operation will be published here. On the recommendation of the Artillery Board a set of Mirror Position Finders was issued to the 61st Artillery Battalion (A. A.) for test. In commenting on the report of this test the Board submitted the following:

1. The limitations of the instrument preclude its use as a service altimeter or its use in the field.

2. The mirror position finder has two attributes that determine its value, namely: accuracy and a visible permanent record from which all pertinent data may be computed at leisure. It is essentially an apparatus of precision adaptable only to such experimental or development problems as do not require an immediate rendition of observations into concrete data. It was as an ordnance instrument that the Chief of Antiaircraft Service, A. E. F., recommended the purchase of mirror position finders.

3. The mirror position finder, like most precision instruments, is inconvenient to use if the maximum possible accuracy be sought. On the other hand the instrument preserves a record from which may be obtained, at leisure, all the elements of a point in space or of flight with as great accuracy as that obtainable by theodolites. Unless and until this claim is disproved, the mirror position finder is the best instrument available for experimental antiaircraft work.

4. The mirror position finder is of practical value in the following cases:

a. In computing the ballistic properties of gun, projectile or fuse. This is primarily an ordnance function, but affects the Coast Artillery Corps when different types of ammunition, fuses, tracers, etc., are given them for test.

b. In verifying the firing of trial shots by the battery and perfection of the methods of fire correction.

c. In determining the wind where a meteorological service is not available. In studying the effects of wind on the projectile and verifying the wind corrections.

d. In testing altimeters. The only other basis for determination of accuracy is the altimeter in the aeroplane. Not only is the mirror position finder more accurate than the aeroplane altimeter, but there would exist, while using it, no need for synchronism between plane and ground.

e. In testing methods and materiel for prediction in antiaircraft fire. At any instant predicted data can be noted and compared with the actual position of the plane at the end of the time of prediction.

f. In testing the methods of antiaircraft fire, for example, comparing continuous fire with volley fire upon the even fuse settings with fuses ready before firing (British method) in a similar manner to *e.*

g. In testing sighting or Case II and III gun setting systems and training and testing the operators thereof in a similar manner to *e.*

h. In analyzing antiaircraft target practice.

i. Coast Artillery Board Project No. 128 (Combined Air Service-Coast Artillery Training) if approved binds the Coast Artillery Corps to cooperation with the Air Service in studying experimental flights and tactical maneuvers as well as aerial bombing. Such studies can be made most accurately by means of the mirror position finder. It is noted that the mirror position finder determines altitudes for itself whereas the camera obscura as now used in airplane tests, requires that the altitude be furnished.

5. *Recommendations.* *a.* It is recommended that the mirror position finders be retained by the 61st Artillery Battalion (A.A.) for further test and use in experimentation as herein outlined.

b. If additional sets are now available it is recommended that they be furnished to as many antiaircraft organizations as possible in order to assist such organizations in carrying out experimental and analytical work.

c. The purchase or modification of mirror position finders is not recommended until their further use by antiaircraft units enables a more complete study of results to be made.

Project No. 207, Test of Azimuth and Elevation Scales for 3-Inch Antiaircraft Gun.—This is a special study that grew out of the recommenda-

tions of the Board in Project No. 166, Study and Test of 3-inch A.A. Guns on Carriage M-1917 (Fixed, Mount) published in Coast Artillery Board Notes January, 1924, COAST ARTILLERY JOURNAL. The Ordnance Department has constructed azimuth and elevation scales for 3-inch Antiaircraft Guns. These are in the hands of the artillery for service test.

Project No. 209, Range Scales for Percentage Corrector.—The operation of the Percentage Corrector is described in report on Projects No. 170 and 152 published in Coast Artillery Board Notes December, 1923, COAST ARTILLERY JOURNAL. Scales for the corrector have been constructed by the Coast Artillery Board and will be furnished on application.

Project No. 211, Modification of Range Correction Chart for Pratt Range Board, Model 1905.

1. Under Coast Artillery Board Project No. 170 (see Coast Artillery Board Notes, December, 1923 COAST ARTILLERY JOURNAL), the Range Correction Board, Model E, 1923, was recommended for use with Howitzers and Mortars. Recommendations were also made for changes to apply to all charts. In letter O.C.C.A. 413.6816/I, 8th Ind., dated April 15, 1922, it was recommended that range correction charts be constructed for only two heights of site to take into account the effect of height of site on the other corrections.

2. Under Project No. 170, the following recommendations to apply to all charts were made:

- a. Curves on charts to be in percent, to scale of 1 inch = 2 percent.
- b. Ruler of board to show correction in range rather than corrected range, to scale of 1 inch = 2 percent.
- c. A percentage correction device to be used which permits the ballistic correction set to vary with the range in a normal manner without requiring continuous use of the board.

d. Chart to show curves for corrections due to rotation of earth, temperature elasticity, and variation in weight of projectile from standard.

e. Along vertical margin various range table data to be indicated.

3. In view of the presence of the ballistic density in the standard meteorological message, the present procedure in fixed defenses of converting temperature and pressure into atmosphere reference number by the use of the atmosphere slide rule, is no longer satisfactory. The density in the meteorological message is a ballistic density given in percent of normal; the present reference numbers varying from 0 to 32 correspond to a variation from 116 percent to 84 percent of normal density. Future range correction charts should have atmosphere reference numbers read in percent of normal to agree with the meteorological message.

4. The correction for rotation of earth depends upon the latitude of the battery. The latitude of Panama is about 7 degrees N; of Manila about 14 degrees N; of Honolulu about 21 degrees N; and in the United States it varies from 26 degrees N to 49 degrees N. The greatest range correction due to rotation of earth (at 90 degrees azimuth and range for maximum correction) is shown for various guns in the following table:

Gun	Range Yards	Weight of Projectile lbs.	Velocity f.s.	Latitude North		
				10°	35°	50°
8-Inch S. C.	18,000	200	2600	57 yds.	47 yds.	37 yds.
12-Inch S. C.	26,000	900	2325	110 yds.	91 yds.	72 yds.
14-Inch S. C.	23,000	1400	2400	113 yds.	93 yds.	74 yds.
16-Inch How.	20,000	2100	1950	88 yds.	73 yds.	58 yds.

5. The average latitude for all guns of the United States and its foreign possessions is about 35 degrees North. As can be seen from the table, the maximum possible error in making the rotation of earth correction for 35 degrees latitude instead of the actual latitude of the gun being considered, is not greater than 20 yards. It is therefore believed that much confusion would be avoided and sufficient accuracy obtained if in place of a chart with rotational correction especially computed for the latitude of each gun, all range correction charts for all guns to which the rotational correction is to be applied, base this correction upon the average latitude of 35 degrees North.

6. The use of more than one chart, each based upon a different height of site in order to take into account the effect of varying heights of site on the velocity, atmosphere and wind corrections, is believed unnecessary for the following reasons:

a. The change in the three corrections caused by variations in the height of site, is very small.

b. It is only at short ranges and at great heights of site, where a large correction in the range table range has already been made to take into account the effect of the height of site itself, that these changes are appreciable. The correction for height of site may be so large in itself that the possible theoretical error in it may be as much as the quantities discussed.

c. A change in velocity or air density may cause as great a second order error in the other corrections, as may be caused by a change in height of site. However, such errors are never taken into account.

d. The method of computing the proposed second order corrections which involved the theory of the rigidity of the trajectory, is itself in doubt for short ranges and large heights of site. These corrections would be based on a complete trajectory, whereas they should actually be based on only a portion of a trajectory, or on a trajectory which is greater than a whole one.

e. Another reason for the needlessness of second order corrections in range, lies in the fact that in firing at vertical targets at short ranges, large errors in range cause only small errors in altitude near the point of fall.

7. In any case where difficulty is encountered in fitting in the additional corrections mentioned in paragraph 2 *d* and *e* on account of lack of space in the horizontal direction, enough of the velocity correction curves should be taken out to allow for the complete set of curves. This may happen at low velocities (as in the case of mortars) where the effect of a variation of 300 f.s. in velocity may cause about 100 percent change in range. Provision for making correction for such a large variation in range on account of velocity is unnecessary.

8. It is believed that the atmosphere-velocity slide rule can be eliminated from use in connection with the Pratt Board. As shown in paragraph 3 above, the atmosphere end of the rule is not necessary. Concerning the velocity end of the rule, the following is quoted from paragraph 3, 3rd Indorsement to O. C. C. A. file 353.425/A:

3. Reference the effect of powder on velocity, Part I, I, information is requested concerning the possibility of simplifying this formula. It gives values which act differently from all other similar corrections. It says that for a change from 0 degrees to 10 degrees in powder temperature, the velocity changes by about .25 percent, whereas from 90 percent to 100 percent the velocity changes by about 1.6 percent. A change from 0 degrees to 10 degrees in air temperature causes practically the same change in range as a change from 90 degrees to 100 degrees. A change

in air density from minus 14 percent to minus 16 percent causes practically the same change in range as a change from plus 14 percent to plus 16 percent. It is understood that the Navy uses 2 f.s. per degree F. change in temperature, and that the French use .1 percent change per degree C. or .055 percent per degree F. Some such simple formula could probably be developed which would be more accurate than the present complicated one.

In the 5th Indorsement to the above mentioned letter, the Chief of Ordnance stated that a study is being made of this question. It is believed that the relation 1.5 f.s. change in muzzle velocity for each degree Fahrenheit change in powder temperature should be used until the Ordnance Department has developed a more accurate relation. The atmosphere velocity slide rule can then be dropped from use.

9. It is to be noted that for Coast Defense firing, the meteorological message should give the azimuth of the wind in degrees in order to conform with the graduations on the wind component indicator.

10. *Recommendations.*—In addition to the changes recommended under Project No. 170, the following recommendations were made:

a. That range correction charts have atmosphere reference numbers in percent of normal density varying from 84 percent to 116 percent.

b. That the rotation of earth correction corresponding to 35 degrees N. latitude be used on the single standard chart.

c. That all range correction charts be based upon one standard height of site, zero height to be taken as standard.

d. That the amount of variation in velocity be limited so that all corrections may fit on the chart.

e. That the relation 1.5 f.s. change in velocity per degree Fahrenheit change in powder temperature be used until the Ordnance Department has devised a better one.

f. That the use of the atmosphere velocity slide rule be discontinued.

Project No. 212.—Firing Tables for 16-inch Howitzer, Model 1920, as prepared by the Ordnance Department were submitted to the Coast Artillery Board for final comment. In the opinion of the Board the tables were in satisfactory form for printing.

B. PROJECTS PREVIOUSLY SUBMITTED ON WHICH WORK HAS BEEN ACCOMPLISHED

Project No. 5, 30-foot Coincidence Range Finder.—The following instruments were given a comparative test at Fort Monroe in November and December, 1923:

30-foot Bausch and Lomb Coincidence Range Finder.

