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The Combined Arms in Coast Defense

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FOREWORD

THE handling of the combined arms in coastal warfare is a subject which merits more consideration and study by the Army as a whole than has to date been given. The schedule of Training Regulations to be written calls for a TR on the combined arms in the attack and defense of coast lines to be prepared by the General Staff in conjunction with Leavenworth. This regulation, it is believed, is still to be written. At any rate, it has not been published. The following article, it is hoped, will stimulate the interest of the Army in general, as well as of the Coast Artillery, in the defense side of the subject.

1. DEFINITION OF COAST DEFENSE.

For this country, coast defense consists of the strategical and tactical dispositions and operations of the armed forces of the United States executed for the purpose of defeating hostile attacks upon the sea frontier of the United States or its overseas possessions.

2. FORCES EMPLOYED.

Forces employed in coast defense are:

(a) Naval forces:
  (1) The United States Fleet and detachments.
  (2) The Naval District Coast Defense Forces.
  (3) The Marine Corps.

(b) Military forces:
  (1) The United States Army.

3. FUNCTIONS OF NAVAL FORCES IN COAST DEFENSE.

a. The United States Fleet is a mobile force consisting mainly of first-line war vessels free to operate against hostile fleets, in accordance with the strategical situation, for the purpose of gaining and maintaining command of vital lines of sea communication. Such command,

when gained, denies freedom of movement to hostile vessels and thus protects the coast from attack. Local coast defense is *not* a function of the Fleet.

b. The Naval District Coast Defense Forces are assigned to naval districts to control sea communications therein and to assist in the defense of important coastal areas within the district. Limits of naval districts are considered to extend seaward to include the lanes of coastwise shipping. Their lateral limits or landward boundaries, except in the case of our overseas possessions, do not at present (*but certainly should*) coincide with the boundaries of the Army Sea Frontier Commands or Defense Sectors. When the Fleet is present naval district forces cooperate therewith. When the Fleet is absent they support the Army directly. Such forces comprise patrol vessels, coast defense submarines, mine layers and sweepers, aircraft, and a service for the collection and transmission of information. These forces are kept at the minimum in order that the strength of the Fleet shall not be materially weakened; and in general the vessels assigned to local coast defense are of such type that they cannot advantageously be retained with the Fleet.

c. The Marine Corps, in cooperation with the Fleet secures and defends advanced bases on the naval line of communications until relieved by the Army. Exceptionally, it may be used with the military forces for coast defense and will then conform to the principles governing the Army in coast defense.

4. Functions of the Army in Coast Defense.

From an Army point of view the defense of a seacoast conforms to the general principles of the defense of any position. All arms of the Army form a tactical team and should be so handled in coast defense as well as in purely land warfare. As in any defensive situation certain unimportant parts of the position are lightly held and certain vital areas heavily defended.

The vital areas of Continental United States include the following:

(a) The portion of the United States covered by the seacoast line from Portland, Maine, to Chesapeake Bay, both inclusive.

(b) The southern California area from San Diego to Los Angeles, both inclusive.

(c) The San Francisco basin.

(d) The area including Puget Sound and the mouth of the Columbia.

Certain other areas contiguous to the South Atlantic and Gulf coasts of growing importance might properly be added to the above; but in

any event it is obvious that coastal areas of vital strategic importance are of limited extent compared with the total extent of the coast line.

Moreover, within any particular vital seacoast area a reconnaissance of coast line will show that only a limited portion of the coast is favorable for landing operations, and that among portions favorable for landing operations only a limited number are favorably located with reference to important military objectives. An effective system of coast defense thus resolves itself into the defense, not of the entire coast line, but of a limited number of *harbors* and *beaches* all included within a limited number of vital areas.

Coast Defense therefore naturally falls into two great subdivisions: Harbor Defense and Beach Defense, which must be defined before an intelligent description of the missions and functions of the Army can be given.

Harbor Defense.—In any given section of the seacoast the first-class harbors are naturally the weakest parts of the position and are also of greatest value to the enemy as bases. Hence it is vital that they be provided with coast artillery of the latest type, both fixed and mobile (including antiaircraft weapons), fortifications, searchlights, controlled submarine mines, aircraft, and a highly developed communications system. The naval installations will include anti-submarine and torpedo nets and contact mines. Troops of *all* arms necessary to resist successfully the direct attacks of naval vessels and aircraft, surprise attacks in the nature of raids, and to prevent landings in force by an overseas expedition in the vicinity of the harbor area, must be provided. This means that all arms may be required and that certainly infantry, coast artillery, and air forces will always be needed. The foregoing elements constitute harbor defense.

Specifically, in harbor defense the missions of the *Army* are:

(1) To deny the enemy possession of the base.

(2) To prevent destruction or serious injury of the port, port utilities, and military and naval establishments by any form of enemy attack.

(3) To provide an area off the harbor entrance and within the harbor in which naval vessels and mechant shipping will be protected against all forms of enemy attack.

(4) To assure the safe entry and debouchment of the Fleet or any portion thereof.

Beach Defense.—Beach Defense includes active defense of the "critical landing localities" of the shore line both within and between the harbor areas, and observation and air defense of the remaining portions of the coast line which are not critical.

A "critical landing locality" is defined as a portion of the shore line either within or outside harbor areas, naturally feasible both for hostile landings and operations after landing, and within striking distance of an important base.

From the foregoing it is evident that *within and adjacent to harbor areas, beach defense is a vital element of harbor defense itself.* Outside of harbor areas beach defense differs from harbor defense only in that, protecting less vulnerable and desirable areas, fixed armament, nets, and controlled mines are absent, and the missions are fewer.

In beach defense the missions of the Army are:

(1) To deny enemy landings at "critical localities."

(2) To contain and defeat enemy forces effecting a landing.

Again all arms of the Army may be required and certainly infantry and light artillery, mobile coast artillery, and aircraft will always be needed.

Discussion of the Arms Employed.—The Army has two arms which have a special value in coast defense, but on neither of which can sole reliance be placed. These are the Coast Artillery Corps and the Air Corps.

"*Coast Artillery*" is defined as the artillery designed and trained primarily to fire at *moving* targets, aerial or naval. It is divided into the "*Antiaircraft Artillery,*" which fires at aerial targets, and the "*Seacoast Artillery,*" which fires primarily at naval targets but may be employed against land targets. The need for both branches of the Coast Artillery Corps in both harbor and beach defense is obvious as the enemy will attack us first by sea and air. Seacoast artillery must work in conjunction with the other arms, particularly the Infantry, for, once hostile infantry is landed, artillery alone is helpless. Furthermore, seacoast artillery should be furnished by the Air Corps with facilities for early identification of naval targets and for accurate control and adjustment of fire on such targets when beyond the range of shore visual and sound observation stations.

The Air Corps also is peculiarly fitted to combat an enemy attacking by sea or air, but it too cannot hope to combat successfully *alone* a strong, determined, hostile force of *all* arms. Air power is vital, and an enemy must secure a definite local air superiority during the debarkation period if he expects to make a successful landing except during a time of low visibility. But even should the enemy not have such superiority our Air Corps should depend on the antiaircraft branch of the Coast Artillery Corps for local protection of all ground forces and establishments including even its own airdromes and balloons, as Air Corps units should not be tied down to such a local defensive rôle.

Should the enemy have air superiority, the rôle of antiaircraft artillery assumes added importance. Further, should the enemy make landing attacks during a period of low visibility such as caused by fog when the Air Corps is *peculiarly helpless,* the main rôle in defense falls to the Infantry, supported by the other arms.

As for the Infantry, it is the *sine qua non* in coastal warefare as in purely land warfare. Against an island power dependent on sea-borne commerce for its very existence it might be possible by naval blockade to force a war to a successful conclusion, but against a self-sustaining state such as ours, actual invasion by troops, *i. e.,* infantry and the supporting arms, is a requisite for the successful prosecution of a war, and troops of *all* arms will be needed to defeat such invasion. Infantry can nearest approach "going it alone," but it too, against a well balanced hostile force of all arms, will be inadequate in coast ~~defense~~, just as it would be in land warfare if alone.

Cavalry will, on account of its mobility, be invaluable in sections of the coastal areas not provided with a net-work of metalled roads permitting rapid mechanical transport, and the reserves should then include a heavy proportion of that arm.

The other arms of the Army are just as important in coastal warfare as in purely land warfare.

It is a logical deduction from the above that to defeat a well balanced hostile force of *all* arms such as a Joint Overseas Expedition, a tactical team of *all* arms of the Army will be needed whether the attacks be delivered against a primary harbor area or an open beach outside of a harbor area.

5. ORGANIZATION AND COMMAND OF MILITARY FORCES IN COAST DEFENSE.

For the purpose of Coast Defense by the Army the coast line is divided and subdivided into certain commands. As in any defensive situation these commands will be territorial as well as tactical, but the troops may be concentrated or disposed as the proper commander sees fit to meet any particular situation without regard to territorial limits. These commands are as follows:

a. Sea Frontier Commands.

b. Defense Sectors.

c. Subsectors.

The Sea Frontier Commands, the limits of which are prescribed and forces allotted thereto in accordance with War Department directives, constitute the probable initial theaters of operations in case of attempted invasion and, with certain exceptions, correspond roughly to the seaboard Corps Areas and Overseas Departments. Defense Sectors and

Subsectors are divisions and subdividisions of a frontier command whose limits are prescribed by the proper higher commanders. In general, a sector consists territorially of a first class harbor or base and the area which may be said to be within striking distance of it. When bases are in close proximity a sector may contain two or more bases of the first class.

A Sea Frontier Command consists of two or more sectors with a suitable frontier reserve and is comparable in many respects to the defensive front of an Army.

A Sector consists of two or more subsectors and superposed thereon, but not normally a part of any subsector, will be the units of seacoast artillery assigned to the sector, just as corps artillery units may be superposed on the division sectors of a corps front. Indeed, from the point of view of command, organization, and artillery support, the sector is analogous to a corps and the subsector to a division of the corps.

A Subsector is primarily organized for defense against landing attacks of any nature. Its troops, like those of a division, consist principally of infantry (reinforced by .50-caliber machine guns) and supporting light artillery for employment primarily against hostile infantry making the assault in successive waves of small boats.

A sector commander, like a corps commander, must see that his subsectors receive the additional artillery support necessary for counterbattery and destruction or neutralization of the hostile artillery. He must also furnish the necessary long-range interdiction fires. For these purposes he uses his seacoast artillery just as a corps commander would use the corps artillery.

A subsector commander will be charged with the close defense of any seacoast artillery which may be located in his territory, but will not control it unless it be specifically attached to his command.

Seacoast artillery, on account of its range and power and consequent ability to support normally more than one subsector, is analogous, as stated, to corps or army artillery, and will usually be retained under sector control to take full advantage of its power of concentration. The situation in a sector is similar to that of a corps defensive front in land warfare, except that the corps artillery is echeloned in depth while the seacoast artillery is generally placed well down toward the front line (the water's edge) to attain a maximum seaward range, though in certain cases it may be echeloned along a channel or strait, as at the Dardanelles. As we know, units of corps artillery even when located in division sectors, are rarely attached to divisions. Similarly, it will be unusual to attach seacoast artillery to subsectors, even

when located therein, though it may be done under certain conditions, particularly with tractor seacoast artillery.*

The size and composition of the forces assigned to these various commands will of necessity vary widely and depend on the individual case.

Each Frontier Commander will have under his control a strong Air Force independent of all subordinate commanders in the chain of command, to be known as the Frontier Air Force, comprising all branches of combat aviation, and capable of rapid concentration at any threatened point within the Frontier Command with the offensive-defensive mission of attacking all hostile forces—naval, air or ground, within radius.

In addition to this separate Air Force each sector should have air corps units allotted to it consisting mainly of observation planes and balloons to perform the missions of security and information, reconnaissance for artillery targets, and adjustment of long-range artillery fire.

Each Frontier Commander will have under his control, a mobile frontier reserve of all arms located so that it can be readily concentrated at threatened points to reinforce the sector forces. This reserve should especially include mobile seacoast artillery consisting of railway and heavy tractor guns, not only for the reinforcement of fortified harbors but also for reinforcement of the artillery support of beach defense between fortified harbor areas and the establishment of seacoast artillery defense at secondary harbors without fixed seacoast guns. On account of the extended front of a Frontier Command its reserve, except for the Air Force, may be termed a strategic reserve.

The reserve of each sector will be similar in composition and mobility to the frontier reserve and within the sector will have the same missions. It may possibly include mobile seacoast artillery, depending on the individual case, though usually there will not be sufficient mobile seacoast artillery present in a sector to justify holding any quantity of it in reserve, but all such artillery present can, of course, be shifted anywhere in the sector as the tactical situation may require—an added reason for retaining it under sector control.

The primary requisite of a subsector reserve (which will be similar in general composition to a sector reserve except that it will have no seacoast artillery normally) will be maximum mobility, and for this purpose adequate motor transport and a good road net are highly desirable. Any light artillery retained in reserve should then be of the

*Tractor seacoast artillery consists at present of batteries, battalions, and regiments of 155-mm. guns specially equipped with a system of fire control permitting effective fire on moving naval targets.

portée type. Where a good road net is not available and, for lack of time or other cause, metalled roads cannot be constructed, the reserve should contain a heavy proportion of cavalry and then any light artillery retained in reserve should be horse artillery.

Back of the Frontier Commands the general strategic reserves of all arms (Field Armies and Army Groups) will be concentrated and disposed by GHQ to meet the particular strategic situation.

6. NATURE OF ATTACKS AGAINST SEACOASTS.

a. Classes.—Such attacks may be classified as purely *naval* or *joint* naval and military. They may be further classified as *major* or *minor* depending on the importance of the mission and the size of the attacking forces employed.

A joint attack is usually a major attack involving the attempted landing of large bodies of troops. For a minor attack or raid requiring landing parties, marines or sailors will ordinarily be used.

b. Forms.—Attacks on a seacoast are divided into ten special forms which may occur either in major or minor operations and may occur as strictly naval efforts or in joint operations. These forms of attack, which may and probably will be employed in many different combinations, are as follows:

(1) Aircraft attacks on the seacoast and contiguous areas.

(2) Mine laying off the seacoast or entrances of harbors.

(3) Mine sweeping and attempts to destroy nets or other barriers.

(4) Naval raids on coastwise shipping and undefended or lightly defended coastal areas.

(5) Attacks on our naval forces off the coast, entering into or debouching from harbors.

(6) Torpedo fire from surface or subsurface craft into seaports.

(7) Blocking attacks on seaports.

(8) Bombardment of seaports or other coastal areas by naval vessels.

(9) Penetration into a harbor or water area by naval vessels.

(10) Landing attacks.

7. PRINCIPLES GOVERNING JOINT ARMY AND NAVY ACTION IN MEETING ATTACKS ON THE SEACOAST.

Directives approved by the Joint Board will be issued by the War and Navy Departments to their respective tactical and territorial commanders which will cover specifically the respective responsibilities of military and naval commanders in the defense of any particular area to cover all foreseen conditions, and the control to be exercised by the commanders of one service over the forces of another.

Joint maneuvers in time of peace will result in the determination of the situations likely to arise, and in advance plans of joint action to meet each probable situation.

In general, the following principles will be adhered to:

(a) When an enemy force of a strength greatly superior to that of the naval force available for use against it approaches the coast, the Army will control the defense and the senior naval officer present will subordinate the operations of the naval forces to those of the military forces. Example: When the enemy has undisputed command of the sea and is approaching our coast with a joint overseas expedition.

(b) When the enemy can be engaged by a naval force approximating the strength of the enemy, the Navy will control the defense and the senior army officer present will subordinate the operations of the military forces to those of the naval forces. Should our naval forces, however, by reason of decisive defeat, detachments, or other causes revert to the status prescribed in (a), the Army will then assume control of the defense. Example: A general engagement between our own and the enemy fleet which occurs within range of our heavy seacoast artillery armament or within radius of action of Army planes. During such an engagement the Army will support our naval forces. Should such engagement result in our fleet being defeated and driven into port the Army will assume control of the defense.

(c) In the application of these principles to any particular situation, it is assumed that both the Army and Navy have forces present suitable for operating against enemy attacking forces.

8. General Action of the Army in Meeting the Various Forms of Attack.

a. It will be noted that the first nine forms of hostile attack involve operations by enemy aircraft and war vessels *only*. The Army means of defense against these nine forms may be classified as "Air" and "Artillery," as the Army employs *only* the Air Corps and the Coast Artillery Corps to meet them.

(1) Aircraft Attacks.

Air Defense.—The most effective method of countering such attacks is aggressive action against enemy air bases, land or floating, and against enemy aircraft. The means available to the Army for this purpose are the aircraft of its Air Corps. Operations of Army air forces will be coordinated with the operations of our naval vessels and aircraft engaged.

Artillery Defense.—Defense by antiaircraft artillery.

The Army furnishes local defense by the antiaircraft branch of the Coast Artillery of all military and naval shore establishments,

port utilities, and industrial areas against aerial attack. The searchlights and listening devices of the Antiaircraft Service will be utilized to assist pursuit planes of the Army and Navy air forces in countering night attacks.

(2) Attacks by war vessels only.

Air Defense.—Locate and attack hostile vessels.

Artillery Defense.—This consists of the employment of destruction, nuetralization, and interdiction fires by the seacoast artillery against the various classes of war vessels and the closing of harbor entrances by controlled mines. The seacoast artillery furnishes gun protection to its own and Navy mine fields and to the anti-torpedo and submarine nets installed by the Navy.

As noted elsewhere the observation and adjustment of long-range artillery fire by means of the planes and balloons of the Air Corps is a necessity to the seacoast artillery.

The Air Corps and the Coast Artillery Corps in cooperation can therefore successfully perform the missions of the Army in coast defense *so long as no landing attacks are involved,* but when landing attacks are made, each of the above arms plays a subordinate rôle in supporting the *Infantry* which then as in all warfare becomes the back-bone of the body military.

b. Consider now the tenth form—landing attacks. The defense against such attacks may involve all arms of the Army. These attacks are subdivided into:

(1) *Raids.*—These may be independent or in conjunction with other forms of attack. For instance, surprise night raids might be made by picked landing parties to capture or destroy seacoast artillery, mine casemates, and searchlights in connection with a run-by of enemy vessels.

Unless these raids are made during such time of fog or mist that air operations are impossible, our aircraft will attack the landing parties in small boats or ashore with personnel bombs and machine-gun fire. These raids will further be countered by infantry and machine guns, supported by light, medium, and seacoast artillery.

(2) *Landings in force (Joint Overseas Expeditions).*—Such attacks, as stated, require the enemy to have command of the sea and a very definite air superiority. This means that our Fleet has been decisively defeated or is decisively outmatched and is contained in port or is absent in distant waters; and that our air forces have been decisively defeated, or are inadequate and will be until the enemy can hope to make a landing in force. Under such conditions, as stated previously, the Army will control the defense of the area attacked. Available naval

forces will cooperate. An outline of the character of operations to be expected from a hostile joint overseas expedition and of the Army defense against such operations follows.

9. CHARACTER OF OPERATIONS TO BE EXPECTED OF A HOSTILE JOINT OVERSEAS EXPEDITION.

A Hostile Joint Overseas Expedition will have for its objective the capture and securing of a suitable base for future operations military and naval. Such an expedition will be attempted only when the enemy has command of the sea and can hope to obtain local air superiority at least to cover the period of debarkation. Only a first-class harbor with adequate utilities will serve as such a base. We may therefore expect the landings in force will be attempted within striking distance of such a base, as close to it as practicable with any prospect of success, depending on the hydrography, currents, tides, weather conditions, topography, road and rail net, and resistance to be encounted.

Strategic surprise for so large a force will be impracticable. Tactical surprise as to the exact time, location, and strength of attacks may be practicable.

Attacks may be delivered:

(1) In the immediate vicinity of a fortified primary harbor or base.

(2) Against a secondary harbor having no fixed seacoast armament, but within striking distance of a primary harbor or base.

(3) Against an open beach within striking distance of a primary harbor or base.

For all three cases the enemy will employ an *Advance Force* of light cruisers, destroyers, and mine sweepers to clear the selected debarkation area of our naval district craft or at least to drive them back under the protection of our seacoast guns. This Advance Force will be accompanied by a powerful air force consisting principally of pursuit and observation planes operating either from carriers or an advanced base. Some bombers may accompany this force for the purpose of attacking our submarines or other craft. At this time the enemy will make every effort to establish local air superiority. Mine sweepers will attempt to clean up our mine barriers or fields. Vigorous reconaissance of the entire debarkation area will be pushed by air, sea and land to locate our defensive dispositions and in particular our seacoast artillery positions. Landing raids for purposes of reconnaissance and for destruction of seacoast artillery, bridges, and canal locks, and to interrupt communications generally will be attempted.

In the first case (an attack in the immediate vicinity of the base) where our heavy seacoast artillery must necessarily be present, an

enemy *Bombarding Force* will follow the Advance Force at short interval depending on the time required by the Advance Force to clear the debarkation area. This Bombarding Force will be composed of heavily armored capital ships mounting major-caliber long-range guns and an air force consisting of heavy bombers and more pursuit or fighting planes to protect them. Additional observation planes may accompany this force. This air force too may operate from carriers or from an advanced base. Destroyers equipped with depth bombs will accompany the Bombarding Force for protection of the capital ships and plane carriers against submarine attack. This force will make a reconnaissance in force to develop particularly the heavy artillery positions of the defense which have not been located by the Advance Force and will fire a general long-range artillery preparation with H. E. and possibly gas shell, of varying duration, depending on the situation; and during this period the enemy, if he has not already succeeded, must establish definite local air superiority or suspend his landing attacks until he does establish such superiority. He will attempt to bomb the defenses of the base, particularly the seacoast artillery, and naval vessels protected by the defenses and military and naval shore establishments such as airdromes. Attempts will be made to cut the communications of the base laterally and with the interior to prevent or delay reinforcements. Intensive air reconnaissance will be continued. Landing raids may be expected as during the operations of the Advance Force. Every effort will be made to harass the defenders and keep them continuously alerted, to exhaust them, and to lower their morale without seriously risking capital ships.

Following this period of artillery and air bombardment, which may last several days, the hostile *Support Force,* consisting mainly of armored and light cruisers and destroyers mounting secondary armament, and the transports will approach and attempt forced landings in small craft, usually beginning under cover of fog or darkness and continuing under smoke screens. These landings will be made with all possible speed on a broad front in successive waves and transports will anchor as close to shore as our heavy guns will permit. Attempt will be made by the initial landing forces to establish a general beach-head or beach-heads back from the shore a distance sufficient to protect subsequent landings at least from our light artillery fire.

The hostile Support Force, supplemented by elements of the Advance and Bombarding Forces, depending on the situation during the early stages of the general landing attacks, will furnish the local artillery preparations, interdiction, and accompanying artillery fires until the enemy can get artillery ashore. Thereafter it will supplement fires of

the landed artillery as the situation develops. We may expect naval vessels supporting landing attacks to be equipped for curved fire and to use H. E. shell and possibly gas shell in the future.

During this phase of landing attacks in force the Bombarding Force will attempt to neutralize our heavy artillery elements with H. E. and possibly gas shell and, preceded by elements of the Advance Force, may attempt to force the harbor entrance either as a feint or a main naval effort to divert our heavy artillery fire from support of the beach defenses against the landing attacks. Various combinations of the ten special forms of attack may be made, depending on the circumstances.

Once the enemy has succeeded in establishing his general beachheads and has landed large bodies of troops the character of the operations will be similar to operations in land warfare with the addition that the enemy will have naval artillery and naval plane support.

In the second case (attacks against a secondary harbor having no fixed armament) the character of the operations will be similar to the first case, if we have railway and tractor seacoast artillery guns (as we should), though possibly the general artillery preparation and air bombing by the hostile Bombarding Force may not be so continued and sustained, depending on the amount of mobile seacoast armament we have been able to concentrate. The task of the hostile Advance Force will also possibly be less arduous as our naval coast defense forces will probably not be so strong and mine fields and nets so well prepared. If we have not been able to concentrate any mobile seacoast artillery armament the operation will resemble the attack of an open beach without seacoast artillery support.

In the third case (attacks against an open beach within striking distance of a primary base) if we have naval coast defense forces present and naval contact mines have been laid and we have been able to concentrate mobile seacoast artillery, the enemy operations will approximate those of the first case and must be rather elaborate and extended prior to the actual landing attacks in force, thus affording us time to bring up reinforcements, including additional mobile seacoast artillery.

But if in the third case we have no mobile seacoast artillery present, naval coast defense forces will be driven off promptly by the hostile Advance Force, naval contact mine fields which may have been laid being unprotected by guns capable of firing effectively at moving targets will be rapidly swept up, and landing attacks may be made promptly with a large element of surprise and an excellent chance of success.

10. Character of Defense Against Overseas Expeditions.

First Stage.—During the first stage (operations of the hostile Ad-

vance Force) the elements of the Air Corps present or which can be promptly concentrated, will vigorously attack the enemy force. In particular bombing attacks will be made on any enemy carriers present. Effort will be made to put more planes than the enemy in the air initially and to shoot down his planes as he sends them off the carriers. Destroyers hunting down our submarines and patrol vessels will be bombed.

Supplementing our air attacks, the Coast Artillery Corps will furnish gun support and protection to our naval coast defense forces and to our mine fields and ground antiaircraft protection to the various elements of the defense. Every effort will be made to deny and deceive hostile aerial reconnaissance, particularly photographic. Smoke pots and previously constructed dummy positions will be utilized to conceal actual locations of batteries. Primary armament will normally remain silent and secondary batteries, preferably mobile, will execute the seacoast artillery missions during this period.

