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TABLE OF CONTENTS

FOR

Vol. 57. No. 6

DECEMBER, 1922

Whole No. 196

THE COAST ARTILLERY RIFLE TEAM, 1922.....	(Frontispiece)...
THE MISSION OF THE COAST ARTILLERY CORPS.....	479
BY LT. COL. H. C. BARNES, C. A. C.	
ON THE FIRING LINE OF THE INDUSTRIAL SECTOR, III.....	485
B. Y. JARRATT A. MORFORD.	
G. H. Q. AND ITS RELATION TO THE WAR DEPARTMENT GENERAL STAFF.....	492
BY LIEUT. COLONEL UPTON BIRNIE, JR., F. A.	
SOME MORE DOPE ON SHOOTING.....	501
BY CAPTAIN H. C. BARNES, JR., C. A. C.	
A MINIATURE RANGE AND GUN.....	513
BY 1ST LIEUTENANT WALTER R. GOODRICH, C. A. C.	
SUMMARY OF TESTS OF CATERPILLAR ADAPTERS FOR THE G. P. F.....	523
BY CAPTAIN L. A. MILLER, C. A. C.	
ERRORS OF RANGE AND AZIMUTH PREDICTION BOARDS.....	529
BY MAJOR JOHN S. PRATT, C. A. C.	
ARMY TRAINING IN RELATION TO NATIONAL CONDUCT AND CITIZENSHIP.....	531
BY MAJOR FORREST E. WILLIFORD, C. A. C.	
PROFESSIONAL NOTE—3-INCH ANTI-AIRCRAFT MATERIEL— TRAILER MOUNT.....	534
FRENCH ARTILLERY DOCTRINE.....	535
GALLIPOLI IN 1914.....	540
EDITORIAL:	
The Message of the Christmas Seal.....	543
Making the Best of Things.....	545
The Non-Commissioned Officer and National Defense.....	548
The Book Review Section.....	549
COAST ARTILLERY BOARD NOTES.....	550
THE BEATEN ZONE:	
Employment of Heavy Artillery—Problem No. 5—A Solution...	553
Employment of Heavy Artillery—Problem No. 6.....	555
THE BULLETIN BOARD.....	557
BOOK REVIEWS.....	560

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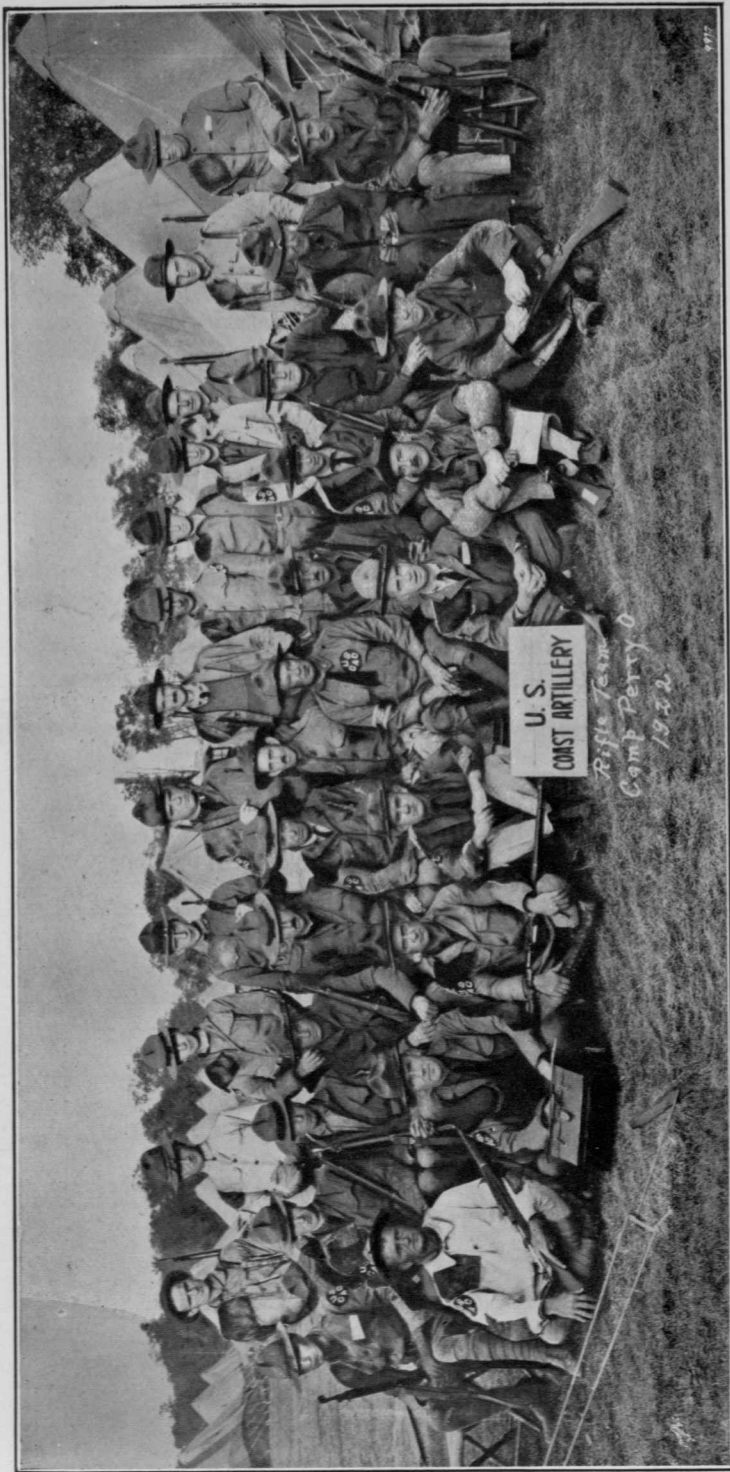
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THE COAST ARTILLERY RIFLE TEAM, 1922

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The Coast Artillery Journal

Vol. 57 No. 6

DECEMBER, 1922

Whole No. 196

The Mission of the Coast Artillery Corps

By Lt. Col. H. C. Barnes, C. A. C.,

Executive Assistant to the Chief of Coast Artillery



THE regular army component of the Coast Artillery, like the regular army component of every other branch of the service, truly may be said to have two distinct missions. The first is the ultimate or War Mission, the second, the current or Peace Mission. The fulfillment of our War mission presupposes the availability of the full quota of personnel and equipment to be allotted the Coast Artillery from national resources in accordance with the dictates of national policy.

OUR WAR MISSION

The fundamental statement of the War Mission of the Coast Artillery is to be found in the following quotation from the document entitled, *Joint Army and Navy Action in Coast Defense*:

"1. *The harbor defenses.*—Harbor defense includes dispositions and operations for the defense of limited portions of the seacoast, ordinarily confined to important harbors. Such dispositions usually include fixed armament, mobile armament, controlled submarine mines, and the troops and accessories required for their employment and local defense. Harbor defenses have distinct missions over the sea and the land areas covered by their armament:

- (1) To deny the enemy possession of the position and its facilities.
- (2) To prevent destruction or serious injury by bombardment of the harbor utilities.
- (3) To provide an area off the harbor entrance in which naval vessels and merchant shipping will be protected as far as possible against all forms of enemy attack."

This document appeared in 1920, and its statement of the War Mission of Coast Artillery was supplemented, as well as strengthened, by Training Regulations No. 10 - 5, dated December 23, 1921. Paragraph 15 of these Training Regulations states the mission, and the training to accomplish it, in the following terms:

"A. COAST ARTILLERY.—*a.* Is the artillery charged with the service of the fixed and movable elements of the land and coast fortifications, of railroad artillery, anti-aircraft artillery, and trench mortar artillery. Its primary weapons are the cannon, the anti-aircraft gun, and the submarine mine. Its other weapons are auxiliary. This branch has the independent rôle of keeping the area within reach of its guns clear of hostile vessels, and of preventing a run-by. When manning the heavy cannon of coast and land fortifications, it will constitute a point of support for the associated combat branches. Its essential characteristic is fire power.

b. This branch will be trained in:

(1) Opening effective fire in the minimum time with the gun to which assigned against any target within its range, and sustaining such fire at a maximum rate.

(2) Mobility of fire.

(3) The rapid installation, care, and operation of its submarine equipment.

(4) Selection, occupation, and organization of position for the movable elements of permanent land and coast fortifications.

(5) Observation of fire; observation and identification of targets.

(6) Coordination of the various defense elements.

(7) Cooperation with the Navy.

(8) Operation of armament when the normal installation is inoperative or unserviceable.

(9) Sound ranging.

(10) Use of its auxiliary weapons.

(11) Care and maintenance of fortifications and their equipment."

It is perfectly apparent that the accomplishment of this War Mission is only possible, and can only be expected, when a fully adequate personnel is available for manning all the matériel in all places which are assigned to the Coast Artillery. Consequently it is both necessary and fair to recognize a second and modified mission of the regular component of the Coast Artillery in time of peace, consisting of the adjustment and compromise of the effort to be expected from the available personnel in order the most effectively to facilitate the rapid assumption of the full responsibilities of the Coast Artillery upon the outbreak or imminence of war.

This adjustment and compromise have constituted one of the difficult tasks confronting the Chief of Coast Artillery and the War Department, and have involved the balancing of numerous important considerations. It is believed that a discussion of these considerations and a statement of the decision based thereon, resulting in the modified mission of the regular Coast Artillery Corps under which we are now functioning, may be of real value to the members of the Corps, to the service in general, and to any others who may be interested.

CONSIDERATIONS AFFECTING OUR PEACE MISSION

As in the case of other branches of the service, there are three sources of supply for units of the Coast Artillery required for various purposes, namely, The Regular Army, the National Guard, and the Organized Reserves.

Those units required for service in the fortifications of our Insular possessions must be kept at full strength at all times. Those required in the fortifications of the Panama Canal must be kept at all times at a certain percentage of their full strength, such percentage being determined as the result of a consideration of the possibilities of promptly bringing them to full strength when necessity requires. The units so required for our foreign garrisons must, therefore, be drawn from the first category, the Regular Army.

There must also be provided from the Coast Artillery Corps of the Regular Army, certain units for the service of railroad, tractor, and anti-aircraft artillery, and of the sound ranging service. These units are required for use in training officers and specialists of the regular Coast Artillery Corps in the service of these classes of artillery, for test and development of the matériel, and as training units in connection with the Coast Artillery of the National Guard and of the Organized Reserves. It would be desirable also that a small unit of trench mortar artillery be maintained in the regular Coast Artillery Corps, but it has been decided that such action is not practicable, due to the greatly reduced strength of the Corps, and the relatively less important character of this class of armament.

The present allotment of personnel to the various activities above mentioned, is considerably less than that required for the most efficient training in time of peace and expansion in time of war, but it is the maximum which could be made with the very limited personnel available. The allotment made to anti-aircraft units was recently increased in spite of the decrease in the authorized strength of the Corps for the following reasons:

a. The services of anti-aircraft artillery units will probably be required at the very beginning of any war in which the United States might become involved in the near future.

b. This service involves a new science and differs materially from the service of any armament with which the personnel of the Coast Artillery Corps has in the past been familiar. It is therefore important that a knowledge of this service be disseminated throughout the Corps as soon as practicable, in order to provide competent instructors for the large number of units of anti-aircraft artillery which must be provided for in the second and third categories,—The National Guard and The Organized Reserves.

The allotment of Coast Artillery Corps personnel to activities as the

result of the considerations set forth above, left the difference between this total and the full authorized strength of the Corps (12,026) available for allotment to the Fixed Defenses in the continental United States. This available number was so small that, after a careful study of all conditions, it was concluded that tactical considerations must be disregarded in making distribution to the various coast defense commands, such distribution being made purely with a view to facilitating training—both of the Regular Coast Artillery Corps personnel and that of the Coast Artillery of the National Guard and Organized Reserves—and to so placing this personnel as to permit of its administration and supply in the most economical manner.

As the result of these considerations, allotments have been made to coast defense commands on the following basis:

<i>Coast Defenses</i>	<i>Remarks</i>
Long Island Sound	Sufficient personnel to permit of the organization of four companies—one headquarters company, one gun company, one mortar company, and one mine company. The Coast Defenses of Long Island Sound are also provided with sufficient additional personnel for the organization of a company to be used in connection with the development of sub-aqueous sound ranging.
Sandy Hook	
Chesapeake Bay	
San Francisco	
Puget Sound	
Boston	Sufficient personnel to permit of the organization of three companies—one headquarters company, one gun company, and one mortar company.
Narragansett Bay	
Los Angeles	
Portland	Sufficient personnel to permit of the organization of one company for use, in addition to the care of the armament, as a training unit in connection with National Guard Coast Artillery.
Pensacola	

All other coast defense commands within the continental United States have necessarily had to be placed on a caretaking basis with an allotment of personnel deemed sufficient merely to keep the armament, fire control equipment and other accessories in condition at all times for use in training or in war. This means that all armament and accessories in these coast defense commands is "in commission" but "out of service," as explained in paragraph 405, D.R.C.A., 1914. In this connection it might be well to state that the task of maintaining these conditions in the coast defense commands, which have been placed on a caretaking basis, is one of very great importance. A failure in this respect might result in rendering useless, through deterioration, the in-

installations which have been provided at immense expense for the defense of our harbors, or in these installations failing of their purpose in an emergency due to their not being kept in condition for use at all times. Careful selection is, therefore, made of the officers and enlisted specialists assigned to this important duty.

It must be remembered that the employment of Anti-aircraft Artillery, with its auxiliaries, is not by any means limited to the specific requirements of harbor defense; also, that the Coast Artillery has a secondary mission in mobile warfare imposed upon it by the assignment to it of Railroad Artillery, the Sound and Flash Ranging Service, and Heavy Tractor Artillery. While the heavy tractor artillery is assigned to the Coast Artillery for use "in land and seacoast fortifications" paragraph 2, section V, G. O. 36, War Dept., August 21, 1921, prescribes that " * * * * this shall not be construed to prohibit the organization within the Coast Artillery of such mobile units as may be needed in land or coast fortifications, or the employment of such units with the Field Armies whenever and wherever conditions of combat indicate the desirability of such employment." Needless to say, this provision requires that all heavy tractor units organized in the Coast Artillery—either Regular, National Guard, or Organized Reserves—must be trained to fire on moving targets on the water, and in addition, to fire on targets which would be encountered by them in the service of this matériel when employed with the field armies.

OUR PEACE MISSION

Having in mind the preceding discussion as to the factors which have had to be taken into consideration in providing for our peace time activities, the secondary or Peace mission of the regular Coast Artillery Corps may be formulated in somewhat the following terms:

In the Insular Garrisons: To supply personnel, sufficient in numbers and properly trained at all times, to carry out the War Missions assigned them.

In the Panama Garrison: To supply personnel, in certain reduced numbers, properly trained at all times, to carry out the temporary mission assigned them for execution at the outbreak of hostilities.

In the Continental United States: To supply trained personnel,

1st.—To care for the matériel, both fixed and movable, which has been supplied and installed at immense expense, and insure its being in serviceable condition whenever needed.

2nd.—To furnish nuclei of personnel, properly trained in the operation of all classes of matériel assigned to the Coast Artillery, and so organized as to permit of quick expansion to the full authorized strength allotted to each such class of matériel under the Tables of Organization for a Regular Army of 280,000.

3rd.—To furnish trained personnel to act as instructors of units of

Coast Artillery provided in the National Guard, Organized Reserves, in R. O. T. C. colleges and C. M. T. Camps.

4th—To collaborate with the various supply services in the development and improvement of all matériel assigned to the Coast Artillery.

It is perfectly evident that the present organization of the Coast Artillery Corps—so far as concerns the units allotted to activities carried on within the Continental United States—is a mere skeleton, and that the so-called “strong points” of our Positive System of Coast Defense have become strong points in name only. However, the reductions made by Congress in the strength of the Army have made necessary reductions in all branches of the service, and, after very careful and exhaustive study of all conditions affecting the problem, the War Department has directed the reduction of the Coast Artillery Corps to its present authorized strength (12,026).

The Corps has thus been reduced below the strength allotted at any time since the reorganization of the Army in 1901. Furthermore, the developments of the World War have added very materially to our activities. It is a simple thing to accomplish results when all conditions affecting them are favorable, but their accomplishment, in spite of many and great difficulties, is much more worth while. Existing conditions in the Coast Artillery Corps—the reduced personnel and added activities, as set forth above—make the accomplishment of our Peace Mission a most difficult undertaking, which will require enthusiastic and energetic effort on the part of each individual member of the Corps. However, the degree of difficulty encountered and of success attained will be a measure of the satisfaction to be derived from the effort expended. Let's go!

ABILITY AND CREAM

BOTH

RISE TO THE TOP

On the Firing Line of the Industrial Sector

III

By Jarratt A. Morford

Editor's Note.—This paper, focussed on the problems of the Industrial Recruit *In Action*, is the final one in the series, which has been planned especially to be of possible assistance to those officers planning to leave the service in these critical months of reduction and demotion.



HE question was once asked of a young man who had recently connected with a large industrial concern, if he felt he had selected the field best suited to his training and one which he considered would offer him the maximum of financial return, peace of mind and happiness, and which would in twenty years place him where he would wish to be in the industrial world. His answer was rather noncommittal and evidenced either a shrewd wish to avoid the true answer altogether or was indicative of the modern inclination to take a chance at a short cut to wealth and influence. What he said was, "That sir, is my problem; it has to be worked out."

When you consider carefully what it means to have a problem to be worked out, it is obvious that where a man is embarking on a vital undertaking, the less he has to do with unsolved problems, the more likely he is to attain his goal, for then he can devote his entire attention and energy to the working out of his plan which has been cleared of surface problems at least.

No sane man would purchase a railroad ticket without thought of destination merely because there was a ticket office at hand, and plan to decide his destination while traveling fifty miles an hour towards "somewhere or other." Such a man would be considered by his fellow passengers and the conductor as a lunatic or at least a person who would bear watching. Yet this is usually the manner in which the recruit to industry begins his industrial trip through life. With no thoughts or plans; what right has such a traveler to be surprised if he finds his destination different than he had expected? Why should he regret the delay and sidetracking which could have been avoided by proper routing? His journey was "haphazard" and is considered in the light of retrospective thoughts which are largely keen regrets.

It may be that in making the choice, we believe sincerely in the correctness of what seems the big thing that looks best to carry out our ideals and plans, yet despite our most careful consideration, we

find it is quite afield from what we had anticipated. Even then it is well to consider carefully before a change is made: Avoid the danger of looking longingly at green pastures just over the fence and the habit of thinking that the other opportunity is better than the one in hand, and the constant desire to "try it out" with every new proposition which presents itself, becomes less and less pronounced.

If, after careful analysis, it is deemed best to enter the hardware manufacturing field, learn hardware—not as an abstract thing which is necessary to gain a position and a livelihood—think hardware, dream hardware, talk hardware and know hardware, read hardware, believe hardware and make the other fellow realize everlastingly that you know hardware and that you are first, last and always a hardware man. It is quite surprising how rapidly the hardware habit will become part of yourself and your counsel and advice will be sought in matters pertaining to hardware. Also, while it is quite removed from the idea to permit a warping of judgment because of too much hardware knowledge, it may not, on the other hand, be at all undesirable in the early years of climbing, to permit the belief that you are quite a crank on the hardware subject to the exclusion of pretty much else.

It is so vitally important to know your job and everything pertaining to it, that it cannot be over-emphasized and as the world is made up, in a great measure, of men who must accomplish whatever is accomplished by the hardest kind of repeating and repeating in order to master the situation. It is quite a fatal mistake to believe that a genius is hidden away in our very ordinary make-up and trust to the future to develop it for us in some miraculous way. Again and again it is the continuous thought of the chosen field that brings out not the genius, but the ability through painstaking analysis and absorption of a, many times, drab routine that finally places us in the position to know and direct in our chosen field. So it is that the man with an unsolved problem concerning what he determines for his future is very apt to be classed with the ticket purchaser of unknown destination.

The officer who would permit his men to go into action without their rifles in the hope that rifles could be picked up somewhere on the field would be quite inconceivable, yet the same situation may be met with frequently in him who rushes headlong into the world of industry without a proper thought of his strongest weapon of defense—a fixed plan and purpose—and hopes to find it as the discarded rifle on the field. It is much more likely that the 14-inch siege gun that had been looked for as lying about ready to pound a way to success, will turn out to be a first class pop gun with a decayed cork on a rotten string.

Our Western Indians, armed with a lance and a formidable knife, were quite equal to their task of exterminating the isolated advanced posts of civilization because they knew their task well, but when, in the fullness of their belief in their prowess and weapons, they elected

to assist in the struggle between North and South, they soon learned that a stone hatchet and a bow were mighty poor equipment to offer in resistance to artillery and rifle fire. Knowledge of and preparation for the job ahead would have taught the Red Brother that his part in the program must necessarily be limited unless he could meet his opponent on an equal footing. The fact that he knew of the "wheel gun" meant nothing if he could not also offer a knowledge of its operation, therefore he could only play the part of the onlooker with the usual fatal result.

So it seems that where a man is going into action—industrial or fighting—which will require the utmost of his energy, courage and forethought, and has a problem or problems dangling about to trip and confuse him, there is a pretty certain assumption that the problems are such and are there, only because he has failed to *know* his undertaking and therefore he has a very remote possibility of making good—in fact, probably will not make good.

Very recently, a man having the finest of social attainments, a cultured gentleman with a finely taught mind, came to an office in the hope of connecting with some industrial plant where he could show his worth. In the discussion which followed the question was asked of him, "What do you feel is your greatest asset—your greatest selling point?" After considering it for several minutes, he answered, "I have a university training behind me and I am a gentleman." Perfectly fine equipment with some concrete backing but of itself difficult to appraise. It is the trained mind that is sought—it is the character and fine type that the word "gentleman" implies that is sought—but if you wish to purchase bread, the finest of silk stockings will not answer, nor will the finest of gloves serve the purpose when rubber boots are needed.

It is fundamentally necessary to know your chosen line and then sell yourself to it, never forgetting that when the connection is safely and satisfactorily accomplished, the selling process has only just begun. Industrial conditions are changing constantly and even the office routine of all large concerns and most small ones is carried forward by more and more elaborate and complicated labor-saving devices which must be known if the field chosen has been that of the accountant. Even more exacting are the fields of mechanical, power, production work—changes are rapid and many and if the mastery of the branch with which your connection has been made is to be more than mediocre, it means constant application to know of the development and advancement in not only the type of equipment used but the advancing methods of manufacture of the product in which you are interested.

A very natural reaction to the question of preparation is one that says, "Oh, yes, its all very well to preach and prate of being prepared and making proper selection of a place to work and choosing a branch of work to which I am fitted, and so on and so on, but what am I to do or how am I to go about getting this place?" It is a well known fact

to the employer that it is very hard to fill his worthwhile places with worthwhile men. Also, it is an equally well known fact to both employer and applicants, that it is very hard for a great many applicants to get any kind of a place at all. Consequently, we have a number of worthwhile places with few applicants who are equal to taking them, whereas there are comparatively few mediocre places with a vast army of mediocre applicants to fill them. The answer is quite obvious: If it is an easy, mediocre place that is sought, the applicant will find his task prepared and his chances of success remote. If on the other hand he really wants a worthwhile place, let him determine in what line, then make his approach, prepared to aim high and he will find his task an easy one. It is a man's ability to fill the place and sell himself to it that will put him in a position to start right, and practically any large industrial organization in the country is ready and willing to receive worthwhile men for the worthwhile places on this basis. It is the old question of the round peg in a square hole and it is quite proper in some cases to square the circle if the applicant is big enough to fit after the squaring process has been completed.

It is considered in most plants that the crucial time for new employees is the passing of the third week of employment successfully. The reaction of an employee caused by a change of occupation depends upon his intelligence and training. It is very rare indeed that the new place is accepted and the first few days passed without a slump in morale or interest in some degree, and while the higher type of industrial unit may feel that this cannot apply or have effect in his case, it is nevertheless causing a deep and urging inclination to sift and weigh the desirability of remaining with the chosen industry when everything seems to be going at "sixes and sevens." When the new job involves radical changes in custom and habit, the recruit is very apt to react unfavorably; fears, misgivings and doubts will cause no end of mischief with himself and his job, which may be relieved by some understanding friend on whom he can unload his troubles.

The great difficulty in the industrial world, as in any other walk of life, is the failure to decide promptly the minor questions of each day. Competent counsel is well, and should be ever sought and used, but it should also be tempered with a determination to decide promptly such questions of ordinary character that can have no serious effect on our plans of life, and so develop the habit of believing in one's own ability to decide and in one's judgment after deciding.

I had a friend who might almost be classed as an eccentric because of his habit of deciding arbitrarily simple questions of daily habit of contact, but after a time the matter took on quite a new light for I found him to be quite unruffled in facing perplexing questions which required a prompt decision and he became known pretty generally as the man who knew his own mind. When, in the course of his day, he

was asked what his preference was in cigars, a snappy "King Perfecto" was his answer; or what soda he preferred, a sharp, decisive "Chocolate Milk"; what color, what books, what policy of action, what type of machine, etc., etc., each brought its clear-cut answer. "Oh, I don't much care," "Anything will do," "I am not particular" never entered his mind as an answer, and while he did not always like his selection, he, nevertheless, stood by his decision and profited immensely.

While this phase of the early industrial experience has made many a recruit turn almost about face, it will be well to keep in mind that no fair judgment can be made with any degree of assurance under a year or even two years, and if the preliminary problems have been settled and swept aside, it is exceedingly unwise to permit the reaction slump to influence a change.

Perhaps the most difficult of all phases of the early period of industrial work is that of placing a true estimate of worth upon our work, our value financially and our warrant for speedy promotion. Supply and demand play so important a part in this estimating that it is a factor to be reckoned with constantly, and while we hear much to the contrary, nevertheless it is true that few industrial concerns can stand playing the philanthropist for any great period of time—and certainly not to the average unit who comes from a field which is professional in its character, be it that of the soldier, the lawyer or the doctor.

The right question is: *How quickly and how completely can I be replaced.* Industry has comparatively few pension lists, and the replacement question is as constant as day and night; it is constantly facing every industrial unit and to blind itself to it, is to seriously impair his future. *How seriously am I needed,* determines rate of advancement in the great majority of cases and rate standards are so set from the top to the bottom of industry. That a unit may perform the work in his department very well is not at all a determining factor if any number of other recruits can do exactly as well and the work is ordinary in its scope. That he knows one small department well, prompts his chief to keep him fixed there, unless he looks beyond that point and shows his aptitude for greater capacity. Length of service brings its own financial reward in small increases but it is a mighty poor way to big things unless something else goes with it.

An electrician of a large plant gained his post by the most simple acceptance of this principle. At the plant in question, a large cafeteria occupied most of the floor at the top of the building. This floor was also used as a meeting room and frequently was called into service at night. While the main lighting of the cafeteria was controlled by a switch box placed in the regular position of the other switch boxes throughout the plant, the lights for the stairway and hall were controlled by two obscurely placed individual switches. The man in question, who frequently attended these meetings, was not then attached to the electrician's

department. He was almost vainly hoping to advance in the stock department where he was employed, for he noticed more and more forcibly that every time he suggested something or tried to work out new plans, someone else knew more of the whole matter than he did, until he was ready to give up so far as getting ahead was concerned. Then a thought came that awakened him—"If I can find something that no one else can do in this plant, or that no one else knows of, I can—if opportunity comes to show this knowledge—ask for a raise with some hope of getting it." So he looked about him for such an advantage. His slight knowledge of electrical construction prompted him to seek the Chief Electrician but without success, and as he attended the meetings in the cafeteria, he asked several of the other foremen at different times to put in a word to assist him in securing a place as electrician's helper. But these men were usually too busy hunting for the hall and stair switches to pay much attention to his plea. Then came his big idea: with much care and infinite pains he located and charted every switch in the building, tried the boxes, learned the position of even the most obscure of them and what each controlled until he was sure that no one knew as much about them as he did. Then came his opportunity. At a cafeteria meeting which was attended by a non-resident official of the company, some plant policy involving the question of serving brought a suggestion of going over that floor and perhaps over the building. The watchman's lantern was quite insufficient light for the purpose and unfortunately and quite to his embarrassment, the Chief Electrician confessed that he was not familiar with many of the obscure switch boxes. That admission brought our young friend into the strategic position of a rank outsider—not connected with the electrical department—offering to do that which the Chief could not—and he proved his knowledge to the satisfaction of every one. As was quite proper, he was recommended for a place on the electrical staff, where he studied hard and finally became Chief Electrician.

This man's success was due to quite a simple procedure but the point is right here: the higher up in the scale one goes in the industrial world, the more certain is the necessity of knowing just that much more than the other fellow about your own job and a good deal about the job the other fellow is holding, as well. Then set your rate and get it. That you may be a Harvard, West Point, Yale or Princeton graduate means only that you hold an advantage in brain development, but it is not a warrant to demand special financial consideration until you have proven your superior knowledge and capacity and have a clearer understanding of your limitations, which after all, are the real drawbacks to advancement and which can be lessened if not entirely corrected.

Watch the possibilities of demotion, of replacement, guard against them, then set yourself the task of reaching the strategic position of *I know* and *I can* and the sun of accomplishment will break through the clouds of doubt and trial and your place on the Firing Line of the Industrial Sector will be safely and peacefully secure through the Armistice of Success.

A HUNDRED HURRY
TO CATCH UP
WHERE ONE HURRIES
TO GET AHEAD

—Kodak.

G. H. Q. and Its Relation to the War Department General Staff

By Lieut. Colonel Upton Birnie, Jr., F. A.



WHILE it must be conceded that the events of the World War are still too close to be viewed in an altogether correct perspective, yet it is already possible to see at least more clearly than formerly, the application of many previously known, even if not fully appreciated military ideas and principles. In the intervals between wars, the military factor becomes of such relative unimportance in countries possessing the more democratic forms of government, as almost entirely to be lost sight of in the national life. This is notably so in the United States, and this general apathy to questions of preparedness is still further increased in our case, by a wide-spread feeling of very much overestimated security based upon our supposedly isolated geographical position.

During these periods there continues however, principally within the restricted ranks of the military profession, a constant effort through study to discover, and by practice, as far as it may be possible, to develop new ideas or new applications of old ideas to the Art of War. From this study there results the expression of a great many varying views and opinions, but it is only in the test of actual war that the soundness of the theories advanced can be more or less definitely determined. Of many outstanding conclusions which in the light of practice can now be drawn from our recent war experience, there appears to be none of greater importance, or clearer definition, than that regarding the relationship between the General Headquarters of the Forces in the Field and the War Department General Staff. It is true that in every war in which we have engaged there has always been represented in each theatre in some form a field headquarters, directing and controlling, at least in part, the operations against the enemy; but it is only by a war of such magnitude as the last that there becomes fully emphasized the necessity of a clear and sound conception of the division of functions between these agencies if successful and coordinated action in the military effort is to be brought about.

It will hardly be disputed that the ideal condition exists for the successful waging of war, when the war making powers are placed unlimitedly in the hands of the head of the state. War in its modern conception presents a problem of such size and complexity, and involves

in one way or another every phase of the national life to such an extent, as to make coordination possible only by a strong centralization of control. Under the Constitution and theory of our form of government this is not, theoretically, possible. The war powers are divided between the Executive and the Congress, that each may act as a check on the other. But in actual practice, in the last war, there was such a general recognition and acceptance of this principle of the centralization of war powers, that Congress was able by its enabling acts to entrust the President with practically single-handed control in the prosecution of the war. Incongruous as it may seem, the head of the state under the American Democracy, thus exercised more exclusive and absolute war authority than did the head of any other state in the world.

These broad war powers are exercised through a number of existing or war-created agencies, but it is upon the War Department that there devolves both in peace and war, the primary function of making and executing the war plans for the employment of the land forces against the enemy. Under the Secretary of War it forms the executive arm for war, and both the General Headquarters of the Field Forces and the War Department General Staff are organs for the performance of its functions.

Now, while there exist more or less widely divergent views on the details of organization, and the secondary division of functions, it must be agreed that in the final analysis the tasks incident to the prosecution of a war can be included in two broad, general, and basic classes. One of these has to do with the mobilization and maintenance of the forces for war, the other with the employment of those forces, and the divisions between the two classes is along clear-cut functional lines. Upon this basis the respective functions of the War Department General Staff, and of a General Headquarters, become at once evident, and the line of demarkation between them clearly defined—the War Department General Staff is charged with providing the forces for war, the General Headquarters with employing against the enemy the forces provided.

This division does not imply absolute separation and independence of action. On the contrary, it is essential that between them there must be the very closest coordination and cooperation. Indeed, upon the extent to which this is effected will depend in great measure the success of the war effort. In peace time, military administrative organization tends toward compartment building, and the jealous guarding of prerogatives and authority frequently overshadows in importance the missions to be performed. Fortunately the actual business of war makes the importance of accomplishment loom larger, and coordination and cooperation are easier of attainment.

Under this general division there can now be examined more concretely, both the character and exercise by it, of the particular functions falling to G.H.Q. In the case of war against the United States threaten-

ing an invasion of its continental territory, four frontiers are presented to hostile operations—the Canadian, the Mexican, the Atlantic, and the Pacific. It is not necessary to disavow any undue concern for our own safety, or as well, any hostile intentions against either Canada or Mexico, to discuss in an illustrative way only, the situation that could arise requiring the employment of our military forces upon any or all of these fronts.

Considering first the northern frontier, because of its extent, and of the proximity thereto of certain of our critical, or even vital strategic regions, there are found conceivably at least three important different theatres of operations on this front alone. While the distance separating them, and the distinctness of the objectives requires for each a separate commander, it is evident that there must exist between the operations undertaken in all such an inter-relation and inter-dependence as to make of this front a single theatre of war. The application of the principles of economy and cooperation of forces clearly requires the interposition of a higher headquarters to coordinate the action of all the forces employed on this front. As illustrating this principle, it has been seen in the World War how on the Western Front it became necessary for the French to group their different operations in the same theatre of war under the control of a single higher command.