15-foot Bausch and Lomb Coincidence Range Finder.

9-foot Barr and Stroud Coincidence Range Finder.

4-meter Goerz Coincidence Range Finder.

4-meter Zeiss Stereoscopic Range Finder.

The 9-foot Barr and Stroud Range Finder available for test was apparently in poor operating condition. The results it gave were so erratic and inferior that it was soon eliminated.

Figure 1 shows the 30-foot instrument mounted on the parapet at Fort Monroe; Figure 2 shows the interior of the housing for the operators. The telescope was built in 1918 for the Navy Department in accordance with its specifications while the mount, carriage and stand were built later in accordance with specifications of the War Department. The various adjustments and operation of the instrument are very much the same as in the 15-foot Bausch and Lomb Range Finder described in Chapter IX, Part IV, Heavy Artillery Materiel, C.A.C.

Figure 3 is a plot showing the average errors reference target obtained by all instruments observing on moving targets. These graphs take into consideration all readings on all moving targets under varying conditions of visibility, the mean

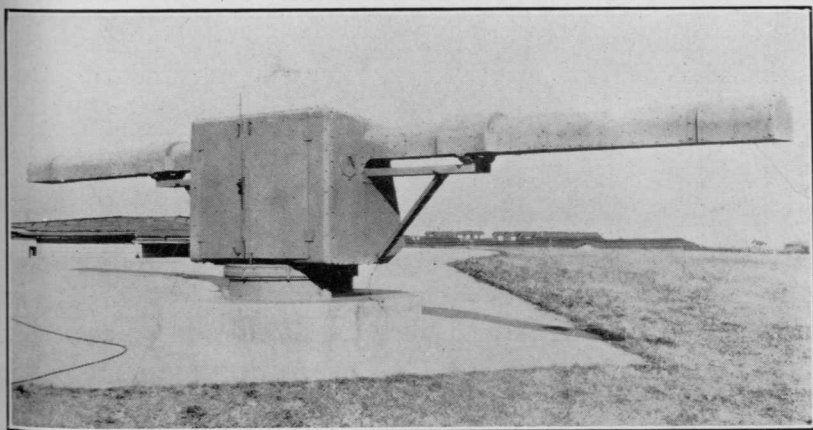


FIG. 1

of the ranges determined by the two horizontal bases being taken as the correct range and used as a basis for comparing the ranges read on the Range Finders.

Ranges were read by all instruments on fixed targets at varying ranges and on moving targets. The moving targets were tracked by two horizontal base systems and ranges were taken on the bell at one minute intervals by all instruments and both horizontal base systems to serve as a basis for comparison.

The complete report of the test, including all details and records of observations, is too long for publication here, but it is thought that the following extracts of Conclusions and Recommendations will be of general interest:

Conclusions.—1. Based on a study of its performance during this test the Coast Artillery Board is of the opinion that the 30-foot Range Finder is superior to any yet tested by the Board for general Coast Defense work.

2. The Board is of the opinion that a Range Finder equal to or superior to the Bausch and Lomb 30-foot would be an extremely valuable adjunct to the fire control equipment of long range batteries; that in some respects it is superior to a horizontal base system; and that our modern long range batteries normally using the long horizontal base system should be equipped with self-contained base Range Finders also.

The performance of the 30-foot instrument tested was good enough to warrant these conclusions and it is believed that this Range Finder can be improved considerably, especially various mechanical and optical features. The Bausch and

Lomb Company have produced a 33½-foot instrument which they claim to be superior to, and more efficient than, the 30-foot Range Finder. From description and specifications furnished by the company it is believed that the 33½-foot Range Finder constructed to eliminate defects and bad features found in the 30-foot Range Finder will be an excellent instrument for use by the Coast Artillery. It will be of sufficient utility and accuracy to warrant adoption for emergency use by major caliber modern long range seacoast batteries.

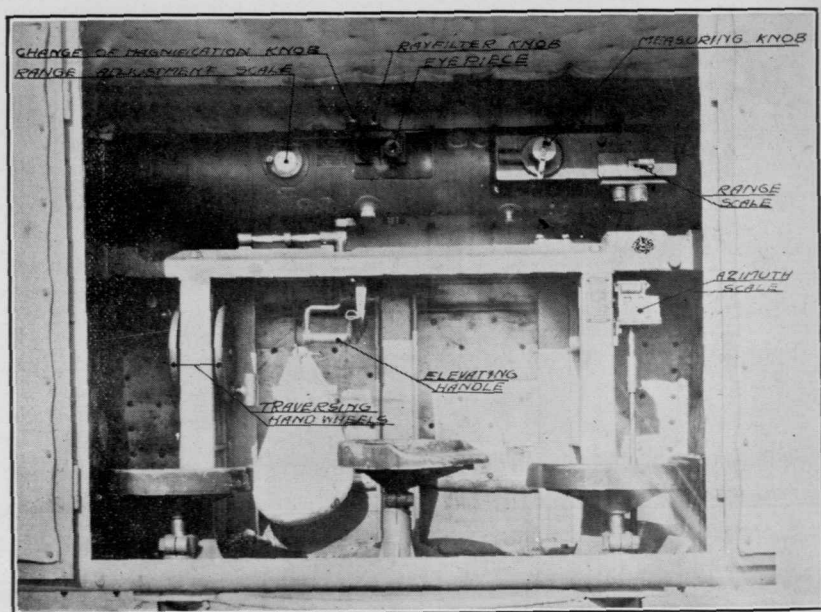


FIG. 2

3. In addition to the data on the 30-foot instrument, this test has furnished a measure of accuracy to be expected from the 4-meter Goerz Coincidence and the 4-meter Zeiss Stereoscopic range finders. The following tabulation gives the average error, reference target, from observations on moving targets. It constitutes a fair measure of the accuracy to be expected from these instruments when used for tracking ships:

AVERAGE ERROR REFERENCE TARGET

Range	Goerz 4-meter Coincidence	Zeiss 4-meter Stereoscopic
2,000 yards	30 yards	30 yards
4,000 yards	50 yards	50 yards
6,000 yards	100 yards	100 yards
8,000 yards	160 yards	160 yards
10,000 yards	220 yards	240 yards
12,000 yards	310 yards	310 yards
14,000 yards	400 yards	410 yards
16,000 yards	520 yards	550 yards
18,000 yards	580 yards	650 yards
20,000 yards	710 yards	800 yards

AVERAGE ERROR REFERENCE TARGET (MOVING TARGET)
TEST OF SELF CONTAINED BASE RANGE FINDERS
APPENDIX C. PART V. NO. 2.

LEGEND—

0.30-FOOT EMUSCH AND LUMB CONCORDANCE

0.15-FOOT BAUSCH AND LUMB CONCORDANCE

X 4-METER GIERZ CONCORDANCE

4.4-METER ZEISS STERNCONCORDANCE

NUMBERS OPPOSITE PLUMS REPRESENT NUMBER OF READINGS MADE

COAST ARTILLERY BOARD TEST RANGE 10A JAN 15 1924

SCALE 100 YDS

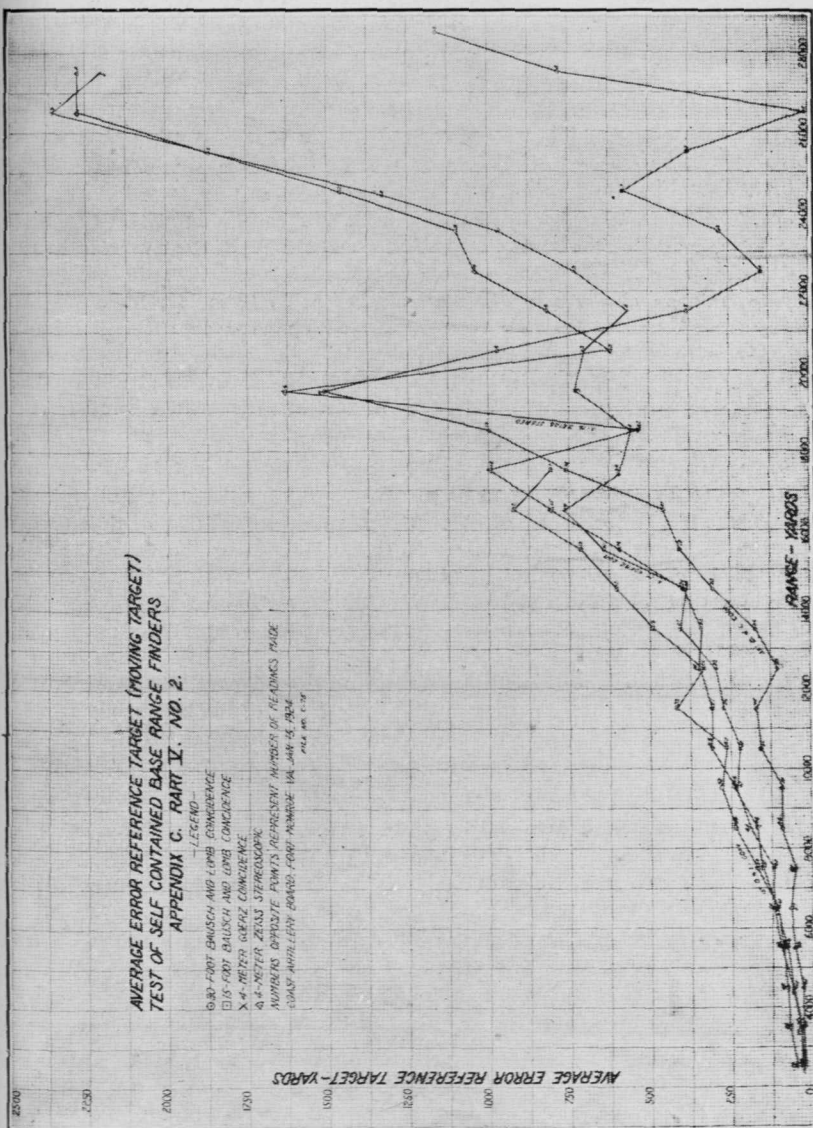


Fig. 3

The Board is of the opinion that a portable self-contained base range finder of accuracy equal to or greater than the 4-meter base instruments tested would be of great value to mobile batteries. Normally, ranges to moving targets should be determined by means of a long horizontal base, but for emergency use, each battery should have a self-contained range finder. The principal factor limiting the size of the range finder adopted, including length of base, will be the weight, which must be great enough to insure stability and ruggedness under field conditions, and yet small enough for the instrument to be easily portable. The length of base should not be less than four meters. A more complete comparison of the self-contained range finders with long horizontal base system appears in a later paragraph. The selection of the range finder best suited for use with mobile artillery should be made the subject of a special study.