The infantry and supporting arms will have the mission of defeating any landing raids by the hostile Advance Force which may be made for reconnaissance purposes, to cut communications, or to destroy our heavy guns, but the bulk of the infantry will remain in concealed positions. Tractor seacoast artillery will furnish invaluable support in repelling and breaking up such raids, not only by destruction fire on the small boats containing the raiding parties while these boats are beyond range of machine-gun and light artillery fire, but also by furnishing illumination in case of night raids. Should such raids be made during periods of good visibility, attack aviation will play an important part, particularly in defeating raids directed at points which, because of distance or isolation, are not capable of prompt support otherwise.

Second Stage.—During this stage (reconnaissance in force and general artillery and air bombardment) our Air Service units will vigorously counter the enemy air attacks. Every effort must be made to concentrate air reinforcements from the Frontier Air Force and the general strategic reserves. Once decisively beaten in the air, subsequent enemy attacks have little chance of success save in an extended period of fog and poor visibility.

During this second stage the heavy guns of the seacoast artillery, assisted by Air Corps observation and adjustment of fire, will counterbattery the enemy artillery fire to deny effective bombardment of the area and the antiaircraft artillery will release the Air Corps for offensive missions by furnishing ground antiaircraft protection to the defenses. Mine fields and naval coast defense forces will be protected and supported by seacoast artillery as during the first stage.

As before, the infantry and supporting light artillery, reinforced by tractor seacoast artillery and attack planes will continue to have the mission of defeating landing raids. The bulk of the infantry, *i. e.*, the reserves, will continue to remain in concealed and protected positions during this period of bombardment. Even the garrisons of beach defense strong points may be withdrawn to covered positions in rear at this time, but critical landing localities will be patrolled and bodies of infantry held ready for prompt concentration to meet threatened raids.

Third Stage.—The Third Stage (attempted landings in force) premises (1) that the enemy has gained local air superiority or (2) a period of low visibility such as caused by fog. Under the first premise our air force, in spite of hostile superiority, will make determined efforts to bomb enemy transports and *must* without fail attack enemy troops in small boats and ashore with fragmentation bombs and machine gun fire. At this time attack aviation will play its most important rôle.

Seacoast artillery will support the beach defense against landing attacks by interdiction of the close approach of the enemy troop transports and supporting war vessels and by counterbattery and destruction fires. The primary, armor-piercing armament of the seacoast artillery must keep enemy capital ships from closing to the effective range of the ships' secondary guns.

This last mission is extremely important when we consider that the first five battleships of one of the principal naval powers of the world carry as secondary armament no less than ninety-six 5.5-inch and 6-inch guns, or the equivalent of a whole corps artillery brigade in number and far exceeding the brigade in mobility, range, power, and rapidity of fire. We may rest assured further that the ships of this power and of other powers when supporting landing attacks will be equipped for curved fire and use H. E. and even gas shell. That lesson was learned at the Dardanelles.

Unfortunately the beach defense forces as outlined in our present official document, *A Positive System of Coast Defense,* will be woefully inadequate under modern conditions, for this document denies the necessity generally for either railway or heavy tractor artillery in beach defense though it admits such artillery might be useful. It is more than useful, it is vital; and fortunately our net work of coastal roads and railroads is such that railway and tractor seacoast artillery can be used in all of our vital areas. This failure to appreciate the vital importance of mobile seacoast artillery in beach defense is based on erroneous assumptions as to the *present* value of naval artillery support. If an enemy attacks you with highly mobile, rapid fire, armored heavy artillery you are at a tremendous disadvantage if you have no armor-

piercing heavy artillery trained and equipped to fire at moving targets, which can counterbattery and hold him off, especially as under modern conditions, as indicated, we may expect naval artillery supporting landing attacks, to be equipped specially for curved fire. This will permit the enemy to search reverse slopes for defiladed elements of the defense and furnish effective accompanying fires to the attack. If we lack seacoast artillery to combat him the enemy can stand in much closer with his transports, his landing waves will have a much shorter distance to traverse in small boats where he is at a maximum disadvantage, and his naval support force will stand in close, just out of range of our light and medium artillery, and with the aid of plane spotting most effectively neutralize or destroy it, as well as our machine guns and other elements of the defense, undisturbed by counterbattery.

During this third stage, support and protection will be furnished by seacoast artillery as before to our naval forces present. In particular, at this time, our submarines attacking transports will be supported by secondary gun fire to sink or drive off hostile destroyers counterattacking them with depth bombs. The landing waves of enemy troops in small boats will be attacked by tractor seacoast artillery, particularly while beyond the ranges of our light and medium artillery and machine guns. In time of good visibility seacoast artillery will rely on visual ground observation and fire control supplemented by Air Corps observation and adjustment of fire; but in time of fog or poor visibility dependence will have to be placed on other methods. Mine fields and nets will be protected as before. Once an enemy effects a landing the seacoast artillery must be prepared to fire on hostile elements ashore, particularly artillery. Organized fires must be prepared for use against enemy forces on the beach in time of fog or poor visibility to supplement the fires of light and medium artillery and machine guns.

The antiaircraft artillery will furnish ground protection of the defense elements as before and will cooperate with the Air Corps in driving off hostile air raids.

Prepared Defense by a Division Against Landing in Force.—During this third stage all arms of the Army will actively participate. A division for instance in defense of an important stretch of seacoast will establish a resolute defense at the water's edge of all critical landing places. Not more than one-third of the infantry will occupy previously prepared water line defenses; the remainder will be held in mobile reserve (with motor transport where advantageous). The force in water line defense will be organized in separated but mutually supporting strong points garrisoned normally by one infantry company with a suitable complement of .30- and .50-caliber machine guns, and howitzer com-

pany elements where desirable. Owing to the power and range of the .50-caliber machine gun these strong points may be much more widely separated than in a defense employing .30-caliber machine guns alone.

It is believed as the result of maneuvers and studies that, given a critical stretch of seacoast with a *continuous* good beach line from a hydrographical standpoint and favorable terrain with a good road net in back thereof to facilitate operations, it will require a division reinforced by six "sector" machine-gun companies of eight .50-caliber machine guns each to cover effectively the defense of approximately a 12-mile front. This permits of putting four battalions of infantry (or twelve rifle companies) in water-line defense in twelve strong points about a mile apart and of allotting one platoon or four .50-caliber machine guns to each strong point, this in addition to the thirty-two .30-caliber machine guns which are an organic part of the four battalions. In certain cases it may be advisable to bring the total of .30-caliber machine guns up to forty-eight or more by attachment of machine guns from the reserve battalions. This would certainly be advisable if no .50-caliber machine guns were present. Back of the water line defenses in local reserve with motor transport where advisable would be the remaining two battalions of the First Brigade. As stated before, it is believed advisable to put the regimental Howitzer Companies either in or near the most vulnerable or important front-line strong points and immediately available for action. Back of this at a distance depending on the terrain and the road net would be located in division reserve, with motor transport, the remaining brigade, the engineer regiment, the tank company, and other division troops. This amounts to a defense by the First Brigade with regiments abreast and a defense by the division with brigades in column. Under certain conditions it may be more desirable to make the defense with brigades abreast, detaching a regiment from each brigade to form the division reserve, but this form also will normally have four battalions in water-line defense, two in local reserve and six in division reserve, thus conforming to the principle of not having more than one-third of the infantry strength in water-line defense.

These strong points will be trenched, wired, furnished with shelter, and supplied for a protracted defense. Garrisons of strong points will fight in place and be withdrawn only on orders of the high command. Their mission will be to stop landing attacks on the water or at the beach. Should the enemy gain a foothold on the beach they must so delay and disorganize his landing attacks that reserves will have time to concentrate and dislodge the attacks. In any event the establishment of a general beach-head will be denied. As in any defense, counter-

attack is the essence of success and troops must be disposed in depth. The critical landing places should be wired and under-water obstacles provided where conditions permit, but there should be no continuous line of trenches paralleling the entire shore line. It must be practicable to concentrate a heavy fire on any portion of a critical landing locality.

The two organic light artillery regiments, regardless of the formation, will normally support the entire division front as follows:

Each regiment of 75's will support approximately one-half of the division front, or, with brigades abreast, one brigade sector. From the point of view of light artillery support this formation is perhaps preferable. Each regiment of 75's will normally be echeloned by battalion, with one battalion in water-line defense sited by battery for direct fire at landing parties in small boats and the other battalion in positions to the rear and prepared to place prearranged defensive fires immediately in front of and on the beach. In certain situations, as when tractor seacoast artillery is not present, it may be advisable initially to site all light artillery for direct fire in forward positions but with previously prepared withdrawal positions and easy routes of access for all guns, to which the light artillery can withdraw by echelon in event the landing attack threatens to be successful. In time of dense fog it will probably be advisable to place prearranged defensive fires in front of and on the beach on call of the infantry in water-line defense. To meet all contingencies, therefore, it may be necessary to select and prepare forward direct fire positions for all 75's of the organic artillery and also retired, indirect fire positions for all guns with easy routes of access back and forth.

Should a 155-mm. howitzer regiment be attached to the division, its weapons will be sited for indirect fire to cover the landing beaches, particularly those abutted by precipitious terrain as the present weapon is unsuitable for fire at moving targets due to the limited traverse of the weapon on the carriage and unsuitable fire control equipment. A similar use will be made of trench artillery, if present.

Supplementing this, it will be necessary to have the support of mobile seacoast artillery to hold transports and war vessels well out and to fire at landing parties while beyond the range of the light artillery. This mobile seacoast artillery will be analogous to corps artillery and, except in special cases, no portion of it should be attached to a division.

The form of defense just described most nearly conforms to a prepared defense and should be so called, though it differs in many respects from the prepared defense as known in land warfare.

11. General Considerations and Future Developments.

Automotive artillery of medium and heavy type, when properly developed, on combination wheel and caterpillar mounts, permitting rapid transport on good roads and capable of maneuvering across country, will be of great value in coast defense, assuring a maximum of strategic and tactical mobility. Such mounts should be designed so that the gun may be traversed through a wide field of fire without moving the mount.

A 75-mm. gun with a split trail and a maximum range of 15,000 yards would be vastly superior to our present 75 for beach defense. The present weapon of this caliber, with which our light artillery is armed, is comparatively inefficient for fire on landing parties in small craft due to its limited range and very small traverse on the carriage.

A 4.7-inch corps gun, with a split trail and an increased range, would also be an invaluable weapon in coast defense, as would a 155-mm. gun with a 25,000-yard range. Split trail howitzers with increased ranges would also furnish much better artillery support in coast defense than the present weapons.

A good network of roads and railroads is absolutely essential to efficient coast defense, and every effort should be made to provide same. Fortunately, as stated before, our coastal areas are now fairly well provided with such nets, but there is room for systematic improvement. Where good roads do not exist Cavalry must be utilized to a maximum, particularly in the reserves.

Good signal communication is also an absolute essential to efficient coast defense. Existing commercial systems must be tied in with the military net and with naval communications. The last named includes the Coast Guard installations.

In a period of fog or low visibility surprise landing attacks in force may be attempted, particularly on open beaches outside of harbor areas. In this case the listening devices (hydrophones) of our submarines and patrol vessels, and radio direction finders will be utilized for location of the enemy at a distance.

While withdrawal positions, parallel or oblique to the beach line, may be selected and prepared for defense, it must be borne in mind that a purely passive defense in such positions is contemplated only in case the tactical situation demands it. Resolute defense at the beach line by the smaller part of the defending force, combined with vigorous offensive action by the bulk of the troops, is the essence of the defense of a coast line. Demolitions to delay the enemy may be prepared, but should be executed only on orders of the high command, particularly in case of those structures that are of importance in contemplated

counter offensive operations. Consideration must be given to protection of Seacoast Artillery; positions which would require unwarranted dispersion of the Infantry for their protection against raids must be avoided. Artillery which cannot be withdrawn in case of emergency must be prepared for demolition.

For long-range or strategic reconnaissance reliance must be placed on the naval forces. Army observation planes can, within their radii, supplement the naval scouting planes, and the Army Air Corps will furnish battle reconnaissance.

The infantry charged with beach defense furnishes the necessary patrols to guard against surprise, particularly at night or in foggy weather. Searchlights and plane flares must be used at night for illuminating the water approaches. All patrolling by water will be done by naval forces.

The handling of the Army in coast defense conforms to the principles of land warfare. While strategically coast defense by the Army is a passive defense, it must be possible to concentrate forces for vigorous offensive action. The possibility of a successful landing at noncritical points, *i. e.*, points not within ready striking distance of a base, must be discounted by the consideration that it will be possible to concentrate forces and defeat such landed forces before they can secure the desired and to the enemy indispensable objective. UNDUE DISPERSION MUST BE AVOIDED.

It is impossible to give standard invariable figures on the strength of a military force required to defend a certain number of miles of sea coast. This will depend upon too many variable factors to be determined by intensive study of each individual stretch of sea coast and by maneuvers of actual forces to determine time and space factors under the different hypotheses as to attacks. Only in this way can the adequacy, proper composition, and disposition of the defending force be determined and undue dispersion be avoided. On previous pages there has been given what seems to be a reasonable proposition for the defense of twelve miles of *continuous* beach, good hydrographically and topographically for landing and for operations after landing, and within striking distance of a base. Such a beach at a distance from the base or separated from the base by a mountain range with few passes, in other words not within striking distance, would require nothing like such a prepared defense as we have indicated. Again, while we do have such continuous stretches of beach within striking distance, *they are not usual.* Much of our coast line in the vicinity of bases consists of stretches of favorable beaches alternating with rock bound, coral bound, or surf bound stretches; and often where good beaches do exist for

actual landing purposes they are unsuitable for the enemy from the standpoint of further operations, either because the beaches are on narrow bottle-neck peninsulas or sand spits, or the terrain back of the beaches is impassable, or because there is no suitable road net. There are situations where a division can adequately hold as much as twenty miles of sea coast, even within a critical area.

12. CONCLUSION.

To sum up, it is evident from all of the foregoing discussion, that all arms of the Army will be required for efficient coast defense. Neither the Coast Artillery Corps nor the Air Corps *alone* can adequately protect primary harbor areas, nor can the other arms of the Army *alone* effectively protect secondary harbors and open beaches outside the harbor areas. *ALL MILITARY FORCES OF THE COUNTRY MUST BE EMPLOYED AS A COMBINED TEAM IN COAST DEFENSE AS IN ALL WARFARE.*

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Making Use of the 155-mm. G. P. F. in Our Fixed Defenses

By Lieut. L. D. Flory, C. A. C.

After serving one and a half years in a regiment of 155-mm. G. P. F.'s, I seem to have developed a hobby for this gun. The gun itself is one of the finest pieces of artillery we possess. Its mobility, reliability, and accuracy cannot be questioned. It is thoroughly capable of fulfilling every mission that has been assigned to it. To see a battery of four guns spit forth four projectiles every fifteen seconds at a moving target, to watch the perfect-functioning recoil on the gun, and then to watch this battery crawl out of position and move on to the next gives me one of the biggest thrills I can get. I am not trying to force my particular hobby on anyone but merely wish that the officers who are in charge of these guns in the various coast defenses would give them a chance. I am sure the results will be gratifying to everyone concerned. It is true, we may not have the complete equipment for this gun, but every ounce of effort expended in getting together the fire-control system will benefit us one hundred fold.

In this article I will endeavor to go through the steps necessary in preparation for a 155-mm. gun practice of a gun which has been assigned one of our Coast Defenses as a secondary assignment. I will divide my remarks under four heads: Preparation of fire control squipment, emplacement and orientation of the battery, utilizing the fire-control system of the H. D., and training of the battery.

Preparation of Fire-Control Equipment

The standard equipment for Case III firing consists of the following:

1 Cloke Plotting Board,
1 Pratt Range Board,
1 Range Percentage Corrector,
1 Universal Deflection Board,
1 Predictor,
1 Wind Component Indicator,
1 Spotting Board,
1 Impact Board,
2 Azimuth Instruments (Model 1918) for observers,

2 B. C. Instruments or Azimuth Instruments (Model 1918) for Spotters.
1 B. C. Instrument for Battery Commander, and
1 Range Table.

After taking inventory, we found the Cloke plotting board, and two azimuth instruments (Model 1918) in mils were the only instruments we had that could be used without change. The following blue prints were then obtained from the President of the Coast Artillery Board:

Blue print of scales for the Modified Impact Board.
Blue print for the Range Correction Board, having curves for normal and super-charge adapted for use on the Pratt range board.
Blue print of combined range and elevation tape with percentage scales for range percentage corrector.
Blue print azimuth tape, combined wind and drift curves, and arbitrary correction scales for the Universal deflection board.
Blue print of the mil-azimuth circle for the wind component indicator.

A Pratt range board and a wind component indicator were obtained from a six-inch battery on which were placed the blue prints of the range correction curves and azimuth circle respectively.

A universal deflection board, a range percentage corrector, and a modified impact board were constructed by the battery mechanic. A time-range interpolating device, as outlined in C. A. B. project No. 222, was attached to the range percentage corrector. A predictor was also constructed, having a movable slide so that the time of flight could be handled directly by the plotter.

As the two mil instruments on hand had to be used for the observers, we were compelled to use the Model 1910 azimuth instrument in degrees for spotting and also for taking the lateral deviations. This, however, did not necessitate any great change in our instruments. A Gray spotting board in use in the six-inch battery was entirely graduated in degrees. Our only change was to make a mil-azimuth circle in place of the degree azimuth circle, since the azimuth of the gun-target came from the plotting board in mils.

To take care of the adjusment of fire in direction we could have converted the correction from *hundredths* of degrees into mils and applied it directly to the Universal deflection board. However, to make our system foolproof we changed the arbitrary correction scale on the universal deflection board from mils to degrees, making the degree divisions correspond to their proper equivalent in mils. We also found that by making the scale read like the spotters scale in the azimuth

instrument, but in the reverse manner, we could set whatever deviation accrued, and the proper correction in direction would be made when the side was moved. For example, a deviation of 3°.25 is observed and it is desired to correct the fire by that amount; then it is necessary only to call out "Deflection 3.25". The operator of the Universal deflection board sets the small pointer to "3.25" and moves the slide to its correct position. This automatically makes the correction of fire in the right direction. The advantage of this system is that the operator does not have to worry whether he is making the correction in the right direction or not; he is merely setting a reference number. This, together with a range table, completed the equipment necessary for Case III firing.

Emplacement and Orientation of the Battery

Although the battery may be emplaced wherever desired, it is usually most convenient to emplace it near some available harbor defense station which may be used as a plotting room and B. C. The guns should be emplaced on firm ground in such a direction that the maximum use of their 60° traverse may be had in the field of fire. A platform should always be used. If the regular platform is not available, two heavy blocks or planks may be placed under the wheels and the wheels chocked. The gun should be made as level as possible. This will help the gun pointer and the elevation setter in keeping the sight bubbles level.

After the battery has been emplaced, our next problems are, first, to determine the position of the battery with reference to the base line, so that the plotting board may be oriented; and, second, to orient the guns. If the guns can be seen from both base end stations, the problem of determining their position is simple. It is necessary only to orient the instrument at each station and take a shot on a rod held over the directing point of the battery or over the pintle center of the gun if only one gun is used. We have then the length of the base line and two angles from which the position and all data needed for orienting the plotting board may be calculated. If, however, the guns are obscured from view from one or both base end stations, a traverse may be run from the directing point of a battery nearby or any convenient bench mark.

For orienting the guns, a stake should be placed about one hundred yards to the front. The position of the stake may be determined as above either by shots from the base end stations or by a traverse. A transit is then placed over the stake, oriented, and we are ready to take a sight on each gun. Fine strings or threads are placed over the muzzle of the gun and the gun elevated or traversed until the line of sight from

the transit bisects the bore. The gun is now oriented on the back azimuth of the transit-gun line. The panoramic sight is placed on the sight bracket and the sight leveled. The sight is turned without disturbing the gun until the cross-hairs bisect the aiming point which has been picked out. The gun-transit azimuth is then set on the sight by means of the slip collar adjusting screw. The gun is now oriented. This operation is performed for each gun in the battery. After the guns are oriented, if any azimuth is set on the sights and the guns traversed until the cross-hairs of the sights bisect the aiming point, each gun will be pointing on that azimuth. Any convergence of fire is then taken care of by making individual corrections on the sights.

The aiming point should be some well defined object as a flag pole, light house, steeple, etc., at least half a mile away (the farther the better). In picking an aiming point consider the usual direction of the wind, smoke, and dust kicked up by the blast during rapid firing and also the fact that the elevation setter and gun pointer will obscure the line of sight in some positions. If the wind presents no problem the best position for an aiming point is on the right flank of the battery.

Utilizing the Fire-Control System of the H. D.

This is one phase where the harbor defense has an advantage over the mobile outfit. If the battery is emplaced near a seacoast battery the minimum of extra lines will have to be run. One of the seacoast battery base lines, the plotting room, and the B. C. station may be used instead of surveying a new base line, of housing the plotting room in a tent and the B. C. on a platform. Three field data lines and one T. I. line will have to be run to the battery position. Two of the data lines being from the universal deflection board and range percentage corrector in the plotting room to the gun pointer and elevation setter at the guns. These lines should terminate near the left wheel of the gun. The telephones should be fastened to a post driven into the ground close enough to the wheel so that the telephone cord will reach the gun pointer or elevation setter when they are setting data. The other line is used for an order line from the B. C. to a point about twenty yards in rear of the battery. The T. I. line can be tapped wherever convenient and run close enough so that the T. I. bell may be heard by the gun section. Two discs will have to be used on the time interval device, one disc set for 30-second impulses for the observing stations and plotting room and the other disc set for 15-second impulses for guns if we are going to fire on 15-second intervals.

The observing and spotting instruments may be placed beside the

pedestal in the base end stations. Any error in length of base line or azimuth resulting from this displacement will be negligible.

Training of the Battery

Having the guns emplaced and oriented, the plotting room equipment in shape and the communications installed, we were then ready to place our men and train them as a unit. The men were picked out according to their qualifications and placed in three groups: group 1, the observers, readers, and spotters; group 2, the range section; group 3, the gun section. The following assignment of officers was made for training purposes: group 1, the battery commander; group 2, the range officer; and group 3, the executive. A short talk was then given by the battery commander on the various missions of the 155-mm. G. P. F.'s as assigned to the Coast Artillery—its peace use, the capabilities of the gun, the development of the fire-control system, the reason for having so accurate a system, and the necessity of teamwork and cooperation in training. After the men were assigned individual positions, each officer in charge of training gave his group a short talk on the functioning of the entire system and how his group fitted into the system. The first day was spent in individual instruction, getting each man acquainted with his instrument or position. The gun section was, however, able to get in a little drill. The second day the plotting room drill was conducted with canned data, plotting every minute. This was really a slow motion drill to establish the sequence of data. In a short time the drill was cut down to a 30-second prediction and data were sent to the guns. No attempt was made up to this point to conduct a battery drill—each officer being intent on perfecting the drill of his group; the officer at the guns however, taking advantage whenever possible of the data that were transmitted to him from the plotting room. On the third day the men in the plotting room were able to use the time-range and azimuth interpolating device and sent data out every fifteen seconds. The interpolated data were sent out about two or three seconds after the 30-second bell in the plotting room. This prevented the gun pointer and elevation setter from ever receiving data as the gun was being fired and allowed them twelve or thirteen seconds to aim and lay the piece before the next bell.

Battery drill was then conducted during which several hypothetical target practices were run off. The spotters sent in hypothetical deviations whenever any rounds were ordered fired. These deviations were plotted and fire corrected as in an actual practice. It was necessary to conduct battery drill quite a number of times in order that the sequence

of orders might be thoroughly understood at the guns, plotting room, and base end stations. The battery was trained along the lines laid down in Coast Artillery Board Project No. 75. Several time-saving devices had to be used to help the gun section cut the drill so they could fire every fifteen seconds. The rammer was covered with burlap and was used as a combination rammer and sponge. In other words, when a new projectile was being rammed home, the wet burlap acted as a sponge in the powder chamber. This saved several seconds in the drill. Another time saver can be had by cutting a section out of the ring on the front of the shell tray large enough for the rammer staff to go through. This allows Nos. 6 and 7 to drop the shell tray as soon as the projectile has been pushed off and to get it out of the way of Nos. 2 and 3 when they ram the projectile home.

After analyzing several drills it was found that data were being transmitted in good shape and the battery was declared ready for service practice.

APHORISME XI.

Who undertakes a long Voyage by Sea, and at a great charge, must resolve to hold on his course against all accidents that may offer to oppose him: So a Generall being engaged in a great Action, must wrastle with all difficulties rather than quit the Enterprize: better it were to foresee the dangers at first and prevent them, or desist: but if once set forwards, hee must take up this resolution, To goe on with the Sword, or fall on the Sword: for in this he puts his fortunes upon tryall, but in retrograding hee purchaseth shame and losse.—Ward's Animadversions of War (*London, 1639*).

Preparedness—The Guarantee of Peace

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IN the United States there is becoming very noticeable an ever-increasing agitation for disarmament, disbanding of our military forces, and more particularly an agitation, which many good patriots regard as extremely dangerous, having for its object a renunciation of all patriotic obligations and especially the prime obligation: that of bearing arms in time of our country's need. There is abroad in our land an insidious propaganda which theatens the very existence of our Anglo-Saxon institutions and which is making a stealthy attack on the vitality of our nation.

Government—any government—makes and, if it is to continue as a sovereign power, must always make three demands on its citizens: obedience to law, payment of taxes, and military service. Under our present order of existence, to make the individual unwilling to render allegiance to his country is to weaken that country. A propaganda having such a result for its avowed purpose should be forced to pass the scrutiny of every good citizen. Such an inquiry calls for an examination of the question of military preparedness, since weakening and elimination of our military forces is the thing the pacifist is so stridently demanding.