But, in addition to the northern, situations may develop requiring the conduct of operations simultaneously on any one or all of our other frontiers. For example, southern California, the region of Chesapeake Bay, and the Mexican border, may become involved. Just as the theatres of operations on a single front are related, so are the various fronts or theatres of war, as concerns coordination in the employment of all the field forces. The coordinating authority demanded is actual operative control. It is not simply a coordinating direction, but an exercise of the functions of command. Command in the technical military sense, where authority and responsibility for conducting the combat against the enemy's fighting forces pertain indisputably to leadership. This command cannot be exercised in the War Department. It is distinct from providing and maintaining the combat forces—that is, mobilization, as it has come to be understood—which is the War Department's primary function, and it requires the presence in the field with the forces, of a responsible supreme commander. This commander has come to be known as the Commander-in-Chief, and his headquarters as the General Headquarters. During the war it was a common practice to refer to them, respectively, as the C-in-C, and the G.H.Q.

Accepting this conception of the general division of functions, and leaving to be taken up later a fuller discussion of the scope of G.H.Q. control, there should be pointed out here, and emphasized, a basic principle governing the relationship of G.H.Q. with the War Department. It is fundamental in the exercise of command that authority go

hand in hand with responsibility. The commander of a single operation, as well as the C-in-C of all operations being undertaken against the enemy, must exercise actual, not nominal control. Except so far as interference may be necessitated by a compelling state policy, the General Headquarters must be given a free hand in the execution of the plans entrusted to it. This does not mean freedom to employ the armed forces without consideration of all these factors which are of vital concern to the nation and state, but freedom, after policies and plans have been determined upon, and in the determination of which G.H.Q. must have an important voice, to carry them out in the exercise of its own judgment and professional skill.

History furnishes many examples of its violation in which failure attests to the soundness of this principle. There is none more striking than our own experience during the Civil War. The practice which prevailed of trying to exercise field command functions within the War Department is so well known as hardly to need mention. For three years there was such undue and costly interference with the conduct of operations by field commanders, as seriously to threaten the ultimate success of the Union cause. Notwithstanding the superiority at all times of the North to the South in strength and resources, the forces of the Union were unable to attain success, hardly able even to stave off defeat, until the exercise of the control of operations was taken away from the War Department, and the supreme authority for the command of all the Northern Armies was definitely placed in the hands of General Grant. Similar examples are furnished by the history of other states. On the other hand, whether profiting by this lesson, or because of the distance separating the theatre of war from Washington, for this is admittedly a factor, perhaps in part to both reasons, non-interference by the War Department with the Commander-in-Chief during the World War was marked from the beginning and continued to the end of the war. The success attained by American arms under a supreme commander in the field, unhampered in the exercise of the full operative control of the American Expeditionary Forces in France, must in great measure be credited to the sound policy followed in the adoption of this basic command principle.

Recurring now to the question of the scope of its authority, if it be asked whether the control of G.H.Q. should extend to the garrisons of the insular possessions, to the coast defenses, and to special operations, the answer would seem to be, in the general application of the principle, that it should. It is the real purpose and function of a G.H.Q. to weigh the situation in all theatres of war and operations, to decide which are the more important and which the less important, where the defense can be assumed and where the offense is called for, and to concentrate at the point or points where they will count for most, all available forces and effort to bring about success. G.H.Q. can only do this when all

forces ready for combat, and all supplies available for their maintenance, are in fact at its disposal. History probably records no more often-repeated mistake in the prosecution of a war, than a dispersion of forces, and a division of authority for their operation. This is not infrequently brought about by the necessity of yielding to political expediency at the expense of sound military policy. Unnecessary violations of the military principle must however be guarded against.

Even in a correct application of the general rule it is conceivable that certain exceptions may become necessary. Circumstances will govern in each case, and in every case the final decision should rest with the G.H.Q. In the World War the theatre for us was France. The relationship to the operations there of our coast defense, and our insular possessions, under the existing military situation, and of the Expeditionary Forces in Eastern Siberia was remote. The forces involved were relatively small, and the effect upon the operations in the principal theatre of war was not material. They remained under the operative control of the War Department. But in the case of a war with an enemy possessing sea power, the defense of the coasts, and of the insular possessions, and Panama, becomes so much an integral part of the main problem of operations, that they should certainly come under G.H.Q. control. It is believed the principle is clear in any case—when-ever operative control remains in the War Department, the decision should not be at variance with the opinion of G.H.Q.

It has been stated that in addition to its control over all forces ready for combat, G.H.Q. should also control all available supplies and means, for their operation and maintenance. It is not necessary to conceive of an organization in every case of an S.O.S., under the G.H.Q., as it existed in the A.E.F. The distance of the theatre of war from the home base, the possibility of interference with the steady flow of supplies to the front by attacks upon a long and vulnerable line of water communications, made necessary not only a determination of the needs and a coordination of the questions of immediate supply, but required as well, an accumulation of reserves, and an operative agency under G.H.Q. for their storage and distribution. In the A.E.F. there was also performed the function of procurement to a very considerable extent. This was brought about because sources of supply in Europe were made available by the Allies in order sooner to get the American Army equipped and into active participation.

But, if we consider the supply problem of G.H.Q. on this continent, and in the general case, the situation appears different. Supply never fully meets demand, and a decision always has to be made as to where what is available can most profitably be used. It would be the broad function of G.H.Q. based on its plans for the employment of the field forces, to determine, coordinate, and inform the War Department of their needs, and fix priorities for distribution of the supplies available.

G.H.Q. would thus control the kind and quantity of supplies to be furnished, and their use. Upon the War Department would devolve procurement, used in the broad sense of making supplies available, and in the general case, under its charge would remain the great reserves, both of men and materials in the depots of the interior, from which issues would be made direct to the different theatres of war or operations, on credits established by G.H.Q. It must however be expected that there will be exceptions to the general rule, and a similar situation may again require the organization of an S.O.S. as in the A.E.F.

It is not intended to include in the scope of this discussion a consideration of the details of organization of a G.H.Q. There will, however, be outlined the general idea to which it would appear the organization should conform. Considering the broad functions of a G.H.Q.—the actual conduct of operations against the enemy—its staff should be a relatively small compact body, of the minimum number of subdivisions consistent with including in each, closely related functions and activities. Headed and coordinated by its chief of staff, it thinks, devises, and plans for the C-in-C, and converts his decisions into orders, the execution of which it directs and controls. It should be emphasized especially that the G.H.Q. staff must be kept as purely a broadly planning and controlling staff as practicable, leaving to the various high commanders, and to the War Department, the executive and administrative tasks, arising in connection with the accomplishment and execution of the plans G.H.Q. has determined upon.

In determining the number of subdivisions under the Chief of Staff, it is not so much a question of how many he can directly handle and coordinate, but how few can be gotten along with, while at the same time adhering to more or less clearly defined functional lines. Under this conception it would seem that normally all the staff duties of a G.H.Q. can be handled through the General Staff alone, and that experience has shown that all of the functions incident thereto, in the general case, can be performed through the four principal divisions of personnel, enemy intelligence, operations, and supply. The correct determination of opinion or advice upon any question relative to any combatant arm, any technical arm or service, is insured by such a composition of the G.H.Q. General Staff as will include the necessary representation of the arms and services therein. The Adjutant General's, Inspector General's, and Judge-Advocate General's Departments should be provided for, because the duties of administration pertaining to these agencies arise at G.H.Q. in connection with the conduct of operations and cannot be performed by the General Staff.

This corresponds to the organization finally determined upon for the G.H.Q., A.E.F., except that a separate training section in the general staff, and chiefs of combatant arms were provided for, although of the latter only a Chief of Artillery was ever appointed. Training con-

stituted a special problem in the A.E.F., for in addition to the forces actually ready for combat, many units in preparation therefor had to be handled. The necessities of the transportation, equipment, and replacement situation, required the performance of what, in the general case, seems plainly a War Department function. And if we examine the functions devolving upon the training section of G.H.Q., A.E.F., and those prescribed for the chiefs of its combatant arms, it will be found that such as did not result from this special training, and in a way, mobilization problem, appear to fall more properly in the other four General Staff sections. However, it must not be lost sight of that there may again be presented the same situation as in the A.E.F., and as in that case, a special solution will be called for.

Under our military policy as thus far developed, it is a well accepted rule that our permanent military force shall be small. As a consequence our peace-time organization must be such as will permit of rapid expansion in the event of war. It is of equal importance that this expansion shall not be disruptive of the existing machinery. If therefore, a General Headquarters is to exist in time of war, provision must be made for it in time of peace. The correctness of this can be no more convincingly shown than by our experience on entering the World War. We had neither an agency to take up the tasks of a general headquarters, nor could the war expansion take place without an almost complete upsetting of the existing military establishment. The G.H.Q. of the A.E.F., starting from a relatively small group of officers who accompanied the Commander-in-Chief to France, not only had to bring itself into being, but in the process had to pass through some trying experiences before it developed into the efficient machine it eventually became. We may very well reflect what would have been our predicament, and what the outcome, had we been required upon our entrance into the war immediately to begin active participation. Nor must it be lost sight of that the time of our entry was of our own choosing. Our enemies can not often be counted upon to leave this decision to us.

So far there has been considered only the theory, or principles, which seem to underlie the functions and organization of a G.H.Q. and its relation to the War Department General Staff, and a presentation of the arguments by which the conclusions arrived at have been reached. There remains to be examined the application of these principles to a determination of what our military machinery should, and can be, under present military policy and existing laws. This will be done by a consideration and discussion of the scheme for the reorganization of the War Department General Staff, now embodied in Army Regulations, so far as relates to the organization and relation thereto of a G.H.Q.

Under the plan adopted there has been provided in the War Department General Staff, in addition to the four divisions of Personnel, In-

telligence, Operations, and Supply, a fifth, called the War Plans Division. The function, in general, of the War Plans Division is the formulation in time of peace, of the plans for the use of the military forces in the theatre of war. In time of war, supplemented is so far as practicable by personnel from the Army War College, it will furnish the General Staff of the General Headquarters which will supervise the actual execution of the plans prepared. In the event of minor operations, not requiring the organization of G.H.Q., while the personnel for the nucleus of the General Staff of the headquarters charged with these operations would be drawn from the War Plans Division, this division, as such, would continue its functions as a part of the War Department General Staff. But in the event of a major war effort, and a general mobilization, the function of formulating the plans for the use of the field forces would be withdrawn from the War Department and would pass to G.H.Q.

By this arrangement there is recognized the separation in time of war of the functions of command and mobilization, and there is provided in time of peace, agencies for each, so as to preclude on the transition from peace to war, such disruption of war machinery as has heretofore been experienced. Interference by the War Department with operations in the field is guarded against, and readiness in time of peace of the machinery to carry on the war is insured.

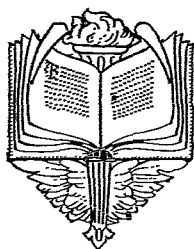
By utilizing as the nucleus of the General Staff of G.H.Q. that division of the War Department General Staff which in peace has been charged with the formulation of the war plans, close coordination between peace time plans and war time execution must necessarily result. It must of course be recognized that plans determined upon beforehand in time of peace for the employment of the forces in the field against the enemy can only be perfected to a certain point; that after the initial strategic deployment under the basic plan adopted, the enemy action enters as a factor; that in reality a clear dividing line exists between the preparation of plans for operations before and after war begins. But in any case, the advantage of having a continuing agency for these functions is evident. By using the personnel of the Army War College for the expansion of the War Plans Division into the G.H.Q. General Staff, a draft upon the War Department or elsewhere, at a time it can be least endured, is avoided.

The plan of organizing a virtual war time G.H.Q. in the War Department is preferable to that of having a separate G.H.Q. in time of peace. Apart from the difficulties which would be presented under the existing military laws, there would be positive disadvantages in this latter plan. Under the law the head of the military establishment is the Chief of Staff, and while at present there exists the position of a General of the Armies of the United States, no functions as such are attached thereto. But even if this could be overcome in a measure by

Executive order, the setting up of a separate headquarters and staff, coordinate in a sense with the War Department General Staff would, so long as the office of Chief of Staff remained, inevitably lead to friction. With separate heads it would be difficult to as clearly define and separate their respective functions, and the coordination and cooperation possible under the plan adopted could not be expected. Moreover, if the conception of a separate G.H.Q. in time of peace is based upon the existing occupancy of the office of General of the Armies of the United States, this will cease, until our next great war at least, with the termination of the present incumbency.

Finally, in examining the practical working in time of war of the plan of reorganization which has been determined upon, it becomes evident, if the conclusions arrived at are sound, that the greatest certainty of cooperation and coordination between the operations in the field and the War Department will be assured, if the command of the field forces is entrusted to the Chief of Staff. In the event of a general mobilization he would establish a General Headquarters in the field, built up upon the War Plans Division of the War Department General Staff and would actually direct by command, the employment of the forces against the enemy in the execution of the plans prepared in time of peace under his own supervision. As the Chief of Staff his supervisory control and coordinating authority over the War Department General Staff could continue, but its actual exercise would devolve upon the Deputy Chief of Staff, who would become, as such, the virtual War Department Chief of Staff.

In the realization of this scheme, better coordination of the military part of the war effort could hardly be conceived. Under our system there can be, of course, no positive assurance that in the event of war, the Chief of Staff will be appointed to command the forces in the field, but by the reorganization of the War Department under the present theory, and by the appointment of the General of the Armies of the United States to the office of Chief of Staff, it is to be hoped that both the principle and its application will become firmly established.



Some More Dope on Shooting

(Being the log of the 1922 Coast Artillery Rifle and Pistol Teams)

By Captain H. C. Barnes, Jr., C. A. C.



IN this article an attempt will be made to outline in detail just what was done toward developing rifle and pistol teams to represent the Coast Artillery in the National Matches this year, what problems confronted the team captain and coaches, what methods were employed in dealing with these problems, and finally what results were obtained.

Early in the spring Major Wm. S. Fulton, C. A. C., was designated by the Chief of Coast Artillery to captain the teams. Major Fulton was exceptionally well qualified for such work having at the time been one year a rifle team member (1919), two years team captain (1920-1921), and one year a pistol team member (1920).

With one very important addition, the preliminary practice and method of selection as decided on by Major Fulton, the method was substantially the same as that followed in 1921. As in 1921, local rifle and pistol "shoots" in the nature of try-outs were held in each of several coast defenses, camps, and posts. These were supervised by officers who had gone through at least one season's training at Wakefield and the National Matches at Camp Perry.

These various try-outs began about the first of May and lasted anywhere from two weeks to a month or more depending on local conditions and activities. It was in a way unfortunate that more time could not have been devoted to them as new rifle-shots are ever present and it remains only to discover their aptitude and ability. This can be done only by devoting the necessary amount of time and patience to the task.

The selection of officers and men to participate in these "shoots" was made in the main by the team captain after consulting past and present marksmanship records of individuals, their general physical condition, age, eyesight and any other points having a bearing on the matter in hand. In connection with this it might be said that should there be anyone not considered in the preliminary selection who might wish to try out, it only remains for him to apply to his coast defense commander for permission to do so as each of these latter officers is given authority to add as he sees fit to the list of competitors under his command.

The competitors were given every help that it was found practicable to give and an earnest effort was made by the supervising officers to bring to light and to develop new material. In some cases it was found that although a man had not made particularly high scores in these local shoots, he however possessed certain qualifications such as interest, past experience, and the like which would warrant his being recommended for further instruction at Wakefield, and accordingly such recommendations were made.

Upon the completion of the local try-outs the officers in charge of them rendered to the Chief of Coast Artillery reports containing in detail all information connected with the "shoot." Some of the points covered were: the course fired, the time devoted to the firing, the names of all contestants, the daily scores made by each contestant and the opinion of the officer in charge as to the value of each contestant, as a prospective team member. These reports were turned over to the team captain who after consulting them, selected the squad which later was assembled at Wakefield.

As stated above there was one very important addition to the methods followed in the preliminary training. In 1920 the Camp Perry squad numbered about thirty men. From this number the team of ten shooting members and two alternates were selected. This left a balance of twenty of whom all but about five were new men, that is to say, those who had never actually fired on a National Match Team. These men had received a great deal of very valuable experience in match shooting throughout all of the individual matches and formed a very strong nucleus for the next year's team. It was realized at the end of the 1921 season that our team's weakest point was the short range work and that steps would have to be taken to improve this condition. Accordingly early in May Major Fulton assembled at Wakefield about eight or ten members of last year's squad—men who were eligible for the team as new members. This procedure was also followed on the west coast, the men being assembled at Fort Winfield Scott, under Major L. F. J. Zerbee. They were put thru a very intensive short range course, with which were combined certain physical exercises calculated to develop the muscles that are brought into play in shooting. This training lasted slightly over a month and was very fruitful of results. When it is considered that of the eight new members of this year's team, five were from among those who received this preliminary training, it will be seen just how valuable it was. This training should most certainly be carried out each year and developed to the fullest extent as our team has now placed itself among the contenders for first place and every opportunity to improve it will have to be grasped in order to make it a winning team.

The latter part of June saw the team squad assembled at Wakefield. Many of those present were very well acquainted with the range and

surrounding country, having been there before, but there were also many new faces to be seen, a fact which was most encouraging to those who were familiar with the problems confronting us. There is never very much concern as to what the old team members are going to do, as they have already shown their work by previous shooting, but the new men are the ones who are watched very critically and on whom are based many of the hopes of success.

For those who are not acquainted with the Wakefield range, a short description might not be uninteresting. In the first place, the range is located about three miles from Wakefield, a very attractive town of about twelve thousand inhabitants, ten miles north of Boston. The range faces about north northeast and is very well appointed. The firing points are laid out after the best approved design, all being on the same line. The targets are therefore necessarily placed in echelon. For each range with the exception of the thousand yard one, there are about fifteen targets and in the latter case, ten. There are to be found several buildings on the range most of which were built by the Navy during the war and which are now used as living quarters for members of those rifle and pistol squads which use the Wakefield range. Altogether there is ample room for a squad of any size we shall ever find necessary to assemble there.

The assembling of the squad brought together many old friends and everyone soon saw that his stay at Wakefield was to be pleasant as well as profitable. The squad numbered approximately seventy and was composed of officers and men from practically every Coast Artillery post and station in the United States.

Equipment was issued at once and those uninitiated in all of the plunder used in shooting were more than a little surprised to find themselves suddenly possessed of every imaginable thing from new star gauged rifles, telescopes, and kit boxes to ear protectors and score books. The sight of a modern rifleman equipped according to the latest fashion and carrying all of his equipment reminds one of the picture presented by the typical German and his wife returning from a large afternoon's shopping orgy—that is to say, it reminds one of the wife. Such is the burden of the aspirant marksman.

Shooting for the first two or three days was taken rather easily in order to limber up stiff muscles and "target in" the new rifles. Then it began in earnest. The National Match course, 200 slow fire standing, 200 and 300 rapid fire, 600 and 1000 slow fire, was fired daily by each man and scores were recorded.

It was decided to designate two days in each week as "record days" while the remaining four were to be for practice. Every man was encouraged to use the practice days for any experimenting that he might wish to do. The scores made on the record days were recorded and posted throughout the entire season and it was from these scores

that the Camp Perry squad was finally picked. The scores made on the practice days were kept also but were used only for observing the progress of the individuals in order that coaching might be given where it was most needed.

As the shooting got under way, a systematic scheme of instruction rapidly developed and the scores mounted higher day by day. Regular conferences were held daily at which were talked over all questions which had arisen during the day and which were connected with the work in hand. From the very first it was the announced policy of the team captain to develop a team instead of a group of individual shots and to this end everything else was subordinated. Every effort was made to help individuals over rough places but from dawn till dark the team stood first. This fact was constantly impressed on the minds of the contestants and they were given to understand, and soon came to believe firmly, that on this depended our ultimate success or failure.

After a month's steady shooting the squad had practically arranged itself in order of merit, certain men being always near the top and certain others, near the bottom of the list, and it was then necessary that the first eliminations be made. The squad was reduced to about fifty in number and the race for places on the team began in earnest. It behooved everyone to put out the best in him and the old shots were by no means confident of a certain number of places on the team but were continually being outshot by new members or were being strongly pushed from behind.

In addition to our squad, there were in training at Wakefield, the Marine Corps and Massachusetts National Guard Teams. Ever since we have been shooting at Wakefield (1920-1922 inclusive) we have been with these teams and a sincere friendship has sprung up among us all. Of course the rivalry formed among competing teams is always present but it is of the most desirable sort. It is to the Marine Corps Team of 1919 that we really owe our start in shooting. The matches that year were held at Caldwell, N. J., and they formed the Coast Artillery Team, a recruit team of the first water. Only one or two of our members had had much experience in big match shooting, and little team shooting. The Marines loaned us equipment of all sorts and even went so far as to detail coaches to help us out. That spirit of friendship still exists and has done much towards making our work at Wakefield a real pleasure.

On August sixteenth the matches of the United Services of New England began. The results of these matches have been published in a past number of the JOURNAL but comment on one or two points here should be made. Two individual matches were won by us, they being the McKinzie Match, won by Captain A. C. Chesledon, who made a perfect score of 50 out of 50 plus 5 added bull's eyes at 600 yards, the next highest competitor making 50 plus 4 added bull's eyes, while the

Bench Match was won by Captain H. C. Barnes, Jr., who made a perfect score. This match was fired at 200 yards, the target used being very similar to the bobbing target used in pistol shooting.

In these matches however the one which proved most interesting and instructive to us was the Hayden Match. This was a team match fired under National Match conditions as to ranges and number of shots, and although we did not at the time know it, what happened then was to be repeated later almost in detail in the National Match at Camp Perry.

There were nine teams entered, the Coast Artillery having three, the Marines three, the Massachusetts National Guard two, and the Navy Submarine Base from Boston one. Our team after the 200 offhand stage led the next nearest team (Marine No. 2) by about 15 points and remained in the lead through 200 and 300 rapid fire and 600 slow fire. Our lead was never at any time very great as the first three or four teams were bunched very closely so that when we began the 1000 yard stage we were not as far ahead as we had wished to be and it proved to be as much our undoing as it was the making of the Marines. After an exciting finish, we finally landed in third place, fourteen points behind the leading team (Marine No. 1) and four points behind second place which was won by Marine Team No. 2. This match was fired under good weather and light conditions and afforded us an opportunity to compare ourselves with a very strong team. The result, although we were beaten, encouraged us tremendously for never before had one of our teams finished as close to a team as strong as that from the Marine Corps. The scores in this match were quite high, the winners shooting 93.6% by scoring 2809 out of a possible 3000 points. Our team averaged 93.2%, making a total score of 2795.

Up to this time we had had nothing on which to base our hopes except the good shooting of the squad as a whole and the excellent morale and team spirit throughout. Reports had come to us of the work of the other Army teams and we had been able to observe the work of the Marines and the Massachusetts National Guard, but the Hayden Match gave us something definite to work on by showing to us our strength and weakness. It remained now for us to do our best during the time remaining before the National Match to improve where improvement was needed and to keep up the already-high standard of the rest of the work. Into this task went all of our efforts and energy and the good will of all so that when called upon, our team might not be found wanting.

Soon came the time for the squad to be further reduced and to start for Camp Perry. The last of August saw us on our way, the squad being composed as follows:

Major W. S. Fulton, Team Captain. Major L. F. J. Zerbee,

Major C. W. Baird,

Major S. W. Stanley,

Major W. D. Fraser,

Capt. W. W. Rhein, Team Coach,

Capt. A. C. Chesledon,	Lieut. H. I. Borden,
Capt. C. E. Loucks,	Lieut. L. A. White,
Capt. E. F. Olsen,	Lieut. P. S. Lowe,
Capt. E. H. Stillman,	Lieut. G. W. Trichel,
Capt. J. T. Campbell,	Lieut. K. S. Stice,
Capt. E. W. King,	Mas. Sgt. Otto Hahn,
Capt. J. A. Ryan,	Tech. Sgt. James Christian,
Capt. H. C. Barnes, Jr.	Sergeant G. B. Ping,
Capt. M. H. Parsons,	Sergeant Otto Bentz,
Capt. G. deL. Carrington,	Sergeant P. J. White,
Capt. F. S. Swett,	Sergeant E. B. Porter,
Capt. Percy Adams,	Sergeant James Wertzberger,
Lieut. L. L. Lemnitzer,	Private J. J. Dyba.

Upon our arrival at Camp Perry we found that the reputation gained by us in the Hayden Match had preceded us and questions began to descend upon us from all quarters. This fact made it a little difficult because, even though we were all sure that our team was a good one, to answer the questions, and yet not to appear to boast, was sometimes trying.

Camp Perry is the Mecca of the American rifleman, it being by far the best equipped range in the country if not in the world. There are over two hundred targets on the rifle range, complete pistol and small bore ranges, and lastly and of great interest and attraction to many, a trap shooting range.

On this historic range annually are gathered the country's best shots, military and civilian. Here are seen all manner of people—policemen, gun-smiths, soldiers, sailors, marines, R.O.T.C. students, and even a few of the old time Westerners—all there for one purpose; to shoot. There is hardly any other sport that admits to its ranks of devotees so many people of so many different physical characteristics. It is open to all irrespective of age, weight, strength, or height and upon seeing the assembled shooters one is sometimes put in mind of an old army poem entitled, "The Dogs of Fort Snelling," of which one of the opening verses goes something like this:

"Long dogs, short dogs,
Fat dogs, and thin."

Our team settled down to work immediately to prepare for the many individual matches which precede the big team match. During this preliminary period, due to the great numbers of riflemen present, it was found impracticable to give to any one team more than two targets on any range and in many cases only one was to be had. This meant that a regular schedule of firings had to be made up and adhered to, and any time of the day would find members of the squad rushing from one range to another in order to fire the course laid out by the team officials.

As the results of the individual matches have been given in a previous issue of the JOURNAL, they will not be put in this article except to make mention of those matches in which Coast Artillerymen were the winners.

The first match to fall to our credit was the Marine Corps Cup Match, won by Private J. J. Dyba from Fort Terry, N. Y. Dyba was a new inexperienced shot but succeeded in defeating a field of some 590



PRIVATE JOSEPH J. DYBA, C. A. C., AND HIS TROPHY
THE MARINE CORPS CUP

competitors over a course fired at 600 and 1000 yards. His score in this match was 194 out of a possible 200, which not only gave him first honors but also the custody for one year of the beautiful silver cup from which the match derives its name.

The next to come our way was the President's Match. This was fired over the same course as the National Match minus the rapid fire, or in other words 10 shots at 200 off shoulder, 10 at 600 prone, and 20 at 1000 yards prone. Captain E. W. King from Fort Du Pont, Delaware, out of a possible 200 scored 191 points, winning the match which carried as its prize a gold medal, a gold "President's Hundred" badge, and an autographed letter from the President of the United States. Lieutenant H. I. Borden from Fort Winfield Scott was King's nearest

Coast Artillery runner up, winning third place with a score the same as that made by King but being outranked by the many and varied means of deciding ties.

Now comes the biggest one yet. This in itself might be a separate story if all were known concerning the ambition, work, and determination that went before it. The National Individual Match, fired over the Infantry qualification course, is considered as the biggest of all the individual matches. It is attractive not only as a competition but also because the medals won in it go toward making up the required three credits necessary to make an officer or enlisted man in the Army a Distinguished Marksman. It is therefore a very hotly contested match. Throughout the slow fire stages there were many competitors who were either on top or very close behind so that it could not be said that any one man had a decided advantage over all others. It was then seen that as usual the result was to be decided on the last range and incidentally in this case the hardest—500 rapid fire. Captain M. H. Parsons of Fort Monroe, when he finished with 337 out of 350 points possible, was the highest Coast Artilleryman and apparently the highest of all so everything looked rosy for our side. Our advantage was however to be only short lived. Later that afternoon an Infantryman turned in a score tying Parsons' but unfortunately ranking it. It looked as though we were doomed for disappointment but we still had one more hope. Sergeant Otto Bentz from Fort Worden, Washington, had at that time to fire 300 and 500 yards rapid fire and in order to win he could lose but one point. This he realized fully and went out determined to do his best under those trying conditions. He made at 300 yards 50 out of 50 and at 500 yards a 49, thus tying the high man but being placed ahead of him because of having a higher score at 500 yards. This gave us first and third places in the most coveted of the individual matches. Sergeant Bentz's achievement is all the more noteworthy when it is known that until this year, all during his service of some fifteen or more years, he has been a left handed shot. Between the 1921 and 1922 matches he changed to right handed shooting, which feat in itself will be realized by those familiar with rifle shooting as being very difficult of successful accomplishment.

One more match was yet to be ours. Upon the completion of the National Team Match we were to learn that Major W. D. Frazer one of our most experienced shots had won the All-Round Championship, a match embracing shooting with rifle, pistol, small bore, and shot gun. In this match were entered many of the pistol, shot gun, and small bore cracks of the country so that its winning is a matter of no easy accomplishment. Once more had the Big Gun Corps scored.

About this time came the National Pistol Team Match in which the Coast Artillery Team composed of the following members stood fourth place:

Major W. D. Frazer,
 Capt. A. C. Chesledon,
 Capt. H. C. Barnes, Jr.
 Tech. Sgt. James Christian,
 Sergeant E. B. Porter.

The score made by our team, although it was relatively high, was very poor so the less said the better. It should be mentioned however that the three teams beating us were the Marines, the Infantry and the Cavalry.

Now for the National Match. After two days' final practice the match began. The week preceding it had seen some very cold weather and everyone was devoutly glad to see the first day of the match dawn clear and pleasant with only light winds blowing. In 1919, 1920, and 1921 the weather during the matches left very little to be undesired which caused a consequent lowering of scores. A match fired under good conditions was what not many of us had ever seen but for which we all hoped. Our wish was granted, for through the entire two days' shooting the weather was ideal.

The team as entered in the match lined up as follows:

Major Fulton—Team Captain.	Sgt. Ping, Member,
Capt. Rhein—Team Coach,	Lt. Trichel, “
Capt. Ryan—Member,	Sgt. Hahn, “
Major Frazer, “	Capt. Campbell “
Capt. Parsons, “	Sgt. Wertzberger “
Sgt. Bentz, “	Capt. Olsen—Alternate,
Lt. Lowe “	Sgt. White, “

We started off by taking the lead in the off hand stage, three points ahead of the Cavalry, five ahead of the Navy, and seven ahead of the Marines and Infantry who were tied for fifth place. Next came the 200 rapid fire wherein we sprang a surprise on everyone present including ourselves. In this event, out of ten men, nine on our team scored possibles and the tenth, a 49. This score of 499 out of a possible 500 was said at the time to be a world's record for team shooting over that particular range. Certainly its making was a pleasure to behold and we then were still in first place with the lead over the Cavalry increased by four points.

The 300 rapid fire left us still ahead but by a margin of only four points over the Marines who had crept into second place and who were followed by the Navy, Cavalry, and Infantry in order named. It now became apparent that no decided advantage was to be gained by any team on the short ranges and that the climax of the match was to be on the 1000 yard range.

The completion of the 600 yard firing finished the first day's work and found us with a slightly greater lead on the second place team, the Marines. They were doggedly pressing us with the Infantry, Cavalry, and Navy close behind. At this point the scores were as follows:

Coast Artillery.....	1924	Ex 2000
Marines.....	1915	" "
Infantry.....	1910	" "
Cavalry-Engineer....	1909	" "
Navy.....	1907	" "

We had succeeded in staying ahead for four fifths of the race and now it was to be seen whether or not we could sprint home and win.

Our first two pairs to fire the next morning at 1000 yards did some very nice work and increased our lead by nine points. Things were still looking up and the goose hanging high. At this point however we were doomed to fall and by the time our fourth pair had finished we were in second place having been passed by the Marines. Our last pair went to the firing point with a task well nigh impossible to perform, for in order for us to win they could afford to lose only three points between them thus making it necessary for them to turn in 197 out of 200. This was by far too much to expect so it was for us to do our best to land in second place. This also was denied us and when the match ended we had captured third place, 24 points behind the leaders, Marine Corps, and 14 behind the Infantry.

The match went off and ended as a real fine sporting event should, the decision being held until the very last. All the way through the high teams were very close together and a slip by any one of them was very apt to cause a change in the standing. Our ultimate losing out after having done so well is not excused in any way whatsoever, for without doubt the best team won, thus demonstrating once again the truth of the age old principle of the survival of the fittest.

The scores and standing of the first ten teams and the individual scores of our own team are given below:

1. Marine Corps.....	2848
2. Infantry.....	2838
3. Coast Artillery.....	2824
4. Navy.....	2814
5. Cavalry-Engineer.....	2813
6. Massachusetts N. G.....	2800
7. Illinois Civilian.....	2762
8. New York N. G.....	2745
9. Pennsylvania N. G.....	2738
10. 9th Corps Area, C.M.T.C.....	2730

Coast Artillery Team Scores

<i>Name</i>	<i>200 Sl.</i>	<i>200 Rap.</i>	<i>300 Rap.</i>	<i>600 Sl.</i>	<i>1000 Sl.</i>	<i>Total</i>
Ryan, J. A., Capt.	45	50	50	49	89	283
Frazer, W. D., Maj.	45	50	48	49	83	275
Parsons, M. H., Capt.	45	50	48	46	85	274
Bentz, Otto, Sgt.	44	50	50	49	92	285
Lowe, P. S., 1st Lt.	46	50	50	50	86	282
Ping, G. B., Sgt.	45	49	49	48	89	280
Trichel, G. W., 1st Lt.	46	50	46	49	95	286
Hahn, Otto, Mas. Sgt.	45	50	50	48	97	290
Campbell, J. T., Capt.	44	50	50	48	94	286
Wertzberger, James, Sgt.	47	50	49	47	90	283
Totals	452	499	490	483	900	2824

Too much credit cannot be given to Major Fulton and Captain Rhein, the captain and coach of the team. These officers gave their undivided efforts and attention toward developing a team that would have but one object in view, the winning of the National Match. They developed a morale and team spirit that has never been even approached by that of any of our previous teams. There was during the entire season such a feeling of good will and comradeship that the long period of routine which under the attendant nervous strain may easily become very trying, was not only robbed of any monotony but was made immensely pleasant.