4. The Board is unable to come to any definite conclusion at this time as to the relative merits of the 30-foot range finder and the D. P. F. at varying heights of site, observing on a target at varying ranges. While it is believed that it is as easy to train an observer to effect coincidence as to train him to waterline a target, the amount of training required for an observer on either instrument probably will not be the determining factor in the selection of an instrument. Where the height of site obtainable for a D. P. F. is sufficient to give it an accuracy comparable with that obtained from the 30-foot range finder, considerations of economy will dictate installation of the D. P. F.

5. *Comparison of 30-foot Range Finder with long horizontal base.*—*a.* The 30-foot range finder has several material advantages over the horizontal base system. There is a better chance of obtaining an uninterrupted flow of data from a self-contained base range finder than from the stations at the ends of a long horizontal base, the communication system is less complicated and therefore less likely to get out of order and to be cut by shell fragments; range finders often can be set up adjacent to the battery they serve. The range finder usually will be close by and immediately available. Even in peace time, communication with distant stations often is difficult to maintain and the danger of telephone lines being cut and of telephones getting out of order is one of the best arguments for the adoption of a self-contained range finder, especially for use in emergency conditions. It will afford an additional assurance that a battery will not have to go out of effective action for lack of accurate firing data if the target can be seen from shore.

b. Personnel errors are reduced. One reader on the range finder replaces readers at primary and secondary stations and the secondary arm setter in the plotting room.

c. A single range finder can be placed on the proper target with greater certainty than can the two instruments of the horizontal base. It happens at drill—it was experienced at both the Fort Story and Fort Monroe tests—that one station tracks one target and the other station tracks another target.

d. During this test moving targets were tracked by two horizontal base systems. Occasionally there was a greater difference in ranges to the target as determined by the two base lines than between the ranges obtained by any one base line and the 30-foot instrument. To cite an extreme case, at a certain time on one track, one base line gave a range of 16,700 yards; the other a range of 17,070 yards, a difference of 370 yards while the 30-foot range finder gave a range of about 16,900 yards or about the mean between the two base lines. The large differences in ranges obtained at the same instants to the same targets by the two

horizontal base systems during this test is believed to be due to lack of trained personnel, especially observers, at the base end stations.

e. One material advantage that the horizontal base line has over the 30-foot instrument, in addition to the greater accuracy that may be expected, is that on foggy and hazy days the cross wires of an azimuth instrument (Model 1910) may be kept on a target for several thousand yards after it has become impracticable to effect coincidence with the 30-foot instrument. When the weather is so hazy that a target cannot be observed through a telescope beyond a few thousand yards any system based upon terrestrial observation will fail. However, the test showed conclusively that, for targets in the water area approximately normal to the base line, the horizontal base system (length of base 2826 yards) may be depended upon for tracking under bad weather conditions for from 2000 to 4000 yards (average 2600 yards) beyond the limit of the 30-foot instrument. Displacement of the target in prolongation of the base line or increase of the length of the base line will tend to offset this disadvantage as the limit of visibility for the horizontal base is the limit of its more distant station.

6. *Recommendations.*—In view of the excellence of the results obtained in this and in previous tests it was recommended that the policy be adopted of equipping eventually each battery of Coast Artillery, fixed or mobile, with a suitable Range Finder for emergency use.

7. It was recommended that a coincidence Range Finder equal to or superior to the 30-meter instruments tested to be assigned to each major caliber fixed defense battery other than those enumerated in the preceding paragraph.

9. The assignment of a portable Range Finder equal or superior to the 4-meter instruments tested was recommended as suitable for emergency use by mobile batteries, both tractor drawn and railway.

10. The Board further recommended the purchase of one or more of the new Bausch and Lomb 33½-foot Range Finders for use and service test with long range batteries. The Board specified in detail in its report all the desirable features to be incorporated in this Range Finder. These consisted chiefly in modifications of certain of the mechanical and optical features of the 30-foot Range Finder and included better and more convenient traversing and elevating mechanisms, the addition of a finder to facilitate azimuth training, use of invert rather than erect coincidence principle, one power of magnification (25 x), elimination of interior adjusting scale and alterations in range and azimuth scales.

11. The Board further recommended that a definite standard of proficiency be adopted for operators of self-contained Range Finders and that no observer be permitted to operate one of these instrument during firing unless he first attained this standard of proficiency.

Project No. 128, Manual for Combined Training of Coast Artillery and Air Service in Coast Defense.—This Manual was prepared by the Board in collaboration with officers from Langley Field. It has been forwarded for final approval by the Chiefs of the two services and will be then published to the service.

Project No. 131, Panoramic Sights For Mobile Artillery.—This project has been completed but the report is too long to permit publication in this issue of the JOURNAL.

Project No. 155, Test of Six Fuse Setter Mountings.—

1. In June, 1921, Modified Bracket Fuse Setters, Model of 1916, for anti-aircraft use, were sent by the Chief of Ordnance to the Coast Artillery Board for

test. The Board by 2d Indorsement to the correspondence quoted above transmitted a report of the test of those fuse setters which was subsequently approved.

2. The report of the Board, or, more properly speaking, of the First Antiaircraft Battalion (now 61st Artillery Battalion), which conducted the test suggested a certain method for mounting these bracket fuse setters. Without detailing the numerous proposals and counter proposals shown by the correspondence thereafter, there eventually arrived six fuse setter mountings constructed as shown in Figure 4. These mountings arrived in September, 1923, and were transmitted to the 61st Artillery Battalion (A.A.) for test in actual service use.

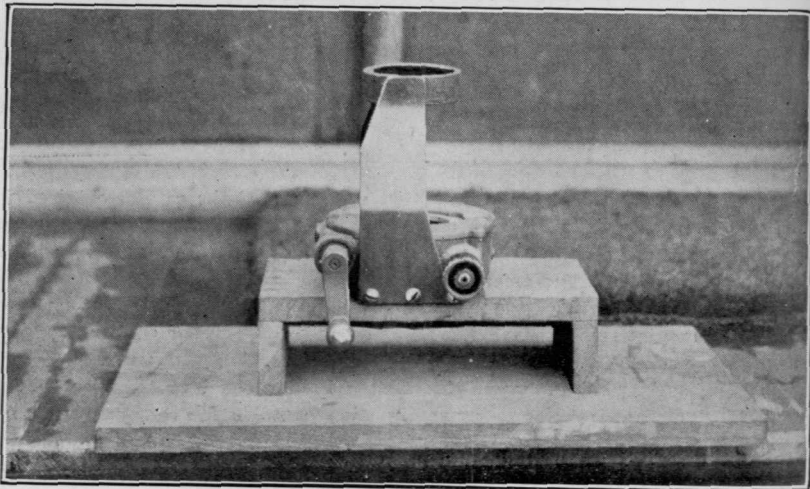


FIG. 4

3. The fuse setter mountings were used by the Antiaircraft Battalion to which they were delivered for all drills and firings from the time of their receipt until the latter part of December when certain modifications (specified herein) were suggested by the Board. The mounting as thus modified was then given a thorough test in actual use.

4. The design of a fuse setter mounting should be based on the following underlying considerations:

a. Ease of operation by the fuse setter. This very important cannoneer, on whose work the effect of fire so largely depends, must concentrate on two things; receiving the correct fuse setting through his headset and keeping this constantly changing value set correctly on his instrument. He should be in a comfortable position and no great physical exertion should be necessary for the proper accomplishment of his duties. Corrector and fuse indices and scales must be visible to him at all times and there must be no possibility of interference between him and the ammunition details.

b. Ease of operation by the ammunition details. The fuse setter must be presented to these details in the most suitable position for inserting the projectile, setting the fuse, and getting clear of the succeeding man. The fuse setter must be steady. The ammunition detail must have no other function than the manipulation of the projectile; for example, it should not be required that the man carrying the projectile hold the fuse setter steady while turning the fuse.

c. The results to be made possible by the construction as indicated in the two preceding subparagraphs are accuracy and speed. Speed in turn affects accuracy through the resultant constancy of, and decrease in, the dead time. Seconds and fractions of seconds saved by the efficient use of fuse setter and mounting and systematic training of ammunition details make the difference between a good and an inferior gun crew.

5. In further explanation of the points enumerated in the preceding paragraph it was considered that the fuse setter mounting problem could be solved, specifically, as follows:

a. The most convenient position for the fuse setter to operate is seated. The indices should be convenient to his eye and the operating handle to his hand; therefore the fuse setter should be immediately in front of him, in fact the

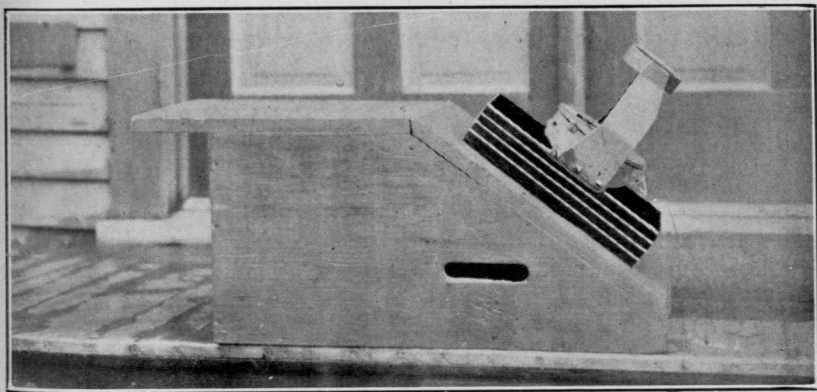


FIG. 5

mounting should be an integral part of the seat. If the fuse setter be turned so that the operating handle is on his right side, the index will be away from him, or in other words, will be invisible to the operator when a projectile is in the fuse setter. Of the two disadvantages concerned, one of which must be accepted, interruptions to the visibility of the index would be most detrimental. The fuse setter, therefore, should be mounted with the index toward the operator and operating handle on the left. The graduations on the dial are thus inverted, but are easily read.

If the fuse setter be horizontal the ammunition details must necessarily approach so close to the operator that interference will result. The inclination of the fuse setter, however, should be effected more by the conditions discussed in the succeeding subparagraph than by this factor.

b. The most convenient manner for the ammunition details to carry a projectile is with the left hand underneath the shell proper, palm up, and right hand grasping the base of the cartridge case, palm against the base and fingers along the sides of the case, the projectile held about waist high. With an inclined fuse setter mounting, the detail lowers the nose of the projectile into the setter, guided by the left hand, leans slightly forward, applying pressure with his right hand and turns the projectile so as to set the fuse without the necessity for changing the manner of holding with either hand, or the position of body and feet. The

pressure of the body behind the right hand prevents the fuse from "jumping" the lug except when the fuse is corroded and sets with great difficulty. The position of the detail, with the projectile inclined instead of vertical, is sufficiently far from the operator so that no interference occurs. The weight of the operator seated on the mounting, maintains the setter stationary.

c. By means of a mounting thus constructed the time of setting fuses is reduced to a minimum and the fuse setter can operate continuously and without interference by the ammunition details, thus enabling the maximum accuracy possible to obtain.

d. The mounting should be sufficiently light to be maneuvered behind the gun as the target changes azimuth materially.