As the scheme of things is presently constituted, an attack on the military power of our nation reacts directly on the chances of its continuance as a separate, autonomous people.

Thus far in world history military preparedness has been profoundly essential to independent national existence. There is little at the present time which will allow us to hope otherwise with any reasonable prospect of realization in the near future. Therefore, disarmament is a matter which should be given very, very serious regard before being entered upon.

National autonomous existence, belief in the preciousness of separate unity, belief in one's own value in the make-up of the universe—all these things which any self-respecting nation holds dear are qualities easily discernible in the individuals of which all nations are composed. There is a close parallel between the motives and ideals of an individual and those of a nation, since those of any nation are built from the composite interests of many individuals.

When the interests of citizens in a nation conflict there is recourse to the law for settlement of difficulties. The decision of the courts is respected for the reason that the force of the entire community and nation lies behind their decrees. Law, to be obeyed, must be capable of enforcement should a question arise. Within our nation the time has passed when each man was a law to himself. With the expansion of the functions of government the individual citizen needs to give less attention to safeguarding his life and can give more efforts to other matters. However, we must not forget that there was a time, not so long ago, when every man had to protect himself. In that time, to go unarmed was a foolhardy thing.

When the interests of nations, or rather the interests of nations' citizens, conflict, the matter is nowhere nearly so simple. In the first instance, there is no body of international mandates closely comparable to the law of any given nation. International law is not so clearly defined and codified as is municipal law. It cannot be, because of the very nature of its growth. Secondly, even if there were in existence a well organized code, there is lacking the power of adequate enforcement.

This situation makes it necessary for each nation to find, as best it may, safeguards for its interests and those of its citizens and subjects. Even when groups of nations are able to reconcile their individual aims sufficiently to agree in concerted action on some issue or other, their opinion is respected only so long as they possess force, exercised or potential. Force, it must be remembered, is the ultimate appeal today just as it has been through the ages and just as it is likely to be for some little time in the future.

For a nation to possess an adequate armed force is not for it to assume an attitude of braggadocio. The mere possession of an armed force does not lead to war. The possession of an insurance policy does not lead the normal individual to seek death. It must be emphasized that an army is a tool, not a cause of war. The trained boxer engages in no more private fights than any other person; however, should it be necessary for him to fight, he may be expected to acquit himself quite creditably. May not a nation be allowed the same defense as a man? Any difference is only in degree, not in kind.

The burden of armament to a nation is very great. So is that of insurance to the individual citizen. The cautious, provident citizen would not for a moment entertain the notion of being without insurance. Neither should a nation allow itself to be without adequate preparation. Preparation is for peace, not, as is too often reiterated, for war.

We Americans have only recently had an object-lesson which should be, if it is not, convincing. We entered the last war, as we have all wars, miserably unprepared. America was unable to furnish ammunition for what little artillery she was able to put into action. It was necessary to depend on the British and French for our ammunition supply. We had no airplanes. Suppose, for one moment—and this is not jingoistic—that we had been pitted against those allies. What then?

Our soldiers were insufficiently trained. Many lives were criminally wasted. The monstrosity of it all is that such slaughter might have been prevented through exercise of foresight on the part of those who steer the destiny of our nation. What sane employer would set men in his factory at work with expensive and highly complicated machinery when they had had no training in its use? Yet our tools of war, whose cost is so much complained of, were put in the hands of those who had had no specialized instruction. An army cannot spring up and be efficient overnight. It takes time to make a soldier. America needs more than a mushroom protection. As for the assertion that possession of military power creates bloodthirstiness in a nation, we shall cite the example of Great Britian to prove its falsity. Great Britain has been mistress of the seas for three centuries, and her army is maintained at an effective strength. Yet she has engaged in as few wars as any other comparable nation, indeed fewer. Her influence has been great in the preservation of peace. It is safe to say that the people under her control are better governed and better contented than any others in the world, America not excepted. Britain has not used her strength for unnecessary bloodshed. Her great strength has been one of the largest factors in the promotion of civilization.

A strong nation is able to make its policies felt in the World. The position of a great nation in the family of nations is comparable to that of a prominent citizen in the community. Through its heightened influence a great nation is permitted to be the advocate of reform; it can pursue a consistent course in regard to any question and hence serve humanity well in bringing matters to a workable solution. Little of real value can come from weakness.

Pacifists would insist that a strong military establishment tends to promote the development of a war caste who would become a menace to peace. There is no logical ground for this contention. The truest democracy of America exists in her army; the democracy of a man taken at his own worth, making his place through his ability to serve the ideals which, thank God, many Americans still hold—ideals of the worth of the individual, of right, justice, tolerance, of the value of national autonomy. America has nothing to fear from her army. Her

military men are, first, citizens and then soldiers. So long as the army is regarded in its proper light as a necessary tool there is no danger from a military caste. It is our boast that in our democracy control of our government rests in the hands of our citizens. So long as this be true there need be no fear of class rule.

Preparedness is denounced on the grounds of expensiveness and consequent heavy tax burden. Unfortunately valuable things are quite often very expensive. If there is to be no more war, then, indeed, preparedness is very expensive. However, so long as it is possible for war to come, preparedness is an extremely valuable asset. If it is conceivable that we may be ever again engaged in war, then the surest way to peace is to be able to go through that war successfully and in the shortest possible time with the loss of as few precious lives as possible. Armament is expensive; but the killing of helpless men like rats in a trap by enemy airplanes unmolested by antiaircraft is far more expensive. Preparedness is expensive; but suffocation by poison gas of soldiers without gas masks or knowledge of their use is pitiful—all the more miserably pitiful when the pretty penny thus saved is spent in some other "less wasteful" way. Hideously laughable that America, the Crœsus of the world, should be snared by this type of economy. America must be indeed rich when her lifeblood is so cheap and her dollars so dear. People object to preparedness because of religious scruples, because "War is incompatible with the principles of Christianity." There, again is the wrong emphasis, the wrong interpretation. Preparedness is for peace, not for war. These religionists are forgetting for a moment the wrath of God, the wars of the Chosen People, the scourging of the money-lenders from the temple by an angry Christ. They are forgetting the Crusades, the extension of Christianity through its protection by armed forces. They are forgetting that there is at this very moment menace of religious war against Christianity. That is how they value their religion. They would lay open our entire civilization to destruction because protection "does not agree with their religious principles."

If these pacifists and weakeners of our country are sincere in their efforts for world brotherhood, as are we all, they must see that elimination of war can come about only through the development of international good will as a result of a workable solution of economic and racial antagonism, the true causes of war. There is the proper field of the pacifist. Let him work with the individual, not by inciting him to anarchy and revolt against government, but by striving for the elimination of selfishness and its causes through some better arrangement of our economic and governmental system. Peace is easy when there is

nothing to fight about; but the great to-do about Peace and the cry "Peace, Peace" is miserably futile when there is no peace.

Before we eliminate preparedness let us be sure that we have something better in its stead. Let us be certain that we shall be at least equally secure. Let us make certain that the weak and helpless and innocent shall be no more oppressed than at present. Let us make sure that man is a bit more inclined toward peace. Let us not forget that men have fought through long ages, at first with sticks and stones, and now with sixteen-inch guns and aerial bombs.

Let those who would reduce our measures of defense remember that "in the responsible conduct of affairs, it is worse than folly to ignore the imperfections which still cling to human nature." Elimination of armaments must be gradual; it must be universal when attempted. There must exist stronger international organization and more brotherly love. There must first come the sacrifice of many things which man as a patriotic nationalist holds dear. Growth must be gradual. Let us be sure that we are good American citizens before we go about being world citizens. The one will lead to the other.

"We cannot move safely if our plans of life altogether out-run our instincts. It is true that human nature can be modified; new ideals, new opportunities, new methods of action, as history shows, alter it very much, even in a few generations; but still, it is a growth and therefore gradual, and changes of our social organization must wait on it, and therefore must be gradual too."

APHORISME IX

Worth is valued by the qualitie, not the greatnesse of a thing; as the goodnesse of a Fortresse consisteth rather in the conformity of the parts, and the answerable distances, than in the unproportionable greatnesse: so the strength of an Army stands more in the valour and good order of the Combatants, than in the number; against which number, are these two principall advantages, great Ordnance, and good Ordnance.—Ward's Animadversions of War *(London, 1639).*

Army Correspondence Courses

PURPOSES OF CORRESPONDENCE COURSES

1. *General.*—On January 1, 1926, there were approximately 97,000 Reserve Officers, of whom approximately 20,000 were taking Correspondence Courses. Approximately 3000 National Guard Officers and enlisted men were also taking these courses. On the same date there were approximately 4000 Coast Artillery Reserve Officers, of whom approximately 1200 were taking these courses.

The facts that approximately twice as many Reserve and National Guard Officers as there are officers in the Regular Army are taking these courses, and that approximately as many Coast Artillery Reserve and National Guard Officers as there are officers in the Coast Artillery Corps are taking the Coast Artillery Courses, indicate the importance of the rôle that has been assumed by the Correspondence Courses in connection with the training and instruction of the officers of the National Army.

2. *General Purpose.*—It is not expected, nor contemplated by the War Department that soldiers can be made by mail, and this is not the purpose of the Army Correspondence Courses. The general professional qualifications of an officer, and the special technical requirements of a Coast Artillery Officer, can be attained only by long continuous study and by extensive practical experience under many varied conditions, and this fact is emphasized in these courses. Furthermore, there are many matters, in regard to which an officer must be proficient, that are not susceptible of treatment by correspondence methods.

Such courses, however, if properly prepared, should afford to the student much fundamental information which would not be readily accessible otherwise, and should serve to acquaint him with some of the more important general principles which govern in the employment of the materiel with the service of which he may be charged. They may futhermore serve to stimulate his professional interest and to encourage him to make the most of his opportunities to extend his professional knowledge by practical experience and by an intelligent study of such professional literature as may, from time to time, become available.

Such courses may also serve both to standardize the instruction of individuals and of units and to facilitate the work of the officers charged with this instruction.

3. *Reserve and National Guard Officers.*—In so far as concerns Reserve and National Guard Officers, for whose requirements the Correspondence Courses were primarily designed, these courses are intended to accomplish, so far as is practicable by correspondence methods, the following specific ends:

a. To provide a substitute for the continuous training with troops and for the opportunities offered officers of the Regular Army, of taking courses in the Special and the General Service Schools, and to afford to Reserve and National Guard Officers some opportunity of preparing themselves for the performance of their normal duties, both at their home armories and during their periods of active duty.

b. To prepare Reserve and National Guard Officers for their examinations for promotion.

c. To provide a means of establishing approximate standards of proficiency for Reserve and National Guard Officers of different arms of the Service and of different grades, and of enabling some degree of selectivity to be exercised in the appointment, promotion, and assignment of these officers.

d. To provide a means of standardizing the instruction of these officers within their own units.

e. To facilitate the work of the officers charged with the instructions of individual officers and of units of the Reserve and National Guard.

4. *Regular Army Officers.*—In so far as Regular Officers of the Regular Army are concerned, these courses were, as originally conceived, designed to afford some opportunity for directed study primarily to officers on detached duty and to officers preparing to take courses in the Special or General Service Schools.

OUTLINE OF SYSTEM OF CORRESPONDENCE COURSES

5. *Basis of System.*—The army system of Correspondence Courses is based upon the approved proceedings of a Board of Officers convened in 1924 by the War Department for the purpose of preparing Programs of Instruction for all branch correspondence courses and for a Command and General Staff Correspondence Course. The following extract from the report of the Board outlines clearly the general scheme of these courses:

> 1. The board has proceeded in its work upon the principle that the Army Correspondence Courses should parallel the instruction of troop, special, and general service schools:
>
> (a) In subject matter (in so far as correspondence methods permit);

(b) In use of the applicatory method;

(c) In texts and authorities used.

2. The board has divided the correspondence courses in accordance with the progressive plan outlined in TR 10-5. In general, this division has taken the form of a basic, a company, and an advanced course for each branch, corresponding to similar instruction provided in the army schools.

3. The courses of the various branches have been made of approximately equal length and so organized that completion of corresponding courses will bring officers of the different branches to approximately the same point in their military education.

4. The branch courses have been developed to serve the immediate purpose of instruction in the branch concerned and also to prepare the officer for admission to the correspondence course of the Command and General Staff School.

5. In so far as information concerning standards of promotion for the reserve was available, the board aimed at coordination of the correspondence courses with those standards in order that the officer might secure exemption from examinations for promotion in the subjects which he satisfactorily completes by correspondence.

6. Careful analysis of the subject matter to be covered by the correspondence courses was made for the purpose of determining for what portions of the courses the same lessons might serve two or more branches. Common lessons and subcourses were prescribed for these subjects in order to reduce the labor involved in preparation of courses and to prevent duplication of work.

7. The board prescribed that all programs of instruction should be predicated upon training regulations, and training regulations themselves should be used as texts whenever available. Priority in use of other texts was prescribed as follows:

(a) Army regulations and other official publications;

(b) School conferences and lectures;

(c) Specially prepared abstracts and explanations;

(d) Commercial publications.

8. The Board invites attention to the fact that much of the material used in the Correspondence Courses is susceptible for use in local National Guard and Organized Reserve Schools and conferences.

6. *Branch Courses.—a.* As will be seen from the preceding paragraph, for each branch there is prescribed a Basic Course, a Battery Officers' Course, and an Advanced Course. Each of these courses requires a total of about 200 hours for its completion.

As the courses are outlined, a Reserve Officer mav complete a course during the period between his promotions by devoting to the work about two hours per week during each instruction year, of about forty weeks, from October to June.

(1) The basic courses include the subjects which are required by an officer for appointment to the grade of second lieutenant and for promotion to, and duty in, the grade of first lieutenant. Cer-

tain subjects, such as military organization, administration, military law, and military hygiene are common to all the basic courses. The other subjects include the technique of the weapons and the materiel of the branch.

(2) The Battery Officers' or similar courses cover, in general, the tactics and technique embraced in the battery officers' course in the Special Service School of the Branch. These subjects are such as an officer requires for promotion to, and duty in, the grade of captain.

(3) The Advanced Course covers, in general, the advanced tactics and technique of the branch, and includes such subjects as are required for promotion to, and duty in, the grade of major. The subjects of combat orders and the solution of problems, the associated arms, staff duties, and methods of training are common to the Advanced Course in practically all branches.

b. Each course is subdivided into a number of subcourses, each of which requires from 10 to 35 hours for its completion.

c Each subcourse is subdivided into a number of lessons, each of which requires from one to four hours for its completion. It is desirable that, when practicable, the length of each lesson shall be such as to permit of its completion in one evening's work.

7. *Command and General Staff Correspondence Course.*—This course covers the combined employment of all arms and branches and the functions of the commanders and staff officers in divisions and in corps. This course is based on the instruction given at the Command and General Staff School, General Service Schools, Fort Leavenworth, Kansas. The subjects are those that an officer requires for promotion to, and duty in, the grades of lieutenant colonel and colonel in the combatant arms. Officers of the Reserve and National Guard and civilians who satisfactorily complete the Command and General Staff Correspondence Course will be listed by the War Department for special consideration in time of national emergency in connection with command and staff assignments or for special additional preparation for such assignment. Approximately 500 hours study are required to complete the course. Graduates of the Advanced Course, of all Branches, may be excused from taking subcourse 1.

8. *Lessons.*—Each lesson consists of:

a. A Lesson Assignment Sheet showing:

(1) Name of branch;

(2) Name of course (Basic, Battery Officers', or Advanced);

(3) Number and title of subcourse;

(4) Number and title of lesson;

(5) Statement as to time allowance for lesson;

(6) Reference texts, which may include a citation of certain portions of authorized texts or which may consist in whole or in part of an "attached memorandum";

(7) Statement as to materials (maps, tables, etc.) required;

(8) Suggestions.

b. An exercise.

9. *Solutions and Examinations.*—For each lesson there are prepared full solutions for each exercise, and for each subcourse there are prepared, annually, an examination and full solutions thereto. These solutions are not furnished the student.

10. *Functions of Special Service Schools.*—In each Special Service School there has been organized a Department of Correspondence Courses which is charged with the continuing mission of preparing and revising the Branch Correspondence Courses, including the texts, exercises, examinations, and solutions.

For the guidance of the officers charged with these duties the War Department issued in 1924 a pamphlet entitled *Instructions for Authors.* This pamphlet, in addition to prescribing in detail the forms for use in the preparation of the subcourses, contains valuable suggestions as to the methods to be used in presenting the subject matter.

11. *Functions of War Department.*—Subcourses, when prepared by a Special Service School, are forwarded to the office of the Chief of the Branch, where they are reviewed and, when necessary, the concurrence of other Branches in their texts obtained.

When completed these courses are submitted to the office of the Adjutant General for approval. Upon approval by the War Department they, together with the texts therefor, are reproduced or procured by the office of the Adjutant General and are distributed by that office to the Corps Area or Department commanders.

12. *Functions of Corps Area and Subordinate Commanders.*—The Correspondence Courses are conducted by the Corps Area (or Department) commanders, by means of Corps Area Correspondence Schools and branches of these schools. In many Corps Areas the District commander is charged with the conduct of the Coast Artillery correspondence courses. The Corps Area commander (or the District commander) makes request upon the Adjutant General's Office for correspondence course material and for the necessary texts in accordance with the requirements for the number of the students enrolled within the Corps Area.

The instructors of the Corps Area Correspondence Schools are usually the Regular Army Officers on duty with reserve and National Guard units, though the Corps Area commander may detail other Reg-

ular officers (except officers on duty with the National Guard) for duty as instructors in these schools. Instructors with the National Guard may be designated to conduct the correspondence course work of their own units.

Subject to the limitations noted herein, the following are eligible for enrollment in the Branch courses:

(1) Personnel of the Officers and Enlisted Reserve Corps;

(2) Personnel of the National Guard;

(3) Qualified civilians, when facilities for instruction are available;

(4) Regular Army officers on detached duty of a nature such as to preclude their receiving instruction through other agencies;

(5) Enlisted men in the Regular Army who desire to qualify for commissions in the Officers' Reserve Corps.

The following are eligible for enrollment in the Command and General Staff Correspondence Courses:

(1) All officers who have satisfactorily completed their Branch Advance Course.

(2) Officers of the Reserve Corps and of the National Guard who are on the General Staff eligible list.

(3) In the discretion of the Corps Area Commander, officers of the Reserve Corps and of the National Guard above the grade of Major, and civilians who served during the World War as commissioned officers in the grade above that of Major.

(4) Officers of the Regular Army, on recommendation of the chief of branch or Corps Area commander.

Candidates eligible for enrollment in the Army Correspondence Courses, make application for enrollment on A. G. O. Form No. 145 (Application for Enrollment). This application is submitted in duplicate through military channels. Corps Area commanders prescribe the approving authority for such applications. The application of a Reserve officer, belonging to a Reserve division or to a Coast Artillery District or Field Artillery Group, will be approved by the division or other indicated headquarters. A Reserve officer of the non-divisional group will have his application approved by Corps Area headquarters. Applications of National Guard personnel are approved by the authority agreed upon between the Corps Area Commander and the State officials concerned. In the event of disapproval, an application must be forwarded to Corps Area headquarters for final action.

The approving authority designates the instructor who will conduct the course of the particular student. As previously stated this instruc-

tor is usually an officer of the Regular Army on duty with the applicant's organization.

When the application has been approved and the instructor designated, the instructor fills out Form No. 147 A. G. O. (Lesson Assignment Card) and, in duplicate, Form No. 148 A. G. O. (Progress Card), one copy for the use of the instructor and one copy for transmission to the school conducting the course.

The original of the application, Form No. 145 A. G. O. (Application for Enrollment), together with the introduction to the subcourse, lesson assignment sheets Nos. 1 and 2, such texts as are supplied gratuitously, and necessary franked envelopes are sent to the student.

Upon return of the first lesson paper, the date of return is entered on Form 147 A. G. O. (Lesson Assignment Card) and upon the returned lesson paper. The instructor then corrects the paper and returns it to the student, together with lesson assignment No. 3. Subsequent lessons are handled in the same manner, the student always having an exercise upon which he is working while the preceding one is with the instructor. The instructor notes upon the record cards the date of correction and date of return to the student.

When all lessons of the subcourse have been, or are about to be, completed, the instructor notifies the school conducting the course that an examination is required. This is sent to the instructor, who in turn sends it to the student when all lesson assignment sheets have been submitted by the student and returned corrected. The student returns his examination paper to the instructor, who transmits it to the school conducting the course except when he is designated as examiner. With the examination, the student is required to submit a certificate to the effect that he has not received any unauthorized assistance. The school designates examiners, generally the instructors. In the event the student is found deficient the paper must be marked by two other examiners, the final rating being the average of the three.

The student's rating as determined by the subcourse examination, is entered on both copies of Form 148 A. G. O. (Progress Card). The examination paper is returned to him by the instructor, together with a certificate of completion, in case of successful completion of the subcourse. This certificate is signed in duplicate by the instructor, one copy being approvd by the Corps Area Commander and returned for the student.

In the event of the student's failure in a subcourse, he will continue on this subcourse, until he is prepared to take another examination. Upon passing the reexamination, he goes on to another subcourse of the particular course he is taking.

The student's work as shown by Form 148 A. G. O. (Progress Card) will be given due credit by the examining board in granting exemption from professional examination in accordance with Paragraph 6 *g* (2), AR 140-21.

13. *War Department Requirements.*—All enrollments in the correspondence courses are entirely voluntary. While it is desired that the student shall complete at least one entire course between periods of promotion, he is permitted to maintain his enrollment if he completes forty hours of work per school year. He is, however, given credit for the completion of the subcourse per school year and in general is permitted to re-enroll if this is done.

Due to the voluntary nature of the work the success of the courses depends very largely upon the manner in which they are prepared and upon the interest, initiative, zeal, and ability of the instructors. The chief inducement offered to the Reserve or National Guard student for taking these courses, outside of the interest and the desire for professional instruction that may be attained, is the fact that the satisfactory completion of a correspondence course or subcourse in any subject exempts him from examination for promotion in that subject. Another consideration which tends increasingly to induce Reserve and National Guard officers to take these courses is that, due to the considerably increasing numbers of candidates for Reserve and National Guard commissions, it is becoming practicable to exercise a greater degree of selectivity in granting such commissions, and the successful completion of important correspondence courses constitutes a valuable asset to the candidate for appointment or for promotion.

SPECIAL PROBLEMS AND METHODS

14. *Character of Instruction in Coast Artillery Courses.—a. Individual instruction.* The nature of this instruction is such that the courses must be designed primarily with the view of enabling the individual student, with such written matter as may be made available to him, to take a course with profit. The lack of personal contact between the author or the instructor and the student is a serious handicap in any method of instruction by correspondence. The fact that the student is unable to clear up doubtful points or to obtain additional information by direct conference with the instructor renders its necessary that special care be exercised, in the preparation of each lesson, that the text assignments of the lesson shall be clear and concise and shall be sufficiently comprehensive to afford a working knowledge of the principles or of the subject matter it is intended to cover, and that the contents and sequence of the preceding lessons shall be such as to

prepare the way, in a logical manner, for the consideration of the subject matter of the lesson in hand.

As an expedient to minimize the disadvantages incident to the lack of personal contact referred to above, resort is had to the use of "Suggestions" in each lesson assignment sheet, in the nature of comments upon the purpose of that particular lesson, upon the relationship to preceding and to succeeding lessons, and upon certain matters in explanation of, or in amplification of, portions of the lesson texts. In many cases illustrative problems are also given, with their solutions and with explanatory comments, covering portions of the text which it may otherwise be difficult for the student, unaided, to master.

The facts that the instruction is individual and that the exercises are of the free answer type, permitting the student to prepare his solutions deliberately and in his own words, affords the advantage that it permits and encourages the student to reveal his line of reasoning and hence permits the instructor both to comment advisably and constructively upon the solution of the student and to appraise the reasoning powers of the student.

b. Group instruction.—While, as above indicated, the courses are prepared with the primary object of rendering practicable individual instruction, they are also designed to facilitate group instruction by affording to the instructor carefully selected and prepared instructional material from which he may make such selection as may best meet the particular requirements.

The purpose of the courses is primarily to facilitate the acquirement of professional knowledge to the greatest practical extent. It is believed that it will serve both to accomplish this end and to stimulate and maintain interest if lessons are prepared jointly by several students, and this is encouraged. Students are, similarly, encouraged to consult any references or to obtain any competent advice available in connection with the preparation of the various exercises.

15. *Scope of Instruction.*—It is endeavored, in so far as may be practicable, to include in these courses instruction that fits the grade of the student. In the exercises, effort is made to cause the student either to arrive at conclusions upon matters which are of general professional interest to every Coast Artillery officer or which concern directly the normal duties of his grade, or to require him to make decisions upon matters of the same general nature as those he might reasonably expect to have presented to him in service for decision.

In these Coast Artillery subcourses that deal primarily with materiel, the scope of the instruction has necessarily been limited by the fact that frequently the student will not, at the time, have access to

the materiel itself. While it has, in many cases, been practicable to render available to the student diagrams and drawings covering certain features of the materiel under study, it has, in general, been deemed advisable in the preparation of exercises to minimize the number of questions requiring for their solution a detailed knowledge of the minutiæ of the various types of materiel, and to emphasize the principal characteristics of the materiel and the general principles underlying its design and employment, with the view of enabling the student, when he may have an opportunity for actual experience with the materiel, to study intelligently the details of its design and functioning.

