

THE COAST ARTILLERY JOURNAL

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VOL. 63 CONTENTS FOR SEPTEMBER, 1925 No. 3

QUARTERS, COMMANDING GENERAL, FORT MONROE *Frontispiece*

A FIVE FOOT BOOK SHELF FOR COAST ARTILLERYMEN 209
By BRIGADIER GENERAL R. E. CALLAN, *U. S. Army.*

THE THIRD COAST ARTILLERY 217
By LIEUTENANT COMMANDER SIDNEY BALLOU, U. S. N. R. F.

LIMITATIONS OF AIRCRAFT IN NAVAL WARFARE 236
By MAJOR GEORGE RUHLEN, JR., C. A. C.

THE BATTLES OF LUDENDORFF ON THE RUSSIAN FRONT 250
By GENERAL HUBERT CAMON, *French Army*

PROFESSIONAL NOTES:

THE SPIRAL METHOD OF UNILATERAL OBSERVATION FOR ADJUSTMENT OF
FIRE ON FIXED TARGETS *Major G. F. Moore* 270

A METHOD OF ELIMINATING ERRORS IN THE ELEVATING MECHANISM OF
ANTI-AIRCRAFT GUNS *Lieutenant J. E. Reiersen* 275

THE 8-INCH RAILWAY GUN *Captain E. M. Benitez* 278

BETTER ANTI-AIRCRAFT GUNS 281

FORT WORDEN, WASHINGTON *First Lieutenant L. Supple* 282

APPROXIMATE DETERMINATION OF THE HEIGHT OF BURST 284
Enrico Bianco di S. Secondo

BACHELOR OF SCIENCE IN MILITARY ENGINEERING 287

COMPARATIVE ENROLLMENT CIVILIAN MILITARY TRAINING CAMPS 288

MILITARY NOTES 289

GREAT BRITAIN'S MEDICAL CORPS RESERVES—REORGANIZATION OF THE
JAPANESE ARMY—STRENGTH OF THE ARMY IN INDIA.

COAST ARTILLERY BOARD NOTES 293

BOOK REVIEWS 301

ROBERT E. LEE, THE SOLDIER—THE UNITED STATES AND THE PHILIPPINES—
FAR HARBORS. AROUND THE WORLD—FUNDAMENTAL PRINCIPLES OF
GENERATORS AND MOTORS—THESE UNITED STATES, A SYMPOSIUM—
EINSTEIN'S THEORY OF RELATIVITY—THE GERMAN SECRET SERVICE.

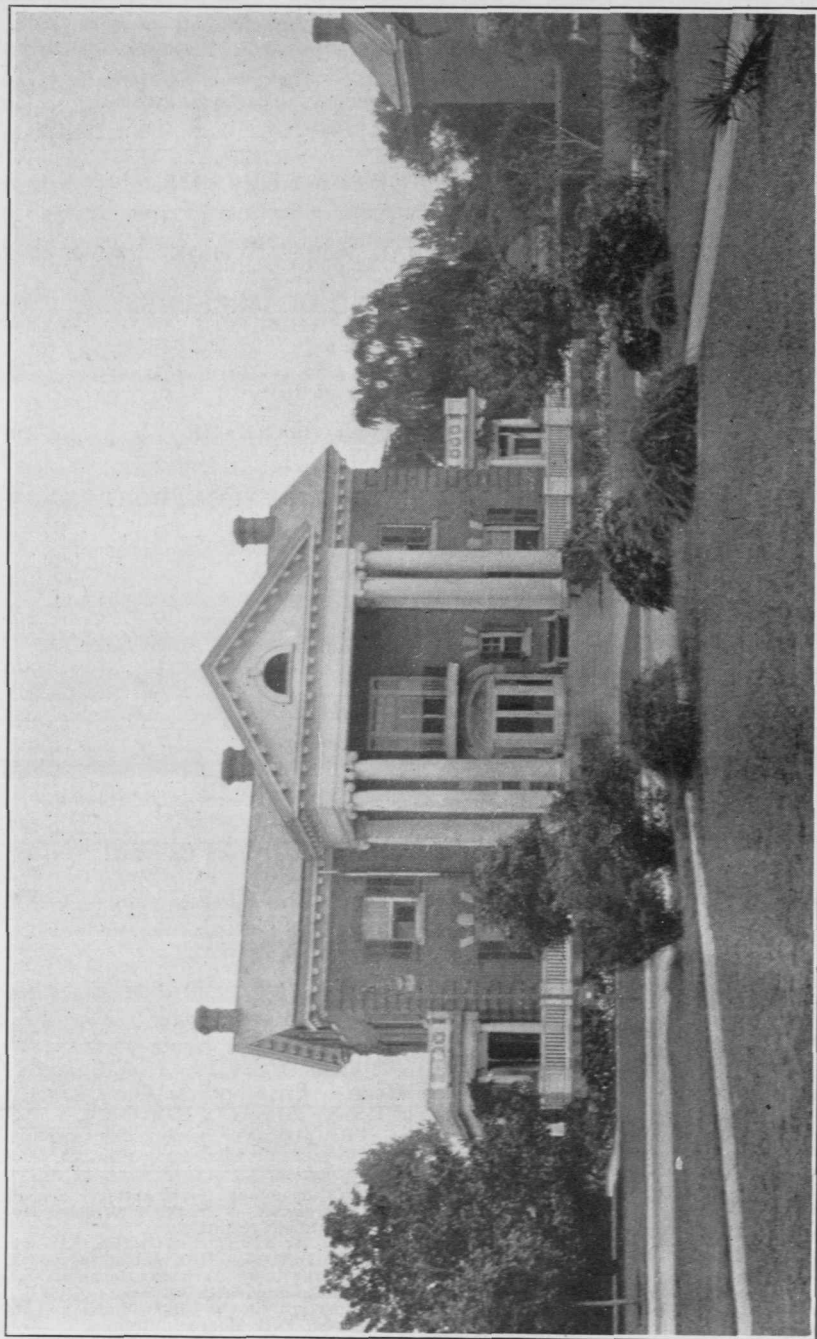
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QUARTERS OF THE COMMANDING GENERAL, THIRD COAST ARTILLERY DISTRICT, FORT MONROE, VA.

THE COAST ARTILLERY JOURNAL

VOL. 63

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NO. 3

A Five Foot Book Shelf for Coast Artillerymen

By BRIGADIER GENERAL R. E. CALLAN, *U. S. Army*

DURING the major portion of my tour of duty in the Philippines (1915-1917), I was Assistant Chief of Staff and in charge of the Military Information Division. This Division contained a most interesting library of some 11,000 volumes peculiarly suited for reading in military subjects and Far East travel. I was struck by the interest that was taken by officers of all arms in the library and was continually prodded into the purchase of up-to-date books, particularly along military lines.

One thing that was outstanding in the search of many officers, was the desire to obtain some reasonable limit to the kind and number of books whose study would cover even generally their profession. This led me to the utilization of Dr. Eliot's idea of a five foot shelf. I established such a series of shelves at the entrance to the library commencing with one for Infantry officers. After consulting with many able officers of that branch, I placed together a series of books covering the technique and tactics of that branch graduating into the use of the combined arms and concluding with studies on war by some of the best European authorities. A notice was put on the shelf that any Infantry officer was always at liberty to take any book out of the shelf and have it replaced by some other book in the library or by one that I should purchase. The whole thing provoked considerable interest and discussion and finally resulted in a fairly stable shelf of books. I did the same thing for the other combat branches with the clear result that the more technical arms had too many scattered technical works and too few tactical treatises to make a valuable five foot shelf. Naturally this was particularly true of the Coast Artillery.

Shortly after coming to my present command* I was talking to my Plans and Training Officer, Capt. W. W. Irvine, C. A. C.,

*General Callan is at present Commanding General of the Third Coast Artillery District and Commandant of the Coast Artillery School.

about this matter and realizing that many of the deficiencies referred to above have been corrected since 1917, I suggested to him that he get up such a shelf for the Coast Artillery officers and advise and consult with the Coast Artillery School and the Coast Artillery Board in its preparation. This list is appended and is the result of much more labor on the part of the officers concerned than would be apparent at first glance.

There is at the present time a distinct demand by the officers of the Coast Artillery Corps for guidance in their reading and study in order that they may perfect their knowledge as artillerymen and fit themselves for tactical command. Under the present policy of the War Department, only a few officers will attend all the service schools and many officers will not take both the Battery Officers' Course and the Advanced Course of the C. A. School. The technical and tactical education of an officer is gained by experience, by attendance at service schools, and by individual study. The individual effort of those officers who do not attend the service schools should be stimulated in every way, and in particular by suggesting a series of books and pamphlets for their study. The collection of books listed in this article actually measures about four feet; it should be borne in mind that the selection does not represent the choice of any one officer; the assistant commandant, the directors, and instructors of the Coast Artillery School, the members of the Coast Artillery Board, and other officers have assisted.

It is improbable that many officers will desire to collect this list of books, except over a period of years. Obviously, a list can not be prepared which will meet the requirements of all grades. Requirements in grade vary with experience, service schools attended, etc. The officer just entering the army will not need books on tactics. He is concerned primarily with technique. The books listed on tactics will probably pass through several revised editions before he will desire to purchase them. On the other hand, the officer of from five to ten years' experience will wish to take up the tactics of his arm and at the same time keep up his interest in technique. Other officers, say those of twenty years' service, will be much concerned with tactics of all arms. Their study of technique will be diminished accordingly.

It is evident from a study of this bookshelf that a few texts need revision and that in some cases a compilation into one publication of several texts is desirable; for instance, the publication of a text book on Tactics for Seacoast Artillery. The several texts listed under the heading "Tactics, Seacoast Artillery," are not considered altogether satisfactory.

Some subjects that should be covered do not appear in the list. Most of these subjects will be covered by War Department training regulations and other publications. It was deemed best at the present time to omit references to subjects where satisfactory texts have not been printed.

Of the 139 training regulations, pamphlets, mimeographs, and books, 94 can be obtained from the War Department and 23 can be obtained at a small cost from the Command and General Staff School or the COAST ARTILLERY JOURNAL. While the 21 Coast Artillery School publications are not available for distribution, they can be obtained by loan from the Coast Artillery School library.

The younger officer should avoid going into the subject of tactics before becoming proficient in the technique of artillery. Tactical decisions will seldom be made by an officer of Coast Artillery below the grade of major, and tactical decisions of any officer will be of little value if he and his battery commanders are not thorough technicians. The coast artilleryman must know his gunnery and his materiel, if he is to render effective service in battle. The battery commander may have many qualities of leadership but if he is deficient in the technique of artillery it will avail him little.

The last quarter of a century has witnessed tremendous progress in fire against moving naval and aerial targets. However, many gunnery problems still need improved solutions, especially in fire against aerial targets. Most inventions and discoveries have been the result of a general advance in knowledge all along the line. Often inventions and discoveries have been made almost at the same time by several men. It is seldom that a single individual, unaided by the experience of others, makes remarkable strides in any kind of research. For this reason, if we are to solve the problems now facing us, it must be by united and progressive effort.

In addition to the needed improvement of technique to meet the different fire problems that the Coast Artillery officer must solve, there is a crying need for a great revival in seacoast artillery tactics. Such problems include the tactical principles underlying prompt action of coast cannon against warships, the tactical combinations or groupings of such cannon, the proper utilization of reinforcement artillery, both railway and tractor drawn, the emplacement of the latter classes of artillery out of support of fixed cannon, and the relation and organization of all classes of Coast Artillery to sector and sub-sector commanders. All of these questions are well worth rather intensive study by coast artillery field officers. The five foot book shelf can be strengthened particularly along these lines and it is hoped that many interested officers will come forward and present

their views on these matters both in their tactical exercises and in articles for the *COAST ARTILLERY JOURNAL*. The result of such studies in a few years could provide additions to the Coast Artillery five foot shelf that would be most valuable to all officers in the Corps.

COAST ARTILLERY

TACTICS

ANTIAIRCRAFT ARTILLERY

TR 435-30, Tactical Employment of Antiaircraft Artillery. War Department. 5 cents.

A Study of the Organization, Command, and Employment of Antiaircraft Artillery. Coast Artillery School.

ARTILLERY WITH LAND FORCES

Tactical employment of Railway Artillery. Coast Artillery School. This mimeograph, when approved will be published as TR 435-25. See also Notes on Railway Artillery, listed elsewhere.

TR 435-105, Tactical Employment F. A. War Department. 15 cents.

TR 435-155, Reconnaissance and Occupation of Position. War Department. 10 cents.

SEACOAST

TR 435-20, Emplacement and Tactical Employment of Coast Artillery in Harbor Defense. War Department. 5 cents.

Tactical Employment of Tractor Artillery in Coast Defense. Coast Artillery School.

Coast Artillery War Game (W. D. Doc. 540). War Department.

Joint Army and Navy Action in Coast Defense. War Department.

Notes on Seacoast Defense. Coast Artillery School. Confidential. Not available for distribution.

Naval Strategy and Tactics with Special Reference to Seacoast Fortifications. Coast Artillery School. Confidential. Also included in Notes in Seacoast Defense.

TECHNIQUE

FIRE CONTROL, POSITION FINDING, AND COMMUNICATIONS

TR 435-221, Fire Control and Position Finding. War Department. 10 cents.

Signal Corps Manual No. 8 (W. D. Doc. 483). War Department. Confidential.

Elementary Principles of Radio Telegraphy and Telephony (W. D. Doc. 1064). War Department. 10 cents.

The Principles Underlying Radio Communication (W. D. Doc. 1069). War Department. \$1.00.

MATERIEL

Heavy Artillery Materiel, Parts I-VI. Coast Artillery Journal. \$1.50.

Handbook of American Coast Artillery Materiel (W. D. Doc. 2042). War Department.

Military Motor Transportation. Coast Artillery Journal. \$1.00.

Ordnance Pamphlets on Piece and Carriage of Battery to which Officer is Assigned. War Department. These pamphlets will all be published as TR.

Manual of Submarine Mines (W. D. Doc. 399). War Department. Confidential.

TR 310-20, Fire Control Instrument, Mobile Artillery. War Department. 10 cents.

Railway Artillery-Characteristics and Scope of Utility. Vol. I, only. War Department.

GUNNERY

Gunnery for Heavy Artillery, 1925. Coast Artillery School. This book will be published during 1925 as TR 435-280.

TR 435-210, Gunnery for Antiaircraft Machine Guns. War Department. 5 cents.

TR 435-160, Gunnery for Antiaircraft Artillery. War Department. 5 cents.

Antiaircraft Gunnery and Position Finding, 1925. Coast Artillery Journal. 75 cents.

Firing Tables. War Department.

ORIENTATION AND MAP READING

TR 435-325, Orientation for Heavy Artillery. War Department.

TR 190-5, Map Reading. War Department. 5 cents.

TR 190-10, Conventional Signs. War Department. 5 cents.

Geodetic Surveying. (Mimeograph Eng. School.) Engineer School.

AR 100-5, Maps and Mapping. War Department. Will be published as TR 445-90.

ORGANIZATION AND TRAINING

ANTIAIRCRAFT

TR 435-75, Searchlight Battery. War Department. 5 cents.

TR 435-85, Machine Gun Battery. War Department. 5 cents.

TR 435-90, Gun Battery. War Department. 5 cents.

TR 435-95, Service Battery. War Department. 5 cents.

TR 435-98, Separate Battalion. War Department. 5 cents.

TR 435-105, Bn. Hq. & C. T. Machine Gun Battery. War Department. 5 cents.

TR 435-100, Bn. Hq. & C. T. Gun Battery. War Department. 5 cents.

TR 435-110, Gun Battalion. War Department. 5 cents.

TR 435-115, Hq. & Hq. Btry. A. A. Regt. War Department. 5 cents

TR 435-120, A. A. Regt. War Department. 5 cents.

TR 435-161, Identification of Aircraft. War Department. 5 cents.

TR 435-211, Machine Gun Marksmanship. War Department. 5 cents.

TR 310-136, Description, Operation, etc., of Mobile Searchlight. (Provisional.) War Department. (O. C. E. Mimeo.) Will probably be published as TR.

This is a C. A. M. No. 6.

Antiaircraft Target Practice, and Searchlight Exercise. War Department. (O. C. C. A.)

HARBOR DEFENSE

TR 435-220, The Battery Command. War Department. 10 cents.

TR 435-290, The Fire Command. War Department. 5 cents.

TR 435-295, The Fort Command. War Department. 5 cents.

TR 435-300, The Coast Defense Command. War Department. 5 cents.

Tactical Use of Searchlights (Prov. TR 435-330). Coast Artillery School.

Type Programs and Schedules of Training Required within a Coast Defense Command upon Mobilization. War Department. (O. C. C. A.) This bulletin will later be issued as a TR.

Coast Artillery Definitions (Prov. TR 435-307). Coast Artillery School.

The Mine Command (Prov. TR 435-315). Coast Artillery School.

Headquarters Battery C. A. Regt. (TR 435-222). War Department. (O. C. C. A.) Distributed in mimeograph form.

RAILWAY ARTILLERY

Notes on Railway Artillery. Coast Artillery School. This text is a compilation covering to some extent technique and tactics.

The Battery Command, Railway Artillery (Prov. TR 435-225). Coast Artillery School. All provisional training regulations when approved will be published by the War Department as TR.

Battalion Railway Artillery (Prov. TR 435-170). Coast Artillery School.
 Service Battery (Prov. TR 435-240). Coast Artillery School.
 Regiment Railway Artillery (Prov. TR 435-175). Coast Artillery School.
 Brigade Railway Artillery (Prov. TR 435-180). Coast Artillery School.

TRACTOR ARTILLERY

Battery Command Heavy Tractor Artillery (Prov. TR 435-185). Coast Artillery School.
 Battalion Heavy Tractor Artillery (Prov. TR 435-189). Coast Artillery School.
 Regiment Heavy Tractor Artillery (Prov. TR 435-190). Coast Artillery School.

TRENCH ARTILLERY

Training regulations are being prepared on this subject.

SOUND RANGING

Flash, Sound, and High Burst Ranging. Coast Artillery School. Four TR on SR have been prepared but not published.

GENERAL

TR 435-55, Analysis of Drill and Analysis and Rpt. of TP. War Department. 10 cents.
 TR 435-56, The Schloming Film and Tangent Scale. War Department. 5 cents.
 TR 435-310, Examination for Gunners. War Department. 5 cents.
 Service of the Piece, TR for Armament to which Assigned. War Department. 5 cents.
 Mine and Sub-mine Target Practice (Prov. TR 435-51). Coast Artillery School.
 Tables of Organization for Coast Artillery Units. War Department.
 Operation of a Coast Defense Meteorological Station. Coast Artillery School. A mimeograph.
 TR 50-15, Instruction Dismounted without Arms. War Department. 5 cents.
 TR 50-20, Instruction Dismounted with Rifle. War Department. 5 cents.
 TR 20-25, Instruction with Bayonet. War Department. 5 cents.
 TR 50-55, Instruction Dismounted with Pistol. War Department. 5 cents.
 TR 50-90, Display of Equipment. War Department. 5 cents.
 TR 75-85, The Motor Vehicle Operator. War Department. 5 cents.
 TR 112-5, Outlines of First Aid for the Injured or Sick. War Department. 5 cents.
 TR 113-5, Principles of Personal Hygiene. War Department. 5 cents.
 TR 135-5, Ceremonies of Guard Mounting Foot Troops. War Department. 5 cents.
 TR 150-5, Marksmanship, Rifle Individual. War Department. 5 cents.
 TR 150-10, Marksmanship, General. War Department. 5 cents.
 TR 150-30, Marksmanship, The Automatic Rifle. War Department. 10 cents.
 TR 150-35, Marksmanship, The Machine Gun. War Department. 15 cents.
 TR 185-5, Rigging. War Department. 5 cents.
 TR 200-5, Scouting and Patrolling (Dismounted). War Department. 10 cents.
 TR 310-50, Field Ranges. War Department. 15 cents.
 TR 320-10, U. S. Rifle. War Department. 5 cents.
 TR 320-15 Automatic Pistol. War Department. 5 cents.
 TR 420-20, Dismounted Ceremonies. War Department. 5 cents.
 TR 420-40, Drill and Combat Signals. War Department. 5 cents.
 TR 420-45, Infantry General. War Department. 5 cents.
 TR 420-50, Drill, The Rifle Squad, etc. War Department. 10 cents.
 TR 420-60, Drill, The Infantry Battalion. War Department. 5 cents.
 TR 420-80, Drill, The Infantry Regiment, etc. War Department. 5 cents.
 TR 420-85, Extended Order, etc. War Department. 5 cents.

OTHER ARMS

GENERAL

TR 10-5, Doctrine, Principles and Methods. War Department. 5 cents.
 Field Service Regulations, 1923 (W. D. Doc. 1120). War Department.
 The Military Policy of the United States, Bulletin 1921. War Department.
 This title is listed as TR 15-5, not yet published.
 Methods of Training, 1923. Command and General Staff School. 50 cents.
 Tables of Organizations, Infantry and Cavalry Divisions. Command and General Staff School. 50 cents.
 General Map of Gettysburg, 1924, 1" = 5 miles. Command and General Staff School. 50 cents.
 Topographical Map of Gettysburg—Antietam, 10 sheets. Command and General Staff School. 5 cents each. Mounted on Muslin, \$3.00.
 Geological Survey, 37 sheets. Command and General Staff School. 5 cents each.
 Military Organization of U. S. Command and General Staff School. 15 cents.
 Military Aid to Civil Powers. Command and General Staff School.
 Military Protection (W. D. Doc. 882). War Department.
 TR 160-5, Signal Communications, All Arms. War Department. 10 cents.
 Rules for Land Warfare (W. D. Doc. 67). War Department.
 Epitome of Upton's Military Policy (W. D. Doc. 505). War Department.
 A Manual for Courts-Martial, U. S. Army. War Department.

TACTICS AND TECHNIQUE OF THE SEPARATE BRANCHES

Tactics of Separate Branches, Vols. I and II. Command and General Staff School. 50 cents each.
 Combat Orders, 1924. Command and General Staff School. 50 cents.
 Solution of Map Problems, 1924. Command and General Staff School. 25 cents.
 Field Fortifications. Command and General Staff School. 50 cents.
 Tactical Principles and Decisions, Vols. I and II. Command and General Staff School. \$5.00 (approx). Published in separate chapters loose leaf binders.
 Each chapter from 10 to 40 cents.
 Command Staff and Logistics. Command and General Staff School. \$1.50.
 Notes on Combat Intelligence. Command and General Staff School. 50 cents.
 Troop Leading, Vols. I and II. Command and General Staff School. 75 cents.
 Tactical and Strategical Studies, The Corps Vol. I. Command and General Staff School. \$1.00.
 Tactical and Strategical Studies, Corps and Army, Vol. II. Command and General Staff School. \$2.00.
 Tactics and Technique of Artillery, Vols. I and II. Command and General Staff School. \$1.50.
 Tactics and Technique of Separate Branches, Cav. Command and General Staff School.
 Tactical Employment of Machine Guns. Command and General Staff School.
 TR 420-105, Combat Principles, The Rifle Squad. War Department. 10 cents.
 TR 420-110, Combat Principles, The Rifle Section. War Department. 5 cents.
 TR 420-115, Combat Principles, The Rifle Platoon. War Department. 10 cents.
 TR 420-120, Combat Principles, The Rifle Company. War Department. 5 cents.
 TR 420-125, Combat Principles, The Machine Gun Section. War Department. 5 cents.
 TR 420-130, Combat Principles, The Machine Gun Platoon. War Department. 5 cents.
 TR 420-135, Combat Principles, The Machine Gun Company. War Department. 5 cents.
 TR 420-140, Combat Principles, Howitzer Company Squads. War Department. 5 cents.

- TR 420-150, Combat Principles, Howitzer Company Platoons. War Department. 5 cents.
TR 420-155, Combat Principles, Howitzer Company. War Department. 5 cents.
TR 420-160, Combat Principles, The Infantry Battalion. War Department. 5 cents.
TR 420-170, Combat Principles, The Infantry Regiment. War Department. 5 cents.
TR 420-180, Combat Principles, The Service Company. War Department. 5 cents.
TR 420-185, Combat Principles, The Infantry Brigade. War Department. 5 cents.

SUMMARY

COAST ARTILLERY:

Tactics, 11; Technique, 21; Organization and Training, 65; Sub Total, 97.

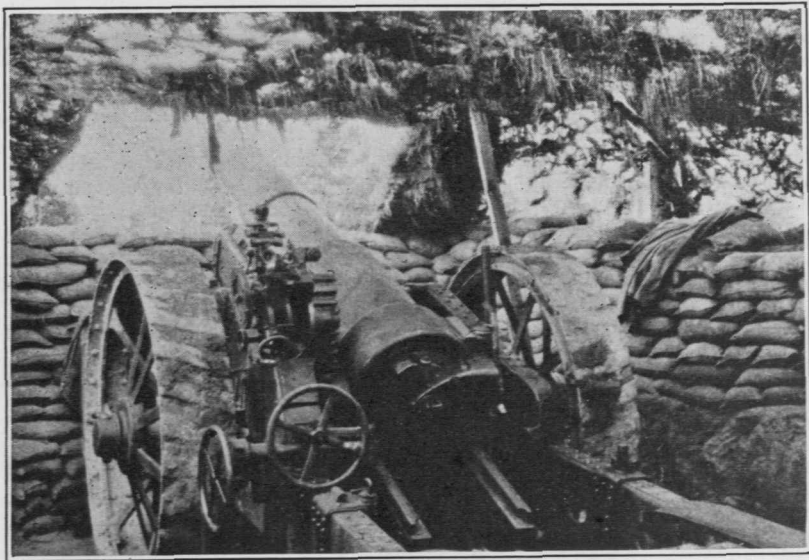
OTHER ARMS:

General, 15; Tactics and Technique, 27; Sub Total, 42; Grand Total, 139.

PUBLISHERS:

War Department, 94; Coast Artillery School, 221; Command and General Staff School, 20; Coast Artillery Journal, 3; Engineer School, 1.

NOTE: C. & G. S. S. books may be purchased through the COAST ARTILLERY JOURNAL.



The Third Coast Artillery

A Historical Sketch

By MAJOR GEORGE RUHLEN, JR., C. A. C.

THE Third Coast Artillery was organized July 1, 1924, under the provisions of General Orders No. 8, War Department, February 27, 1924, by reconstituting the former Third Regiment of United States Artillery which was broken up in 1901 when the artillery of the Army was formed into a corps. The companies of the Coast Artillery Corps constituting the Third Coast Artillery were batteries of the Third Regiment of Artillery, and all have been in existence since the respective dates of organizations as combat units.

<i>C. A. C. Serial Designation 1901</i>	<i>Designation in 3rd Regiment of Artillery (Organized 1821)</i>	<i>Battery Designation in 3rd Coast Artillery July 1st, 1924</i>	<i>Original Date of Organization</i>
25th Company	A	A	1812
26th Company	B	B	1794
27th Company	D	D	1794
28th Company	E	E	1821
31st Company	I	C	1812
34th Company	M	F	1847
35th Company	N	G	1899
36th Company	O	Hq. Btry.	1899

Batteries B and D are the oldest Coast Artillery batteries in the Army.

The artillery arm of the service has been in continuous existence since 1775, prior to the adoption of the Declaration of Independence. Artillery was present and participated in the Battle of Bunker Hill. There was a Third Regiment of Artillery in the Continental Army, which was disbanded at the close of the Revolution. During the War of 1812 one of the regiments of artillery was known as the Third Artillery and was commanded by Colonel Alexander Macomb, who afterwards became general in chief of the army. This regiment enjoyed a brief though highly distinguished career, serving like its revolu-

NOTE: General Wm. E. Birkhimer's historical sketch of the Third United States Artillery, published by the Military Service Institute in March, 1893, has been drawn upon freely for historical data pertaining to the Civil War and prior thereto. Reference to lettered batteries apply to the battery designations in the old Third Artillery. Batteries A, B, D, and E have retained their former designations.

tionary predecessor, from the first to last in the face of the enemy. In 1814 the regiments of artillery were formed into a Corps of Artillery composed of battalions and companies.