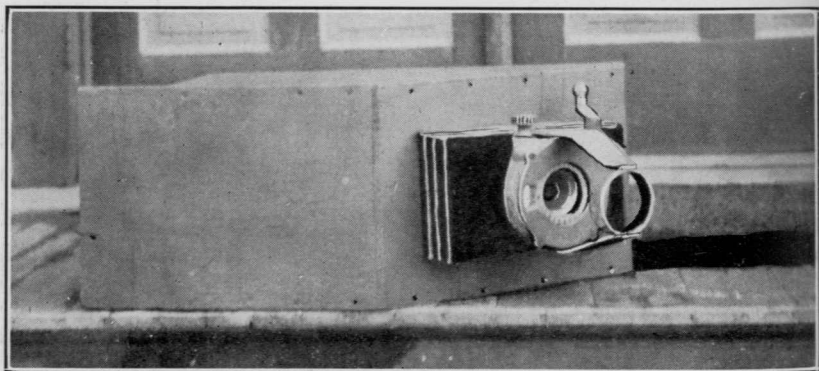


FIG. 6

6. *Conclusions.*—As a means of supporting the bracket fuse setter the mounting submitted for test (Figure 4) is satisfactory except that the two small blocks supporting the fuse setter above the large base board should be at least of 1-inch material.

7. In point of convenience and time the fuse setter mounting submitted for test is subject to improvement as suggested in paragraph 5 hereof and illustrated in Figures 5 and 6. The mounting as submitted could be adapted with little trouble to the suggested form by a battery mechanic. It is believed, however, that better construction with little added cost would result from the supply of the mounting complete by the Ordnance Department.

8. *Recommendations.*—The Board recommended that fuse setter mountings in form similar to that shown by Figures 5 and 6 be manufactured by the Ordnance Department and furnished to antiaircraft gun batteries in the ratio of four per battery.

9. The modification of the bracket fuse setter is not recommended inasmuch as the present one can be utilized with the objections mentioned, and the cost of the alterations be saved.

10. In connection with the general question of fuse design the present test and past experience have shown that special attention should be devoted to ease of setting. The torque necessary to turn the fuse should be a minimum. It was recommended that this point be submitted to the Ordnance Department for consideration in future fuse construction.

BULLETIN BOARD

Success in the Military Service

By MAJOR W. K. WILSON, C. A. C.

EDITOR'S NOTE: This is the second of a series of "five minute" talks by Major Wilson. The first, "Our Aim in the Military Service," appeared in the February issue of the JOURNAL. It is believed the subject matter of these addresses is particularly suited for use by organization commanders in short talks to their commands.

In January I addressed the students of the Non-commissioned Officers' School on the subject of "Our Aim in the Military Service." Today, I wish to talk to you for a few minutes on the subject of "Success in the Military Service."

It is a natural thing for a man to be interested in success. Any man who is half a man wants to do well the thing which he starts out to do. In art, in literature, in music, in business, and in professions men seek success, and this is true not only in the serious things of life, but also in their sports and pleasures. In baseball, football, golf, tennis, and fishing, those who engage want to be successful.

There can be no doubt about it that men all around us are seeking success. The question arises what is success? I can tell you that a foot consists of twelve inches and I can give you a yardstick or a tape measure with inches and feet marked on it. You can then take the yardstick or tape measure and measure with considerable accuracy, distances of various lengths. Unfortunately, we have no such measuring rod for success. One man may consider that he has been successful in business if he owns a small corner store which does enough business to afford a modest living for himself and his family. Another man would not consider that he had been successful in business unless he owned a chain of large stores extending from one end of the country to the other. So we see that after all "Success" is not something which we can measure definitely, but success is a comparative term. What is success to one man may mean failure to another.

How then can we define success in the Military Service? There are some who would tell us that only those at the very top have succeeded. This cannot be true for we cannot all be generals yet truly we can all succeed in the Military Service. That soldier who day by day has done his duty in full, and who has climbed as high in the military service as his basic education, his age, and his length of service warrant, is truly a successful soldier.

In attaining success, what are some of the essential qualifications? In the first place, there must be desire. In order to succeed a man must desire to succeed. Who ever heard of a man being a great artist who did not desire to be an artist? Who ever heard of a man being a great musician who did not first desire to be one? Who ever heard of a man being a successful business man who did not desire to succeed in business? In the Military Service, it is the same way. To succeed, the first thing a man must do is to desire to succeed. Your presence at the Noncommissioned Officers' School indicate to me that you have shown the officers who selected you for the school that you desire to succeed.

In the second place, you must believe that you can succeed. This is self-confidence and must not be confused with conceit. If you do not believe in yourself, how can you make another person believe in you? Those about you must be shown that you can succeed. You must believe that you can succeed right from the very start. You do not have to climb a particular mountain to believe that you can climb it. You do not have to walk any particular distance in order to believe that you can do it. You do not have to pass a particular examination in order to believe that you can pass it. Your confidence in what you can do is based upon the various things you have done in the past. You must believe that you can succeed in order to succeed.

In the third place you must be persistent. Having the desire to succeed and the belief that you can succeed, you must let no obstacle stand between you and success. Too often a man starts out all right but allows his aim to be diverted. He forgets his objective and turns off the straight pathway to success. Persistence was necessary for the success of the great musicians, the great artists and the great inventors, and it is necessary for your success.

In the fourth place, hard work is necessary to success. Since the world began men have been trying to find a short road to success which went around hard work, but such a short road is just as hard to find as the famous "Fountain of Youth." Did you ever hear of a great musician who had not spent hours and hours in practice? Did you ever hear of a great artist who had not spent hours and hours in perfecting his art? Did you ever hear of a great inventor who had not spent hours and hours at his invention? Nothing worth while can be obtained without hard work. In the Military Service it is the same way. If you would be successful you must work.

In the fifth place, patience is necessary to success. A great wall is not built in one day. After the foundation is laid, the wall is built by placing one stone upon another. One by one the stones are laid and the whole wall grows. The great musicians did not start in playing the wonderful music for which they are noted, but starting with the simplest music they had to advance step by step. Patience is a great virtue, and it takes lots of patience to succeed. On the road to success there are many things which discourage us, and we are apt to feel that we are not making the progress which we would like. Then it is that we need patience, and we must make ourselves believe the words of Coue, "Day by day in every way we are getting better and better."

In the sixth place, cheerfulness is necessary to success. No one likes a grouch, or a grumbler. You can be sure that he would never be the man selected for an important detail. He has a bad effect upon those around him. In the Military Service cheerfulness is especially important. A soldier will be given many duties which are unpleasant ones, but even the worst duties can become less unpleasant, if he remains cheerful. We cannot always choose our assignments, but we can always receive them with a smile.

In the seventh place, self control is necessary to success. It goes without saying that a man who cannot control himself cannot control others. This does not mean that in order to be a successful leader, a man must have no temper, nor other passions which go to make up a normal man. Far from it, the more humane a man is, the more he can understand those under him. It does mean, however, in order to succeed as a leader he must be master of himself first.

In the eighth place, courage is necessary to success. It requires courage to go boldly into places of great danger. True soldiers have no respect for the man who hesitates or who runs away when the enemy is facing us. You may

think it unnecessary to speak of courage to soldiers. However, the courage to which I refer has a far deeper meaning than the physical courage required to enter a fight. The courage so necessary to success is the moral courage which enables a man to do right when it is much easier to do wrong. It is the courage which enables a man to do right no matter how many may try to prevent him.

In the ninth place, preparedness is necessary to success. By preparedness, I mean the ability to take advantage of the opportunities as they come your way. When the United States entered the World War in 1917, it became necessary to secure additional officers at once. I was on duty at the War Department and assisted in making up lists of enlisted men to be commissioned without examination. These lists were based upon the recommendations of the various commanding officers. As a result of these lists, several hundred enlisted men were commissioned. This action came as a surprise to the enlisted men. It was an opportunity for which many of them were always prepared. While some of them failed, many succeeded. Some were advanced from time to time to field officers grades. Many of those former enlisted men are holding permanent commissions today. They were prepared for the emergency which they did not expect.

In the tenth place, honor is necessary to success. In business, a man who does not keep his word, does not last very long. Since we were little children we have heard the old adage "Honesty is the best policy," and it is true. Our banking system is built upon a foundation of honesty. Honor is very important in the Military Service. A soldier's word should be as good as his oath. A liar may last for a time, but how unpopular he becomes when men find him out. In the Army, honor is essential. We live together in barracks and cannot lock all our belongings up. We must trust each other. In time of war, while some sleep, others stand guard to protect the sleepers from the enemy. We must trust those on guard. Without honor, an Army cannot last.

In the last place, loyalty is necessary to success. In business those are promoted who are loyal to their employers. Loyalty demands faithful service in the Military Service as well as in the business world. We are honored by being made the representatives of our Country. He who would be disloyal to our Country and to our flag has no place among us. In order to succeed in the Military Service, it is necessary to be loyal to our Country, and to those placed over us by legal authority.

The motto on the Coat of Arms of the United States Military Academy contains these words

"DUTY, HONOR, COUNTRY."

To sum up, my formula for success in the Military service is:

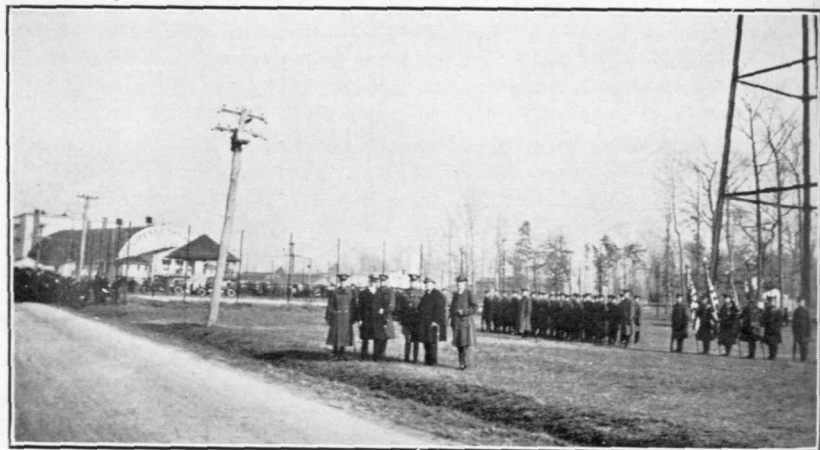
Desire to Succeed. Self-Confidence. Persistence. Hard Work. Patience. Cheerfulness. Self-Control. Courage. Preparedness. Honor. Loyalty.