16. *Character of Texts and of Exercises.*—The problem of maintaining the interest of the student is one of the most difficult ones involved in the preparation of correspondence courses. The character of the subject matter of some of the lessons is such that it is often exceedingly difficult to present it to the student by correspondence methods in such a manner as to make it interesting. This is particularly true where such subjects as tables or charts of organization, tables of characteristics of materiel, and the preparation of reports and analysis are involved, and the exercises are designed to require the student to examine the tables or charts carefully with a definite purpose in mind. The fact is emphasized that such tables are primarily for reference purposes and that the student is not expected to memorize other than a few data of outstanding importance.

Effort is made to avoid the use of the same title or of the same text for two or more lessons, and care is exercised that the text assignments are pertinent to the exercises and are as concise as practicable.

Some students lose interest in the courses because they find them too difficult; some because they consider them too elementary. It is the purpose of the War Department that completion of one of the full courses by a Reserve officer shall represent in proportion to the time and opportunities available to him in civil life as much earnest effort and as much of an accomplishment as completion of a similar course in a service school represents in the educational life of a Regular Army officer.

A large number of the Reserve officers who take the Coast Artillery correspondence courses are men of high educational and technical qualifications; they take the work seriously and they reasonably expect that the benefit to be gained from taking these courses shall be commensurate with the time and effort involved.

It is a general principle in the preparation of these courses that the maintenance of the interest of an officer of this type in the correspondence courses is dependent to a large degree upon the extent to

which they serve to impart to him information of a professional character which he could not readily obtain from other sources, and that the interest of an intelligent student, even in a difficult subject, is more likely to be aroused and maintained by its presentation in a thorough manner than by an endeavor to present for his study only a superficial outline of elementary and self-evident generalities or a compilation of encyclopedic facts.

17. *Time Limitation.*—Most of the Coast Artillery subcourses are allotted from 15 to 35 hours for their completion. A consideration of the nature of the subjects to be covered by these subcourses will render obvious some of the practical difficulties involved in the preparation of many of these subcourses which are imposed by limitations of time. Such difficulties exist to a special degree in the subcourses dealing with the tactics of fixed and mobile seacoast artillery and of antiaircraft artillery. Since each such subcourse, under the present arrangement, must be complete in itself, it is necessary that it include such preliminary instruction, including that in organization and in the characteristics of the materiel, as may be required to afford a reasonably satisfactory basis for the study of the tactical employment of this materiel.

Futhermore, while theoretically the student is supposed to take the Basic, Battery Officers', and Advanced Courses in sequence, in practice for some time to come this will be exceptional and in the ordinary case the course which the student actually takes will probably be determined chiefly by his rank. It cannot therefore be assumed that the student who takes any one course has taken the preceding courses. It follows that, while it is desirable that the subcourses in each course shall prepare the way in a logical manner for such corresponding subcourses as may be given in following courses, it is actually necessary that each subcourse be sufficiently comprehensive in its scope to enable it to be taken advantageously by a student who has not taken the preceding course. This necessarily results in some duplication, in the tactical subcourses particularly, in the subject covered. The effort is made, however, to arrange the text assignments for the Advanced Courses so that they embody a more comprehensive treatment of the subject matter than is the case in the preceding courses, and, in general, the exercises are entirely different and in each course are based upon the special requirements of that particular course.

In most Corps Areas no definite sequence in which subcourses are to be taken is prescribed. In other Corps Areas this sequence is prescribed with the view of standardizing the instruction, of insuring that the subcourses are taken in a logical order, and of facilitating the work of the instructors.

Due to the time limitations above referred to, the number of map problems that can be advantageously used in the Coast Artillery tactical subcourses is necessarily limited on account of the wide scope of the subject matter which must be covered by the exercises of these subcourses. This renders particularly difficult the use of the applicatory method of instruction in these tactical subcourses.

It is also a general principle in all army correspondence courses that the use of questions that require the mere mechanical copying of portions of the text must be avoided.

In order to minimize the amount of the time required on the part of the student and in order better to enable the exercises to cover as wide an application as practicable of the principles or of the information contained in the text, it is often necessary in the tactical subcourses, due to the impracticability of using map problems of the ordinary type, to require the student to base a decision entirely upon the consideration of certain assumed conditions, whereas in practice many other conditions would constitute important factors in his decision. In this respect the exercises in some cases are more or less academic in their nature. They are, however, designed to accomplish the purpose of requiring the student to make a number of decisions based upon a careful consideration of the text as a whole.

18. *Other Considerations.*—Special care is necessary to insure that exercises are clear, concise, and unambiguous in their requirements, since it is essential, if the interest of the student is to be aroused and held, that he shall be able to understand clearly what he is required to do or to decide.

In general, effort has been made to prepare the exercises, and, where practicable, the examinations themselves, so that the student may be free to consult, in the preparation of his solutions, any texts that may be available.

In the preparation of the solutions to the various exercises and examinations, which solutions are furnished the instructor, special effort has been made to facilitate the work of the instructor. With this purpose in view the solutions have in many cases been made considerably more comprehensive and complete than would be ncessary in the solution of the student. This has been done in order to render available to the instructor information or comments in addition to or in amplification of the text references.

19. *Use of "Attached Memoranda."*—An extensive use has been made, in many of the Coast Artillery subcourses, of an "Attached Memorandum" for each of the lessons, which has been especially prepared with the view of presenting to the student in one place the text

required for study and for reference. This has been done particularly where the nature of the subject matter has been such that existing texts were not readily available or where the existing textual matter was widely scattered in a number of different publications.

The use of these memoranda has been designed to save time for the student and to assist in maintaining his interest by obviating the necessity for referring to many short and more or less unrelated passages in many different publications and by eliminating frequent repetitions in the text assignment for the different lessons. By affording to the student, in each lesson, in concise form all the text necessary for the solution of the exercise, it has been practicable to extend considerably the scope of the various subcourses.

APPLICATION OF CORRESPONDENCE COURSES TO INSTRUCTION IN THE REGULAR ARMY

20. *Officers Preparing for the Coast Artillery School.*—As stated above, it was originally contemplated that the correspondence courses would afford some opportunity for directed study to Regular Army officers who were on detached service or who were preparing for the Special or General Service Schools.

In this connection, for officers preparing for the Battery Officers' Course, Coast Artillery School, Subcourses 2, 3, 4, 6, and 7 of the Battery Officers' Course are recommended, and for officers preparing for the Advanced Course, Coast Artillery School, Subcourses 6 and 7, Battery Officers' Course, and Subcourses 1, 2*a*, and 5*a* of the Advanced Course are recommended.

21. *Possible Uses in Future.*—*a. Basic Course.* It is believed that the use of correspondence course methods, including the employment of certain subcourses especially prepared for the purpose, will serve both to standardize the instruction of newly commissioned officers taking the Basic Course and to minimize the amount of time required on the part of other officers in connection with the conduct of these Basic Courses.

b. Officers' Troop Schools.—It is also believed that the use of the correspondence courses, including possibly the use of several specially prepared subcourses, will serve both to standardize the instruction in Officers' Troop Schools and to minimize the amount of time required by the instructors and the students in connection with these schools. In this case the correspondence courses would be prepared with a special view to adapting them to the requirements of group instruction.

In this connection the use of a special course in probability of fire and fire adjustment, as an annual refresher course for all officers, would

probably be found advantageous. In view of the limited opportunities probable in future for field and battery officers to serve with troops, and in view of the various kinds of material manned by the Coast Artillery Corps, it is believed that the use of certain of the subcourses of the Battery Officers', and of the Advanced Courses would serve to afford to many field and battery officers an opportunity to broaden their professional knowledge, especially of those types of artillery with which they may not have had a recent opportunity to serve. In the preparation of many of these subcourses special effort has been made to adapt them to the requirements of instruction of officers of the Regular Army.

22. *Miscellaneous.*—Coast Artillery Officers may, in addition to the ways indicated above, have occasion to come in contact with the Army Correspondence Courses in various other ways, among which may be mentioned the following:

a. They may be detailed for duty with the Organized Reserves or with the National Guard, in which case one of their principal functions will be to act as instructors in the correspondence courses.

b. They may be detailed for duty with the Department of Correspondence Courses at the Coast Artillery School, in which case they will have occasion to prepare or revise Coast Artillery correspondence courses.

c. They may be detailed on duty at Corps Area or Coast Artillery District headquarters, in which case their duties may be directly concerned with the conduct of correspondence courses.

d. They may be detailed on duties of such a nature that it may be advisable for them to become students of certain subcourses, including not only those of the Coast Artillery courses, but also those pertaining to the courses of other branches of the service.

OUTLINE OF COAST ARTILLERY CORRESPONDENCE COURSES

23. For purpose of reference there is given below an outline of the various Coast Artillery Correspondence Courses.

I. Basic Officers' Course

a. Scope.—Subjects susceptible of correspondence methods, which are required of both First and Second Lieutenants not previously prepared in these subjects, and subjects which the officer requires for promotion to and duty in the grade of First Lieutenant.

b. Duration of the Course.—The subcourses are to be studied in sequence. To complete the Basic Course requires approximately 200 hours, of which 98 hours are required of both First and Second Lieutenants not previously prepared in the subjects covered by subcourses 1, 6, 7, 10, and 11.

c. Program.

Subcourse	*Approximate Hours*
1. ORGANIZATION OF THE ARMY.	10

Divided into two sections: first, the Army in general; second, the Coast Artillery Corps. This subcourse presents to the officer that knowledge of general army organization which is regarded as essential for all army officers. Following this is a more detailed presentation of coast artillery organization.

2. WEAPONS.	25

(Required of all officers except antiaircraft artillerymen with whom it is optional.)

Fixed and mobile armament; guns, carriages, and accessories; trench, railway, tractor, and self-propelled artillery; antiaircraft artillery and machine guns.

2*a*. WEAPONS, ANTIAIRCRAFT.	25

(Required of antiaircraft artillerymen; optional with other officers.)

Antiaircraft materiel, including guns, machine guns, carriages, and accessories; antiaircraft searchlights.

3. POWDERS, PROJECTILES, PRIMERS, AND FUZES.	14

Description, care, and uses of the various powders, projectiles, primers, and fuzes.

4. ELEMENTARY GUNNERY.	30

(Required of all officers except antiaircraft artillerymen with whom it is optional.)

The principles of fire, the problems to which they give rise, and the means for their solution.

5. ANTIAIRCRAFT GUNNERY.	30

(Required of antiaircraft artillerymen; optional with other officers.)

The principles of antiaircraft artillery and antiaircraft machine-gun fire, the problems to which they give rise, and the means for their solution.

6. ADMINISTRATION, DISCIPLINE, AND COURTESIES.	26

Problems which will concern the junior officers, mobilization, rail transportation, battery records, individual records of soldiers, battery reports, military correspondence, mess management, and property responsibility. A brief description of military discipline, courtesies, and customs of the service.

7. MAP READING AND SKETCHING.	30

This subcourse is designed to give the officer a working knowledge of map reading, and includes horizontal and vertical distances, direction, slopes, visibility, coordinates, and conventional signs. A brief presentation of military sketching is included.

8. FIRE CONTROL AND POSITION FINDING.	25

(Required of all officers except antiaircraft artillerymen with whom it is optional.)

To familiarize the officer with the organization of the fire-control and position-finding service, the identification of targets, the

duties of the various details, and the instruments used.

8*a*. ANTIAIRCRAFT FIRE CONTROL; IDENTIFICATION OF AIRCRAFT. 25

(Required of antiaircraft artillerymen; optional with other officers.)

To familiarize the officer with the organization of the antiaircraft fire-control system; the identification of aircraft.

9. THE BATTERY COMMAND. 10

To include the organization of the battery, battery formations, marching maneuvers, and inspections; general duties of the lieutenant in drill and in action.

10. MILITARY HYGIENE AND FIRST AID. 10

The fundamentals of hygiene and sanitation, both personal and as applied to organizations; and the general subject of first aid.

11. MILITARY LAW. 20

Those principles of military law governing the administration of military justice with which all officers should be acquainted.

II. BATTERY OFFICERS COURSE

a. Scope.—Subjects susceptible of correspondence course methods which are required to prepare an officer for promotion to and duty in the grade of captain.

b. Duration of Course.—The subcourses are to be studied in sequence. To complete the Battery Officers' Course requires approximately 205 hours.

c. Program.

Subcourse *Approximate Hours*

1. THE BATTERY COMMAND. 30

To include a knowledge of all duties that would normally be required of a captain of coast artillery in training, drill, and action of the Battery Command.

2. APPLIED GUNNERY. 35

Problems covering gunnery for battery commanders; aiming, laying, and topographical preparations; calculation of initial firing data; probability and dispersion, adjustment of fire; unilateral adjustment; analysis of drill and target practice.

3. ORIENTATION AND FIELD FORTIFICATION. 35

The principles of orientation, the problems to which they give rise, and the means for their solution. The construction and concealment of battery positions.

4. GASOLINE ENGINES AND MOTOR TRANSPORT. 35

The principles of gasoline engines; cooling, fuel, and lubrication systems; carburetion and carburetors; starting, lighting, and ignition systems. The operation, care, and maintenance of motor transportation, running gear, driving instruction, road and convoy rules.

5. ARTILLERY TACTICS; SEACOAST ARTILLERY. 35

(Antiaircraft artillerymen may omit this subcourse or subcourse 6.)

The tactical employment of seacoast artillery, its mission and

general requirements for the accomplishment of seacoast defense; disposition and emplacement of the elements of the defense; employment of railway and tractor artillery in seacoast defense; joint army and navy action in seacoast defense; fleet formations; forms of naval attack; effects of fire. Combat orders.

6. ARTILLERY TACTICS; LAND WARFARE ARTILLERY. 35

(Antiaircraft artillerymen may omit this subcourse or subcourse 5.)

The missions and tactical employment of railway and tractor artillery in land warfare; the artillery information service; ammunition supply; effects of fire; reconnaissance, selection, occupation, and organization of battery positions. Combat orders.

7. ARTILLERY TACTICS—ANTIAIRCRAFT ARTILLERY. 35

(Required of antiaircraft artillerymen; optional with other officers.)

The missions and tactical employment of antiaircraft artillery, to include antiaircraft guns, machine guns, and searchlights in front line and back area defense; defense of cities; communication systems; reconnaissance, selection, and occupation of positions for antiaircraft weapons.

III. ADVANCED COURSE

a. Scope.—Subjects susceptible of correspondence course methods which are required to prepare an officer for promotion to and duty in the grade of Major.

b. Duration of Course.—The subcourses are to be studied in sequence. To complete the Advanced Course requires approximately 185 hours.

c. Program.

Subcourse *Approximate Hours*

1. COMBAT ORDERS AND THE SOLUTION OF PROBLEMS. 35

Estimate of situation; the mechanism of solving tactical problems; combat orders, general; coast artillery orders, operation orders, or annexes.

2. COAST ARTILLERY COMMAND. 35

(Required of all officers except antiaircraft artillerymen with whom it is optional.)

To include a knowledge of the duties required of a field officer in the group, the Fort, and the Harbor Defense.

2*a*. THE ANTIAIRCRAFT COMMAND. 35

(Required of all antiaircraft artillerymen; optional with other officers.)

To include a knowledge of the duties required of a field officer in an antiaircraft battalion and regiment.

3. ADVANCED GUNNERY. 35

This subcourse is a continuation of subcourse 2, Battery Officers' Course, and includes the analysis of artillery firing; the supervision and criticism of the reports of artillery firings; advanced gunnery.

4. THE ASSOCIATED ARMS. 30

The tactical employment of the other combat arms; a brief

description of the operation of the supply branches in the field; and signal communication for all arms.

5. TACTICS AND TECHNIQUE OF ARTILLERY OTHER THAN ANTIAIRCRAFT. 35

(Required of all officers except those assigned to antiaircraft artillery with whom it is optional.)

To include the tactical employment of seacoast, tractor, and railway artillery, and their use when employed in connection with the other arms of the service.

5*a*. TACTICS AND TECHNIQUE OF ANTIAIRCRAFT ARTILLERY, MACHINE GUNS AND SEARCHLIGHTS. 35

(Required of all antiaircraft artillerymen; optional with other officers.)

To include the tactical employment of antiaircraft weapons in gun areas; in the defense of cities, coast defenses, and other important points; the tactical employment of antiaircraft; searchlights in airplane areas; the technique of antiaircraft weapons in so far as it affects their tactical employment.

6. METHODS OF TRAINING. 15

The preparation of training programs and schedules of instruction. The preparation of technical and tactical problems.

24. For those who may have occasion to need further information covering the Army Correspondence Courses, the following references are given:

a. A. R. 135-10.

b. A. R. 140-5, 140-21, 140-27.

c. Regulation for Army Correspondence Courses (and changes), as reprinted August 11, 1925.

d. Report of the Proceedings of a Board of Officers appointed to prepare programs of instruction for all Branch Correspondence Courses and for a Command and General Staff Correspondence Course, pursuant to par. 6, S. O. 85, W. D., April 10, 1924.

e. Instructions for Authors, as amended October 22, 1924.

f. Announcement for Army Correspondence Courses, 1925-1926.

g. Article by Lieutenant-Colonel Klein, GS, *Infantry Journal*, January, 1925.

Wars have a way with them of seeking even those who do not seek them.—*Canon Dimnet*

EDITORIAL

The Annual Prize Essay

AFTER a careful and deliberate study of all manuscript received, the Committee of Award in the annual prize essay competition has awarded first place to Major Rodney H. Smith, whose article, "The Combined Arms in Coast Defense," appears in this issue. It is particularly appropriate that such a subject should be brought thus forcibly to our attention at this time. The pre-war conception of coast defense as involving the Navy, the Coast Artillery, and the mobile Army as separate entities in the defense of the coast line leads obviously to a violation of the principles of war. That these forces should work in the closest cooperation and harmony with a view to teamwork is universally admitted. In the details only will divergences of opinion be found; and we are now sufficiently distant, in point of time, from the influences of the World War to begin to consider these differences of opinion and attempt to establish a reasonable and sound doctrine.

In expressing his own views, Major Smith unofficially speaks for one school of thought. He does not approach the subject as a coast artilleryman endeavoring to fix upon the proper employment of seacoast artillery in a situation in which the lines of action of other organizations are but vaguely known, that is, from the bottom up. His approach is more that of a higher commander confronted by the problem of coast defense, into which he must fit, in their proper places, all the available agencies of defense; so that he may obtain a maximum of defensive power. This method is, of course, the one which promises the more rapid solution of the problem.

The conclusions reached in the paper published this month represent the views of many of our officers. They are not, however, representative of the views of all. The JOURNAL, while not committing itself to any particular point of view, feels that the subject is so timely and so important that it would be glad to receive constructive discussion of the details of coast defense from other officers. As is always the case, the manuscripts should not embody destructive criticism of established policies, individuals, or branches of the service, but otherwise there will be no censorship.

For second place, the Committee found a group of manuscripts of practically identical merit, all discussing phases of fire control.

After due consideration it was decided that the second prize should be awarded as a tie between three papers:

"Mechanical Fire Adjustment," by Lieut. G. A. Patrick,

"Preparation and Adjustment of Antiaircraft Fire," by Capt. B. F. Harmon, and

"A Suggestion for the New Method of Locating Aircraft at Night," by Capt. W. Sackville and Lieut. J. E. Ollivares.

Honorable mention was awarded to "The Preparation of Fire for Antiaircraft Artillery," by Capt. C. S. Harris.

It is also appropriate that such a subject group should be represented among the prize winners. No less than tactics and organization, the technique of our service requires constant thought and study. The field of position finding and fire control, particularly in the antiaircraft service, holds great promise for development in the near future. It is encouraging to note that so many of the manuscripts submitted were concerned with the control of fire, for never will our range finding be so perfected that it will be incapable of further improvement. So long as we have guns to fire, just so long will we find research in fire control methods and equipment necessary, and just so long will articles on these matters be of value and interest to JOURNAL readers.

The members of the Committee of Award deserve an expression of appreciation from the JOURNAL and its readers for their labor in the behalf of the competitors. Their interest and cooperation have brought the contest to a timely close, and the papers selected by them will be published in the near future.

The Regular Army

The Regular Army of the United States, in which for this discussion let the marines be included, have availed this Country at home and abroad in small crises and in great ones, and its value as such has scarcely been at any time in our history popularly appreciated. The marines at Belleau Wood, the First and Second Divisions in the Argonne, are striking instances.

The Regular Army is in General Pershing's words "the nucleus force." Upon it the volunteers and drafted men in our history have rallied. The civilian forces have been trained by regular noncommissioned officers and led by regular commissioned officers, pretty largely. In the greatest martial test of our history, the Civil War, the regular troops saved the Republic in the earlier days. The great strategists of that war were all West Point graduates and Regular Army officers. Eminent as were the services of the civilian generals, they were pre-

cluded by their lack of military education from becoming Lees and Jacksons, Grants and Shermans. That great strategist, Joseph E. Johnston, said that Confederate General Forrest had the greatest natural genius of any on either side but was handicapped by lack of West Point training.

General Perishing thinks the Army has already been pared down to the degree that its efficiency will be seriously impaired by any more of the same mistaken economy. The General ought to know, and doubtless does. The country will do well to heed his words.

True, there is small chance of our entanglement in war for years to come. We won our security for perhaps fifty years in 1917-18. Yet there is always the chance. But that is not the chief consideration.

The chief consideration is the continuity of the Army as an adequate nucleus. This does not mean a large army, nor necessarily an expensive one. But it does mean maintenance of an adequate establishment, and as to what that may be, the experts are naturally the best guides.

The Army that George Washington, General Knox and Alexander Hamilton modeled has been perpetuated through the political generations. It reached us as a competent instrument in 1917. We ought to provide that as such it will reach our posterity in 1950, say. Let this generation respect the great tradition and hand it on unimpaired to those who come after us. Such is our American duty. It is likewise our self-interest.—*Minneapolis Journal.*

Inadequate Defense is Profligacy

For some reason or other more official heed is paid in Washington to a comparatively small company of vociferous pacifists than to the great body of inarticulate American citizenship when it comes to shaping national defense policies. What our enlightened voters ask for is a prudent economy in providing for land, sea and air forces, not a mere saving of money that involves undue national hazards. They do not want "incomparably the greatest navy," or anything of that sort, but neither are they clamoring for what the ultra-pacifists have in mind.

The nation is at peace at home and with all other nations, but that has been true of many and prolonged periods that came to a tragic and costly end. Where is the thoughtful man who can look out over the world and convince himself that war is a thing of the past? Where is the prudent American who feels that his nation can go along henceforth with a complacent sense of security against enemy

assault? There is no such American qualifying as prudent. Defense, therefore, is a rational policy, and the policy is rational according as defense is adequate to the case. Inadequate defense is rightly understood as profligacy, not economy.—*Minneapolis Tribune.*

Army Training for War

Major General Robert H. Tyndall voiced the opinion of every critic of American military policies when he declared that the greatest need of the Army is large training areas within the reach of troops. He referred to the experience of two wars as having demonstrated that the weakness of the American army lies in its inexperience in handling large bodies of troops. The Spanish war certainly proved that neglect in the training of higher officers to maneuver large bodies of troops in the field exacts, in time of emergency, a terrible toll of lives. During the great war the staff work of the American army was a last-minute development under French and British inspection; and it was far below a reasonable standard of efficiency.

The fault is not the Army's. It has an excellent staff school. But its problems are worked out on maps and, in the field, with small bodies of troops so distributed as to make an appearance of an army. There is no such thing in the Army as general maneuvers. The Navy goes to sea and works out defense problems on a war scale, but this practice is denied to the Army. Even with the war experience fresh in mind, the Government is not providing for regular army maneuvers on a scale large enough to afford higher officers an opportunity to deal with the problems of troop handling on a war scale.—*Indianapolis News.*

The New French Army Plan

In the decision of France to cut its period of conscripted military service from eighteen months to twelve, thus by degrees reducing its total military strength from 600,000 to 500,000, and in the parallel plan to increase the regular army to 200,000 and to make the profession of soldiering more attractive, we see the nation most military in spirit of them all coming closer to what many military critics in this country would call an ideal defensive system.

France improves on the American system, however. Our fault is in depending wholly on the regular army and in forgetting almost entirely, between wars, the training of a citizen soldiery. One year of

military training will hurt no young man. Rather will it benefit him, straighten his shoulders, teach him the value of mass discipline and individual responsibility.

If we distinguish between the experiences of warfare and the training received in service, we find, we believe, that, although the war worked many hardships and harms, the training itself was beneficial. A large majority of veterans, we think, will agree with us that their period of service gave them a new outlook on life that has helped them since the war.

We are not sure how one year of military service would be accepted by the young men of this country. We are sure that it would do them good. France revises its military system downward. America could well afford to revise hers upward.—*Chicago Tribune.*

APHORISME XII.

As the Oratour placeth his strongest arguments in the entrance of his plea, to perswade and confirm the Auditorie: So should a Generall bend all his best forces upon the first peece he attempteth, to animate and encourage his Souldiers, and to give reputation to the action he intendeth; for first actions make deepest impressions either of feare or courage. Hee is therefore so much to tender his reputation at the first onset, as to leave nothing behinde him unbroken but that which bendeth.—Ward's Animadversions of War *(London, 1639).*

LIEUTENANT COLONEL ROYAL T. FRANK
Commandant Artillery School, November 6, 1888-March 26, 1898

PROFESSIONAL NOTES

The Twelfth Coast Artillery (HD)

The Coat of Arms of the 12th Coast Artillery (HD) was approved by the War Department in 1924 and is blazoned thus:

Shield: Gules (red) a fess dancette *sable* (black) fimbriated *argent* (silver), in chief two fleur-de-lys *or* (gold).

Crest: On a wreath of the colors, *or* (gold) and *gules* (red), a griffin statant with wings elevated and addorsed *or* (gold).