The history of the Third Regiment of the United States Artillery dated from the reorganization of the army pursuant to the Act of Congress approved March 2, 1821. This act reduced the military establishment and fixed the line of the army at four regiments of artillery and seven of infantry. The Third Regiment of Artillery was organized from the Corps of Artillery formed by the Act of March 30, 1814, from the Corps of Artillerists and Engineers organized in 1794, from the First Regiment of Artillery organized in 1802, and the Second and Third Regiments of the Artillery organized in 1812.

During the War of 1812, Battery A was engaged at Fort Oswego, N. Y., May 5-6, 1814, where on May 5th it repulsed the landing of British troops in small boats by a deadly artillery fire. Battery B was stationed at Fort Johnson, South Carolina, from 1812 to 1816. Battery D was stationed at Fort Nelson, Norfolk, Virginia, and was present during the British attack and repulse on the navy yard at that place June 22, 1813. Battery I (now C, 3d Coast Artillery) was stationed at Petersburg, Virginia, in 1812, and at Craney Island, Virginia, in 1815.

Among many distinguished officers who served with the Third Artillery were General W. K. Armistead, the first colonel of the regiment; Roger Jones, for many years Adjutant General of the Army; Albert E. Church, the honored Professor of Mathematics at West Point; Robert Anderson, the hero of Fort Sumter, was an officer of the regiment for thirty-two years; Erasmus D. Keyes; George G. Meade, the Union commander at Gettysburg; Thomas W. Sherman; Braxton Bragg, afterwards lieutenant-general in the Confederate service; Wm. T. Sherman; Stewart Van Vliet; Jubal A. Early; George H. Thomas; John F. Reynolds, who was killed while commanding his Corps on the first day of Gettysburg; E. O. C. Ord; Samuel G. Field; A. E. Burnside; Romeyn B. Ayres; Beekman DuBarry, subsequently commissary general; Henry J. Hunt, the distinguished artilleryman of the Army of the Potomac during the Civil War; Horatio G. Gibson, until lately the oldest living graduate of the West Point Military Academy; E. B. Williston; Ramsay D. Potts; Sedgwick Pratt; Walter A. Bethel, recently Judge Advocate General of the Army; Peyton C. March, Chief of Staff during the World War; Wm. A. Kobbe; George P. Scriven and George O. Squier, both Chief Signal Officers of the Army; Jas. M. Ingalls, the ballistician of international reputation; Wallace F. Randolph, the

first Chief of Artillery; Charles T. Menoher, commander of the Famous Rainbow Division during the World War and now commanding the Ninth Corps Area; William G. Haan; John D. Barrette; Henry D. Todd, Jr., commanding Ninth Coast Artillery District under whose command the regiment is now serving. Besides those named there are many who rendered conspicuous and distinguished service.

In 1821 the Third was stationed along the Atlantic seaboard from Annapolis, Maryland, to Charleston, South Carolina. One company of the regiment, G, now Battery C, 62d Coast Artillery (AA), furnished the first garrison of Fort Monroe in 1824, when that fort was established. In 1827 the station of the Third was changed to the New England Coast with headquarters at Fort Independence, Massachusetts. In 1831 B and E took station at Fort Monroe, whence next year B was sent to Charleston, South Carolina, to assist in putting down the nullificationists; proceeding thence to the disturbed Seminole and Creek Indian districts of Florida and Alabama and was present when the Florida War broke out, precipitated by a tragic event familiarly known as Dade's massacre. On December 28, 1835, Brevet Major Francis L. Dade, 4th Infantry, with C of the Second Artillery, and B of the Third while marching from Fort Brooke, Tampa Bay, to Fort King, Florida, was ambushed by Seminole Indians near the crossing of the Withlacoochee River, Florida, three privates only escaped, one of whom belonged to B Company and although badly wounded made their way back to Fort Brooke with news of the massacre. Upon receipt of this intelligence, the steps of the whole regiment were at once directed toward the scene of hostilities where A, D, and E arrived in June, 1836; I already was in the theatre of operations. B, after its annihilation, was reorganized in Massachusetts, and joined the regiment in the field in January, 1837, being engaged with the enemy at Camp Monroe, Florida, February 8, 1837. Numerous engagements with hostiles took place during the year.

The regiment fought back and forth across the Florida Peninsula during the seven long years the war lasted and until nearly all the Indians had been killed or expelled. Forty-seven thousand square miles of Florida territory was occupied by an enemy by nature vindictive and revengeful, treacherous and subtle, striving for their rights and lands. The theatre of operations was a wilderness and every hummock and swamp a citadel. Driven from one fastness to another the enemy were rarely seen, and it was impossible to bring them to bay except they wished it. The service was distressing beyond description. The heat the greater part of the year was in-

tense; the water bad; the food poor. The innumerable annoying and venomous insects of the swamps rendered existence intolerable. Malaria and yellow fever were prevalent. The climate was an enemy more successful than the Seminoles and "its victims counted not by single files but by platoons if not battalions." The service of the regiment, the patient endurance and fidelity of the soldiers, the intelligence, zeal and activities of its officers, and the successes which crowned its efforts, well entitled them to the trite but hard-earned encomium, that they had done their duty. Eleven officers and 158 enlisted men fell victims to the climate or were struck down by hostile bullets and tomahawks. The casualties of the Third, whose services in the war were longer than that of any other regiment, were greater than those of any other organization, excepting only the 2d Dragoons.

The war being over, the Third, in 1842, occupied the stations from Smithville, South Carolina, to St. Augustine, Florida, where it remained until the Mexican War.

The Mexican War again brought the Third into the field. A, E and I, with other troops were sent in 1845 to Corpus Christi, Texas, forming General Zachary Taylor's army of occupation. A and I as part of the Artillery Foot Battalion were present when the opening gun of the war was fired at Palo Alto, May 8, 1846, and on the following day again were engaged at Resaca de la Palma. The Artillery Foot Battalion, serving as infantry, under command of Brevet Lieut-Colonel Thomas Childs, Captain 3d Artillery, formed the right of the American left wing; near the center of the line. During the height of the battle this battalion was advanced to support the 18-pounder battery on its right. This battery consisted of two 18-pounder guns mounted on siege carriages drawn by ten yoke of oxen and was commanded by Lt. Churchhill, 3d Artillery. A strong demonstration of cavalry was made against this part of the line and the enemy column continued to advance against a severe fire from our artillery. The battalion was instantly formed into a square and held ready to receive the cavalry charge; but when the advancing squadrons were within close range a withering fire of canister from the 18-pounders and the fire from the square dispersed them. A brisk small arms fire was then opened on the square, but a well directed volley from the front face of the square silenced all further firing from the enemy in that quarter. This was the first case in which American infantry resorted to the square for motion and protection against cavalry. Darkness settling down closed the action on the right of the line, the enemy having been driven back from his position and failed in every attempt against our line. At

Resaca de la Palma the artillery battalion formed the reserve and wagon train guard and as the enemy was driven from his position was ordered to pursue. The retreating Mexicans were rapidly followed to the Rio Grande River, few prisoners were taken but a number of the enemy were supposed to have been drowned in attempting to swim the river. E, during this time, equipped with four 6-pounder guns, was at Fort Brown, now Brownsville, Texas, forming part of the garrison which for 160 hours stood off and finally repulsed an overwhelming besieging force. Shortly afterwards it was mounted as light artillery. Braxton Bragg, commanding, with George H. Thomas and John F. Reynolds as assistants. A wonderful trio! The first the victor of Chickamauga; the second at Nashville; and the third the incomparable commander of the First Army Corps who fell in the forefront at Gettysburg.

Under the Act of May 13, 1846, authorizing 100 privates per company, many companies in the field were broken up, the men transferred and the officers sent home to recruit. This happened to I, July 7, 1846. Its place was filled by B which arrived at Mier, Mexico, July 31, 1846, under command of Captain Vinton.

In the movement against Monterey A and B were part of the artillery battalion, armed as infantry, which together with the 8th Infantry and Light Battery A, 2d Artillery formed the 1st Brigade, 2d Division (General Worth). This division led the advance, leaving Camargo on the Rio Grande the last of August, 1846. E, mounted as light artillery marched with the 1st Brigade, 1st Division (General Twiggs). The distance to Monterey is 180 miles and that region for the most part was described as rough, dry, desolate and dreary. In the attack of September 21st on Monterey Worth's division was charged with the duty of the turning movement and main attack. A and B formed part of the storming column sent against Loma de Federacion, which gallantly carried the position and promptly turned the captured guns on the adjoining Mexican fortifications. Throughout the day they toiled up the steep slopes, through the cold rain exposed to the violent storm of the elements and the fire of the enemy on the heights. As the sun went down the joy of victory was so great that it made the hardships seem a pleasure, and even the wild storm did not abate the expressions of their triumph. The American losses were slight. Experience has shown that heights are generally carried without entailing heavy losses. On the following day at 3:00 a. m., A, under Captain Vinton, headed the advance up the heights of the hill Independencia and at daybreak arrived within 100 yards of the crest before being discovered by the enemy. A well delivered fire followed by the bayonet gave the works

to the Americans. The enemy fled in confusion closely pursued by A Company. The Bishop's Palace, a dominating strong, point was taken and thence from house to house into the center of the city which then capitulated on the twenty-third.

While Worth's division was attacking the left of the Mexican line, E under Bragg, with the 1st Brigade, 1st Division advanced against the Mexican right. The gallantry of this light battery was never surpassed. Its fire could make but little impression upon the substantial earthworks and heavily built houses of the city, but whenever the enemy showed themselves in the open they were at once assailed by a rapid and accurate artillery fire which quickly caused them to seek shelter.

Soon after this event nearly all the regular troops, including A and B, and many of the volunteer commands were transferred to General Scott's Army destined to the attack on Vera Cruz, and the City of Mexico. Worth's division left Saltillo for the Rio Grande January 9, 1847. Light batteries C and E alone of the Third were left to General Taylor. The former under the command of Captain Braxton Bragg, who was transferred November 7th, and the latter under Captain Thomas W. Sherman, who had been arbitrarily kept out of its command by General Taylor, but who was now assigned to his proper station, joining February 14, 1847, just in time to take part in the battle of Buena Vista.

The American forces being divided and Taylor left with only 4600 men, of whom only 476 were regulars, General Santa Anna determined to act and attacked with the Mexican Army. The result was the Battle of Buena Vista, fought February 22-23, 1847, which shed unfading luster on the American arms and particularly upon the artillery.

The pass of Buena Vista, called by the Mexicans La Angostura, breaks through a lofty mountain chain running from east to west six miles south of the city of Saltillo. It varies in width from one and one-half to four miles and is about eight miles long. The western side of the pass was so cut up by deep gulches as to be impassable for any troops. On the eastern side were several plateaus, separated by ravines running from the mountain slopes to the middle of the pass. Most of these ravines could be crossed by infantry but with difficulty. It was upon these plateaus and around the heads of the ravines that the main part of the fighting of Buena Vista was done. The line of battle extended eastward along the middle of the larger of these plateaus for about 3000 yards at the beginning of the battle but shifted considerably throughout the engagement. It was along this extended front that General Taylor placed his small

army, and against them marched Santa Anna's Mexican forces of over 14,000 especially formidable in artillery and cavalry, which were the favorite arms of the Mexican General.

The battle opened on the afternoon of the 22d of February, 1847, and continued throughout the 23d. The volunteers on our left gave way and fled, but the center and right held. The American artillery was everywhere upon the field; galloping from place to place, into action for a few moments directing a destructive fire against overwhelming numbers of the enemy and then rushing to another position. It was late in the afternoon of the 23d when the critical and deciding moment came. The powerful Mexican reserve, several thousands strong, advanced on our right and center in a perfect blaze of fire driving our troops before them. It was a single column composed of the best soldiers of the Mexican Republic and having for its advanced battalions the veteran regiments. There was nothing impeding the progress of the enemy but the pieces of Lieutenants Thomas of E Battery and O'Brien, B, 4th Artillery; and though their infantry supports were gone, they fell back no faster than the recoil of their guns would take them. The advance of the enemy column, however, was not retarded for they were troops of the old line. It was a critical moment and a most perilous situation. Still onward came the Mexicans; no troops could have behaved better than they did. Canister tore through them, but there was no faltering; the wide gaps opened in their ranks were immediately closed up, and the men still pressed on. Just as the Mexicans reached the muzzles of O'Brien's guns and closed about them Captain Bragg with C Battery, closely followed by Captain Sherman with the rest of E, their horses jaded, came onto the plateau through the retreating infantry under whip and spur and wheeled into battery. Captain Bragg, with a rueful look at the retiring infantry, remarked to General Taylor, as he was doing this, "I will lose my guns, for I have no supports." "Oh," replied Taylor, "Major Bliss and I will support you." It was on this occasion that the famous remark, "A little more grape, Captain Bragg," is purported to have been passed, but far from wasting time on imaginary grape, General Taylor called out in clarion voice, "Give them hell, Captain," and hell broke loose. The guns belched forth a storm of iron and lead which prostrated everything in their front. In the words of a participant on that day, "Nothing could withstand the terrible fury. The struggle was most desperate. The whole air vibrated with the rushing current of balls. The Mexicans fought as they never fought before, and with utter disregard for life. Each moment the artillery fire seemed to grow more destructive. At

length the head of the Mexican column began to fall back; not by retreating, but by being shot away. Others pressed on to fill the places of the fallen; but they too went down." Finding it utterly impossible, notwithstanding all were advancing to gain ground against such a tempest, the whole column faltered a moment, then gave way, and in confusion retreated to cover of the deep ravine in front. But even there the hail of cannister and shell found them, and drove them out in headlong flight.

General Taylor in his official report stated that Captain Bragg with his artillery had "saved the day," and General Wool's report stated that "without our artillery we could not have maintained our positions a single hour."

A and B after leaving Taylor's army at Monterey proceeded to Tampico, an important point of entry and the capital of a district held under military government with Colonel Gates of the Third as governor. Here regimental headquarters and D remained during the whole war, D being equipped part of the time as a 6-pounder horse-battery and particularly distinguished itself in action on the Calabosa River July 12, 1847, and proved the salvation of the Louisiana volunteers who were attacked while crossing the stream. I was being recruited and M was not yet organized.

A and B landed at Vera Cruz with General Scott's army and took part in the siege March 9-28, 1847. At General Scott's request Commodore Conner of the Navy permitted the marines of the squadron, under Captain Edson, to join the Army; they were attached to serve with the Third Artillery. During this siege, Captain Vinton of B Company was killed in the trenches by an 8-inch shell. It was one of those singular cases in which death resulted from the close proximity of a projectile in flight. His clothes were not even disarranged. The projectile afterwards recovered unexploded, now rests on his grave at Providence, R. I. The capture of Vera Cruz was an affair wholly of engineering and artillery in which the companies of the Third alternated in daily service at one or more of the 10-inch siege mortar batteries.

In organizing the army for the advance upon the City of Mexico, A, B, G, and K serving as infantry were in the Third Artillery battalion under command of Lt. Colonel Belton, 3d Artillery, in the 1st Brigade (Colonel Garland); 1st Division (General Worth) and here the battalion remained during the war. The battle of Cerro Gordo was fought April 17-18, 1847. The city of Puebla was entered without resistance May 15, 1847. A was stopped at Perote and I took its place in the battalion, it having participated in the battle at National Bridge, June 11-12, 1847. B, G, I and K formed

the foot battalion of the Third and advanced with the army from Puebla, August 7, 1847.

The battle of Contreras was fought and won by Twiggs division a little after sunrise, August 20, 1847. The reinforcements from Worth's division—Garland's brigade—ordered during the night, barely reached the field when ordered to return to their former position. Worth's division on the right then moved against the fortified village of San Antonio and Churubusco. The Third advanced on the extreme right and men from this regiment were among the first to enter the bridge head redoubt, having climbed over the parapets on the left face under heavy fire. Using one of the captured guns they pursued the retreating enemy along the highway towards the City of Mexico.

The fruitless armistice which followed this event having been terminated, the battle of Molino-del-Rey was fought September 8, 1847. Molinos-del-Rey (The King's Mills) were a huge mass of red sandstone buildings used as a cannon foundry and powder factory. Heavy thick walls extended three or four feet above the roofs, and the yards and courts between the detached buildings were closed by thick, strong doors barred by heavy wooden beams and guarded by stone or earth barricades, all was commanded by the castle of Chapultepec on a height in rear.

Garland's brigade was placed on the right of the American line opposite the Molino. A selected storming party of 500 including 50 men of the Third formed next on the left. Advancing at 3:00 a. m., this column when close to the front of the mills came under a heavy cross fire of musketry at close range and suffered many casualties, 12 of the 14 officers of the command fell during the first five minutes. Quickly reinforced by Garland's brigade they fought their way into the buildings breaking through barricaded gates and doorways while exposed to a close fire from enemy on the roofs and behind barred windows. The enemy when driven from one position would retire to another, contesting every inch of ground, roof, floor and walls. After two hours of stubborn fighting the main buildings were taken and the Mexicans captured or driven out. It was a brilliant but costly victory, one quarter of the American command were casualties.

Chapultepec alone remained to be fought—September 12-14, 1847—and all the Third with the army was engaged. The Second and Third Artillery having suffered such heavy losses at Molino del Rey, were temporarily formed into four companies. They moved with Worth's division along the causeway driving back the enemy until at San Cosme garita night put an end to the battle. The next day the Capital City was entered.

The war was practically ended when the City of Mexico was captured, September 14, 1847. There were a few brushes with the enemy besides the heavy fighting already mentioned. A equipped as field artillery was present at Huamantla, October 9, 1847, at Atlixco, October 19, 1847, and at Matamoras, near Puebla, November 23, 1847. These were the last among Santa Anna's guerilla warfare and A won high encomiums for its conduct.

The army evacuated the City of Mexico June 12, 1848, and Vera Cruz July 16, 1848. Worth's division, the last to leave the Mexican capital assembled in the Grand Plaza at 6:00 a. m., the American flag was hauled down and saluted by B Battery, then by a Mexican battery, after which the Mexican flag was hoisted. M saw no fighting in the war. Leaving New York for the scene of hostilities October 12, 1847, it was wrecked and put into Charleston, S. C., November 5. Left Fort Moultrie December 17, and arrived at the City of Mexico early in 1848, where also was established regimental headquarters. Colonel Gates remained as governor of Tampico and Captain Martin Burke temporarily commanded the regiment. At this time the companies of the regiment were distributed as follows: A, Perote; B, G, H, I, K, L, M, City of Mexico; C, E, Walnut Springs near Monterey, Mexico; F, Monterey, California, where it arrived early in 1847; D, Tampico. C and D were equipped as horse artillery; A, E, and H as field artillery; the rest were armed as infantry. The regiment except C, E, and F was concentrated at Fort Monroe and thence distributed to the New England stations which they had left thirteen years before the Florida War. E left Fort Brown, Texas, October 26, 1848, for Fort Trumbull, Connecticut.

Soon afterwards the Seminoles who had been left in Florida became restive. Accordingly, in September, 1849, B and D embarked for Palatka, Florida, near the scene of disturbance. Here they remained marching through the swamps until order was restored, when they returned to their stations in 1850. The regiment now looked forward to the enjoyment for a while at least of a quiet life. But this hope was short lived. In the nature of things it could not long be indulged in. We had acquired on the Pacific Coast a vast and unsettled territory by conquest; it was inhabited by savages or semi-savages. The army was needed to keep them in subjection.

In October, 1848, M sailed for California around Cape Horn to join F. The movement of the regiment, though contemplated was deferred. But our recently conquered subjects were restless and had to be kept in order. With this object in view B was sent early

in April, 1853, to Texas, where it remained until early in 1854. This was a fortunate circumstance as it missed one of the direst calamities that has ever befallen our army on the seas.

The deferred movement of the regiment to California was ordered in 1853. On December 21st, Headquarters, the band, A, D, G, H, I, K and a large detachment of recruits embarked for California, via Cape Horn on the steamer *San Francisco*. The vessel was new, its machinery excellent and it was believed to be seaworthy. Of the 600 aboard, 500 belonged to the regiment. On the 22d the vessel was at sea. The 23d ended with a fresh breeze, cloudy and threatening weather. Out of the ominous calm that night a wind came up with terrific force from the northwest. Mountainous waves swept over the ship, disabled the machinery and soon rendered the vessel unmanageable. At 9:00 a. m., 24th, a huge wave struck, stripping everything from the upper deck including the saloon, in which a large number of soldiers and other passengers had taken refuge. It is estimated that 175 souls perished at this time. Nothing could exceed the terror of the situation. To add to the horror of the storm the vessel sprung a leak and was kept afloat with difficulty. On the 25th the brig *Napoleon* was spoken but sailed away to Boston. On the 26th another vessel was sighted but lost in the night. The men now began to die from exposure and exhaustion. On the 28th the bark *Kilby* of Boston stood by the wreck and on the following day ran a hawser and took off 108 passengers. That night the storm freshened, the hawser parted and the *San Francisco* drifted out of sight. After vainly searching two and a half days the *Kilby* sailed for New York. At 9:30 a. m., 31st, the British ship, *Three Bells*, of Glasgow, was spoken and lay to. The storm raged unabated. On January 3, 1854, the *Three Bells* was joined by the *Antartic* of Liverpool. On the 4th and 5th all survivors were transferred to these two vessels. The *Three Bells* sailed for New York. The *Antartic* carried her 142 survivors to Liverpool, England, which port was reached January 23; the first American troops to land in England. On February 1st they embarked on the steamship *America* and arrived at Boston, February 16th.

Nothing daunted, the Third was soon again enroute, this time by the Isthmus of Panama. Headquarters, B and L, embarked at New York, April 5, 1854, on the steamer *Illinois* and arrived at Benicia, California, May 5, following. The band with D, G, I and K were not so fortunate. Embarking on the steamer *Falcon* they nearly repeated the experience of the *San Francisco*, but though disabled the vessel managed to make Hampton Roads where the troops were landed at Fort Monroe. In May, 1854, they were

picked up by the steamer *Illinois* and finally, after many tribulations reached the California shore.

A and H marched overland from Fort Leavenworth, May 29, 1854; wintered at Salt Lake City, resumed the march to California April 4, 1855. The summit of the Sierra Nevada mountains was crossed July 1st; Benicia was reached July 12th. Almost immediately afterwards A was sent to Fort Yuma, California, where it remained for three years.

From 1854 to 1861 the Third was actively employed in marching and scouting over the Pacific Coast through its length and breadth. There was not an Indian tribe from the Rockies to the Pacific whom they did not visit. Scarcely had D landed at Benicia when it was sent on an expedition against the Indians of the Pitt and McCloud rivers. B marched against the Yakimas in October and November, 1855. During the same year D was engaged against the Klamath and M against the Puget Sound Indians. In the action at Hungry Hill, October 31-November 1, 1855, Lieutenant Horatio G. Gibson, commanding D was wounded. It was only recently that General Gibson, for many years colonel of the regiment and the oldest living graduate of West Point, answered the call of the Great Beyond. In the winter of 1855-56, B was sent against the Rouge River Indians, then on the war path. They were attacked at their village, Mackanootney, Oregon, March 28, 1855, routed and their village burned. On April 28th, following they were met and defeated again. In June, 1856, they sued for peace. General Scott in orders from Army Headquarters complimented the troops for their gallant conduct in the war. In the same order the services of M on Puget Sound were mentioned with commendation. E also was doing good work in Minnesota under its indefatigable Captain T. W. Sherman. The Indians at Yellow Medicine Agency began to manifest an ugly disposition. Sherman took their breath away by appearing among them with his battery, thus, in the language of General Order 14, Hdqrs. of the Army, 1857, "by his promptness, judgment and firmness preserving the country from a war with the tribes of the Sioux Nation."

In May, 1858, after two years of quiet the Indians in Washington Territory suddenly went on the war path. The uprising was entirely unexpected, but the news spread and the neighboring tribes flew to arms. Safety to the frontier settlements required the chastisement of the Indians. Accordingly an expedition was fitted out for this purpose under Colonel Wright, 9th Infantry. The Third composed the major part of the troops and they were rapidly concentrated. A from Yuma; B, Rouge River; D, San Diego, where

it had taken station February 1, 1858, and M the Presidio of San Francisco with other troops were united at Walla Walla, Washington. The Indians were vastly more numerous than the troops but the latter were armed with rifle-muskets, just then issued to the army, the former with smooth-bores which were ineffective within range of the rifle-muskets. The Indians were signally defeated at Four Lakes, September 1, Spokane Plains, September 5, Spokane River, September 8, 1858. The principal chiefs were captured and hanged and the tribes so humbled that they have never gone on the war path since. In general orders from Headquarters of the Army, General Scott testified his appreciation of the regiment in this campaign in most eulogistic terms.

In 1859 the dispute over the British Columbia-Washington Boundary line and who should own San Jaun Island, seemed likely to precipitate war with Great Britain. Accordingly August 8, 1859, A, B and D left Fort Vancouver, Washington and joined other troops at Camp Pickett on the southern, while British troops occupied the northern end of the island. In this position the forces of the countries glared at each other; but as there was no fear of immediate hostilities after General Scott arranged for joint occupation, the companies mentioned returned to Fort Vancouver in December, 1859.

Early in 1860 D and I were sent on an expedition into Nevada, where they attacked and defeated the Indians, under Young Winaumucca, near Truckee River, June 2, 1860. In July of the same year A, B and M left Fort Vancouver, Washington, scouted through the Snake River Country, met and routed the Indians at Harney Lake, Oregon, and returned to Fort Vancouver in September.

When the Civil War was precipitated the Government was extremely anxious about the temper of the states on the Pacific Slope, particularly California. This led to energetic measures to secure the safety of San Francisco. All of the companies of the Third on the Coast, except D were at once concentrated in that harbor. In October, 1861, regimental headquarters and five companies including M were embarked for New York via Isthmus of Panama. This left A, B, and I at San Francisco, and D at Vancouver, the latter proceeding in February, 1862 from Camp Pickett, San Juan Island, to Alcatraz, San Francisco. Here B and D remained during the whole war. I was sent east in 1864, and equipped as a light battery. A, in February, 1862, equipped as light artillery, proceeded to Camp Drum, Wilmington, California, and there joined General Carleton's column which marched in 1862, from California, across the deserts to Tuscon, Arizona, and then into New Mexico, where it served as

a light battery until 1865 when it was transferred to Boston Harbor. While in New Mexico the light battery saw exceedingly hard service. It marched much of the time, when not as artillery against the Indians as cavalry. No company of the regiment saw harder service during the war than A.

We now turn to the companies in the great theatre of the Civil War. E came from Fort Ridgely, Minnesota, in May, 1861, and was present at Blackburn's Ford July 18, and again at Bull Run July 21, 1861. At Bull Run it had to content itself with engaging the enemy at long range. It assisted with other batteries to cover the retreat of the army. In these engagements it lost three men killed and two wounded. Soon afterward E started on an expedition to the South along the coast of South Carolina and Florida, where it kept active until February, 1864. It was engaged June 10, 1862, at Secessionville, South Carolina, at Pocataligo, October 22, where hard fighting was done. It joined in the assault and repulse at Fort Wagner, South Carolina, July 18, 1863, and was engaged in the siege of that place July 18 to September 7, 1863. On the evening of July 12, 1863, from a position on an advanced point on Morris Island the battery opened fire on an enemy steamer lying in Charleston Harbor and succeeded in completely disabling it. On February 20, 1864, it was present at the sanguinary battle at Olustee, Florida, and suffered great loss. All the officers were wounded; 12 men were killed, 21 wounded and 6 missing. This terminated the service of E in the South. In April, 1864, it was assigned to duty with the Army of the James, being part of the artillery brigade of the 3d Division. It was present at Port Walthall Junction May 19-20, 1864, and all the battles in which that army was engaged, afterwards in the entrenched lines at Bermuda Hundred and on both sides of the James River, and in the works before Petersburg from August to September. It was present at Laurel Hill, October 7, 1864, when the 10th Corps repelled Longstreet. It was present at both attacks on Fort Fisher, North Carolina, having several skirmishes with the enemy. In March, 1865, E with the 10th Corps joined General Sherman's Army engaging in the pursuit of General J. E. Johnston, until the final surrender of the Confederate forces. E remained in South Carolina until August, 1868, when it marched to Atlanta, Ga., where the battery was dismounted March 2, 1869. The troops were sent to St. Augustine, Florida, for station from which place it moved to Fort Pulaski, Georgia, August 6, 1869.