Fort Eustis

EDITOR'S NOTE: The JOURNAL is indebted to Colonel H. E. Cloke, C.A.C., for the following notes descriptive of Fort Eustis.

Fort Eustis is coming to the front as one of the most popular stations in the Army. It now has a garrison of about two thousand troops and in the neighborhood of seven hundred civilians, including women and children. In the old days Fort Eustis, then Camp Eustis, was considered as a rather doleful place for station, this being due principally to the fact that there were no good

roads entering it, and buildings were in a more or less unattractive and dilapidated condition. There was little drainage and considerable inconvenience was caused due to the mud and the quarters were far from being in a state of comfortable occupancy. But all these things and many others have been corrected. It now consists of a regiment of Railroad Artillery, a regiment of 155-mm. Tractor Artillery, a regiment of Infantry, an Ordnance Company, a Sound Ranging Company, and a large number of staff troops of the Medical and Quartermaster Corps. From a professional standpoint there is no better place for an artilleryman to serve than Fort Eustis. It is conceded by all that railroad and tractor artillery will be very important factors in future coast defense duty. The work connected with the utilization of these two branches of artillery

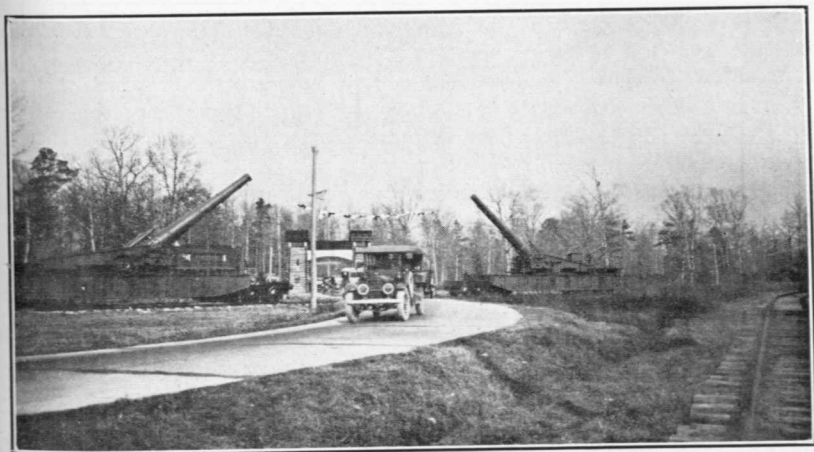


GOVERNOR TRINKLE OF VIRGINIA AT REVIEW OF 34TH INFANTRY

is intensely interesting as well as instructive to the personnel, and is constantly progressive. It is at Fort Eustis where practically all the experiments and tests in fire control instruments are used in the adaptation of these two arms to firing on moving targets. It is here that these experiments were first initiated and where they proved so highly successful. Largely for this reason these two arms have been retained as part of our permanent coast defense system. The Sound Ranging Company stationed here is the only one in the whole United States Army. The extent of experimentation and future development of this arm of the service is almost unlimited.

The barracks and quarters at Fort Eustis have been, within the past year and a half, almost completely remodeled. Their exteriors and interiors have been repaired and painted so as to render them attractive in appearance and comfortable for living. Many old and unsightly buildings have been torn down and many of the utilities of the post have been moved and changed so as to render the garrison more compact for facility and administration and supply. Everyone here, from the commanding officer down, has taken a personal interest in the beautification of the grounds and buildings such that when spring comes the whole reservation becomes a veritable garden of all kinds of flowers and shrubs. All

the old board walks that were so dilapidated in the old days have been removed and fine gravel walks installed in their places. There is now a splendid concrete road leading from the post that connects with the main highway to Newport News, Hampton, and Old Point Comfort, and to the north the concrete now extends as far as Providence Forge, almost to Richmond. The trip can be made to Old Point Comfort in an hour and fifteen minutes, to Richmond in two hours and a half with ease. The trip to Washington, which is made very frequently by members stationed here, can be made in eight hours. Fort Eustis has its own laundry. It has a central heating plant for all of the officers' quarters. It has its own ice plant and refrigeration system. It has a commissary equipped with a greater variety of sales articles than the average. It has a central electric plant



MAIN ENTRANCE TO FORT EUSTIS

for lighting and power purposes and artesian water derived from wells driven over five hundred feet into the ground. It has four splendid athletic fields, one with a huge grandstand just completed. It has a nine-hole golf course which is becoming more and more popular. It has one of the most attractive officers' clubs in the Army, quaint in its style of architecture and homelike in its interior design. Card clubs, mah-jong clubs, dinner parties, dances and receptions are all held here by the officers. Each regiment has a very fine service club each of which is equipped with all conveniences. One of these service clubs has recently acquired a good bowling alley. Each club has pool and billiard tables. There is a hostess house at Fort Eustis. In it are rooms and baths for visiting relatives or friends of members of the garrison. Good meals are served at the hostess house at reasonable hours for a small charge.

At Yorktown about ten miles distant a fine new eighteen-hole golf course has recently been constructed at considerable cost. There will be a golf club organized there next June. A three million dollar hotel is also contracted for at Yorktown. It is understood that this hotel is now completely financed and that the ground has actually been broken for its foundations. This hotel will undoubtedly be a tremendous asset to the residents of Fort Eustis.

Only Twenty Years Ago

The "Twenty Years Ago" column of the New York Tribune recently published an item which it would be a good thing to furnish every member of Congress at present opposed to spending the money absolutely essential if aviation is not almost wholly to disappear in the United States. The item, under a Washington date line, states: "Representative Robinson of Indiana in the House today attacked bitterly the War Department's policy in spending money to aid in the development of the Langley airship. He said the Department had put \$100,000 into a project 'which every sensible man knows has no utility.' He continued: 'Here is \$100,000 of the people's money wasted on this scientific aerial navigation experiment because some man, perchance a professor, wandering in his dreams, was able to impress the officers that his aerial flight scheme had some utility.'"

Probably the majority of the mechanical inventions of greatest importance since the first days of the development of modern industry have been made in this country. In spite of the fact that we have produced the inventors, that we are supposed to be an imaginative people, ever pressing forward, the fact remains that the above is too typical of the average attitude, with the result that though we invent, Europe generally develops.

This is certainly true of aviation today, where even in disturbed, beaten, poverty-stricken Germany the use of aviation for commercial purposes has almost become commonplace.—*Army and Navy Journal*.

A Letter to the Editor

Fort Preble, Maine, Feb. 28, 1924.

Dear Edditer:

i receeved yure dumm leter askin me 2 cum acrost with tree doller fore nex yere journal Now i aint got no more money than i ever had an i am getten dam tired of thees beggin letters.

Furst thè jappaneese erthquake ask me for five doller, then red cross ask some more, then Salivatune army ask me to help drive—drive what ask i—into yure pockets thay say—nex they say send more money for memoriale for late presidente, i been late much times but thay never put up me a memmorielle but he being a regerlar guy i say K. O. and send more money—then army releef asso-sheashun they want some more all rite i am game as you say i send more. Then tax collector he send me dam long sheet look like paper chase problem at Fort Leavenworth—He say toss coin and if it come heds send me check for all your checking account ballance, if it come tales send cash. i am today riting to A. G. to take my money and prorate it among red cross, Book Dept G. S. S. (meening grate smoke service) collector Internal Revenoo—an arty gernel, and charge the rest to my account at Ft 11 worth club. i surely thot that having been cell pardners at Ely's skule you mite have put me on the xchange list—do you, ile say you dont. You just say plees help us—we need it. As an edditer you are one dam good golluf player. I send the three dollars for yure paper. But for old times sake put out a real comic supplement. The journal next month will probably offer a reward to anyone who discovers or discloses the author. But next month will be two late. i will be adjutant at St. Elizabeths then, writing checks for the associated charities.

NOT SIGNED

N. C. O. School, Hawaiian C. A. District

A demonstration was given recently by members of the graduating class of the Non-commissioned Officer's School at Fort De Russy, Honolulu, H. T. Major General C. P. Summerall, commanding the Hawaiian Department, and Brigadier General John D. Barrette, commanding the the Hawaiian Coast Artillery District, were particularly pleased with the progress of the school as evidenced by the varied work demonstrated by the members of the class.

The program was as follows: Rifle marksmanship, mechanical maneuvers, wig-wag signalling, demonstration of care of equipment, pistol marksmanship, machine gun squad drill, dismounting and assembling automatic rifles, demonstration in first aid, mounting and assembling machine guns, cordage, rifle marksmanship for positions, coaching and pit detail, inspections and equipment, construction of thousand-inch target and filling belts for machine guns, mechanical maneuvers with hydraulic jacks, gas mask drill, message center, infantry drill by entire student body including school of the soldier, school of the squad, school of the platoon and company, extended order and riot duty.

Among the Coast Artillery Corps officers present at the demonstration were: Colonel Lawrence C. Brown, commanding the Coast Defenses of Honolulu, Major Walter K. Wilson, Major Harry Stark, Major William C. Foote, Major Charles A. French, Capt. Charles Finley, Capt. Gordon Welch, Capt. Erwin Manthey, Capt. Ellicott Freeland, Capt. Francis Swett, Capt. William Braley, Lieut. Robert Crichlow, Lieut. E. Carl Engelhart, and Lieut. Henry Williams.

Training Camps

This year the citizens' military training camps should register attendance much greater than ever before. Experience has given the nation to see the need for training young men along the lines followed by the camps. The lack of such training proved impressively costly in the World War. To guard against repetition of such experience, the government is providing the camps and is urging those fit and in need of military training to take advantage of them.

The camps offer an exceptional opportunity to promote national defensive strength and to improve self. Not only patriotism but self-interest urges young men to attend. The training is along lines that make for preparedness against possible military attack. But this is not all. Camp training and instruction also make for better citizenship, for bodily improvement, for development of qualities helpful in the business of life.

Knowledge of the camps and what they offer should be all that is necessary to convince any young American who can attend that he should do so. Such knowledge is spreading by operation of the camps and, to that end, information is being broadcast by the government and by organizations working in cooperation. This should greatly stimulate this year's movement campward.—*Washington Post*.

Not To Drop "Mister" For Lieutenants

Request was made of the War Department, by the commandant of the Infantry School, to promulgate instructions prescribing for the title "Lieutenant" instead of "Mister" to be used when addressing second lieutenants, but this was returned to Fort Benning disapproved.