It is to be hoped that our future team captains will be able to carry on the spirit that pervaded this year's team. Without this spirit a winning team can not be produced and with it there is no mark within bounds that may not be reached.

As a mark of appreciation for his work in connection with the Summer's shooting, a dinner was given to Major Fulton by the officers on the squad. Besides being a function whereat a certain amount of food was consumed and stories swapped, it was the occasion of the organization of the "Order of the North Bound Cat." This animal had been taken as the mascot of the team and was represented always as being headed toward the target butts with his tail in the air, thus signifying that the team morale and spirit was always high—never low.

There had been found among us two gentlemen of poetical inclination who managed to describe in a rather attractive manner some of the events of the summer. The results of their efforts are shown below.

FOLLOWERS OF THE NORTH BOUND CAT

From the sunny sands of Florida,
From the rocky coast of Maine,
From the Golden Gate of 'Frisco,
They came by bus and train.

Their destination Wakefield
To learn the shooting game,
To make Pop Fulton's rifle team
A winner was their aim.

They challenged all their misses
And telephoned the pits
To look the targets over
For they sure contained some hits.

They learned by sad experience
One can miss the black with ease
And that after all, old Pop was right,
You've got to hold and squeeze.

The first few days were hard ones
The scores were rather thin;
No change in elevation
Could seem to get them in.

Then possibles at rapid
Came plentiful and fast
And a big score at a thousand,
Hot dog! I'm off at last.

But elevation troubles
And normals that would soar
And shoulders raw and battered
Caused heartburns by the score.

The alibis were plenty,
"The black came off my sight,"
"A flea lit on my eyeball,"
"I shot in rotten light."

At night the gang would gather
In Jimmie's room at seven
And if Wade didn't catch them
They played until eleven.

The ante was a penny,
A nickle was the top;
And for a full or better hand
They'd go a nickle up.

Now Wade would say, "Tis foolish
'Twill make your eyes all sore
And you'll wonder on the morrow
Why you have a rotten score."

But with all their dissipation
Of heaving a naughty card,
They aimed a wicked rifle
And verily they hit hard.

We've captured several trophies
And rightly proud I am
And now we want the big team match
And if we win—Hot Dam!



A Miniature Range and Gun

By 1st Lieutenant Walter R. Goodrich, C. A. C.



UPON the arrival of the 59th Artillery (155 G.P.F.) at Fort Mills, P. I., a problem developed which led to the construction of a miniature range. This problem anticipated several things, namely, target practice with its numerous difficulties, the limited and difficult terrain at Fort Mills for maneuvering, and above all, it was believed the use of a miniature range would concentrate in a very small area, everything pertaining to a service practice.

So far as is known, this is the first successful attempt to install a system, whereby all actual conditions in Heavy Mobile Artillery were simulated with the aid of a miniature gun and out of door range.

This method provides a means of training officers and enlisted men in the duties which they are called upon to perform in action. This training includes the Service of the Piece, the proper use of commands, correct telephone messages, the assignment of targets, the adjustment of fire, various types of observation and the directing of a Battery over a field telephone.

It must be appreciated that a Battery Commander must place great dependence upon his enlisted personnel, especially his observers as they are often miles from his post of command, and a wrong observation at any time during Trial or Improvement Fire will have a very serious effect upon the results obtained. In other words, the miniature range gives each Commander, (Regimental, Battalion, and Battery) an opportunity to supervise the execution of his orders by his Juniors, and further gives the battery Commander an opportunity to watch his enlisted personnel, which is not possible at artillery drill, since the officers and men are more or less separated.

The primary considerations were: first, where to select a small plot of ground which was conveniently located, and next, to obtain a gun on a desirable mount to give a small burst which could be observed.

THE RANGE

Before a section of terrain was chosen for the miniature range many things had to be considered, and the plot of ground selected necessarily had to fulfill many requirements.

Primarily, there were the many different methods of observation, that is the small space had to be suitable for actual Bilateral, Unilateral, Axial, and simulated Balloon and Aeroplane observation.

Secondarily, the position of the miniature gun with its flat trajectory had to be at an elevation higher than any of the targets so as to diminish the danger space, and reduce the possibility of too great a number of hits.

Finally a small plot of ground about 75 ft. wide by 150 ft. long was selected within a five minute walk of the Regimental area. This small section of ground was covered with a quadrillage on a scale of 1 to 300, and stakes driven in the ground at every 1500 M. to scale on the X and Y coordinates.

These stakes projected above ground about two inches, and on top were marked the X and Y coordinates of that particular point. By this method a Battery Commander could plot his O.P.s, the target and

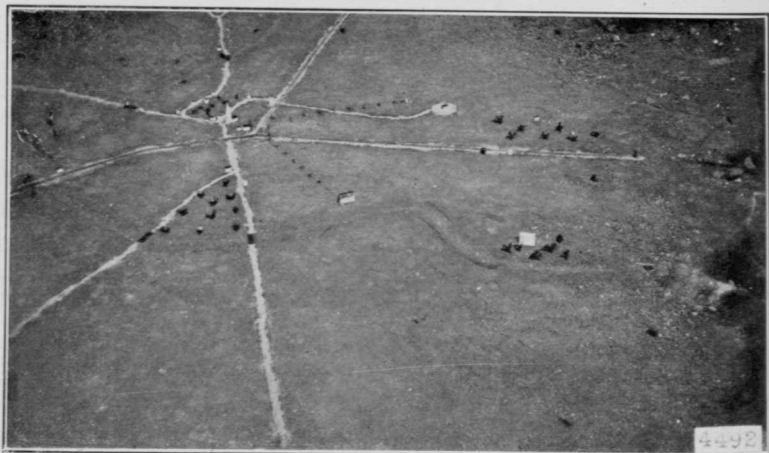


FIG. 1.

gun, reproduce a battle map or firing chart, by coordinates, in fact anything he desired to facilitate firing. This quadrillage as laid out on the ground corresponded exactly with a small section of coordinates taken from the map of the Philippine Islands. Two important features of this selected terrain were: first, that it gave simulated aeroplane observation at the targets, and second, a slight elevation in the ground about 30 M. from the targets made an ideal position for the miniature gun. Incidentally, an observing instrument set up immediately behind the gun offered good simulated balloon observation.

The elevation of the aeroplane station and also that of the balloon station was about 15 ft. higher than the targets, and this, on the scale of the range, would give distances etc., as though the observer's altitude was 1500 M. The convenience of this scale of 1 to 300 was evidenced in the aeroplane observations, in that they were made fairly simple to estimate, when one foot on the ground corresponded to approximately 100 M. or 6 inches approximated 50 M. The observation posts were

located so as to afford the type of observation desired, while at the same time due regard was maintained for safety precautions. The method of observation for any particular shoot was generally left to the discretion of the Battery Commander.

The actual area of targets covered about a 5 M. square, corresponding to 1500 M. to scale, and as can be seen in Fig. 1, the targets consisted of houses, bridges, cross-roads, a railroad station, etc. The wooden structures were on the same scale as the range, which made them from 2 to 4 inches in height. Roads were made of white beach sand and the river of dark blue sand. The railroad was hand constructed, being merely two lines of hemp cord about an eighth of an inch in diameter,



FIG. 2.

to which were tied small sticks to represent the ties. Miniature telephone lines were constructed which rendered the terrain more realistic. These small, lightly constructed affairs were continually being destroyed in the solution of problems and proper repairs and replacements had to be made each morning in order to have the range prepared for firing in the afternoon. However, with the buildings etc., constructed of steel there might be a possibility of a ricochet when firing, so for the sake of safety, all features of the range were done in wood.

The greatest annoyance was vegetation. Nothing could be transplanted so that it would take on the appearance of tree or woods, or if it did for a few moments the tropical sun would soon wilt it. The only substance which withstood the shooting and the sun, and took on the appearance of vegetation from the O.P.s, was bamboo. A stalk of bamboo about a half an inch in diameter was split several times and spread, then dipped in green paint, and would after a fashion answer the purpose of vegetation.

Fig. 2 shows the range as viewed from the miniature gun position, and as it would appear for balloon observation. Before going further, it would be well to state that this ground, as can be seen in the figures, is entirely free of grass, in fact, the soil is a dry red clay, the upper surface of which is dusty and when hit with a bullet gives an ideal simulated burst. The aeroplane station as viewed in Fig. 2 would be to the upper left on top of the bank, and in observing from this point the range would present itself as in Fig. 1.



FIG. 3.

THE GUN

A wooden platform was constructed upon which to mount the miniature gun. (See Fig. 3) This platform was embedded in the ground, the elevation of which was approximately 15 feet higher than the target area, and this was one of the controlling factors in regard to the danger space at the targets. Another factor which reduced the danger space was the fact that the range had about a 10 degree slope toward the gun. The combination of these two factors seemed to give the proper results as shown later when firing the gun to determine its Probable Error.

The miniature gun consisted of a Browning Machine Gun Tripod, Model of 1917, upon which was mounted a U. S. Springfield Armory Rifle, Cal. 22, Model of 1903. The gun was attached to the tripod in such a manner that in moving the elevation and deflection hand wheels it would take the corresponding range and direction.

The elevation hand wheel "E" as shown in Figures 3 and 4 was attached to the gun stock. The other point of rest was immediately behind the muzzle where the gun rested securely in an arm which in turn was attached to the tripod. The body of the elevation hand wheel contained 25 divisions, each of which corresponded to one mil, while on the spindle even units of 25 mils were marked. For example, when the spindle was run out to its maximum height the hand wheel would read zero, while the spindle would show 350 mils, the next 375 mils,

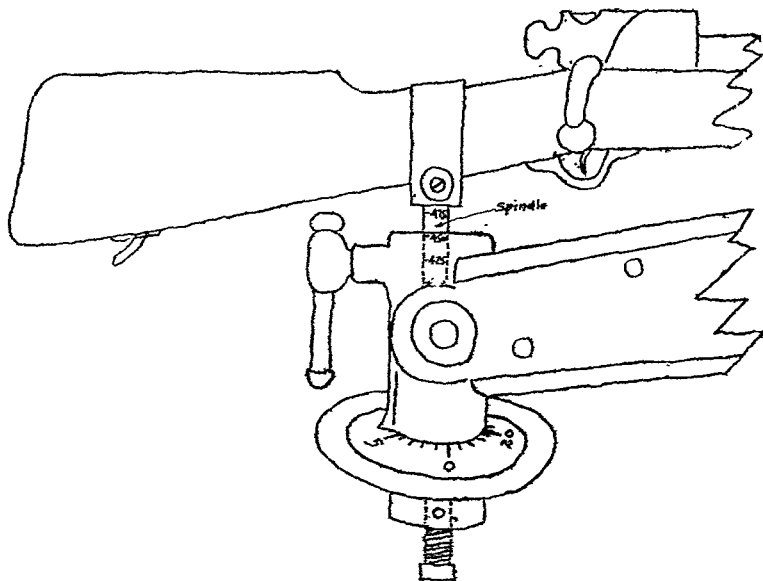


FIG. 4. SKETCH SHOWING ELEVATING HANDWHEEL

then 400 and so on up the spindle. The arbitrary marking of the spindle with 350 mils as a starting point will be explained later, as this was determined after the Probable Error of the gun had been obtained. By the above marking, any elevation could be had on the gun which would cause it to shoot at a distance on the small range corresponding to the actual range of a 155 G.P.F. when raised to the same elevation.

The deflection hand wheel "D" controlled the gun in its deflection and allowed the gun to be set at any deflection from 0 to 6400 mils, in graduations of two mils each.

THE GUN AND THE RANGE

The next step was to fit the gun to the range, so to speak, and the first thing done as has been stated before, was to mount the gun on a wooden platform, which position placed the gun approximately 30 M. from the center of the target area. The probable error of the gun then

had to be determined, and after accurately levelling the gun and gun platform, this was accomplished by firing 4 series of 50 rounds each at a target in the center of the target area. Every shot of each series was accurately measured, and the average probable error of the four series was 11.87 inches. At the scale of the range, 11.87 inches equalled 89.98 M. which corresponded to a Probable error of a 155 G.P.F. at a range of 11,600 M. (See Provisional Range Table for 155 G.P.F. Charge 2 Bis) Knowing this essential fact concerning the gun, a way was opened upon which to base the orientation of the gun and range. As stated above, the point fired at was in the center of the range, and the distribution of the miniature targets was made so as to radiate about this point.

In Fig. 1 the church steeple can be seen as marking the central point of the range, and the range from this point to the gun was considered to be 11,600 M. with an elevation of 433 mils. (Taken from Prov. Range Table, Chg. 2 Bis) Going up and down from this elevation the maximum limit was then determined to be at 475 mils and the minimum limit at 350 mils, then comparing these elevations with the range table it was seen that the miniature gun would cover a distance on the range from 10,400 M. to 12,150 M. From the above the spindle on the elevating device was marked.

The spindle was run out to its maximum length which gave the gun its lowest depression or 350 mils. The numerals 350 were stamped on the spindle while it was in this position. The hand wheel was then given one complete revolution, or turned thru 25 mils, which automatically ran the spindle down and gave the gun an elevation 25 mils higher than the first. At this point on the spindle, the numerals 375 were stamped. This process was continued at 25 mil jumps marking each division to 475 mils, which gave the gun its highest elevation.

The question may arise here as to whether the gun when fired at any other elevation than 433 mils, at which elevation the P.E. was determined, would respond to a corresponding probable error for the elevation given. There was a slight variation in the gun's dispersion in firing it at an elevation of 350 mils and then raising it to 475 mils, but this dispersion did not correspond to the probable error of those elevations. For this reason the probable error of the gun was determined at a mid range elevation, and for practically all firing a bracket of from 25 to 40 mils was used.

With the gun set at an elevation of 350 mils an aiming point was set out on the range a little to the left and front of the central point. The azimuth between the gun and this aiming point was computed from the coordinates. Now, having an aiming point, the gun elevation and azimuth of which was known, the gun could be oriented for each days firing. In this manner any target on the range could be fired upon and would always have the same elevation and deflection.

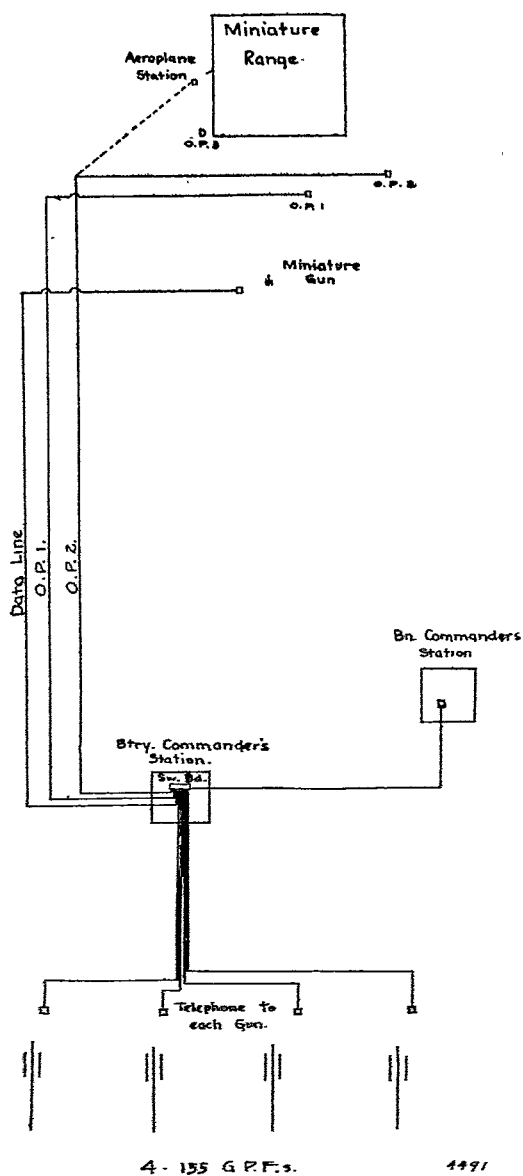


FIG. 6. SKETCH OF COMMUNICATION LINES TO MINIATURE RANGE

COMMUNICATIONS

Communication lines were established between the O.P.s, the Battery Commanders station, the miniature range, the 155 G.P.F. guns, and the Battalion Commanders station. (See Fig. 5)

The telephones and switchboards were installed and manned by Battery communication details, and much good was realized from this work. It trained the enlisted men in the field methods of stringing wire, setting poles, and connecting phones and switchboards.

Undoubtedly the best instruction and training was realized in reducing telephone conversation to a minimum, hearing correctly what was said, the sending and receiving of messages, and trouble hunting.

Over a mile and a half of outpost wire was strung in the construction of the two O.P. lines and the data line, the Battery Commander's Station being about 2500 feet from the miniature range. All lines ran into the Battery Commander's station switchboard. Separate lines ran to the Battalion Commander's station and to each of the four 155 G.P.F. guns in the gun park.

The data line in connection with the miniature range practically answered two purposes, in that the data given to the miniature gun from the B. C. station was transferred simultaneously to the 155 guns, which permitted the gun sections to drill at the same time that the Battery Commander was firing a problem on the miniature range.

It can be seen that there are many advantages to be brought at this point. The Battery Commander can take station at the forward O.P.s to observe his own fire, or he may take station at the 155 G.P.F. guns, or he may be at the B.C. Station. He may fire his problem from any of these points, thus allowing him to station himself where the instruction of his enlisted personnel is most needed.

The inter-connections between the different positions are secured thru the switchboards and it is highly desirable that competent enlisted men be chosen to operate these boards. Intensive training is also necessary for these men so that a shoot may be conducted with all possible dispatch.

OBSERVATION

All forms of observation were taken up and satisfactory results obtained. With terrestrial observation the O.P.s were manned by a rated observer and a telephone operator, all observations being transmitted to the Battery Commander as in service practice.

The instrument used is known as the B.C. telescope, scissors type. The training of the observers was a paramount factor in each day's practice and the observation of shots, coupled with the daily use of the instrument, gave excellent training results.

In aeroplane observation the observer, generally an officer, took station on top of the bank as shown to the upper left in Fig. 2 and re-

ferred his observations on the gun-target line, as so many meters over or short and so many meters right or left. The scale of the range, 1 to 300, permitted the estimation of such bursts to be readily made, in that one foot on the ground approximated 100 M. in range.

Not much can be said further regarding observation other than that all known methods for the observation of fire in Heavy Mobile Artillery were followed with precision. The officers firing were held responsible that all commands and observations reported corresponded to the methods as laid down in Drill Manuals, etc.

GUN SECTIONS

In having the inter-connections between the miniature range and the gun park, all 155 G.P.F. guns could be manned and drill on the data obtained at the miniature gun. An example of this can be shown as follows: The Battery Commander is at his B.C. station—the elevation and deflection for the initial shot is sent to the battery No. 1 gun, which is sent simultaneously to the miniature gun. This data is set off at the battery and on the miniature gun. Gun No. 1 at the battery reports "Ready." The Battery Commander gives the command to fire. Gun No. 1 fires and reports "Shot on the Way." At the expiration of the time of flight the miniature gun is fired, and the observations come in to the Battery Commander from the O.P.s. The necessary corrections are made and the operation repeated, going thru Trial Fire, Improvement Fire and Fire for Effect. The above is for single gun ranging, altho several problems were fired in ranging by salvos, using four shots from the miniature gun to obtain a Center of Impact, and satisfactory results obtained.

In the above illustration it is well to remember that all commands given to the 155 guns from the B.C. station, or from the 155 guns to the B.C. station, were transmitted directly to the miniature range, which eliminated all relay of commands.

RESUME

It is realized that the miniature range as outlined in this article is only in its infancy, and there is plenty of leeway for many improvements and extensions.

Referring to the paragraph headed "The Gun and the Range" it will be seen that in determining the P.E. of the gun the corresponding range was 11,600 M. Also, the statement was made that the gun was approximately 30 M. from the center of the target area, which distance at the scale of the range, would give a firing range of 9000 M. These two statements are rather conflicting, and except in a very rare case, a miniature gun would not give a probable error which would fit the exact distance from the gun to the target. Assuming that this had to be so, the distance on the range for this gun, instead of being 30 M.

should have been approximately 39 M. However, this did not seem to be very important, in that there was no point at issue as to whether the gun was 10 M. or 50 M. from the targets as long as a probable error could be had that corresponded to some range for the 155 G.P.F.

Careful study and about two weeks work were required to put this range in order for firing, and thereafter two enlisted men were necessary for its proper maintenance.

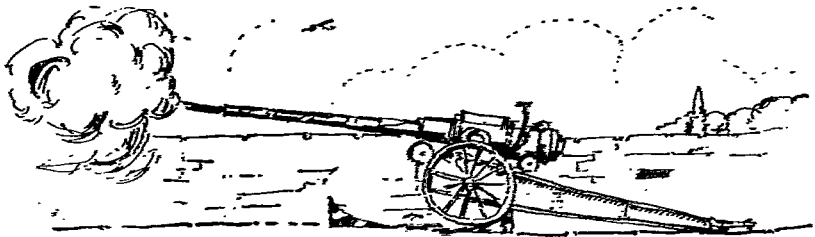
An officer should be selected to assist the officer firing, in preparing his initial data from the range, selecting his O.P.s, and to maintain a close supervision over the gun while it is fired. It is very important that the gun should not be disturbed, even to the slightest degree during the firing of a problem, except that its changes come thru the elevation and deflection devices.

No sights were used on the gun except in the orientation which took place each day before firing, at which time the open sights were used. It is believed that with very little effort a panoramic sight could be attached so that indirect fire might be employed. However, this would be more or less superfluous, as the gun pointer secures his training, in the service of the piece, at the gun park.

The gunner at the miniature gun, when a target was designated, was instructed to aim the gun so that the first shot would strike away from the target both in range and deflection, and thereafter made no corrections except on the order of the officer firing the problem, who calculated the necessary corrections.

As a beginning in such a miniature range practice, it is suggested that all officers assemble at the miniature range to fire several problems without the aid of the communications, and in this way many small difficulties will be ironed out before all sections of the range are put to work.

Critiques should be had on all problems fired, either during or after the completion of the firing, with all errors and mistakes carefully discussed.



- | | |
|---------------------------|------------------------------|
| (a) Marching Ability. | (d) Position Maneuvering. |
| (b) Tactical Mobility. | (e) Stability during Firing. |
| (c) Strategical Mobility. | |

At the conclusion of these tests the following more important comparisons were noted:

(a) That it is necessary to use tractor power in order to spread the treads when the adapter mount is being placed in firing position. Further, that by using a tractor to spread the treads an area 60 feet wide by 36 feet deep is torn up around the mount by the tractor, as compared with an area 24 feet wide by 20 feet deep around the tractor drawn wheel mount.

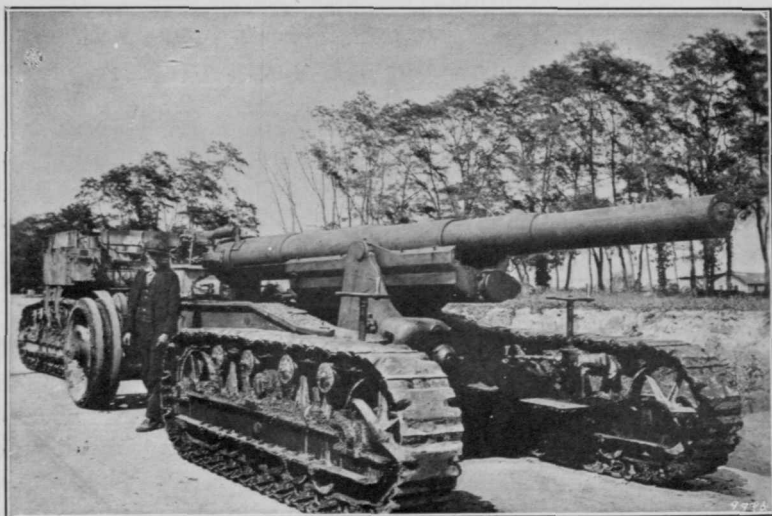


FIG. 1.

(b) That it is not possible to use the jack beam while preparing the adapter mount for firing because the treads prevent the jacks being placed in the proper positions. It is necessary to use a jack under each trail for these operations. After each trail is jacked up it is then necessary to block up under the rear maneuvering lug and remove the jacks before the trails can be spread or closed.

(c) That in order to change the line of fire by an amount which will necessitate changing the treads it is necessary to close and lock the treads and in addition to remove the pivot pin and replace the spring shackles before the mount can be turned about its vertical axis.

(d) That the adapter mount is more difficult to maneuver in position than the wheel mount.

(e) That there is excessive vibration when the adapter mount is traveling on concrete roads. The vibration is so great that the brakeman cannot ride comfortably on the brakeman's platform.

(f) That the adapter mount and the wheel mount can be maneuvered with equal facility with tractor power on the fall of a block and tackle.

(g) That it almost impossible to place the adapter mount exactly over a given point during position maneuvering.

(h) That the wheel mount, with caterpillar bands, and the adapter mount can negotiate rough muddy cross country roads and the ordinary obstacles such as swampy ground, mud holes, and shell holes with equal facility. The adapter mount will surpass the wheel mount where there are deep narrow ditches or trenches to cross, thereby bringing into use the cantilevering ability of the adapter treads.

(i) The following is a tabulation of the comparative draw bar pull, obtained while vehicles were in motion, between the adapter mount and the wheel mount, as determined at Aberdeen Proving Ground:

<i>Type of Mount</i>	<i>Type of Road</i>	<i>Grade</i>	<i>Speed— M.P.H.</i>	<i>D. B. Pull lbs.</i>	<i>Differ- ence lbs.</i>	<i>Remarks</i>
Adapter Wheel	Concrete	Level	8.18 8.40	1090 130	960	Max. Speed
Adapter Wheel	"	"	2.06 4.04	1500 420	1080	Medium Speed
Adapter Wheel	"	"	1.54 1.60	876 490	386	Min. Speed
Adapter Wheel	Dirt	Level	7.63 7.30	1226 910	316	Max. Speed
Adapter Wheel	"	"	4.06 3.99	1015 680	335	Medium Speed
Adapter Wheel	"	"	1.56 1.55	1290 810	480	Min. Speed
Adapter Wheel	Across Country	5% "	6.80 7.00	1530 1950	-420	Max. Speed
Adapter Wheel	"	"	3.93 3.90	1200 1110	90	Med. Speed
Adapter. Wheel	"	"	1.61 1.58	1380 1110	270	Min. Speed
Adapter	Macadam	17% "	3.57 3.50	3780 2340	1440	— —

It is to be noted that with one exception the draw bar pull of the adapter mount is much greater than that of the wheel mount. The caterpillar bands were not used on the wheel mount during the "Across Country" determination.

(j) The following is a comparison of the weights of the Adapter Mount with that of the wheel mount as determined at Aberdeen Proving Ground:

Weight of 155 mm. Adapter Mount without limber . . 29,730 lbs.
 Weight of 155 mm. Wheel Mount without limber . . . 23,890 lbs.
 Difference in weight. 5,840 lbs.

(k) That the slight advantage to be gained by the use of the caterpillar adapter, in a few cases, does not warrant the increased draw bar pull due to the frictional resistance of a caterpillar track and the addition of nearly three tons of weight concentrated on the gun axle, as shown in (i) and (j), above. The added weight of 3 tons together with the racking effect of a caterpillar tread will necessitate much stronger bridges than those necessary for the wheel mount. In addition the difficulty of steering the adapter mount and the twisting effects of the tracks changing directions suddenly will tend to weaken a bridge.

(l) That the wheel mount, with caterpillar bands, and the adapter mount are both capable of negotiating any terrain with equal facility over which the 10-ton Artillery Tractor is capable of drawing them.

(m) That the adapter mount is as stable as the wheel mount during firing and that the adapter threads form a satisfactory substitute for the platform of the wheel mount.

(n) That the advantages of the adapter mount are not of sufficient advantage to warrant converting any 155 mm. Gun Material now on hand into that type in case of war.

The following comparative summary shows the advantages and disadvantages of the 155 mm. Adapter Mount over the Wheel Mount:

<i>Advantages Over Wheel Mount</i>	<i>Disadvantages Over Wheel Mount</i>	<i>Remarks</i>
1. No firing platform necessary.	1. The greatly increased drawbar pull due to the frictional resistance of a caterpillar track.	This would mean greater gasoline and oil consumption and greater wear and tear on the tractor.
2. Cantilevering ability of treads when crossing deep narrow ditches or trenches.	2. The additional load of nearly three tons on the gun axle.	
3. The distribution of the load on the gun axle over a much larger area by the caterpillar tracks.	3. The larger turning radius.	The minimum turning radius of the Adapter mount was 35' and that of the Wheel Mount 27'.

<i>Advantages Over Wheel Mount</i>	<i>Disadvantages Over Wheel Mount</i>	<i>Remarks</i>
	4. The difficulty of position maneuvering.	The jack beam could not be used. The treads must be opened and closed by tractor power. Pivot pin must be withdrawn and spring shackles replaced before mount can be turned about on its vertical axis. No hand maneuvering possible.
	5. The racking effect on bridges.	
	6. The excessive vibration when traveling on concrete roads.	The vibration was so great that the brakeman could not comfortably stand on the brakeman's platform during travel on concrete roads.
	7. The decreasing of the strategical mobility of the G.P.F.	The Wheel Mount was designed to be drawn by trucks over good hard roads and is capable of maintaining a speed of 20 m.p.h., under these conditions.
	8. The greater difficulty of maintenance.	The addition to the wheel mount of the many moving parts of the adapter assembly will necessitate carrying many more spare parts and will result in more replacements and repairs.
	9. The difficulty of placing the adapter mount exactly over a selected spot.	During the test the adapter mount could not be placed nearer than 2' to the stake marking its position. This would result in appreciable error in the computed deflection if an aiming point near the battery position was used.
	10. The difficulty of constructing a holdfast strong enough to withstand the pull of the adapter mount during position maneuvering with block and tackle.	It was necessary to use large trees for holdfasts during the tests. Constructed holdfasts would not hold.

*Advantages
Wheel Mount*

*Disadvantages
Wheel Mount*

Remarks

- | | |
|--|--|
| <ol style="list-style-type: none"> 11. The tearing up of a large area around the mount during the placing of the mount in position. 12. The difficulty of loosening, opening, closing, and tightening the caterpillar treads. 13. The greater fatigue of the gun crew during position maneuvering. 14. The necessity for carrying caterpillar bands for the limber wheels. | <p>An area 60 feet wide and 36 feet deep was torn up around the adapter as compared with an area 24 feet wide and 20 feet deep around the wheel mount.</p> |
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IS YOUR
EMPLACEMENT BOOK
UP TO DATE?

Errors of Range and Azimuth Prediction Boards

By Major John S. Pratt, C. A. C.



IN the operation of range and azimuth prediction boards, it is assumed that the *rate* of range and azimuth change during the predicting interval plus the time of flight is the same as that during the last observing interval (30 seconds). In all cases except two, this assumption leads to the introduction of errors in determining the range and azimuth of the set-forward point. The excepted cases are when the target is moving on a course directly towards or away from the battery, or when it is moving on the arc of a circle with the battery as the center.

A series of computations has been made for straight courses to determine errors inherent in range and azimuth prediction boards at various ranges and inclinations of the track of the target to the battery-target line. The ranges selected were 5000, 10,000 and 13,500 yards for mortars, and 5000, 10,000, 15,000, 20,000 and 25,000 yards for guns, with inclinations at each range of 90°, 45° and 25°. A speed of 20 miles (terrestrial miles) per hour and a predicting interval of 1 minute were assumed. The computations were made for the 12-inch steel mortar, Model 1908 (aliquot part charges), and the 12-inch gun, Model 1895, mounted on barbette carriage, Model 1917, using range table times of flight.

The following tables indicate the computed errors for the selected ranges and inclinations:

12-Inch Mortar

Range		5000	10000	13500
Range Errors, yards	90°	- 130	- 90	- 77
	45°	- 58	- 35	- 32
	25°	- 17	- 11	- 8
Azimuth Errors	90°	+0°.30	+0°.07	+0°.02
	45°	+1°.47	+0°.46	+0°.18
	25°	+1°.01	+0°.33	+0°.20

12-Inch Gun

Range		5000	10000	15000	20000	25000
Range Errors	90°	-65	-38	-33	-33	-34
	45°	-26	-17	-16	-13	-12
	25°	- 8	- 5	- 7	- 7	- 3
Azimuth Errors	90°	+0°.13	+0°.02	+0°.01	+0°.00	+0°.01
	45°	+0°.68	+0°.23	+0°.13	+0°.10	+0°.09
	25°	+0°.49	+0°.17	+0°.09	+0°.07	+0°.06

The following factors tend to increase the range and azimuth error:

- (1) An increase in the speed of the target.
- (2) An increase in the predicting interval.
- (3) An increase in the time of flight.

It will be noted that all range errors are negative in sign (short of the target), and all azimuths errors positive in sign (ahead of the target).

These data are presented to invite attention to errors inherent in range and azimuth prediction boards under service conditions of speed of target.

WHAT ARE YOU GOING TO DO ABOUT IT?