When McClellan's army moved to the Peninsula in 1862, the batteries of the Third including M were attached to the Army artillery. M was engaged at Newbridge, Virginia, June 19; Mechanics-

ville, June 26, and Gains' Mill, June 27, 1862. At the latter place it was on the right, about 500 yards in front of the line where it fought with great gallantry and under great disadvantage, the battery commander being wounded, and all the horses killed. During the change of base to the James River, it fought at Turkey Bend, June 28-29; at Turkey Bridge, June 30; at Malvern Hill, June 30-July 1, 1862, during which all its lieutenants were wounded. It was present at Fredericksburg, Va., December 11-15, 1862, but the jammed condition of the street prevented its going into action. In March, 1863, when the 9th Corps was sent West, M accompanied it. The corps arrived at Vicksburg in season to take part in the siege of that place and afterwards, July 10-16, in the siege of Jackson, Mississippi. From this time until March 16, 1864, M operated in the West. On May 24, that year it again rejoined the Army of the Potomac. All this time it formed part of the artillery of the 9th Corps. It took part meanwhile in Burnside's campaign in East Tennessee in 1863, was engaged at Philadelphia, Tennessee, October 16th, Campbell Station, Tennessee, November 16th, was in position in the trenches during the siege of Knoxville, Tennessee, November 17th-December 5th; in pursuit of Longstreet's Army at Blain's cross-roads, Tennessee, December 17, 1863; and again at Strawberry Plains, Tennessee, January 2, 1864. Its next fighting was in the Wilderness, under General Grant, from May 5 to 14, 1864, whence it was sent back to the defenses of Washington where it was joined by I. They remained in a condition of preparedness for active service; but from this time on, except when Early made his attempt on Washington in July, 1864, nothing seriously demanding their attention occurred.

Following the Civil War the batteries and companies of the regiment were moved from station to station throughout the United States. The stations of the regiment alternated between the North Atlantic, and South Atlantic and Gulf Stations. By the Act of Congress, July 28, 1866, the term battery was applied to all artillery companies. Prior to that time the designation battery was used only for the companies equipped as field artillery.

In 1876, the year of the Custer Massacre, several batteries were ordered to the Department of the Platte, which embraced the Middle Western States. They were returned to their seacoast stations after quiet had been restored.

The most desperate and extensive strike that has yet occurred in the country was that of 1877, by the employees of the principal railroad trunk lines, the Baltimore and Ohio, the Pennsylvania, the Erie, the New York Central, and their western prolongations.

Freight traffic was entirely suspended and passenger and mail service was greatly impeded. When new employees sought to work militia had to be called out to preserve order. Bloody riots were common occurrences. In July, at the requests of the governors of the states involved, President Hayes dispatched regular troops including the Third, to Pennsylvania, Maryland and West Virginia. Faced by these forces the rioters in every instance gave way without bloodshed and normalcy was restored.

In 1896 the regiment was transferred from the Gulf Stations to San Francisco, where it was stationed at the outbreak of the Spanish War.

In June, 1898, a battalion of four batteries—G, H, K and L—under command of Major (now Major General, retired) William A. Kobbe, Third Artillery, sailed for the Philippines as part of the Third Manila Expedition. The battalion participated in the attack and capture of Manila and later served creditably during the Philippine Insurrection.

A, consisting of four officers and 191 enlisted men embarked at San Francisco, California, August 20, 1898, on the steamer *Humbolt* for service in Alaska. One officer and 72 enlisted men were debarked September 3, at St. Michaels, while the remainder of the battery proceeded to Ciole City, arriving September 29th. The following August, A returned to San Francisco.

The Act of March 2, 1899, added two batteries to each artillery regiment. N and O were organized at Presidio of San Francisco.

The Boxer uprising in China called for the presence of all available troops. A, D, I and O embarked at San Francisco, July 28, 1900, on the transport Hancock and arrived at Taku, China, August 20th; then moved by rail the following day to Teinsin where camp was established in the compound of the German concession. September 7th the battalion moved to the Chinese Government inclosure designated Liscum Barracks, named in honor of General E. H. Liscum who was killed at the battle of Teinsin July 13th. Here the battalion was assigned to the 2d Brigade, China Relief Expedition. The batteries of the Third were the only Coast Artillery organizations which participated in this expedition. The brigade being discontinued October 21st, the batteries were transferred to Manila, which port was reached November 20. Therefrom they were immediately sent into the field and actively participated in numerous engagements with the Insurrectos.

The Act of February 2, 1901, discontinued the regimental organization of the artillery arm and constituted an Artillery Corps, consisting of coast and field artillery, comprising 126 companies of

coast artillery and 30 batteries of field artillery, which were given serial numbers in their respective branches. The strength of each coast artillery company was fixed at three officers and 109 enlisted men. The serial numbers assigned to the batteries now comprising the Third Coast Artillery are given at the beginning of this sketch. They were stationed as follows: 25th, 27th, 31st, and 36th Companies, Phillipine Islands; 26th Company, Fort Flagler, Washington; 28th Company, Presidio of San Francisco; 34th Company Fort Stevens, Oregon; 35th Company Fort Moultrie, S. C.

The four companies in the Phillipines returned in April, 1903; 25th and 27th Companies took station at San Francisco; 31st, Fort Caswell; 36th, Fort Moultrie. 28th Company was stationed at Camp McKinley, Honolulu, H. I., from April 30, 1904, to July 11, 1905, whence it proceeded via San Francisco to Fort Rosecrans, San Diego, California, for station, arriving July 25, 1905. 35th Company served in the Phillipines from 1908 to 1910, returning after its tour to Fort Monroe. 36th Company was transferred in 1909 to Fort Du Pont, Delaware, from which place it was sent to the Phillipines.

All of the companies of the old Third stationed at San Francisco on the occasion of the disastrous earthquake and fire of April 16, 1906, were called out and rendered invaluable assistance in preserving order and guarding property. Their services were officially recognized by resolution of the California State Legislature.

From 1911 to the outbreak of the World War during disturbances in Mexico E saw considerable service in the field along the Mexican border of Lower California, preserving the neutrality of the United States and serving as border patrol. C was present with the First Separate Brigade at Galveston, Texas, in 1911.

In compliance with War Department instruction of June 27, 1916, and General Orders No. 31, War Department, July 24, 1916, the serial designations of coast artillery companies were changed from a single series to separate series for each fort. Subsequently in July, 1917, this arrangement was again changed and companies were designated serially for each coast defense. Under this system the identity and origin of the old organizations were lost and confusion entailed in attempts to compile historical data and chronicle of events pertinent to the World War. The Chief of Coast Artillery perceiving the chaotic condition into which records had become involved instituted an exhaustive research and study of the organization of all coast artillery units which work was performed in an excellent manner by the late Colonel R. H. C. Kelton, Coast Artillery Corps. As a result of his research the historical continuity of

the coast artillery organizations was established and General Orders No. 21, War Department, 1922, issued, which order restored to the old companies the serial numbers assigned in 1901.

The World War having demonstrated the advantage and need of regimental organization in the coast artillery, General Orders No. 8, War Department, 1924, issued, effecting the arrangement of the Coast Artillery Corps, not already so formed, into regiments. In carrying out the provisions of this order the former seven regiments discontinued in 1901 were reconstituted by placing in each regiment as many as practicable of the batteries which formerly belonged to it. Eight of its former batteries were assigned to the Third Coast Artillery.

At the outbreak of the World War the batteries of the regiment were stationed as follows: Headquarters Battery, Coast Defenses of Manila and Subic Bay; A and D, Coast Defenses of San Francisco; B, Puget Sound; E, Fort Rosecrans, San Diego; C, Fort Caswell, N. C.; F, Fort Stevens, Oregon; G, Fort Monroe, Va. A was assigned as Battery C, 18th Artillery, which regiment was disbanded in December, 1918; D was sent overseas in November, 1917, as the 4th separate anti-aircraft battery and saw active service on the western front; C became Battery E, 53d Artillery, manned railway guns and participated in action in the Champaigne sector, Aisne-Marne defensive, St. Mihiel and Meuse-Argonne offensives. The remaining batteries remained at their fixed batteries and served as nuclei for regiments and other units organized for war service.

When additional companies of coast artillery were formed in 1901, the 92d, 93d and 94th, now batteries of the 14th Coast Artillery, were organized by transferring alternate men from the 28th, 34th and 36th Companies, respectively. Former batteries G, I, K and L of the Third Artillery were assigned to the 62d Coast Artillery when that organization was expanded into a regiment in 1922. The former band is the band of the 6th Coast Artillery; former batteries C and F are batteries E, 1st Field Artillery, and A, 3d Field Artillery, respectively.

The Third Coast Artillery was constituted with fitting ceremony at Fort MacArthur, California, July 1, 1924. Major General William A. Kobbe, retired, was the guest of honor, representing the old Third Artillery, in which regiment he served for over thirty years. He reviewed the organization and presented its colors. Colonel Ben H. Dorcy, retired, whose first service was as private and corporal, Battery E, represented the enlisted men of the old Third and presented the battery guidons. The reorganization was made

an occasion for local celebration in which naval, veteran and all civil organizations of the community were present and participated.

Regimental Headquarters, Headquarters Battery, 1st Battalion, including Batteries A and B, are stationed in the Coast Defenses of Los Angeles, Fort MacArthur, California; the 2d Battalion, Batteries C and D, in the Coast Defenses of San Diego, Fort Rosecrans, California; the 3d Battalion, Batteries E, F and G, in the Coast Defenses of the Columbia, Fort Stevens, Oregon.

The Third Artillery stood upon its record. It ever did its whole duty and never intrigued to impose that duty on another. The history and traditions of that organization are perpetuated in the reconstituted regiment. Our duty is to emulate the devotion to service of the rank and file who have gone before and preserve the heritage bequeathed by those artillerymen who were prepared for any service that duty might call.

In all our wars—always forced upon us—we have as a nation entered absolutely unprepared. One would think that such experiences, costly beyond estimate in money and loss of life, would prove effective warnings against a repetition, but the warnings have not been heeded nor the lesson learned. The old cry, "The war just ended will be the last one in the world," still finds ready listeners, and Government appropriations continue to be inadequate. There is much talk about the immense sums annually spent upon pensions and other public burdens which come as the aftermath of our wars. Had we long ago adopted and adhered to an efficient military policy, such as that which for the first time in our history is now furnished by this national defense act, it is probable that war might have been avoided, and it is certain that the cost in life and treasure and the burden forced on succeeding generations would have been enormously reduced. It is usual to blame politicians and the lawmakers for the lack of adequate legislation and appropriation, but they are much less to blame than the people of the country at large who through supineness and lack of vision are indifferent to the necessities of a national defense program in peace as well as in war. An active interest by the voters in the proper defense of the country would inevitably be reflected in the actions of Congress. The issue cannot be dodged without paying the penalty.—Major General Hunter Liggett in "*Commanding an American Army.*"

Limitations of Aircraft in Naval Warfare

By LIEUTENANT COMMANDER SIDNEY BALLOU, U. S. N. R. F.

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WITH an adequate air service one of our greatest present day necessities, it may seem inadvisable, as well as ungracious, to emphasize the limitations of aircraft. Unfortunately, however, aircraft enthusiasts have not contented themselves with constructive argument as to the value of this new instrument of warfare, but are preaching the doctrine that old and tried instruments may be dispensed with, particularly if they are expensive, and that the national defense may largely, if not wholly, be entrusted to the new and cheaper arm. A brief catalog of some of the limitations to which aircraft are subject may therefore tend to a saner, if less sensational, view of the probability of their fulfilling all the expectations claimed by their protagonists.

In the destructive side of aircraft propaganda it is noteworthy that the Navy is signalled out for attack. An anchored battleship, with no means of defense, is sunk after a day's bombing and the word goes out at once that the battleship is obsolete. An entire brigade of infantry, represented in dummy form, could, under the same conditions, be wiped out in less time, but this experiment is never tried and no one rushes into print with the proposition that the infantryman is obsolete. There is an utter lack of contention that no more of the taxpayers' money should be spent on field guns and tanks, so easily wiped out by a single bomb from the elusive airplane.

One might think that this failure to enthuse over the destructive power of aircraft against land forces was due to the fact that there are too many men alive who have seen it tried under actual service conditions. This cannot be the explanation, however, for the achievements of airplanes on land, little as they tended to prove aircraft more than a strong auxiliary arm, were overwhelming in comparison to the infinitesimal damage done by airplanes to ships. So far from getting any comfort out of naval experience during the war the aircraft exponents are driven at the outset to throwing overboard all war history and to depending wholly on postwar developments in aviation to form the basis which war experience refuses to supply.

Whatever may be the reason, it is certain that those who conceive it their duty to exalt the air service at the expense of the other branches are busy pulling down the Navy and not the Army. It is with relation to naval warfare that they hope to convince the country that old principles are obsolete, that old arms should be scrapped and that the air service should rise triumphant above the scrap heap. It is with relation to naval warfare, therefore, that some of the limitations of aircraft will be examined.

Sea Power.—Sea power being the force to be conquered and supplanted, let us attempt to visualize sea power by a concrete example. Within a few months from the outbreak of the World War every German raider had been driven from the ocean, a period of time likely to be lessened as the use of wireless on merchantmen becomes universal. For four years the Seven Seas were highways for the Allies and the Allies alone. Ships were bringing rubber from Singapore, nitrates from Chile, wheat from the Argentine, and above all, supplies, munitions and afterwards the decisive troops from America. Germany was getting nothing except what was available by way of her land communications, one closed sea and two perilous trips of a cargo submarine. All this was possible because at Scapa Flow, 500 miles from the nearest German port, lay a fleet of battleships of such strength that the German Navy dared not force it to decisive action.

Sea power is itself but an auxiliary arm. Its own guns can range but a short distance inland. Its sole function is to assure supplies and communications over the high seas to its possessors and to deny them to the enemy. Nevertheless, so vital are supplies and communications to armies and so necessary to them are the highways of the sea that sea power is usually the decisive factor in great wars.

It will be observed that the control of seas is not in proportion to the strength of the rival navies. Because the fleets are in proportion of sixty to forty does not mean that the superior fleet commands sixty per cent of the waters of the earth and the inferior fleet forty. The portion of the superior fleet is the entire ocean, that of the inferior fleet is zero.

Radius of Action.—Against sea power, thus holding dominion over the Seven Seas, it is now proposed to launch air power. From what point? The trade routes of the earth were bearing assistance to the Allies, but not the most imaginative can envisage improved airplanes leaving Germany to seize and hold the trade routes of the earth. Even the most important route, the ocean lane from Hoboken to Brest or Bordeaux, over which troops and supplies were pouring,

is as much beyond the radius of action of any postwar plane based on Germany as it was out of reach during the war. If planes improve it is only necessary to shift terminals and make the land route a little longer. We could have landed at Marseilles if necessary.

If it is proposed to strike directly at the heart of sea power, at the battleship fleet whose existence is paralyzing surface operations, the same weakness is manifest. In holding the seas, the main fleet of heavy ships is not obliged to lie within the striking distance of airplanes based on an enemy port. Blockaders have already been driven back by the threat of torpedo craft, and may be driven back further, but wireless communication more than compensates for the distance. The blockade of the next war will be a further extension of the elastic blockade, based on light craft inshore with heavier ships within supporting distance.

Briefly, then, aircraft are too limited in radius of action to wage successful war on sea power. The theatre of operations is too large. A battle fleet radiates lines of power from its position like a queen on a chessboard. It can check from the opposite side of the board. A knight can attack and even capture a queen without danger to itself if it can get near enough and in the right position, but when a knight is proved to be stronger than a queen, then an airplane will be stronger than a battleship.

Aircraft Carriers.—It is to remedy that fatal lack of radius of action that planes are to be put aboard carriers. Now they can be brought to any vital point. The terminology of the argument shifts a little, for now the potency of sea power is admitted, but it is to be exercised by a different type of capital ship. Old principles are to remain unaltered, except for the contention that a ship armed with bombing and torpedo planes is superior to one armed with 16-inch guns. Before two such ships are placed in tactical contact, however, there are numerous complications to be discussed.

The first limitation on aircraft carriers is artificial, but it is none the less real. They are limited by the Washington Treaty. Against our ultimate 525,000 tons of battleships, supported by 135,000 tons of carrier capacity of our own, the only carriers we have to figure on are 135,000 tons of Great Britain, 81,000 tons of Japan, and 60,000 tons each of France and Italy.

Aircraft carriers are neither cheap nor can they be built overnight—two of the arguments most stressed for aircraft. Differing radically in design from other types of vessels, they cannot be readily extemporized after war is declared, assuming that war would scrap the Washington Treaty. We are therefore driven to figuring whether our fleet of eighteen battleships, with its 192 big guns, sup-

ported by our own carrier capacity of 135,000 tons, is rendered obsolete and should be allowed to deteriorate by reason of the aircraft which can be carried upon say three Japanese carriers of 27,000 tons each. Anyone supporting this thesis should do some convincing figuring for the public.

Carriers as Surface Craft.—In estimating the value of carriers as supplying the essential radius of action, we are not, however, obliged to rely wholly upon the limitations of the Washington Treaty. An aircraft carrier is a surface vessel, and when we have put our aircraft aboard we have subjected it to all the limitations of surface craft. Imagination, like the planes, must come down from the air, for now we are again on the charted seas of experience.

As a surface vessel the carrier has no more power than a cruiser, and it is against cruisers, not capital ships, that she would have to battle her way to the point where she could strike at the battle fleet. There is no more reason why she should not get there than the destroyer, the submarine or any other type of vessel that for the past thirty years has been trying to put the battleship out of business.

A variation on the idea of putting airplanes on carriers has recently appeared in the assertion that it will soon be possible to refuel airplanes from surface ships. The answer is the same. We have only to remember as far back as the World War to know that there is one sure way to keep the enemy's surface ships off the ocean and that is to have an adequate navy. If any weight is to be given to this new possibility it merely emphasizes the necessity of a sufficient number of cruisers, for against cruisers, when properly supported by heavier ships, no surface craft can operate.

It may be difficult to show the average landsman just why a fleet of heavy battleships, properly supported by cruisers and other auxiliaries, denies the seas to all lighter surface craft, but this is too familiar ground to need recapitulation here. Experience is the best guide and the experience of the war is too conclusive and too recent to require much elaboration. Once admit that aircraft must be put on carriers to bring them into action, or that they must get their fuel supply from surface ships, and they have been relegated definitely to the spasmodic raiding activities of an inferior fleet.

Limited radius of action does not prevent aircraft from being powerful defensive weapons, but defense does not win wars, nor is it a substitute for sea power. The argument on this whole point may be tersely summarized in the proposition that an airplane cannot sink a battleship because it cannot carry enough fuel. Thus put it will be found to carry a new idea to the average aircraft advocate.

Two questions will immediately arise; first, from what point the air-plane start, and second, how did it get to that starting point unmolested. By the time these are given some consideration it will be found that the average amateur has been thinking solely in terms of tactics, with the two opponents already in actual contact, and that the most elementary considerations of strategy and logistics have been wholly ignored.

Tactical Weakness.—Supplementing this important strategic limitation there is an almost equally important tactical weakness. The best defense against aircraft is aircraft. The defense against air attack will undoubtedly develop along the same lines as the defense against torpedo boat attack—that is, meeting kind with kind.

Battleships have anti-aircraft guns as they have anti-torpedo guns, but their first and most important line of defense will be their own aircraft, just as it is now their own torpedo craft.

Here, however, there is a line of divergence. When the torpedo boat was answered by the destroyer, it, in turn, became a destroyer, and attack and defense developed along parallel lines. There is no inherent reason why a destroyer attacking a battleship should be inferior to one designed for its defense.

With aircraft it is different. The attacking ship is a bombing or torpedo plane. Its enemy is the combat plane, particularly the single-seated pursuit plane. No development in aviation, past or future, can change the fundamental relation between these two types. The pursuit planes carried by a fleet for its protection will always be faster than the bombing and torpedo planes seeking its destruction.

Speed is not everything, but in every other military weapon lack of speed is made up by some compensating advantage. The submarine is slower than the destroyer it must evade, but it has invisibility. The battleship is slower than a cruiser, but besides its enormous destructive power, it is practically invulnerable to cruiser attack. The bombing plane alone is asked to take the air against an enemy which, so far as inherent quality goes, it is not strong enough to fight nor fast enough to evade.

So far as sea-going aircraft are concerned, that is aircraft which accompany the fleet, the bomber may reasonably count on being outnumbered as well as out-maneuvered. On a given carrier displacement it will usually be possible to put at least two pursuit planes as against one bomber. A fleet which elects to defend itself in the air instead of using its air force for attack can therefore count on a substantial numerical superiority of defensive planes. In addition to those carried on the regular carriers, battleships and

cruisers, while not adapted for carrying bombers, may add their quota of combat planes.

Under these circumstances, whatever may be the future developments of aviation, there is no reason to doubt that the defense will have no difficulty in keeping pace with any new form of attack from the air.

Weather.—Next to limited radius of action and inherent weakness of attack against defense, probably the most serious limitation of aircraft is the weather.

It would seem axiomatic that in sustained operations of war no commander can afford to place his main reliance upon any force which is not available at any time and under all circumstances. He may employ auxiliary forces of a special kind, subject to special limitations, such as gas or smoke dependent on the direction and velocity of the wind. To adopt a major force of any such kind for attack is to limit attacking periods to an extent which necessity may not permit. To adopt it for defense is merely to invite the enemy to make his attack when such force is unavailable. Dependability is one of the most fundamental requisites of any military force.

The airplane is not a dependable weapon. Making every allowance for improvements in the past and in the future there remains a considerable percentage of weather during which it cannot fight. Not only severe storms but even ordinary cloud conditions frequently put it out of action.

We are all familiar with frequent postponements of flights and flying maneuvers in times of peace, when no unnecessary risks need be run, but few realize how materially air fighting is slowed up by weather in time of war. Most war narratives are diaries of achievement, with no mention of periods of inactivity, but any serious study of sustained operations shows up this defect in a striking manner. Take these extracts from the work of Admiral Sir Reginald Bacon on the Dover Patrol:

Heavy gales and great quantities of rain were experienced during fourteen of the thirty-one days in December, 1915, and no flying was possible, while on others the conditions were such that while protective patrols were carried out over the warships off La Panne, it was not considered feasible to undertake offensive work.*

A break in the weather called a halt in the continuous bombing attacks on both sides during the first two weeks of February, 1917, and, except for an occasional odd day, no flying operations were possible.†

So much for sustained operations. How easily ordinary weather on a summer day can put aircraft out of action may be judged from this random letter from the book of a British aviator:

* Bacon, *The Dover Patrol*, Vol. 2, p. 230.

† *Ibid*, p. 255.

August 26, 1915.

Dear Dad:

What do you think of forty warships bombarding Zeebrugge? We were all due out there, of course, some spotting and fighters to protect the spotters. As luck would have it the weather was dud—clouds at 1500 feet—with the result that no one got there, except a solitary fighter, and he was rewarded by a scrap with a German seaplane

HAROLD ROSHER.*

As a prelude to the greatest of sea fights it is now well known that Admiral Scheer made elaborate plans, depending on preliminary observations by Zeppelins, that he was repeatedly disappointed by weather conditions and that the High Seas fleet finally went out without the necessary information at a time when the British fleet was actually at sea.†

If we have worked ourselves into the frame of mind where we believe that air control will decide the next war within forty-eight hours we may dismiss these considerations from discussion, but if we anticipate any continuous effort we must realize that any nation depending on aircraft for its primary weapon is under a severe handicap as compared with one which can do its fighting in all weathers.

One Point in Space.—Unlike any other military weapon the bombing airplane depends wholly on the force of gravity for the delivery of its projectile. It follows that, if its target is a single object and not an area, its attack must be made from what, without mathematical exactness, may fairly be described as one point in space. A torpedo plane, considering that it is not practicable to drop a torpedo more than fifteen feet without injury to its delicate mechanism, has not much more latitude.

During the entire time that an attacking plane of either type is within range of antiaircraft guns, it is in itself an impotent target, except for one brief moment at one definite and predictable point. From the moment it is sighted the path that it must traverse to reach its striking point is known. It is only necessary to put in that path a creeping or "ladder" barrage of bursting shells to make the odds against arriving rather heavy.

We hear considerable about the development of aircraft since the War, but not so much about the development of antiaircraft weapons. As a matter of fact, some very efficient guns have been developed. We have machine guns with tracer ammunition visible up to 10,000 feet. We have a 3-inch semi-automatic, throwing shrapnel to an effective height of 21,000 feet and a 4.7-inch gun which can throw a 45-pound bursting shell higher than any bomber can

* Rosher. *With the Flying Squadron*, p. 130.† Scheer. *Germany's High Sea Fleet*, p. 135.

climb. As we are now considering the limitations of aircraft rather than the strength of defensive measures, it is unnecessary to elaborate on the performance of these guns. The immediate point is that modern practice is not to aim at the airplane, which would be an elusive target, but to fill its predetermined path with bursting shells, which is taking advantage of a very definite weakness.

One Shot in the Locker.—When a bombing plane has battled its way against distance, against the weather, against faster pursuit planes and against antiaircraft guns to the one point at the one moment at which it can deliver its blow, what has it to deliver? Without much exaggeration it can be said: one shot.

It is true that bombers can carry a number of small bombs, but these are not calculated to sink battleships nor even to penetrate armoured decks. Airplanes that are risking their existence to mess up the upper works of a battleship are playing a game not worth the candle. It is likewise true that the heavier types of land bombers can carry several bombs of considerable size. As to these it is doubtful, as already stated, if battleships will be found within their range of flight, or whether a multiplicity of bombs will mean a multiplicity of shots in the sense that any corrections can be made for misses. So far as seagoing aircraft are concerned it is certain that any airplane that can be stowed on a carrier and take off in the length of a flying deck cannot be of a size sufficient to carry more than one torpedo or more than one bomb of a size sufficient seriously to injure a dreadnaught.

Now a military weapon that is out of action after firing one shot, or even one salvo, cannot be classed as an efficient weapon. It is fighting against the most persistent of enemies—the doctrine of mathematical chances.

No other weapon in practical use has this serious limitation. The naval gun, for example, has the most elaborate mathematical devices for finding the range and speed of the enemy and for solving the intricate problem of making curving shell and moving target arrive at the same point at the same instant. Yet with all this no battleship commander would consider it more than a lucky chance to be "on" with his first salvo. Coast defense guns have a stable platform and instruments of much greater precision than those possible afloat. Suppose we compile their target records for ten years to find what percentage of the first or "trial" shots landed on the target. Yet the airplane has only its trial shot, delivered from the most unstable of platforms at a moment to be determined from the

factors of its exact altitude, its own speed and direction, speed and direction of target and wind velocity. One solution only, no corrections allowed.

Mental Hazard.—Airplanes, of course, have target practice and records of their own, but there is a notorious difference between practice and war performance. In the old days a dueling expert could break the stem of a wine glass at twenty paces but found it very different when the glass was replaced by a man with a pistol of his own. The present generation is more familiar with the example of a fullback kicking field goals with mathematical precision before the game and his relative performance when two opposing ends are charging down upon him.

A few weapons, like the bayonet and hand grenade, call for closer contact with the enemy, but no one but an aviator is called upon to make his final estimate and calculation under conditions of such hurried strain and such imminent peril to himself and his mission. If there is any sort of defense in the air he will not only be dodging a pursuit plane armed with a machine gun, but will be wondering whether he can get his bomb off before the next antiaircraft burst will get him. With all the courage in the world and conceding that his anxiety is not for himself but for his success, these conditions are not going to make for accuracy in firing his one uncorrected shot.

Hit or miss, the airplane's usefulness practically ends when that one shot is fired. For that action at least, there is no reloading. Hasty retreat to a distant base is in order. In proportion to the effective force it can expend in one action, the airplane is probably the most expensive weapon devised.

Experience.—All this may seem hypercritical. The future alone can tell. In judging of the future, however, we may avail ourselves of the customary liberty of looking at the past.