For over 100 years, certain customs have governed the matter of addressing lieutenants. When speaking directly to them or when introducing them, lieuten-

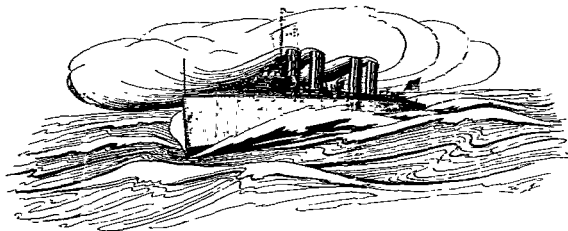
ants have been called "Mister"; when speaking of them and when making references to them to enlisted men they have been called "lieutenant." Enlisted men have always addressed them as "Lieutenant." The War Department in disapproving this request, does not favor adopting a rule whereby lieutenants will be habitually addressed as such, and indicates that it attaches value to the old customs to the extent of favor in their continuance.

In some quarters, during and since the World War, this tradition to a certain extent has been ignored, due to the fact that to large numbers of persons who entered the Service old customs of the Army were unknown. The commandant of the Infantry School has therefore directed that the custom of the Service respecting the title by which lieutenants are known will be adhered to, and all officers of this grade will be addressed by other commissioned officers as "Mister" except in official written communications.—*Army and Navy Register*.

Times Have Changed

A few years after the institution of the Federal Government, the Chevalier de Pontgibaud, who had served through the Revolutionary War as aide-de-camp to the Marquis de Lafayette, revisited the United States, and on his return made this comment:

"The Government officials were as simple in their manners as ever. I had occasion to call upon Mr. McHenry, the Secretary of War. It was about eleven o'clock in the morning when I called. There was no sentinel at the door, all the rooms, the walls of which were covered with maps, were open, and in the midst of the solitude I found two clerks each sitting at his own table, engaged in writing. At last I met a servant, or rather *the* servant, for there was but one in the house, and asked for the Secretary. He replied that his master was absent for the moment, having gone to the barber's to be shaved. Mr. McHenry's name figured in the State Budget for \$2,000, a salary quite sufficient in a country where the Secretary of War goes in the morning to his neighbor, the barber, to get shaved. I was as much surprised to find all the business of the War Office transacted by two clerks, as I was to hear that the Secretary had gone to the barber's.—*The Work of the War Department*.



PROFESSIONAL NOTES

Enemy Combinations of the Future

Translated by Colonel George Ruhlen, U. S. Army, from an article in the Militar-Wochenblatt by Lieutenant-General Von Altmack.

As projected by Wilson armies were to be dismissed after the World War and the destinies of nations conducted in future peaceably by the League of Nations. But Germany alone was disarmed by the treaty of Versailles. The remaining world bristled with weapons more than ever before. No "Watch on the Rhine" guards its frontier "safely and faithfully" any longer; the enemy has torn away wide strips of German lands from the west, east, north and south; an enemy stands on the banks of the Sarre, on the Rhine, in Baden, Westphalia, in the North Mark, on the Vistula, in Pomerania, Silesia, and in the Alps where once Andreas Hofer died for freedom. German lives, rights, property and customs are exposed to an enemy's arbitrary license. The League of Nations is subject to the control of our opponents. Right and justice are for the strong only. Disarmament lies as a heavy burden on the German and threatens destruction of his children and his children's children. Never, perhaps, has Germany's situation been more grievous than it is at this moment.

Let us consider more accurately the ring of hostility surrounding Germany in order that we may appreciate fully the helplessness of our situation. Europe's armed force is France. It already threatens England, which discarded its armament entirely too soon, and upholds the entente only to have an opportunity to take a part diplomatically. As an actual fact its "splendid isolation" was never more greatly endangered than it is at this moment. No "balance of power" permits it, as was formerly the case, to play the nations of Europe one against the other. England has delivered Germany up against its own interests and has compelled it to come to terms with France. But it is known throughout the British empire that England's insular situation has been done away with by modern war appliances; that only a few days will be required to make wreck and ruin of the industrial centers of southern England with French long range guns, and bombs from flying squadrons; that London, in case of war will remain alive only by grace of France. And he who lives in a glass house is disinclined to throw stones.

France has placed a network of steel around Germany with its vassal states. All around Germany are nations bristling with arms and Germany in their midst endures a miserable existence. France has at its disposal security troops of a peace establishment of 750,000 men; Belgium, 120,000; Esthonia over 17,000; Rumania over 190,000; Jugo-Slavonia over 160,000; Italy over 360,000, all in the peace establishment. This aggregates 2,267,000 *peace soldiers*, who are prepared to come down against disarmed Germany at any time. If this peace establishment is changed to war strength some twenty million trained soldiers will, in the near future, be available against Germany's 100,000 *armed men*.

This enormous superiority in numbers of our presumptive opponents is very greatly increased by their modern equipment and armament. Nearly all their armies have heavy artillery; combat, bombing and observation squadrons; armored wagons; tanks of most recent construction; and a gigantic superiority of guns of all kinds, machine guns, minenwerfers, an inexhaustible supply of ammunition of all sorts, gas ammunition and gas protection devices, all of which are denied to Germany.

France is ahead of all others in aerial warfare for "conquest of the air is the primary condition of victory." Even a modern army would be condemned to impotency without the tactical and strategical means of the military aviation system. Victory is dependent upon reconnaissance, observation and the tactical assistance of flyers. Modern flying craft can play from elevations of 4,000 meters and maintain themselves in the air for hours and are able to make flights to great distances. The French bomb flyers are constructed for long flights and for carrying heavy weights. They can cover distances up to 800 kilometers with a bomb equipment wholly unknown during the World War. Experiments with giant bombs of over 4,000 pounds weight, thirteen and one-half feet long, charged with 2,000 pounds of high explosives, have already been made in America. One such bomb can lay entire city squares in dust and ashes.

In wars of the future the initial hostile attack will be directed against the great nerve and communication centers of the enemy's territory; against its large cities, factory centers, ammunition producing places, artificial water supplying establishments, breakwaters, water supply lines, gas factories; in fact, against every life artery of the country. Discharge of poisonous gases will become the rule since great progress has been made in the domains of production of poison gas. Such attacks will be carried to great depths in rear of the actual fighting troops. Entire regions inhabited by peaceful population will be continually threatened with extinction. The war will frequently have the appearance of a destruction en masse of the entire civil population rather than a combat of armed men.

Register Velocity of Shell Inside of Gun

An expansometer recently developed at the Bureau of Standards can be used to determine the time at which a shell passes a given point in a gun by observing the expansion of the gun at that point. The instrument is placed around the gun on the outside, and when the shell passes it the sudden expansion of the gun, due to the pressure of the gases behind the shell, causes an electric signal to be transmitted to a high speed recording instrument. A record can be made of the passage of the shell through the bore of the gun and its velocity at any desired point determined.

New British Submarine Fastest, Biggest in World

The submarine X-1, which is nearing completion at a Chatham dockyard for the British navy, will be the longest as well as the fastest submersible craft in the world, according to the *Morning Post*. She will have a surface speed of thirty-three knots, thus enabling her to accompany battleships when steaming at full speed. The submarine will carry six 5.5-inch guns, an armament said to be unique for undersea craft. Her displacement will be 3,500 tons. It is recalled that the first British submarine, built in 1901, displaced 120 tons and had a surface speed of nine knots.—*Boston Transcript*.

The Panama Canal Essential to Our Peace

Representative Kahn of California, the veteran chairman of the house committee on military affairs, a civilian expert on national defense through years of study of its problems, has made a statement on the Panama Canal which every American ought to consider seriously. Mr. Kahn says the canal is virtually defenseless and he urges that without further delay it be made as nearly impregnable as we can make it. We do not discuss the technical military and naval considerations involved, although an intelligent civilian equipped with a map and some elementary information can come to a sound conclusion as to the serious situation in which the canal has been left. But we would have our readers think seriously upon the nation's vital interest in the manufacture and security of that main link of empire. We wish especially to indorse and emphasize the following assertion of Mr. Kahn:

What the Erie Canal has meant to the growth of our great middle west, the Panama Canal means to the continents of North and South America. Through its influence, we have been drawn into channels of ever growing trade and these contacts are leading to the more delicate ones of diplomacy. American trade with the countries of South America has grown to a point where our exports to those countries represent close to half of what they buy from the whole outside world.

Congress ought to have sufficient grasp of our national economic interest to avoid a pennywise policy respecting the canal, even though it is incapable, as it seems to be, of taking a problem of national defense seriously in time of peace. But if congress should take national defense seriously, it would realize that while the canal is a factor of first rank in the defense of our shores, greatly increasing the efficiency and therefore the economy of our navy, it becomes an element not of strength but of weakness, if it can be taken by an enemy. That ought to be almost as clear as an axiom in geometry. Any man fit for a seat in congress will see it if he will not close his mind and lock it before he looks at the facts.—*Chicago Tribune*.

Fate of the Big Berthas

There were no less than seven "Big Berthas," but none now remains, we are told by the Frankfort *General Anzeiger*. *Le Matin* (Paris) quotes the following passages, with reservations, as a purely German version of the facts. We read: "The long-range guns that bombarded Paris in 1918 were built in the Krupp works. Seven guns of this type were made in all. When the German army began its movement of retreat in the summer of 1918, three of these pieces were in service at the front, while the others were still in the Krupp factory. As there was no more chance of bombarding Paris, two of them were completely taken apart; some of the parts served to build other cannon, while the rest was melted up. Two other guns had been so used up that they could be no longer employed for long range work and were finally broken up at the works. On the signature of the Armistice there were in existence only three long-range guns, which had been placed since the beginning of the German retreat. It is therefore not at all strange that, despite the precipitate retreat of the Germans, the cannon in question were not discovered. Foreseeing the occupation of the Ruhr, these three guns were completely destroyed in the course of the year 1919; their remains were broken up or used for building industrial or other machinery. All the statements made in divers places, according to which four long-range cannon still exist in one form or another, are absolutely without foundation.—*Literary Digest*.

Testing Small Arms

Aside from the watch industry there is probably no other demanding so much exactness as the gun trade. A vast amount of the work is done to the degree of perfection to a thousandth of an inch. The Colt Patent Fire Arms Company has developed a vast number of precision experts.

In the years of development of the pistol and revolver the "why" of such careful work has been learned by experience and the long service men pass on the traditions incidental to the doing of the work so carefully, in a manner that is quite different from the mere reading of measurements on a blue print. It is done by the human interest element of knowing because of participation.

There are about 800 inspections in connection with the manufacture of a Colt revolver or pistol. These include those made by the operators engaged in the production of the small parts in addition to those of the assembly inspectors. Every operator, in a sense, is an inspector of his own work, before it goes to the regular inspector.

The manufacture of Colt revolvers and pistols is a constant succession of inspections but that does not preclude the final inspection. Every pistol leaving the factory is fired and tested. Special weapons in which extreme accuracy is demanded are tested by one of the greatest experts in the country. J. H. Fitzgerald is in charge. Every spring he goes to New York and cooperates with the New York state police department in the training of the men in the use of pistols, being a member of the faculty. He also goes about the country to the principal cities assisting local police departments.—*Hartford Daily Courant*.

Rate of Fire of the 155-mm. G. P. F.