Motto: Impiger et Animous (Alert and courageous).

The shield is the same color as the regimental flag, that is, red, and shows to which branch of the service the organization belongs. The black fess dancette or zigzag figure, is taken from the Coat of Arms of the Harbor Defenses of Chesapeake Bay and is edged with silver as the shield of the same Harbor Defenses, where the 12th Coast Artillery was organized. Two batteries, Headquarters Battery and Battery C of this regiment, saw service in France during the World War and were then designated as Battery A, 60th Artillery, Coast Artillery Corps, and Headquarters and Service Company, 1st Antiaircraft Battalion, respectively. This service is represented by the fleur-de-lys (lilies). The crest is the Griffin, a fictitious, heraldic animal pictured as half eagle and half lion, which is noted for watchfulness and strength, also further emphasized in the motto "Alert and Courageous."

The griffin in gold surrounded by a red ribbon in enamels, on which is the motto also in gold, is worn by the personnel of the organization as the distinctive regimental badge—on the shoulder loop by the officers and on the collar by the enlisted men.

The history of the units of this organization is as follows:

Headquarters Battery was organized in 1901 as the 112th Company, Coast Artillery, at Fort DuPont, Delaware; was designated 4th Company, Fort DuPont, in 1916 and 4th Company, Coast Defenses of Delaware in 1917; became Battery A, 60th Artillery, Coast Artillery Corps, in December, 1917, and embarked for France in March, 1918. It participated in the St. Mihiel and Meuse-Argonne offensives and returned to the United States in February, 1919, and demobilized; was reconstituted and incorporated with Headquarters Battery, which was designated as such in 1924.

Battery A was organized in 1899 at Fort Hamilton as Battery N, 5th Regiment of Artillery; was designated 58th Company, Coast Artillery, in 1901; became 3rd Company, Fort Monroe, in 1916 and 3rd Company, Coast Defenses of Chesapeake Bay in 1917; 58th Company, Coast Artillery Corps, in 1922; was designated Battery A, 12th Coast Artillery, in 1924.

Battery B was organized at Fort DuPont in 1907 as the 139th Company, Coast Artillery Corps; designated 2nd Company, Fort DuPont in 1916 and 2nd Company, Coast Defenses of Delaware, in 1917; 139th Company, Coast Artillery Corps, in 1922; became Battery B, 12th Coast Artillery, in 1924.

Battery C was organized at the Presidio of San Francisco as the 158th Company, Coast Artillery Corps, in 1907; was designated 5th Company, Fort Winfield Scott, in 1916 and 5th Company, Coast Defenses of San Francisco, in 1917; became Headquarters and Service Company, 1st Antiaircraft Battalion, in 1917 and participated in the St. Mihiel and Meuse-Argonne offensives in 1918. On its return to the United States it was sent to San Francisco and became again the 5th Company, Coast Defenses of San Francisco; was discontinued in 1919; in 1922 was reconstituted and consolidated with the 4th Company, Coast Defenses of Los Angeles; became 158th Company, Coast Artillery Corps, in 1922; and was designated Battery C, 12th Coast Artillery, in 1924.

Battery D was organized at Jackson Barracks in 1907 as the 164th Company, Coast Artillery Corps; designated 1st Company Jackson Barracks, in 1916 and 1st Company, Coast Defenses of New Orleans, in 1917; was disbanded in 1921 but reconstituted and consolidated with the Caretaking Detachment, Coast Defenses of Baltimore, and named the 164th Company, Coast Artillery Corps, in 1922; and became Battery D, 12th Coast Artillery, in 1924.

Battery E was organized at Fort Howard in 1907 as the 103rd Company, Coast Artillery Corps; designated 2nd Company, Fort Howard, in 1916 and 2nd Company, Coast Defenses of Baltimore, in 1917; was disbanded in 1918; reconstituted with the 10th Company, Coast Defenses of Chesapeake Bay, in 1922 and designated 103rd Company, Coast Artillery Corps; became Battery E, 12th Coast Artillery, in 1924.

Battery F was organized at Fort Monroe, in 1907 as the 166th Company, Coast Artillery Corps; designated 7th Company, Fort Monroe, in 1916 and 7th Company, Coast Defenses of Chesapeake Bay, in 1917; became 166th Company, Coast Artillery Corps, in 1922; and Battery F, 12th Coast Artillery, in 1924.

Battery G was organized at Fort Monroe in 1907 as the 169th Company, Coast Artillery Corps; designated 9th Company, Fort Monroe, in 1916 and 9th Company, Coast Defenses of Chesapeake Bay, in 1917; was absorbed by the 3rd Company, Coast Defenses of Chesapeake Bay, in 1919; reconstituted and consolidated with the 11th Company, Coast Defenses of Chesapeake Bay, in 1922 and designated the 169th Company, Coast Artillery Corps; and became Battery G, 12th Coast Artillery, in 1924.

Reference is made above, to the Coat of Arms of the Harbor Defenses of Chesapeake Bay, an illustration of which appeared on page 138, in the August, 1923, number of the COAST ARTILLERY JOURNAL and is described as follows:

The shield of the Harbor Defenses of Chesapeake Bay has for its base the arms of Lord Delaware, the first Governor of the Colony of Virginia, who met and turned back the departing colonists at the mouth of the James River in 1610, thereby saving the Colony. His arms consisted of a silver shield bearing a jagged black stripe placed horizontally across the center, known to heralds as a fess dancetty. To this is added a red cross, symbolic of the landing of the first settlers at Cape Henry in 1607, their first act being to erect a cross and offer thanks for their safe arrival. The crest is a hand in a gauntlet of silver mail grasping a gold trident, which commemorates the battle between the Monitor and the Merrimac in Hampton Roads, the first conflict between the iron clads, which type of vessels at once became supreme in naval warfare. The mailed hand grasping the trident of Neptune, the God of the Sea, fittingly symbolized that Suprem-

acy. The motto is *Portam Primam Defendo* (I defend the first gateway) with special reference, of course, to the approaches to Washington, Baltimore, and other important centers lying at the head of Chesapeake Bay.

New Classification for Reserve Officers

An important conference was recently held in the War Department with Brigadier General Roy Hoffman, President of the Reserve Officers' Association, and several other officers of the Association, at which the pressing needs of the Reserve Officers were discussed. This conference was the culmination of a series of conferences with Reserve Officers, which have been held for the purpose of developing the future plans for the Officers' Reserve Corps. As a result of these conferences and detailed studies which have been conducted in the War Department extending over a period of many months, the following conclusions have been reached:

1. To establish in the War Department under the Chief of Staff an executive office to handle the affairs of the Officers' Reserve Corps.

2. To modify our present policies governing the procurement, promotion, assignment, reappointment and discharge of Reserve Officers in the following essential particulars:

a. To provide a definite number of Reserve Officers by rank and branch who will be procured in peace time with provisions for such extra numbers in the higher grades as to afford latitude in filling vacancies in regiments from officers in the regimental areas.

b. To coordinate promotion in the Officers' Reserve Corps with promotion in the Regular Army.

c. To provide for the establishment of an unassigned section of the Reserve Corps to which may be transferred upon reappointment officers who for any reason are unable to devote any time to military duties. To provide a minimum requirement of military work as a prerequisite for reappointment in the assigned Reserves.

d. To provide means for the assignment of interested Reserve Officers.

Immediately after the war and in order not to lose the valuable interest and services of the World War veterans, the War Department proceeded with the organization of the Officers' Reserve Corps before completion of initial mobilization plans which were essential to the ascertainment of requirements by grade in commissioned personnel. Due to the many problems connected with the project for the development of this component, the satisfactory solution of these problems has been delayed in order that a careful and well-considered plan might be assured for the future.

Promotion in the Reserve Corps has been very rapid. The numbers in some grades of Reserve Officers now exceed the numbers in corresponding grades in the A. E. F. in November of 1918.

Every Reserve Officer has accepted his commission with the highest patriotic motives. However, many have found it impracticable to devote any time or interest to their military office. As a result, there has been formed a large inactive element in the Reserve Corps, whose members are an obstacle to the advancement of those other officers who give serious application to perfecting themselves in both the theory and practice of military science. Many of these unassigned officers

are desirous of assignment whereas among assigned Reserve Officers are many who cannot spare time to participate in the activities of their units.

Our regulations for some years have contemplated the continuation of only such Reserve Officers as were able to keep in touch with the main developments of interest to their grade. However, such regulations are difficult of administration. Many Reserve Officers are unable to spare any time to military duties, yet their past experience would make their services of great value in the event of an emergency. Yet to establish the Reserve Corps on a fresh basis and make a deserved reward of promotion where merited by experience and application, vacancies must be created in the higher grades.

The policies outlined above aim to provide a remedy for the conditions in the Officers' Reserve Corps. They provide for two groups in the Reserve Corps—one active and one inactive. When the current period expires on any commission, an officer will have opportunity to indicate in which group he desires to have his renewed commission. If he selects the inactive group he will not be expected to be available for any military training or duty except when subject to call under provisions of law.

The active group will be divided initially among the various grades on the basis of a total between seventy and eighty thousand, distributed in accordance with Tables of Organization. This total will not affect the acceptance of an unlimited number of candidates from the R. O. T. C., the enlisted Reserve Corps, the C. M. T. C. or similar sources, which will be allowed irrespective of whatever total may be serving as the basis of apportionment. If there occurs a surplus in lower grades which can not be absorbed by promotions to existing vacancies, then a new basis will be adopted whereby all grades will be increased by corresponding promotions. A standard will be prescribed as a basis for determination of the officers to be transferred to the inactive group of the Reserve Corps. This standard will be at least 300 hours' duty during the five-year period of an appointment. Credit will be given for time at lectures and classes conducted by the executive officers on duty with the Reserve Corps, for correspondence schools, for inactive duty training and for active duty training. A fifteen-day training period would count for 60 hours, or one-fifth of the total requirement.

All Reserve Officers can not have active duty training due to the limitation of funds for training. However, a Certificate of Capacity will continue to be regarded as best evidence of an officer's right to remain with the active group. Tours on the General Staff or at the Service Schools would receive similar consideration.

The question has arisen as to the desirability of retaining indefinitely in the inactive group those officers who neither have had war service nor have received requisite instruction during the period of their commission. As a rule, advantageous use can be made of the civil experience of officers in the field grades. However, those below field grade are not so readily adaptable for assignment, so it has been decided that the best interests of the Reserve Corps would be met if officers in the grades of captain and lieutenant were not allowed to remain in the inactive group for more than one five-year period, at the conclusion of which they would be ineligible for further commission unless they had satisfied the requirements which permitted their assignment to the active group.

The full effect of these various proposals will not be felt for a number of years. However, all angles of these questions have been considered and the War Department has adopted a system whereby promotions will be regulated so that

stagnation will not be so apt to occur again. Promotion in the Reserve Corps will be subject to the same general restrictions which have been found desirable for promotions in the Regular Army. These general restrictions may be summarized as adequate experience in each grade, fitness as demonstrated by interest or practice, theoretical preparation for an increase in responsibilities, and availability of the vacancy.

New Plan for Inactive Units, Regular Army

In 1921, upon reduction of the strength of the Regular Army, many units were made inactive. Each was given an active unit as its associate. This active associate was required to perform the administrative functions of the inactive unit, as well as to have ready a trained cadre for its reconstitution. Due to the continued reduction in the enlisted strength of the Regular Army, the active associates are not able in the majority of cases to furnish cadres for the inactive units. To do so would reduce the active units to impotency in many instances.

In order to relieve the active associates of the burden of the inactive units, a policy has been adopted which eventually will divorce the two. In other words, the active unit will be free to move at once without giving a thought to its former inactive associate.

In brief the new plan is to assign inactive units to the various corps areas. In the event of an emergency the corps area commander will be responsible for the reconstitution of the inactive units of the Regular Army allocated to his corps area. There are on duty in the various corps areas, officers and enlisted men of the Regular Army who are not assigned to any organization. Certain of these officers and enlisted men will be assigned to the inactive unit of the Regular Army in addition to their other duties, so that in the event the reconstitution of an inactive unit becomes necessary, its commander, senior officers and a nucleus of enlisted men will be at hand to facilitate the reconstitution. Previous instruments provide for the assignment to the inactive units of Reserve officers.

The policy further provides that as soon as funds become available the colors or standards and records of the inactive units be assembled at the various corps area headquarters and that all administrative functions of the inactive units be performed at those headquarters.

The new plan has several advantages. It will relieve the active associate of all duties in connection with the inactive unit; it will give the corps area commander the necessary means to reconstitute the inactive unit; it will enable the inactive unit and its Reserve personnel to be trained as a unit; and eventually it will localize the inactive unit so that it will be permanently identified with a particular locality.

Field Artillery Observers to Direct Fire Urged

Field Artillery observers in the United States Army are under the present regulations, officers of the Air Corps, but many officers of Field Artillery believe that such observers should be officers of Field Artillery, as it is believed that they could better direct the fire than the Air Corps officers. As to this contention, Maj. Gen. William J. Snow, Chief of Field Artillery, U. S. A., says:

> Field Artillery aerial observers should be Field Artillery officers. To the best of my knowledge this is the practice in foreign armies, and certainly it is common sense. Yet in our Army, Field Artillery observers are Air

Service officers. The principle business of the Field Artillery observer is to adjust fire. Then why not assign this duty to a man whose ordinary everyday work, is the adjustment of fire—a Field Artilleryman, for Field Artillery adjustment? Instead of this, we take an Air Service officer whose principal business is flying a plane, and try and make an observer out of him. The procedure is illogical.

In his daily work of adjusting fire, the Field Artillery officer invariably seeks the best post of observation—a hill, tree, steeple, etc.—The higher the better. Going up in an airplane is but one step further. After a few flights to give him the feel of the air, he has no difficulty in making better observation than he can on the ground. But if Field Artillerymen are to be "artillery observers" the financial benefits now accruing to the Air Service officer, should accrue to the Field Artillery officer also. This is simple justice.—*Army and Navy Journal.*

Attention is invited to an article on this subject that appeared on page 454 of the JOURNAL of the United States Artillery for November, 1921.

Foreign Periodicals

The use of flying craft in the service of supply.—The *Militär-Wochenblatt* of July 25, 1926, contains an article on this subject, written by Baron von Wangenheim,, that is deserving of thoughtful attention by all who have to do with the transportation branch of the supply service of the army. A translation follows:

"Aircraft was not applied in the service of supply of material in the World War. Under special circumstances German flyers were charged with dropping from airplanes subsistence or ammunition for relief of riflemen lying under shelter in concealed lines of crater fields, but such use of flying craft can hardly be classified as service of supply because distribution of subsistence and ammunition to firing lines of riflemen was not the duty of supply service formations but that of the troops themselves. Still, these activities of flying craft may serve to point out later possibilities in the service of supply.

"The reason why aircraft has, as yet, found no application in the service of supply may be that, in the first place, the aircraft industry had its hands full during the entire period of the war in providing the necessary fighting aircraft and was unable to furnish freight-carrying airplanes, and again, lines of communication—railways, roads—were so abundantly available in the French and Belgian theaters of war that there was no appreciable necessity for other ways of transportation of material. There would, however, have been considerable occasion for rendering such services in the Eastern fields of military operations. They would certainly have been of incalculable service on the Turkish fronts which were so deficient in ways of communication.

"But the aircraft industry has now, since the close of the war and because of suspension of extensive manufacture of military aircraft, had opportunity to enter into the construction of machines provided with such powerful motors that it is possible to make a nearer approach to the thought of the use of aircraft in the service of supply.

"So far as known to me, a special flying craft for the supply service was made by the firm Dornier and was used only during the war in the form of a sanitary flying vehicle for transportation of wounded men to the rear. The English have also made use of flying craft in Irak to some extent for transporting men. A special aircraft vehicle designed exclusively for carrying subsistence or

ammunition dues not appear to have been brought out as yet. There are, however, no technical difficulties in the wa yof its manufacture because all the requirements of an aircraft vehicle adapted for transportation of material have not only already been met but have been exceeded by the aircraft manufacturing industries.

"The following are among the conditions that must be met by supply service carrying aircraft: carrying capacity 3 tons; I choose this figure because it adapts itself most readily to our [German] supply service system (3-ton motor freight wagons, 30-ton division freight wagon columns, and 30-ton animal draft wagon columns) and facilitates transfer from one to the other.

"Rising capacity must be only sufficient to overcome heights in mountainous regions that may have to be taken into account. Twenty-five hundred meters would generally meet European conditions in this respect. Speed is immaterial; 150 kilometers per hour would be sufficient. The load space would have to be deep enough to permit loads—principally flour, sacks of oats, cases of preserves—to be easily placed and removed.

"It would be of special importance to have flying craft with capacity for making good landings and startings, because favorable landing and starting places would not always be at hand for supply service of this kind. Radius of action would be about 500 kilometers, based on the assumption that the supply base of an army would seldom be more than 250 kilometers from the troops to be supplied.

"I conceive the most favorable organization of an air supply service echelon to be a unit of ten planes with total carrying capacity of 30 tons. Since the daily supply of a division requires about 60 tons, it would require one such unit to make two round trips per day to supply a division. If the base of supply is 250 kilometers from the troops this would require aircraft to fly 1000 kilometers in the 24 hours, a flying time of approximately 7 hours of the 24—neither condition demanding extraordinary exertion.

"Providing divisions now and at once with such outfits is not, because of costs, practicable, nor would it be necessary. It would be sufficient to have a number of units at hand in readiness for each army. These units would be established where every other means of transport has failed due to the fact that no ordinary roadway lines of communication were available or that they had been made impassable by obstructions or by destruction of bridges or were exposed to bombing from the air. One will have to take into account the above named possibility in the next war more than ever before. For that reason the supply service echelon units will prove to be of utility in all West European countries, notwithstanding the abundance of lines of communications generally found there. They will be especially valuable for service with large bodies of cavalry which were, in the World War, frequently and not always unreasonably, tied to their bases of supply to such an extent that they were unable to fulfill thoroughly the tasks assigned to them.

"These aircraft supply units are absolutely indispensable for operations in East European countries and in the West Asiatic sections, such as Turkey, Persia, and Afghanistan which are rapidly developing in military aspects, where the construction of railways and net work of roads is getting under way but cannot, within the next decennial, reach a point that would be required for facilities to keep a modern army adequately supplied with munitions.

"It is important to show for comparison the kinds of material and personnel that are applicable to army transportation activities and the amount of care and

of operating material these would require for their own maintenance. Let us proceed with the assumption that the base of supply of a division is 250 kilometers from the troops to be supplied, a supposition that would not be very unusual in the above-mentioned Asiatic countries. We would then have the general outlook shown in the following tabular form:

Means of Transportation	*Weight in tons.*	*Daily marches in kilometers.*	*Number of columns required for 250 kilometer distance to and from bases.*	*Number of vehicles.*	*Number of horses.*	*Number of men plus 10 per cent supervisory personnel.*	*Feed at 5 kilograms per animal.*	*Provisions at 1.1 kilograms per man per day.*	*Operating material, lubricants, gasoline, &c., kilograms.*	*Total weight in tons.*
							(Quantities required for self-maintenance)			
Army freight motor wagon columns of 20 wagons for each column . . .	60	125	4	30	.....	176	.....	193	4500	5
Animal traction columns of 40 wagons each . . .	30	25	40	1600	3200	3250	16,000	3824	.....	20
Pack animal columns of 100 animals each . .	7.5	25	160	.....	16,000	17,600	80,000	19,360	.....	100
Units of flying craft echelons of 10 planes per unit	30	1000	1 unit	.....	.....	22	.....	25	6700	7

"The quantities of material required for operation cannot be accurately given here. It would be influenced by elevation, weather conditions, and nature of roads. In the table, personnel and material required for care and supervision and maintenance of vehicles required for ordinary transport service of the troops and that required for the upkeep of roads are not considered. The quantities given are, therefore, only approximate. They are, however, sufficient for giving an approximate figure of the extraordinary saving of men and horses that would be accomplished by substitution of machines. As compared with pack animals which are, for example, in Eastern Asia, Persia and Afghanistan almost the sole means of freight transportation, the saving is so great that the numbers of fighting men could be doubled.

"There remains for comparison consideration of the first cost and maintenance and upkeep of the several means of transportation mentioned in the table and of men required for their service. But an attempt for such comparison is subject to very great difficulties on account of the great differences in prices in different countries and other prevailing conditions. At any rate aircraft would not come out unfavorably in such comparison.

"Inasmuch as the supply service airplanes would not be considered as fighting aircraft, but exclusively for carrier service, they would be defenseless against enemy fighting planes. It would therefore be necessary to assign a number of fighting planes for their protection. But the means required for that purpose would not, probably, be much greater that those demanded for protection of the columns and other service assigned to accompanying aircraft.

"The danger that these airplanes would become obsolete and revert to iron junk in time of peace can be met by arranging so that these supply service planes can be incorporated in and become a part of means of air transportation used in times of peace for passenger, freight, and postal carrying service. In countries not provided with good roads and other means of traffic, the use of aircraft for transporting freight and passengers might well become a source of economic traffic.

Based on what has been said above it seems to me unquestionable that the supply service airplane is well suited to play an important rôle in the next war, in whatever country that may be. It is also incumbent on the aircraft industry to bring out a construction that will be best adapted to this service."—G. R.

COMMAND OR DIRECTIVE ORDER: A CONTRIBUTION TO FIGHTING TRAINING.—The *Oesterreichische Wehrzeitung* of July 30, 1926, publishes an article on the above subject written by Lieut. Colonel Heribert Wuczkowski, of the Austrian army, from which the following is extracted:

Strict military bearing and discipline were severely strained in the last months of the World War. Leaders, as well as soldiers, felt that the army's stamina was reaching its end. It came to be a matter of making requests rather than of giving orders; unquestioned obedience had disappeared almost entirely. The function of leadership came to be that of one who endeavors to bring a worn-out wanderer to his goal by kindly persuasion rather than by harsh commands. Under the then existing circumstances that conception of the situation appeared to be most pertinent, but its practice failed to bring the desired results. We lost the war. There came a time when the leader's word failed to be heeded by the subordinate and he had to resort to bargaining.

In organizing the new national army after the war it became clear to all patriotically minded persons that this condition could be no longer endured and an attempt must be made to seize again the reins that had been allowed to slip out of hand. This conception found most favorable expression, in a military sense, by the introduction of military drills and exercises in close order formations: the return was immediate. The national army is today a well disciplined body whose worth the severest critic cannot deny.

We have been engaged for a considerable time in practicing our fighting training in a more intensive manner and in that we frequently encounter the view that we should proceed by methods of fixed formations and formal words of command. I consider that dangerous. It is asserted that, in the moment of danger, a man will do only that which has been drilled into him in peace; that he must have a set pattern. The advocates of this line of procedure believe that they can accomplish their purpose in the fight by means of a certain number of fixed formulas learned by heart, which are to be executed mechanically by short words of command.

Form of action is, to a certain extent, in its tactical sense, a matter of fashion dictated by and frequently dependent upon the enemy's armament and also upon the opinions prevailing at the time. The war gave convincing evidence of the fact that formulas have only a transient value. We were, in 1914, soon compelled to admit that the normal form of attack taught in peace with its "irresistible urge to push forward" was a stilted pattern expression involving enormous and costly sacrifices; we learned to appreciate the value of the spade much sooner than antewar regulations would have approved. The forms of attack and defense were, during the course of the first five war years, subjected to repeated fundamental changes; one was obliged to re-learn them almost every month. It was the same in former times. When the French achieved victory in 1859 over the Austrians by their irresistible bayonet attacks we began, in Austria, to favor that method of fighting in close combat but soon found that it did not pay in the mass attack against the needle gun in 1866. Thus we have a surprise in every war and in a prolonged war, in almost every succeeding fight. Is it then expedient to rely upon

a few stencil patterned expressions poured into ones head as through a funnel?

If one could but succeed in arriving at a result by use of a few normal forms the regulation commands might suffice, but as it is one must, in every instance supplement almost every command by explanations, additions and alterations and call attention to peculiar circumstances then prevailing. Aside from the fact that there are not enough words of command to meet all the numerous possible cases, it is questionable whether the command in tone and voice is, in psychological effect, the best means of conveying to the subordinate the leader's will in the most intelligible form.

One has, in war, much more than for giving out fighting instructions than in the hastily instituted peace exercises. Why then stint the use of words at the expense of clearness? Only a few cases—surprise, panic, immediate attack, threatening danger—require a short distinct command in the fight. One will, in such cases, hardly ever need more than "halt," "forward," "fire." There are no normal formations in the fight, hence fighting commands are seldom applicable. Why then should one insist in drilling in peacetime things that will not suffice when an emergency arises?

The opposition alludes to the necessity for quick training of masses, claiming that it cannot be made too simple and easy. But one forgets how difficult it is to drive out of a troop things that have been drilled into it. Take, for instance, the long since discarded and worn-out skirmish line that still flourishes today. One must not rely on fixed formulas that will have to be dropped in war, but with the use of words of command only such forms are hammered in.

But the method of using formal words of command only is still more detrimental to the fighting efficiency of our growing leader personnel. The modern fight will not put up with automatons; it demands independence of action and exercise of thought from the youngest soldier, and how much more from the leader! By creating normal forms of words of command leaders are relieved from the necessity of thinking. They are fully trained to look for a stenciled formula to meet every case and take no further care to give profound thought to the situation; they look to the formula for solution. They are unable to conceive of groupings other than those set up in stilted forms and neither are they in a position to realize that there may be other situations and give necessary orders for their disposition.