As already indicated, the aircraft enthusiast is apt to dismiss all the experience of the World War with the observation that "aviation was in its infancy." We may fairly ask a more critical examination of the failure of air power to exercise any appreciable effect on sea power, except as an auxiliary weapon whose effectiveness is not in dispute. Aviation has not changed in kind since the close of the war, only in degree, and if there was any indication of a beginning along the lines now under discussion its budding promise ought at least to be discernible. It is not.

The principal points which are relied on to support the contention that modern airships must not be judged by those of wartime is that the size and radius of action of airplanes have greatly in-

creased and that they carry much heavier bombs. It happens, however, that Germany had, first and last, over fifty Zeppelins, and that no modern airplane has yet approached these in size, radius or weight of bombs. They proved vulnerable to weather, but as long as they lasted they should have shown what aircraft with plenty of radius and lifting power could do.

The first subject to challenge the attention of a military student is the failure of air power to close the line of communication between England and France. This was well within the radius of German aircraft. Zeppelins bombarded London but were utterly unable, in the slightest degree, to stop the flow of men and munitions across the English Channel. This artery was the most important sea lane of the entire war. "The British Navy," says Admiral Sims, "transported about 20,000,000 souls back and forth between England and France in four years, and in this great movement sea-planes, dirigibles and other forms of aircraft played an important part."*

Here we have a typical instance of sea power, aided by aircraft acting in an auxiliary and defensive capacity, holding open a line so vital that a month's closing would have meant the loss of the war. Against this line Germany threw her underseas weapon without serious effect. Why was her air power spent on inconclusive raids over the adjacent land areas instead of smashing this neck of the bottle with the conclusive ease with which paper air fleets are destroying paper surface fleets in every popular magazine of today?

Except for radius of action, which this sample is chosen to eliminate, the answer must lie in the limitations here discussed. We may speculate at will as to their relative importance, perhaps the defensive aircraft, perhaps the uncertainties of weather, perhaps the effort needed to launch the meagre number of missiles carried.

Certain it is that within practically the same theatre of operations the Germans conducted air raids which were (a) intermittent; (b) at night when air defense could not readily gather; (c) in weather of their own choosing and hence merely occasional; (d) directed against large areas as targets. They failed utterly to solve a far more important problem calling for effort (a) continuous, (b) in daytime when defensive aircraft could see them, (c) in all weather in which surface craft could operate, and (d) with individual ships as targets. If this problem is not as inherently insolvable today as it was then, it behooves the airmen to come down from the clouds long enough to tell us wherein the difference lies.

* Sims. *The Victory at Sea*, p. 323.

Airship against Battleship.—Even upon the narrower issue of airship against battleship the utter failure of the airship under war conditions needs more explanation than has yet been forthcoming. It must be repeated that Germany's monopoly of Zeppelins gave her air fleet a backbone of fighting craft which in the matter of radius of action and weight of bombs were superior to present day airplanes. It must also be remembered that even with increased radius of action not all European apprehension need be shared nor all European practice followed by a nation still separated from possible enemies by 3000 miles of water. The fact now to be pondered, however, is that Zeppelin and airplane alike inflicted no damage on capital ships and very little on other types, even within easy radius.

To one who has seen the chart of the North Sea "sweeps" of the Grand Fleet, such as now hangs in the cabin of the *Hood*, this fact is very striking. Apparently, no attention whatever was paid to the fact that they were often within easy reach of German air bases. As for cruisers and all lighter craft, the entire North Sea was theirs to the limits of the German mine fields off Heligoland and Horn Reef. With aircraft for observation and bombers galore the enemy allowed the British fleet to cruise with impunity within striking distance of their coast.

An individual instance of the failure of wartime experience to measure up to the roseate promises of today is that of the *Konigsberg*. When her raiding activities could no longer be maintained this cruiser was marooned in a shallow river in German East Africa. Here she lay, as helpless as a target ship, with the one exception that she had her anti-aircraft guns. The British brought down two seaplanes to bomb her. In the face of the anti-aircraft fire they proved unequal to the task. After several attempts one of them crashed into the sea and was wrecked.* Then the admiralty sent down two monitors, and with seaplanes spotting for the indirect fire—just the kind of auxiliary service which all admit is invaluable—the *Konigsberg* was quickly destroyed.†

Jutland.—The culmination of naval fighting was Jutland. If ever sea power needed effective air power to aid it, or if ever air power proposed to demonstrate the beginnings of an ultimate superiority, it was that day. Preliminary plans for Zeppelin observations had gone wrong, owing to unfavorable weather conditions. Admiral Scheer's "list of warships which took part in the battle of the Skagerrak and the operations connected therewith" includes ten Zeppelins. Five of them took the air when the British fleet was first

* Corbett, *Naval Operations*, Vol. 3, p. 8.

† *Ibid.*, p. 66.

sighted. Their achievements are briefly chronicled. "They took no part in the battle that so soon was to follow, neither did they see anything of their own main fleet, nor of the enemy, nor hear anything of the battle."*

The first mention of a Zeppelin by the British was at daybreak after the engagement. Jellicoe's battleships were off Horn Reef, as near the enemy's base as they dared to go on account of mine fields. A Zeppelin was sighted which reported the position of the British fleet to Scheer. Shortly afterwards, when Napier reported that he was engaging another Zeppelin with his cruisers, the British battle fleet, which the day before had turned away from destroyer attacks, went over and helped. The airship disappeared to the eastward and no molesting force came out to show what "control of the air" could accomplish.

At no time during the war did aircraft in touch with enemy fleets function to any degree such as we would now be led to expect. On August 18, 1916, Jellicoe notes: "Zeppelins were frequently in sight from both the battle and the battle cruiser fleet and were fired at, but they kept at too long a range for our fire to be effective." The next day the commander of the Harwich force reported that "his force was shadowed by airships during the whole period of daylight on the nineteenth. * * * It was evident that a very large force of airships was out."†

Offensive Operations.—Allied aircraft were by no means confined to defensive operations. The British had bombers and used them in naval operations. During 1917 Jellicoe reports persistent aerial attacks against vessels at German naval bases in Belgium, but the only victory claimed is that German destroyers found it so uncomfortable that they moved. The location of the German battleships in their harbor was perfectly well known and the whole North Sea was available for the launching of seaplanes on any calm day, but damage to capital ships there was none.

Meanwhile submarines were infesting British coastal waters and were hunted by aircraft as well as by every other kind of vessel. Well within range, observable even when submerged, vulnerable to small bombs and utterly helpless against aerial attack, the total bag to the credit of bombs from British aircraft was probably five.‡

American Experience.—Yankee ingenuity and initiative brought no better results. Admiral Sims has an entire chapter on "Fighting Submarines from the Air," which is instructive reading. Extremely useful as auxiliaries to naval forces, invaluable for scouting and ob-

* Scheer, *Germany's High Sea Fleet*, p. 141.

† Jellicoe, *The Grand Fleet*, p. 436.

‡ Sims, *The Victory at Sea*, p. 320.

servation, there is not a suggestion that aircraft could be depended on to go out unaided to find the enemy and sink him with bombs.

Here is Admiral Sims' description of the work:

At the cessation of hostilities we had a total of 500 planes of various descriptions actually in commission, a large number of which were in actual operation over the North Sea, the Irish Sea, the Bay of Biscay, and the Adriatic; our bombing planes were making frequent flights over enemy submarine bases and 2,500 officers and 22,000 enlisted men were making raids, doing patrols, bombing submarines, bombing enemy bases, taking photographs, making reconnaissance over enemy waters and engaging enemy aircraft.*

With all this activity American aircraft were credited with just one submarine destroyed by direct action and one "probably damaged" when Ensign Ives dropped a dud upon it. As Admiral Sims calls this latter "perhaps the most amazing hit made by any sea-plane in the war" we need look no further for more material results.

The whole summary of war experience may be quoted from the same distinguished author:

I have said that the destructive achievement of aircraft figure only moderately in the statistics of the war; this was because the greater part of their most valuable work was done in cooperation with war vessels.†

Which, so far as human prescience goes, will probably be as true tomorrow as it was yesterday.

Conclusion.—Neither in a careful estimate of present day conditions nor in the light of war experience with every allowance for improvements can we discover any warrant for the claim that the airship is likely to put the battleship out of business.

The fundamental reason goes back to the dawn of the history of warfare. The bombing airplane is by nature a raider, designed to deliver its blow and retire. It is, in fact, the most helpless of weapons after it has delivered its shot. By its nature it cannot hold a position once taken, and so is incapable of exercising that steady pressure by which wars are won.

Battleships can take and hold positions. Usually the position is one from which the inferior enemy fleet can be contained, after which cruisers can maintain all lines of communication. If necessary to cut an enemy line of communications a force able to hold its position must be stationed across it.

No raiding operations ever severed a line of sea communications. The French tried it for centuries with their commerce destroyers. The German submarine came near succeeding, largely

* Sims, *The Victory at Sea*, p. 333.

† Sims, *The Victory at Sea*, p. 321.

through the novelty of the problem to be solved, but development of the defense, notably the depth bomb and the adoption of the convoy system, soon swung the balance. With all its relative disadvantages and special limitations of its own there is no reason to believe that the airplane will succeed where the submarine failed.

Wars, whether on land or sea, will be won in the future as they have been in the past by the comparatively slow but irresistible force which is able to move from one strategic position to another, take it, consolidate it, hold it, and move on the next. On land this force is the infantry, on sea it is the battleship. The airplane is not of this type.

We, as Americans, love, cherish and desire peace to the very limit that peace can honorably be maintained. Yet despite our love for peace, every generation of Americans has unhappily been forced to wage war in order that this country might enjoy righteous and honorable peace. The soldiers of George Washington won our liberties on the battlefield,—their sons were called upon to defend this nation by force of arms in 1812 — their grandsons in 1860 — their great-grandsons in 1898—and their great-great-grandsons in 1917, to mention only four wars which this great peace-loving country has been forced to wage.—*Honorable Dwight F. Davis, Acting Secretary of War.*

The Battles of Ludendorff On the Russian Front*

By GENERAL HUBERT CAMON, *French Army*

Translated by Captain E. M. Benitez, C. A. C., and reprinted by special arrangement with Berger-Levrault, publishers of *Revue Militaire Generale*

BATTLE OF TANNENBERG

AUGUST 26, 27, 28, 29 AND 30

GENERAL Moltke,† in the belief that nothing but cavalry raids were to be feared in East Prussia during the first twenty days after the declaration of war, left only four corps of landwehr and landstrum, which constituted the VIII Army, under command of General von Prittwitz. These troops, resting on the fortified barrier created by the lines of lakes from Angerburg to Johannisburg, were sufficient to cover this province.

The northern gap from Angerburg to the sea, south of the Pregel to the Angerapp, was to be guarded by the I and XVII Corps and I Reserve Corps, and north of Pregel, towards the Deime, by the main Reserve of the Königsberg garrison.

The southern sector, between Johannisburg and Thorn, was assigned to the XX Corps. This corps, supported by the two mobile corps of the garrisons of Thorn and Graudenz, was to extend itself towards Deutsch-Eylau and protect the railway which supplied the VIII Army.

The German forces numbered about 60,000 men.

On the 15th of August, the 1st and 2d Russian Armies,‡ commanded by General Jilinsky, invaded East Prussia, some time before it had been calculated by the German General Staff. The 1st Army (Niemen Army) consisting of 300,000 men, under command of General Rennenkampf, appeared to the north of the barrier of lakes,

* In three parts, of which this is the second, the first part having been published in the August Journal.

† TRANSLATOR'S NOTE: General Moltke was, in August, 1914, Chief of Staff of the German Army, and was in direct command of the German forces.

‡ TRANSLATOR'S NOTE: At the beginning of the War, the Russian forces, on the Eastern Front (Russia's Western Front), comprising six armies, were organized into two army groups, operating under the Grand Duke Nicholas as Commander in Chief. The Eastern Front was divided into the Northwestern and Southwestern Front. The 1st army group (Northwestern Front), comprised the 1st Army (Niemen Army), commanded by General Rennenkampf, and the 2d Army (Narew Army), commanded by General Samsonov. Both armies were under the control of General Jilinsky. The Southwestern Group, controlled by General Ivanov, consisted of the 3d Army, General Ruzki; 4th Army, General Salza; 5th Army, General Plehve, and 8th Army, General Brusilov.

while the 2d Army (Narew Army) consisting of 250,000 men, under command of General Samsonov, came up to the south of this barrier.

The left of the German VIII Army was defeated at Gumbinnen and, in order to avoid being surrounded, General von Prittwitz decided to retreat towards the Vistula. It was then that Moltke directed Ludendorff to assume the general supervision of operations, and calling Hindenburg into active service, placed him in command of the VIII Army.

While going through General Headquarters at Coblenz, Ludendorff desiring by all means to make the lines of communications of the VIII Army sure, telegraphed the General Staff of this Army, ordering the movement of the I Corps to the south of the XX Corps, in order to effect junction with it.

AUGUST 23.—On August 23d, at 2 p. m., Hindenburg and Ludendorff arrived at Marienburg, where they were shown by the General Staff of the VIII Army, the plan of operations of General Jalin-sky, who commanded the Russian Group, composed by the 1st and 2d Armies. This plan was found in possession of a captured Russian officer.

"The Army of *Rennenkampf*," writes Hindenburg, "winding around the Masurian lakes on the north was to advance against the *Insterburg-Angerburg* line. It was to attack the German forces presumed to be behind the *Angerapp*, while the *Narew Army* was to cross the *Lotzen-Ortelsburg* line to attack the Germans in flank. The Russians were thus planning a concentric attack against the VIII Army, but Samsonov's Army was already extended farther west than was originally intended."—HINDENBURG, "*Out of My Life*."

AUGUST 24.—Generals Ludendorff and Hindenburg arrived at Tannenberg, close to General Scholtz who commanded the XX Corps.

The plan of General Jilinsky was as follows: While *Rennenkampf* was holding off the VIII Army, Samsonov would come up on the rear of this army by the railway *Rastenburg-Seeburg*. The 1st and 2d Armies would effect their junction to the northeast of *Rastenburg*.

With some minor delays, the bulk of Samsonov's Army had crossed the frontier from the 21st to the 22d of August. This army was already greatly exhausted, having crossed Poland by forced marches. Its equipment advanced very slowly along the sandy roads, and consequently the supply of the army was uncertain. Nothing could be found in this territory, and by this time, both

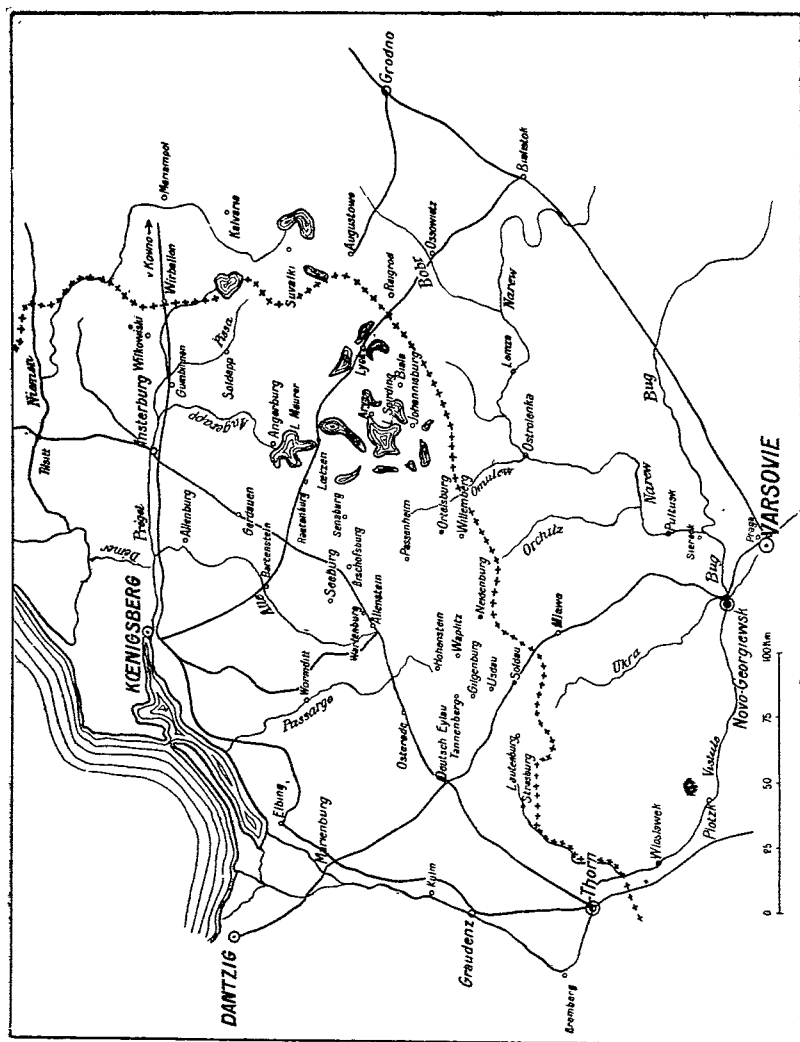


FIG. 8. MAP OF EAST RUSSIA

bread and forage were scarce. Samsonov's Army advanced along a front of 100 kilometers, in the following order from left to right: 23d, 13th, 6th and 2d Corps,* with the cavalry at the flanks. After having crossed the frontier, the 2d Corps of the Narew Army was attached to Rennenkampf's Army, and replaced by the 1st Corps, which after Novo Georgiewsk was to take its place at the left of the 23d Corps.

Samsonov was trying to push his left towards the Novo-Georgiewsk-Mlawa-Soldau railway. He was camped in this locality, when he perceived the rapid retreat of the Germans, at the most propitious moment for cutting off their retreat.

The support of his left, as above mentioned, was to bring about an extension of front that would cut off all liaison with the 1st Army.

"Instinctively," writes Ludendorff, "the idea of profiting by the separation of the two armies came to the minds of our General Staff.

"We shall only make a screen demonstration against Rennenkampf and will concentrate all our forces against the most dangerous army, that of Samsonov, who contemplates an enveloping attack."

The tactical disposition of the battle was not a sudden conception of Ludendorff.

"The conception of the battle," he says, "was gradually formed during the period of August 24th to 26th. The military profession has become an art, and in a battle of mobile warfare, events take place very rapidly and we must keep this fact foremost in our minds."

In regard to the VIII Army, Ludendorff had already issued orders while going through Coblenz, to halt the retreat of the XVII Corps and I Reserve Corps and the Main Reserve of the Königsberg garrison, which should hold their lines. The 1st A. C. was to be detained, south of the XX Corps, somewhere in the Deutsch-Eylau region.

Any available troops from the garrisons of Thorn, Kulm, Graudenz and Marienburg, all of which were landwehr and landstrum, were to go to Strassburg and Lautenberg.

"Thus," writes Ludendorff, "a strong group was formed in the southwest part of Prussia, while the Northern Group, either continued its retreat in a southwesterly direction, or could be brought straight down south to assist in the action against the Narew Army.

* Less one division (3d Guard Inf. Division), kept in reserve at Augustowo, and which was not to participate in the battle.

Of course, an actual decision as to the plan to be adopted could only be made on the spot.

"The great question was whether or not it would really be possible to withdraw the I Reserve Corps and the XVII Army Corps from their positions facing Rennenkampf, so as to unite them with other units of the VIII Army for a blow against the Narew Army. It depended solely upon Rennenkampf himself, for if he knew how to make the most of his success at Gumbinnen and advance quickly, my plan would be unthinkable. In this case, there would be no alternative but to withdraw the I Reserve Corps and the XVII Army Corps in a more southwesterly direction towards Wormditt, while the other part of the VIII Army held up the Narew Army, and prepared to check it if occasion served.

"We gradually discovered that Rennenkampf was advancing very slowly. As a consequence, the two army corps which were retreating on the line Bartenstein-Gerdauen, could, therefore, be gradually deflected in a sharp southwesterly direction towards Bischofsburg-Neidenburg. Only the First Cavalry division remained facing Rennenkampf, and on the 26th the First Cavalry brigade of this division received the order to move on Sansburg via Rossel. After August 27th, only two cavalry divisions stood between Lake Mauer and the Pregel, facing twenty-four strong infantry divisions, and several cavalry divisions of Rennenkampf's Army."—LUDENDORFF, "My War Memories, 1914-1918."

It was truly certain that further economy of forces could hardly be attained.

"The I R. C. and the XVII Corps were marching in the rear of the Narew Army from Neidenburg to Allenstein. In this way they exposed their rear, without adequate protection, to Rennenkampf's Army, which was only two or three days' march away. When the battle began in real earnest on the 27th, and in contrast to previous wars, was not finished in one day, but continued until the 30th, Rennenkampf's formidable host hung like a threatening thunder-cloud to the northeast. He need only have closed and we should have been beaten. Few knew the anxiety with which I watched the Niemen Army during those long days."—LUDENDORFF, "My War Memories, 1914-1918."

THE PLAN OF BATTLE BECOMES PRECISE.—On the 24th,* Ludendorff learned from an intercepted enemy wireless message, Samsonov's dispositions for the advance of the 26th. The Russian Army was extended from Soldau to Bischofsburg, a distance of nearly 100 kilometers, while the I Army Corps marched from Mława towards

* NOTE: Ludendorff writes: "On the journey from Marienburg to Tannenberg * * *," which implies that it was on the 24th.

Soldau protecting the western flank, at a distance of from 25 to 30 kilometers from the 23d Corps, which was its right neighbor.

"The Narew Army was advancing," writes Ludendorff, "in echelons, with its right wing in the lead, its 6th Corps directed via Ortelsburg on Bischofsburg, which was reached or passed by the 26th, and its 13th Corps directed from Neidenburg through Passenheim on Allenstein. The 15th and 23d were following. On the 26th, the most southerly echelon was to be found somewhere near Waplitz. Still further back to the left, and pushing west, the 1st Corps, covered by several cavalry divisions, was moving through Mlawka and Soldau, against Lautenberg and Strasburg. It was a question of breaking up this movement of the enemy by an attack from the west with the Southern Group of the VIII Army. It was a great temptation to attack simultaneously south of Soldau, in order to surround the 1st Russian Corps as well. The defeat of the Narew Army could thus have been absolutely annihilating, but the forces at my disposal were insufficient."—LUDENDORFF, "My War Memories, 1914-1918."

Let us now see the plan of battle as outlined by Hindenburg:

"In the first place we opposed a thin centre to Samsonov's solid mass. This centre (the XX Corps), might bend under the enemy's pressure, but it would not break, and while it was engaged, two important groups on its wings were to carry out the decisive attack. The troops of the I Corps, reinforced by Landwehr, were brought for the battle from the right, the northwest, the troops of the XVII Corps and the I Reserve Corps, with a Landwehr brigade, from the left, the north and the northeast.

"At the extreme right, General von Muhlmann, subordinated to the Commander of the I Corps, protected the left flank of this corps against enemy cavalry with troops withdrawn from the fortified garrisons of the Vistula."—HINDENBURG, "Out of My Life."

Thus, according to Hindenburg, the battle against Samsonov's Army was planned on the scheme of the battle of Cannae. Ludendorff's plan was not so ambitious. He considered the Narew Army too large a mouthful for the forces at his disposal. As the First Russian Army Corps was totally separated from the others, Ludendorff wished to profit by this circumstance and crush this corps first of all. He intended then to plan a battle along the scheme of Cannae, against the bulk of Samsonov's Army.

"So I proposed to General von Hindenburg that an attack be made in the direction of Usdau by the I Corps on the line Deutsch-Eylau-Montowo, and by the right wing of the reinforced XX Corps from the direction of Gilgenburg, so as to throw back the Russian 1st Corps to the south, beyond Soldau. Then our I-Corps was to

break through in the direction of Neidenburg, in conjunction with I and XVII Corps and I Reserve Corps, in order to surround, at least, the main body of the Narew Army."—LUDENDORFF, "My War Memories, 1914-1918."

AUGUST 26.—Ludendorff concentrated the I Corps (Francois) coming up from the south and half of the right of the XX Corps, reinforced by the 3d Reserve Division, coming up from the north, against the First Russian Corps, at Usdau.

In the meantime, the other half of the XX Corps, reinforced by von der Goltz' landwehr division, which had come from Schleswig-Holstein and had taken position at the left of that corps, was to hold off the bulk of Samsonov's Army. Usdau was captured in the morning by the I Corps, and the Russians were pushed as far back as Soldau.

ENVELOPMENT OF THE MAIN BODY OF SAMSONOV'S ARMY.—On the 26th, the I Reserve Corps (von Below), coming from the north had reached the Seeburg region. The XVII Corps (Mackensen), at the left of the I Reserve Corps, had attacked a division of the 6th Russian Corps, repulsing it towards Bischofsburg. The VI landwehr brigade that had advanced to the northwest of Bischofsburg, participated in the above combat.

AUGUST 27.—The I Reserve Corps reached Wartenburg on the evening of this day, and the 6th Russian Corps forming the right of Samsonov's Army, was now in full retreat in front of the XVII Corps. The bulk of this corps camped near Mensguth on that evening.

At the centre, the XX Corps greatly weakened by these attacks, could not advance. On the 27th the situation was as follows:

The 6th Russian Corps was retreating in great disorder in front of the I Reserve Corps and the XVII Corps. The Russian positions at Usdau had been taken by the I Corps. The Russian Corps of the centre,—23d, 15th and 13th,—continued their advance towards Allenstein and Gilgenberg, and were getting deeper and deeper in Ludendorff's net, in which they were eventually to be caught.

"Now, when the enemy's centre pushed forward farther towards Allenstein-Hohenstein, it was no longer victory but destruction that lured it on. For us the situation was clear. On the evening of this day we gave orders for the complete encirclement of the enemy's central mass."—HINDENBURG, "Out of My Life."

These orders were as follows: The I Corps (von Francois) was to seize Neidenburg; on the left, the I Reserve Corps and the XVII Corps (Below and Mackensen respectively), giving up the pursuit of the remnants of the 6th Russian Corps were to descend towards the southwest on Allenstein (occupied by the 13th Russian Corps) and Passenheim, and were to seek cover towards Ortelsburg. At the centre, the XX Corps was to vigorously push ahead, while von der Goltz' landwehr division was to attack Hohenstein.

Thus, while the XX Corps and von der Goltz' division were holding off the Russian central mass, composed of the 23d, 15th and 13th Corps, the two German wings, effecting their junction to the west of Willenberg, would close the circle in rear of these Russian forces.

AUGUST 28.—During the morning of this day, the situation of the VIII Army was very delicate. The right wing (I Corps), had captured Neidenburg, but the centre had made no progress. Thus, although the two flanks had succeeded in advancing, the centre was running the risk of being pierced.

"The situation at this point might have become dangerous and a grave crisis might have resulted, if the enemy had attacked with his concentrated forces. At the best, the battle would have been prolonged. Finally, Rennenkampf might have continued his march. But the enemy made no attack on the 41st Division and the Niemen Army did not march. During the afternoon, the situation changed to our advantage. The 3d Reserve Division, and later the 37th Infantry Division gained ground west of Hohenstein; von der Goltz' landwehr division entered Hohenstein itself. The enemy front appeared to be wavering. Towards the evening, we were not at all clear as to how things stood with the individual units; but there was no doubt that the battle was won. *Whether it would prove a real Cannae was still uncertain.* The I Corps had to send a detachment to Willenberg, whither the XVII Corps was also to proceed. The retreat of the Russians was to be cut off.

"During the night we learned further details. The Russian 13th Corps had advanced from Allenstein on Hohenstein, and had pressed the landwehr severely. The I Reserve Corps had come down southwest of Allenstein. Its further advance would close around the Russian 13th Corps and thus conclude the whole operation, whilst the I and XVII Corps cut off the retreat of the other portions."—LUDENDORFF, "My War Memories. 1914-1918."

AUGUST 29.—On the morning of the 29th, Ludendorff was informed that while the I Corps was advancing towards Willenberg to

complete the encircling ring, a Russian Corps coming from the north had appeared at its rear, to the southwest of Allenstein.

All the available forces were immediately dispatched towards Neidenburg, but General Francois, commander of the I Corps, pulled himself out the difficulty.

Ludendorff then thought of withdrawing the I Reserve Corps and the XX Corps in order to have both of them available for any unforeseen attack.