Army Training in Relation to National Conduct and Citizenship

*By Major Forrest E. Williford, C. A. C., P. M. S. and T.,
Virginia Polytechnic Inst.*



N extensive war, such as the World War just experienced, involves much more than the military forces themselves. It involves, in the extreme, the maximum effort of the nation. Doctrines of War, therefore, should cover not only doctrines which guide the military forces but also doctrines to be followed by the nation as such in order to have effective well-supplied military forces. Nor is this all. Political and economic activities lead to war and result from war.

Considering the immense losses and burdens resulting from war the national policies (or doctrines) which we are to insist upon, even at the cost of war, must indeed be sound and of high order. The coming or the avoidance of war is so closely associated with the national policies (Doctrine for the Conduct of International Relations), and the ultimate effects of the war are so closely associated not only with the outcome of the war, but also with internal policies (Doctrine for the Conduct of Internal Relations) that war cannot be considered apart from the nation at war. Therefore, a "Doctrine of War" which is less than a "Doctrine of the nation" is but a part of what the Army and Navy should consider if they are to serve the best interests of the nation.

If it was important that the Pennsylvania Railroad have a well-developed doctrine before it allotted an immense sum for the construction of its terminal in New York City how much more important is it for a nation of 110,000,000 people (perhaps 140,000,000 in 1950) to adopt a sound far-reaching doctrine for the conduct of its affairs. It is upon the soundness of these doctrines that our periodic avoidance of war depends. In the soundness of these doctrines and in the degree to which they are known and followed by our public men lie our prospects for the continued realization of those benefits enumerated in the Preamble to the Constitution.

Men of broad vision will assure others that we have high national ideals but they will not agree as to our "Doctrines of the Nation," and the average citizen has scarcely begun to crystalize these doctrines in his mind.

Who shall formulate these international and national policies or

doctrines and who shall formulate the more limited doctrines of war proper—manifestly, a group of men foremost in diplomacy, history, finance, economics, government, legislation, psychology of the American, doctrines of war, and methods of combat. No labor now open to these eminent men is capable of greater or more lasting benefits than would accrue from the writing of a sound "Doctrine of the Nation."

Dissemination of the "Doctrine of the Nation," once it is written, will be a slow and difficult process. It cannot be given to our public as the doctrine of the nation but must be infiltrated by parts, gradually dispelling incorrect ideas of government and citizenship now so prevalent.

The daily press is widely read and would be an excellent vehicle for this dissemination save for its diseased condition and the lack of freedom of the editorial staffs which control it.

Our numerous excellent educational institutions are potent vehicles which may well be widely used for this dissemination. The reaction on the public from this source will be the main reliance ultimately,¹ and of great value even in the near future, but it will not immediately reach that class with which the army is most concerned. Because of this, and wholly aside from the efficacy with which it may be done, the army must inculcate these proper doctrines in the minds of all who come under its wing for training. Hence it is that Army teachings should cover points of doctrine normally considered wholly outside the province of war training.

It may be well to go behind the training idea and ask "What is the rôle of the Army?" The bulk of answers will undoubtedly be "To win wars," and that is true once the war becomes imminent or once it has begun. A better answer is "To protect the Government and its citizens."

Congress has often been told that national insurance resulting from a strong well-trained army is well worth its expense, and the statement can not be successfully disputed. If the quality and strength of the army could result in enforcing our national will upon our possible adversary without resorting to war our performance would have maximum merit.

The training, then, must contribute to this peace power as well as to war power, first by having the proper doctrines firmly inculcated in the minds of the last-enlisted man to add moral quality to the army itself, and second by inculcating these same doctrines in the minds of civilians who come into contact with individuals of the army to insure reasonable National demands and to insure against unjust and unnecessary wars.

This contribution by the Army to the training of the national mind will thus fill a real need and can be made not only without detriment to its training "To win wars" but in furtherance of it, and doctrines taught should be selected accordingly.

Observation of past national conduct suggests the following as points of national doctrine which have guided us:—

NATIONAL DOCTRINE

<i>Open Door.</i>	All nations are equally privileged.
<i>Freedom of the Seas.</i>	The high seas belong to no nation and are equally free for the use of all nations.
<i>Monroe Doctrine.</i>	As indirect protection for itself it is the duty of the United States to protect weaker nations on the American Continents.
<i>No Entangling Alliances.</i>	The United States does not seek active participation in European or Asiatic affairs.
<i>Territory.</i>	The United States does not seek to enlarge its territory.
<i>Peace.</i>	International differences should be reconciled by diplomatic understanding. Failing this understanding unlimited war is a duty of Government.
<i>Equality.</i>	Birth, degree of economic independence, occupation, race, or education do not constitute class or establish privilege.

These points are always matters of political discussion and issue, hence the Army cannot instruct the public in them. The very fact that they are vehicles of political expediency, always subject to change with the entry of a new political party, emphasizes the need for the formulation of a sound national doctrine to be uninterruptedly continued.

While the Army dare not (nor does it wish so to do) instruct in political issues it can, as stated above, most efficaciously instruct in "citizenship."

The following are a few salient points to be taught to those citizens who are officers and soldiers. There are undoubtedly other similar points of equal merit which may be added.

CITIZEN'S DOCTRINE

<i>The Constitution</i>	of the United States is its basic law.
<i>Offense</i>	against the laws of Government is offense against citizens of the Government.
<i>An Oath</i>	to the Government is an oath to each and every fellow citizen.
<i>The United States Flag</i>	is symbolic of Government and Constitution. To reverence and protect it is to keep faith, in its highest form, with all fellow-citizens.
<i>Citizenship</i>	is membership in the Government.
<i>The Dead of a War</i>	have died for living citizens.
<i>The Wounded of a War</i>	have suffered in the stead of the non-wounded fellow-citizens and merit the moral and economic assistance of the latter.

The above is written to advance the belief that the Army has a distinct peace rôle as well as a definite war rôle, the belief that high grade citizenship, engendered from within by education of the individual, is the basis of continued prosperous government, the belief that the high officer personnel of the army specially fits it to *impart and impress* a high grade of citizenship, and the belief that the Army will be derelict in its duty if it confines its instruction purely to that necessary "To win wars."

Professional Note.—3-INCH ANTI-AIRCRAFT MATERIEL—TRAILER MOUNT

From Army Ordnance, September-October, 1922.

This mount was designed in the Ordnance Office and manufactured at Rock Island Arsenal where it was given a preliminary proof firing test. It was later shipped to Aberdeen Proving Ground for final proof firing and road test.

The object of the test at Aberdeen as completed to date was to establish the powder charge, proof and adjustment of the recoil mechanism, proof and adjustment of the mount to withstand the firing stress, behavior of the matériel when transported, adjustment in service and determination of wear in service.

The powder charge has been established. The recoil mechanism, which is of the hydro-pneumatic type, works smoothly through all angles of elevation. The elevating mechanism, which is assisted by the spring equilibrator, works with entire satisfaction. The traversing and traversing deflection mechanism works satisfactorily and there have been no broken or deformed parts due to the firing or road test.

The outrigger floats have sufficient area to support the mount, which has been fired on turf both wet and dry and on sand and clay mixture.

Two hundred rounds have been fired and the trailer with mount assembled has traveled 550 miles on the road test at an average rate of 11 miles per hour.

The report shows that the mount was stable at all angles of elevation and traverse and that, starting with the mount in traveling position, five and one-half minutes are required to get into firing position. This includes setting the outriggers and platforms, lifting the trailer so that the weight of the mount is entirely off the springs, leveling the mount and removing the traveling lock from the gun.

French Artillery Doctrine

*A Report dated September 12, 1922, furnished through the courtesy
of the Military Intelligence Division, General Staff*



AMERICAN artillery officers will recall the handbook entitled "Artillery Firing" published in March 1918 by the headquarters of the A.E.F. as a translation from the French edition of November 1917. For many months an artillery commission has been engaged on the revision of this document which forms the basis of artillery instruction in the French Army. The finally approved "General Instructions on Artillery Firing" dated March 20, 1922, has just been published and represents a valuable contribution to artillery literature.

The introduction to this book is of particular interest as it lays down the fundamental principles of French Artillery doctrine. Its translation follows:

I.

"The doctrine of artillery fire is the same for all units of the arm. Its fundamental principles are the following:

A. *The weapon of the artillery is the projectile.*

The power of a deployed artillery is not only measured by the number, the caliber, the rapidity of fire of the matériel in line. It depends especially on the ammunition supply available with the guns and the conditions in which this supply can be renewed.

B. By means of its projectiles *the artillery seeks to destroy*, and by destruction is meant a *sudden, complete and brutal* destruction. When circumstances do not allow the artillery to undertake destruction, its use is to embarrass the enemy in accomplishing his missions. It tries to paralyze him, at least momentarily, by threatening his destruction. The action corresponding to this latter situation is generally called "neutralization."

C. *To be effective artillery fire must be regulated.*

Artillery fire is regulated by *preparation* and by *adjustment*. By "preparation" the artilleryman tries to eliminate errors *a priori*; by "adjustment" the artilleryman verifies the errors and corrects them by successive approximations. Preparation and adjustment complete each other. As a general rule firing is prepared as if it was not to be adjusted, and it is adjusted as if it had not been prepared. But occasionally firing must take place without preparation; occasionally firing must

take place without adjustment; occasionally a superficial preparation and incomplete adjustment must suffice.

D. *In order to be effective artillery fire must be opened at the right moment.*

E. *In order to be effective artillery fire must utilize the right projectiles, the right fuses and the right powder charges, depending on the nature and the situation of the target.*

F. *To be effective artillery fire must be dense.* The artilleryman brackets the target with a sheaf of trajectories more or less dense according to the nature of the target and the effect desired. The possibility of hitting with a single shot, as a matter of fact, is practically zero, and is small in case of firing comparatively few shots. Even when adjusted, firing remains the slave of dispersion.

G. *In order to be effective artillery fire must be carried out rapidly.* From the point of view of morale, the losses which fire inflicts on the enemy are more effective when they surprise him and when they are produced in a short period of time. Moreover, the time may allow a moving target to withdraw from the material effects of the projectile, either by sheltering itself or by taking up another position.

Any slowness in carrying out fire decreases the value of means of observation. Time changes certain firing conditions and makes the center of impact capricious. Time is adverse to fire adjustment.

The artilleryman consequently will economize time as much as is compatible with proper service and the care and upkeep of his guns.

H. *Since artillery fire must be both dense and rapid, the best chances of effective fire are obtained if a large number of guns participate in the firing.*

Instead of attacking simultaneously several targets with several batteries, it is better, from the point of view of efficiency and if other considerations do not intervene, to concentrate the fire of all the batteries successively on the various targets.

Concentration of artillery firing is consequently sought for as a general rule. The commanding officer who organizes it takes into consideration the aptitude of changing target by the guns which he controls. He regulates the quantity of ammunition to be fired according to the result desired, independent of the number of guns put into play. Concentration, which is one way of economizing time, must not lead to a waste of ammunition.

I. *Observation renders the most valuable services to the artillery.*

The observation service is always on guard and is a source of information.

Observation permits the adjustment and control of fire. In this way it completes or corrects the preparation of fire. The artilleryman never makes too great an effort to observe, but he does not always succeed. As a matter of fact:

Terrestrial observation stations are occasionally difficult to find, to join up with the batteries, and they may be entirely lacking.

Aerial observation is not assured under all circumstances.

Observation, difficult at night, becomes impracticable in foggy weather or during an intense artillery action.

In such a case the consumption of ammunition increases; the efficiency of the artillery becomes more a question of chance. Deprived of observation, firing is impaired. As a general rule it is not prevented. Except in exceptional cases observation is not indispensable to artillery firing, and the lack of observation does not justify the inactivity of this arm.

II.

In its most general form firing includes the following operations:

During preparation. By means of instruments and topographic processes the artilleryman determines the relative position of the target and the battery.

From this he deduces, in consulting the firing tables, first of all the elements of the normal trajectory, i.e., the trajectory of the battery to the target under the basic condition of the tables. Then the corrections for the conditions of the moment are applied in so far as the basic elements are effected.

He makes these corrections and in this way obtains the initial firing data (more or less approximate) to open fire.

During the adjustment of fire. The artilleryman tries out these elements:

He improves them by displacing his fire according to the errors which observation reveals to him; in this way he obtains a bracket on the target.

He immediately carries out fire for effect apportionate to the target engaged.

The problem of fire becomes complicated on the battlefield.

It frequently happens that the artilleryman is poorly supplied, his instruments are poor, he is badly oriented, his information concerning the target or concerning the position of the battery, or concerning the multiple influences which affect trajectory is poor.

Often the conditions in which he operates are little favorable to the accuracy of his measurements and calculations.

Finally an obligation is imposed on the artilleryman:

He must conform either to the orders of his commanding officer or, in case such orders are lacking, to the intentions which this officer has manifested or to the exigencies of the situation. The artilleryman is generally not master of his time.

As a result it may happen that he is forced to open fire without making measurements and without calculations, to fire for effect before

being certain that he has bracketed the target. On other occasions no adjustment is possible. He commences at once fire for effect in order to obtain the surprise desired by headquarters.

In order to obtain in such varied situations the highest efficiency from his ammunition, the artilleryman must have a profound knowledge of the various methods of fire and the way they should be used.

In studying profoundly a great number of particular cases he will have acquired the notion of the sense and the amount of the various corrections of which circumstances do not always permit the exact calculations. Prepared in this way, he will be in a position to improve the results of simplified operations without loss of time. He will moreover be guaranteed against serious errors in calculations, errors to which complete operations are always exposed.

Finally, the artilleryman must be able to estimate a situation, to adapt to the conditions and circumstances of the moment the methods of preparation, of observation, and of execution of fire which are furnished by the present instructions on artillery firing. A sure judgment is the first quality of the artilleryman. This judgment is formed not only by the study of text books but better still on the ground under the direction of the commanding officer and the instructor.

III.

For the reasons indicated above the general instructions on artillery firing could not have the character of an imperative regulation. It sets forth processes, justifies them, shows their advantages and disadvantages, defines their conditions of use. It seeks to treat each question in such a way as to make it easily understood. It is this latter consideration which has regulated the development given to the various methods and not their chances, more or less good, of being used, chances, moreover, which it would be imprudent to define.

The general instruction on artillery firing is no other than the instructions of August 26, 1920, made over. In this new edition the majority of the observations and desires formulated during the period of examination of the earlier text have been taken into consideration. The general instructions on artillery firing include seven sections and a supplement. The seven sections are for the use of all artillery officers. They treat:

Section 1—Ballistics and dispersion.

Section 2—The effects of projectiles and their conditions of use.

Section 3—The preparation of fire.

Section 4—The rules of fire.

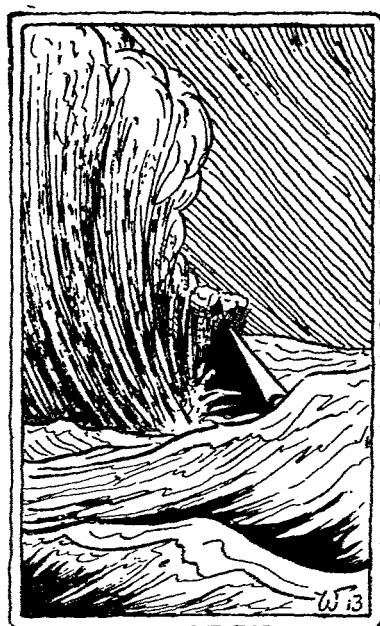
Section 5—Observation.

Section 6—High burst ranging.

Section 7—The conduct of fire.

The supplement consists of 14 annexes in which are set forth demonstrations, presented as far as possible in a simple way, explanations and supplementary information and methods that are not frequently used.

The general instruction on artillery firing treats neither questions of topography nor firing with the use of an aerial observation which represent special information to be inserted in the artillery drill regulations."



Gallipoli in 1914

*Reprinted from the Journal of the United Service Institution of
India, October, 1921*



IF anyone at the outbreak of the Great War had described the Gallipoli peninsula as the key of the whole enemy position he would probably have been accused of putting the wrong end of the telescope to his eye. Indeed, many people would have been startled by such a statement, but perhaps the only startling thing about it is that the pre-eminent importance of this peninsula was not more generally realized.

The allied navies were naturally anxious to try and force the Dardanelles by themselves, but though they were confident of success the Imperial General Staff considered that a purely naval attack would be a risky business. The opinion now most generally held is that even if the allied navies had made the attempt in November, 1914, they would not have succeeded singlehanded, and that by postponing it until the following February they made failure a certainty.

The essential preliminary to the forcing of the Dardanelles was the occupation of the Gallipoli peninsula with troops; in other words, it should have been made a military operation, to be carried out with the assistance of the fleets. But owing to the pressing need of troops on the western front, the Cabinet decided to make it a naval operation without involving the army at all. The writer contends that if the various expeditionary forces, which were sent from India in 1914 to different theatres, had been amalgamated and organized as four complete divisions, and then flung on to the western shores of the Gallipoli peninsula at the earliest possible moment after the wanton Turco-German attack on Odessa on the 29th October, 1914, the Great War would have been over in the spring of 1915.

This may appear to be a sweeping statement, but an attempt will be made to show that, at all events, it is not inconsistent with facts.

Now in order to make what follows as clear as possible, it will be necessary to show the dispositions of the Turkish forces when Turkey came into the war. The subjoined table, which was prepared at the Ministry of War, Constantinople, will do this:

European Turkey.....	7 Divisions.
Western Asia Minor.....	9 “
Eastern Asia Minor.....	9 “

Syria and Palestine.....	5 Divisions.
Hejaz, Yemen, and Asir... 4	"
Mesopotamia..... 4	"

—
Total.....38 Divisions.

There were also five divisions in the early stages of formation. It will therefore be observed that, when Turkey entered the lists, *three-quarters of the entire army was in Asia*. In the Gallipoli peninsula itself there was only a portion of *one* division, the 9th, whose headquarters were at Chanak. The landing places, which by the following April had been converted into veritable death-traps, were in November entirely undefended and unoccupied. If therefore the amalgamated Indian expeditionary forces had been sent to the Gallipoli peninsula in November, 1914, it is highly probable that they could have landed without a single shot being fired. If there had been any opposition at all it could only have been very slight and could not possibly have saved Sari Bair, the Kilid Bahr plateau, and Achi Baba from immediate capture. With these three key positions in our hands, the Dardanelles forts, which are entirely commanded by them, would have been obliged to surrender, whereupon the allied fleets could have passed up the straits at once.

The only Turkish troops which could have been used to oppose our first advance were those actually in the peninsula at the time, namely the bulk of one division. As regards Turkish reinforcements, practically only those troops who were already on the European side would have been available against us because the command of the Sea of Marmora would have passed into the hands of the allied fleets before arrangements could have been made to transport regiments across from any large garrison centre, with the possible exception of Panderma. Moreover, our troops at Anzac or Suvla were very much closer to the Bulair lines than any one of the Turkish divisions, as will be seen from the following table which shows the dispositions of the Turkish army in Europe on the 1st November, 1914:

<i>Division</i>	<i>Station</i>
1st	Constantinople.
2nd	Hademkeui.
3rd	Constantinople.
4th	Adrianople.
5th	Adrianople.
6th	Kirk Kilisse.
7th	Rodosto.

About this time there were six Turkish divisions in transit as follows: two divisions were *en route* to Panderma from Denizli and Konia; two to the Black Sea littoral; and two to Constantinople from Kaiseriya and Adana. Even assuming that a regiment or two could have been got

across from Panderma in time, and that some of the troops in transit could have been diverted to Constantinople, it is difficult to see how more than eleven Turkish divisions could have been concentrated in Europe before the Turks lost command of the Sea of Marmora.

It must not be forgotten that at this time the Turks were very anxious about the attitude of Bulgaria and that they were obliged to keep a considerable force to watch that frontier. This alone immobilized four or five divisions, whilst at least one other was required for garrison duties in and round Constantinople. The maximum striking force immediately available against the peninsula would therefore have been six divisions.

It is contended that, with the allied fleets both in the Sea of Marmora and the Gulf of Saros, the Bulair lines could have been easily held against the Turks. These lines are in fact only tenable by forces having command of the sea, and it is merely necessary to glance at the map to realise what a hopeless task it would have been for the Turks to have attacked them, with our ships strung out along both shores of the narrow isthmus, and taking the Turkish line of advance in both flanks at close ranges for several miles.

With the command of the Sea of Marmora in our hands the Turkish army would have been cut in two, and all their divisions on the Caucasus, Egyptian, and Mesopotamian fronts would have been in the air, with no line of supply. Moreover, a line of communication with Russia would have been opened up, which alone might have turned the scales of war.

There is evidence that Germany and Austria began to think about peace as early as January, 1915. With Turkey down and out in the first round, how long would they have dared to carry on the conflict alone?





EDITORIAL

The Message of the Christmas Seal

 CHRISTMAS Seals have come to be as closely associated with that holiday season of the year as Santa Claus, mistletoe and plum pudding. Packages that are wrapped with holly and red ribbon do not seem complete now without the little Christmas stickers. And why? Because every Health Seal that appears on letters, cards or bundles shows that its purchaser has given a helpful thought to somebody less fortunate. And Christmas is the season when everybody *feels* the spirit of doing for others.

The tiny seals are sold in order that everybody who buys may become a working partner in the great campaign to stamp out tuberculosis. Such a stupendous amount of good has been brought about through these yearly sales that every seal bears a message of vast accomplishment and undaunted courage. Each seal tells the story of a woman and her followers who had sufficient faith in their convictions to carry on a nation-wide crusade against the disease, tuberculosis. That their work has been successful cannot be doubted when it is realized that in these years of selling seals the death rate in this country has been cut in half. The message of such a seemingly impossible feat is surely worth while spreading.

Fifteen years ago, a woman with a vision, Miss Emily P. Bissell, of Wilmington, Delaware, conceived the idea of raising funds to help in the anti-tuberculosis work of her state. She had read in the Outlook magazine an article by Jacob Riis on the Christmas stamp sold in Denmark for the support of a children's hospital.

At the time Miss Bissell was secretary of the Delaware Red Cross Chapter. With but \$40.00 secured from two friends, as her capital, she obtained the official consent of her chapter and of the post office authorities to put a few thousand seals into circulation. Stores, newspapers and women's clubs all supported her with great enthusiasm from the first. Through such generous and united effort, three hundred thousand, to her a number beyond all her dreams, were sold that first

year and \$1,000 was paid on the site of the first tuberculosis Sanatorium in Delaware, known as Hope Farm.

From the beginning, all those interested in the movement realized that their task should be to spread a knowledge of the disease, to teach the public that it might be prevented and thereby decrease its enormous death toll. From the very start then, the campaign to fight tuberculosis has been an educational Campaign.

As a result of Miss Bissell's demonstration and earnest pleading, the American Red Cross decided to take up the enterprise on a nationwide scale the next year, 1908. The parent organization was handicapped by lack of funds and again Miss Bissell found the necessary



backers who shared her faith. She personally undertook the task of writing to 4,000 newspaper editors throughout the country, asking them to publish the fact that orders for seals should be sent to national headquarters. The result was a veritable flood of orders.

The seal design varies from year to year. The first year was a simple holly wreath surrounding a red cross with the greeting "Merry Christmas," done in red on a white background. The 1919 seal was the first to carry the Double-Barred Cross, which specifically symbolized the fight against tuberculosis and is the emblem of the National Tuberculosis Association and its 1200 state and local agencies.

This year's seal with the mother and child, is symbolic of the helpful guardianship of this cross over the children of our country. Mr. T. M. Cleland, artist of the Seal, says "To me the design means the sentiment and impressions of the protective function of the Tuberculosis Crusade. The protective love of the mother and the cross are symbols indicative of this general impression."

To attempt to account for the great accomplishment that have been realized through Miss Bissell's initiative would be impossible. The

tuberculosis death rate sixteen years ago was 200 per 100,000 in the Registration Area, and it is now but 100 per 100,000. This means the saving of 100,000 lives annually. From the economic standpoint, this means the saving of \$10,000,000 a year to the nation.

There are briefly summarized eight elements in the campaign to which Christmas Seal Sale money has been and is applied. These are (1) for increasing the number of hospitals and sanatoria for the treatment of tuberculosis from 100 (16 years ago) to nearly 700 with approximately 60,000 beds; (2) for establishing over 550 clinics and dispensaries; (3) in securing at least 3500 special tuberculosis nurses who instruct in the home, mothers, and their families; (4) toward research work; (5) for statistical study; (6) for publicity in distributing during the past 16 years approximately 1,000,000 pieces of printed matter; (7) for the Modern Health Crusade which has enrolled nearly 8,000,000 school children who are learning daily health habits; (8) toward securing over 3000 open-air schools and preventoria.

Over \$20,000,000 has been raised from the Christmas Seal, to spread information regarding tuberculosis and the most effective ways to combat the disease. Sanatoria and other institutions have been built, and today there are about 60,000 beds for tuberculosis patients. Estimating the original cost of a bed at \$1500 these sanatoria are worth 90 million dollars.

Yet there are at the present time over one million active cases of tuberculosis in this country. It is estimated, moreover that there are that number of inactive cases. And yet, tuberculosis is a preventable disease. If everybody can be taught to lead healthy lives through plenty of rest, fresh air, nourishing food and through watchfulness over the physical condition by having periodic physical examinations there can be a still greater decrease.

Over one billion Christmas Seals will be in circulation this year in December. A chance is given everybody then to help carry on the work of Miss Bissell and share in making the dream of tuberculosis workers come true. Their efforts will not cease until they have conquered completely this unnecessary disease. Buy Tuberculosis Seals in December. Let all your packages and letters show the spirit of joyous helpfulness and carry the message of hope and health that is hidden in every Christmas Seal.



Making the best of Things

The readers of the JOURNAL may have observed during the last few months that the larger portion of the editorial comment in the JOURNAL has been directed toward the human problems of the Coast Artillery rather than to its technical and tactical problems. This emphasis has

been laid, not with any failure to recognize the tremendous field for technical progress which challenges the fullest Coast Artillery effort, but because it is believed that in the troublous months of uncertainty through which the Army has been passing, our human problems for the time being transcend in importance all others. For the accomplishment of any really worthwhile technical progress, a sound, philosophical foundation of courage, confidence and enthusiasm is necessary. Unfortunately there have been too many untoward circumstances which have tended to undermine this foundation. Hence the emphasis on those factors which it is believed are essential to buttress the foundation.

In spite of all obstacles we still have a basis for courage, confidence and enthusiasm. Unfortunately, this basis rests in a necessary modification of the point of view which some of us have been accustomed to hold. Perhaps the sanest presentation of this point of view has been given by the Honorable Frank L. Greene, Representative in Congress from Vermont and a member of the House Military Committee. Mr. Greene has always been a sympathetic friend of the Army and an informed student of military affairs. To illustrate Mr. Greene's acquaintance and interest in military affairs, a bit of personal reminiscence will be hazarded. The writer remembers an occasion fourteen years ago when Mr. Greene visited for some days the Norwich University Corps of Cadets, while on its annual practice march. He lived in Camp with the Commandant, and took an active interest in the training program and camp routine, while in the evening he sat before an open fire with the Commandant and some of the Cadet officers, telling inimitable stories until far into the night. Mr. Greene's advice to the Army is extracted in full from an address delivered by Rear Admiral Sims, U. S. N., published in the September, 1922, issue of the U. S. Naval Institute Proceedings, and could well be printed in large type and posted on the Bulletin Board of every Coast Artillery organization.

"As a matter of practice I do not like to anticipate congressional action by any attempts at prophecy in public or by any anticipatory criticism of anything of the kind. However, I am not at all averse to expressing my judgment as to what it might well become the army to do under the circumstances, and inasmuch as I do not need to assure you of my warm friendly concern in the army's welfare, I do not hesitate to venture a few suggestions.

"In the first place, when all is said and done, this country may count itself lucky that it has not shared more deeply in the general popular reaction that has all over the world followed the Great War. We are lucky indeed that the "let-down" of tense nerves and strained minds and wearied flesh has not precipitated us into troubles even more serious than those we now experience.

"Whatever may be the psychological aspects of the business, whatever may be the true situation with regard to this, that or the other phase of it, we are quite certain of one prominent fact and there is no possible escape from it—and that is that the government as well as the people must economize for several years to come, and economize in something more than a perfunctory fashion, too. No matter how we turn or with what argument, to face this or that condition or to

question the responsibility for this or that condition, this one sober fact stares us in the face at every move—we must economize.

"Now, of course it is always true that economy should be observed with good sense and discretion and that there is such a thing as overdoing it and ruining the very agency that one might otherwise hope to save. It is true that misdirected economy is often destructive or at least weakening of agencies and institutions and should be preserved in life and activity.

"I can understand with very sympathetic interest how the War Department and the army literally shiver at the prospect of having to undergo such radical and drastic treatment at the hands of congressional economists that the very heart and hope are cut out of the plans for the national defense and of the training of soldiers and citizens for the national defense that are the result of years of study and the hard-bought lessons of experience on the battlefield. I know it is discouraging.

"Of course there is a jar to the high-tensioned, high-purposed professional mind in all this. There is a dread of ruthless assault upon ideals, practical ideals, and much of that kind that is something more than merely discouraging to professional ambition.

"There is also, and this is more important, the deep sense of injury to a very vital governmental policy, a policy that has been learned through nearly a century and a half of cruel and bitter experience in wars. The army naturally feels that it is a custodian of that experience and should be held in confidence and trust as a great instrument that is to conserve that experience, profit by its teachings, and be responsible to the people at any time for the state of preparation for defense of the nation in any crisis.

"But I would say to the army at this time that it can only be held responsible for that degree of preparation for national defense that the congressional policy and appropriations will permit.

"After we have each in our several spheres made the best argument we can why economy should not go beyond a certain point, we must all prepare ourselves in whatever agency of the government we may be situated, for a period of enforced and rather drastic economy, after all. There is no use trying to reason out of it or to give any excuse why one should not be included in it. It is a condition and not a theory, in all the significance of that much used phrase. Economy is going to be applied to every agency and institution of this government. Perhaps in many respects Congress may be persuaded to make all those economies reasonable. But in any event, those agencies and institutions that accept that policy with a smile and make the best of the circumstances are most likely to emerge at the end of that period with something like that degree of popular and congressional confidence that may make their path smoother thereafter.

"That is about all I have in mind to say just now. I think the army will be very, very wise if it takes its medicine with a grin, buckles down to work, makes the best it can of a hard situation, summons all the philosophy of Mark Tapley to its aid, breathes cheerfulness and hope and loyalty and good faith constantly in all its relations with the government and the people, tightens up its belt, and works hopefully for the dawn of a brighter day.

"There is bound to be a reaction following this wave of economy. There is bound to come a time when harsh and drastic measures of economy must cease or they will become destructive, and there is bound to come a time when the people themselves, no longer over-influenced by those who are trying for unreasonable economies, will come into the realization of their own power and the necessity for its use and simply put the radical and unreasonable economists out of business.

"This country is going to have an army and it is going to be along the general

lines laid down in the amended National Defense Act of June 4, 1920, and the public is going to support that idea when the public more thoroughly understands it, and, may I say, when the public gets more and more closely and familiarly in touch and understanding of its own army and its own army people.

"For my part, I think it would be a wise thing if the army went quietly about its business for the next few years, sought every proper means of showing its own inherent worth, both to government and the people, cleaned its house wherever necessary, both in personnel and in customs, and then found itself ready to take advantage of the turn of the tide. And the tide will surely turn."



The Non-commissioned Officer and National Defense

A recent editorial in a Washington newspaper took occasion to slander non-commissioned officers by the implication that "those fellows who wear chevrons" are products of a system which multiplies petty tyrants and task-masters, and implies that the privates of the Army could not only get along without the leadership of non-commissioned officers, but would be better off if all chevrons were stripped off and the wearers were side by side with the privates in the ranks. The aspersions as to the fairness of our non-commissioned officers is as unjustified as the theory that they constitute unwarrantable overhead. As a matter of fact the function of a non-commissioned officer is not only to exercise control and discipline, but to serve as an instructor and as a responsible custodian for government property. Neither good disciplinarians, instructors nor custodians can be obtained and retained without adequate prestige and reward. In the whole scheme of modern life the only field which bids successfully for high talent without adequate compensation is the field of evangelism. Few worthwhile men are going to look forward to a career which does not hold the promise of successive and continual advancement. The grades and ratings by which a man in the military service may climb the ladder of opportunity are not only necessary for the maintenance of discipline, but are of even greater importance in the scheme of National Defense to insure the development of the necessary nucleus of instructors and models for the National Guard, the Reserves, the R. O. T. C., and Civilian Military Training Camps.

Although the number of non-commissioned officers in each grade was not fixed by the National Defense Act of 1920 by specific number, but by a percentage based on the total enlisted strength of the authorized regular Army of 280,000, yet these percentages as fixed in the law were intended to meet the requirements not only for non-commissioned officers with tactical organizations, but also for all the other duties in connection with the carrying out of the other features of military policy.

The subsequent reductions in the enlisted strength of the Army successively to 175,000, 150,000 and now to 125,000 were executed without regard to the important place in the scheme of National Defense reserved for the non-commissioned officer. As things now stand about 1600 of the senior non-commissioned officers of the Army are to be demoted unless some increase is made in authorized numbers. This demotion will so reduce their already meagre incomes that many of the best and most necessary men will be forced out of the service, thus hampering the accomplishment of our mission under the National Defense Act, and what is of equal importance, doing a gross injustice to the men who have given the best years of their lives to the military service of their country, who have already demonstrated their ability and fidelity in the greatest of Wars, many of them as commissioned officers. Consequently, it is most earnestly hoped that the next Congress will heed the request of the Secretary of War to amend the National Defense Act so as to authorize adequate numbers of non-commissioned officers in the higher grades.