Practical war purpose is the only guiding principle for peace time training. One should learn by it only what is exercised in war. The word of command becomes a rarity in a fight, directive instruction is the rule. It is more pliant and adapts itself to all changes; it is also more comprehensible to the recipient of the order because it takes into account his individuality. It must, therefore, receive preponderence in peacetime training. Unskilled leaders frequently permit their directive instructions to be drawn out into endless recital. The remedy is frequent and thorough schooling and application in different situations in practical exercises. Drilling in set forms by use of fixed words of command is of course less irksome and may impress the layman onlooker in peace exercises, but has nothing in common with warlike fighting training.

But we do not, by any means, desire to disavow the urgent necessity of formal drills in their places. Exercises in close formation are an indispensable means of training, but they belong to the military exercise field and to the barrack yard and very seldom to the fighting field. In that there are no drilled in formations but only groupings in keeping with then existing conditions.

I say, therefore: Give commands on the drill ground but give only directive orders on the fighting field.—G. R.

A NEW WORK ON BALLISTICS.—On page 535 of the May, 1926, issue of the COAST ARTILLERY JOURNAL mention is made of a new work on ballistics by Professor Doctor Kranz. The *Militär-Wochenblatt* of October 25, 1926, contains an extended notice of the recently-issued second volume of the series of which the book referred to in the May number of the JOURNAL is the first.

Volume I covered "Exterior Ballistics," that is the movements of the projectile and the forces acting on it after it leaves the muzzle, while the second volume treats of "Interior Ballistics"—the forces in action and their influence on the projectile and on the gun from the explosion of the charge to leaving the muzzle of the gun.

The author indicates that the principal purpose of interior ballistics is ascertainment of the gas pressure, acceleration of the velocity of the projectile and of the temperature of the powder gases as functions of the time and lines of direction of the movement of the projectile in the barrel. Computation of the force of recoil and of rifle twist are taken up and enter the domain of gun construction.

The chemico-physical treatment of the explosive components (decomposition equivalents, density of charges, heat of combustion and temperature, specific pressure, and other causes) are of great interest to the powder specialist. The investigation of the manner and rapidity of the decomposition of the powder (combustion, explosion, and detonation) and the nature of high-explosive materials indicate that a clear distinction between varying acceptations of the processes is not as complete as has been assumed by the layman. The more or less violent effect of a moving force depends not entirely upon the composition of the powder but also on density of the charge, weight and pressure resistance of the projectile, kind of detonator, and above all others upon the exterior surface form of the powder. At the conclusion of this paragraph an attempt is made to work out a law of combustion of the powder and of its termination with relation to the path of the projectile in the barrel.

Investigation of air thrust waves incident to explosions in the open air, in partly enclosed spaces, and under water are of interest to the explosive technician. Occurrences at the muzzle of the weapon are explained by the aid of excellent photographs. A distinction is made between "fire (flashes) from the muzzle" caused by theretofore unburned particles of powder and the real "muzzle flashes" due to retarded explosions under the influence of the oxygen of the air and the back pressure air wave originating at the muzzle which is shown, by the pictures taken, to be invariably present.

The author's treatment of the working balance and useful effect of the energies released within the weapons by the powder charge are of interest. Following are the computations resulting from observation of a shot from a rifle:

	Percentage of total energy developed.
Energy used for the direct linear movement at the muzzle	32.4%
Energy absorbed by the weapon (heating, barrel vibration, and other causes)	22.4%
Energy of projectile rotation at muzzle	0.1%
Energy of recoil of weapon	0.1%

Loss of energy at the charge (moving the gases and the unconsumed portions of the powder and thrusting out the air cylinder, heating the cartridge shell, and other causes) ___ 45.0%

From this it is seen that only about one-third of the energy of the charge is devoted to movement of the projectile proper.

The author finds in favor of an increasing twist, for the guns at least, and this coincides with the views of gun constructors.

On the whole the book fills out a heretofore seriously felt gap in German special literature on this subject and takes its place as a successful endeavor at a timely summary presentation of the subject of Interior Ballistics. It can be highly recommended to every scientifically inclined officer and also for permanent inclusion among military works.—G. R.

APHORISME VIII

A Businesse well begunne is halfe ended: wherefore it much imports to the happie or disastrous issue of any affaires, what manner of entrance and beginning he makes, especially in that of War; for good successe in the first encounter greatly advances the maine of his businesse, & takes away both courage and reputation, yea, and resolution from the losing side: herein therefore consists the maine care of a Generall.—Ward's Animadversions of War (*London, 1639*).

COAST ARTILLERY BOARD NOTES

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

Projects Initiated During the Month of January

Project No. 516, Target for 3-inch Antiaircraft Guns.—The present target, much smaller than that used last year, is the subject of an investigation to determine what should be the proper shape and dimensions of the theoretical target.

Project No. 517, Sketching Board, Modification of Scales.—It is proposed to change the scales on the clinometer for the sketching board (Engineer Equipment) from angular degrees to a scale reading per cent of slope, and to change the alidade graduations from three inches to the mile and six inches to the mile to scales of 1:20,000 and 1:10,000, respectively. These changes are necessary to have instruments conform to scales prescribed in AR 100-15.

Project No. 518, Report on Test of Range Percentage Corrector by Battery "H," 2d Coast Artillery.—The Battery Commander, Battery "H," 2d Coast Artillery, recommended certain modifications to the Range Percentage Corrector, several of which are considered meritorious.

Project No. 519, Rail Tractors for 16-inch Gun and 16-inch Howitzer Ammunition Car.—Comments were made on report of a test of gasoline rail tractor for ammunition cars for 16-inch guns and 16-inch howitzers, conducted in Panama.

Project No. 520, Comments on Target Practice Reports, 1926.—There have been received to date, for review and comment, target practice reports of all batteries of 3-inch, 6-inch, and 10-inch seacoast armament.

Project No. 521, Instrumental Accuracy of Plotting Boards.—A test of the instrumental accuracy of plotting boards and deflection boards has been initiated.

Project No. 522, Confidential.

Project No. 523, Revision of Manual of Combined Training of Coast Artillery and Air Corps in Coast Defense.—A revision, prepared by the Coast Artillery Board to bring this Manual up to date, has been submitted.

Project No. 524, Engineer (Drafting) Equipment for Tractor Artillery.—An investigation of the desirability of adding to drafting equipment of tractor artillery regiments certain specially graduated protractors, T-squares, etc.

Project No. 525, Shoulder Stocks for Antiaircraft Machine-Gun Tripod, M1925E.—An investigation of the suitability of the present shoulder stock for the .30-caliber A. A. machine gun, for use with the .50-caliber A. A. machine gun.

Project No. 526, Test of Fire Control Cars and Equipment (Railway Artillery).—The Coast Artillery Board has been directed to supervise a test of new fire control cars (modified ammunition cars) for railway artillery.

Project No. 527, Experimental Lever for 10-inch and 12-inch Guns, Model 1895MI, Test of.—The Chief of Coast Artillery has directed the Coast Artillery Board to have tested under its supervision a bronze experimental locking lever for 10-inch and 12-inch seacoast guns, which has recently been received from Watervliet Arsenal. The new locking lever is simpler in design and less expensive to manufacture than the two piece steel levers in use.

Completed Projects

Project No. 424, Aerial Spotting and Communications From Spotting Plane to Ground.

I—History of the Project.

1. On July 30, 1924, an Air Service-Harbor Defense Artillery Board and an Air Service-Railroad and Tractor Artillery Board were detailed by G. O. No. 4, Headquarters Third Coast Artillery District, for the purpose of preparing reports on tests and observations made during the spring and summer target practices in which the Air Corps and Coast Artillery acted jointly. The several reports submitted are OCCA 353/607; OCCA 353/6C3; OCCA 353/6C2.

2. The Coast Artillery Board was directed by OCCA 665/CA, dated December 2, 1925, as follows:

> 1. It is desired that the Coast Artillery Board investigate and report on the best system to be used in reporting deviations obtained by aerial spotting; the best system for communication between the spotting plane and the battery; and the code to be used in inter-communication between plane and battery.
>
> 2. Consideration should be given to the reports of the Proceedings of the Air Service-Railroad and Tractor Artillery Board; the Air Service-Harbor Defense Artillery Board; and the Report on Spotting, Panama Coast Artillery District, enclosed herewith, . . .

3. In order to obtain further information the Coast Artillery Board corresponded with the Panama Coast Artillery District Commander, the Hawaiian Coast Artillery District Commander, and with the Navy Department through the Office of the Chief of Coast Artillery (OCCA 665/CA-1).

II—Discussion.

A. Spotting

4. There are two general methods of airplane spotting, *i. e.*, the over, short, right and left, or rectangular coordinate method, with the gun-target line as a reference line, and the TAB or polar coordinate method, where the zero or reference line may be the gun-target line, the course of the target, the magnetic or true north, and the target reference point line where it is possible to select a conspicuous point visible to the aerial observer.

5. Rectangular coordinate system seems to be the easiest to apply, the most rapid, and the one preferred by all when its use is practicable. The Coast Artillery Board believes, however, that the opportunities for using this method will occur so seldom as to make it a special case applicable to but a few fixed batteries and practically never to mobile batteries. The post-war tendency is to emplace heavy batteries so that they will be effectively concealed both from enemy ships and aerial observation. This being the policy then it will show faulty emplacement when the battery-target line can be used as a reference line except where the area for emplacing the battery is so small as to make concealment impossible.

Moreover, at long ranges where aerial position finding is used as well as aerial spotting, the primary reason for such position finding will be because of such poor visibility due to haze, fog, smoke screens, etc., that terrestrial position finding is impossible, and conversely, the battery will in general be invisible from a plane in a position to observe effectively the target and splashes. The Coast Artillery Board is therefore of the opinion that the rectangular coordinate system of spotting with the gun-target reference line should be considered as a special case.

6. The polar coordinate system using the gun-target line or a reference point-target line as the zero line is objectionable for the same reason as the rectangular coordinate system. However, the reference point-target line, when there is an easily distinguishable reference point well out in the field of fire, or a high and prominent land mark on shore, should be of more general application than reference to the gun-target line.

7. When the course of the target is used as the zero line, there might be difficulty in determining the true course of a target running a sinuous course. Except for this objection, it would seem that this method would be satisfactory.

8. If the magnetic or true north is used as the zero line, with the polar coordinate system, then aerial observation will be independent of landmarks and is dependent only upon the observers ability to see the target and splashes. The Coast Artillery Board is of the opinion that this system most nearly approaches a universal system of aerial observation.

9. *a.* In the report of the Air Service-Railroad and Tractor Artillery Board, dated August 18, 1925, the following conclusions relative to spotting are quoted:

> 2. SYSTEMS OF SPOTTING OBTAINING INFORMATION, ETC.
>
> *a. T. A. B. clock system.* The T. A. B. clock system of reporting deviations was found slow and cumbersome in that all reported deviations had to be converted to battery-target line deviations before made of use. This is difficult and requires a particularly efficient operator in the case of moving targets. Error in orientation of the clock in likely to occur, with resultant error in the report of deviations.
>
> *b. The Battery-Target Line System.* The battery-target line system of reporting deviation was found equally accurate, more rapid and direct than the T. A. B. clock system, and no intermediate operation is necessary. Observers experienced no difficulty in establishing the battery-target line at the instant of splash or burst. The flash at the muzzle of the gun at the instant of firing can normally be seen by the observer.
>
> * * * * *
>
> 4. SPOTTING.
>
> The battery-target line system, reporting deviations as over, short, right, or left should be adopted as the normal system of spotting, being superior to the T. A. B. clock sytsem in rapidity and accuracy.

b. The Commanding General, 3d Coast Artillery District, remarked upon the above conclusions as follows:

> *d.* I am convinced that the spotting method should be a two coordinate one; rectangular coordinates are out of the question for long range work, therefore, the method must be one of polar coordinates. The o'clock method is naturally the simplest. I do not like the clock system where 12 o'clock is in the direction of the target's course. The origin of coordinates should not shift. I prefer 12 o'clock being the magnetic or true North, or grid North, whichever one fits in best with the shore plotting. The airplane compass should always be made so that the clock lines can be shifted to avoid relocations at the shore stations. This method of polar coordinate spotting has great advantages:

(1) It is independent of the ranges; being as accurate at 45,000 yards as at 5000 yards.
(2) It frees the airplane from all concern about land marks.
(3) It is independent of the target's maneuver because it furnishes true polar coordinates.

c. In 4th Indorsement, OCCA 353/6C3, the Chief of Air Service remarked on the two systems of spotting as follows:

2. Reference paragraph (c) of the recommendations, it is the belief of this office that the T. A. B. Clock system will not be found superior to the "over, short, right, and left" system. While a test of the two systems is encouraged, it is believed that serious consideration should be given before recommending any changes from the present method. It may be stated that the clock system was used by the British in the World War and was at first adopted by our service. After consideration, however, it was deemed that the French method was better, and this system has now become very deeply grounded in the service; hence any change would be difficult to effect.

3. The Board indicates that there may be times when the observer will not know the B. T. line, hence, the reason for the T. A. B. Clock system with true or magnetic north. It is believed that such lack of knowledge on the part of the observer will be an extremely rare occasion. If, however, such is the occasion and he has to use a true or magnetic north, it must be borne in mind that he will be far out to sea and will have to obtain the true or magnetic north from the magnetic north of his compass. This will mean that the observer will have to visualize a dial in the cockpit and then transpose that imaginary dial to the target. It can therefore be seen that the clock system possesses possibilities of great error.

and in 7th Indorsement on the same document, as follows:

2. In reference to question which seems to have been raised concerning the use of two methods for reporting artillery fire, it was stated by this office in our fourth indorsement that a test of the two methods was encouraged. There is no objection to using either method, but it is desired to state that serious consideration should be given the use of the T. A. B. clock system before recommending its extensive use. As stated in our previous indorsement, this method is obsolete and is not used any longer in adjusting fire for Field Artillery. In fact, that system is not taught any longer in the Air Service Advanced Flying School, Kelly Field, Texas. It is believed that the Training Regulations referred to (T. R. 205-5) are only in mimeographed form and have been only tentatively approved. Since the T. A. B. clock system is obsolete for Field Artillery-Air Service Liaison, it is suggested that the Chief of Coast Artillery give the matter very careful consideration before recommending its use for Coast Artillery-Air Service Liaison. There is no objection by this office to using either or both systems, but since the "over, short, right, and left" system has proved so far superior, it is believed much better definitely to adopt one system for the purpose of standardization.

10. On OCCA 665/35E, in 6th Indorsement the Commanding Officer, Harbor Defenses of Balboa, Fort Amador, Canal Zone, recommended as follows:

2. *a.* 1922. During the year 1922, one plane was employed at a time spotting for a single firing battery, two-way radio communication between the airplane and the harbor defense radio station was used with a local receiving set at the battery, and spots were reported directly as overs and shorts, in yards, with reference to the gun-target line. The results were, in general, quite satisfactory at the time.

* * * * *

2. *c.* 1924. During the year 1924 it was, however, impracticable to use the system which had been employed with satisfactory results during the preceding years for the following reasons:

(1) Instructions from the War Department required that the polar coordinate (or clock system) of reporting deviations from the tug-target line instead of with reference to the gun-target line be employed.

* * * * *

9. *The Polar Coordinate or Clock System of Reporting Deviations.*—In this system the polar coordinates of the splash with reference to the tug-target line (or the course of the vessel under fire) as the axis and to the target line as the origin are reported by the observer. The advantage of this system is that it renders it unnecessary for the airplane observer to keep himself oriented with reference to the gun-target line and that it does not require him to go through the mental operation of projecting the splash into the gun-target line in order to estimate its longitudinal deviation.

With reference to the claim, often advanced, that this system is materially more accurate than the ordinary system of reporting the longitudinal deviations with reference to the gun-target line, it may be stated that the experience in this harbor defense indicates that in this harbor defense with equally well trained observers no material difference in accuracy exists between the two systems and that in either case the probable error of either method does not, particularly for small deviations, exceed about one-third the probable error of the armament. It is considered that this is sufficient accuracy of spotting for all practical purposes.

10. The disadvantage of the clock system as compared with the ordinary system of reporting the overs and shorts (the longitudinal deviations with reference to the gun-target line) is that it is inherently slower and that there is a greater probability of personnel errors.

The normal procedure when the overs-and-shorts system is used (assuming the most unfavorable case where the telegraph alone and not the telephone is used) is for the telephone operator in the radio receiving station to repeat the spots as announced by the radio operator as overs and shorts in yards, directly to all B. C. stations in the Group (or, if desired, to the plotting rooms) with the result that normally the airplane spot is available to the officer who is to use it, within about seven or eight seconds after the splash.

The normal procedure when the clock system is used is for the radio operator in the radio station to decide the message from the airplane observer and to announce it to the telephone operator who then repeats it to one or to all of the spotting rooms in the group, where the operator of the spotting board determines the longitudinal deviation and announces it to a telephone operator who transmits it to the B. C. station (or to the plotting room.) The operations involved in the use of the spotting board require that the azimuth of the course of the target must be measured (ordinarily by the plotter in the plotting room), that the azimuth of the gun-target line must be noted, that these data must be furnished the operator of the spotting board and be kept set by him on the spotting board, that the polar coordinates of the splash must be plotted and that the longitudinal deviation of the splash must be determined by graphic means or by direct.

* * * * *

Experience has shown that the irreducible minimum of time within which this operation can be performed, especially in the case of a rapidly moving target on a curved course, is materially greater than this amount [an available maximum of about 6 seconds.]

As a matter of fact, during the firings in 1924 when the clock system was used in this harbor defense, the radio spotting data was not received by the battery commander in time to enable it to be used for any shot fired.

* * * * *

12. In localities where the armament is widely dispersed over a front of several miles and where conspicuous landmarks do not exist, the clock system affords probably the most practicable and satisfactory method of airplane spotting and the rate of fire must be sacrificed, if necessary, in order that this system may be used.

As a result of the experience of the past three years, it is my conviction however that rapidity is the essential prerequisite to successful airplane spotting under service conditions where several batteries are firing simultaneously and that for successful operation in practice it is essential that the splash be identified and the correction determined by the battery concerned before any other splash occurs.

The facts that condition in this harbor defense are exceptionally favorable to the use of the system of reporting overs and shorts directly, that no material or useful increase in accuracy has resulted from the use of the clock system, and that the use of the clock system has been found to militate seriously against the successful operation of an airplane spotting system under the service conditions which were simulated in the recent exercises, constitute the basis for the recommendation contained in the basic communication, that all airplane spotting *for this harbor defense* be with reference to the gun-target line.

In my opinion any slight convenience to the airplane spotter that may result from the use in this harbor defense of the clock system is entirely incommensurate with the consequent disadvantages to the firing batteries in connection with the identification of their splashes and with the adjustment and correction of fire.

11. In the 7th Indorsement on the same letter, the Coast Artillery District Commander remarked as follows:

1. It is believed that for the majority of harbor defenses, the clock system of spotting by airplane observers based on the course of the target, or the tug-target line, will be found more reliable than a system based on the gun-target line.

* * * * *

3. If the Air Service is willing to undertake different methods of spotting for the different harbor defenses there is no further objection to the approval for the Harbor Defenses of Balboa of the system proposed by the Harbor Defense Commander in the 6th Indorsement. If this cannot be undertaken, and the Air Service wishes to adhere to one system of spotting for all harbor defenses, the clock system as now used is considered preferable.

12. The Air Corps Officer, Canal Zone, remarked on the 6th and 7th Indorsements, in the 9th Indorsement, as follows:

1. It is recommended that the clock system be used in all spotting done by the Air Service for the Coast Artillery. This system is recommended for the following reasons:

a. The use of the gun-target line gives fair satisfaction only when the target and battery are plainly visible, but cannot be used under service conditions when the target will ordinarily be at extreme ranges and obscured by smoke, etc.

b. It eliminates the necessity for the observer to orient himself with respect to the gun-target line and involves only the location of the shot with reference to the target. When using the gun-target line with a moving target, the observer must orient himself with respect to the battery for every shot, this delays his report and on long ranges causes considerable inaccuracy due to the difficulty in correctly locating the gun-target line.

c. It is sufficiently rapid and more accurate.

13. The Commanding General, Panama Canal Department, remarked as follows, in the 10th Indorsement:

2. With reference to the system of spotting by airplane observers, it it believed that the clock system is more reliable than a system based on the gun-target line, especially at long ranges. It is more readily and accurately used by observers. Therefore the clock system is recommended.

14. The reports of the Commanding Officer, Battery "A," 12th Coast Artil-

lery, on the aerial fire control and spotting target practices at Fort Monroe and Fort Story have been studied with a view of obtaining further information on spotting. It appears that all spotting was done using the T. A. B. clock system with zero at the magnetic north, with the exception of the first problem fired at Fort Monroe, when only one shot was fired and it was reported by the O. S. R. L. system with the gun-target line as a reference line. The following is the battery commander's comment on spotting:

> Errors of spotting due to approximate polar directions to the nearest hour of the clock are not considered accurate enough. The Air Corps should be provided with a better device so as to give these direction to the quarter hour.

15. It would seems that for both systems of aerial spotting there is urgent need for a suitable spotting device to be used in the plane. A device for use in the O. S. H. L. system can be improvised quite readily but, so far as is known, there is no instrument in existence which is in any sense satisfactory for the TAB clock system.

16. Under Project No. 281, *Test of Spotting Instruments, Model E, (FA-1923)*, the Coast Artillery Board tested and reported on an instrument submitted for test to determine its suitability for aerial spotting. In theory this instrument appeared to be ideal but the instrument was found to be far from practicable for spotting from a plane. The following quoted conclusions of the Coast Artillery Board in Project No. 281 show the principal defects noted:

III—CONCLUSIONS.

14. The Coast Artillery Board is of the opinion:

a. That the Spotting Instrument FA-1923, in its present form, is unsuitable for the purpose intended, but gives promise of sufficient military value to warrant further development with minor modifications.

b. That due to the severe conditions under which the airplane observer works, the use of the device as a free hand instrument is impracticable and a mount made along the line suggested herein should be provided.

c. That experiments should be conducted with a view to correcting the fading out of the ellipse spots when observing under bright light conditions.

d. That the instrument should cover working altitudes from 2000 to 10,000 feet.

17. The Coast Artillery Board does not know what further development has been made on an airplane spotting instrument, but believes that future design should be with a view of using it through the floor of the observers cock-pit rather than over the side, as was necessary with the Model E instrument. The Coast Artillery Board's idea of the instrument required is as follows:

An instrument with a wide field of view (not less than 15°); a compass dial to be mounted on gimbals and counter-balanced in such a way as to keep the dial horizontal at all times; the dial to be marked with radial lines corresponding to magnetic north bearing, with zero at the north, and with concentric circles corresponding to ranges of 50 and 100 yards on the two inner circles, and varying by 100 yards and thereafter out to 1000 yards. The instrument should be mounted to a floor plate by means of a ball and socket or universal joint so that it can be pointed in any direction up to an angle of 30° from the vertical. The chief difficulty with this type of instrument will be to design a compass that will work satisfactorily. The metal parts of the plane and electrical equipment would probably make it very difficult to adjust the compass to read true magnetic north

bearings. It is not known what progress has been made in the development of gyro-compasses for use in airplanes, but should they be developed satisfactorily it is believed that the construction of an observing instrument for aerial spotting will be greatly facilitated since the instrument dial could be either directly connected to the plane compass or could be connected electrically by means of a repeater system.

18. The Coast Artillery Board realizes the difficulty under which an observer now works in obtaining polar coordinate deviations referred to the magnetic north, where the plane compass must be used, and believes that results so obtained can never be as accurate as might be desired. On the other hand, a consideration of the rectangular coordinate system convinces the Coast Artillery Board that any system depending upon the visibility of the battery position or other landmark is a special case and in time of war, when both the friendly and enemy air forces, as well as destroyers are active, it is believed one of the important conditions to be considered will be the probability of every engagement making extensive use of smoke screens laid both from the air and from destroyers.

19. Referring back to paragraph 9c, it is noted that the office of the Chief of Air Service favors the rectangular coordinate system. It must be borne in mind that aerial observation and spotting during the World War was on fixed terrestrial targets where the coordination with accurate maps was possible. Such being the case, the rectangular coordinate method was undoubtedly superior to the polar coordinate method. Let an extreme case with a 16-inch battery of modern post-war heavy seacoast artillery now be considered. The battery has an extreme range of 45,000 yards. It is desired to fire upon a hostile fleet, approaching directly toward the battery, as soon as it comes within range. Let it be further assumed that the atmosphere is hazy. Aerial position finding and spotting becomes the only method of firing upon this fleet with any certainty of hitting it. At 45,000 yards on a moderately hazy day the ships would be invisible from shore, and the shore invisible from the ships as well as from the plane. The only objects visible from the plane are the ships, the open sea, a bank of haze on the horizon and what celestial bodies may be in the sky at the time. The only reference marks available to the observer outside of such means as a transatlantic flyer would have (*i. e.*, celestial bodies and compass) are the enemy ships and their wakes. It is therefore apparent that in this assumed case, which may be extreme but not outside the realm of possibility, dependence must be placed upon some clock system of observing the fall of shots until some better system is devised.

20. Of the two clock systems that can be used in the example cited in paragraph 19, *i. e.*, the magnetic north and the course of the target as reference lines, using the latter system would complicate the operation of the spotting board since it would necessitate plotting the course of the target, whereas in the former case the target position need only be plotted as a point. Furthermore, if aerial position finding is to be used, it will be used either at long ranges or when the target is obscured by haze, smoke, or othewise from shore observing stations, the course of the target must be reported by the observer to the firing battery, the easiest, and in fact the only, method that will be at all accurate is to report the bearing of the target's course referred to the airplane compass. If a suitable spotting instrument incorporating a compass can be constructed this same instrument would be a much better means of reporting the target's course than any instrument now extant.