AUGUST 30.—“On August 30, the enemy concentrated fresh troops in the south and east and attempted to break our encircling ring from without. From Myszaniec, that is, from the direction of Ostrolenka, he brought up new and strong columns to Neidenburg and Ortelsburg against our troops, which had already completely enveloped the Russian centre and were therefore presenting their rear to the new foe. Francois and Mackensen sent their reserves to meet the new enemy. Against their resistance the attempt to mitigate the catastrophe to Samsonov came to naught.”—HINDENBURG, “Out of My Life.”

On the 31st, Hindenburg sent the following report to the Kaiser:

“The ring around the larger part of the Russian Army was closed yesterday. The 13th, 15th and 23d Army Corps have been destroyed. We have already taken more than 60,000 prisoners, among them the Corps Commanders of the 13th and 15th Corps. The guns are still in the forests and are now being brought in. The booty is immense though it cannot yet be assessed in detail. The corps outside our ring, the 1st and 6th, have also suffered severely and are now retreating in hot haste through Mlawa and Myszaniec.”

General Samsonov committed suicide and was buried unrecognized not far from Willenberg.

The final number of prisoners was 90,000, according to Hindenburg. The Russian losses in killed and wounded were also very heavy. The Germans then proceeded to give a name to this battle.

“At my suggestion, the battle was named the Battle of Tannenberg, in memory of that other battle long ago in which the Teutonic Knights succumbed to united Lithuanian and Polish hosts.”—LUDENDORFF, “My War Memories, 1914-1918.”

It was rather a delayed revenge of the Teutons over the Slavs.

“One of the most brilliant battles in the history of the world has been fought. It was a glorious triumph for the generals and their troops, indeed, for every officer and man, and the whole country,” modestly writes Ludendorff in War Memories, forgetting to thank

Rennenkampf for his immobility and neglecting to mention the great luck which he had in obtaining a secret code which enabled him to read the Russian radiograms like an open book.

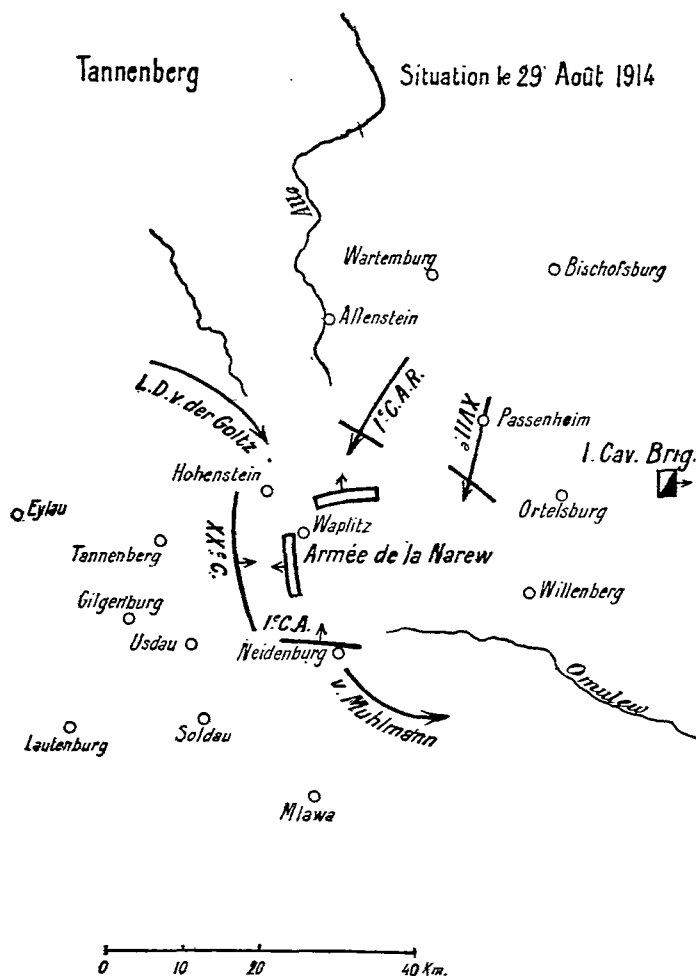


FIG. 9. THE BATTLE OF TANNENBERG [SITUATION AUG. 29, 1914]

"We were proud of this battle. The victory had been brought about by a break-through, an encircling movement, firm resolution to win and intelligent limitations of aims. Despite our inferiority on the Eastern Front, we had succeeded in assembling on the battle-field a force nearly as strong as that of the foe. I thought of General Count von Schlieffen and thanked him for his teaching."—LUDENDORFF, "My War Memories, 1914-1918."

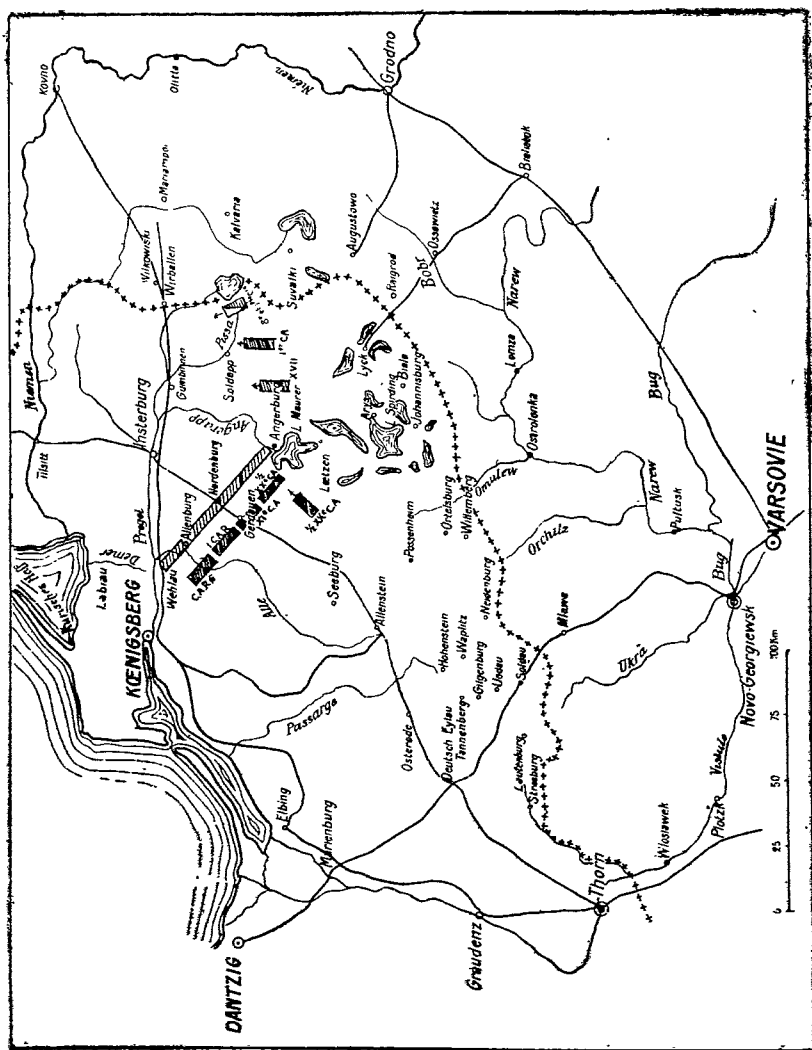


FIG. 10. THE BATTLE OF THE MASURIAN LAKES OR INTERBURG [SEPT. 8-15, 1914]

This was the first battle on the Eastern Front in which Hindenburg and Ludendorff had participated. As a matter of justice, the audacity of the decision and the prudence in the execution deserve praise. The Narew Army was not enveloped in its entirety, because the 1st and 6th Corps which were the first ones to be attacked were thrown outside the circle which enclosed the 23d, 15th and 13th Corps. The results obtained by the scheme of Cannæ, favored by Schlieffen, were superb. Both Hindenburg and Ludendorff confess that they spent uneasy hours during the five days of battle.

The conduct of the Russian Command is puzzling. It is said that Rennenkampf was at the time with his cavalry and could not be located on time. But where was General Jilinsky, the Commander of the Army Group made up by the armies of Rennenkampf and Samsonov? The inactivity of the Niemen Army must be accounted for by the intentions of the Russian G. H. Q. of not using hurriedly mobilized troops in defensive operations. The Russian General Staff thought, without doubt, that by invading Eastern Prussia, the mission of helping the French Army had been accomplished. It did not want to expose the great contemplated maneuver with all the Russian forces unnecessarily, by engaging the two armies of the North. This is the only explanation for Rennenkampf's concern in reorganizing a strong defensive position between the Pregel and the lakes, prolonged to the north by the line of the Deime to Labiau.

If this is the true explanation, then it was Samsonov, who carried away by his first successes, went beyond his instructions and that was why he committed suicide when he saw that his defeat was imminent.

We now quote some extracts from the book of M. Paleologue, the French ambassador at St. Petersburg, which throw some light on the operations on the Russian side:

"AUGUST 24.—Our operations on the Belgian and French Fronts have taken a bad turn. I received orders to appeal to the Imperial Government in order to accelerate the Russian offensive as much as possible. I visited the Ministry of War and energetically pressed the request of the French Government."

On the 26th, M. Sazonov, the Minister, informed the French Ambassador, M. Paleologue:

"General Jilinsky, the Commander in Chief of the Northwestern Front, considers that an offensive in Eastern Prussia is doomed to fail, because our troops are too scattered and transportation is very difficult. (The Masurian region is covered with forests, rivers and

lakes.) General Yannouchkewitch, Chief of Staff, is also of the same opinion and greatly discourages the offensive. But General Danilov explained not less forcibly that we had no right to let our Allies perish, and that in spite of the unavoidable risks of the enterprise, we should attack without delay. The Grand Duke has just decided to carry out this plan.

“Under the imperative and repeated orders of the Grand Duke, the five Corps of General Samsonov attacked the enemy day before yesterday (August 26) in the Mlawa-Soldau region. The point of attack was well chosen and will compel the Germans to divert large forces to this region. A Russian victory in the direction of Allenstein would have the double result of opening the route to Danzig, and also of cutting off the retreat of the German Army which has just been defeated at Gumbinnen.”

THE BATTLE OF THE MASURIAN LAKES OR INSTERBURG

SEPTEMBER 8-15, 1914

On August 30, after the battle of Tannenberg, General Conrad* requested Hindenburg to effect a general offensive in the direction of Warsaw, for the relief of the Austro-Hungarian Armies.

First of all, however, it was necessary to dispose of Rennenkampff, because his army might advance through Allenstein against the rear of the VIII Army.

On August 31st, Hindenburg was informed that two corps from the Western Front, the XI Corps and the Guard Reserve Corps and the 8th Cavalry division were on the way to Eastern Prussia to assist in driving Rennenkampff out of this province, and after this to immediately take the offensive against Warsaw.

“Rennenkampff had apparently withdrawn his advanced units several kilometers, but he seemed to intend a stand between the river Pregel and Lake Mauer. The VIII army was compelled to fight a second battle, and had to use all its available strength. In the execution of this plan, the reinforcements from the west were detrained on the Allenstein-Elbing line, and the VIII Army was concentrated ready to advance between the Willenberg and Allenstein Front. Only small forces were left behind for the defense of the frontier near Soldau. They were to advance into Poland in the direction of Mlawa.

“As soon as the troops had been concentrated, we intended to attack Rennenkampff on a wide front between the river Pregel and

* TRANSLATOR'S NOTE: General Conrad was Chief of Staff of the Austro-Hungarian Army.

Lake Mauer, while enveloping his left beyond Lotzen and further south."—LUDENDORFF, "My War Memories, 1914-1918."

A flanking corps was to advance towards Lyck, in order to "guard the army from attack from Augustowo and Osowiec, where we expected hostile forces to detrain."

"The operation also was extraordinarily daring. To begin with, the Russian Neimen Army, with its twenty-four infantry divisions, was very much stronger than the VIII Army, with its fifteen to sixteen divisions. Moreover, the Russian divisions consisted of sixteen battalions, and ours, at that time, of twelve. The Russian fighting strength was further increased by from four to six divisions, which were being assembled around Osowiec and Augustowo. This immense superiority could be concentrated against us at any moment and at any chosen point. Our right wing, in particular, was in danger to the east of the lakes. It might be overwhelmed. Even in such a situation as this, we did not hesitate for a moment to venture on a battle. Our superior training was in our favor. Tannenberg had given us a great advantage."—LUDENDORFF, "My War Memories, 1914-1918.

"We did not know," writes Hindenburg, "what forces the enemy had to catch us by surprise in the region southeast of the Masurian lakes. Rennenkampf had doubtless received reinforcements. The Russian reserve divisions from the interior were now ready to take the field. Would these units be sent to Rennenkampf or brought up near him, either to give him direct support or to strike at us from some unexpected quarter?"

Rennenkampf, however, intimidated by Samsonov's defeat, abandoned all thoughts of an offensive. He took position between the Kurisches Haff and the region of the lakes, so as to close the route to the VIII Army

His front of nearly 80 kilometers, followed the Deime to Pregel to Allenburg, thereby obstructing the interval between Allenburg and Angersburg and cutting the railway Thorn-Insterburg, perpendicularly. Further to the south, the Russians also occupied the line of lakes.

Ludendorff with only sixteen divisions wanted to attack Rennenkampf who besides having twenty-four infantry divisions was moreover strengthened by strong positions along this organized 80-kilometer line, which extended as far as the line of the lakes. With such unequal forces, the Germans could not fight a battle of Cannae, using two enveloping masses, but Ludendorff conceived another plan.

Holding off the Russians along the entire front, he would launch a turning attack at Lotzen (region of the lakes), against the rear

of the Russian left and in the general direction of the Insterburg-Wirbatten road and railroad, which constituted the lines of supply and retreat of the Russian Army.

This turning mass would compel Rennenkampf to either evacuate his position or to withdraw forces from his left wing in order to oppose it, thus weakening his left. Ludendorff would then be ready for the break-through.

"On the 5th of September," writes Hindenburg, "the plan of attack against the Niemen Army was definitely decided upon.

"Four corps (the XX, XI, I Reserve and Guard Reserve) and the troops from Königsberg—comparatively a strong force—advanced against the enemy's front on the Angerburg-Deime line. Two corps (the I and XVII) were to push through the lake region. The 3d Reserve Division, as the right echelon of our enveloping wing, had to follow south of the Masurian lakes, while the 1st and 8th Cavalry Divisions had to be held in readiness behind the main columns, to range at large as soon as the lake defiles were forced. Such were the forces against Rennenkampf's flank. So the scheme differed from the movements which had led to the victory of Tannenberg. This grouping of our columns was imposed upon us by the necessity of securing ourselves against Rennenkampf's strong reserves."

This was Napoleon's normal plan of battle, and it may be briefly analyzed as follows: A front strong enough to check the enemy, *neutralizing and compelling* him to use his reserves; a *turning mass* against the rear of the enemy left flank behind which lay the line of retreat; a break-through mass, in front of the enemy left, which would also serve as general reserve. This break-through mass was, however, too weak. It consisted of only one division of the XX Corps, which was due to disappear immediately at the urgent calls of the XX Corps Commander, which Ludendorff was bound to heed.

"We would have liked," writes Ludendorff, "the right wing to have been stronger, and a division of the XX Corps, west of the lakes, has been kept ready to be placed at our disposal. But this division had to be returned to the Corps. The front of fifty kilometers, on which the four corps attacked the enemy, was certainly very long. Further, the staff of the Guard Reserve Corps, fearing a Russian attack, had therefore concentrated its units. The north wing had to stand firm on the Pregel, otherwise the VIII Army might be outflanked there. The attack of the enveloping wing must not be stronger than we had allowed for. We had to wait and see whether our main attack would succeed or fail. Hard fighting would be the

decisive factor here. We could only do everything in our power to secure the success at which we aimed."

After reading these lines, it can be seen that Ludendorff intended to strengthen the turning mass with troops withdrawn from the front, after the Russian resistance at this front had decreased.

"The enemy positions," writes Ludendorff, "were strong and skillfully organized."

THE BATTLE.—On September 6th and 7th, the VIII Army deployed in front of the Russian position. Large Russian forces were discovered at Insterburg and at Wehlau on the Pregel, and still larger forces to the north of Nordenburg, that is to say, at the centre of the position. They remained stationary and did not interfere with the deployment of the German Corps, which began a methodic attack against the Russian lines.

SEPTEMBER 7.—The turning mass, passing by the fortress of Lotzen, assaulted the barrier of the lines of lakes. Further to the south, the 3d Reserve Division, after a brilliant combat at Biala, crushed one-half of the 22d Russian Corps.

SEPTEMBER 8.—"We were entering upon the crisis of our new operations. The next few days would show whether *Rennenkampf* intended to attempt a counterattack. Our frontal attack made no progress, but things went better on our right wing. In that quarter two corps had broken through the enemy's lake defenses and were turning north and northeast. Our objective was now the enemy's line of communications. Our cavalry appeared to have an open road in that direction."—HINDENBURG, "Out of My Life."

SEPTEMBER 9.—The battle continued in all its fury, without appreciable results, on the front from Wehlau to Angerburg. On the contrary, the turning mass advanced to the east of the lakes, but the two cavalry divisions could not break an unexpected resistance with all the desired rapidity.

The 3d Reserve Division, which was the echelon of the turning mass, defeated a stronger opponent at Lyck, and thus relieved Ludendorff's anxiety on the south.

SEPTEMBER 10.—Hindenburg and Ludendorff were anxiously awaiting for the disclosure of *Rennenkampf's* plan, when on the night of the 9th to the 10th, patrols discovered that the Russians had evacuated Gerdauen.

"The report seemed to us incredible. It was only about mid-day that we were compelled to accept the improbable and *undesirable* fact. The enemy had actually begun a general retreat, even though he offered a stout resistance here and there, and indeed threw heavy columns against us in disconnected attacks. It was now our business to draw the corps and cavalry divisions on our right wing sharply northeast, and set them at the enemy's communications with Insterburg and Kovno."—HINDENBURG, "Out of My Life."

Ludendorff, in turn, writes:

"On the morning of September 10th, we received the decisive news that during the night the enemy had evacuated his position facing the I Reserve Corps north of Gerdauen, probably in consequence of the continuous attacks of the I and XVII Corps. It was said that the corps had occupied their position, and intended to march on. The rejoicing at Headquarters can be imagined. A great success had once more been achieved, but still nothing decisive. The Russian Army was not yet beaten by any means. Northeast of Lotzen we had only local successes. It was important to carry out a frontal attack with all our strength and throw ourselves on the receding enemy, while the enveloping wing advanced east of the plains of Rominten towards the Wirballen-Kovno road. In this way we intended to drive the Russians as far as possible towards the Niemen.

"It had also to be taken into account that Rennenkampf, who was now cooperating with the reinforcements arriving further south, would be able to make a vigorous attack in any direction. Our lines were very thin everywhere, though the two northern groups, which had hitherto been separated by Lake Mauer, had joined up again. The situation was still extremely critical, and the tension was great." LUDENDORFF—"My War Memories, 1914-1918.

Before following the VIII Army in its pursuit against the Russians, let us stop for a moment for discussion of the battle proper.

The news of the evacuation of the Russian positions north of Gerdauen filled Ludendorff with great joy. "The rejoicing at Headquarters can be imagined," he writes, and then continues, "but still nothing decisive. The Russian Army was not yet beaten by any means. Northeast of Lotzen we had only local successes."

Hindenburg, with habitual frankness, writes in turn: "It was only about midday that we were compelled to accept the improbable and *undesirable* fact."

In spite of numerical inferiority, Hindenburg and Ludendorff feeling confident of Napoleon's scheme, hoped to encircle Rennenkampf to the south of Insterburg.

This operation failed due to the Russian retreat. The advance of the turning mass, which "could not be further strengthened until we learned how the combat at the front was succeeding," was sufficient to cause Rennenkampf to retreat, but was not sufficient to encircle him.

Since the corps at the front could not hold out and retain the enemy, the Napoleonic scheme did not *make its full effects felt*, but it caused Rennenkampf to retreat. It was necessary to take advantage of this and inflict all possible damage.

THE PURSUIT. SEPTEMBER 11.—The Corps of the Niemen Army were retreating in three close columns. They moved slowly and to cover the retreat, Rennenkampf engaged important forces. On the 11th of September, bloody combats were taking place all along the front from Goldap to the Pregel.

The German troops were formed in as many columns as there were roads. They had orders to maintain strict liaison between them and to press the enemy to the utmost. If the enemy was in position, they were to wait the neighbor's columns before attacking.

"These movements did not turn out quite as I had hoped. Friend and foe were difficult to distinguish. Our own columns fired on one another. The troops made too vigorous frontal attacks, and did not wait the cooperation of neighboring columns. But the most serious difficulty was caused by the fact that on September 11th the XI Corps thought it was being attacked by a very superior force. This was quite conceivable and had to be taken into account. Under the existing conditions as regards the strength of the two forces, the front line required the close tactical support of the enveloping Corps. We had, therefore, to decide to bring the XVII and the I Corps further north than was originally intended. After a few hours the belief of the XI Corps proved to be unfounded. But the order had already been given to the enveloping wing. Later, the Corps were again diverted to their original route, but by then at least half a day had been lost"—LUDENDORFF, "My War Memories, 1914-1918."

Thus, through the fault of the XI Corps, the net was tightened instead of having been enlarged, and this permitted the escape of part of Rennenkampf's forces.

The German troops of the north reached Insterburg on the 11th, while at the south, the 3d Reserve Division entered Suwalki. The southern flank of Rennenkampf's Army barely escaped the envelopment of the I Corps south of Stallupönen. As the northern encirclement was not contemplated any further Ludendorff with-

drew the Guard Reserve Corps from the, pursuit in order to have it ready for any eventuality.

SEPTEMBER 13.—On this date, the German Corps reached Eydtkunen (frontier station on the line Insterburg-Kovno) and used their machine guns against the retreating Russian forces.

“Unfortunately,” writes Hindenburg, “we did not reach the great main road from Wirballen to Wylkowyszki this day. The enemy knew that this would spell annihilation to many of his columns which nothing could now stop. He therefore scraped together everything he had in the way of battle-worthy units and threw them against our exhausted troops south of the road.”

The battle actually ended on the 13th.

SEPTEMBER 14.—On the 14th, Rennenkampf's troops disappeared in the marshy and wooded region, situated west of the Niemen between Olita and Kovno. The VIII Army could not pursue them there.

SEPTEMBER 15.—On the 15th the battle of the Masurian Lakes, socalled by the Kaiser, ended in Russian soil, after a pursuit of more than 100 kilometers, which the veteran German Corps covered in four days in spite of the combats and fatigue.

Outside the great battlefield, the 3d Reserve Division (General von Morgen) and the landwehr division of von der Goltz, that were protecting the right flank, fought successfully against forces numerically greatly superior, at Biialla. The landwehr division was held up at Ossowitz, while the 3d Reserve took Augustowo and Suwalki after heavy fighting.

Hindenburg and Ludendorff arrived at Insterburg on the 14th.

“We took lodging at Dessauer-Hof, where Rennenkampf had established his General Headquarters. Not long ago, the Grand Duke Nicholas himself had abandoned the village.”

RESULTS OF THE BATTLE.—“While at Tannenberg we took over 90,000 prisoners, we could now only count 45,000.

“The results of the battle were not as striking as those of Tannenberg. There were no operations in the enemy's rear, for they were not possible. The enemy did not make a stand, but withdrew, so that it could only be forced back still further by frontal and flanking attacks. The Russian Army, threatened by an envelopment, recrossed the Niemen in disorder. It could not be considered for

weeks to come as first class fighting material, unless the Russians should reinforce it with fresh troops."—LUDENDORFF, "My War Memories, 1914-1918."

Ludendorff, desiring to influence the judgment of posterity, has written:

"The battle of the Masurian Lakes has not received the recognition it deserves. It was a decisive engagement, ambitiously planned, and carefully executed against an extraordinary numerical superiority. It was attended with grave risks, but the enemy did not realize his strength. He did not even attempt to fight it out, but withdrew so very hastily that, under our pressure, the retreat assumed the character of a flight."

In justice, Hindenburg and Ludendorff may glory themselves in having carried out Napoleon's scheme and of having attained such results as we have mentioned with sixteen exhausted divisions against the twenty-four divisions of Rennenkampf which would not accept combat.

"Freedom, independence, self - government, are all opposed to anything that resembles a mercenary force. But while military science has advanced to such a degree that it is necessary constantly to maintain a considerable body of trained experts in that profession, the true spirit of American institutions requires that each citizen shall be potentially a soldier, ready to take his place in the ranks in time of peril, either in the field or in the necessary productive activity. * * * It is exactly because we wish to keep our standing forces small that the average citizen must give some time to military affairs, precisely as he gives some attention to other government affairs, in order that he may express a deliberate and informed judgment at the ballot box."—*President Coolidge.*

PROFESSIONAL NOTES

The Spiral Method of Unilateral Observation for Adjustment of Fire on Fixed Targets

By MAJOR G. F. MOORE, C. A. C.

The method described below for adjustment of fire on fixed targets by unilateral observation was discovered by Colonel S. C. Vestal, Coast Artillery Corps, while in command of the 339th Field Artillery. During the training period of this regiment in 1917-18 the thought occurred to him that some method should be available which would be much more simple than the methods in use, and by application of which more rapid adjustment could be secured, thus saving time and ammunition. In observing the firing problems from an observation post it became apparent to him that if the observer would place the intersection of the cross wires of the observing instrument on the base of the target the terrain would be divided into four quadrants. By noting the quadrant in which the shot fell the observer would be able to furnish the battery commander with definite information as to whether the point of impact was "over," "short," "right," or "left," with respect to the gun position.

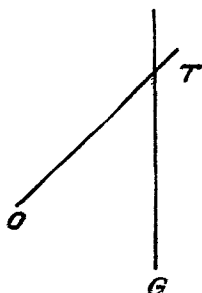


FIG. 1

Before explaining the use of this method of observation of fire a brief explanation of the use of unilateral observation, Case I and Case II, will be given. Comparison with these two standard methods is desired. Unilateral Observation Case I is used when the angle Gun-Target-Observer is from 100 to 300 mils (Fig. 1). The observer gives to the battery commander certain information as to the fall of a shot with reference to the OT line, or the target, as seen from O.P. In other words he will sense the burst as "right" or "left," a definite amount, and when the burst occurs close enough to the OT line to be within the limits of the target he will also sense the shot as "over" or "short." The battery commander will then proceed to adjust the center of impact on the target. In order that he may properly conduct the adjustment fire the battery commander makes use of certain factors which depend upon the location of the guns, observation post, and the target.

To determine these factors the following must be known for each target: (a) The angle OTG; (b) The distance OT; (c) The distance GT. There are two factors used in Unilateral Observation Case I, the "R" factor and the "F" factor. The "R" factor is the factor used at the guns by which observed deviations at the OP must be multiplied in order to throw the burst on the OT line. The "F" factor, used in sliding, determines the amount of change in deflection that must be made at the guns, when a change of one fork in elevation is made, in order to keep the burst on the OT line.

Unilateral Observation Case II is used when the angle OTG is larger than 300 mils. In this case there are three factors to consider, these factors depending upon the same conditions as in Case I. The "R" factor is again used to determine definite right or left deflections. The "M" factor is used to throw the burst on the OT line. The "S" factor is used in sliding, being the factor by which range change per mil change in deflection is determined.

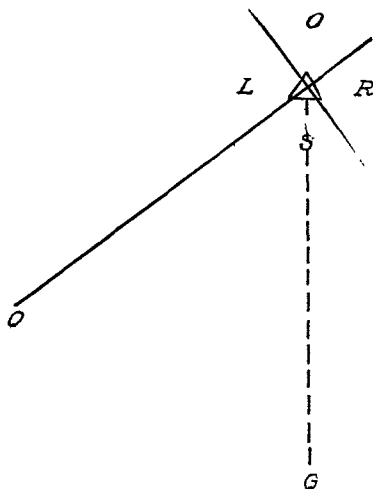


FIG. 2

In explaining the Spiral method of Unilateral Observation reference is made to Fig. 2. The observer places the intersection of the cross wires of the observing instrument on the target. The terrain in the vicinity of the target is divided into four quadrants as shown marked O, R, S, and L. The observer knows that he is on the left of the GT line. He knows that any shot falling in quadrant O is surely "over" from the battery and he so reports. Similarly shots falling in quadrants R, S, and L would be, respectively, "right," "short," and "left." When a shot falls on or near the dividing line of two quadrants, for example on the line between O and R, information of double value is obtained. It would be sensed as "over" and "right."