The Book Review Section

It is desired to invite especial attention to the effort which has been made to enhance the value of the Book Review Section in this, the holiday edition of the JOURNAL. For the benefit of our readers, the usual number of pages has, for this issue, been increased by sixteen, to provide the opportunity for a more extended notice of the serious books which come within our purview.



COAST ARTILLERY BOARD NOTES

Work of Board for Month of October, 1922

1. Personnel of the Board on November 1, 1922:
Colonel H. J. Hatch, C. A. C., President. (Absent Sick.)
Major W. B. Hardigg, Ordnance Department.
Captain G. W. Morris, Signal Corps.
Captain L. W. Jefferson, C. A. C., Secretary.
1st Lieutenant J. J. Johnson, C. A. C., Computer.

2. Attached:
Lieut.-Colonel H. L. Butler, C. A. C., Acting President.
Major C. C. Jones, C. A. C.
Major J. S. Pratt, C. A. C., Training Regulations.
Major H. F. Spurgin, C. A. C.
Major R. B. Colton, C. A. C.
Major O. L. Spiller, C. A. C., Antiaircraft Projects only.
Major E. C. Kelton, Corps of Engineers.

3. The preparation of and consideration of Training Regulations continued to occupy a large portion of the Board's time during October. The "Battery Command" is very nearly completed. In addition to consideration of this subject, the "Service of the Piece for 12-inch Mortars" has been completed and forwarded. The new drill regulations for both 12-inch mortars and 12-inch guns have actually received test in the mortar and gun batteries at Fort Monroe. Suggestions relative to the preparation of, and material to be incorporated in, these pamphlets, coming from officers throughout the service will be given careful consideration by the Board.

4. New Projects received during October.
Standard Drafting and Duplicating
Engineer Equipment—Project No. 71.

A combined drafting and duplicating equipment weighing 100 lbs. including carrying chest, has been recommended for organizations to take the place of the Engineer Company drafting equipment and hectograph now authorized. The weight of the proposed equipment, including carrying chest is 100 lbs. whereas the weight of the equipment now authorized is about 300 lbs.

The Signal Corps finds that some of the items in the authorized equipment are much too large for ordinary requirements while other items are unnecessary.

The Coast Artillery Board was requested to indicate whether the equipment authorized for Coast Artillery troops was satisfactory, or whether the requirements would be better served by the substitution of a single, compact outfit such as the one proposed.

The Coast Artillery Board finds that the present authorized equipment for Fixed Defenses and for Railway units is satisfactory.

5. Projects previously submitted on which work has been accomplished:

(a) Project No. 11. Test of French Tangent Reticule Instruments for High Burst Ranging.

The program for conducting this test has been drawn up and approved. The actual firing is scheduled to take place during the latter part of November. A report of the results of the test can be anticipated in the next issue of the JOURNAL.

(b) Project No. 16. The Cullen Deflection Computer.

A complete description of this device is contained in the June 1920 issue of the JOURNAL. At Major Cullen's request the computer has been returned to him for further study and modification if necessary.

(c) Project No. 47. Test of Self Contained Range Finders.

During October, observers for all instruments on hand for test were given training and the work of making the final test readings was started. These tests occupied the entire afternoons of three members of the Board until work had to be stopped in the latter part of October to release the enlisted observers for duty with the Joint Coast Artillery-Air Service maneuvers.

(d) A very careful study has been made of the eight different spotting devices before the Board. Enlisted men have been specially trained in the operation of each device and all devices have been given a thorough test during the extensive firing in the Artillery-Air Service exercises. Detailed descriptions of these Boards and their relative merits will be given in a later issue of the JOURNAL.

(e) Project No. 20—Milnor Long Range Plotting Board.

This board has been under consideration for some time. It was designed by Major P. L. Milnor, C. A. C., at Fort Mills, P. I. to plot at extreme ranges without reducing the scale to such an extent as to render accuracy difficult. Briefly the board is an all around fire, 150° , 9 ft. radius board, plotting to 30,000 yards at a scale of 300 yds. equals 1 inch, and is suitable for vertical base or any horizontal base up to 30,000 yds. in length. It is very like a Whistler-Hearn Board except that it has a larger radius and to enable the plotter to work on it the base of the board is cut out. The working table is 40 inches wide and pivots under the gun arm so it can be set at any desired azimuth. The device has apparently several important advantages but after a careful study the Coast Artillery Board is of the opinion that the new target and battery computers now being tested in the Panama Coast Defenses or even a Whistler-Hearn or 110° plotting board with reduced scale would be more satisfactory than the board proposed by Major Milnor. Pending completion of tests of fire control apparatus based on target and battery computers the Coast Artillery Board does not favor the adoption of any of the several other devices designed to solve the problem of plotting and target location for firing at long ranges. Major Milnor's board, however, has some features that commend it highly.

(f) Project No. 38—Comparative test of T. I. Bells.

(1) One large and one small Time Interval Bell of a commercial type were received for comparative test with the present type of time interval bell to determine their suitability as an item of standard equipment replacing the present type of bell. It was especially desired that the test determine all the electrical characteristics of the bells, particularly as to their operation over long lines of high resistance.

(2) The Bells were received and installed in the coast defenses of Chesapeake Bay. They were subjected to a comparative test with present standard types under Service conditions over a period of about four months. The results are as follows:

(a) The fact that the mechanism of both commercial bells is inclosed in a moistureproof case is deemed a decided advantage. However the past record of present types as installed in coast defenses indicate that little or no difficulty

has arisen from moisture interfering with their operation. Especially is this so with the later magnet spools having a moisture-proof insulation.

(b) The mechanical features, especially of the smaller bell, are considered quite satisfactory. A distinction is here drawn between the large and small bells for the reason that the hammer of the former operates against the inner side of the gong which causes considerable difficulty in adjusting the stroke. The smaller bell has the hammer arranged to strike on the outer rim of the gong which is believed to be decidedly better.

(c) The resistance of each bell furnished for test measured 32 ohms, that of the present T. I. Bells (large and small) is 240 and 250 ohms, respectively. The low resistance of the test bells prevented satisfactory operation except on lines of low resistance. In this respect it is desired to invite attention to a special case existing in the coast defenses of Chesapeake Bay where four (4) standard T. I. bells operate satisfactorily on a 30 volt supply over a No. 19 B & S gauge cable pair having a cable length of 9539 feet. The resistance of this line is 162 ohms. An attempt to operate test bells on this circuit proved unsatisfactory.

(d) The adjustment of test bells is more difficult and less readily made.

(e) The test bells do not ring as loud as existing service types.

(3) It is the opinion of the Artillery Board that the bells in their present form are not satisfactory. That better results could be obtained, especially with the smaller bell, provided magnet spools were wound with a larger number of turns.

(4) It was recommended that the T. I. Bells in question or equivalents be rewound to same specifications as present T. I. Bells and returned for further service trials.

(g) Project No. 33—Sound Ranging Plotting Board.

The Board has under consideration a Sound Ranging Plotting Board scheme submitted by Captain H. H. Blackwell, C. A. C., which embodies the use of the time difference relations obtained from three listening stations only. During a number of field trials the scheme as proposed developed several limitations among which is that of accuracy incident to the use of three stations. There is the difficulty of applying wind and terrain corrections and a range limit of 5000 yards. Further work is in progress along these lines with a view to its improvement and correction of present defects. It is the opinion of the Artillery Board that this method will be found useful and with further modifications prove to be an important addition to the present methods of plotting sound range data.

Considerable progress has been made in the new Sound ranging sets undergoing development by the Signal Corps as shown by recent tests.

(h) Project No. 22. A. A. Machine Gun, Peyru Sights.

During the month the antiaircraft battalion made preparations for the test of Peyru (rear area) sights for antiaircraft machine guns. The actual test will be conducted under supervision of the Artillery Board upon completion of the joint Coast Artillery-Air Service Training Exercises.

(i) Project No. 50—Mounts for A. A. Caliber .30 automatic.

The test of antiaircraft machine guns and mounts was suspended during the month on account of the joint exercises. These tests will be continued as soon as the personnel is released from work in connection with the joint exercises.



Employment of Heavy Artillery—Problem No. 5—A Solution

1st Requirement:

See sketch on Page 554.

2nd Requirement:

From a study of the Map, Maj A sees that the roads assigned him are placed very advantageously for interdiction from his batteries as they run parallel or nearly so to his line of fire so that variations in range will still hit the road if the deflection is good.

Inasmuch as he is not to fire until the enemy bombardment begins Maj A decides that it will be useless to attempt interdiction on either road to the west of the high ridge McALLISTER – WOLF HILL – ROCKY GROVE SH as the enemy reserves will already be behind the cover of this ridge before that time.

Maj A therefore decides to assign the following points on the BALTIMORE TURNPIKE to B Btry for the reasons given:

Point No. 1, RJ 516 (McALLISTER) because this is a road junction where troops coming from GETTYSBURG have their choice of two approaches to the BLUE lines.

Point No. 2, Bridge at 352 – 746.9 because if destroyed it will seriously interfere with the passage of enemy supplies and possibly also with troops.

Point No. 3, 352.9 – 746.2 which is a junction of an unimproved road with the BALTIMORE TURNPIKE. This point is selected because if interdicted successfully it will interfere with the passage of troops who have followed the trails across the ridge and are attempting to reach the main highway at this point.

He assigns the following targets on the HANOVER ROAD to A Btry.

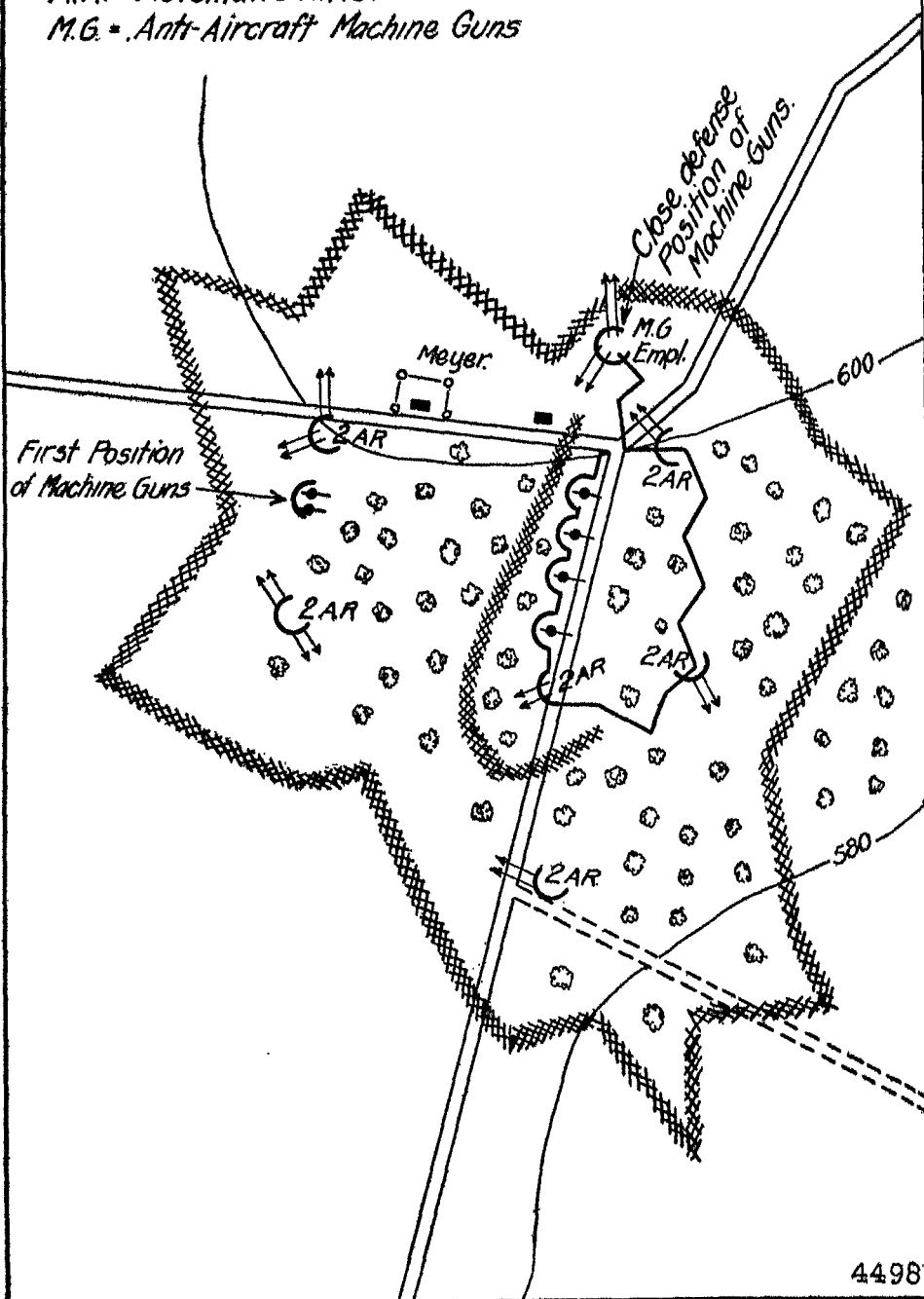
Point No. 1, 352.8 – 749.3 which is a point where a wood trail crosses the main road on the west side of the ridge. This point is selected because it is the logical point for the enemy to enter the woods on the ridge and to take to the various trails crossing the ridge and if successfully interdicted would cause considerable inconvenience.

Point No. 2, 353.4 – 749.1 which is a junction of an unimproved road leading south which connects the HANOVER ROAD with another good road leading toward the east. The reason for this point being selected is that if successfully fired upon it will embarrass the enemy in his use of the improved road paralleling the HANOVER ROAD to the south, particularly as regards his trains.

EMPLOYMENT OF HEAVY ARTILLERY
Problem No. 5. *1st Requirement.*

A.R. = Automatic Rifle.

M.G. = Anti-Aircraft Machine Guns



Point No. 3, RJ 550. This is an important junction and it is important to prevent its use if possible.

Point No. 4, RJ 546. This is selected for the same reason as No. 3.

All points will be fired upon simultaneously, 100 rounds being fired at each point. Instantaneous fuses will be used. Firing will be at the rate of 1 shot per minute at each point. Where points are not visible from the OP's, zone fire will be employed. Upon the completion of interdiction fire, harassing fire on these points will be employed using short bursts of fire at irregular intervals and without regard to numerical order of the targets.

3d Requirement:

Field message to A and B batteries by runner.

Hostile Infantry assembling in bed of WHITE RUN between RJ 452 - CR 516 and BALTIMORE TURNPIKE. Lay your guns for parallel fire. Battery A will sweep this area beginning at RJ 452 - CR 516 and sweeping left. Btry B will also sweep same area beginning at BALTIMORE TURNPIKE and sweeping right. Change deflection by 50 mils after each salvo. Btry A sweep at average map range first then increase $\frac{1}{2}$ fork for second sweep and decrease 1 fork for 3d sweep, then repeat. Btry B. decrease $\frac{1}{2}$ fork for 1st sweep and increase by $\frac{1}{2}$ fork until 3d sweep. Then repeat, use instantaneous fuse and fire until further orders, rate one round per gun per minute.

A.
Major.

* * * * *

Field Message to C. G., 301st FA Brig by motorcycle.

8th Div reports hostile infantry assembling in bed of WHITE RUN between BALTIMORE TURNPIKE and road 452 - 516 and requests violent concentration on this area at once. Am complying with request pending further instructions.

A
Major.

* * * * *

Field Message to Capt. E, Liaison Officer with 8th Div. by motorcycle.

Am complying with request immediately. Notify me when no longer required.

A
Major.

Employment of Heavy Artillery—Problem No. 6

References: Gettysburg 3-inch, New Oxford, Bonneauville, Gettysburg and Hunterstown Sheets, and 1-inch reduced from 12-inch War Game Map.

General Situation: In continuation of Problems 2 and 4.

Special Situation (Blue): The 1st Bn 901st Art (12-inch Mortar Ry CAC troops), with its section of service battery and attached Ordnance and Medical troops went into position in the 4th Corps sector near BRUSH RUN during night 27-28 March. It was placed under tactical control of III Corps.

The day 28 March was spent in improving positions and calculating firing data.

Late in the afternoon Major A, the Bn Commander, received the following information and instructions:

"An attempt to pierce the 3d Corps front is expected within the next 24 hours; the Corps is to hold its position at all costs; two days of fire will be placed at battery positions."

He was summoned to BHQ where he was shown list of targets (herewith) of which 5, 7, 8, and 9 were assigned to his Bn for counter preparation fires, but no firing would be undertaken until directed by BHQ. He was told that the total ammunition expenditures must not exceed one day of fire without further orders. (A day of fire is 50 rounds per piece or 200 per battery).

1st Requirement:

Maj A's orders for counter preparation fires.

2nd Requirement:

As captain of Btry A, in event of a successful hostile attack threatening your battery with capture, what steps would you take to destroy your guns?

Note:

The student should understand that the employment of 12-inch Railway Mortars against objectives and in a situation as here required, is not to be considered as normal use of this armament. In order, however, to fit this and the succeeding Mortar Problems into a general situation permitted by the maps available, so as to illustrate the mechanics of the handling a Railway Artillery Bn in land warfare, the assumption is made that this Bn is being employed because the guns and organization were available, whereas more appropriate weapons for the missions involved were not available in sufficient numbers.

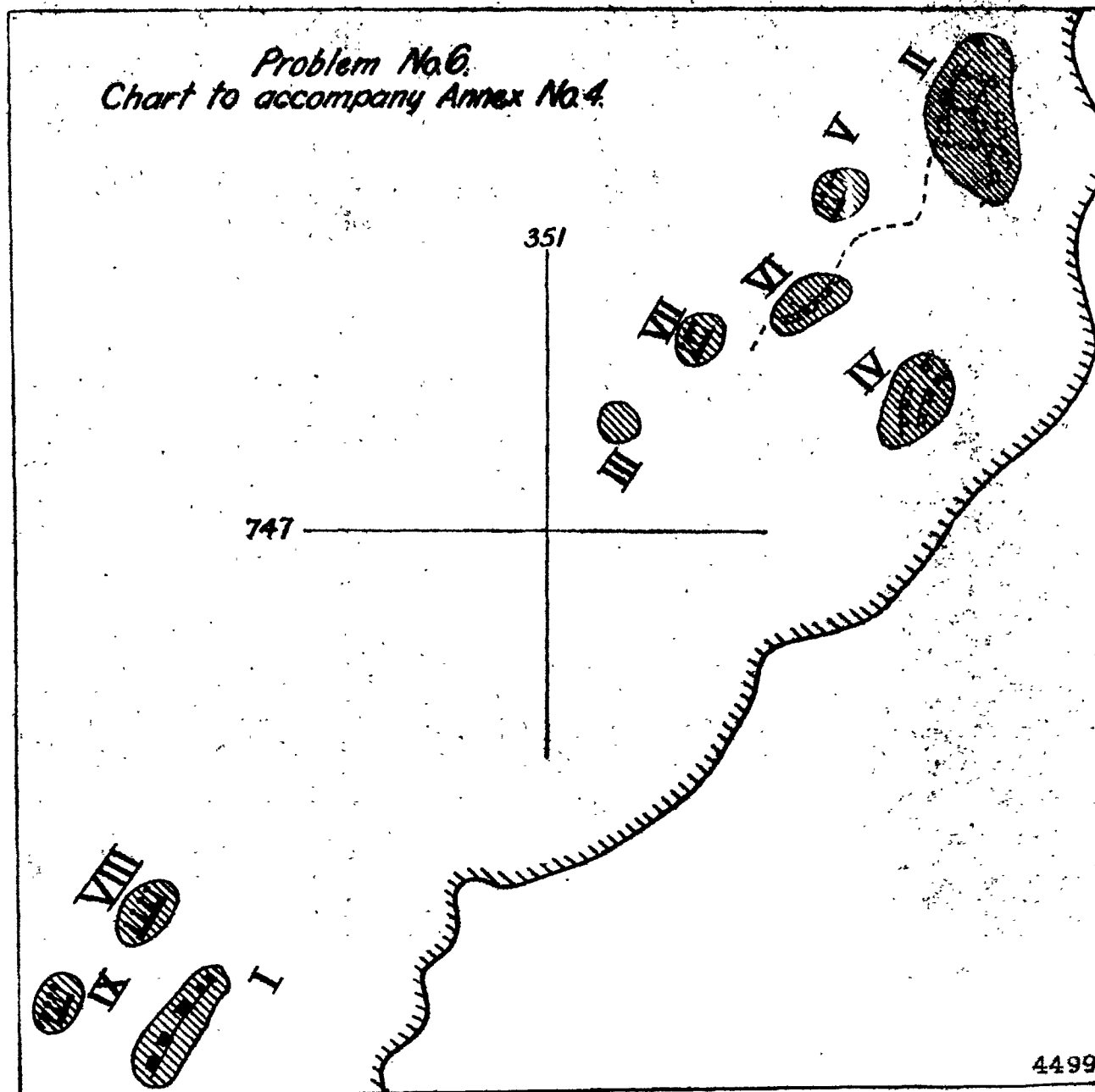
Annex No. 4.

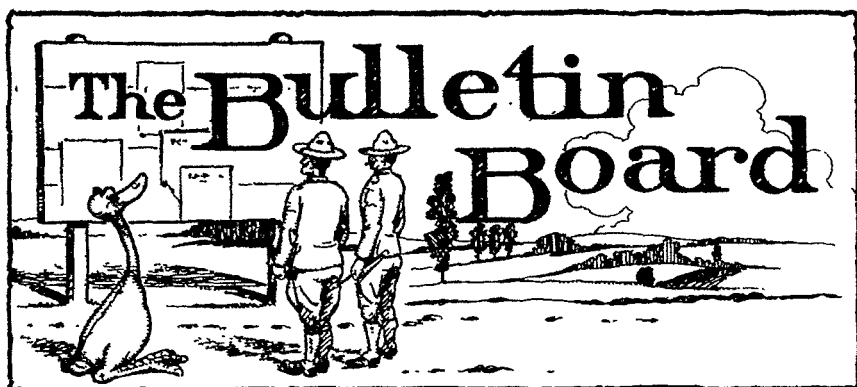
Corps Artillery Targets.

TARGET.

1. Concrete dugouts in a strong point having 4 ft. of overhead cover.
2. Splinter-proof and cover trenches in a strong point.
3. Wooden bridge (30' x 20').
4. Dugouts in a strong point.
5. Howitzer battery in position of deep defilade.
6. Dugout in a strong point.
7. Casemated battery.
8. Casemated battery.
9. Casemated battery.

Problem No. 6.
Chart to accompany Annex No. 4.





Travel Suggestions

The following suggestions to officers are extracted from a paper by Major Charles M. Wood, C. A. C., in the belief that the data furnished by the experience of Major Wood may be of use to others.

Trips Afforded by Philippine Service

(1) Every officer is allowed under ordinary conditions two weeks D. S., each year at Baguio, a cool mountain resort in the Igorot Country of Northern Luzon.

(2) During Christmas holidays short trips may be made to the Negrito Country (Mariveles Mountains), or other points on Luzon.

(3) One trip to the Southern Islands is allowed, about 10 days D. S., taking in Zamboanga on Mindanao, the Moro Country.

(4) One month leave may be taken, if available, to visit China and Japan. This trip may be taken on a transport, in which case little is seen except Nagasaki, Tientsin, and Peking. However, the majority of officers prefer to spend their savings on Chinese rugs rather than seeing China or Japan. The trip ordinarily may be taken after 6 months' foreign service in Philippine Islands is completed.

(5) On return to the United States from the Philippines, the Department Commander is authorized to grant up to 4 months leave (if available) to enable officers to return to the United States by way of India and Suez. The foreign service tour may be extended to such a time as to permit the officer to pass through India during the cooler months, that is from October to April. From the end of April to September the heat is almost unbearable. On this trip paragraph 60, Army Regulations, 1913, allows one month D. S., not counted as leave.

The following are brief outlines of trips taken by myself, followed by suggestions as to clothing, equipment, etc.

Trip to China-Japan-Korea-Manchuria

Itinerary:

Sept. 20-1920 Left Manila on T.K.K.S. *Korea Maru* for Hong Kong.

Sept. 23-1920 Left Hong Kong on C.P.O.S. *Empress of Asia*.

Sept. 25-1920 Shanghai

Sept. 27-1920 Nagasaki

Sept. 28-1920 Inland Sea

Sept. 29-1920 Kobe

- Oct. 1-1920 Shimizu
- Oct. 1-1920 Yokohama
- Oct. 2-1920 Rail to Nikko
- Oct. 3-1920 Rail: Tokio to Shimoneseki, via Kyoto and Osaka.
- Oct. 7-1920 Ferry to Fusan
- Oct. 7-1920 Seoul
- Oct. 8-1920 Mukden
- Oct. 9-1920 Pekin
- Oct. 11-1920 Ching Lung Chao (Great Wall) West of Pekin toward Kalgan.
- Oct. 14-1920 Nankin
- Oct. 15-1920 Shanghai (by rail)
- Oct. 16-1920 Sailed for Manila, Pacific Mail Steamer, *Venezuela*.
- Oct. 21-1920 Arrived at Manila.

Total cost of trip, Six Hundred (\$600.00) Dollars.

Hong Kong. This is the most beautiful city in China. There is a very pleasing combination of marine and mountain scenery. It is the base for British Naval and commercial ships in the far east and is fortified by strong Coast Defenses. A trip to Canton can be made in a day and a half and should not be missed.

Shanghai. Sometimes called the Paris of the Orient.

Japan. The trip through the Inland Sea is picturesque. Nikko, Tokio, Yokohama, Nara, Kyoto, and Osaka are points which should be included in the trip.

Korea. Proceeding North from Fusan by rail a stop should be made at Seoul.

Manchuria. A short stay at Mukden will suffice, unless time permits a trip to Harbin, or Port Arthur.

China. A day at Tientsin is enough (Headquarters for 15th Infantry); Then proceed to Pekin which is the most interesting city in China. From Pekin a trip to Kalgan on the edge of the Gobe Desert passing the Great Wall is very interesting.

Trains run south from Pekin to Hankau and Nankin. The Nankin Line has better service and makes better time. At Nankin a visit to the American University is worth while. From Nankin to Shanghai a train along the Yangtze, or a boat, can be taken, but the boat is much slower.

On this trip I would suggest civilian clothes be worn, but passport should show clearly the army status. A small vest pocket kodak is recommended. A letter of credit is a safe and convenient means of carrying funds. As to baggage a large suit case should be sufficient for a bachelor.

Trip to United States from Philippines by Way of India and Suez

Itinerary:

- April 5-1922 Left Manila on Hamburg-American German Steamer *Gaveland*, for Singapore.
- April 12-1922 Left Singapore by rail for Panama, via Kuala Lumpur.
- April 15-1922 Left Panang by Steamer *Edavama* for Rangoon. Changed to steamer *Arkankola*.
- April 20-1922 Calcutta
- April 23-1922 Benares
- April 24-1922 Agra
- April 25-1922 Delhi
- April 29-1922 Bombay
- May 6-1922 Left Bombay on City Line Steamer *City of Benares*.
- May 17-1922 Port Said
- May 18-1922 Cairo

May	23-1922	Luxor
May	25-1922	Kantara
May	26-1922	Jerusalem
May	28-1922	Haifa
May	29-1922	Haifa to Damascus by auto.
June	1-1922	Beyrouth to Damascus by auto.
June	5-1922	Beyrouth to Constantinople by U. S. Destroyer No. 244 <i>Williamson</i> .
June	8-1922	Constantinople.
June	9-1922	Up the Bosphorus to Black Sea by Ferry Boat.
June	11-1922	Sailed on U. S. S. <i>Acropolis</i> , anchored overnight Gallipoli.
June	15-1922	Coaled at Zea Harbor (small island southeast of Piraeus.
June	14-1922	Piraeus and Athens.
June	16-1922	Left Piraeus on Italian Steamer <i>Umbria</i> for Brindisi via Corinth Canal and Gulf of Corinth.
June	17-1922	Rail—Brindisi to Naples.
June	20-1922	Rome
June	23-1922	Florence
June	24-1922	Venice
June	28-1922	Basel
June	29-1922	Zurich
June	30-1922	Vienna
July	2-1922	Berlin
July	5-1922	Mayence
July	6-1922	Weisbaden
July	7-1922	Coblenz
July	8-1922	Cologne
July	9-1922	Brussels
July	11-1922	Paris
July	21-1922	Reims
July	22-1922	Left Cherbourg, Cunard, <i>Aquitania</i> .
July	28-1922	Arrived—New York.

Total cost of trip: thirteen hundred dollars.

In making the above trip there are three points which should be included which I missed, namely: Saigon, French Indo China; Simla, summer capital of India; Madrid, Spain. Within the limited space available it would be impossible to go into a description of places visited on the trip. The trip would have been easier if made earlier in the spring when the weather in India and Egypt would have been cooler.

The same remarks as to clothing, funds, baggage, and kodaks apply as stated for China trip.

The following articles of clothing should be taken, or purchased as needed on the way. :

- 2 Palm beach suits.
- 1 Tuxedo.
- 1 Cap, 1 soft felt hat, 1 helmet.
- 1 Pair high or low shoes, 1 pair pumps.
- 1 Pair smoked glasses.
- 1 Average weight dark business suit.

I would suggest no uniform be taken as they are bulky and not needed. In traveling in the east or near east a careful watch must be kept on baggage at all times, and all suit cases should be habitually locked. The trip can be made alone as well as with one or two other officers. There are always hotels to be

found where English is spoken. With English, and a slight knowledge of French, the language question causes no inconvenience.

I would recommend the purchase and study of a standard guide for each country as it is approached. Guide books by Baedeker or Cook contain about everything that is needed, and save money otherwise wasted on native guides. Native guides usually should not be employed unless recommended by hotels, and even then not without due consideration of the price.

The American Consul should always be called on, if present at a town through which one passes; his knowledge of local conditions and his good advice are a great help. Letters of introduction or personal friends among American business houses or officials along the way make the trip far easier, and give the traveler a big advantage. The American Express Company has offices at all large towns for purchase of tickets or to obtain cash. Generally it is bad policy to try and map too far ahead. Steamer tickets should not be purchased until the port from which it is desired to sail is reached; this insures getting the best boat, and the most reasonable price, and allows a more flexible schedule.

As to natives with whom one comes in contact, the best service is obtained when you use kindness and fairness. Losing one's temper or giving lavish tips do not get results desired.

BOOK REVIEWS

HISTORY AND GOVERNMENT

Admirals of the Caribbean. By Francis R. Hart. Houghton, Mifflin Co. New York. 1922. 6" x 9". 203 pp. 16 ill. Price, \$3.00.

The author of these sketches relates in detail and with literary skill the records of events in the Caribbean during the sixteenth, seventeenth and eighteenth centuries. He very sensibly remarks at the outset that the "romantic interest which attaches to the waters of the Caribbean has to some extent obscured the fact that these records are an integral part of the history of England and of the American colonies. Battles fought in the Caribbean Sea were often an important factor in making peace or war in Europe."

The book is divided into six chapters: "The Early Navigators," "Sir Francis Drake," "Sir Henry Morgan," "Admirals de Pointis and DuCasse," "Admiral Vernore," and "Lord Rodney." "These monographs which have been here brought together," Mr. Hart says, "were written as a contribution to the better understanding of West Indian history; those on Drake and on the French Expedition to Cartagena were printed some years ago in an historical publication in America; that on Vernore appeared in 'Hispania'; (London and in Spanish in the *Boletín de Historia y Antigue dades de la Academia Nacional de Historia* (Bogota). "All of these have been made the subject of revision and extension. The accounts of Morgan and Rodney have not been previously published."

They deal with the voyages of these intrepid mariners and breathe the atmosphere of life in these very early settlements for "not only were settlements established in the West Indies and in the Spanish Main, a century in advance of those in North America, but for three hundred years the struggles of the European nations for the control of the commerce of this region had a direct effect upon the material, political, and racial development of the North American colonies."

The author's story of Columbus and his followers, of the great seamen of Elizabeth's reign—Drake, Hawkins, and Frobisher, of the naval undertakings of Morgan, Vernore and Rodney, is full of the stirring incidents of these early times.



The Causes of the War of Independence, Vol. I. By Claude H. Van Tyne. Houghton, Mifflin Co. Boston. 1922. 5¼" x 9". 499 pp. Price, \$5.00.

We are advised that among scholars there has been during the last twenty years a decided modification in the old views of the causes which led to the American Revolution. This volume by the head of the history department in the University of Michigan, is the first volume of a history of the founding of the American Republic. This volume is concerned with the growth of the spirit of independence which made Americans discontented with their subordinate position in the British Empire. The second volume will tell the story of the war for independence, and the effort of Americans to set up new political institutions in their several provinces and to solve the problem of imperial organization which England failed to solve in time to preserve the loyalty of her colonies. The third volume will be concerned with the failure of the first American experiment in organizing an effective union and the story of the successful attempt which brought the Constitution of the United States.

The results of the labors of many historians which caused these changes in the old way of viewing this problem and the author's twenty years of investigation in the archives of America, France and England are the bases upon which this authoritative historical study is built.



England. By An Overseas Englishman. Houghton, Mifflin Co. Boston. 1922. 5" x 7½". 272 pp. Price, \$2.00.

The publishers tell us that this anonymous study of England was written from the Colonial point of view by a distinguished Colonial who served with the British Army in France, Italy, Egypt and Palestine, was in Paris during the Versailles Conference, has undertaken missions in Germany and Belgium and has spent much time in England.