B. COMMUNICATIONS BETWEEN SPOTTING PLANE AND GROUND

20. If it were possible to assume that in time of war a seacoast battery or group would always be served by the same Air Corps personnel, then it would be permissible to allow each battery or group to arrange with its supporting Air Corps personnel special and simple means of communication and codes to meet local conditions. Unfortunately such cannot be assumed, so it is necessary to use means of communication and codes which are simple, brief, and understood by all seacoast artillery and Air Corps observing personnel. The system adopted must be such that it is taught in peacetime in order that instructors in time of war will be able to carry on their peacetime system without the added burden of learning and teaching a new system.

21. There are two air ground systems of communication in common use at the present time. They are visual and radio communication. Radio communication is further subdivided into telegraph and telephone. Visual signalling, at best, is very unsatisfactory for spotting, since it is of necessity a very slow procedure to transmit visual signals over great ranges due to the size of the agencies that must be employed. Panels are employed on the ground, and to be readily seen by a plane at long range on the rare occasion when they can be seen at all must be large and of necessity slow to manipulate, especially in windy weather. Probably the best means of signalling visually from plane to ground are by maneuvering the plane or by omitting smoke from the exhaust or otherwise. At long ranges the plane maneuvers must be over large areas in order to be seen, as must also smoke signals be made large. Either method would require too much time to allow the information so transmitted to a firing battery to be of value in adjusting fire on the target.

22. Radio is a new art. It is believed that its possibilities have not yet been touched. Radio telegraphy has been used extensively commercially and in the military services of the world only a matter of some twenty years, whereas radio telephony, although used to some extent for the past ten or twelve years has been used extensively in only the last five years. It is only within the last two years that radio telephone sets which are at all reliable have been installed on service airplanes, and at best it can be said that the radio telephone in airplanes has hardly passed the experimental stage. It is probably true that to maintain constant two-way radio telephone communication between ground and the present service airplanes will require the constant attention of an operator in the plane. In addition to the difficulty of maintaining two-way radio telephone communication, there is the added and much more serious consideration that interference,, either intentional or unintentional, is so frequently to be encountered that the radio telephone in its present state of development cannot be considered as a dependable means of communication between spotting plane and ground in time of an engagement between an enemy fleet and our harbor defenses. The Coast Artillery Board is therefore of the opinion that the radio telephone at present cannot be considered as a reliable means of communication between spotting plane and ground, but believes that it should be used jointly with the telegraph in order that Army personnel may keep up with the latest developments, so that when in what is believed the not distant future, further development will make it a reliable means of communication, the operating personnel can change to the telephone without any serious confusion or introduction to new apparatus.

23. It follows from the above, in the opinion of the Coast Artillery Board, that the only satisfactory means of communication now available between spotting plane and ground is radio telegraph, and the code adopted must meet the following conditions:

a. Be brief, simple, and easily memorized.

b. Conform to present approved Air-Fire Control Code.

c. Be readily adaptable to radio telephone and visual signalling for purposes of training, development, and emergency.

24. The question has come up as to the distribution of radio sets for harbor defense personnel. The group is ordinarily the smallest unit to which a transmitting and receiving set is issued and which will in general have qualified operators. This distribution would be satisfactory if only one plane is spotting for the group; but should the ideal conditions arise of having a spotting plane for each battery in each group, then communications would either break down or transmission of essential spotting data would be so slow that the information would be valueless for spotting. It would be a very expensive project to issue complete transmitting and receiving equipment to each harbor defense battery, both fixed and mobile, and this should not be necessary. The Coast Artillery Board believes that each battery should be supplied with an efficient receiving set for receiving spotting data at the battery. The group radio station would be the net control station for the several spotting planes which would of necessity be required to operate on different frequencies. The net control station would transmit all messages to spotting planes from the firing batteries by changing to the proper frequency.

25. The use of a receiving set only at a battery, if telephones were used, would be a comparatively simple matter, but with the use of telegraph the question comes up as to how necessary operators are to be obtained. In time of war undoubtedly all qualified operators will be taken by some of the other services where radio operators are in greater demand. In a command of the size required to man one of our harbor defense batteries, whose strength will vary from 150 enlisted men on up to perhaps 250, there should be no difficulty in selecting two or three bright and intelligent young men who could learn in a surprisingly short time to receive radio telegraph code messages at the rate they will be sent from a spotting plane. It is believed that such a battery detail would be very desirable and the competition for obtaining it would be keen. This would be particularly true in time of war, and it is believed that less time would be required to train a qualified reception operator than would be required *to train* the remaining members of a battery in their many duties. In our peacetime army, with the reduced battery personnel, the problem would be more difficult, but on the other hand a longer time is available for training and should not be beyond solution in view of the importance of aerial spotting.

C. SPOTTING CODE

26. The following extracts on codes from the communications noted are quoted to show the varying views throughout the service on spotting codes:

a. OCCA 353.607, Proceedings of the Air Service-Railroad and Tractor Board:

> *b.* The T. A. B. clock used for the problem was oriented with 12 o'clock in the direction grid north. It was drawn to a scale of 1 inch 100 yards. Radial lines were drawn representing each even hour. Concentric circles were drawn on the dial with the center of the clock representing

the center of the target. The inner circle had a radius of ¼ inch, or 25 yards. The area included within this circle was laid off in quadrants. The quadrant between 9 and 12 o'clock was referred to by the letter "W," between 12 and 3 o'clock by the letter "X," between 3 and 6 o'clock by "Y," and between 6 and 9 o'clock by "Z." The following circle had a radius of ½ inch or 50 yards. The area between the first and second circle was referred to as "A." The third circle had a radius of 1 inch or 100 yards and the area between the second and third circle was called "B." The radius of subsequent circles were increased by 1 inch each and the areas included between the successive circles labelled "C," "D," "E," etc., in order from the center. This system of lettering the circular areas simplified transmission of reports, in that only one figure and one letter were required for each observation, except at the hours of 10, 11, and 12, where two figures and one letter were required. On the dial of the T. A. B. clock used at the receiving station, the battery-target line was laid off. Observed centers of impact were plotted on the dial and then readily converted to battery-target line deviations.

b. OCCA 665/35E, letter from Chief of Coast Artillery to Chief Signal Officer, dated July 2, 1925:

3. *n*.... It is believed to be essential to the maintenance of a satisfactory airplane spotting service for these coast defenses that two modern radio stations be provided, that two planes, each operating on a different wave length, be employed, that all spotting be with reference to the gun-target line, and that the simplest possible code be used, preferably a one-letter code. In this connection, it may be stated that the code recently prescribed does not satisfactorily meet the requirements of the Coast Artillery and that it is considered that a special but relatively simple and abbreviated code, is essential for the purpose.

c. 1st Indorsement to OCCA 665/35E, July 14, 1925:

1. It is impracticable for this office to comment upon the proposed spotting scheme unless further details be made available. It is not clear whether two radio stations per firing unit, per defense unit, or two for the entire Canal Zone, are proposed.

2. With reference to the requirements of the Coast Artillery for a simplified code, attention is invited to the fact that the number of possible one-letter signals is 26. The number of words and phrases to be signalled in fire control work by Field Artillery and Coast Artilley, after many attempts at condensation, reduction, and elimination, was found to be approximately 70.

3. In order to reduce the signals to 26 in number a separate and special code for Coast Artillery would have to be authorized. The basic communication states that this is considered to be essential. The addition of a separate and special code for Coast Artillery might be deemed undesirable because it would necessitate two fire control codes being learned by the Air Service personnel. What the comments of the Field Artillery and Air Service might be concerning the new code probably will not be obtained until this code has been distributed. However, so far as the fire control section of the code is concerned it is practically identical with the one successfully employed and recommended by Kelly Field and other activities of the Air Service; as well as by various Field Artillery activities.

d. 6th Indorsement on OCCA 665/35E:

2. *b*.... A one-letter spotting code was developed and used during these tests. The general characteristics of this code were those of the proposed Fire Control Code which will be referred to below. The normal procedure actually followed in transmitting a spot from the airplane was as follows:

Assuming the message to the "200 yards short" and the code letter to be *f* (where *f* meant a short 200 plus or minus 50 yards short) the aerial observer first repeated several times by radio telephone the words "two

zero zero short," then repeated by the same means the letter *f* a considerable number of times, and then sent by radio telegraph the International Telegraph Code symbol for the letter *f* a considerable number of times (By "Considerable number of times" is meant about three or four groups of about four letters each as follows: "ffff [pause] ffff [pause] ffff [pause] ffff." The results obtained were very satisfactory and it was decided to employ this system in future.

* * * * *

13. *Codes for Coast Artillery Spotting.*—In the Joint Operations of the Coast Artillery and the Air Service, the communications between the airplanes and the ground will include those pertaining to the following two general classes:

a. The observation of fire.

b. Miscellaneous matters, including information relative to the enemy and all other communications at times other than when the Coast Artillery is in action.

14. The communications pertaining to information relative to the enemy include those relative to the composition, location, strength, formation, and movements of the hostile naval forces. Such information would become especially necessary in case of the discovery of the enemy by distant airplane patrols and when, as in case of a fog or of a smoke screen or in case of the presence of submerged submarines, the conditions of observation were materially more favorable to the airplanes than to the observers on shore.

In general, it is believed that, with reference to the communications referred to in paragraph 13 *b*, any code that may be determined to be best adapted to the requirements both of the Air Service and of the branches other than the Coast Artillery can be utilized by the Coast Artillery, provided it include provision for each of the important, though relatively few, types of naval vessels and also for the relatively few hydrographic areas normally used in connection with the fire control of the harbor defense concerned.

* * * * *

16. From a consideration of what has been said above, it is considered that, with reference to the Coast Artillery, communication between airplanes and the ground requires, as of primary importance, a suitable code (below referred to as a Fire Control Code) for use by the airplanes in reporting deviations of shots and by the ground stations in indicating the kind and distribution of the fire to be delivered by the guns. This code should be simple, reliable, short, quickly sent, easily remembered, and easily understood. If practicable, the same code should be used in any of the normal means of communicating between the airplane and the ground. The letters, figures, words, or combinations thereof employed should therefore be so selected as to minimize the possibility of their being misunderstood, irrespective of the method of transmission that may be employed.

For such a fire control code the requirements of rapidity, simplicity, and reliability under conditions of radio interference are of such primary importance that a reduction to the lowest practicable number is desirable in the number and length of the code combinations to be used.

17. It is accordingly considered that the First Control Code for the Coast Artillery should consist preferably of single letters, differing as much as possible in sound, both when spoken by radio telephone and when sent by the International telegraph code, and that the normal procedure should be to repeat this letter in groups of about four until about four such groups have been sent.

The advantage of such a code, which is intended to provide only for such essential communication between the plane and the ground as may be necessary during the time the plane is actually spotting Coast Artillery fire, lies primarily in the fact that since but a single letter is used the chance of its being heard at least once by the receiving operator and hence of the message itself being received, with any considerable degree of radio interference that may exist, is greater than would be the case were some combination of two or more letters employed.

18. *Proposed Fire Control Code for Coast Artillery.*—A code made up along the lines above indicated as desirable and deemed suitable for use as a Coast Artillery Fire Control Code is shown in Inclosure 2, herewith. In connection with this code the following will be noted:

a. It consists entirely of single letters of the alphabet. These twenty-six letters cover the words and phrases, as determined by three years' experience in target practice, in Joint Exercises with the Navy, and in Field Exercises, necessary for spotting purposes. It is considered that, if the approximately forty-five words and phrases covered by this code can be transmitted and received quickly under very adverse conditions of interference, effective spotting can be carried on, and that such other messages as it may be necessary to transmit can be transmitted by means of whatever code is adopted for miscellaneous communication between airplanes and the ground.

b. Considering transmission from the airplane, these letters are so selected as to facilitate the codes being memorized and used. Thus, *e* is the first one of the letters representing a short shot and the following five letters in sequence each represents an additional 100 yards deviation short; similarly, *n* is the first of the six letters representing the deviations over and *u* is the first of the four letters representing lateral deviations; also, *a* and *z*, the first and last letters of the alphabet, respectively, represent short and over (the other letters *e* to *j* representing shorts are also nearer the first of the alphabet than are the letters *n* to *s*, representing overs;) *l* means *line* shot, *t* means *target*, *b* means *bracketed*; there remain but three or four letters, such as *c*, *k* and *r*, which require to be memorized outright.

c. Considering transmission from the ground, the code is similarly designed to facilitate its being memorized and used.

d. The letters normally used in spotting (*e-j*, incl., and *n-s*, incl.,) which have been selected in sequence, have been selected so as to minimize so far as practicable the use of letters having a similar sound. This facilitates the use of the code in radio telephone communication.

e. It requires less reference to cards or sheets, on the part of the airplane observer, than is the case with other fire control codes. In fact, this code has been used by observers after but a few minutes study. It may be noted in this connection that the Panama Canal Department War Plan provides that in time of war one or two airplaens are assigned to Albrook Field primarily for work with the Harbor Defenses of Balboa. The Harbor Defense War Plans contemplate that these observers will be given intensive training in spotting Coast Artillery fire and it is believed that even with untrained observers the proposed Fire Control Code could be learned thoroughly in one or two days of such instruction.

f. Any code that may be adopted for miscellaneous communication between airplanes and the ground can be used without interfering with the usefulness or value of the Fire Control Code for the purpose for which intended.

19. *The Present Approved Code.*—The code recently approved and required for general use between airplanes and the ground in the Panama Canal Department is the Panama Canal Department Standard Code. In connection with this code it may be noted:

a. This code is a two-letter code containing a total of about 300 code combinations of which approximately 55 are useful for work with the Coast Artillery. Of those 55, approximately 40% are covered in the proposed Fire Control Code above referred to, leaving about 35 code combinations of this standard code that would be required for Coast Artillery work in addition to Fire Control Code.

b. The Standard Code group is, in most cases, an arbitrary two-letter combination. It cannot be memorized and requires the airplane observer to refer to a Code Book (the one issued has 21 pages). Since the Fire Control Code can be memorized easily it follows that its use would reduce to about 35 the number of code combinations of the Standard Code required for ordinary work with the Coast Artillery.

c. This Standard Code is considered to be satisfactory for the miscellaneous communications, between the airplane and the ground, referred to in paragraph 13 *b* above.

20. The Standard Code referred to does not, however, cover the artillery spotting, a special code of 21 letters (shown on Inclosure 3) being prescribed for that purpose.

In connection with the special code it may be noted:

a. It apparently contemplates that the clock system will normally be used for artillery spotting.

b. In using the clock system a type message would be "II-DD". It is necessary for the first three of the four letters to be received, whereas in the proposed Fire Control Code the receipt of but one single letter conveys the entire message.

c. In using the over-short system a type message would be "OO-DD." It is necessary for two of the four letters in the group to be received whereas in the proposed Fire Control Code the receipt of any one letter in the group of four conveys the entire message.

It is easier for a telegraph operator to recognize a single letter when it is repeated several times than to recognize each letter of a two-letter group similarly repeated.

d. Assuming four 4-letter groups or sixteen letters to be sent, it will be observed that with the Special Code the spot will be transmitted but four times whereas with the proposed Fire Control Code it would have been transmitted sixteen times. This indicates the greater reliability of the proposed code in case of considerable radio interference.

e. The code combination for a "short" is SS; that for an over is OO. The international Morse Code signal for an S is three dots and that for an O is three dashes. With an inexperienced operator transmitting confusion might easily arise as to whether the sensing was over or short. In the proposed Fire Control Code no such difficulty is likely to occur, since if a single letter in a group is received both the sensing and the amount of the deviation is conveyed.

f. In case the spotting is transmitted by radio telephone, whether the clock system or the over-short system be used, the Special Code is not well adapted to the purpose since, of the 21 letters in the Range Conversion Code, T, B, C, D, E, G, P, V, and Z, or approximately half, have a similar sound when spoken over a telephone, thus introducing a considerable chance of error. In the proposed Fire Control Code, the letters are selected so as to obviate this difficulty to a large extent. That code, therefore, is considered to be more suitable for radio telephone work than the Special Code.

g. The memorizing of the 21 letters used in the special code serves only to convey deviations in yards. The memorizing of the 26 letters used in the proposed Fire Control Code however enables not only the sensings and such deviations in yards as may be necessary to be conveyed but also enables nearly half of all those messages in the entire Standard Code which are useful to artillery work to be conveyed.

21. The proposed Fire Control Code is accordingly considered to be quicker, less subject to interference, easier to memorize, more flexible, and generally more reliable and satisfactory for the purpose than the Special Code now prescribed for Coast Artillery Spotting.

22. * * * *

i. The use of the simplest and most reliable Fire Control Code possible, preferably a one-letter code. The proposed Fire Control Code shown in Inclosure No. 3 is regarded as satisfactory for this purpose.

e. From 7th Indorsement on OCCA 665/35E:

2. The use of various codes and methods of spotting for different harbor defenses would undoubtedly throw an increased burden on the Air Service observers. This has been the principal objection to the gun-target spotting system for the Harbor Defenses of Balboa. There is no question as to the advantage of a one-letter code over two-letter codes for spotting

reports so far as the speed and reliability of transmission are concerned. The use of a special code for Air Service-Coast Artillery work is not believed to offer serious disadvantages.

f. From 9th Indorsement on OCCA 665/35E.

3. The present code system, as used by the Coast Defenses of the Panama Coast Artillery District, was prepared by a board of officers appointed by the Department Commander, the Coast Artillery having a representative on this board. With reference to paragraph 2 of the 7th Indorsement, this office does not concur in the statement that there is no question as to the advantage of a one-letter code over two-letter codes, as the actual increase in time of transmission of a two letter code group over a single letter is comparatively small, which delay is more than offset by the fact that it eliminates the necessity for a special code. With reference to the code desired, this office concours in the statement that the simplest code be used, but does not believe that a one-letter code will answer the purpose. The one-letter code, with only twenty-six letters available, is not sufficiently large for even the most important signals and does not lend itself to expansion to cover any local or general conditions. It is essential that Air Service observers be equally versed in observation work of all branches in order to avoid having different codes for different types of observation work with the ensuing confusion due to letters or numbers having one meaning in one code and entirely different meanings in others. It is extremely desirable to have one general code covering all signals necessary for use by all branches of the Army. This general code should be complete, simple, and universal. The signals should be easily understood, and the most important ones should lend themselves to easy memorizing. Extracts from this General Code should be furnished to ground troops as in the past. These extracts contain all signals of value to that branch, but do not contain signals exclusively pertaining to any other branch.

4. The Air-Ground Radio and Panel Code prepared by the above board is entirely satisfactory from the Air Service point of view, and has been used to the entire satisfaction of the Harbor Defenses of Fort Sherman and Fort Randolph.

g. From 10th Indorsement on OCCA 655/35E.

3. With refrence to the Fire Control Code, it is believed to be essential that only one (1) code be prescribed for the use of airplane observers. Therefore a special code for Coast Artillery is not recommended.

26. When the rectangular coordinate method of spotting is used the present approved Air-Fire Control Code is satisfactory and contains the necessary code symbols and groups.

27. The so-called T. A. B. Clock System uses twelve radial lines. This nomenclature and number of lines probably has a two-fold origin; first, it is an off-spring of the common method of spotting shots in small-arms target practice; and secondly, originally twelve radial lines were probably considered sufficient to give data within the accuracy of any observing instruments in existence up to date.

28. The Coast Artillery Board believes a better method is to adopt the 32 point circle used on the mariner's compass. This not only has the advantage of being easily converted to mils, but also the circle and quadrants are divided into segments whose magnitude is readily understood and also gives 32 divisions of the circle instead of 12 used in the o'clock system. It is believed that such increased accuracy is desirable, provided the necessarily accurate observing instrument can be developed.

29. The preceding paragraph illustrates the Coast Artillery Board's idea for obtaining the direction of the splash from the target. The next consideration is

to obtain the lineal deviation. It is the opinion of the Coast Artillery Board that the deviation of shots falling within two probable errors of the target should be given to the nearest one-half probable error and that shots beyond that to the nearest probable error. At mid ranges for our heavy caliber guns the probable error can be taken roughly as 100 yards. This value offers a convenient yard stick for measuring linear deviation in values that can be readily used by the spotting section. Such being assumed, then the spotting device should be graduated for linear deviations by a series of concentric circles which, read from the inner one out, would read 50 yards, 100 yards, 150 yards, 200 yards, etc., out to 1000 yards. These concentric circles, beginning at the inner circle for convenience in encoding, are lettered A, B, C, out to include K.

30. With the system outlined in paragraphs 28 and 29, the code necessary to transmit an observation of a splash would then consist of a code group containing three symbols, the first two the number corresponding to the direction of the splash from the target and the third a letter corresponding to the concentric circle representing the distance of the splash from the target.

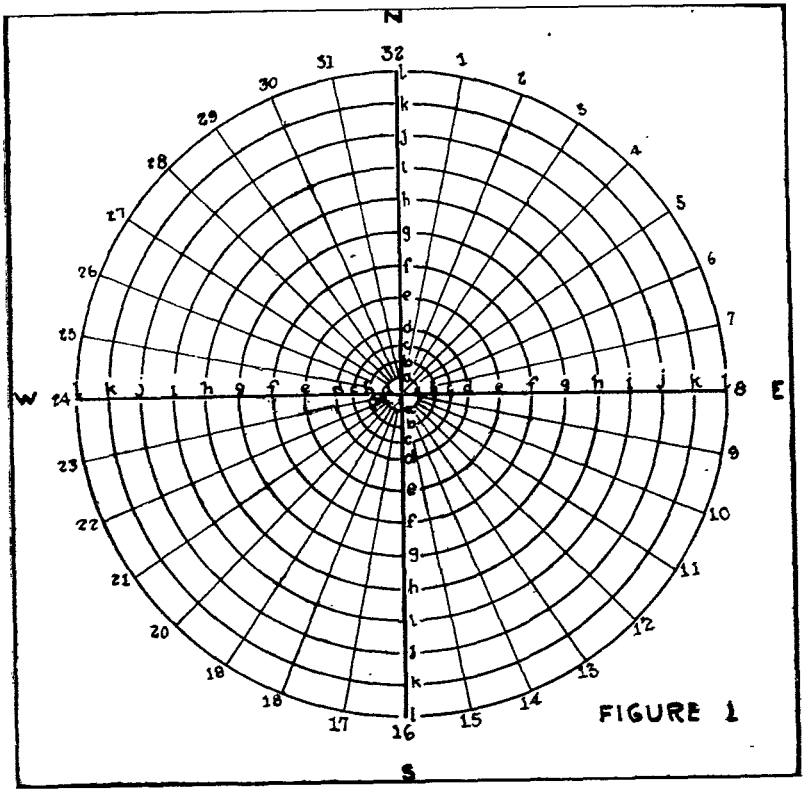
31. In order to reduce the time of transmission to a minimum it has been recommended that a one-letter code group be used for reporting deviations of splashes. This is obviously impossible without decreasing the number of radial lines and concentric circles and then only one coordinate could be given. If the number of groups is limited to two symbols then the possible number of concentric circles and radial lines is thirty-five, *i. e.*, twenty-six letters and nine numerals.

32. Using the suggested code, the longest group to transmit would be a shot on the number 29 radial line with a deviation of 900 yards, or on the J circle. This group would be transmitted 29 J. With only moderately trained transmitting and receiving personnel it is estimated that not over four seconds would be required to transmit this group and with well trained operators it could be transmitted in from 2½ to 3 seconds.

33. To obtain maximum spotting speed with the system a special but simple and easily improvised spotting board would be required. This spotting board should have a dial similar to the observers dial but of larger scale, perforated at the intersection of radial lines with concentric circles. This dial should be mounted and pivoted on a rectangular grid graduated to the same scale in yards representing overs, shorts, rights, and lefts. The dial should also be graduated in degrees of azimuth. One axial line of the grid, with a setoff index for setting off magnetic declination, would represent the gun target line and would be kept set by the spotter at the approximate azimuth of the target as obtained from the plotting board. If it be desired to read lateral deviations in angular units, the cross-section grid could be mounted on rollers, ruled as a parallax protracter and graduated along the gun-target line in range. The proper range would then be set at the pivot of the dial and lateral angular deviations could be read off directly as easily as linear deviations. The battery radio operator should be stationed near the spotting board and at a black board visible to the assistant spotter. As the observed data on the splash are received the radio operator would write them down on the black board and the assistant spotter would repeat the data to the spotter. The first number repeated would give the spotter the general direction of the splash, the second number would fix the direction; and the final letter would fix the amount of the deviation. If this prcedure is followed the spotter would have the splash plotted and would be ready to transmit the deviations in terms

of yards over or short, right or left, just as soon as transmission was completed. With average trained personnel throughout it is estimated that a maximum of 5 seconds would elapse from the time of the splash until the deviations were obtained in the units of measure desired.

34. With this suggestied code no changes in the present Air-Fire Control Code would be required. Its understanding would be based entirely upon proper training of the Air Corps and Artillery personnel. However, in order that it would always be available it would be advantageous to have a diagram of the spotting dial printed on the W. D. Air-Fire Control Code. This could be done by a slight rearrangement of the present code.



35. It is the opinion of the Coast Artillery Board that:

a. The use in target practice of special methods and special codes not suited to use under service conditions is undesirable and improper.

b. Any method of reporting deviation of splashes which is dependent upon the airplane observer orienting himself with reference to some terrestrial landmark, including the firing battery, is unsatisfactory and would fall down in time of war.

c. The polar coordinate system using the magnetic north or target course are the only methods which can have any certainty of success under unfavorable

visibility conditions or when the battery is firing at its maximum range.

d. Provided a satisfactory instrument can be designed for referring deviations to the magnetic north, the polar coordinate system with the magnetic north as a reference line is the most satisfactory.

e. The system using the 12-hour clock does not give sufficiently accurate data, and the number of radial lines should be increased to 32.