Consider now the Battery Commander. He knows whether he is on the right or the left of the GT line and that is all the data he needs to conduct the adjustment. He does not have to compute any factors or remember any complicated rules of adjustment. He is furnished by the observer with definite information as to the fall of shots with reference to the GT line. With this information he may apply simple rules for adjustment, similar to the bracketing

method used with axial observation, and in a comparatively small number of rounds will secure an adjustment.

The following rules for adjustment may be used with this method of observation:

TRIAL FIRE. (a) Fire first shot with computed, measured, or estimated data depending on time available for computation.

(b) Change elevation, or deflection, or both, by one "preliminary bracket" when an observation is obtained. The size of the "preliminary bracket" should be determined by the dependability of the initial firing data. The "preliminary bracket" should be large enough so that one change of data will give a sense in the opposite direction. In case too small an initial change has been selected more than one application of the "preliminary bracket" will be necessary before an opposite sense is secured.

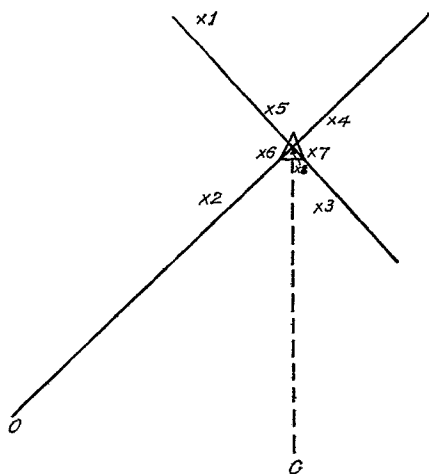


FIG. 3

(c) When an opposite sense has been secured "split" between elevation and deflection limits until a "hit," "contradiction" or "a verified bracket of one range table fork" is secured. A "hit" or "contradiction" is justification for beginning improvement fire with the elevation and deflection at which these results were obtained. If a verified bracket of one range table fork is obtained the mean of the bracketing data is the trial data.

IMPROVEMENT FIRE. (a) Using trial data fire a series of six or eight shots. If in any series an equal number of overs and shorts and rights and lefts does not occur, apply the "over-short" rule and the resulting data will be the adjusted data.

FIRE FOR EFFECT. (a) Fire for effect will follow improvement fire without interruption beginning with the adjusted data and the center of impact will be kept near the target with an equality of overs and shorts by the method prescribed for improvement fire.

In order to illustrate the application of this method a typical example is shown in Fig. 3. Noting the points of impact of successive shots, as the rules for adjustment are applied, the reason for the name "spiral" will be apparent.

Assume the first burst to be at X 1. The observer's report will be "over," and a correction by the battery commander of down "one preliminary bracket" in elevation will cause the second burst to appear at X 2, "left." A change of one "preliminary bracket" in deflection will throw the next burst at X 3, "short." Split the elevations at which the first and third shots were fired and the fourth shot is shown at X 4, "right." Following the rules for adjustment split the deflections used for the second and fourth shots and the fifth burst will be at X 5, "over."

Split again between the closest elevation limits, shots 3 and 5, and the sixth burst will be at X 6, "left." Splitting between closest deflection limits, shots 4 and 6, the seventh shot will fall at X 7. Again splitting deflection between shots 6 and 7 will secure a burst at X 8, a "hit." Of course such exact response to corrections will not always take place in actual firing but in most problems will approximate these very closely.

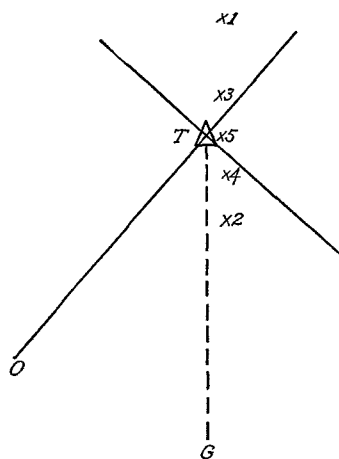


FIG. 4

Another case which will often arise is when you may start firing with the approximately correct deflection, but be considerably off in range. This situation is illustrated in Fig. 4. Assume the first burst at X 1. The second shot fired with an elevation which has been decreased by one "preliminary bracket" will strike at X 2. Splitting elevations will throw the impact of shot No. 3 at X 3. Continuing to narrow the elevation bracket in the same manner will throw the next two bursts at X 4 and X 5. X 5 will be reported as "right," this being the first information the Battery Commander has received as regards deflection. The point that it is desired to emphasize is that it would now be an improper procedure for the Battery Commander to apply a deflection change of a "preliminary bracket" in deflection. Such a change would throw the next shot entirely off the target in deflection and several shots would have to be fired before the center of impact would be back as close to the target as it is now. The fact that five shots were fired before a deflection observation was obtained, two "over" and two "short" and one "right" is a sure indication that the deflection is very nearly correct otherwise shots 3 and 4 would probably have been "right." At this stage the Battery Commander should confine his deflection changes to a range table deflection fork in proceeding with his adjustment.

A similar case to this will arise when the problem is started with an approximately correct range, the bursts in this case moving from side to side across the target. (Fig. 5).

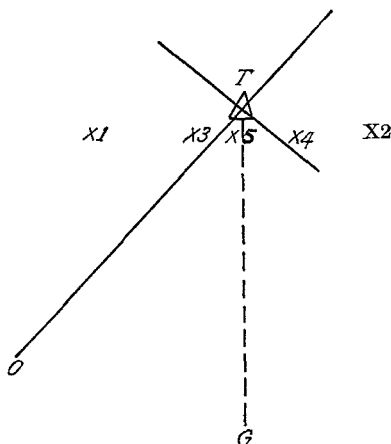


FIG. 5

Another case often arises when double information may be obtained from the fall of a shot. Referring to Fig. 6 assume the first shot to fall at X 1, "over." Decreasing the elevation by one "preliminary bracket" throws the next burst at X 2. This being on the dividing line between two quadrants will be sensed, "right"

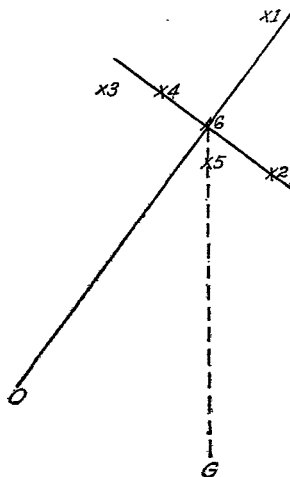


FIG. 6

and "short." A correction left one "preliminary bracket" should be made and the elevation split between elevations used for shots 1 and 2. Firing with this data assume the next burst at X 3, "left." Splitting between shots 2 and 3 for a deflection correction will cause the next shot to fall at X 4, on or near the dividing line of two quadrants. Here again is information of double value, this burst being sensed as "left" and "over." Now split between the elevations and de-

flections used for shots 2 and 4 and the next shot will fall at X 5, "short." Splitting the elevations at which shots 4 and 5 were fired will throw the next burst at or near the target.

The spiral method has been successfully used in the 92d Coast Artillery (PS) when training officers in fire adjustment.

The following advantages of this method are claimed in comparison with Case I and Case II unilateral observation:

- (a) No orientation of OP required.
- (b) No computation factors necessary.
- (c) Good for any angle of observation.
- (d) Application of simple rules of adjustment.
- (e) Observer not limited to any one position or to any particular target.
- (f) Adjustment more quickly secured with a consequent saving of time and ammunition.

This paper is submitted for publication with the hope that it will attract the attention of artillery officers and if found worthy of merit that the method may be adopted as one of the standard methods of fire adjustment with unilateral observation.

A Method of Eliminating Errors in the Elevating Mechanism of Antiaircraft Guns

By LIEUT. J. E. REIERSON, C. A. C.

There are such large variable errors in the elevating mechanism in the 3-inch A. A. guns that it was necessary to devise some method to correct for the same if we were to get satisfactory results.

A mean arbitrary correction was used at first but this was unsatisfactory for the errors varied as much as 20 mils from the mean on some; thus giving differences of 40 mils in the angular heights of bursts at some parts of the course.

The following method which practically eliminates all errors in elevation due to backlash, lost motion and faulty parts has been used by both batteries of the 62d Coast Artillery, for all record and test practices in the Joint Exercises of the Coast Artillery and Air Service now being held at Fort Tilden, N. Y., and given practically no errors in elevation. It is based on the following facts.

1. That when firing at a moving target the angle of site increases and the fuze range decreases when the gun is elevated, and the angle of site decreases and the fuze range increases when the gun is depressed.
2. That the quadrant elevation error in the elevating mechanism will be practically the same whenever the gun is given the elevation, the angle of site and the fuze range with which it was determined (under conditions Par. 1).
3. The errors in the elevating mechanism are not materially different for quadrant elevations differing by 50 mils (depending on the gun) for the same angle of site and fuze range; for example:

<i>i</i>	<i>s</i>	<i>B</i>	<i>Error</i>	<i>Arbitrary Correction</i>
450	346	14	+ 70 mils	— 70 mils
500	396	14	+ 69 mils	— 69 mils
550	446	14	+ 65 mils	— 65 mils

therefore $i = 500$ can be used in determining the errors for quadrant elevations 450 — 550 and $i = 600$ for 550 — 650, etc. (the elevations and angles of site both gotten by elevating to their readings while the fuzes were gotten by depressing the disc).

4. That it is possible to obtain the quadrant elevation of the gun at any time by putting a fixed index on the trunnion cap and a mil scale on the trunnion; this can be read by the vertical deflection setter.

The following is done in sequence:

The gun is borsighted as follows: the regulation target is used and the gun is given an elevation of 178 mils and the target so placed that the axis of the bore passes through its center; the sight is now *elevated* to its target and the reading recorded. This process should be done three times and the mean of the three recorded; this to be known as the Elevated Bore Sight (E. B. S.). The reverse should now be done three times, that is, depress the sight and the mean recorded, this to be known as the Depressed Bore Sight (D. B. S.). This gives the error in the sight when the sight is elevated, that is (178 — E. B. S.) and the error when the sight is depressed (178 — D. B. S.).

The gun is given a quadrant elevation of say 500 mils and by entering the Table of Fuze Settings all angles of site and the fuze ranges for that trajectory can be obtained and the errors in the elevating mechanism for each burst determined as follows:

The elevation being set, the gun pointer sets the angle of site (corrected) on his sight and the Fuze Range Setter sets the fuze for that burst and No. 1 brings the pointers together by means of the Arbitrary Correction Knob* and the reading (correction) recorded. The same is done for every trajectory differing by 100 mils (or less depending on the gun) and corrections for each determined being careful that when the gun is *elevated* to its reading that the sight is *elevated* to its angle of site and the Fuze Range Disc is rotated by *decreasing ranges* to its Fuze Range and vice-versa when depressing. The gun having been *elevated* to (or *depressed* to) 500 mils, it remains undisturbed for all bursts on that trajectory.

The corrections for a 3-in. A. A. gun for a 500 mil trajectory are as follows:

ARBITRARY CORRECTIONS FOR DECREASING FUZES

Gun No.	i	(E)B.S.	(E)B.S. Corr.	Angle of Site	Corr. Site	B*	ACDB	ACDB	ACDB	AV ACDB
I	500	154	-23	370	347	16	-97	-101	-100	-97
				377	355	15.5	-95	-101	-100	-97
				383	360	15	-100	-101	-99	-100
				390	367	14.5	-100	-101	-99	-100
				396	373	14	-100	-101	-100	-100
				402	379	13.5	-100	-97	-100	-99
				408	385	13	-99	-96	-94	-96
				414	391	12.5	-97	-95	-98	-97
				419	396	12	-97	-96	-98	-97
				424	401	11.5	-90	-91	-91	-91
				429	405	11	-91	-88	-92	-90
				434	411	10.5	-89	-85	-92	-89
				438	415	10	-91	-90	-86	-88
				443	420	9.5	-91	-86	-86	-88
				448	425	9	-89	-85	-86	-87
				452	429	8.5	-88	-85	-86	-87
				456	433	8	-86	-86	-85	-85

*Only those fuzes likely to be used.

i—Elevation.

(E) B. S.—(Elevated) Bore Sight.

B—Fuze.

ACDB—Arbitrary Correction Decreasing Fuze.

*With some guns where there is backlash in the gear of the arbitrary correction scale it will be necessary to get the elevation pointers to always approach coincidence in the same way; likewise to set corrections on the scale. The same may be necessary in setting vertical deflections.

ARBITRARY CORRECTIONS FOR INCREASING FUZES

Gun No.	i	(D)B.S.	(D)B.S. Corr.	Angle of Site	Corr. Site	B*	ACIB	ACIB	ACIB	AV ACIB
1	500	-133	-45	456	411	8	-71	-69	-71	-70
			-45	452	401	8.5	-71	-72	-72	-72
			-45	448	403	9	-74	-76	-74	-74
			-45	443	398	9.5	-74	-73	-73	-75
			-45	438	393	10	-75	-71	-74	-74
			-45	434	388	10.5	-75	-72	-74	-74
			-45	429	384	11	-77	-77	-76	-77
			-45	424	388	11.5	-79	-79	-78	-79
			-45	419	374	12	-79	-79	-83	-80
			-45	414	368	12.5	-79	-79	-82	-80
			-45	408	363	13	-84	-83	-88	-85
			-45	402	357	13.5	-88	-89	-89	-89
			-45	396	351	14	-88	-85	-84	-87
			-45	390	344	14.5	-84	-85	-89	-87
			-45	383	338	15	-88	-85	-92	-85
			-45	377	332	15.5	-92	-88	-90	-89
			-45	370	325	16	-97	-94	-93	-95

*Only those fuzes likely to be used.

i—Elevation.

(D) B. S.—(Depressed) Bore Sight.

B—Fuze.

ACIB—Arbitrary Correction Increasing Fuze.

Corr.—Correction.

The arbitrary corrections for each trajectory (differing by 100) can be tabulated in a column on the Fuze Range Disc so that each correction is tabulated on the proper curve. The columns of ACDF to be on the left of the Fuze Range Disc figures and the columns of ACIF to be on the right. Red ink can be used for the minus corrections and black for plus; as that is the color of the figures on the knob. The fuze Range Setter sets the corrections shown on the curve which pointer is on, the correction being determined by the quadrant elevation and the increasing or decreasing fuzes.

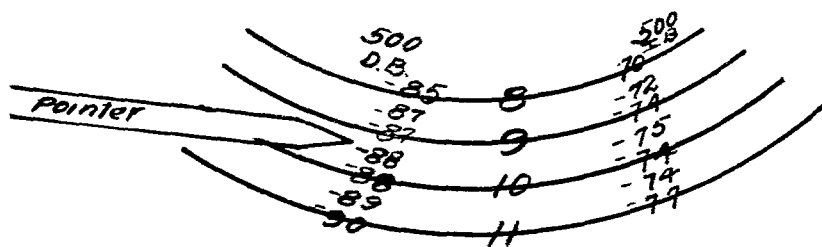


FIG. 1

For example if his Fuze Range Pointer was on 9.5 and the fuzes were decreasing he would set -88 on his arbitrary correction knob, or these columns could be put on a chart (as below) if the lines of flight were not known, or for war conditions when all elevations might be used; and another man be added to the section to give the corrections to the fuze range setter.

INCREASING FUZES			DECREASING FUZES		
<i>i</i>	<i>B</i>	<i>A. C.</i>	<i>i</i>	<i>B</i>	<i>A. C.</i>
200	2	— 20	200	2	+ 23
	2.5	— 18		2.5	+ 23
	3	— 18		3	+ 28
	3.5	— 16		3.5	+ 34
	4	— 20		4	+ 36
	4.5	— 23		4.5	+ 43
	5	— 27		5	+ 50
	5.5	— 20		5.5	+ 50

The correctness of this method is proved by setting the corrected angle of site, fuze, and arbitrary correction for any burst and elevating (or depressing, if the arbitrary correction was obtained for increasing fuzes) the gun until the pointers are together. The elevation is now taken with the quadrant and should give the elevation of the trajectory which this burst is in. For example; the ACBD for $i = 500$, $B = 10$, $S = 438$, Corr. angle site = 415, is — 88 mils, therefore to prove the correctness of —88 we depress the gun below 500 mils; set 10 on the fuze range disc (by depressing to 10); set the arbitrary —88 on the arbitrary correction knob; set the corrected angle of site 415 on the sight by *elevating* the sight to 415. The gun is now elevated until the pointers are together. The elevation is now checked by quadrant and should be 500 mils. This method of proof is used to find when it is necessary to obtain new arbitrary corrections. It will usually be necessary to determine new arbitrary corrections whenever any adjustments or replacements of parts have been made in the elevating mechanism. This requires less than an hour per gun.

It is the opinion of the writer that this method will put a large amount of unserviceable (due to errors in the elevating mechanism) materiel into service.

The 8-Inch Railway Gun

By CAPTAIN E. M. BENITEZ, C. A. C.

There is one type of artillery that has not received as much publicity as it deserves, and it is my purpose in writing this article to acquaint the officers of the Corps with the latest developments and results obtained with the Railway Artillery that we now have, with particular reference to the 8-inch gun.

Our present Railway Artillery regiments are equipped with 12-inch mortars and 8-inch guns on railway mounts attaining ranges of 15,000 and 23,000 yards respectively, and are the only all-around-fire guns available for training at present as new types are not ready for issue. Without any doubt, at the outbreak of a war, these two types of weapons will be called upon to play an important part and will be the first to go into service due to the large number available at the present time. Furthermore, training on these guns will enable the battery organization to handle any of the new types of railway mounts that are being developed.

While the relative accuracy of the 12-inch mortar has not been questioned, yet there are a large number of officers who believe that the 8-inch railway gun is very erratic and are skeptical about its use and value in actual warfare. It is, therefore, important that this erroneous belief be cast aside and facts be presented so that a clear conception of the accuracy and usefulness of this type of armament may be established.

FIRE CONTROL SYSTEM.—The fire control system at present used in the 52d Coast Artillery has been designed and perfected by different officers on duty with that regiment since 1922, and has been designed so that it is applicable without modifications, except as to minor details, to railway guns in general and for use at fixed or moving targets. It is also capable of furnishing when necessary, firing data to each gun of a *four-gun* battery, firing one four-gun salvo per minute, and permits the application of group and individual corrections for each separate gun for both range and direction. A typical interior arrangement of a fire control car is shown herewith.

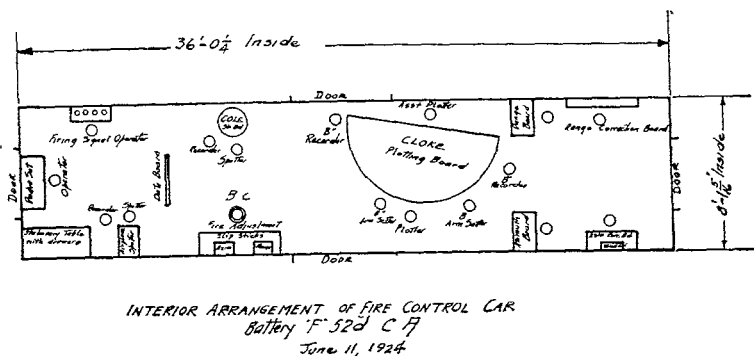


FIG. 1

GENERAL INFORMATION ON THE 8-INCH RAILWAY GUN.—The diameter of the bore between lands is eight inches and the total length of the gun is 35-calibers with a weight of 32,000 pounds. It has 360 degrees traverse with a firing angle of from 0 to 42 degrees, giving a maximum range of 23,000 yards, when firing a 323 lb. projectile with a muzzle velocity of 2250 feet per second. It has one cast steel recoil cylinder, 9.25 inches inside diameter by 54 inches in length, the recoil mechanism operating on the principle of the hydraulic brake, and is designed to limit the distance and regulate the velocity with which the gun moves to the rear when the piece is fired. The greater portion of the energy of recoil is taken up by the resistance of the oil in the recoil cylinder to being forced through the orifices formed by the throttling grooves. The length of recoil is 48 inches. The counter recoil mechanism consists of four cylinders secured to the cradle by forged steel bands, each cylinder containing a set of three coil springs. As the gun recoils when the piece is fired, it carries with it the spring rod and piston thus causing the springs to be compressed. With the gun in full recoil position there is sufficient energy stored in the springs to bring the gun back to battery.

The amount is of the outrigger type, eight outriggers being furnished with each car, which form braces to prevent the car from tipping over or from sliding on the ground when the gun is fired.

BATTERY ORGANIZATION.—The composition of an 8-inch gun battery is four guns, five officers and 177 enlisted men (See Table of Organization 500 W). The assignment of officers is as follows: Battery Commander, Battery Executive, Assistant Executive, Range Officer and Railway Officer. The battery is composed of Battery Headquarters, Firing Sections and Maintenance Sections, with their corresponding duties to perform.

RESULTS AND COMMENTS.—One of the main arguments used against railway artillery is lack of accuracy, but if we are to judge the results obtained by the

8-inch railway gun in target practices, then this argument can be readily disproven, notwithstanding the fact that these mounts were hurriedly designed when guns were badly needed at the front and consequently do not approach the ideal. If after examining the results which will be herein presented, it is considered that these target practices mentioned have been fired with a "home-made" fire control system, with boards constructed locally admitting errors due to shrinkage of wood and defects in workmanship, then it can be readily seen that this 8-inch fires just as well and as accurately as any fixed defense gun of equal caliber.

In December, 1922, the fire control system at present used by the 52d Coast Artillery was first used and two target practices were fired at an average range of 12,700 yards. Four-gun salvos per minute were successfully fired and the probable error developed by this gun was 75 yards.

During two target practices conducted by Battery F, 52d Coast Artillery in May, 1923, in which a total of 107 shots were fired, the probable error developed by this gun at mean ranges of 13,476 and 13,630 yards was 62 yards and 70 yards respectively. Firing indirect fire in the last of these two practices, in which the "slip-stick" method of fire adjustment was employed and in which a total of 57 shots were fired, the percentage of shots falling within 50 yards of the target was 33, while 51 percent of the shots fired fell within one and one-half times the Range Table probable error which is 72 yards. The greatest range deviation was 241 yards, all shots falling within the ladder of dispersion, and the 57 shots of the practice were fired in 39 minutes, twenty-two two-gun salvos being fired with only one relay, which was almost unavoidable. Can such a gun be classified as erratic? What major caliber fixed defense battery (not calibrated), can produce better results for such a long sustained rate of fire?

Excellent results were also obtained at the annual target practice of this same battery on June 11, 1924, at which the probable error developed at a range of 14,000 yards was 67 yards.

On July 12, 1924, this same battery fired a problem under the direction of the Reserve Officers of the 603d Coast Artillery (Railway), and better results than those obtained can hardly be expected. The last three salvos fired for effect fell as follows: short 30, over 12; short 33, short 3; over 18, over 39, giving center of impact of short 9; short 18; over 24 yards respectively.

Thus we see that these gratifying results obtained by the 8-inch railway gun have not been obtained through mere luck or chance, and have been consistently obtained in practically all target practices that I have witnessed since 1922.

I could not close this article without saying a word in favor of railway artillery, which has now passed its trial stages and which in the successful accomplishment of the mission of Coast Artillery is destined to play a leading part.

A close study of the official railroad map published by Rand McNally Co., will convince anyone that this is an ideal country for the use of railway artillery, where the tracks have been laid and the bridges designed to stand heavy loads, and even without further construction there is practically no part of the coast or border lines, that cannot be readily and easily defended by this formidable weapon.

It must be admitted that the Navy is in a better position to judge what type of shore batteries render more effective results in guarding the coast, thus giving the Navy a freedom of strategic movement. If we study the most recent papers on naval strategy and tactics, we will see that experienced officers of our own navy believe that railway artillery presents to an attacking fleet a more complicated and difficult problem than fixed seacoast fortifications. Large caliber railway guns moving about in defense of a coastal area would be very puz-

zling to an admiral charged with landing an army on a hostile coast, much more puzzling than if the same number of guns were in a fixed position where their range is known and cannot be extended. However, if they are able to shift their position along the coast, the area they defend is no longer a semicircular one, but is a broad coastal band that is very forbidding to hostile fleets and transports.

Better Antiaircraft Guns

[Reprinted from the *New York Times*]

The practice firing of antiaircraft guns at targets towed by airplanes near Fortress Monroe, March 6, was so poor that it was generally believed General William Mitchell had proved his case. It was his contention that bombing planes were in no serious danger from guns mounted on ships or in fixed positions on shore. At the front in France planes seldom succumbed to gunfire, although shot at constantly. A service periodical, the *COAST ARTILLERY JOURNAL*, took issue with General Mitchell in its March number. Admitting that a few years ago the Army and the Navy had no antiaircraft guns to afford protection to military and industrial areas, it said:

Today, thanks to the enormous strides that have been made in the development of our antiaircraft guns, conditions are vastly different. Even with the equipment we now have, America's antiaircraft troops would make it a most hazardous undertaking for an enemy flier to soar over any area defended by them. These troops are not at present equipped with the last types of antiaircraft cannon and machine guns. When they are so equipped, no enemy bombing plane will be able to fly at a sufficiently high altitude to avoid the probability of being quickly shot down by them, nor will any enemy fighting plane be able to attack at low altitudes without being met with a withering fire from our newly developed, high-powered machine guns with their rate of fire of 450 rounds per minute.

This service paper seems to be right, judging from the results of recent practice firing at Fort Tilden, New York, Fort Barrancas, Fla., and San Francisco. At Fort Tilden the target used was a cloth bag about nineteen feet long and five feet in diameter, tapering down to three and a half feet. Its surface was about one-fourth that of a bombing airplane. At the end of a wire, 2100 feet long this target was towed by a plane at an elevation of 6000 feet. The Fort Tilden gunners scored twenty-five hits in eight minutes and forty seconds of firing while the target moved at a speed of seventy miles an hour. Altogether 445 shots were fired. According to an advance statement given out at Washington, the percentage of hits was 5.6.

The guns used at Fort Tilden were three-inch. Another report from the New York practice is that sixteen machine guns, firing 15,574 rounds in five minutes, scored thirty-nine hits against low-flying plane targets 3000 feet distant. A "hit" was a technical term as used by two observers of the practice. One was in the plane towing the target and another was on the ground. If a shell burst fifty yards from the flying target, a "hit" was recorded. The reason, given by General Hines, Chief of Staff, is that high explosive shells have a wide range of destructiveness. Single shots are of course not fired at enemy airplanes. The formula adopted for target practice in this case is fair. At San Francisco and at Fort Barrancas, Fla., the firing was not done on such an extensive scale, but a good percentage of hits was scored. In the practice at Fort Tilden one target was shot down and seven holes were counted in other targets.

The showing made by the coast artillerists will doubtless be challenged by aviators. They will not be inclined to acknowledge "bursts" as hits, and they

will point to the fact that the latest bombing airplanes move at a much greater speed than seventy miles an hour. They will argue that the element of surprise does not exist in peace target practice. And they will declare that such practice is always much better in "results" than the scores made in the excitement and nervous tension of battle. The obvious rejoinder is that, just as the COAST ARTILLERY JOURNAL has held, "enormous strides" have been made in improving anti-aircraft guns. They can now comb the sky as never before. As to the experiments at Fortress Monroe on March 6, it is only fair to the gunners to say that the weapons used were not of the latest type and that they had to contend with a very high wind.

Fort Worden, Washington

By FIRST. LIEUT. EDWARD L. SUPPLE, C. A. C.

The history of Fort Worden, Washington, is rooted deeply in the contest for the possession of the western coast of North America. From the voyage of discovery of Cortez in 1521 and Drake in 1579 dates the struggle between Great Britain and Spain for the possession of our western shore. This struggle, spurred on by the Russian explorations and the raise of the Russian fur trade in 1740, was finally concluded by the Nootka Treaty in 1790, in which Spain relinquished title to the region north of the Oregon country and gave to England ocean to ocean possession of what is now the Dominion of Canada.