The author takes as his theme,—“Has England reached the zenith of her greatness?” “Who to-day amongst the children of men thinks and speaks of England as a former generation spoke of her? Is she to-day even the ‘predominant partner?’ In what circles, foreign or domestic, political, diplomatic, industrial or administrative, do Englishmen predominate?” The author goes on: “They see the British Empire ‘being run by Scotch brains, Welsh brains, Irish brains, Jewish brains,’” quoting Bernard Shaw, “while the Englishman relapse more and more into the rôle of figurehead.”

The author asks the question: “Has England as a separate homogeneous race and nation really spent itself?” His reply is: “She no longer possesses anything, but is herself possessed. She has fulfilled literally her part of the bargain imposed by the Union, and in humility and self-effacement has wiped herself off the world's map. Under an appellation of magnitude which mocks at her racial origins and her geographical dimensions, she is now again but the southern half of great Britain.”

Having presented his theme in a general way the author devotes his second chapter to The English Parliament. His tribute to his motherland for this gift to the world is to say the least highly dramatic. “If Egypt has given to the civilized world its alphabet; Syria and the far east its religion; Greece its standard

of art and literature; the Moors its algebra; and Rome its laws; to England alone are due its political organization and constitutional systems. The English Parliament is the Mother and exemplar of Congress and Assembly, Reichstag and Duma, Cortes and Diet, Rikstag and Storthing, Sobranje and Meiljiss, and all other representative parliaments, however indigenous they appear of the modern world."

The author ranges over an unusually large variety of subjects, such as England's expansion, her character, her classes, her church, her literature and art, her agriculture, her press, her physique, her philanthropy, her relations with Scotland, with Ireland, with India, with Egypt and with foreigners.

A little farther on we read: "The gifts of England to America are of the same kind as she bestows upon her own children and upon a scale only limited by America's capacity and inclination to receive them." A little later he grows confidential. "Let us turn now to France. In spite of all the gushing professions about the *entente cordiale*, every shrewd, downright Englishman knows in his heart that the two nations are as far apart to-day as they ever were and always will be—perhaps always should be."

And by way of a final touch the author puts this question: "What sort of world would we be living in had the course of the history of colonization been altered in the seventeenth and eighteenth centuries and England had not been the supreme civilizing power, but France or Spain or Germany or Holland?" He answers in no uncertain language: "We need hardly ask what North America would have been when we have South America before us. Would Australia and New Zealand be free commonwealths under Germany? Would the constitutions of culture and wealth, would a wholly French Canada be commensurate with those which a partially French Canada has made? Would Africa under the rule of Holland be more splendid than the retrograde portion which remained for so long in the hands of the Boers? Would India be moving forward in material wealth, intellectual progress, and self-government under the aegis of Spain?"

The author in his sorrowing over England's ordeal by battle spares not even the United States Army. "And one of the traditions"—he sends this thrust home—"which will linger longest in France and Italy is that of the huge camps of pampered private soldiers, each drawing six shillings a day, gorging themselves on a thousand luxuries unknown to them in times of peace, officered by youths whose pay seasoned French generals would not scorn, while a league away the unpaid battalions of a more spartan republic, unmurmuring at their hardy fare, moved grimly and shabbily onward to the slopes and valleys of Verdun."

This Colonial sings his "swan song" with the true "abandon" of an Englishman.—"We of the Colonies who are English, will soon have, in turn, only our traditions, for the English amongst us are also slowly being hemmed in and absorbed by the Scotch, Irish, Germans, Scandinavians, and the other races. When the England of the English passes, we shall have no national home to follow, no true racial sanctuary."



An Introduction to the History of History. By J. T. Shotwell, Ph.D. Columbia University Press. New York. 1922. 6" x 9 1/4". 339 pp. Frontispiece. Price, \$4.00.

Dr. Shotwell, the author of this book, is the editor of the series of volumes entitled "Records of Civilization: Source and Studies." Three volumes in the series have previously appeared, consisting of documents in translation, commentaries and interpretations, and bibliographical guides.

The present volume, while fitting in with the remainder of the series, is distinctly different in scope and treatment. As its name implies, it is an examina-

tion of the *development*, (that is, the history) of the process of recording history. In point of time this introduction advances no farther than the beginning of mediævalism, although Dr. Shotwell adds as a postscript a final chapter on mediæval and modern history entitled *The Interpretation of History*.

The preliminary section of the book introduces the notions as to the meaning and scope of history as such, the relative importance of prehistoric myth and legend, and the dependence of formal history on such things as the invention of books, writing, and paper, as well as on the conception of the measurement of time, which was in itself a distinct achievement in human thought. Following the discussion of such records as were left by the Egyptians, Babylonians, Assyrians and Persians, is perhaps the most interesting section of the whole book, five chapters devoted to Jewish History and an examination of the Old Testament as a historical record. After studying carefully these chapters it is easy to understand the reason for the author's early observation that although "higher criticism has robbed it of its unique distinction as a special revelation of Jehovah, * * * nevertheless, it is possible to claim that, judged as historical material, the Old Testament stands higher today than when its text was protected with the sanctions of religion."

Following this section on Jewish History are several sections devoted to the examination of historical records in Greek History, Roman History and the early Christian Era. Without attempting, in the limited space available to this notice, critical comment on the great number of interesting reactions of the author toward historical material which afford new conceptions of their significance and interpretation, it may yet be asserted that in this work Dr. Shotwell has contributed a guide to the approach of historical sources in any field, which could profitably be followed by every officer undertaking serious research in his particular field of military history.



History of the Latin-American Nations. By William Spence Robertson. D. Appleton and Co. New York. 1922. 5¾" x 9". 617 pp. Cloth. Price, \$4.00.

Mr. Robertson in writing this history has successfully accomplished the stupendous task of covering, in detail, the span of years from the Incas to the League of Nations in some 617 pages of printed matter. Brevity, at a sacrifice of smoothness of reading, would be the first impression of the reader, but when it is realized that this is the first book which surveys the Latin-American people throughout their entire history, and that its preparation was to provide a much needed text book, it must be admitted that Mr. Robertson has made a valuable contribution to a barren field.



An Introduction to World Politics. By Herbert Adams Gibbons. The Century Company. New York. 6¼" x 9". 595 pp. Maps. Price, \$5.00.

This book appeals to the reviewer as the greatest contribution to the literature of world affairs any American has made during the present generation.

In its scope it reaches from the beginning of modern society to the present time; in its theme it upholds the rights of weak nations. Mr. Gibbons believes that a world peace will prevail only when the great powers shall grant to the small nations, not only self-determination, but privileges and protection without exacting their obedience.

The growth of modern world powers was coincident with the growth of steam-power. Great Britain was more zealous than other nations in the development

of this economic factor and as her ships carried the wealth of her mines and factories to the four corners of the earth, she built her navy to protect her trade. Other nations followed her lead, rivalries arose, and finally a struggle grew up in Europe to maintain the balance of power.

America entered the lists as a world power, when, after her war with Spain she acquired the Philippines and Guam; annexed Hawaii; and when she built the Panama Canal.

The motivation of all the great powers has been self-interest. Not only the small nations but the great weak nations have been the victims for exploitation by the powers.

The time came in European affairs when Germany, failing utterly to understand the Anglo-Saxon psychology, felt that her own strength was great enough to disregard the Balance of Power—when, by a mighty stroke, she might become the world power.

The ideal for which the people, everywhere, fought in the Great War was the self-determination of nations; but the real underlying motive of every nation was self-interest. All this was clearly revealed in the Versailles treaty and those following. A note of that for which the people fought was struck only at the Washington Conference for the Limitation of Armament when Mr. Hughes presented a real program—the scrapping of battleships and a naval holiday. It is only by the abandonment of the old form of foreign policy that a world peace can ever be secured.

Mr. Gibbons' pictures are clear cut as cameos; his research has been extremely wide, and no one interested in the present trend of world affairs can afford to miss *An Introduction to World Politics*.



The Mexican Mind. By Wallace Thompson. Little, Brown and Co. Boston. 1922. 5¼" x 8". 303 pp. Price, \$2.50.

This study of national psychology opens up a new avenue of approach to the Mexican problem. For the average reader as well as for the student of human affairs this interpretation affords an opportunity for a comparison of the people of the American continent on the basis of race.

Mr. Thompson approaches his subject well equipped by reason of long acquaintance with Mexican affairs. This volume was preceded by "The People of Mexico" published last year, in which the author described the difficulties of the Mexican problem. He offers this effort as a beginning of a study to which many minds and many years should be devoted—the clarifying of the mutual understanding of the Latin and Saxon peoples of the Western Hemisphere by a frank comparison of the workings of their minds. He offers a solution of this perplexing problem—the education of the masses.

Throughout the volume the author endeavors to show that we cannot classify the Mexican mind by any criteria which we yet know; that the great need is for a study of the individual in his solitude and in his group reactions, and from that the creation of a basic standard from which to start.



The Northward Course of Empire. By Vilhjalmur Stefansson. Harcourt, Brace and Company. New York. 275 pp. 5" x 7". Cloth.

Mr. Stefansson sees the Great North as the only hope of relief from the overcrowding that is menacing our times. He begins his interesting narrative by enrolling the reader in "Dr. Crothers' University of Unlearning," that is he completely shatters many long cherished ideas of the Frozen North, or to quote him "demol-

ishes all misknowledge." The next step in enlightenment is the feasibility of approaching this ice bound world either by submarine or air, which he presents in a very plausible manner. Assuming that the means of approach are established, he challenges the interest of the reader with a statement that mathematically the increased population without an increased food supply will in the next fifty years "make a planked steak as scarce as caviar." With this statement as a basis, he explains most convincingly what a simple matter it is to raise caribou and ovibos as a beef supplement or substitute.

Mr. Stefansson with his years of experience as an arctic explorer, plus his experience in the west as a cattleman is eminently suitable to write and advise on this new and different food market. His book is instructive, convincing and very readable.



Our Changing Constitution. By C. W. Pierson. Doubleday, Page and Co. Garden City, New York. 5½" x 7¾". 181 pp. Price, \$1.50.

Mr. Pierson has compiled a careful examination of the undeniable changes which have been and are continuing to be effected in the theory and form of American Government by the encroachment of Federal power on the sovereignty of the individual States. He reviews the facts with which most of us should be familiar as to the controversies which preceded the establishment of the Constitution, and the result which was thought to have been achieved by the fathers in creating a Federal government with sufficient power for the necessary accomplishment of national unity, without impairing the individual sovereignty of the several States. This emphasis is contrasted with the methods by which our Constitution has in effect been changed through the decisions of the Supreme Court, Constitutional Amendment, Foreign Treaties, and Federal Legislation based on the constitutional interstate commerce and taxation clauses. Important chapters are devoted to the Prohibition, Women's Suffrage and Income Tax Amendments, while the chapter devoted to the Federal Government and the Trusts is particularly illuminating, especially with regard to the evils of the "Holding Company" device. The author is apparently of the opinion that the process of centralization of Government and the usurpation of State authority will continue until the Federal Government breaks down of its own weight, when an inevitable reaction will follow. He hopes that a timely recognition of the value and importance of reserving to the States their proper functions may forestall the over-centralization which has so far been the outstanding feature of governmental history within the last sixty years.



A Prisoner of the Reds. By Captain Francis McCullagh, Royal Irish Fusiliers. E. P. Dutton and Co. New York. 1922. 5½" x 8½". 346 pp. Cloth. Price, \$5.00.

As a member of the British Military Mission in Omsk, Captain McCullagh was an eye witness of the collapse of the Kolchak régime, and thoroughly cognizant of the hopelessness of the Siberian situation. His book is a simple statement of conditions which is neither propaganda for Bolshevism nor propaganda against it. He merely states the facts and the reader is at liberty to make his own deductions.

The account of Captain McCullagh's flight from Omsk, his capture by the Reds and his personal investigation of the murder of the Russian Royal Family at Ekaterinburg are told so vividly and so convincingly that the reader feels he has a true insight into Bolshevism and the awful havoc it has created in Russia.

This is a truly remarkable volume, and a liberal education in itself.

The Russian Turmoil. By General A. I. Denikin. E. P. Dutton Company. New York. 1922. 6 "x 9'¼". 344 pp. 21 ill. 6 Maps. Price, \$3.00.

The story of Russia, from the days of its first mobilization for the World War through the successive periods of national unity, disintegration of the Empire, the fitful stages of the first revolution, and the horrible tragedy of the Bolshevie régime, is so full of lurid drama and sombre pathos that all the multitude of books together which have been called forth by this kaleidoscopic story would perhaps fail to give an adequate impression of the suffering of the Russian people. But certainly if any one book could afford a real glimpse into the tragic breakdown of Russia, it would be these simple and straight-forward memoirs of General Denikin, the son of a peasant serf who rose through the ranks of the army to the grade of 2nd Lieutenant, and who himself by the most arduous efforts obtained an education and a commission, and in spite of his humble origin, rose under Czarism to the command of an Army Corps. The book presents in surprisingly temperate language the mental struggles and the arduous difficulties of the higher officers of the old régime who for the sake of Russia, accepted the fact of the Revolution, and under it, in spite of abuses, interferences and indignity, strove to prevent the defeat and demoralization of the Army and the breakdown of national institutions. To one who has read this detailed account of the irresponsible manner in which the control of the military situation was thrown about like a shuttlecock at the instance of constantly shifting political demagogues, the remarkable thing is that men of the type of General Denikin could have found it possible to stay with the game at all. The futility and thanklessness of their effort are progressively shown in the course of the book, terminating in their imprisonment under the most vile and degrading circumstances by the Bolsheviks. But the book has an additional value in that there is an important source of historical reference in the subsequent determination of the catastrophic breakdown of the Western Front in the World War.



The Corner-Stone of Philippine Independence. By Francis Burton Harrison. The Century Co. New York. 1922. 5¼" x 7¾". 343 pp. 25 Illustrations. Price, \$3.00.

In October, 1913, Francis Burton Harrison was appointed Governor General of the Philippine Islands. He inherited a government that was very efficient, but which was practically a benevolent despotism, controlled almost entirely by American officials.

Seven years later, just before the coming into power of the Republican Party, he resigned, leaving a government which was much more democratic, and also much less efficient.

In his book, *The Corner-Stone of Philippine Independence*, Governor-General Harrison discusses the Philippine problem as he saw it during these seven years. He starts his book with a brief, compact and interesting history of the Filipino people, from the beginning up to the earlier years of American Occupation. Later chapters are devoted to the Filipinization of the government of the Philippine Islands, to The Moros, the Hill Tribes of Luzon, The American Garrison in the Philippines, The Philippines During the War, the Japanese menace, and The Independence of the Philippines.

The subject is discussed as he and the Democratic Party in general see it. This is of course somewhat different from the view point of the Republican Party, the Army Officer who has been stationed in the Philippines, and of the business man, both American and foreign, of the Islands. Many of his statements differ considerably from what the American resident of the Philippines and the Press

believe and state, but his information was first hand and it is possible that "everybody was out of step but Jim." He takes up and discusses several of the American arguments against the Filipino and Philippine Independence, usually taking the stand that the American resident in the Philippines is so prejudiced that he cannot possibly see but one side of the subject. Other arguments, particularly strong are not mentioned. He seems to be particularly bitter against the American Army in the Philippines and has many unkind things to say about the American Army Officers. He gives the Filipinos credit for most of the success attained by the Philippine Government, and lays most of the failures to the opposition of the Army, the American business man, and the American Politician, including some leading members of his own party. Speaking of the commission sent out by President Harding to report on conditions in the Philippines he complains that "all members of the party are Army Officers, except one civilian, a former Governor-General noted for his opposition to Independence."

While most Americans who have lived in the Philippines will not agree with many of the ideas set forth, all will find the book decidedly interesting and readable. His ideas as to the future of the Islands will furnish food for thought. There is no doubt that the Philippines would be a source of great weakness in case of war with Japan. It is also probable that many of the leading Filipinos are most anxious for real independence, and will not be forever satisfied to remain subject to the United States. Education, increasing control of their government, and continued denial of Independence, may ultimately lead to a revolt on the part of the Filipinos. Then will come an expensive war, or withdrawal under fire. We have gone so far and talked so much about independence that we will ultimately have to grant it or fight to maintain our control. Mr. Harrison believes that the handwriting is on the wall and that we should withdraw gracefully as friends before we are forced out as enemies.



ECONOMICS AND SOCIOLOGY

The Social Trend. By Edward Alsworth Ross. The Century Co. New York. 1922. 5" x 7½". 235 pp. Price, \$1.75.

Within the last two years a remarkable series of books has appeared, prompted by the effort to interpret the social and political signs which mark the undeniable flux in the state of our present civilization. Many of these books have been reviewed in the *COAST ARTILLERY JOURNAL*, and of these so noticed, nearly all have breathed in differing degrees a tone of distinct pessimism as to the future outlook for the social, economic, political, or eugenic progress of civilization and of America. This somber tone has called forth the expressive phrase of Glenn Frank, the editor of the *Century Magazine*—"Our literature of Despair." Consequently it is distinctly refreshing to encounter an author, known to be equally informed as any of his gloomy predecessors, who is able to survey the same array of facts, and still find a healthy promise in our social trend.

The present work sweeps so wide a field that space forbids an examination in detail of the outlook of Professor Ross. Certain of his observations, however, demand at least a mention. In his insistence on recognition for the principle of "Adaptive Fecundity" he illumines the widespread discussion of birth control, adding force to the contention for its necessity. His analysis of rural decline, ascribing its cause to what he calls "folk depletion" will be seconded heartily by the reader familiar with the communities described. His two chapters on the position of women, and those on prohibition, the legal profession, "The Conscience of the Expert," "Training Citizens with 'Spunk' for Social Service," advocating

a legal dismissal wage, and on war, all contain unusual contributions to a saner outlook for the future.

Finally it deserves to be said that the author has done a real kindness in writing with so delicate and light-hearted a touch that the book is more than merely worthwhile—it is distinctly interesting reading.



An Introduction to Economic History. By N. S. B. Gras. Harper & Brothers. New York. 1922. 5½" x 8½". 350 pp.

Among the theories of economic development is that which considers economic relations and laws to have been developed on the basis of social grouping into municipal units. This theory underlies the present work of Dr. Gras, Professor of Economic History in the University of Minnesota. He traces chapter by chapter the development of human economy through the successive stages which he labels Collectional Economics, Cultural Nomadic Economics, Settled Village Economics, Town Economics and Metropolitan Economics.

The book is intended as a text book and consequently the author has found it necessary to attempt a rather detailed statement of observed conditions and historical facts pertaining to each phase of economic development which he is describing. The result gives almost an encyclopedic mass of detail which would be even more difficult to absorb and to fit in the author's general thesis, but for the liberal use of side headings, and likewise but for the rigorous segregation of notes and bibliographical references to the end of each chapter.

The book is valuable for its consistent emphasis on the interdependence of the growth of municipal organizations and the ramifications of economic life. It is evidently the optimistic belief of the author that the present day dominance of the metropolitan cities of the United States over the rest of the country is a definite step in advance and not, as many would believe, an unavoidable evil. Whether or no the reader can share the author's belief the presentation of his viewpoint is made in a logical and effective fashion.



The Revolt Against Civilization. By Lothrop Stoddard. Scribners. New York. 6¼" x 8½". 274 pp. Price, \$2.50.

There is no hedging, no begging the question in Dr. Stoddard's discussion of the (to him) not insoluble problem of Bolshevism.

With a most convincing array of conclusions, arrived at by psychological tests; with the facts which have resulted from biological investigation and research work during the last few decades, the author shows how impossible ever was or ever will be that for which the "fathers" fought—the equality of man. Dr. Stoddard's quarrel, however, is not with the "fathers," who were superior men struggling against unjust conditions for the betterment of society; but he condemns vigorously the Under-Man—the Bolshevik, whose doctrine of Prolet-Cult is the destruction of all society. He makes us realize the awful menace of Bolshevism in his exposition of the fact that this organization of only about 600,000 people maintains a dictatorship over 1/6 of the world's population. The people most easily inoculated with the virus of this Prolet-Cult are those of the average or below-average class which is nearly 60% of the whole. Besides these are all the criminals and degenerates.

Dr. Stoddard does not leave us hopelessly facing chaos but presents a most plausible solution of the problem. He would segregate the unfit that they may not reproduce their kind, and he would increase the fit by the principles of eugenics.

The greatest hope of civilization would seem to be in the fact that men like

Dr. Stoddard are bringing the facts before the world, so that he who runs may read. A book like *The Revolt Against Civilization* should be given widest advertising and circulation.



Parenthood and Child Nurture. By Edna Dean Baker, M.A. The Macmillan Company. New York. 5½" x 8¼". 178 pp.

In this volume it is the plan to aid the study of the parent by presenting a summary of the facts of child development during the full period of childhood from birth to eleven years.

Edna Dean Baker, M.A., President of the National Kindergarten and Elementary College is eminently suited for a practical discussion of this subject not only because of her training but because of her keen observation of child life—work and play—both directed and undirected. She considers so called "mother instinct" by no means adequate for the responsibility of leading the child from infancy to maturity with a practical and helpful start towards moral, spiritual and physical development. "The original nature of the child is not all good—there is not one tendency, however good which does not need some care for its perpetuation. Thru the sheer order of things the burden of the training falls more heavily upon the mothers in most homes." "*Parenthood and Child Nurture*" has been especially prepared for the Parent Training Class. But when it is taken into consideration that a child of school age spends from four to seven hours of the twenty-four under the direct supervision and guidance of a teacher, one wishes that the subject matter taught be digested and practiced by all who share even a part of this responsibility.

We should be thankful to be living in an age when the subject of child study is at last receiving as weighty consideration as the raising of live stock and the intricacies of farming. The scope of the book includes every phase of child development. The suggestions in regard to stories, songs and games are unusually helpful and well thought out. The reference reading lists give a parent or teacher an exceptional opportunity to build up a library that would if used prove of inestimable value. The "Questions and Suggestions for Further Study" render it appropriate as a textbook to those who may find it more beneficial to study in groups so that experiences and notes may be compared and commented upon.

Frank Crane says "*Babies mean that this blundering human race has a chance to try again. Thru babies is our only hope of reforming. Adults become set in their ways—babies are plastic. We could attain any Utopia and correct every evil of society, clean up politics, cure all the ills of industry, abolish all disease and altogether hasten the golden age and hurry the millenium if we would only begin with the babies.*"

Surely the author could not have rendered a message likely to prove a more enduring world service than this.



Science and Human Affairs. By Winterton C. Curtis. Harcourt, Brace and Co. New York. 1922. 6" x 8¾". 330 pp. Price, \$4.00.

Professor Curtis from the viewpoint of biology seeks to answer such questions as the following,—What does the statement, that we live in a scientific age, mean historically, and what does it imply for the future? Again, it is said, that the present is a period of readjustment. Readjustment to what, and because of what?

The work is divided into three parts. In part one, on the history and significance of science, are considered,—the meaning of science to mankind, the origins

of science in the ancient world, the decline of ancient learning, the emergence of modern science and the further growth of science; in part two, on the science of biology,—the biological science of the modern period: the cell-doctrine, the theory of organic evolution, and current problems and methods of zoological science; and in part three, on the present importance of science,—philosophical and psychological aspect of science, the nature and meaning of scientific research, the rôle of science in the solution of social problems, the higher values of science, and, mankind and the further progress of science.

The author defines science as the product of human reason applied to the phenomena of nature, human nature included. He challenges the view that science has reached the point of vanishing, that future advances cannot equal those already made. He maintains that nature still presents unlimited problems; that new and more difficult problems arise from each problem solved; that there seems no immediate nearing the goal; that the permanent future of science seems assured, in so far as human inclination is concerned and neither lack of incentive nor exhaustibility of unexplained phenomena, will check its progress, but rather the limitations of human understanding.



Senescence. By G. Stanley Hall, Ph.D. D. Appleton & Company. New York. 1922. 6" x 9½". 518 pp. Cloth. Price, \$5.00.

In this work, which is truly monumental and almost encyclopedic, Dr. Hall has carried out in his own old age a purpose which he has had in mind ever since he prepared the comprehensive study on "Adolescence" fourteen years ago. The earlier work comprised the epitome of all the factors embraced in the philosophical and physiological consideration of the problems of human life from childhood up to the conclusion of the adolescent period. The present book carries out in similar manner the study of human life from the time of its full powers in middle age through the gradual decline which finally terminates in death.

The author begins with a discussion of what he calls "the youth of old age," discussing with the widest reference to the author's experience and that of great workers in all fields, the relative amount and importance of work and effort that have been accomplished before and after middle life, the beginning of the decline of physical powers, the nature of the gradual mental and physical changes which are the result of the decline of sexual life.

Succeeding chapters are devoted to the history of old age, to literature by and on the aged, to statistics of old age and its care, to medical views and treatment of old age, and to the contribution of biology and physiology. In his effort to secure something like a statistical resumé of the outlook and belief of aged people. Dr. Hall prepared and sent out to several hundred distinguished elderly men and women a questionnaire. He devotes an important chapter to the problems of old age based on the returns to this questionnaire.

Although the final chapter consists of an extended physiological study of death and the effects of its concepts among people of all ages, yet the really concluding chapter of the main work is the one next preceding in which the author sets forth his own thesis of what he conceives to be a new conception of the proper usefulness of old age. Briefly this thesis may be stated as the belief that the old have an important contribution yet to make to human life in their ability to develop a capacity for the synthesis of human experience, and for their fitness to guide the formation of opinions and doctrines through the fact of their own detachment from the driving pressure of the productive effort of life. Coupled with this is his insistence that while the old must needs take a new care in husbanding their declining physical powers, yet it is necessary that they should not

abate their mental effort. In short he believes that it is much better to wear out than to rust out.

Dr. Hall is frank in stating his conclusion that there is no such thing as immortality of the human soul, and that such immortality as we may hope to achieve is only through the effect on succeeding generations by our own reproduction of human life, and by the undying results of our achievements and influence. For a young person this book would prove very sombre reading, but nevertheless it is believed that every really thoughtful person who has reached middle age should read this book once in order to prepare for the readjustment of old age. We all know to what a sad and pathetic extent the great majority of people are suddenly confronted, all unawares, with the fact of old age, without being mentally and physically prepared for it. To everyone who is not cut off in youth or in his prime, old age is bound to come. How important then it is to be prepared for this final stage so as to mitigate its loneliness and weakness, and if possible to attain in the last years of life the maximum of happiness and usefulness.



ENGINEERING AND SCIENCE

Aeronautics. By Edwin B. Wilson. John Wiley and Sons. New York. 1920. 6¼" x 9¼". 265 pp. Illustrated.

The usual course in aeronautics includes fluid mechanics as well as rigid mechanics. In some texts, fluid mechanics has been omitted because of its relative unimportance. Professor Wilson includes both in his book, which embraces the elementary parts of courses of lectures he has been giving for several years, covering about ninety out of one hundred and fifty lectures.

The author divides his text into three parts—the introduction, which includes mathematical preliminaries, the pressure on a plane, and the skeleton airplane; rigid mechanics; and fluid mechanics. The mathematical requirements for a proper appreciation of such a course embrace calculus, elementary differential equations, theoretical and applied mechanics. The author in referring to these requirements, says: "It has seemed better to assume too little, rather than too much, as retained in usable form."

Chapter IV, "Motion in a resisting medium," the first chapter on rigid mechanics, treats of such subjects as the determination of the motion of a machine when running along the ground to a stop, and the analysis of the forces acting on the machine (due to gravity, to the thrust of the power system, and to air pressure); the case of a free fall in a vertical direction; the plane moving in a vertical plane in a curved path, as when pulling out of a dive; forces on a curved wing; and bomb trajectories.

Chapter V treats of harmonic motion in connection with the determination of the general equations of motion of the airplane. Motion about the center of gravity is considered in Chapter VI, angular motion in Chapter VII, and the stability of the airplane in Chapter VIII.

The remainder of the text is devoted to fluid mechanics, embracing the topics, motion of a fluid along a tube, planar motion, theory of dimensions, forces on an airplane, stream function, velocity potential, motion of a body in a liquid, and motion in three dimensions. It is concerned with theoretical hydrodynamics and the results of wind tunnel experiments.

This work of Professor Wilson's merits the attention of the student, not only because of his eminent position in the fields of mathematics and physics, but because of the fact that he has produced a reliable text on a subject about which little official information has been published.

Analytical Mechanics for Engineers. By Fred B. Seely and Newton E. Ensign. John Wiley and Sons. New York. 1921. 6" x 9". 486 pp. 454 ill. Price, \$4.00.

The authors' aim in preparing this text book has been to make the principles of mechanics stand out clearly; to build them up as much as possible from common experience; to apply the principles to concrete problems of practical value; and to emphasize the physical rather than the mathematical interpretation of the principles.

Analytical Mechanics has for its object the study of the laws which govern the motions of bodies and the application of these laws to engineering problems. That this has been the object of Professors Seely and Ensign is quite evident from even a cursory examination of the text. The space allotted the three parts, namely, Statics, Kinematics and Kinetics, the stress laid on certain concepts and elementary principles at the beginning, and later the more general principles and problems; the use of illustrative examples at the end of the more important articles; the many problems, practical and at the same time comprehensive; the use of bold-faced type for the important equations and italics for the more important principles, are evidences of a well considered plan to successfully present the principles of mechanics that are believed to be essential for the student of engineering.



Design of Masonry Structures and Foundations. By Clement C. Williams. McGraw-Hill Book Co. New York. 1922. 5 $\frac{3}{4}$ " x 9 $\frac{1}{4}$ ". 555 pp. Profusely illustrated.

Notwithstanding the wonderful development in types of masonry construction from the crude dolmens and cromlechs of barbarous man, these unshaped stones set as columns and partial walls, and covered with slabs of stones without any attempt of attaching one to the other, to the beautiful stone columns erected by the Greeks, with their pointed and true arches, it was not until recent years that masonry design and construction passed from the status of an art to that of a science.

What the invention of methods for calculating stresses in truss members did for bridge design, experimental and analytical investigations of the properties of masonry materials, the forces in masonry structures and the behavior of such structures, did likewise for masonry design and construction.

"The extensive use of concrete" says the author of this volume, in his preface. "with the studies that have been made to improve its quality and to secure economy in its use, and the development of reinforced concrete, a masonry material capable of sustaining tensile strains and requiring a stress analysis in order to proportion the steel, have contributed largely to this changed status in the design of masonry structures."

The author divides his text into fifteen chapters. After considering the general principles, including the historical development of masonry construction, and the factors affecting designs, he takes up successively, stone masonry, plain concrete and reinforced concrete. No attempt has been made to treat reinforced concrete completely, the subject-matters included being largely for reference and for those readers who have not previously pursued a course in this subject.

Then follow chapters on masonry arches, dams, retaining walls, abutments, viaducts, culverts and conduits, bins and chimneys, masonry forms and false-work, foundations on dry ground and under water.

Mr. Williams, who is an engineer as well as a teacher, has prepared a text book of value to the engineer as well as to the student. He has not only kept in mind the aesthetic features of design in the selection of illustrative examples, and

mentioned the underlying principles of good architectural treatment whenever it was possible, but he has carefully treated the various methods of design, the relative economy and not the least important, the costs.



Einstein and the Universe. By Charles Nordmann. Translated by Joseph McCabe, with a preface by Viscount Haldane. Henry Holt and Co. New York. 1922. $5\frac{1}{4}'' \times 8\frac{1}{4}''$. 240 pp. Price, \$2.50.

The author of this volume, Charles Nordmann, is astronomer to the Paris Observatory and according to the publisher's notice on the jacket has written a sensational book, ten thousand copies of which were sold in five days. The London "Daily Mail" in an editorial says of it: "Not often does a great scientist condescend to treat a subject of immense scientific interest and importance with such lucidity and directness."

Viscount Haldane, than whom there is none better qualified to judge, says in the preface to this volume: "I know no book better adapted than the one now translated to give the average English reader some understanding of a principle, still in its infancy, but destined, as I believe, to transform opinion in more regions of knowledge than those merely of mathematical physics."

What is the author's opinion with regard to "Einstein's Theories"? In the introduction he says: "Einstein's theories have brought about a profound revolution in science. In their light the world seems simpler, more co-ordinated, more in unison." He declares that he "will endeavor to make the reader understand accurately, yet without the aid of the esoteric apparatus of the technical writer, the revolution brought about by Einstein."

The average reader "dearly loves" to find his book begin with: What is — ? Followed immediately by a clear and concise answer. Has it not been said that Einstein's theories "are only a play of mathematical formulae, a towering mathematical structure in which the x's shoot out their volutes in bewildering arabesques, with swan-neck integrals describing Louis XV patterns?" "Einstein's theory" says the author "is very different from that, and very much more than that. It is based upon facts. It also leads to facts—new facts." The author likens Einstein's theory to a suspension bridge thrown across an abyss, resting on one side on experimental phenomena, at the other, on hitherto unsuspected phenomena, to which it leads. "Between these two solid experimental columns the mathematical reasoning is like the marvelous network of thousands of steel bars which represent the elegant and translucent structure of the bridge." But is not mathematical reasoning only "a kind of reasoning in a special language, from experimental premises to conclusions which are verifiable by experience?" And is there any "language which cannot in some degree be translated into another language?" Nordmann believes "that it is even now possible to give by means of ordinary speech an idea, rather superficial perhaps, but accurate and substantially complete, of this wonderful Einsteinian structure which ranges all the conquests of science, as in some well-ordered museum, in a new and superb unity," and he is convinced "that the mathematical difficulties of Einstein's theories will some day be replaced by simpler and more accessible formulae."

The work of Einstein derives its importance from the fact that he has shown that we have entirely to revise our ideas of time and space. When we stop to realize that "time and space, the twin pillars of knowledge, the two columns which sustain the edifice of men's understanding" are removed from the structure of human knowledge, we begin to realize, if Einstein be right, the whole of science will have to be reconstructed. This claim of Einstein's that our idea of time and space is false is the first part of his work, "but it goes further. If that were the whole of his work it would be merely negative." To put it in another way, "Ein-

stein showed on the one hand, with astonishing acuteness and depth, that the foundation of our knowledge seems to be different from what we had thought, and that it needs repairing with a new kind of cement. On the other hand, he has reconstructed the edifice on this new basis, and he has given it a bold and remarkably beautiful and harmonious form."