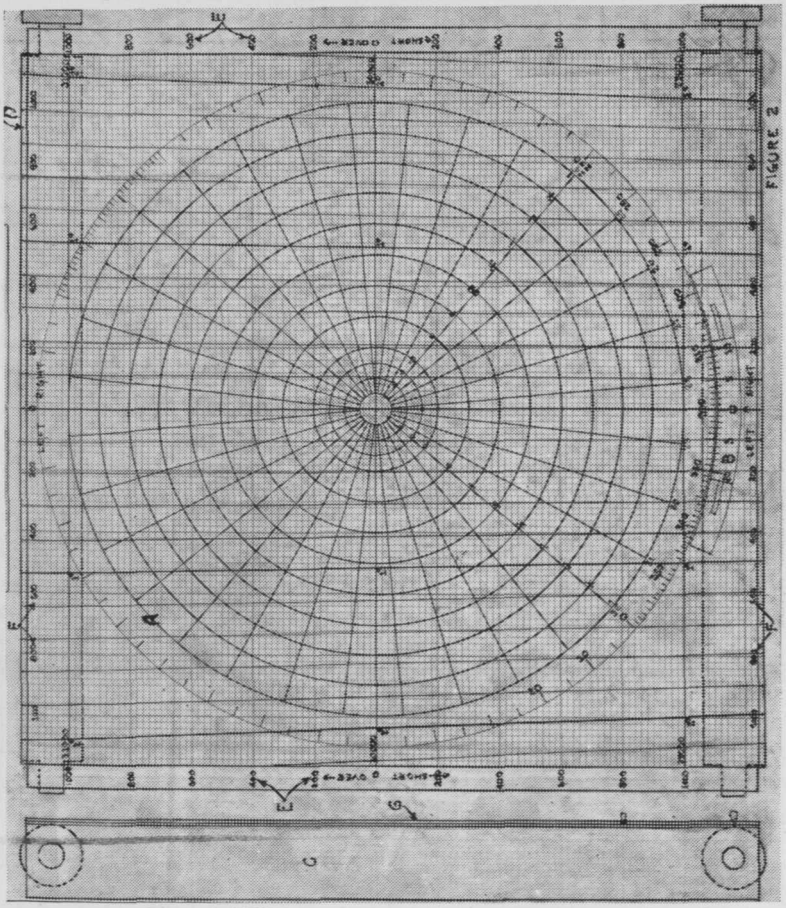


FIGURE 2

f. The concentric circles giving linear deviations should give data to the nearest 50 yards up to a deviation of 200 yards and to the nearest 100 yards beyond that, and the greatest deviations possible on the spotting instrument should be not less than 1000 yards.

g. The Ordnance Department should give high priority to the development of a spotting instrument which will incorporate the polar coordinate system referring deviations to the magnetic north and which can be mounted in the camera opening in the floor of the airplane observer's cockpit.

h. Visual signalling is too slow and unreliable for transmitting spotting data and should be considered as an emergency means only.

i. Radio is the only system of air-ground communication which, at the present time, offers any possibility of success.

k. Radio telephone in its present state of development is not sufficiently reliable to warrant its adoption as standard but should be used in conjunction with radio telegraph in the hope that future development may make its use practicable.

l. Each harbor defense artillery group should be provided with one radio telegraph and telephone transmitting and receiving set of sufficient power to work with an observing plane at a maximum range of 30 miles. The SCR-136 is believed to be the most satisfactory set for this purpose.

m. Each harbor defense battery that may expect to use airplane spotting should be supplied with a suitable receiving set and should train not less than two operators to operate it for reception of both telephone and telegraph spotting data.

n. The present air-fire control code is satisfactory for reporting deviations by the OSRL method.

o. The use of the polar coordinate system requires no change in the air-fire control code, except inclusion of reproduction of the spotting instrument dial is desirable for the information of all concerned.

p. Deviations, if reported with any degree of accuracy, must be transmitted by a three symbol code, the first two symbols to be numerals designating the bearing of the splash, and the third symbol to be a letter designating the deviation in yards.

q. The spotting board for use with the polar coordinate system described herein should consist of a rectangular grid with the target position at the center, about which is pivoted a dial identical in graduations to the observer's instrument dial but of a larger scale and with an azimuth scale added at its periphery, the scale to be the same as that of the grid. One axis of the grid should represent the gun-target line and should be used as an index for orienting the dial.

r. If the battery radio operator is provided with a small blackboard visible to the spotting board detail, deviations can be received and transposed to rectangular coordinate deviations in yards in a maximum of five seconds if the personnel be well trained.

IV—RECOMMENDATIONS.

36. The Coast Artillery Board recommends:

a. That the polar coordinate system be adopted as standard for reporting deviations of splashes.

b. That until such time as a satisfactory compass observing instrument becomes available, the course of the target be used as the reference line.

c. That the Ordnance Department be requested to expedite the development of an observing instrument along the lines discussed herein.

d. That the desirability of the adoption of the polar coordinate system for all aerial observation of the fall of shots be communicated to other services in order that the Air Corps need teach only one method of observation in its schools.

e. That the radio telegraph be adopted as the present standard means of communication, supplemented by the radio telephone, and that visual signals be used only for identification and in emergency.

f. That the three-symbol code discussed herein be adopted for reporting deviation of the fall of shots and the spotting dial be added to the approved air-fire control code.

g. That one SCR-136 radio set be issued to each harbor defense group and one suitable receiving set be issued to each major-caliber battery using aerial spotting.

h. That service tests of the system discussed and recommended herein be continued over several years to determine its feasibility and practicability.

V—ACTION OF CHIEF OF COAST ARTILLERY.

1. With reference to your Project No. 424, *Aerial Spotting and Communications from Spotting Plane to Ground,* you are advised that this project as submitted is approved for publication in the COAST ARTILLERY JOURNAL in order that there may be available full and complete information on this subject for the service.

* * * * *

2. Final decision with reference to the standard system of spotting and communicating will be withheld until reports are received from the Commanding Generals of the Hawaiian, Philippine, and Panama Canal Departments at the conclusion of the 1927 target practice season.

APHORISME XIII.

Mischiefe enters at the open gate of securitie As the Indian Rat shuts himselfe into the belly of the Crocodile that sleepes gaping, and gnawes his guts asunder: So selfe-conceited confidence in our owne strength, and overweening credulity of an enemies insufficiencie, begets this supine negligence; but a watchfull Providence prevents an eminent danger.—Ward's Animadversions of War *(London, 1639).*

BOOK REVIEWS

Man is War. By John Carter. Bobbs Merrill Co. 1926. 5½"x 8½". 390 pp. $5.00.

"The answer to the bitter question, 'Why War?' is the still more bitter reply, 'Man is War.' Until man has mastered himself, the world is no closer to its desire to escape from its destiny of suffering, hatred, bloodshed and violence."

Although the text is stated in terms of bitterness, it must not be inferred that Mr. John Carter has written a gloomy book. On the contrary, he is a joyous cynic, who glories in man as a fighting animal and blasts the pacifists' hopes with relish. Very briefly, his theses are that "Capitalism is war;" "Proletarchy," while aiding in the integration of the race problem, remains a constant menace to security; and "Religion offers no peace to the world, it offers instead the sword of theocracy."

The argument is sociological and historical but the accuracy of the historian is not sought. Indeed we find this in the prefatory note:

> There is a little doubt that any energetic pedant could betray me in a hundred errors of fact; I do not aspire to the position of an authority.

This reviewer feels that Mr. Carter has taken quite full advantage of the freedom from restraint—even irresponsibility—so assumed, and has set down as facts, statements of opinion which—plausible, witty and quotable as they are—cannot be proved, and even some which might be disapproved. For example:

> Beyond any question, the chief force in American politics today, aside from the cult of economic conservatism, is the religious struggle.
>
> A graceful footnote to the whole affair is the spectacle of the Japanese Navy replenishing its full reserves in 1925 with oil from the Elk Hills Naval Oil Reserve in Southern California, when the Government was vainly trying to recover these oil lands . . . for the use of its own navy.
>
> In fact the League has not prevented Great Britain from doing whatever she desires; it has granted her its endorsement on all the British *faits accomplis.*

It should be admitted here that the reviewer has multiplied his quotations more for the reader's entertainment than as incidents of Mr. Carter's tendencies to "Sensationalism."

The reader is not permitted to overlook the instability of the present political situation of the world, in which 283,000,000 white "christians" rule 920,000,000 "backward" colored people, and his attention is called specifically to the fact that the British Empire, which presents the spectacle of "absentee rule" by sixty million Britons over about four hundred million colored peoples, "has been formed and is now maintained by force of arms."

A chapter entitled "Geneva Genetics" gives a fair idea of the present impotence of the League of Nations, with this conclusion—

> Accordingly the effects of the swarm of peace enthusiasts spawned by the recent years of misery and turmoil are utterly beside the point. They can never outlaw war, for war is the first rule of life. . . . The springs of conflict cannot be eliminated through institutions but through reform of the individual human being, and that is a task which has baffled the highest theologians for two thousand years.

An interesting field of speculation is opened with the hypothesis, for argument's sake, that the "League of Nations of today may be the germ of a world movement that will end the principle of the balance of power in favor of a unitary system"—that is, it may, as it must to save the world from itself, become a superstate. We are told that the members would then reduce their armies to police forces, and the superstate recruit its own armies; that in such a state the economic conflict and religious disputes would continue; that in every civil community, conditions might arise which would produce riots; that riots would evolve leadership, and in the course of time a riot become an insurrection, whose forces would have learned the rudiments of war; and finally that the multiplication of such incidents can but lead to a final revolt, to the break-up of the world state and "a new cycle of wars until the end of time or the creation of a uniform breed of men."

To this reviewer the hypotheses is a bit far fetched, but the logic of the subsequent chain of events, unanswerable.

Here is Mr. Carter's vision of the future:

> While it seems reasonably clear that war has not yet been abolished, the wars of pure nationalism are at an end, and the future of the false wars of nationalism—those provoked by economic, religious or internationalist stimuli—need cause no great alarm. Much inflammable material of this sort is still accumulated and the next fifty years will witness a succession of minor, localized explosions, such as are occurring at several points in the world today.
>
> After about a generation, three major wars are likely to develop; a big war in Eastern Europe, involving Russia and Germany, the Baltic States and Poland, whose repercussions may extend as far south as Bulgaria; a Near Eastern war in which Turkey, Great Britain, Italy and perhaps Russia may be implicated and which will settle the mastery of the Arab Peninsula; and a Far Eastern War in which Japan and Russia may come to grips over Manchuria, or Japan may be tempted to seize China's coast, and hold off Great Britain and America by bold naval raids. A world war would only be possible through the fusion of all these three conflicts, but would be so inextricably involved as to render it unlikely. For Russia is an aggressing factor on all fronts, and Russia can not fight Great Britain and in the Near East and cooperate with her in the Far East, unless Great Britain abandons her support of America and turns to Japan for a new alliance—which is not likely in the immediate future.
>
> For in the final analysis the British Empire has dominion over the world, and in any emergency the world admits the British are its masters.
>
> Even the wealthy Senator Couzens from Michigan was suddenly presented with a huge demand for taxes by the Income Tax Department, when his investigation of the taxes paid by large American incomes became annoying to the Treasury.
>
> The late E. H. Harriman desired to build a railroad around the world. . . . He therefore financed the Japanese in the Russo-Japanese War, through his bankers, Kuhn, Loeb and Company.
>
> An offer to arbitrate is an offer to divide. As it is a course of action tinctured with ostensible fairness, it is one most embarassing to whatever

> One thing would more embarrass the Vatican than a wholesale acceptance of Catholicism by the Orthodox, and that would be its wholesale acceptance by the Protestants.
>
> Thus in 1918, Wilson's appeal to the public opinion of Central Europe broke up German resistance.
>
> Nationalism as an active political force is today as moribund as feudalism in the day of Cervantes.
>
> On the eve of the Washington conference, Briand brought Secretary Hughes the offer of an alliance against Great Britain and Japan which was peremptorily rejected.

And this is his lesson for America:

> Unless something happens to release American public opinion from the miasma of parochial politics, to substitute hard common-sense for sentimental "crusades," to suggest that virility and honor have a place in international as well as national life, the next great war will find America a mass of corporations, boards of directors, committees and commissions but no citizens and no clear idea of what is the duty of citizenship. Until American women realize that it is a rank impertinence on their part to preach pacificism to children whose problems they cannot foresee, America will be in danger of the greatest downfall in history, for she is the protagonist of the coming international tragedy, and the fact that the tragedy is three generations removed renders its cause the more inevitable and its results the more deadly. For strength, no less than nobility, has its obligations; weakness, whether moral or physical, is the unpardonable sin of political life.

It is but faint praise to say "Man is War" is worth while not only for what it contains but as a stimulus to serious thought on our future as Americans and citizens of the world.—R. S. A.

Napoleon. By Emil Ludwig. Translated by Eden and Cedar Paul. Boni Liveright, New York. 1926. 6¼"x 9¼". 707 pp. Ill. $5.00.

No novelist could have created a realistic Napoleon, but it requires a pen skilled in imaginative and dramatic writing to depict sympathetically his astonishing and meteoric career. A sub-lieutenant at sixteen, cashiered at twenty-three, brigadier general at twenty-five, famous at twenty-seven, First Consul at thirty, Emperor at thirty-five, excommunicated at forty, and an exile at forty-five, the great Corsican lived a full life at a tremendous tempo.

> Picture to yourself a little man [writes a German in a letter,] no taller than Frederick the Great; very regularly and slenderly built; lean, but sturdy, a large head; Grecian nose, so long that it almost hangs down over the mouth; his mouth is full of humaneness and grace; the firm chin is rather prominent. His movements are brisk, but he has a fine and dignified bearing. You may see him run down a staircase in five or six strides, and yet, as he finishes the last stride, he stands before you as graceful as ever.
>
> He neither hates nor loves [writes Madame de Stäel]; for him, no one exists but himself; all other people are merely number so and so. A great chess-player, for whom humanity is the adversary he hopes to checkmate. His success is quite as much to do with the qualities he lacks as to the qualities he possesses. . . . When his own interest is involved, he pursues it as the just man seeks virtue; if his aim were good, his perseverance would be exemplary. . . . He despises the nation whose applause he seeks; there is not a spark of fervour intermingled with his craving to astound mankind.

Such is the man presented to us by Emil Ludwig, who is not a professional historian. He has written poetic and biographic dramas, novels, essays, and

biographies; and he takes up his study of Napoleon with a training which leads us to expect an unusual volume.

The author, writing sympathetically, dramatically, and vividly, fulfills expectations. The Napoleon of the book is not the military genius with whom we are all familiar (although his campaign necessarily receive considerable attention), but the law-maker and the ruler, the statesman and the diplomat, the husband and the father. The characterization is developed from page to page by copious extracts from Napoleon's own writings and sayings, rather than from the author's conception of him. He and his intimates pass before us as living beings—Tallyrand, brilliant and unscrupulous, Fouché, necessary but untrustworthy, the Bonaparte brothers, Murat, Benthier, Masséna, Bernadotte, Marmont, and the rest, all self-seeking and many ungrateful.

Perhaps the best of the book is found in Part Five, where the author pauses in his chronological record and permits Napoleon to picture himself in his own words. Three elements of the Emperor's character are particularly stressed. The first of these is self-confidence, without which no man ever became great. "After all, what does it matter to me whether I am criticized?" "I shall make my way whithersoever I will." "I am a Roman emperor, in the best line of the Cæsars. . . . A man is born to be a Cæsar."

The second (and a most important) element emphasized by the author is Napoleon's energy, his unusual capacity for work. "I am always at work; I think a great deal. If I appeared to be ever ready and equal to any occasion, it is because I have thought over matters for long before I undertake to do the slightest thing. . . . Everything is turned over in my mind, again and again, always, whether I am at table or at the theatre. At night, I wake up in order to work."

The third element of his personality, the real driving force, is imagination. "I know not what I do, for everything depends on events. I have not a will of my own, but expect everything from their outcome." How far into the future his imagination led him may be illustrated by a remark made after his overthrow.

> Europe would soon have become one nation, and any who travelled in it would always have been in a common fatherland. . . . Sooner or later, this union will be brought about by the force of events. The first impetus has been given; and, after the fall and the disappearance of my system, it seems to me that the only way in which an equilibrium can be achieved in Europe is through a league of nations.

One other remarkable character in this remarkable book must be noted; and that is Letizia, Napoleon's mother. She appears on the first page as a young wife accompanying her husband in the field in insurgent Corsica; she threads her way through the story of her son's career, the one person in whom there existed an doubt of the permanency of Napoleon's successes; and she closes the book on the last page as an old woman, witnessing the restoration of her son's statue to the Vendome column in 1831. "Once again the Emperor is in Paris."

An Autobiography of Abraham Lincoln. By Nathaniel Wright Stephenson. The Bobbs-Merrill Company, Indianapolis. 1926. 5¾"x 8¾". 500 pp. Ill. $5.00.

The interest of the reading public in books with a personal appeal seems to be on the increase. Biographies or autobiographies, as they come from the press, are eagerly sought after; and there is always at least one book of this type listed

among the current best sellers. It has remained for Nathaniel Wright Stephenson to give us a novelty in personal memoirs—the life story of a great man told in his own words sixty-two years after his death.

A wall of legend and myth has gradually grown up around Lincoln, as it has around others of our great men, and from the many portraits held up for our inspection we are at a loss to decide which most nearly resembles the true Lincoln. In his *Autobiography of Abraham Lincoln*, Mr. Stephenson has collected the significant notes, letters, and speeches of the Great Emancipator, including Mr. Lincoln's own account of his early life, and arranged them in chronological order; so that we may watch the gradual mental growth and spiritual development of this remarkable man and know him as he really was, not as others imagined he might be. It is gratifying to feel that the Lincoln revealed to us through his own words is a greater man than his most admiring biographers have realized.

The book contains so much that is illuminating in character revelation, it is permissible to quote from a very few of the shorter documents.

Mr. Lincoln was called "Honest Abe." Here is a note to show how thoroughly he deserved this name.

A letter to George P. Floyd, written when Mr. Lincoln was forty-seven years of age, is dated February 21, 1856.

> I have just received yours of the 16th, with check on Flagg and Savage for twenty-five dollars. You must think I am a high priced man. You are too liberal with your money.
>
> Fifteen dollars is enough for the job. I send you a receipt for fifteen dollars and return you a ten-dollar bill.

A letter to John Hay, written October 18, 1863, in response to one from Mr. Hay, "discussing Mr. Chase's secret attempt to supplant Lincoln as Republican leader," says:

> It is very bad taste, but I am determined to shut my eyes to all these performances. Mr. Chase makes a good Secretary (of the Treasury), and I shall keep him where he is. If he becomes President, all right. I hope we will never have a worse man. . . . I am entirely indifferent as to his failure or success in these schemes so long as he does his duty as head of the Treasury Department.

Mr. Chase finally resigning as Secretary of the Treasury because of his connection with the party trying to discredit Mr. Lincoln's policy, the President appointed him Chief Justice of the United States Supreme Court. In response to a letter from a close friend of Mr. Chase's, expressing amazement at the "magnanimity and patriotism" shown in this appointment, Mr. Lincoln wrote:

> Although I may have appeared to you and Mr. Sumner to have been opposed to Chase's appointment, there never has been a moment since the breath left Taney's body that I did not conceive it to be the best thing to do to appoint Mr. Chase to that high office; and to have done otherwise I should have been recreant to my convictions of duty to the Republican party and to the country.
>
> As to his talk about me, I do not mind that. Chase is . . . a very able man. His only trouble is that he has "the White House fever" a little too bad, but I hope this may cure him and that he will be satisfied.

In 1863 Mr. Lincoln wrote a note of appreciation to James H. Hackett, the actor, after a performance of Mr. Hackett's in a Shakesperian role had aroused the President's admiration. The note expressed regret that he (Mr. Lincoln) had been unable to study the plays of the great English dramatist more fully, and Mr. Hackett carelessly allowing the note to get into print, it was seized by political enemies of Mr. Lincoln as a source of ridicule. Mr. Hackett must have written a letter of apology, and Mr. Lincoln's note of reply is a masterpiece of simple, dignified pathos.

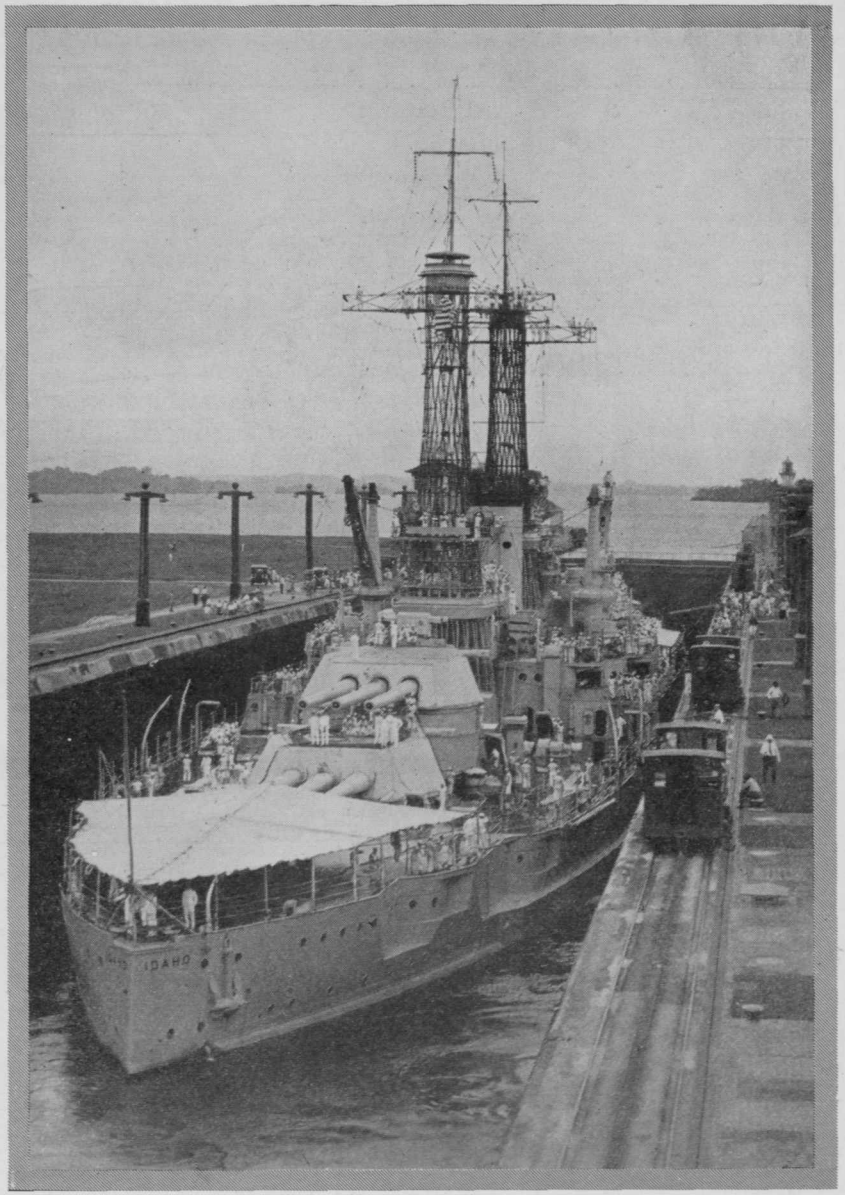
> My note to you I certainly did not expect to see in print, yet I have not been much shocked by the newspaper comments upon it. Those comments constitute a fair specimen of what has occurred to me through life. I have endured a great deal of ridicule without much malice; and have received a great deal of kindness, not quite free from ridicule. I am used to it.—E. L. B.

The Organization of the British Army in the American Revolution. By Edward E. Curtis. Yale University Press, New Haven. 1926. 5½"x 8¾". 223 pp. $2.50.

In the one hundred and fifty years which have followed the Declaration of Independence, there has appeared a great mass of literature concerning all the many phases of the War of the American Revolution. As might be expected, by far the greater number of these books are devoted to the purely military and naval operations of the war or to research into the organization, equipment, and administration of the Continental Army. Professor Curtis therefore enters a comparatively untouched field when he takes up the interior functioning of the British Army.

Rather than a discussion of the British organization, the volume is an investigation of the administration and supply in the army and of the influence that deficiencies in these respects had upon military operations. After a general survey of the organization, equipment, and characteristics of the British army during the Revoluntary period, the author discusses separately the administrative machinery and the organization of the higher echelons of control, recruiting, provisioning, and transportation.

He finds that the "failure of British arms in the American Revolution cannot be ascribed to want of courage on the part of the officers and men." He is in agreement with Tarleton, Stedman, and other writers of the period when he lays the loss of the colonies to "inept generalship," "natural difficulties," and "maladministration." One other factor, which is important and which the author fails to mention, is found in the British navy. That maladministration and poor leadership prevented the army in America from winning the war can scarcely be denied, but it is probable that the war would not, in the end, have been lost by Great Britain had her navy reached its usual heights of tactical and strategical efficiency.



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U. S. S. IDAHO

Displacement, full load, 33,000 tons; length overall, 624 feet; beam, 97 feet 4½ inches; maximum draft, 31 feet; armament, 12 14-inch, 12 5-inch, 8 3-inch (AA), 4 3-pdr., 2 machine guns, 1 landing gun, 2 21-inch torpedo tubes; armour, 14-inch belt (amidships), 8-inch belt (aft), 18-inch turret, 16-inch conning tower; complement, 1434; speed, 21 knots; launched June 20, 1917, by New York Shipbuilding Co.