The purchase of Louisiana in 1803 was the first step of the new born nation freed from the yoke of a tyrannic government, in its territorial expansion. The exploration trip of Lewis and Clark, 1803-07, whose purpose was to find a portage from the headwaters of the Missouri to the Pacific Ocean, opened up a vast territory in the Oregon country, in their finding of this portage from the Missouri to the Snake River. The way shown, brought later a great influx of settlers to the new country, who engaged in fur trading, from which grew an intense rivalry with their British competitors, the Hudson's Bay Company and the Northwest Fur Company. This, from a rivalry of commerce, became a contest between the two nations for the possession of the new territory which was finally settled in 1846 by the Treaty of Limits. The provisions of the Treaty of Limits continued the northern boundary of the United States along the 49th parallel, westward to its junction with the channel passing south of and separating Vancouver Island from the mainland.

The year 1846 also brought out the consideration of the task of fortifying the western coast of the United States. A joint board of Army and Navy officers studied the coast line and made recommendations for the location of the several fortifications that now exist. A more detailed study and plan was recommended by General J. G. Totten in 1860, which, while action was postponed by the Civil War, resulted in President Johnson, in 1866, setting aside large tracts of land along the Pacific Coast as military reservations. Among these was a tract of 640 acres set aside for the site of Fort Worden. The original tract has been added to from time to time as the need has been shown.

The completion of the transcontinental railroad with its terminal at Seattle, Washington, in 1885, and the construction of Puget Sound Navy Yard in 1891, gave rise to a more complete plan for the protection of Puget Sound.

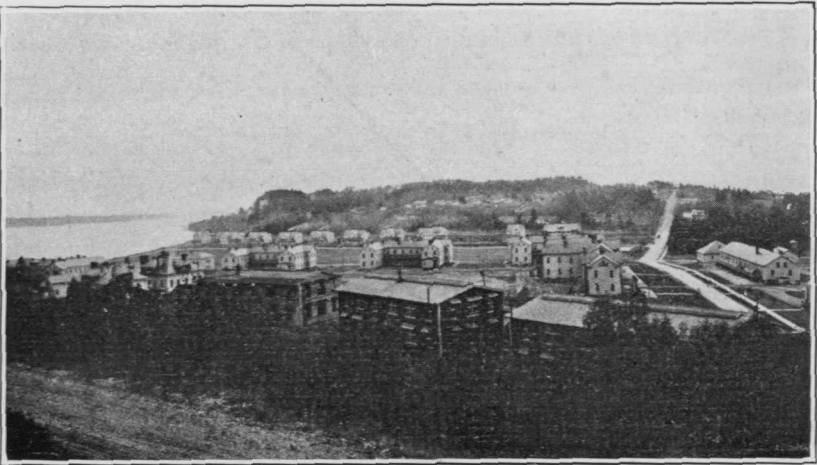
The first batteries constructed were batteries Randol, Quarles and Brannan, commenced in 1898 and completed in 1900. The first two were ten-inch rifles with barbette carriages and the third was a battery of twelve-inch mortars.

The post armament was further strengthened upon the recommendation of a board by Secretary of War Taft, the most modern armament being added to the fortification already installed.

A complete anti-aircraft battery has since been installed, making Fort Worden the most formidable and modern on the Pacific Coast. The present scheme of searchlights was commenced in 1910 and completed in 1911.

Fort Worden during the World War contributed largely to the American Expeditionary Forces, seven regiments of Artillery being organized wholly or in part in the Coast Defenses. Those of the seven that saw action earned an enviable reputation for themselves.

Since the war, Fort Worden, in addition to being charged with the keeping of an adequate defense, has also been given the task of the annual training of the Oregon and Washington National Guard and the Organized Reserves in the State of Washington.



Although the authorized quota of men allotted to the Coast Defenses has been reduced, the training at the several forts is still being carried on with the same high standard of excellence. At the present time preparations are being made for the annual target practice, which holds the attention of everyone.

The Educational and Vocational Training Schools are being carried on by trained corps of instructors. All academic subjects are covered in the educational branch, which, with the Vocational Training School, holds sessions on five afternoons per week. The Vocational School provides courses in Machine Shop Practice, Welding, Forging and all phases of Automobile and Motor Cycle Construction and Repair. These vocational courses have for their laboratories a most complete and modern machine shop capable of turning out any of the largest and most refined pieces of work in automotive construction.

A Service Club, which has been remodeled and enlarged several times since the days of '17, contains a first-class library and assembly room. In the post theatre, housed in the same building, the latest screen productions are shown four times per week.

A brief history of the companies that belong at Fort Worden would complete the story, but it suffices to say that their records date back as far as the days of the Revolution, when the first permanent artillery troops were organized, and their reputations have been sustained through every war since that time.

Approximate Determination of the Height of Burst

By ENRICO BIANCO DI S. SECONDO

Translated from the *Rivista Marittima* by Colonel Frank E. Harris, C. A. C.

On the proving ground as in antiaircraft batteries it may sometimes be desirable to know the approximate height of burst of an antiaircraft projectile when the only data available is the measured angle of site.

The method here given is based on two measurements:

1. The angle of site ϵ , of the smoke ball;
2. The time interval between the burst and its auditory perception.

It will be seen below that the results obtained are more than satisfactory.

Let O be the observer, S the point of burst, ϵ the angle of site of the smoke ball and X the distance measured along the line of site; we will then have:

$$Y = X_{\epsilon} \sin \epsilon.$$

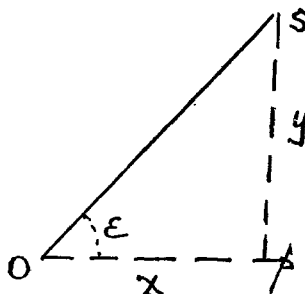


FIG. 1

If W is the velocity of sound and τ the time between the burst and its auditory perception, we have:

$$X_{\epsilon} = W\tau$$

whence

$$Y = W\tau \sin \epsilon. \quad (1)$$

With reference to the factor W , we know that its value depends chiefly on the temperature and is influenced by the humidity and wind. The humidity influence, however, is negligible (Charbonnier.—*Balistique extérieure*) and the wind effect will be discussed further on, so that we may say:

$$W = W_0 \sqrt{1 + \alpha \theta}$$

in which:

θ = air temperature on the centigrade scale

$$\alpha = \frac{1}{273} \text{ and}$$

$$W_0 = (\text{velocity for } \theta = 0) = 330.9.$$

This formula was used to calculate Table I for values of θ from -30° to $+30^\circ$.

If, therefore, the temperature of the air stratum to the point of burst were constant and equal to that at the ground the problem would be solved.

But, as is known, the temperature diminishes as the altitude increases.

Hence the problem will have to be solved in two stages. In the first stage the temperature will be assumed constant and thus a first approximate value of Y obtained:

$$Y_{ap} = W_{\Theta} \tau \sin \epsilon$$

in which W_{Θ} corresponds to the temperature at the ground and is taken from Table I.

Having obtained this approximate value we next apply the temperature formula for the altitude Y :

$$\Theta_y = \Theta_0 - \frac{Y}{100} \Delta \Theta \%$$

in which

Y is the altitude.

$\Delta \Theta \%$ the thermal gradient ($\Delta \Theta$ for $\Delta y = 100$ meters), and

Θ_0 the temperature at the ground.

Hence the mean temperature between the ground and the height Y will be:

$$\Theta_m = \frac{1}{2} (\Theta_0 + \Theta_0 - \Delta \Theta \% \frac{Y}{100}) = \Theta_0 - \Delta \Theta \% \frac{Y}{200} \quad (2)$$

The value of $\Delta \Theta \%$ varies according to the stratum of air considered and the season.

Prof. Gamba's experiments have provided the data for computing Table II, which gives the value of $\Delta \Theta \%$ as a function of the season and the approximate height of burst and serves for the computation of the value of Θ_m (Θ corresponding to $\frac{Y_{ap}}{2}$).

With this value we obtain from Table I the value:

$$W_{\Theta_m}$$

whence we finally have:

$$Y = W_{\Theta_m} \tau \sin \epsilon.$$

From trials made it has been found unnecessary to make a second computation to obtain a closer approximation. (The correction after a third approximation in the least favorable cases would be about one-thirtieth of a meter).

Differentiating the formula:

$$Y = W \tau \sin \epsilon$$

and substituting the finite differences for the corresponding differentials, we have

$$\Delta Y = W \sin \epsilon \Delta \tau + \tau \sin \epsilon \Delta W + W \tau \cos \epsilon \Delta \epsilon$$

We see at once that the first and second terms are maximums for $\epsilon = 90^\circ$ and minimums for $\epsilon = 0^\circ$, and that the third term is a maximum for $\epsilon = 0^\circ$ and a minimum for $\epsilon = 90^\circ$, and hence the maximum value of ΔY will be less than the sum of the maximum.

Let us examine the three terms in succession:

1st term: error in τ

$$\text{We have: } E_{\tau} = W \sin \epsilon \Delta \tau$$

which as a maximum value for $\epsilon = 90^\circ$ and W corresponding to $\Theta = 30^\circ$ (an exaggerated value since Θ is the mean temperature and certainly much lower) gives us

$$E_{\tau(\max)} = 348.6 \Delta \tau$$

Based on experiments made by a careful observer and good chronograph, we may take as a maximum value for $\Delta \tau$ the value of 0.25, and hence:

$$E_{\max} = 87.$$

2nd term: error in W .

We have:

$$E_W = \tau \sin \epsilon \Delta W.$$

and for $\tau = 40$ seconds (corresponding) to X_ϵ of more than 12000 meters, a value that is certainly not attained) and $\epsilon = 90^\circ$ gives us

$$E_{W\max} = 40 \Delta W.$$

What error can be committed in W ?

(1) We have neglected the influence of the humidity: but (Charbonnier-Balistique) the correction of W is but a few tenths of a meter: it is therefore absolutely negligible.

(2) The wind for firings at high altitude and large angles of site, which is the case presented in this study, is nearly normal to the line, point of burst—observer, and, moreover, in proving ground firing, must have a limited value and hence its influence is negligible.

(3) The temperature at the ground is measured with all the accuracy that may be desired and cannot give rise to errors.

(4) The value of $\Delta \theta$ % is also quite accurate, due to the accuracy and number of the experiments from which deduced: and it is to be noted there can be no irregular variation under the conditions the firings are executed on the proving ground (fine weather).

Hence it certainly is not an excessive exaggeration to assume 3 m as a maximum value for ΔW , and hence:

$$E_{W\max} = 120$$

3rd term: error in ϵ

We have

$$E_\epsilon = W \tau \cos \epsilon \Delta \epsilon$$

This error may be quite large owing to the difficulty of observation, particularly for a shot bursting at a distance from the predicted point and on which the telescope is directed, but assuming

$$\Delta \epsilon = 2^\circ$$

we are certainly within rather wide limits.

And therefore, assuming for W the value 348.6, for τ , 40 seconds, and for ϵ , 0° , or, adopting the very worst conditions, we have:

$$E_{\epsilon \max} = 348.6 \times 40 \times .034 = 474.$$

whence

$$\Delta Y_{\max} = 87 \sin \epsilon + 120 \sin \epsilon + 474 \cos \epsilon = 207 \sin \epsilon + 474 \cos \epsilon.$$

And therefore the maximum value of ΔY corresponds to a value of $\tan \epsilon = \frac{207}{474}$,

whence

$$\epsilon = 23^\circ 36' \text{ nearly.}$$

Substituting this value in the expression for $\Delta Y_{\max}$, we obtain:

$$\Delta Y_{\max} = 207 (\sin 23^\circ 36' + 474 \cos 23^\circ 36') = 83 + 434 = 517.$$

This value, however, is a maximum which is never attained.

If for example (taking data corresponding to a practical case) we have:

$$\tau = 30^\circ, \epsilon = 75^\circ, \theta_w = 5^\circ.$$

and we assume the commission of maximum errors of the elements τ , W , and ϵ , we have:

$$\Delta Y = 333.9 \times 0.96593 \times 0.25 + 30 \times 0.96593 + 3 + 100170 \times 0.25884 \times 0.034 = 81 + 87 + 89 = 247.$$

We note that we also have the abscissa of the point of burst;

$$X = X_e \cos \epsilon$$

and by also measuring the azimuth with respect to the plane of fire, we obtain the drift.

We would thus have the three coordinates (x y z) of the point of burst, and the time of burning the fuse and hence, lacking other means, we might also deduce the data for a range table. But evidently the method does not give the desired accuracy though it might, for example, be regarded as sufficient on the occasion of fuse testing.

TABLE No. I
Table of values of W for different values of

θ	0	1	2	3	4	5	6	7	8	9
0	330.9	331.5	332.1	332.7	333.3	333.9	334.5	335.1	335.7	336.3
10	336.9	337.5	338.1	338.7	339.3	339.6	340.5	341.1	341.7	342.3
20	342.8	343.9	344.0	344.6	345.2	345.8	346.3	346.3	347.5	348.0
30	348.6									
θ	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
0	330.9	330.3	329.7	329.1	328.5	327.9	327.8	326.6	326.0	325.4
-10	324.8	324.1	323.6	322.9	322.3	321.7	321.1	320.4	319.8	319.2
-20	318.6	317.9	317.3	316.7	316.0	315.4	314.8	314.1	313.5	312.8
-30	312.2									

TABLE No. II
Values of $\Delta\theta$ %

Season	Approximate Altitude of burst											
	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
Winter.....	0.00	0.19	0.29	0.38	0.43	0.49	0.52	0.55	0.56	0.56	0.54	0.50
Spring.....	0.49	0.53	0.54	0.56	0.59	0.62	0.63	0.64	0.64	0.62	0.59	0.54
Summer.....	0.56	0.57	0.58	0.58	0.58	0.60	0.62	0.66	0.66	0.67	0.65	0.62
Autumn.....	0.39	0.46	0.50	0.54	0.57	0.59	0.61	0.63	0.63	0.63	0.62	0.59

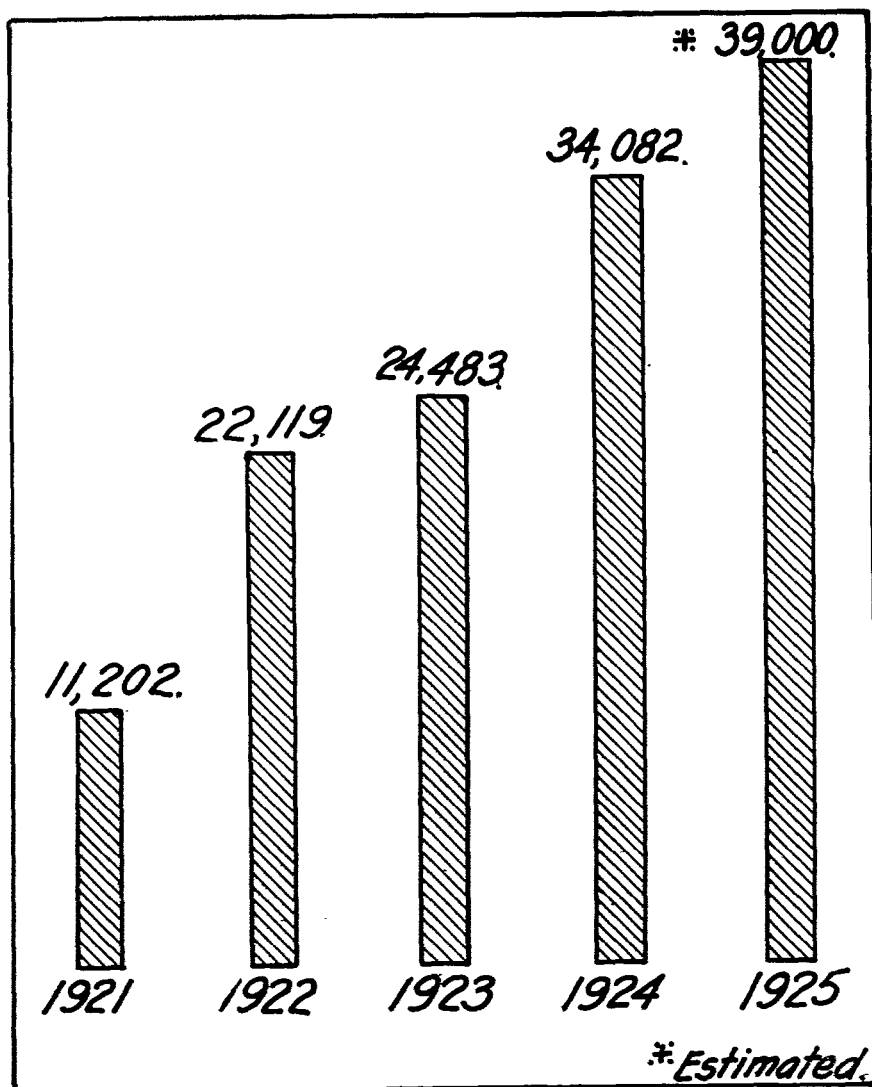
Bachelor of Science in Military Engineering

The following letter was recently received by the Adjutant General of the Army, from Dr. S. W. Stratton, President of the Massachusetts Institute of Technology.

In view of the number of men from various branches of the Army and Navy services detailed to the Massachusetts Institute of Technology for instruction, and after consultation with several of the officials concerned, I am pleased to inform you that the Institute has established a course leading to the degree of Bachelor of Science in Military Engineering.

This course is open only to officers who are graduates of U. S. Naval or Military Academies and to officers in the service who may have received their training at some technical school.

Comparative Enrollment
Civilian Military Training Camps
1921 - 1925



MILITARY NOTES

furnished by

THE MILITARY INTELLIGENCE DIVISION, G. S.

Great Britain

MEDICAL CORPS RESERVES.—It is announced by the British War Office that commissions in the Royal Army Medical Corps Supplementary Reserve of Officers are open to members of the medical profession engaged in civil practice. Medical officers in the Reserve are divided into two categories. Those in the first category (category B) have to undergo a preliminary training at the Royal Army Medical Corps Depot, except in the case of those holding certificates A or B medical of the Officers' Training Corps and an annual training of 14 days. Those in the other category (category C), which is intended for medical men with previous service and those possessing special professional qualifications, are not required to do either preliminary or annual training. The present requirements include a number of specialists in surgery, medicine, mental diseases, X-rays, pathology, bacteriology, and hygiene. The annual gratuity is 25 pounds, and those in category B receive in addition pay and allowances as for Regular officers during all training. An applicant's age should not exceed 32, except in special cases. The rank on appointment is that of lieutenant, corresponding to our grade of 1st lieutenant.

Japan

REORGANIZATION OF THE ARMY.—According to the *Jiji* of May 1, 1925, in conformity with the reform program, the peace establishment of the Japanese Army is to consist of 198,800 officers and men organized into seventeen divisions. This is a decrease of four divisions totaling 37,000 in personnel.

All the transfers, retirements and discharges from active service, resulting from the modernization and reorganization program, will probably have been accomplished by the end of the fiscal year, that is, by March 31, 1926. Should no increase be made in the meantime, the Army would consist of 15,540 officers and 183,260 warrant officers, noncommissioned officers and men. However, as a consequence of the creation of some new units such as antiaircraft battalion and tank companies, and the expansion of other units such as the Air Service, the strength of the Army will be between 198,800 and 205,400 at the end of the present fiscal year. The modernization and reorganization program which is to be carried out by April 1, 1930, calls for the addition of 6600 officers, warrant officers and noncommissioned officers and men, giving a total of 205,400.

Upon the completion of the Reform Program the Japanese Army, according to the *Jiji* will be composed as follows:

<i>Infantry</i>	<i>70 Regiments</i>	<i>706 Companies</i>	<i>Cos.</i>
17 Divisions of	4 Regiments of	10 Companies	680
1 Formosan Regiment of		10 Companies	10
4 Battalions Manchurian Ry. Guards		4 Companies	16
			706
<i>Cavalry</i>	<i>25 Regiments</i>	<i>70 Troops</i>	
17 Divisions of	1 Regiment of 2 Troops	34 Troops	
4 Ind. Brigades of	2 Regiments of 4 Troops	32 Troops	
1 Mach. Gun Troop per each Ind. Cavalry Brigade		4 Troops	

(The organization of Independent Cavalry Brigades as given in Japanese manuals calls for 2 regiments with 1 machine gun troop each, or a total of two for each brigade. However, only four Regiments belonging to Independent Cavalry Brigades actually have machine gun troops. If there are to be only 70 Troops, perhaps same change in the organization of Independent Cavalry Brigades as given in the manuals is contemplated.)

<i>Field Artillery</i>	<i>15 Regiments</i>	<i>90 Batteries</i>	
15 Divisions of	1 Regiment of 3 Bns. of	2 Batteries	90

(The 9th and 11th Divisions have Mountain Artillery instead of Field Artillery.)

<i>Mountain Artillery</i>	<i>4 Regiments</i>	<i>22 Batteries</i>	
2 Regts. of 3 Bns. of 2 Btry. (9th and 11th Regts. in 9th and 11th Divisions)		12 Btry.	
1st Ind. Moun. Arty. (Takata)	2 Bns. of 2 Btry.	4 Btry.	
3d Moun. Art. (Ind.) (Kurume)	2 Bns. of 2 Btry.	4 Btry.	
Formosan Moun. Arty. (Taihoku)	1 Bn. of 2 Btry.	2 Btry.	

<i>Horse Artillery</i>	<i>1 Battalion</i>	<i>2 Troops</i>	
<i>Heavy Field Artillery</i>	<i>8 Regiments</i>	<i>44 Batteries</i>	
6 Regiments of 2 Battalions of 3 Batteries		36 Btry.	
2 Regiments of 2 Battalions of 2 Batteries		8 Btry.	

(7th and 8th Regiments, motorized, have only 2 Batteries per Battalion).

<i>Engineers</i>	<i>17 Battalions</i>	<i>48 Companies</i>	
14 Divisions of	1 Battalion of	3 Companies	42
3 Divisions of	1 Battalion of	2 Companies	6

<i>Railroad Troops</i>	<i>2 Regiments</i>	<i>16 Companies</i>	
2 Regiments of 2 Battalions of		4 Companies	16

<i>Heavy Artillery</i>			
3 Squadrons	8 Independent Battalions	34 Batteries	
3 Regiments of	3 Battalions of	2 Btrys. equals	18
	8 Battalions of	2 Btrys. equals	16

<i>Telegraph Troops</i>	<i>2 Regiments</i>	<i>15 Companies</i>	
1 Regiment of 3 Battalions of		3 Companies	9
1 Regiment of 2 Battalions of		3 Companies	6

(The 1st Telegraph Regiment has an additional Battalion, a wireless Unit.)

<i>Air Service</i>	<i>8 Regiments</i>	<i>26 Sq. (Cos.)</i>
	Pursuit Squadrons	11
	Reconnaissance Squadrons	11
	Bombing Squadrons	4

(Only the 1st 6 Regiments with a total of 16 squadrons are actually in existence although the establishment with a total of 16 squadrons are actually in 1925, has been officially announced. The 8 Regiments are to be completed by April 1, 1929 or 1930.) All Regiments, except the 7th which is the bombing unit, will probably be composite units and have both pursuit and reconnaissance squadrons.

<i>Balloon Corps</i>	<i>1 Corps</i>	<i>2 Companies</i>
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(Only one Company is actually in existence. Another Company is to be added as a part of the Air Service expansion program embodied in the modernization budget.)

<i>Transport</i>	<i>15 Battalions</i>	<i>30 Companies</i>
15 Divisions of 1 Bn. or 15 Bns.		

(The 19th and 20th Divisions in Korea do not have Transport Bns.)

<i>Tank Troops</i>	<i>2 Companies</i>	<i>40 Tanks</i>
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(One Company officially established May 1, 1925 at Korauchi-mura, Fukuoka Prefecture. Tank units are to be completed by April 1, 1928 or 1929.)

<i>Antiaircraft Troops</i>	<i>2 Battalions</i>	<i>6 Companies</i>
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First Battalion officially established at Field Artillery School on May 1, 1925, and removed to Toyohashi on May 7, 1925. Antiaircraft units are to be completed by April 1, 1930.)

MILITARY PROGRAM: The *Jiji* of April 7, 1925, states that the principal object of the Japanese Army is mobile warfare; "that Infantry, in spite of the experiences of the European War, will remain the principal arm; that each Infantry Company is to be equipped with six (three at present) light machine-guns (automatic rifles with tripods), effecting a total increase of 1908 (*sic*) light machine-guns; that the odd numbered Cavalry Regiments belonging to the Cavalry Brigade are to be equipped with 16 machine-guns each, four (4) to each squadron; that range of field guns will be increased from 8,000 to 10,000 meters; that new guns will be furnished the field artillery; and that the supply of the foregoing arms is carried by the item in the Army Modernization and Reorganization Program for 'Improvement of Light Machine-guns, Ordnance, and firing material'."

India

STRENGTH OF ARMY: The following tabulation shows the authorized strength of the Army in India on April first of each year and the proportion of British and Indian troops; the actual strength varies slightly from month to month:

<i>Year</i>	<i>British</i>	<i>Indian</i>	<i>Proportion of</i>	
			<i>British</i>	<i>to Indian</i>
1919	85,989	228,295	27	73
1920	65,926	253,455	21	79
1921	69,559	150,822	32	68
1922	68,411	144,615	32	68
1923	68,563	143,446	32	68
1924	60,514	137,088	31	69

The total annual military expenditure in India during the years in question has been:

	<i>Crores of Rupees</i>	<i>Approximate value in U. S. currency at present rate of exchange.</i>
1919-20	83.00	\$298,800,000.00
1920-21	81.75	291,870,000.00
1921-22	62.20	223,900,000.00
1922-23	67.75	242,100,000.00
1923-24	62.00	223,200,000.00
1924-25 (estimated)	55.48	198,900,000.00

The duties of the War Department General Staff shall be to prepare plans for national defense and the use of the military forces for that purpose, both separately and in conjunction with the naval forces, and for the mobilization of the manpower of the nation and its material resources in an emergency, to investigate and report upon all questions affecting the efficiency of the Army of the United States, and its state of preparation for military operations.—*John W. Weeks, Secretary of War.*

COAST ARTILLERY BOARD NOTES

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

New Projects Initiated During the Month of July

Project No. 366, 12-inch R. R. Mount, (Batignolles).—The Chief of Ordnance made recommendations regarding the correction of minor defects in the 12-inch Batignolles carriage and ground platform. The Board submitted comments on the proposed modifications and recommended an extensive service test of the 12-inch railway gun, model 1918, mounted on all-around fire pivot mount.

Project No. 367, Revision of A. R. 90-20 (Coast Artillery Board).—The Board was directed to revise this regulation to agree with the approved standard form of Army Regulation on the subject of Service Boards.

Project No. 368, Type of Field Desk for Coast Artillery Use.—The Board was directed to study and make recommendations on types of field desks for use by all organizations of the Coast Artillery Corps, including recommendations as to typewriters for field use (whether portable or standard should be furnished).

Project No. 369, Test of Moeller Binoculars.—Three models of the Moeller Binocular have been received for test by the Coast Artillery Board. These Binoculars are of interest because of their compact construction.

Project No. 370, Caliber .30 A. A. Machine Gun Sights (Comparative Test with Tracers).—The Board was directed to make a study of the relative advantages of sights and tracers in firing against antiaircraft sleeve targets. The Board conducted tests and found sights to be superior to tracers as a means of directing antiaircraft machine gun fire.

Project No. 371, Antiaircraft Fire Control Telephone.—The Board was directed to make a test of a system of telephones for transmission of fire control data from the range section to the gun section of A. A. gun batteries. This system was designed and is recommended for use by the Commanding Officer, Battery "B," 61st Coast Artillery

Project No. 372, Taliaferro Antiaircraft Machine Gun Sight.—The Board was directed to make a report on the sight designed by Captain E. H. Taliaferro, Jr., 61st Coast Artillery. This design provides for both lateral and vertical leads depending upon angle of approach and angular height.

Project No. 373, Apparatus and Method of Correlating a Sound Direction Finder and a Searchlight, Particularly for Antiaircraft Defense.—

This is a study by Dr. E. B. Stephenson (Major, Engineer Reserve Corps) and submitted by him to the President of the Board for comment.