The author by means of illustrations and analogies gives a satisfactory idea of Einstein's theories, one that the average reader is fully capable of appreciating with just a little mental effort.



Elementary Hydraulics. By F. C. Lea. Longman's, Green and Co. New York. 1922. 5" x 7½". 224 pp. 156 ill. Price, \$2.40.

The author, who is professor of civil engineering in Birmingham University, has written a standard text on Hydraulics for engineers and engineering students. He has, however, arranged this elementary treatise mainly to meet the need of the students in evening and day technical schools who are desirous of obtaining some knowledge of the principles of hydraulics.

The importance of experimental work in these schools being now well recognized the author maintains that the subject of hydraulics is one which from the experimental, theoretical, and practical sides, is worthy of an important place in the curriculum of such schools. Much experimental plant, which would be of great value in the training of students could be installed with comparatively little expense. For instance, such simple apparatus as a small tank with an orifice either in a vertical or a horizontal plane, or three or four short lengths of brass, copper, or lead pipes, can be effectively used to train students in the habit of controlling an experiment, recording the results obtained, and learning the habit of building up an empirical law by the examination of data and especially by the device of logarithmic plotting.

Professor Lea has produced a text-book which is astonishingly clear not only in the usual subjects considered in a text on elementary hydraulics but in such subjects as the impact of water on vanes, water wheels, turbines, pumps and hydraulic machines, which are perplexing to the average student.



General Design of Warships. By William Hovgaard. E. and F. N. Spon. London. 1920. Spon and Chamberlain, New York. American Agents. 6¾" x 10." 307 pp. Price, \$9.60.

As a result of the Washington Conference, the problem of warship design presents an entirely new phase to the naval constructor and the naval architect. The points with regard to displacement and armament of the dreadnaught are specific—no new capital ship is to displace more than 35,000 tons, 35,560 metric tons, or carry a gun in excess of 16-in. calibre. To meet these conditions and at the same time profit by the lessons of the Great War will require much time and skill. One authority has recently said that the analysis which we have made regarding the various qualities of the modern battleship does not leave us any illusions as regards the impossibility of being able to comprise within the limits of displacement fixed by the Washington Conference all the offensive and defensive power which at the present day would seem desirable. Notwithstanding the limitation put on the construction and development of the dreadnaught the fact remains that the development of smaller and less expensive machines of war continues.

All of which emphasizes the importance of a text on warship design by so noted an authority as Professor Hovgaard.

This text-book is based on lectures prepared for the course in naval construction at Massachusetts Institute of Technology. The author's idea is to give students of naval construction and naval architects a connected and logically arranged description of the principal steps in the general design of warships, accompanied by a discussion of the underlying principles and a statement of such pertinent facts and data as are established by experience and experiment.

The size of warships is considered in one chapter, the preliminary determination of the displacement, principal dimensions and elements of shape, each in a separate chapter. Then follow chapters on stability, construction of lines and preliminary calculations. The important subject of the effects of bilging on buoyancy and stability is dealt with, followed by chapters on watertight division, buoyancy and stability of submarines and transports, subdivision and ballasting of naval oil tankers, and the final chapter on weight calculations. The integraph, description, theory and its limitations, is considered in an appendix.

Professor Hovgaard has devoted the same care and attention to the subject matter in this textbook as he has in his work on *Structural Design of Warships* and *Modern History of Warships*.



Handbook of Meteorology. By Jacques W. Redway. John Wiley and Sons. New York. 1921. 6" x 9". 294 pp. Profusely illustrated. Price \$4.00.

The author, a well-known American geographer, prepared this text for cooperative observers and for the instruction of students in meteorology and aeronautics.

The text is divided into two parts, Part I being devoted to the principles of meteorology, and Part II to a description of the instruments used in meteorology, and the construction and care of them.

No effort has been made to treat the subject of military meteorology, nor is the text designed for field purposes. But as a treatise on elementary meteorology, and a laboratory manual, it is sufficiently comprehensive for the student and the observer. Its language is clear and concise and to the point, and the illustrations are many and varied and show care in selection and arrangement.

An important feature is the large number of conversion and other useful tables that are not available in the publications of the U. S. Weather Bureau.



Lessons in Electricity and Magnetism. By Franklin and MacNutt. Franklin and Charles. Bethlehem, Pennsylvania. 1920. 5¼" x 8½". 255 pp. Cloth.

Lessons in Mechanics. By Franklin and MacNutt. Franklin and Charles. Bethlehem, Pennsylvania. 1920. 5¼" x 8½". 255 pp. Cloth.

These two companion volumes are the presentation of Franklin and MacNutt's college texts in a condensed form, their purpose being to fill the demand for a suitable text for two year schedules in elementary physics.

The books are thoroughly and attractively prepared. Mechanical and Electrical analogies for various phenomena, which with an appendix in each devoted to problems and answers, make the books well adapted to the needs of the student.



Letters of a Radio Engineer to His Son. By John Mills. Harcourt Brace and Co. New York. 1922. 6" x 8". 261 pp. Cloth.

Mr. Mills in his letters, presumably to his son, has displayed a remarkable gift for writing obtuse theory as comprehensively as though it were an extract from the First Reader. His book is splendid for the boy enthusiast who has a multitude of questions his parents and more than likely his teachers cannot answer.

There are unquestionably many amateurs as well as licensed operators, who know little of wireless aside from the mechanics of operating their sets, who would be greatly benefitted by even a single reading of Mr. Mill's presentation of the Electron Theory.

For the purpose of guiding and informing the youngster, as well as untangling "hard knots" for the self taught operator, this book is an excellent contribution to an overcrowded field.



Mecanique des Affûts. Volume I, second edition, revised, corrected and enlarged, by General J. Challeat and A. Thomas, Major of Artillery. Librairie Octave Doin, Paris. 16-mo, 4¾" x 7¼". 360 pages with 97 figures. Cloth. Price, 17 fr.

The importance of artillery has been considerably increased during the last war. Its numerical strength has become comparable to that of the infantry, its types of matériel have been multiplied, its power and mobility have of necessity been augmented in proportions surpassing all previous conjectures. It has therefore become necessary to enlarge the treatise which Captain Challeat had propounded a dozen years ago on the mechanics of gun carriages. Moreover, the old theories, while being conserved, had to be gone over and extended to new types, such as the heavy railway artillery and the artillery on self-propelled caterpillar mounts. The first volume, which has just been published, treats of rigid carriages, that is those carriages without recoil mechanisms of any kind, of hydraulic recoil brakes, and of the stability of mounts during fire; the second volume, which is to include the study of recuperators and recuperator brakes and buffers, of trench artillery and of various special matériel, such as grenade or bomb throwers, matériel with variable recoil mechanisms automatically varied with the angle of fire, etc., will appear shortly.

These two volumes will be indispensable not only to technicians who may find in them formulas capable of reducing in a large measure their difficulties in studies which they may be called upon to make, but also to those artillerymen who desire to have a better knowledge of their matériel, thereby making better use of its possibilities by having a better understanding of its management, functioning and care.

The success obtained by the first edition assures that of the second, written after the most formidable of all wars, in which the authors took an effective part on active duty with their troops.



Modern Practice in Heat Engines. By Telford Petrie. Longman's, Green and Co. New York. 1922. 5¾" x 8¾". 264 pp. Profusely illustrated. Price, \$5.00.

This work is concerned with the subject of power from heat engines and the limitations of theory with respect to the design of modern types. It is divided into three parts, steam boilers, steam prime movers and internal-combustion engines.

In Part I various types of boilers are considered, their construction, the principles of steam generation, and thermal efficiency. It is obvious that in a work which aims at taking a general survey of the methods of obtaining power from heat not all standard makes may be discussed. Boilers are divided into two classes, cylindrical boilers and water-tube boilers, only the latest designs in general use being included in the discussion.

In Part II, steam engines and steam turbines, their description, principles of design, general considerations and thermal efficiency are discussed. Internal-

combustion engines, description, design, general considerations and thermal efficiency are considered in Part III.

The illustrations, charts and sectional designs, many of which show dimensions, have been carefully selected. Not the least valuable feature of a work of this kind is the attention given the selection and arrangement of charts and illustrations if the text is to be of real value to the student and the designer.

This book forms a valuable companion to the late W. Inchley's "Theory of Heat Engines."



Principles of Electrical Engineering. By William H. Timbie and Vannevar Bush. John Wiley and Sons. New York. 1922. 7 $\frac{1}{4}$ " x 7 $\frac{3}{8}$ ". 513 pp. 244 Ill. Price, \$4.00.

The name Timbie associated with an electrical book has been a pretty good indication of its value as a text-book. This latest work of Professors Timbie and Bush fulfills all expectations. It is the outgrowth of the authors' experience in teaching electrical engineering at Massachusetts Institute of Technology and presumes a knowledge of calculus and physics.

The aim of the authors is to provide a substantial first course in the subject by presenting vigorously, and at the same time in understandable form, the basic principles upon which modern electrical engineering rests.

Some idea of the treatment of subject matter may be had from the following list of special features:

1. The subject of the magnetic circuit has been stressed, more space than usual being devoted to this matter.
2. As a basis for explanation, the modern electron theory has been freely used.
3. The subjects of thermionic emission, conduction through gases, electrolytic conduction and high-frequency phenomena have been included.
4. The subject of the behavior of dielectrics has been approached from a standpoint which departs from the historical method of attack in order to gain clearness and unity of treatment.
5. About five hundred live problems are included for illustration, for practice in applying the principles and for the purpose of bringing before the student useful and interesting engineering data. (The answers to these problems are published separately).



Physics of the Air. By W. J. Humphreys. The Franklin Institute. Philadelphia. 1920. 6 $\frac{1}{2}$ " x 9 $\frac{3}{4}$ ". 665 pp. Profusely illustrated. Price, \$5.00.

Professor Humphreys has embodied in this text on the physical phenomena of the earth's atmosphere a series of articles which he prepared for the Journal of The Franklin Institute in 1917, 1918, 1919 and 1920.

The book is divided into five parts. In part one on the mechanics and thermodynamics of the atmosphere, the discussion begins with a description of the types of instruments most generally used in measuring the ordinary meteorological phenomena. Then follow chapters on theoretical temperature relations of the atmosphere, observed vertical temperature gradients, isothermal region, composition of the atmosphere, insolation, atmospheric circulation, winds adverse to aviation, barometric fluctuations, evaporation and condensation, fogs, and clouds, the thunderstorm and lightning. This part embraces over 400 pages, two-thirds of the subject matter.

Part two is concerned with atmospheric electricity and auroras.

In part three on atmospheric optics, a chapter is devoted to each of the following,—perspective phenomena; refraction phenomena; atmospheric refraction; refraction of water drops, refraction of ice crystals; reflection phenomena; diffraction phenomena; phenomena due to scattering: color of sky, sky polarization.

In part four, are considered, factors of climatic control such as,—the principal ice-age theories; vulcanism: theory, observational; and other factors.

In appendix one are included gradient wind velocity tables, in appendix two, constants and equivalents; followed by a comprehensive index.

Professor Humphreys has succeeded in gathering together in an orderly manner the various facts and theories, that comprise the Physics of the Air. The book is invaluable to the student of atmospherics.



Radio, the Book of Wireless Telegraph and Telephone. By A. Frederick Collins. D. Appleton and Co. New York. 1922. 5" x 7 $\frac{3}{4}$ ". 227 pp. Profusely illustrated.

This book on radio for the amateur gives a clear description of wireless telegraph and telephone sets and how to make and operate them, together with a simple explanation of how wireless works.

In planning this book the author had in mind that army of enthusiasts, The American Boy. His appreciation of the ambition of every real boy to make his own apparatus has been his guide in preparing this text. Nothing is too small to escape his attention. The little adjusting screw and its brass arm are shown in figures and dimensions

In his prefatory remarks, "A word to the boy," this pioneer in wireless telephone says: "To be a wireless boy and make your own apparatus is to have the kind of stuff in you of which successful men are made—men who, if they were shipwrecked on a desert isle at day break, would have something to eat by noon, a spring bed to sleep on by night and a wireless station the next day sending out SOS to ships below the horizon, for help."



Physique Elementaire et theories modernes, Part I, Molecules et atomes. By J. Villey. Gauthier-Villars et Cie. Paris. 1921. 6 $\frac{1}{2}$ " x 10". 197 pp.

This elementary treatise on physics is designed for general reading. Considerable space is allotted certain physical phenomena familiar to industry which have been widely applied. This is the first of two volumes designed to cover this subject.

Not only is this work suitable for popular reading but it serves the purpose of a text book on the essentials of up to date physics. The author has succeeded in producing a readable volume that meets the needs of those who wish to familiarize themselves with the latest accepted theories.



Reinforced Concrete. By W. Noble Twelvetreets. Isaac Pitman and Sons. New York. 1920. 5 $\frac{1}{4}$ " x 8 $\frac{1}{2}$ ". 270 pp. Profusely illustrated. Price, \$6.50.

One of the main features of Mr. Twelvetreets' book is the use of the Standard Notation (British). In a foreword on Standard Notation for Engineering Formulae, Mr. E. Fiander Etchells, President of the Concrete Institute (London), says: "This is the first book in the English language which contains a mnemonic notation without the use of subscripts."

The plan the author had in mind in preparing this treatise on the theory and

practice of reinforced concrete construction may be revealed by quoting from the preface: "In the present volume the author has endeavored to put forth as clearly as possible the general characteristics and distinctive properties of reinforced concrete and its constituents, to discuss in a systematic manner the principles underlying the design of homogeneous members, and to show how these principles may be applied to the evolution of formulae for the design of reinforced concrete members of different classes."

Many good books have been written on reinforced concrete, but quite often the conflicting notations have been bewildering, so that this new work, by reason of its use of the Standard Notation and the careful handling of standard formulae, occupies a very distinctive position among worth while texts.

In considering the amount of subject matter that may be embraced in a volume of this size, and the method of treatment, the author says: "The subject of reinforced concrete cannot be dealt with satisfactorily in all its ramifications in a single volume of moderate size. Therefore, the author has restricted his efforts to what he hopes may be considered a thorough exposition of fundamental principles, and to the presentation of a complete series of formulae for the principal classes of members employed in engineering and building construction."



The Telescope. By Louis Bell, Ph. D. The McGraw-Hill Book Co. New York. 1922. 6" x 9". 287 pp. Profusely illustrated. Cloth.

As a treatise on the telescope, its construction and properties, this book is quite complete. The author makes no attempt to go into a detailed description of famous observatories. He concerns himself with "principles and their application to such instruments as are likely to come into the possession or within reach of students and others for whom the Heavens have a compelling call."

The first chapter deals with the evolution of the telescope, tracing its lineage back to spectacles, and briefly describes the steps in its development from the time of Jan Lippershey, who in 1608 applied for a patent, to the latter part of the eighteenth century, when the "reflecting telescope, chiefly in the Gregorian form, held the field in astronomical work, the old reflector of many tubes was the spy-glass of popular use, and the newly introduced achromatic was the instrument of the exclusive trade." The second chapter considers the modern telescope, beginning with Herschel, the greater part of the text being devoted to the modern reflector and refractor.

In chapter three, the author discusses optical glass and its working, and in chapter four, the properties of objectives and mirrors, without going into exhaustive technicalities.

The remaining seven chapters are devoted to mountings, eye-pieces, hand telescopes and binoculars, accessories, the testing and care of telescopes, setting up and housing the telescope and seeing and magnification.

The book is well supplied with illustrations and diagrams, contains a list of many helpful references at the end of many of the chapters, and is provided with an index.



Space, Time and Gravitation. By A. S. Eddington. Cambridge University Press. London, England. 1921. 5½" x 9". 218 pp.

This outline of the general relativity theory by Professor Eddington as was to be expected, sustains its author's recognized position among England's men of science and philosophy as a master of exposition. The author presents a non-mathematical account of this important subject, relativity, which has been so

widely discussed and, for obvious reasons, so little understood. This he accomplishes without introducing anything very technical in the way of mathematics, physics, or philosophy.

The three printings of this book may be cited as evidence of the success of Professor Eddington's attempt to explain this remarkable scientific theory.

While it is intended primarily for readers without technical knowledge of the subject, the author has added some mathematical notes in the appendix to bridge the gap between this and more mathematical treatises, and to indicate the points of contact between the argument in the text and the parallel analytical investigation.



The Theory of Machines. By Robert F. McKay. Longman's, Green and Co. New York. 1920. $5\frac{1}{2}'' \times 8\frac{1}{2}''$. 440 pp. Profusely illustrated. Price, \$6.75.

The author defines a machine "as an assemblage of resistant bodies whose relative motions are successfully constrained so that some form of natural energy may be modified or transmitted to do some special kind of work." This definition is given merely to convey to the newly introduced some idea of the amount and kind of subject matter that must be contained in a text on the theory of machines that aims to treat the different parts of the subject, comprehensively and systematically.

In his analysis of the subject of theory of machines the author says: "In the modification or transmission of energy by machines, there are two possible variants, motion and force. When the modification of motion is considered, neglecting the consideration of the forces producing or produced by that motion, the study is called the kinematics of machines. The general problem of this part of the subject is the determination of the comparative motions of the several parts of a machine. In this case, since considerations of force are not involved, the elements of a machine may be supposed to be skeleton links, and the relative motion of these links may be studied without further disturbing considerations.

"If, on the other hand, the modification of the forces only is considered and the relative motion of the skeleton links of the machine not taken into account, the study is called statics. Statics is concerned with the equilibrium of resistant bodies. For static purposes a machine may be regarded as a structure having pin joints.

"After gaining some idea in these two ways of the motion and forces transmitted by the machine parts, the skeleton links must be replaced by actual links. The size and proportion of the various parts must be discussed so that these parts are neither unnecessarily strong, involving a needless amount of material, nor too weak, involving a risk of fracture, or breakdown. This study is called machine design.

"Lastly, the effects of the motion of the actual links must be considered. Other forces than statical are induced due to the inertia, etc., of the moving parts. The study of these problems leads us to the kinetics of machines."

This analysis indicates the author's plan in dealing with the subjects that are embraced in the theory of machines, namely, the kinematics of machines, and the dynamics of machines, which combines statics and kinetics. The elements of machine design are not included in the text.

In order to obviate the necessity of constantly reverting to elementary matters, the author elaborates those fundamental parts of the elements of mechanics which his experience has taught him give rise to certain misconceptions and difficulties on the part of the student.

This is the second edition of Mr. McKay's book, the first edition having been published in 1915. No drastic changes have been made in the original text, the new matter consisting largely of minor alterations and additions.



The Theory of Modern Optical Instruments. By Alexander Gleichen. Translated from the German by H. H. Emsley and W. Swaine. Second Edition. H. M. Stationery Office. London. 1921. 6" x 9 3/4". 365 pp. Price, 13/6.

The publication of this translation of Dr. Gleichen's *Die Theorie Der Modernen Optischen Instrumente* is a result of the efforts of the Privy Council For Scientific and Industrial Research to assist the optical instrument making industry by the translation and publication of certain foreign works. Messrs. Emsley and Swaine of the firm of Barr and Stroud had begun the translation of Dr. Gleichen's work, one of the books recommended, and agreed to complete the English revision for the Committee.

To quote from the translators' preface: "Dr. Gleichen has divided his work into two portions. In the first he has given a very clear resumé of the more important laws of refraction at spherical surfaces and of the formation of images by lenses and their combinations; the second portion deals with the direct application of these laws to the particular instruments described therein. But portions are written so as to be intelligible to the more elementary student who may not possess the advanced mathematical training necessary for the understanding of more difficult treatises; and, moreover, in such a manner as to permit of ready application."

An idea of the treatment of the subject matter contained in this volume may be had from the chapter headings. In Part I on General Theory are included chapters on Fundamental Ideas, The Laws of Reflection and Refraction, Dispersion and Prisms; Image Formation by a Centred System of Spherical Surfaces in the Paraxial Region; Power and Convergence; Limitation of Rays, Sharp and Blurred Image Formation and Depth of Focus; Rays outside the Paraxial Region and Aberrations. Part II on Optical Instruments includes chapters on the following: The Human Eye; General Theory of Optical Instruments; The Magnifying Glass; The Telescope; Stereoscopy and Vision through Binocular Telescopes; Range Finders; Cystoscopes; The Microscope; The Photographic Objective; Ophthalmic Optics; Aphantism. A complete and modern bibliography and a valuable index appear at the end of the volume.

From the military as well as the commercial standpoint this treatise is of inestimable value to the student and the expert engaged in the problem of the optical instrument.

Messrs. Emsley and Swaine have succeeded in presenting a valuable treatise that occupies a distinct place. Much credit is due the publishers.



Within the Atom. By John Mills. D. Van Nostrand Co. New York. 1922. 5 1/2" x 8". 225 pp. 22 ill. Price, \$2.50.

If an atom is no longer considered an indivisible particle of matter, what is it made up of? What is an electron, and what is its relation to an atom? What is the relation between an electron and a proton? These and many other related questions the author endeavors to answer so that the reader with no previous knowledge of electricity, mechanics or chemistry may become familiar with the basis of modern physical science.

To write a popular explanation of this new science which starts with the in-

visible and intangible entity of electricity would seem almost impossible, but the author has handled his material so skillfully that the non-scientific reader finds little difficulty in following his explanation.

Mr. Mills deals with modern theories as to matter and energy without mathematical formulation so clearly and entertainingly that one cannot but be impressed with the advances in science that have been made since the discovery of the electron.

In order that the reader may get some idea of the quantitative relationships the author has put into an appendix a clear and concise explanation of the magnitudes of electrons and quanta. This he follows with a glossary.



MATHEMATICS

The Calculus. By Ellery William Davis and William Charles Brenke. The Macmillan Co. New York. 1922. 5" x 7½". 410 pp.

This revised edition of the Davis Calculus was prepared by William C. Brenke and E. R. Hedrick and appears ten years after its original presentation.

In the preface to the first edition Professor Davis said: "The significance of the calculus, the possibility of applying it in other fields, its usefulness, ought to be kept constantly and vividly before the student during his study of the subject, rather than be deferred to an uncertain future."

That he succeeded in his plan of bringing out to the student the real significance of the calculus has been amply vouched for during the ten years of its use. Its revision was necessary in order to make the required changes in the exercises which experience indicated were necessary, and to make some minor changes in the arrangement of topics.



Elementary Calculus. By Williams F. Osgood. The Macmillan Co. New York. 1921. 5¼" x 7¾". 224 pp. Illustrated.

The aim of Professor Osgood is "to present the elements of the differential calculus in a form easily accessible for the undergraduate." "It is possible, from the very beginning" says the author, to quote from the preface, "to illustrate the ideas and methods of the calculus by means of applications to physics and geometry, which the student can readily grasp, and which will seem to him of interest and value. To do this, the stress in the illustrative examples worked in the text must be laid first of all on the thought which underlies the method of solution, in distinction from the exposition of a process, reduced in the worst teaching to rules, whereby the answer can be obtained."

What may serve to show what is here meant is the author's treatment of problems in curve tracing in Chapter III and VII, and maximum and minimum problems in Chapter III such as the following on page 49,—"From a piece of tin 3 ft. square a box is to be made by cutting out equal squares from the four corners and bending up the sides. Determine the dimensions of the box of this description which will hold the most."

One important feature of this text is the stress given the application of graphical methods to the approximate solution of numerical equations, which do not come under the standard rules of algebra and trigonometry. Chapter VII which is devoted to these applications, includes the well known methods, interpolation, Newton's Method, and successive approximations.

Not only are whole chapters devoted to applications but many varied exercises are distributed throughout the text as each new step is explained. Chapter I

is given over to the introduction, 10 pages; Chapter II is devoted to differentiation of algebraic functions and general theorems; Chapter III, to application; Chapters IV, V and VI, to infinitesimals and differentials, trigonometric functions, and logarithms and exponentials, respectively; Chapter VII as noted above, to applications; and Chapter VIII, to the inverse trigonometric functions," with special reference to their one great application in the elements of mathematics, namely, their application to integration.

    
College Algebra. By William B. Fite. D. C. Heath and Co. New York. 1921.
 5" x 7½". 347 pp. Cloth. Price, \$1.96.

The opinion generally prevails that of those taking freshman mathematics mighty few have any real desire to know the elements of ordinary algebra. In examining such a text, it is very important then to learn whether the author has planned his work for that class of students who desire to know the elements of algebra, or for the average beginner in freshman mathematics, whose interest in such a subject is usually difficult to arouse.

Professor Fite in answer to this important question, says: "I have selected the problems with a view to convincing the student that algebra is a body of principles by the aid of which certain kinds of important information can be obtained from data that do not give this information explicitly. Many problems have been selected that illustrate the simpler principles of physics, geometry, and analytic geometry. The analytic geometry problems are somewhat of an innovation in a text of this kind, and objection may be made that the difficulties of this subject ought not to be added to those inherent in the algebra. But there is a decided advantage in making the student feel that mathematics is one."

The new material included in this revised edition of Professor Fite's book is an explanation of Newton's method, and a chapter on the theory of investment with four special compound interest tables. As a satisfactory text for freshmen requirements, it covers the ground admirably.

    
Elementary Functions and Applications. By Arthur S. Gale and Charles W. Watkeys. Henry Holt and Co. New York. 1920. 5" x 7½". 436 pp.

The authors present under the above title their idea of a combination course in mathematics for freshmen. In the preparation of their work, they had principally in mind that large group of freshmen who do not continue the study of mathematics in the following years.

In considering some of the questions, such as the training in analysis, teaching the usefulness of mathematics, the applications to problems of everyday sciences, that pertain to a unified course in mathematics, the authors' point of view may well be considered. The following features embody their plan:

"1. The chapter on the theory of measurements gives an outline of statistical methods which are used in many fields such as economics, biology, physics, education, etc.

2. Emphasis is placed upon the determination of a function from a given table of empirical data.

3. Graphical methods of analyzing problems are used freely.

4. Graphical methods are used in problems which can be solved by straight lines, and an algebraic solution is then obtained by finding the equation of certain lines used in the graphical solution.

5. Use is made of the graphs of the trigonometric functions in tying together and affording the means of recalling many properties of these functions.

6. Trigonometric analysis, the most abstract topic included, is postponed until late in the course.

7. The introduction of a considerable amount of the elementary portions of the calculus gives the general student a knowledge of the importance and utility of the fundamental ideas of derivative and integral.

8. The average rate of change of a function is introduced at the start, and is used in studying the linear function.

9. Integration is used to obtain the volume of a pyramid, cone and sphere.

10. Tables of squares, square roots, etc., that is, tables of functions familiar to the student, are used in advance of other tables. The table of logarithms is introduced as a general tool, and is not regarded as something to be used primarily with the trigonometric functions.

11. The use of the slide rule and of logarithmic and semi-logarithmic cross-section paper, are explained in connection with the logarithmic function."

Other interesting material is revealed from a more detailed perusal of the book. The authors have used the text in classroom for the past eight years, revising it from year to year.

The figures and graphs are many and well done, the large number of exercises throughout the text add greatly to its value for student use, and the book as a whole is well printed and attractive.



Elementary Vector Analysis. By C. E. Weatherburn. G. Bell and Sons, Ltd. London. 1921. Am. Agents, The Open Court Pub. Co. Chicago. 5½" x 8¾". 184 pp.

Dr. Weatherburn has made a very effective plea for a more general use of vector analysis in applied mathematics in the production of this text, with its application to geometry and physics.

His object was to provide a simple exposition of elementary vector analysis, and to show how it may be employed with advantage in geometry and mechanics. He makes no claim that his book is a complete textbook in either subject but he does cover much ground in both of them.

If the beginner does not wish to go into the subject as fully as it is treated in the text he may use the short course outlined by the author. For those students who are interested more in mechanics than in geometry another special course is given as a guide.

This book is one of Bell's Mathematical Series, Advanced Section, which includes text-books on elementary differential equations, nomography, non-euclidean geometry, projective vector algebra, and statistics and is up to the excellent standard maintained by the publishers of this series.



Elements of the Differential and Integral Calculus. By William S. Hall. D. Van Nostrand Co. New York. 1922. 6" x 9". 250 pp. Illustrated. Price, \$2.75.

A second edition, revised, of Professor Hall's "Elements of the Differential and Integral Calculus with Applications," now appears, twenty-five years after the first edition was published. Although Chapters I, IV and V have been entirely rewritten, the text as a whole is practically unchanged and compares favorably with the generally accepted texts of more recent publication.

The author's plan of first establishing the fundamental formulas of differentiation and then immediately proceeding to the inverse operations or integration, thus emphasizing the unity of the two branches of calculus, has been well received and much appreciated.

The chapter on differential equations is preserved in the revised editions, and many varied and interesting examples have been added.

Professor Hall's plan was "to present the calculus and some of its important applications simply and concisely, and yet to give as much as it is necessary to know in order to enter upon the study of those subjects which presume a knowledge of the calculus."



Elements D'Analyse Mathématique. By Paul Appel. Gauthier-Villars et Cie. Paris. 1921. $6\frac{1}{2}'' \times 10''$. 715 pp.

The fourth edition of Appel's Elementary Mathematical Analysis appears twenty-two years after the original publication. For those not familiar with this text it may be noted that particular emphasis is given the uses of analysis on physics and mechanics as well as geometry.

The work is designed primarily for engineers and physicists. It has been wholly revised and extended and many examples have been added. An important feature is the solution of particular problems to illustrate different subjects.



First Course in the Theory of Equations. By Leonard E. Dickson. John Wiley and Sons. New York. 1922. $6'' \times 8\frac{1}{2}''$. 168 pp.

It is a treat to find an elementary text by a brilliant mathematician, that meets the many needs of the student. Dr. Dickson planned his book with great care and after wide consultation, having in mind the students' earlier and future mathematical courses.

In the opinion of the author, "The theory of equations is not only a necessity in the mathematical courses and their applications, but furnishes an illuminating sequel to geometry, algebra and analytic geometry. Moreover, it develops anew and in greater detail various fundamental ideas of calculus for the simple, but important, case of polynomials. The theory of equations therefore affords a useful supplement to differential calculus whether taken subsequently or simultaneously."

There are chapters on complex numbers with simple and direct discussion of the roots of unity; on elementary theorems on the roots of an equation; constructions with ruler and compasses, including the trisection of an angle and the construction of regular polygons of 7, 9, 17 and 20 sides; a chapter devoted to cubic and quartic equations; one to plotting the graph of an equation; isolation of the real roots; solution of numerical equation, using Horner's method and Newton's method; a long chapter on determinants, independent of the earlier chapters, with their application to the solution of equations; a chapter on symmetric functions; and the final chapter on elimination, resultants and discriminants.

The book contains many practical applications and numerous exercises of great variety.



Graphic and Mechanical Computations, Parts I and II, by Joseph Lipka. John Wiley and Sons. New York. 1921. $6'' \times 9''$. Part I, 119 pp.; Part II, 259 pp.

Dr. Lipka has simply divided his text on nomograms first published in 1918 into two parts. Part I, which embraces the first five chapters of the original publication, is entitled "Alignment Charts." It includes chapters on "Scales and the Slide Rule," "Network of Scales Charts for Equations in Two and Three Variables," and "Nomographic or Alignment Charts."

Part II, entitled "Experimental Data," comprises chapters on "Empirical Formulas—Non-Periodic Curves," "Interpolation," and "Approximate Integration and Differentiation."

With the development of the nomogram by Professor M. D'Ocagne of Paris, wide recognition has been given the value of this form of chart not only by engineers but by others who now fully appreciate their great saving in the labor of computations.

The author has embodied in these volumes a course given by him for a number of years in the Mathematical Laboratory of the Massachusetts Institute of Technology.



Introduction to Mathematical Analysis. By F. L. Griffin. Houghton Mifflin Co. New York. 1921. $5\frac{1}{4}'' \times 7\frac{3}{4}''$. 512 pp. Price, \$2.75.

For the past nine years the author has given a course in mathematical analysis to college freshmen. His central object was to present a unified course which would include trigonometry, college algebra, analytic geometry, and calculus, so as to enable the student to get some conception of the character and possibilities of modern mathematics and of the relations of its several branches as parts of a unified whole. This object could not be accomplished by the separate subject plan in the case of students who can take only one semester's work. The requisites for this course are plane and solid geometry, and algebra through quadratics.

This book is not written for the writing; it is the product of teaching, the materials presented having been thoroughly tried out. The explanations are brief but sufficient, and the many exercises are more than enough for student use. It is well printed, attractive in appearance, and ample for a beginner's course.



History of The Theory of Numbers. Volumes I and II. By Leonard Eugene Dickson. Carnegie Institution. Washington, D. C. 1919 and 1920. $7\frac{1}{2}'' \times 10\frac{1}{4}''$. 486 and 803 pp.

Those who are familiar with Professor Dickson's first volume in this series of three of the "History of The Theory of Numbers," will welcome this second volume on Diophantine Analysis. This prodigious task in the realms of pure science is worthy of great praise, but the reward for such a project comes almost wholly from the satisfaction of work well done.

In the preface to Volume I the author says: "The theory of numbers is especially entitled to a separate history on account of the great interest which has been taken in it continuously through the centuries from the time of Pythagoras, an interest shared on the one extreme by nearly every noted mathematician and on the other extreme by numerous amateurs attracted by no other part of mathematics. This history aims to give an adequate account of the entire literature of the theory of numbers. The first volume presents in twenty chapters the material relating to divisibility and primality." Further on in the preface, the author in referring to the great names in mathematics, says: "At the end of the volumes is a separate index of authors for each of the twenty chapters, which will facilitate the tracing of the relation of a paper to kindred papers and hence will be of special service in the case of papers inaccessible to the reader. The concluding volume will have a combined index of authors from which will be omitted minor citations found in the chapter indices."