Coast Artillerymen who have read "Artillery Fire" in the March number of the JOURNAL should not be misled by the statement that the maximum rate of fire permitted for the 155 G.P.F. is one round in one and one-half minutes. Such a maximum rate is suitable where firing is to continue over a number of hours, or possibly days, as often occurs in land warfare. In firing at moving targets however, it is entirely practicable to increase this maximum rate to four rounds per minute. Such firing against a moving target has been carried on repeatedly at Fort Eustis. It is unlikely that a marine target will remain within range for a sufficient length of time to cause the gun to become overheated using this maximum rate.

Gasogene

The number of residents of the United States who have heard the name of Imbert is doubtless very few. Yet this same name may be destined to be world famous, for he who bears it is a man who claims to have discovered a substitute for gasoline. Some three or four months ago M. Imbert, an Alsatian engineer, submitted his invention, which he calls "gasogene," to the artillery department of the French ministry of war. He had more success with this body than Daniel Doyce had when, under somewhat similar circumstances, he approached the British circumlocution office, for the Alsatian's invention was at once accepted and he was invited to put it to the test.

That is exactly what he is doing at this moment. At each of two great automobile manufacturing plants in Lyons six powerful motor cars are running

daily for hours on end, driven by the new principle of M. Imbert, and, so far as is known, have up to date run without a hitch. At first, of course, the military authorities and the technical experts were naturally skeptical regarding the claims made for the new motive force, but its actual performance has astonished them and they are now disposed to admit that they are in the presence of a discovery of the first magnitude, by which locomotion will be revolutionized.

In the Imbert mechanism charcoal takes the place of gasoline. The apparatus which contains the charcoal is simple, easy to build and moderate in cost and can be substituted for the gas tank on almost any make of car without much added weight. Through a pipe air is sucked in from without and conveyed to the center of the combustion chamber, where gas is produced by carburation. The underlying principle is the rapid formation of carbon dioxide at a high temperature.

This invention is, as already stated, only in the experimental stage. It may yet fail, promising as are its first efforts; but if it stands up after prolonged trial, its results not only to France, which has to import huge amounts of gasoline every year, but also to the entire world, will be simply epoch-making. It will probably lead to a great modification in the technical construction of automobiles, and the apparently unassailable position hitherto held by gasoline will be successfully challenged by charcoal.—*Washington Post*.

Some Developments in Radio during 1923

The improvements in vacuum tubes for radio purposes were mostly in the direction of increased efficiency of operation and a general betterment of electrical characteristics. It is also interesting to note that during the year there was started in regular production a new tube of the highest power so far standardized, and also the smallest tube requiring the least power expenditure in the filament that has so far been made available to the public for radio receiving sets.

The smallest standard receiving tube, UV-199, operates with an expenditure of only 0.18 watts for the filament, which is of a new type and insures high electron emission, silent operation and long life. A new tube, UV-204-A, of 250 watts output also employs the new filament which decreases the power consumption to about one quarter of its former value and also improves the life.

A transmitting tube of 20 kw. output operates from a direct current source of 12,000 to 15,000 volts. In this tube, UV-207, the anode is also the container and the tube is designed to operate with the anode container immersed in running water so as to dissipate the heat developed in the interior of the tube. Several of these equipments were placed in service, and more than a dozen other sets were being installed or were under construction.

Many important improvements were made in the design and production of radio apparatus, the advances being especially notable in broadcast receivers. The public's interest in broadcasting continued unabated and the demand for apparatus was so insistent that a considerable number of new styles were standardized. New component parts were added to the line of standardized parts already available for use by amateurs and those desirous of constructing their own sets. The principal additions included socket and rheostats for the new low filament current radiotrons as well as adapters for using these tubes in the sockets originally supplied in many sets.

Developments in the line of commercial receivers included the standardization of those used in the trans-Atlantic and trans-Pacific stations of the Radio Corporation of America. The layout of these communication channels consists of

three separate divisions; first, the transmitting station usually located at some advantageous position near the coast for sending the communications across the sea; second, a receiving station, also advantageously located for reception from across the sea, but usually removed from the transmitter; and third, the operating division, usually located in the heart of the business or financial center to which the communication service is to be rendered. The operating division may frequently be separated by 100 to 200 miles from either of the two other divisions, but it directly controls through suitable remote-control relays the operation of these two divisions. Thus, communication is directly carried on from the desired point, without transcription by the other divisions.

For the purpose of securing a high voltage direct-current supply for the operation of radio vacuum tube transmitters, and for experimental work, there was developed and built for the U. S. Navy Department, a kenotron rectifier, rated at 30 kw. at 15,000 volts direct current. It contains twelve Model UV-218 kenotrons, so connected that so-called 3-phase full wave rectification is obtained. This rectifier is now installed in the Navy Department Laboratories at Bellevue, near Washington, D. C.

As a link in the communication system of the U. S. Signal Corps, there was built for installation at Fort Douglas, Utah, a 10-kw. vacuum tube telegraph transmitter. Many novel features of construction were included due to the wide band of wave-lengths which it covers, and to the necessity for including switching mechanism whereby wave-length (frequency) could be readily changed to any one of five predetermined values. Air condensers of a new design were utilized.

A number of vacuum tube telegraph transmitters were built for the communication system of the United Fruit Company. These transmitters are mostly installed in Central and South America, and will, when in service, form what will probably be one of the most modern commercial radio communication systems in existence. They have an output of 20 kw. at any wave length between 2500 and 4500 meters and include switching mechanism, so that any one of two predetermined wave lengths can be readily obtained.

In connection with the air mail service of the U. S. Postoffice Department, there was designed an aircraft transmitter and receiver for use on airplanes. The transmitter of this equipment puts approximately 200 watts into a trailing wire antenna. The power for the operation of the set is obtained from storage batteries which are kept charged by the engine of the plane and these batteries operate a high voltage dynamotor, which supplies high voltage direct current power for the operation of the transmitter. The planes which will utilize the sets are built to carry the pilot only, and it was necessary to develop and design this equipment so that it can be readily operated by the pilot without interfering with the navigation of the plane.—*General Electric Review*, January, 1924.

Helium and Aeronautics

The commercial production of helium is one of the outstanding achievements of modern science. A year or two ago the very existence of this gas was unknown. After its existence was discovered it passed into the laboratory and experimental stage. There its great qualities were recognized, but its practical utilization did not seem likely of realization. Bit by bit, however, the difficulties were overcome, and it can now be manufactured in large quantities at comparatively small cost.

The United States is in the unique position of possessing all the known world supply of this gas, a fact which should speedily give American aeronautics a

superiority over all other countries. Its use has eliminated the danger of explosion, which was one of the greatest handicaps of the modern dirigible. Of all the airship disasters, more than 80 per cent have been due to the explosion of the hydrogen gas used to inflate them.

Helium, in addition to being nonexplosive, possesses a lifting power far superior to any other gas. It is, however, this very quality which has been the greatest drawback to its use. As a dirigible when in flight uses up its gasoline fuel its weight slowly but surely diminishes. As a consequence it rises steadily to higher altitudes. This creates two difficulties—one the danger of the rupture of the gas bags on account of the diminution of the external pressure of the rarified atmosphere and the other the impossibility of bringing the vessel down to the ground without releasing large quantities of the valuable inflating medium.

These difficulties have now been successfully overcome by condensing the water vapor created by the combustion of the gasoline fuel and running it into ballast tanks so that the difference in weight due to the consumption of motive fuel is negligible. It is, therefore, possible to keep an airship steadily at a fixed altitude. When it is desired to descend, the nose of the airship can be pointed earthward by her lateral rudders and she can be forced by her engine power so close to the ground that a crew of men can seize the ropes, she lets down and can tow her into her hangar.

The helium supply now available in the United States would suffice to keep filled and ready for service 200 airships of the size of the Shenandoah. We have the authority of Dr. Richard B. Moore, former chief chemist of the United States bureau of mines, that these ships could be kept in the air for five years.—*Washington Post*.

American Coast Artillery Materiel

American Coast Artillery Materiel was prepared in the office of the Chief of Ordnance. 513 pages, illustrations, bound in buckram. Ordnance Department Document No. 2042. For sale by the Superintendent of Documents, Washington. Price, \$1.00.

This work is one of the finest that has ever appeared on the subject. It is complete, thorough and exact. It should prove to be a most valuable handbook for all those, military and civilian, who are interested in coast artillery materiel.

Part I of the volume contains a history of the development of artillery. Part II traces and explains the many steps connected with the design and manufacture of a great seacoast weapon. Part III gives a detailed description of *American seacoast guns and mounts*. Part IV is devoted to tables of miscellaneous data.

Much of the credit for this monumental piece of ordnance literature is due Colonel H. W. Miller, formerly of the Artillery Division, Office of the Chief of Ordnance, who is one of the foremost authorities on seacoast weapons in this country. His excellent articles on the "German Long Range Gun" which appeared in recent numbers of this magazine, will be recalled by our readers.

We, too, hope, with Colonel Miller, that this book "will serve the purpose of giving to the early as well as the advanced student such a comprehension of the problems of development, design and manufacture of seacoast artillery as will enable him to render more efficient service in any branch of the Army having to do with any type of artillery." We recommend this volume to everyone interested in the subject.—*Army Ordnance*.

BOOK REVIEWS

Une autre Guerre de Nations. By Rene Sauliol, Editor-in-Chief of the *Revue d'Etudes Militaires*, with preface by Jean Fabry. Charles-Lavanuzelle & Co., Paris, 1923. 6¼" x 9½". Paper. 512 pp. 14 annexes. 10 folding maps. Price, 16 francs.

M. Fabry, himself an authority in military affairs, recommends, in a brief preface, this work to all who play a part in National Defense. He sees in the War of Secession an extremely useful term of comparison with the World War of 1914-1918.

The author, in explanation of the title he has given his work, sees in the American Civil War another war of nations, of nations mutually opposed by reasons of race antipathy, economic and political rivalry. Further, the question of slavery has divided the American people into two different nations, two hostile societies.

In a comprehensive introduction the author describes the special characteristics of the war such as the country's Constitutional development since 1783, the American mentality, the religious aspect of the war, the characteristics of the soldier and his leaders, the numerical, financial and economic inequality of the two parties, the systems of recruiting, and the question of strategic initiative. In completing his introduction the author emphasizes the following characteristics as being worthy of study at the present time: 1. The elements of the war are at once political, economical, moral, and military. 2. The long war, contrary to the belief in a short war, the law of numbers, the law of the dollar. 3. The strategic role of the capital. 4. The blockade. 5. The role of government and the role of command. 6. Materiel and moral forces. Inventions. 7. Losses and the sanitary service.

In the "Preliminaries," April 12th to May 15th, 1861, the author treats the bombardment of Fort Sumter as the lightning stroke that modified the heretofore conciliatory and somewhat pacifist attitude of the North. Follows an interesting personal comparison between Lincoln, the Constitutional leader, and Davis, the absolute dictator. The remainder of this chapter is devoted to the modest levy of April 15th for 75,000 men for three months' service, and the call of May 3rd for 83,000 men under various conditions of enlistment.

The period from May, 1861 to April, 1865 is divided into three "parts."

To the first "part," May, 1861 to July, 1861, the author has endowed the appropriate title "The Impotence of Improvised Armies," and treats therein the consequences of the lack of preparation for war, preparation at once political, diplomatic, economic, financial and military. Improvisation is the outstanding characteristic of war plans, choice of leaders, and conduct of operations. The battle of Bull Run demonstrates the impotence of improvised armies, even when led by competent generals, and shows the effect of panic on one side, and on the other side the inability, on account of exhaustion, to exploit success.

The second "part," August, 1861 to March, 1864, is entitled "Two Nations in Arms," the outstanding features of this period being the reorganization of the North in spite of its errors and defeats, and the using up of the South by its victories. This chapter treats comprehensively the evolution of political, moral, economic and military elements on either side, together with a discussion of the strategy and tactics of the period. The operations are described in a particularly attractive manner and with sufficient detail to enable the reader to follow their evolution with the aid of the maps provided in the text.

In the third and last "part," from the spring of 1864 until Lee's capitulation the author finds the period dominated by the following factors: 1. The will of the North, in spite of peace manoeuvres, to obtain a decision. 2. The South's determination to escape such decision. 3. The time it will take the North to crush its adversary. 4. The military and moral value of Lee. 5. The tenacity and energy of Grant, the new Northern chief. 6. The single command in the North. 7. The importance of the fortification of the battlefield. One capital characteristic predominates all others, the inequality or disequilibrium which becomes accentuated between the two parties, the one a formidable reservoir of resources and the other irremediably used up.

M. Sauliol's work demonstrates above all the profound value of a study of the American Civil War as a means of understanding the requirements and the necessity for national organization for the wars of the future. His volume represents an enormous, impartial research through an exhaustive and diversified bibliography and it should be an invaluable addition to the library of anyone having the slightest concern with one of our most pressing, though neglected national problems—Defense.

Theodore Roosevelt. By Lord Charnwood. Atlantic Monthly Press, Boston, Mass. 1923. 6"x 8¾". 212 pp. Price, \$2.50.

Lord Charnwood's volume is not large, but nevertheless, due to finely judged eliminations, it presents to anyone already acquainted with the principal events of Roosevelt's career, a most interesting account of his life. Because of the keen insight of the author into Roosevelt's character the reader would naturally suspect that he knew him well. As a matter of fact the two never met. The book contains great precision of thought and accuracy of expression, and is certain to be accepted as one of the authoritative writings on this wonderful American. No one reading this book can help being impressed anew with the greatness of Roosevelt.

Parliamentary Law. By General Henry M. Robert. The Century Co., New York. 1923. 6"x 9". 576 pp. Price, \$5.00.

This is no elementary book of rules in any sense, and hence the reviewer does not recommend its use by a debating society. It is more in purpose for town and city councils, and could be used by such advantageously.

The structure of the book, at first sight, is a bit hodge-podge, but a reading shows a natural sequence in the business of a deliberate assembly. The author assumes, however, that the reader should be familiar with his earlier work on "Parliamentary Practice." This assumption is of course, a disadvantage to the book in itself.

Some of the chapters that are especially useful are headed: *Motions, Debates, Boards and Committees.* But best of all is a section of a hundred or more pages given over entirely to questions and answers, all germane to the procedure of a deliberative society.

Pistol and Revolver Shooting. By A. L. A. Himmelwright. The MacMillan Company, New York. 1923. $4\frac{3}{4}$ "x $7\frac{1}{4}$ ". 240 pp. Price, \$1.00.

A new edition of a handbook of information on pistols and revolvers, including instructions in their use. This book was first published in 1908 and the author has now attempted to bring it up to date by the addition of a chapter of addenda and revisions and one on the automatic pistol. The book could have been greatly improved by a complete revision with the omission of certain misleading information which it now contains. It is of value and interest to beginners in pistol shooting.

Naval Operations, Volume III. By Sir Julian S. Corbett. New York. Longmans, Green and Co. 1923. $5\frac{1}{2}$ "x 9". 470 pp. 7 maps in text and separate case of 46 maps and diagrams. Price, \$15.00 net. Cloth.

The first two volumes of this work have been already reviewed in this JOURNAL under date of January, 1922. As there outlined, this official history of the Naval Operations of the World War has been published as the separate volumes have been completed. Volume I opened with events surrounding the anticipation of the war and was concluded with the account of the Battle of the Falklands. In the second volume, the narrative was carried forward to include the events surrounding the entry of Italy into the lists of the combatants and was terminated with the operations of the month of May, 1915. In it are delineated the beginnings of the Dardanelles Expedition. The present book, Volume III, begins at this juncture, includes the final evacuation at Gallipoli and is concluded with the operations connected with and attending the battle of Jutland.

The narrative relating to a certain group of operations is not always consecutive. Rather are the chapters frequently made to include events occurring during some interval of time, scattered though the operations may be. A single exception in the case of a major operation is the account of the Battle of Jutland which is consecutive and consolidated. It further is amplified in a series of appendices. For other operations, one must make frequent use of the index to find the many separate references. Due to its magnitude, the Dardanelles Expedition may be readily followed regardless of these interruptions.

Some of the articles recently published in this JOURNAL have included the first two volumes of this text among the references. This last is now available for use and may well take its part. If we are interested in the action of ships against shore batteries, we need but consult this account of actions at Gallipoli, Libau, along the Belgian coast and elsewhere; while detailed reports of hits made at the Battle of Jutland and recorded in one of the appendices will indicate the damage one may expect a modern ship to withstand. The reviewer is tempted to stray further and compare certain passages with extracts from other sources, but their volume is great and space will not permit. Suffice it that Sir Julian Corbett in this his last history of British naval affairs has added an excellent and authentic work to which we may repair for accurate and sufficient references.

The manuscript of this volume was completed but a few hours before the death of the author so the checking of the narrative together with the actual production of the volume devolved upon Lieut. Col. E. Y. Daniel, R. M., Secretary to the Historical Section of the Committee of Imperial Defense. He does not intimate whether the work will be carried on to completion, though it is to be hoped sincerely that this gap from the first of June, 1916 to the termination of the war may soon be filled.

A History of Rome. By Tenney Frank. Henry Holt and Co., New York. 1923. 6"x 9". 613 pp. Price, \$3.50.

The first striking characteristic of this work is that it is intended to meet the needs of Americans. For "the older peoples of European nations are more interested than we in the imperialistic problems of Rome." Whereas, "we are naturally more concerned with Rome's earlier attempts at developing an effective government while trying to preserve democratic institution."

The problem Professor Frank set himself was to write a history not only for those "interested in the political and cultural fortunes of the ancient republic which in so many respects did pioneer work in democratic government," but for the needs of college classes, which "till recently, have had to depend upon elementary books, or upon histories emanating from Europe."

The author has written a consecutive story and not a reference list of dates, an account encyclopedia-like and at the same time uniformly human of just how the Romans actually conducted themselves.

This latest volume in the "American Historical Series" is characterized by careful research and a fitting sense of proportion. It is worthy of a high place among the volumes of this series.

Premier Atlas of the World. Rand McNally & Co., New York and Chicago. 1923. 14¼"x 11¼". 291 pp. Maps, tables, diagrams. Price, \$4.50.

For those who desire an atlas large enough to include a practical size of map on one double page, and yet small enough to permit of convenient handling, this one seems to be "premier." The page size is such that large states, such as Texas, can be spread over two pages, with an area of 14 inches by 21 inches, on a scale of 41 miles to the inch. Rhode Island uses a single page, with a scale of 5 miles to an inch, and the other states vary between these limits. The maps are very well done, water in blue, country boundaries in a transparent buff, and land in a pale yellow, offering a very satisfactory background for the place names, which are printed from a clear, easily-read type.

The atlas contains 142 pages of maps, and articles on recent changes in world maps, Constitution of the United States and Amendments, Covenant of the League of Nations, Congressional vote on five great issues, Declaration of War, Prohibition, Woman Suffrage, Volstead Act, and League of Nations, and a Century of American Immigration. The remaining 130 pages are devoted to a very complete index of towns, divided under state and country headings, and giving population and map location of each city or town. It is an excellent home atlas.

The Mexican Nation, A History. By Herbert Priestley, Ph.D. The MacMillan Company, New York. 6"x 9". 507 pp. 5 pictures. 4 maps.

The author states in his introduction that the characteristic attitude of most Americans toward Mexico is one of ignorant goodwill combined with skepticism concerning the value of her culture and the solidity of her political institutions, and that something more than a well-meaning ignorant goodwill is necessary if the United States is to maintain an adequately satisfactory relationship with her nearest Hispanic American neighbor.

While this book does not offer any concrete solution for the difficulties involved in the dealings of the United States with its Spanish-American neighbors,

it does provide abundant material for thought for those who wish to be intelligently informed regarding the proper relations of the two republics on this continent. It traces the history of Mexico from the prehistoric natives up to the close of the Carranza administration with an effort to show the effect of the preceding periods on the political and economic life of the later times, as well as upon the ways of living and thinking of these same later periods. The author's position as Associate Professor of Mexican History, University of California, and his free reference to other authorities as outlined in his bibliography, allow us to accept the material presented in this book as reliable and worth our consideration.

Mankind at the Crossroads. By Edward M. East. Charles Scribner's Sons, New York. 1923. 6"x 9". 351 pp. Pro. Ill. Price, \$3.50.

Professor East has handled the question of the population and natural resources of the globe based upon a study of biological facts in a manner that is startling in its conclusions. It is a broad, judicious and farsighted discussion of a topic that excels in importance all others.

The subject matter of this volume is handled in a most remarkable manner. The book is important not only because its author stands in the foremost ranks of the world's authorities on the question of food and population, but also because it is written in a style which will appeal to readers who have no previous knowledge of the subject.

The author's aim is "to present a picture of the present world situation as regards the population and its food-supply, and to submit a forecast of the future." The results are startling—startling because they are convincing.

Mankind is indeed at the crossroads, facing the definite conclusion that the world confronts the fulfillment of the Malthusian prediction—where a decision must be made that will influence its whole future for better or for worse. As stated by the author, "This is a world question; it is a question of reducing a swiftly increasing population to fit a rapidly diminishing food reserve."

This work should appeal especially to students of sociology, yet to the average reader it has a pertinent message—a message that should not go unheeded. The many illustrations and graphic charts are a great help in following the points under discussion.

A book that well deserves nation-wide consideration by every thinking man and woman.