In Volume II on Diophantine Analysis the author makes report of upwards of 5000 writings. Besides the work of many experts in proof-reading, the author

devoted a large part of his time for fifteen months to the proof-sheets, comparing them with his original notes, checking computations, comparing reports and readers' suggestions with the original papers, adding reports on current papers, repeating the work done on the manuscript of examining minutely all the reports for results needing citation elsewhere by cross-reference, and inspecting every change made in the proof of the twenty-six chapters embodying this volume. Truly a monumental work.

A concluding Volume III will treat of quadratic and higher forms.



Infinitesimal Calculus. By F. S. Carey. Longmans, Green and Co. New York. 1919. $5\frac{1}{2}'' \times 8\frac{3}{4}''$. 361 pp. Price, \$5.20.

This book is intended not for any special group of students; rather it is "designed for those who desire to use the infinitesimal calculus in the attainment of further knowledge."

In Chapter I, number, function and graph are considered, those domains with which the student ordinarily is familiar. Then follow limit, continuity; differential coefficient; algebraic functions; function of a function; second differential coefficient; inverse differentiation; areas, volumes; and moments by integration. This gives an idea of what is included in the first part.

The complementary part, in which are embodied many of the less familiar functions, includes the following: exponential and hyperbolic functions; motion of a particle along an axis; definite integral; polar coordinates; partial differentiation, double integration; expansion in power series; envelopes, evolutes and roulettes; differential equations; and graphics and nomography. The usual notation with the possible exception of the arrow with a single barb, either upper or lower, which has been successfully tried out in class, and now appears in print for the first time, is used throughout the text.

This book is one of the Longmans' *Modern Mathematical Series*. The author gives no historical notes or references, for the reason that the sources of such information are readily accessible. Not the least important feature is the large variety of exercises.

The book is well printed and neat in appearance, and occupies a distinct place.



Periodic Orbits. By F. R. Moulton. Carnegie Institution, Washington, D. C. 1920. $9'' \times 11\frac{1}{2}''$. 524 pp.

This scholarly work of Professor Moulton and his associates is deserving of careful study particularly by students of "Celestial Mechanics," for although in the greater part of it complete mathematical rigor has been insisted upon, the development has been in a form applicable to practical problems in celestial mechanics. It is also of special interest to students of theoretical ballistics for it will be remembered that Major Moulton successfully applied his knowledge of the orbits of Heavenly bodies to the computation of the trajectory. As a result of his labors and those of many other able mathematicians a practical "short arc" method was evolved. This "short arc" method slightly modified is the one now used by the Ordnance Department of the U. S. Army.

This investigation of the problem of three bodies resulted in the finding of infinitely many families of periodic orbits whereas only a few such families were previously known. This work was started in 1900 and all but the last chapter were completed by 1912. The investigations and computations contained in the last chapter were completed in 1917. Due to service in the army the work was laid aside and later completed.

Professor Moulton's investigation offers a fascinating field for study. The result of his labor and that of his collaborators is not only characterized by careful research but is a finished example of the printer's art, thanks to the Carnegie Institution.



Non-Euclidean Geometry. By Roberto Bonola. Translated by H. S. Carslaw. The Open Court Publishing Co. Chicago. 1912. $5\frac{1}{4}''$ x $7\frac{3}{4}''$. 268 pp.

This text on Non-Euclidean Geometry, a critical and historical study of its development, by Professor Bonola is of inestimable value to those engaged in the training of teachers in this subject.

Professor Carslaw, the translator of this authorized English edition, maintains that the recent changes in the teaching of elementary geometry in England and America are sufficient reasons to tell something of the growth of this science, of the hypothesis on which it is built, the hypotheses on which rest Euclid's theory of parallels, of the long discussion to which that theory was subjected, and of the final discovery of the logical possibility of the different Non-Euclidean Geometries.

The elementary way in which the author treats these questions and the simplicity of the treatment of the subject as a whole are carefully preserved in the translation.



Plane and Solid Analytic Geometry. By William F. Osgood, and William C. Graustein. The Macmillan Co. New York. 1921. $5\frac{1}{4}''$ x $7\frac{3}{4}''$. 614 pp. Illustrated.

Usually when the student begins to study how the methods of algebra can be applied to the study of geometry, he finds himself in a maze of formulas. The authors of this text on analytic geometry after explaining in the introduction how to use positive and negative numbers in geometry, devote Chapter I to rectangular coordinates, and the simple applications embracing distance between two points, slope of a line, curve plotting and the equation of a curve, illustrating each point with numerous exercises.

Following this elementary grounding the straight line is considered in Chapter II, followed by applications in Chapter III. A chapter is devoted to each of the conic sections, a chapter to polar coordinates and one to the transformation of coordinates, before the student is introduced to the general equation of the second degree. The last chapter of the first part of the text includes, determinants and their applications. The complementary part devoted to solid analytic geometry embraces 200 pages, one-half the space devoted to plane analytic geometry, and includes quadric surfaces, spherical and cylindrical coordinates, as well as surfaces of revolution.

"The book is designed" say the authors, "to be at once an introduction to the subject and a handbook of the elements. May it serve alike the needs of the future specialists in geometry, the analyst, the mathematical physicist, and the engineer."



Six-Place Tables. The McGraw-Hill Book Co. New York. 1922. 4'' x $6\frac{3}{4}''$. 124 pp.

This pocket-sized book of tables is very like a suit of faultless cut. For the student, the teacher and the engineer it would be hard to imagine a more compact, a neater, or more comprehensive volume of engineering tables.

The publishers have incorporated in this handy volume nothing new, radical or untried, but the contents, which have been taken from books of formulas and tables, handbooks and pocket-manuals, have been arranged in such a way as to make the book a work of unique value.

The little book contains eight tables. Table I contains Squares, Cubes, Square Roots, Circumferences and Areas from 1 to 1000; Table II, Fifth Roots and Fifth Powers from 0.1 to 40; Table III, Circumferences and areas of Circles from $1/64$ to 100; Table IV, Logarithms of Numbers, six places, from 100 to 1000; Table V, Logarithmic Sines, Cosines, Tangents and Cotangents, six places, for degrees and minutes, with difference column for 1 second, from 0° to 45° ; Table VI, Natural Sines and Cosines, five places, from 0° to 54° ; Table VII, Natural Tangents and Cotangents, five places, from 0° to 45° ; and Table VIII, Trigonometric Formulas.



Vector Calculus. By James Byrnie Shaw. D. Van Nostrand Co. New York. 1922. $5\frac{1}{2}'' \times 8\frac{3}{4}''$. 310 pp. Illustrated. Price, \$3.50.

It has been suggested that addition of vectors could be well given in geometry, the multiplication in trigonometry, the differentiation and integration in calculus, and the applications as part of the scientific subjects to which they pertain. In planning his text on *Vector Calculus*, Professor Shaw was mindful of the difficulty he has had with other texts, in which the mathematical student, after going through a few very elementary notions, "is suddenly plunged into the profundities of mathematical physics, as if he were familiar with them." His object is to make the student "familiar with them by easy graduations."

Vector Calculus, to quote from the introduction, "is a system of mathematical thinking which makes use of a special class of symbols and their combinations according to certain given laws, to study the mathematical conclusions resulting from data which depend upon geometric entities called vectors, or physical entities representable by vectors, or more generally entities of any kind which could be represented for the purposes under discussion by vectors."

The author has found that the use of quaternions is the simplest method both in theory and practice. He develops his theory in the first part of each chapter, and concludes with applications and exercises. The first chapter is devoted to the introduction, the following chapters to scalar fields, vector fields, addition of vectors, vectors in a plane and vectors in space, respectively. Chapter VII contains applications to loci, moments, etc.; Chapter VIII, differentials and integrals; Chapter IX, the linear vector functions; Chapter X, deformable bodies; and Chapter XI, hydrodynamics. The large variety of exercises makes this text extremely valuable, not only to the mathematical student but more particularly to the student of physics.



MISCELLANEOUS

Auto Trails and Commercial Survey of the United States. By George F. Cram Co. New York City. 1922. $11\frac{3}{4}'' \times 15''$. 136 pp. Paper. Price, \$5.00.

In a sense this book is an abbreviated atlas. It contains an excellent fund of information of value to everybody and of importance to the prospective tourist who wishes to make a preliminary outline of a trip. Because of its size and shape, it is only adapted to home or office consultation and is altogether unsuitable for use on the road, and for this reason is not to be compared with the well known automobile tour books. The maps with the indexed keys are excellent which

together with the general postal information and the chart of travel distances between cities make this book a very valuable one.



Dyke's Automobile and Gas Engine Encyclopedia. 13th ed. Chicago. Goodheart-Willcox Company. 1922. 7" x 10". 1238 pp. Cloth, \$6.00. Flexible Morocco, \$7.50.

The present edition of this valuable work has one outstanding improvement over previous editions. The old "chart" pages have been discontinued, and one does not need to "see part 16-A, Chart XIV," but finds the information so arranged and consolidated as to be instantly available.

The index seems even more complete than in earlier editions. A severe check shows practically no omissions, and the arranging has been made most complete; under name of car, under part; and under operation or function of each part.

The "Digest of troubles" is very complete. It brings out, in a concise manner, every possible fault that could produce a certain symptom. The operating instructions, amplified with sketches of control boards and gear shifts, is sufficient to enable any one who understands the operation of automobiles to control and drive any make.

One rather minor, but unusual error was noted by the reviewer: under "Touring Pointers," the "Auto Blue Book" is listed as consisting of twelve volumes, whereas it has been published in four volumes for the past two years at least.

All things being considered, however, this is the book that will best satisfy the amateur who likes to do his own minor repairing and adjusting, as well as for the repairman who wants a complete reference book describing all makes of cars. It is well worth its price.



Map Reading. By G. H. C. Dale. The Macmillan Company. New York. 1921. 5" x 7". 169 pp. Cloth.

Mr. Dale has prepared a book which explains the smallest detail in the mechanics of sketching, map making and map reading. He has unquestionably accomplished his purpose of providing a means whereby those interested may become proficient practical map readers.

The two appendices contain examples worked out which the student at home or "in the field" might encounter. In addition there are some seventeen charts and maps which supplement the text.

The book is well prepared, comprehensive and of a convenient size.



Rand McNally Commercial Atlas of America. Rand McNally Company, Chicago. Ill. 1921. 16" x 21". 500 pp. Cloth. Price, \$15.00.

This edition contains accurately and attractively prepared large scale maps of all the states in the United States and the outlying possessions together with large continental maps of all foreign countries, showing all recent boundary changes.

In addition there is an alphabetical index of more than 150,000 place names and names of physical features, with the key to location on maps; latest available population figures, chief posts of call; many industrial, commercial and historical notations; altitudes of principal mountains, lengths of chief rivers, and the depth of principal lakes.

This atlas contains a truly remarkable fund of information which should be available for reference by students and business men alike.

INDEX TO VOLUME 57

JULY-DECEMBER, 1922

I. Authors

Arthur Robert. Coast Forts in Colonial Maine.....	217
Arthur, Robert. Tidewater Forts of Colonial Virginia.....	3
Ashford, Sanford D. Radio Communication in Coast Artillery....	164
Barnes, H. C. The Mission of the Coast Artillery Corps.....	479
Barnes, H. C., Jr. Some More Dope on Shooting.....	501
Barron, F. W. The Future of the Defense of Coast Fortresses Against Attacks by Land, Sea, and Air, During the Next Ten Years.....	449
Bender, Louis B. What Ails Our Fire Control Telephones.....	21
Birnie, Upton, Jr. G. H. Q. and Its Relation to the War De- partment General Staff.....	492
Bradshaw, Aaron, Jr. Suggestions for Training the Anti-Aircraft Gunner.....	209
Bunker, Paul D. A Range Corrector.....	338
Dickerson, Dorrell G. Mental Conflicts in War.....	130
Dunn, John M. Notes on Water Work in Submarine Mining....	143
Dyer, Edward L. The Army Music School.....	140
Erickson, Hjalmar. War, Its Nature, Doctrines and Methods....	306
Fenner, Raymond H. A Few Comments on Preparedness.....	58
Fisher, M. N. The 1922 Encampment of the Coast Artillery Vir- ginia National Guard.....	322
Goodrich, Walter R. A Miniature Range and Gun.....	513
Greenwood, Donald B. Deviations and Errors.....	160
Hardaway, F. P. Tr. Perney. Organization and Command of the Heavy Artillery of an Army Corps.....	122
Harris, Frank E. Tr. Maitre, A. The American Artillery In France.....	383
Haw, Joseph C. Improved Training Methods for the Fixed De- fenses.....	97
Hazeltine, R. H. Major Hazeltine on Analysis. (Editorial)....	345
Hinman, Dale D. Cotangent Method of Anti-Aircraft Search- light Control.....	435
Jarman, Sanderford. Land Artillery to the Fore.....	408
McCleary, Wm. R. The Coast Artillery Reserve Association, New York District, 2nd Corps Area. (The Bulletin Board)....	279
McConnell, Chrystie. The Training of Coast Artillery Signal Details.....	325
McGlachlin, Edwin F. The Army War College.....	287
McGlachlin, E. F. The Test by Principles.....	1
Maitre, A. The American Artillery in France.....	383
Miller, L. A. Summary of Tests of Caterpillar Adapters for the G. P. F.....	523

INDEX

Morford, J. A. On the Firing Line of the Industrial Sector.	
Part I.....	332
Part II.....	400
Part III.....	485
Morgan, Maurice. Cotangent Method of Anti-Aircraft Searchlight Control.....	435
Officer of the Coast Artillery. The Coast Artillery Garrisons in Panama.....	193
Peace, W. G. Troop Leadership.....	40
Perney. Organization and Command of the Heavy Artillery of an Army Corps.....	122
Potts, Adam E. Origin of the Journal of the United States Artillery.....	118
Pratt, John S. Errors of Range and Azimuth Prediction Boards.....	529
Prentice, James. A Universal Plotting Board for Stationary Targets.....	239
Ruhlen, George. Tr. The War of Stagnated Fronts.....	249
Seton, Sir Bruce. Notes on Scottish Artillery in the 16th Century	243
Seydel, Fred. A Single Base Line for a Fire Command.....	135
Taylor, G. A. Guy B. G. Hanna. (The Bulletin Board).....	87
Thomason, C. Y. The National Significance and Importance of the Reserve Officers Training Corps.....	253
Whittaker, L. A. 16-Inch Gun Making at Watervliet Arsenal.....	49
Wildrick, Meade. A Study on Organization and Training for Coast Artillery Troops.....	315
Williford, Forrest E. Army Training in Relation to National Conduct and Citizenship.....	531
Wood, Charles M. Travel Suggestions. (The Bulletin Board).....	557

II. Subjects

Air Service—Training.	
Joint Coast Artillery and Air Service Training (Bulletin Board)	361
The American Artillery in France	383
Analysis	
Major Hazeltine on Analysis. (Editorial).....	345
Anti-Aircraft Defense	
Cotangent Method of Anti-Aircraft Searchlight Control.....	435
An Appreciation. (Bulletin Board).....	285
The Army Music School.....	140
The Army Relief Society. (Bulletin Board).....	183
Army Training in Relation to National Conduct and Citizenship	531
The Army War College.....	287
Artillery, Anti-aircraft	
Suggestions for Training the Anti-aircraft Gunner.....	209
Artillery Coast—Garrisons	
The Coast Artillery Garrisons in Panama.....	193
Artillery, Coast—Militia	
The 1922 Encampment of the Coast Artillery Virginia National Guard.....	322
Artillery, Coast—Mission	
The Mission of the Coast Artillery Corps.....	479

INDEX

Artillery, Coast—Organization	
A Study on Organization and Training for Coast Artillery Troops.....	315
Artillery, Coast—Signaling	
The Training of Coast Artillery Signal Details.....	325
Artillery, Coast—Training	
The Mission of the Coast Artillery Corps.....	479
Improved Training Methods for the Fixed Defenses.....	97
Joint Coast Artillery and Air Service Training. (Bulletin Board)	361
A Study on Organization and Training for Coast Artillery Troops	315
Artillery, heavy	
Beaten Zone, The	
Employment of heavy artillery	
Problem No. 1.....	81
Solution.....	171
Problem No. 2.....	176
Solution.....	266
Problem No. 3.....	269
Solution.....	352
Problem No. 4.....	353
Solution.....	470
Problem No. 5.....	473
Solution.....	553
Problem No. 6.....	555
Land Artillery to the Fore.....	408
Artillery, Heavy—Organization	
Organization and Command of the Heavy Artillery of an Army Corps.....	122
Artillery, Scotland, 16th Century	
Notes on Scottish Artillery in the 16th Century.....	243
As to Poison Gas. (Editorial).....	168
Balboa, the Pacific Entrance to the Panama Canal. (Illus.).....	193
Bands	
The Army Music School.....	140
Battery at Fort Monroe about 1863. (Illus.).....	1
Beaten Zone, The	
Course in Employment of Heavy Artillery.....	80
Problem No. 1.....	81
Solution.....	171
Problem No. 2.....	176
Solution.....	266
Problem No. 3.....	269
Solution.....	352
Problem No. 4.....	353
Solution.....	470
Problem No. 5.....	473
Solution.....	553
Problem No. 6.....	555
Extracts from Provisional Service Regulations for Railway Artillery	177
Extracts from "The Reconnaissance for and the selection and occupation of Battery Positions for Heavy Artillery," Coast Artillery School.....	272

INDEX

Orientation	
Problem No. 9.....	85
Problem No. 10.....	86
Boards, Prediction	
Errors of Range and Azimuth Prediction Boards.....	529
Book Review Section. (Editorial).....	545
Bulletin Board, The	
An Appreciation.....	285
The Army Relief Society.....	183
California Reserve Officers Assigned to Presidio Posts.....	184
The Citizens' Military Training Camp at Fort Monroe.....	357
The Coast Artillery Rifle Team in the National Matches.....	363
Doings of the Coast Artillery Rifle Team.....	283
55th Artillery Continuing Moving Target Work with G.P.F....	474
Guy B. G. Hanna.....	87
Joint Coast Artillery and Air Service Training.....	361
The Coast Artillery Reserve Association, New York District, 2nd Corps Area.....	279
Memorial Cross.....	185
13th Coast Defense Command, N. Y., National Guard in- augurates scheme of civic cooperation.....	474
Travel Suggestions.....	557
California Reserve Officers Assigned to Presidio Posts (Bulletin Board).....	184
Canal Zone	
The Coast Artillery Garrisons in Panama.....	193
Carriages, Gun—Caterpillar	
Summary of Tests of Caterpillar Adapters for the G.P.F.....	523
Citizens Military Training Camp at Fort Monroe. (Bulletin Board)	357
Citizenship	
Army Training in Relation to National Conduct and Citizenship	531
Coast Artillery Board Notes	
Work of Board for Months of:—	
May.....	70
June.....	170
July.....	260
August.....	350
September.....	467
October.....	550
Coast Artillery Fable, A. (Editorial).....	256
Coast Artillery Garrisons in Panama	
Officer of the Coast Artillery.....	193
Coast Artillery Reserve Association New York District, 2nd Corps Area. (Bulletin Board) (Illus.).....	279
Coast Artillery Rifle Team. (Illus.).....	479
Some More Dope on Shooting.....	501
Coast Artillery Rifle Team in the National Matches. (Bulletin Board).....	363
Doings of the Coast Artillery Rifle Team. (Bulletin Board)---	283
Coast Defense	
Future of Defense of Coast Fortresses Against Attacks by Land, Sea and Air.....	449

INDEX

Coast Forts in Colonial Maine.....	217
Coincidence Target Computer, Model E	
Target Computers under Test. (Coast Artillery Board Notes).....	72
Cotangent Method of Anti-Aircraft Searchlight Control.....	435
Cover, The. (Editorial).....	68
Dardanelles—Siege	
Gallipoli in 1914.....	540
Deviations and Errors.....	160
Doings of the Coast Artillery Rifle Team. (Bulletin Board).....	283
“Duncan” Gold Medal Essay, 1921-1922.	
The Future of the Defense of Coast Fortresses.....	449
Editorial	
The Book Review Section.....	545
A Coast Artillery Fable.....	256
As to Poison Gas.....	168
Coast Artillery-Air Service Training.....	67
Colonel James M. Williams, Deceased.....	342
The Cover.....	68
55th Artillery, C. A. C., Develops G.P.F. as Seacoast Weapon.....	347
Four Years Ago.....	464
Grandmother, Baseball and Other Things.....	465
Major Hazeltine on Analysis.....	345
Making the Best of Things.....	545
Memorial to American Dead.....	169
The Message of the Christmas Seal.....	543
A New Name for an Old Journal.....	64
The Non-Commissioned Officer and National Defense.....	545
The Prize Essay Competition.....	69
A Question.....	259
Sub-Caliber Practice.....	167
United We Stand.....	344
Employment	
Morford, J. A. On the Firing Line of the Industrial Sector.	
Part I.....	332
Part II.....	400
Part III.....	485
Errors of Range and Azimuth Prediction Boards.....	529
European War, 1914-18,—Artillery, U. S.	
The American Artillery in France.....	383
Few Comments on Preparedness, A.....	58
Fifty-Fifth Artillery, C. A. C., Develops G.P.F. as Seacoast Weapon.....	347
Fifty-Fifth Artillery Continuing Moving Target Work with G.P.F. (Bulletin Board).....	474
Fire Control	
What Ails Our Fire Control Telephones?.....	21
Followers of the North-Bound Cat.....	512
Fortifications, Colonial	
Tidewater Ports of Colonial Virginia.....	3
Four Years Ago. (Editorial).....	464
France—Artillery	
French Artillery Doctrine.....	535

INDEX

Future of the Defense of Coast Fortresses	
"Duncan" Gold Medal Essay, 1921-22.....	449
G.H.Q. and Its Relation to the War Department General Staff.....	492
Galitzka Panel	
The modified Galitzka Panel. (C. A. Board Notes).....	262
Gallipoli in 1914.....	540
Gases, Asphyxiating	
As to Poison Gas. (Editorial).....	168
Grandmother, Baseball and Other Things. (Editorial).....	465
Guns, 155-MM. G. P. F. 55th Artillery, C. A. C. Develops G. P. F. as Seacoast Weapon. (Editorial).....	347
Summary of Tests of Caterpillar Adapters for the G. P. F.	523
Guns, 14-Inch—Railway, 1920. The 14-Inch Gun, Railway, Model 1920. (Illus.).....	383
Hanna, Guy G. B. (Bulletin Board).....	87
Improved Training Methods for the Fixed Defenses.....	97
Index to Current Artillery Literature.....	370
Instructions	
A Few Comments on Preparedness.....	58
Joint Coast Artillery and Air Service Training. (Bulletin Board)...	361
Journal U. S. Artillery	
A New Name for an Old Journal.....	64
Origin of the Journal of the United States Artillery.....	118
Land Artillery to the Fore.....	408
Maine—Coast Defense, Early	
Coast Forts in Colonial Maine.....	217
Making the Best of Things. (Editorial).....	545
Management of Men	
Troop Leadership.....	40
Memorial Cross. (The Bulletin Board).....	185
Memorial to American Dead. (Editorial).....	169
Mental Conflicts in War.....	130
Message of the Christmas Seal, The. (Editorial).....	543
Military Art	
War, its Nature, Doctrines and Methods.....	306
Mines, Submarine	
Notes on Water Work in Submarine Mining.....	143
Miniature Range and Gun.....	513
Mission of the Coast Artillery Corps, The.....	479
Monroe, Fort. (Illus.)	
Battery at Fort Monroe about 1863.....	1
The Citizens Military Training Camp. (Bulletin Board).....	357
Governor E. Lee Trinkle of Virginia and party at Fort Monroe (Illus.).....	287
Snapshots of the 1922 Coast Artillery R. O. T. C. Camp at Fort Monroe. (Illus.).....	97
Morale	
Making the Best of Things.....	545
Music	
The Army Music School.....	140
National Significance and Importance of the Reserve Officers Training Corps.....	253

INDEX

National Tuberculosis Association	
The Message of the Christmas Seal. (Editorial).....	543
National Guard, the 1922 Encampment of the Coast Artillery Vir- ginia National Guard.....	322
Non-Commissioned Officer and National Defense. (Editorial).....	545
North-Bound Cat, Followers of the.....	512
Notes on Scottish Artillery in the 16th Century.....	243
Notes on Water Work in Submarine Mining.....	143
Observation, Aerial	
Coast Artillery—Air Service Training. (Editorial).....	67
Officers Reserve Corps	
The Coast Artillery Reserve Association New York District. (Bulletin Board).....	279
On the Firing Line of the Industrial Sector	
Part I.....	332
Part II.....	400
Part III.....	485
Ordnance—Manufacture	
16-Inch Gun Making at Watervliet Arsenal.....	49
Organization and Command of the Heavy Artillery of an Army Corps	122
Origin of the Journal of the United States Artillery.....	118
Panama Canal	
Balboa, the Pacific Entrance to the Panama Canal. (Illus.)	193
Panels, Signaling	
The Modified Galitzka Panel.....	262
Philippine Islands—Travel	
Travel Suggestions. (Bulletin Board).....	557
Plotting Boards	
A Universal Plotting Board for Stationary Targets.....	239
Positions, Battery	
Extracts from "The Reconnaissance for and the Selection of"	272
Preparedness	
A few Comments on Preparedness.....	58
Prize Essay Competition. (Editorial).....	69
Prize Essay Competition, 1921	
What Ails Our Fire Control Telephones? (Honorable Mention)	21
Improved Training Methods for the Fixed Defense. (Honorable Mention).....	97
Question, A. (Editorial).....	259
Radio Communication in Coast Artillery.....	164
Range Correction	
Deviations and Errors.....	160
Range Corrector, A.....	338
Range Finding	
A Single Base Line for Fire Command.....	135
Relocators, Target	
Target Computers under Test. (Coast Artillery Board Notes) .	71
Reserve Officers Training Camps	
Snapshots of the 1922 Coast Artillery R.O.T.C. at Fort Mon- roe. (Illus.).....	97
The National Significance and Importance of the R.O.T.C.....	253
Scottish Artillery in the 16th Century.....	243

INDEX

Searchlights	
Cotangent Method of Anti-Aircraft Searchlight Control.....	435
Shooting	
Some More Dope on Shooting.....	501
Signal Details	
The Training of Coast Artillery Signal Details.....	325
Single Base Line for Fire Command.....	135
16-Inch Gun Making at Watervliet Arsenal.....	49
Snapshots of the 1922 Coast Artillery R.O.T.C. at Fort Monroe. (Illus.).....	97
Some More Dope on Shooting.....	501
Study on Organization and Training for Coast Artillery Troops.....	315
Sub-Caliber Practice. (Editorial).....	167
Suggestions for Training the Anti-Aircraft Gunner.....	209
Summary of Tests of Caterpillar Adapters for the G.P.F.....	523
Tactics	
The Test of Principals.....	1
Target Computers Under Test.....	71
Target Ranges	
A Miniature Range and Gun.....	513
Telegraph, Wireless	
Radio Communication in the Coast Artillery.....	164
Telephones	
What Ails Our Fire Control Telephones?.....	21
Telephone, Wireless	
Radio Communication in the Coast Artillery.....	164
Test by Principles, The.....	1
Thirteenth Coast Defense Command, N. Y. National Guard, In- augurates scheme of Civic Cooperation. (Bulletin Board)---	474
Three Inch Anti-Aircraft Material—Trailer Mount. (Professional Note)	534
Tidewater Ports of Colonial Virginia.....	3
Training of Coast Artillery Signal Details.....	325
Travel Suggestions. (Bulletin Board).....	557
Trench Warfare	
The War of Stagnated Fronts.....	249
Trinkle, E. Lee	
Governor E. Lee Trinkle of Virginia and Party at Fort Monroe. (Illus.).....	287
Troop Leadership.....	40
United We Stand. (Editorial).....	344
Universal Plotting Board for Stationary Targets.....	239
U. S. Army War College.....	287
U. S. General Staff	
G.H.Q. and Its Relation to the War Department.....	492
Virginia—History—Bibl.	
Tidewater Ports of Colonial Virginia.....	3
Virginia—Militia	
The 1922 Encampment of the Coast Artillery Virginia National Guard.....	322
War, Psychology of	
Mental Conflicts in War.....	130
War, its Nature, Doctrines and Methods.....	306

INDEX

War of Stagnated Fronts.....	249
Water Work in Submarine Mining.....	143
Watervliet Arsenal	
16-Inch Gun Making at Watervliet Arsenal.....	49
What Ails our Fire Control Telephones?.....	21
Williams, James Mark—Deceased. (Editorial).....	342
Wilson Model E Target Computer.....	77

III. Book Reviews

Admirals of the Caribbean.....	560
Aeronautics.....	571
Aeroplane Structural Design.....	478
Airplane, The.....	372
America Faces the Future.....	91
American Democracy.....	378
American Expeditionary Forces in Europe, The.....	90
American Party System, The.....	94
Analytical Mechanics for Engineers.....	572
L'Artillerie dans l'offensive.....	90
Asia at the Crossroads.....	476
Auto Trails and Commercial Survey of the United States.....	589
Battle of April 19, 1775, in Lexington, Concord, Lincoln, Arlington, Cambridge, Somerville and Charlestown, Mass., The.....	91
Blocking of Zeebrugge, The.....	477
Building of an Army, The.....	379
Calculus, The.....	582
Causes of the War of Independence, The.....	561
Civil Engineers Pocket-book, The.....	373
College Algebra.....	583
Constitution of the United States, The.....	476
Continuous Wave Wireless Telegraphy.....	89
Corner-stone of Philippine Independence, The.....	566
La Defense des Frontieres Maritimes.....	375
Design of Masonry Structures and Foundations.....	572
Developments of Tactics—World War.....	376
Dyke's Automobile and Gas Engine Encyclopedia. 13th ed.....	590
Dynamics of the Aeroplane.....	373
Einstein and the Universe.....	573
Electric Cables.....	374
Elementary Calculus.....	582
Elementary Functions and Applications.....	583
Elementary Hydraulics.....	574
Elementary Vector Analysis.....	584
Elements d'Analyse Mathematique.....	585
Elements of the Differential and Integral Calculus.....	584
England.....	561
First Course in the Theory of Equations.....	585
From the Somme to the Rhine.....	95
Funk and Wagnalls Practical Standard Dictionary, The.....	192
General Designs of Warships.....	574
Genetics.....	374
Graphic and Mechanical Computations.....	585

INDEX

Handbook of Ethical Theory, A.....	192
Handbook of Meteorology.....	575
History of the Latin-American Nations.....	563
History of the Theory of Numbers.....	586
History of the United States Since the Civil War, A.....	94
Immigration Problem, The.....	380
Infinitesimal Calculus.....	587
Introduction to Economic History, An.....	568
Introduction to the History of History, An.....	562
Introduction to Mathematical Analysis.....	586
Introduction to World Politics, An.....	563
International Relations.....	93
Joining in Public Discussion.....	475
Key of Libberty, The.....	95
King's Complete History of the World War.....	381
Labor and Democracy.....	186
Law of Naval Warfare, The.....	382
Lessons in Electricity and Magnetism.....	575
Lessons in Mechanics.....	575
Letters of a Radio Engineer to His Son.....	575
Life and History.....	192
Little Corner Never Conquered, The.....	187
Manual of Athletic Requirements.....	477
Manual of International Law for the Use of Naval Officers, A.....	92
Manufacture and Use of Explosives.....	374
Map Reading.....	590
Mathematical Philosophy.....	285
Mecanique des Affuts.....	576
Mexican Mind, The.....	564
Modern History of Warships.....	187
Modern Idea of the State, The.....	96
Modern Practice in Heat Engines.....	576
Money.....	380
New Heavens, The.....	375
New Viewpoints in American History.....	92
Non-Euclidean Geometry.....	558
Northward Course of Empire, The.....	564
Our Changing Constitution.....	565
Our 110 Days' Fighting.....	93
Our Navy at War.....	376
Parenthood and Child Nurture.....	569
Peril of the Republic, The.....	475
Periodic Orbits.....	587
Physics of the Air.....	577
Physique Elementaire et Theories Modernes.....	578
Pivot of Civilization, The.....	188
Plane and Solid Analytic Geometry.....	588
Principles of Electrical Engineering.....	577
Prisoner of the Reds, A.....	565
Public Opinion.....	188
Pulling Together.....	89
Quartermaster Corps in the Year 1917 in the World War, The.....	88

INDEX

Radio Handbook. (Lefax).....	94
Radio, the Book of Wireless Telegraph and Telephone.....	578
Rand McNally Commercial Atlas of America.....	590
Reinforced Concrete.....	578
Revolt Against Civilization, The.....	568
Rising Temper of the East, The.....	189
Russia To-Day and To-morrow.....	381
Russian Turmoil, The.....	566
Science and Human Affairs.....	569
Senescence.....	570
Six-Place Tables.....	588
Social Trend, The.....	567
Socialism and The Average Man.....	189
Space, Time and Gravitation.....	579
Special Details of Field Artillery.....	92
Sporting Firearms of Today in Use.....	190
Supply and Demand.....	286
Taschenbuch de Kriegsflootten.....	191
Technical Exposition.....	375
Telescope, The.....	579
Theory of Machines, The.....	580
Theory of Modern Optical Instruments, The.....	581
Universe.....	191
Vector Calculus.....	589
Way to Will-Power, The.....	191
What Happened at Jutland, the Tactics of the Battle.....	379
Within the Atom.....	581
Woman and the New Race.....	382