Project No. 374, Searchlight Project for Fort Story.—This project is an outgrowth of Projects No. 86 and 362 (Fire Control Communications Systems for Fort Story) which did not provide for searchlights.

Project No. 375, 105-mm. Antiaircraft Gun and Mount, Model 1925—The Chief of Coast Artillery directed the Board to submit comments on the design of the proposed 105-mm. antiaircraft gun and mount.

Project No. 376, Field Glass Allowances for 155-mm. Gun Regiments (National Guard).—The Chief of Coast Artillery directed the Board to make a study of the number of field glasses to be issued to 155-mm. gun regiments of the National Guard

Project No. 377, Tables of Allowances for Signal Corps Equipment and Supplies (Antiaircraft).—The Board was directed to submit comments on the question of communications for antiaircraft artillery and the allowances of communications equipment and materiel for the various organizations of A. A. Artillery.

Project No. 378, Plotting Room Equipment for First Sound Ranging Battery.—The Commanding Officer, 1st Sound Ranging Battery, Fort Eustis, Va., recommended that a more accurate plotting board be obtained for its use. He recommended also that a specially designed wind component indicator be constructed for use in sound ranging. This paper was studied by the Board and forwarded to the Chief of Coast Artillery recommending that steps be taken to secure the materiel desired.

Project No. 379, Artillery Recoil Mechanism Book.—The Chief of Ordnance has recommended the use of a recoil mechanism book similar to the present gun book. The Board was directed to submit comments on its desirability.

Completed Projects

Project No. 262, Drift and Cross Wind Charts for Mortar Deflection Board, Model 1906—

I—HISTORY OF THE PROJECT.

1. The latest firing tables for the 12-inch mortar contain drift values which are more accurate than those given by the DeCarre drift chart. The tables also contain values of the effect of cross-wind on the projectiles. The Coast Artillery Board has constructed a chart which can be inserted in the mortar deflection board, Model 1906, and which gives better deflection correction values than the DeCarre chart.

II—DISCUSSION.

2. All fixed mortar batteries are now supplied with mortar deflection boards equipped with the DeCarre drift chart. This chart is based to some extent on theoretical considerations. In view of the existence in the latest firing tables of

DEFLECTION CHART

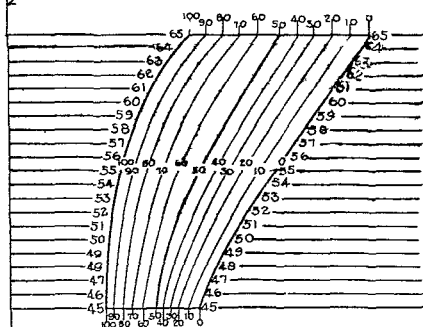
FOR
DRIFT AND CROSS WIND
12-INCH MORTAR
MODELS of 1912
WITH ALIQUOT PART CHARGES

BASED ON FIRING TABLES, DATED NOV. 1924.

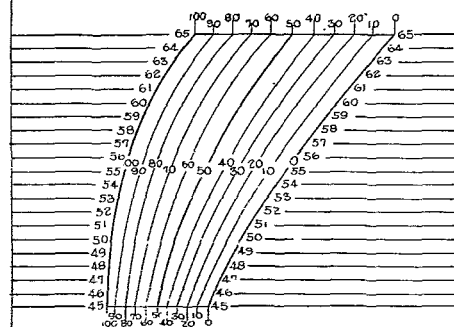
THE COAST ARTILLERY BOARD,

FORT MONROE VA APRIL - 1925.

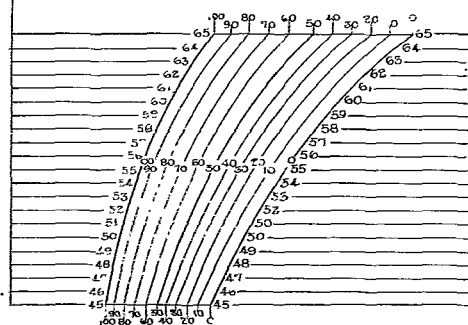
ZERO DEFLECTION



**ZONE
III**
1046 LB.
M.V. 580



**ZONE
IV**
1046 LB.
M.V. 685



**ZONE
V**
1046 LB.
M.V. 790

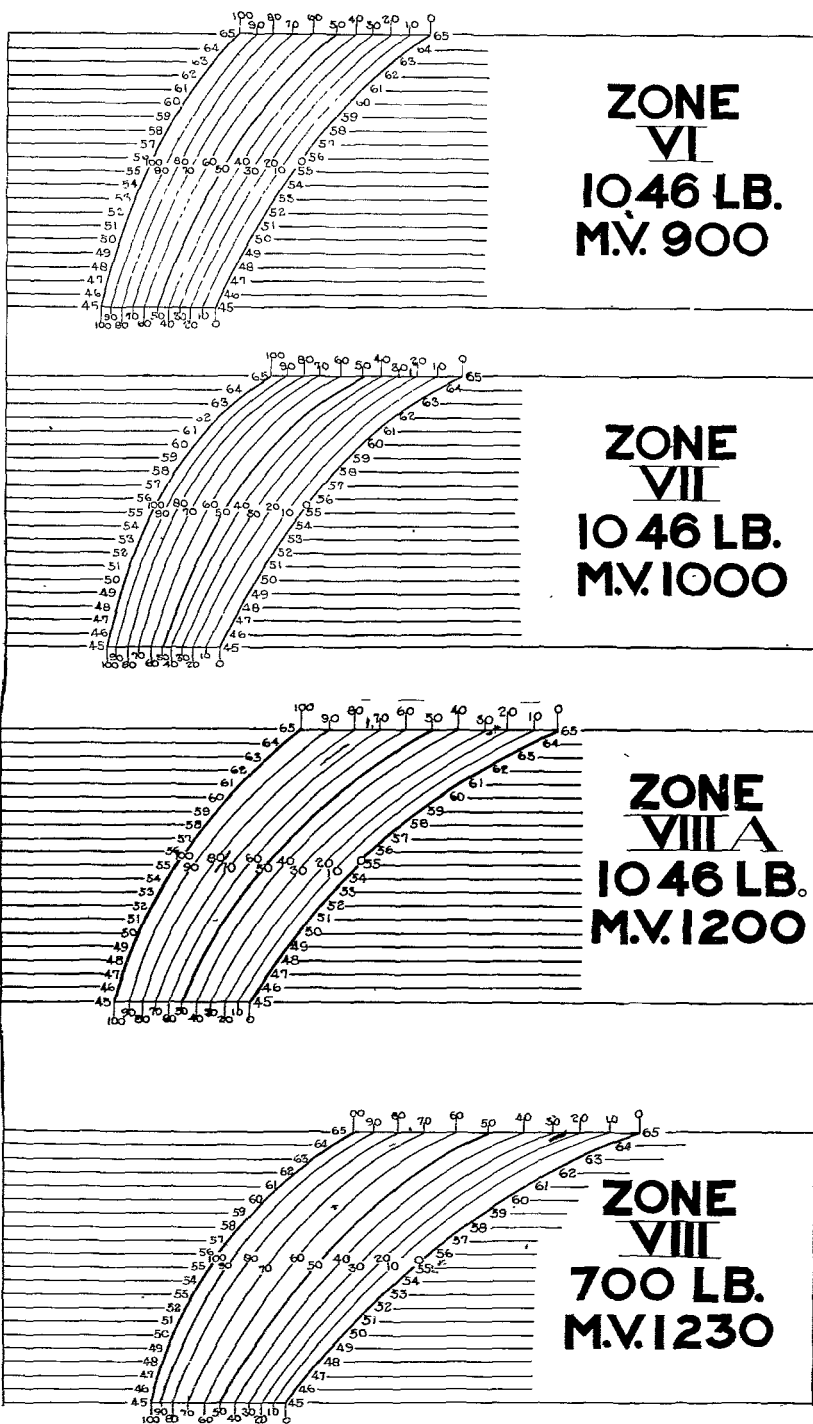
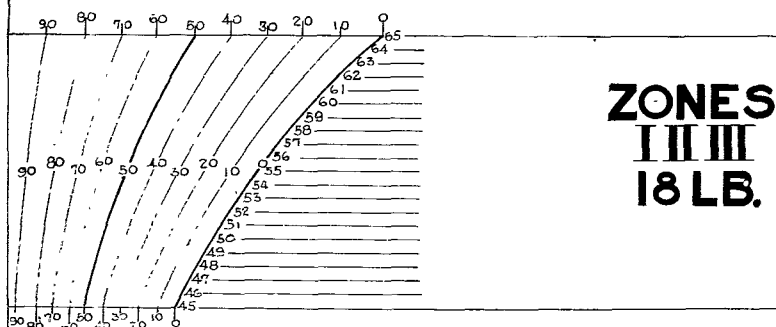
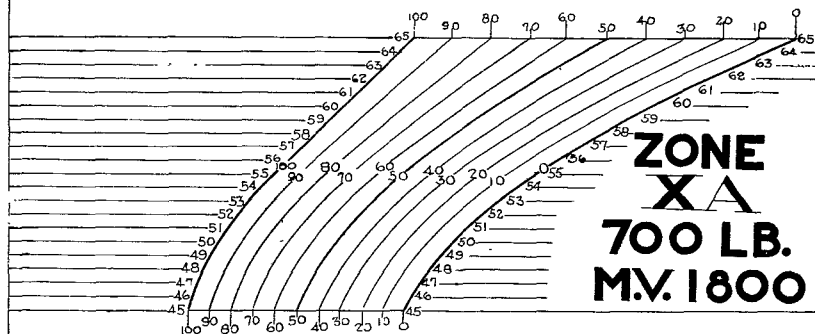
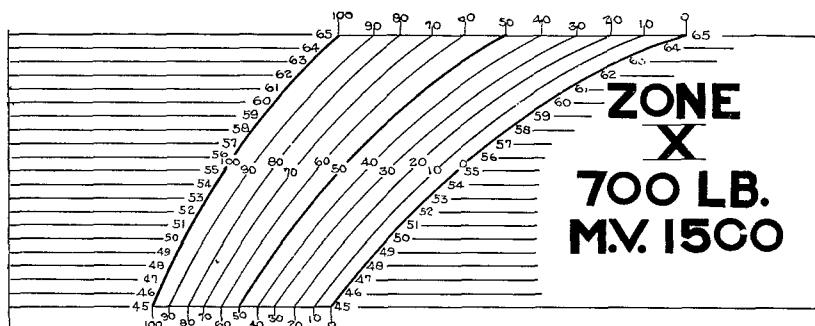


EXHIBIT A



ZERO DEFLECTION

TO ORIENT CHART-1" BEING READ AND SET POINTERS OF DEFLECTION BOARD TO SAME AZIMUTH READING

2" BEING ADJUSTING AND LATERAL WIND CORRECTION SCALES TO NORMAL 3"

3" FASTEN DEFLECTION CHART TO ROLLERS SO THAT "ZERO DEFLECTION LINE" FALLS IMMEDIATELY BELOW THE "3" OF ADJUSTING SCALE.

THIS DISTANCE TO EQUAL LENGTH OF ROLLER BETWEEN FLANGES
14.95"

EXHIBIT A

more accurate measured values of the drift, it would seem that a revision of the DeCarre chart is desirable. The Coast Artillery Board has accomplished this revision and has at the same time included in the chart a set of cross wind correction curves which permits the making of combined drift and cross wind corrections by the setting of a single pointer. Since the introduction of methods for measuring wind aloft, the desirability of making wind corrections in mortar firing has been recognized.

3. A copy of the proposed drift and cross wind chart for use with 12-inch mortars, Models 1890 MI and 1908, on the mortar deflection board, Model 1906, is shown in Exhibit A. This chart is operated in a manner similar to that used in connection with the range correction board. The chart is turned until the corrected elevation appears at the edge of the adjusting scale, and the *arrow* or *three* of this scale set at the proper cross wind reference number as read from the wind component indicator. As changes occur the operator moves the chart to the new corrected elevation and the pointer to the new cross wind reference number. Arbitrary corrections and corrections resulting from trial shots are applied on the so-called lateral wind correction scale. If wind measurements are not available, the pointer may be set on the 50 reference number curve, thus correcting for drift alone.

4. The chart could also be plotted with wind reference numbers along the side and elevation along the top. However, it is not believed that this method of plotting is as natural or as satisfactory as that used in Exhibit A. The rotation-of-earth correction in deflection for 12-inch mortars is almost negligible and does not appear on the proposed chart because the deflection board is so designed that it cannot be made conveniently unless applied as an arbitrary correction.

5. No mechanical change in the deflection board is required to use the proposed chart.

6. A similar chart was used during mortar firing at Fort Monroe and Fort Eustis. It was found to be satisfactory with the exception of minor changes which have been incorporated in the chart shown in Exhibit A.

III—RECOMMENDATIONS.

7. It is recommended that a wind and drift chart be adopted to replace the DeCarre drift chart, until funds are available to equip mortar batteries with a universal deflection board now being developed by the Coast Artillery Board.

IV—ACTION BY CHIEF OF COAST ARTILLERY.

First Indorsement

War Department, O. C. C. A., January 26, 1925—To President, Coast Artillery Board, through Commanding General, 3rd Coast Artillery District, Fort Monroe, Va.

The recommendations of the Coast Artillery Board, contained in paragraph 7 of report on project No. 262, are approved.

Project No. 334, Ballistic Correction Charts for 12-inch Mortars Using Base Increment Type Powder Charges—

I—HISTORY.

1. Complete 12-inch mortar firing tables giving drift, cross wind and range correction values have not yet been supplied for the base increment type powder

charge but they have already been supplied for the new aliquot part type powder charge and the values placed in the latest approved range elevation, deflection, and range correction board charts. Some confusion therefore exists at batteries which are supplied with base increment type powder charges and aliquot part type charts and scales.

II—DISCUSSION.

2. A single cross wind and drift chart is supplied for both D. P. and C. I. projectiles for the standard aliquot part charge for the 1890 and 1908 mortars. A single chart is also supplied for the 1912 mortar for the same kinds of projectiles and powder charges. In using such charts at batteries where only old type base increment powder charges are available, the chart zone to be entered depends on the normal base increment muzzle velocity.

3. The following table shows the aliquot part charge zone corresponding to each base increment charge zone when considering deflection corrections:

TABLE I

Weight of Projectile Lbs.	Base Increment Charge Zone	Charge Velocity F. S.	Aliquot Part Charge Zone	Charge Velocity F. S.
1046	III	660	IV	685
1046	IV	725	IV	685
1046	V	810	V	790
1046	VI	915	VI	900
1046	VII	1050	VII	1000
1046	VIII A	1200	VIII A	1200
700	VIII B	1250	VIII	1230
700	IX	1500	X	1500
700	X	1800	X A	1800

4. The battery commander, if supplied with only base increment charges can temporarily renumber the chart zones in accordance with the above tabulation so that the operator of the deflection board sees only the number corresponding to the base increment zone.

5. Logarithmic range elevation scales for 12-inch mortars are supplied separately for the D. P. and for the C. I. target practice projectiles for the aliquot part type powder charge. One range correction chart which is satisfactory for both types of projectiles for the aliquot part type powder charge is supplied for the 1890 and 1908 mortars and another is supplied for the 1912 mortars.

6. To use the aliquot part range elevation scale and range correction chart at batteries where only the base increment type powder charge is available the procedure can be as follows:

a. The battery commander can temporarily renumber the range elevation scale and range correction chart zone to agree with the base increment zones in accordance with Table I above. In addition the range correction chart can have the normal base increment velocity indicated by a penciled line parallel to the nearest constant velocity line of the chart zone.

b. The range correction board operator, using the temporary numbers, introduces a preliminary ballistic velocity correction corresponding to the difference between the normal aliquot part charge velocity and the actual base increment charge velocity as soon as the base increment velocity is computed or announced. The range elevation board operator also uses the temporary zone numbers for all of his settings. This procedure results in obtaining the proper

corrected elevation for the base increment charge. When complete firing tables have been supplied for the base increment charge range elevation scales, range correction charts and deflection correction charts will be supplied for the base increment charge to all batteries using this type of powder charge.

7. It is to be noted that the range correction and deflection correction charts now being issued by the Coast Artillery Board are based on the assumption that the 1046-lb. projectile is used in the inner zones in order to obtain the maximum effect on the target. The 700-lb. projectile is used in the outer zones to obtain as much range as possible, but with a consequent loss in effectiveness on account of the lower weight of projectile and high explosive charge. This makes the use of the 700-lb. projectile in the inner zones an emergency condition.

III—RECOMMENDATIONS.

8. It is recommended—

a. That the Coast Artillery Board be directed to supply a copy of this project to all 12-inch mortar batteries for which there are requested range elevation scales and range and deflection board correction charts.

b. That this project be brought to the attention of the Chief, Militia Bureau, for such action as he may desire to recommend.

IV—ACTION BY CHIEF OF COAST ARTILLERY.

First Indorsement

War Department, O. C. C. A., March 31, 1925.—To President, Coast Artillery Board, thru Commanding General, 3rd Coast Artillery District, Fort Monroe, Va.

1. Approved.

2. A copy of the report of Proceedings of the Coast Artillery Board on Project No. 334 has been forwarded to the Chief, Militia Bureau, for his information and such action as he might deem proper in the premises.

It is my firm conviction that the duty of National Defense, like the general duty of citizenship, should be broadly extended and borne by all our people.—President Coolidge.

BOOK REVIEWS

Robert E. Lee, the Soldier. By Major General Sir Frederick Maurice. Houghton Mifflin Co., New York. 1925. 5 $\frac{7}{8}$ "x 8 $\frac{3}{4}$ ". 314 pp. with maps. \$4.00.

Major General Sir Frederick Maurice is well known as a military writer and was himself Chief of Operations of the British General Staff during the World War. After examination of the fields of Lee's battles and an exhaustive study of the literature relating thereto, he has written what he calls "an appreciation of Lee's generalship."

The author has prefaced his work with the remark:

Lee, himself, said that his practice in battle was to bring his troops to the field in the best possible way and in the best possible condition and then to commit them to God and his subordinates. This has enabled me to deal very lightly with the stories of the battles and to avoid confusing the main lines of my portrait with details and military technicalities. It has also had the advantage that I have been able to escape almost entirely from those many controversies, which have raged round the performances of particular generals on various battlefields.

In speaking of Lee's strategy, he states:

We find that Lee in his strategy employed three methods, each admirably adapted to the means available and to the political situation at the time. In the first period his policy was, as I have said, purely defensive. He was seeking time to prepare the means for bolder courses, for no one knew better than he that defense by itself is but a sorry weapon. In the second period he was seeking every opportunity to attack, not merely on the battlefields of Virginia, but in the territory of his enemy. He never forgot that he had seen from the heights of Arlington the domes of Washington. He believed that the surest way to cause the North to abandon the attempt to impose union by force of arms would be to seize the seat of the Federal Government, or at least to isolate it from the rest of the Union. So while defending Richmond he had always an eye upon Washington. Military critics are agreed that Napoleon's mastery of the art of war was never more completely displayed than in his first great campaign in Italy. Lee's Campaigns of 1862 are also supreme in conception, and have not been surpassed, as examples of strategy, by any other achievement of their kind, by any other commander in history. Both men had, when they were called to positions of responsibility, a complete grasp of the fundamental principles of war. There are in war few comparisons more striking than that between the inaction of the Southern forces after the first battle of Manassas and Lee's energy, promptness, decision, and boldness in action after the second battle at the same place. True, as I have shown, Davis must take his share of blame for the loss of opportunity in 1861, but in 1862 the President was the same, it was the soldier who was different. One is forced to the conclusion that his absence from Davis' side at this time was fraught with consequences. The evidence is clear that the hastily formed levies of the Confederacy of Manassas were almost as much discouraged by victory

as were the Federal troops by defeat, and Davis had made out for himself a good answer to the charge that he was responsible for stopping an immediate pursuit. But when order had been restored and the unreadiness of the Union was revealed, it is hard to believe that Lee, if he had been given the chance, would not have galvanized the leaders of the Confederacy into action before the winter set in. The troops flushed with victory needed no spur.

The third period of the war, reckoned from the point of view of a consideration of Lee's strategical methods, dates from the failure at Gettysburg. After the battle Lee saw that the growing power of the North and the increasing determination of its people made it impossible to force them to abandon the struggle by an offensive campaign in the border States, even if that campaign were successful. Henceforth the policy for the South was to endeavour to convince the North that the subjugation of the Confederacy was either a task beyond their means or one which would bring them more loss than gain. Lee's procedure was then, not as in the second period to seek to force a decision by boldness and enterprise, but to avoid decision and to cause delay. The Campaign of the Wilderness, of Spottsylvania, and the North Anna is a classical example in military history of how these objects should be sought. In method it was fifty years ahead of the times, and I believe that if the Allies in August, 1914, had applied Lee's tactical methods to the situation which then confronted them the course of the World War would have been changed.

General Joseph E. Johnston, Lee's classmate and close personal friend, the author consider a "good ordinary general," and cites the fact that "when McClellan was hammering at the gates of Richmond, Lee saw that the way to save the town was to make McDowell defend Washington; Johnston waked only to the prospect of a battle with McClellan. There we have a measure of the intellects of the two men." But later on in speaking of the mistake President Davis made in removing Johnston, in front of Sherman in June, 1864, he says, next to Lee, Johnston was the ablest soldier the Confederacy *then* had.

The British are sincere admirers of Stonewall Jackson, perhaps largely because of Henderson's brilliant "Life of Stonewall Jackson," and General Maurice is no exception to the rule. He however says:

It is unnecessary for me to add my quota of praise of Jackson's conduct of the Valley Campaign. Without his tactical skill, fierce energy, and instant comprehension of what was in Lee's mind, Richmond could not have been saved in 1862. But save only in the retreat down the Valley, and in the battles of Cross Keys and Port Republic, the inspiration had in every case come from Lee. For that phase of the campaign the credit must be Jackson's alone. For the initiation of the enterprises which had kept McDowell from Richmond, and brought Jackson to fight McClellan, Lee was responsible, and his daring yet measured planning in adversity displays a degree of enterprise and of strategical ability which has never been surpassed.

Of Longstreet, he says:

Longstreet was an obstinate man. It may be that the experience of Malvern Hill weighed heavily on him, but it is clear that he was obsessed by one idea. He believed the recipe for victory to be to maneuver an army into a position such that the enemy would be compelled to attack at a disadvantage, and there await the blow. That belief of Longstreet's and consequent unwillingness to attack was later to be disastrous to the Confederate cause, and it is at least probable that it saved Pope's army from annihilation on August 29th. Longstreet had in front of him Porter with very inferior numbers and was so placed that he could have speedily enveloped Porter's flank. Curiously enough, while Lee was pressing Longstreet to attack, Pope, who appears to have been unaware that Longstreet's whole force was in the field, was doing the same thing to Porter, who prudently refrained from so desperate a measure until he had more certain informa-

tion of the force opposite him. After the battle Porter was dismissed for failing to do the very thing that Longstreet hoped he would do. A share of the responsibility for Longstreet's inaction must be Lee's. One of the few defects of his generalship was a curious reluctance in battle to back his own judgment against that of his chief subordinates and to enforce his will upon them. It is a hard thing for a commander to draw the line correctly between undue interference and excess of liberty. Lee once described the principles which guided his conduct in battle. "My interference in battle would do more harm than good. I have then to rely on my brigade and division commanders. I think and work with all my power to bring the troops to the right place at the right time; then I have done my duty. As soon as I order them forward into battle, I leave my duty in the hands of God." This, as a system of command, is sound to a point. It is entirely applicable to the commander-in-chief of such huge armies as fought in the Great War, but in forces of the size which Lee commanded some more direct intervention when battle is joined is sometimes necessary. Lee was disposed to err on the battlefield in not asserting his authority enough. He suffered, as the French say, from the defects of his qualities, for it is probable that, if his character had allowed him to be more assertive, he would not have inspired in those he led the devotion which made them endure as men have rarely endured.

After comparing Wellington and Lee the author closes with:

For these reasons then I place Lee as a general above Wellington. "Read and re-read!" said Napoleon, "the eighty-eight campaigns of Alexander, Hannibal, Cæsar, Gustavus, Tuerenne, Eugene, and Frederick. Take them as your models, for it is the only means of becoming a great leader, and of mastering the secrets of the art of war." To that select band of great commanders the name of Robert E. Lee must be added. His exact precedence amongst them I will not attempt to determine, but that they have received him as a soldier worthy of their fellowship, I do not doubt.

The book is delightful reading; it is not a work of simply praise here and criticism there, but an enthusiastic study, largely through the eyes of Lee as shown in *Lee's Confidential Despatches to Davis*, which were published in 1915. "The Profession of Arms" will find it instructive and of absorbing interest. —W. W. I.

The United States and the Philippines. By D. R. Williams. Doubleday, Page & Co., Garden City, N. Y. 1924. 5¾" x 8½". 325 pp. \$3.00.

Judge Williams' book on the American-Philippine relations is, perhaps, the most authoritative book that has appeared on the subject. He was Secretary to the Taft Commission that went to the Philippines in 1900, later served on the bench in the islands, and has lived in the Orient for more than twenty years. He writes, therefore, from long personal contact with the Philippine peoples, as well as from a profound study of their problems.

His book begins with a treatise on the Far Eastern situation as a whole in 1898, with particular reference to the influence exerted by America's entrance on the Asiatic stage on the plans and ambitions of Japan and certain European nations. He then records the story of our entrance, followed by a vivid history (political and economic) of the islands since. He portrays in an interesting and illuminating manner the inherent qualities of the Filipino and the characteristics of the Philippine political leaders.

Most American citizens are not familiar with the history of the recent opposition to General Wood, nor are they aware of the fact that a widespread Philippine Independence propaganda in America was financed by public funds.

Judge Williams covers these matters fully. He arrives at a very definite conclusion as to the future of the Philippines and does not mince matters in the support of his conclusion. His book should be read by every American citizen who would be informed on this problem.—C. S. H.

Far Harbors, Around the World. By Hubbard Hutchinson. G. P. Putman's Sons, New York. 1924. 6 $\frac{1}{4}$ " x 9 $\frac{1}{4}$ ". 324 pp. \$3.75.

If any Army Officer intends to postpone his foreign service tour, let him beware of this book, for having read it, he will be eager to start at once.

The author takes you away from the tourist's trodden path and to out-of-the-way and unusual places. With him you climb to the watch towers of the Great Wall of China, or gaze at the Southern Cross from a moon-lit deck on tropic seas.

If you wish to take a voyage de luxe, having already decided against foreign service, get a copy of this book, an easy chair and be off to the land of your dreams.—L. M. C.

Fundamental Principles of Generators and Motors; Examples. By Prof. F. E. Austin. The Author, Hanover, N. H. 1924. 5" x 8". 108 pp. Ill. \$2.50.

A handy little book giving a clear concise treatment of the subject. The aim of Prof. Austin in this volume, "to consider qualitative phenomena and principles as well as quantitative results, with their relations as regards efficiency," seems to have been attained.

The author introduces his subject with a chapter on induced currents explained in an interesting and somewhat novel manner. He then discusses the principles of the various types of generators and motors laying special emphasis on power efficiency. There are included several applications of Calculus to obtain expressions for the maximum commercial efficiency which are useful and, while the method may not be understood by the reader, the results obtained will be readily understood and can be used by any one interested in this subject. The subject of efficiency is attacked from various angles, all-day, mechanical, electrical and financial. The discussion of costs and financial efficiency will give to the reader a good idea of what size motor to buy and at what load to operate a motor to get the best results. The importance of the first cost of motors is explained.

The principles are well illustrated with simplified diagrams and all of the theoretical calculations are made evident by numerical examples. A set of wire tables is included.

This book should be of value to the engineer. It should be a great help to the instructor in teaching this subject and will give to the engineering student a clear conception of the fundamental principles of generators and motors.—R. W. A.

These United States, a Symposium. Edited by Ernest Gruening. Second Series Boni and Liveright, New York. 1924. 5 $\frac{1}{2}$ " x 8 $\frac{1}{2}$ ". 438 pp. \$3.00.

When the first volume, or First Series, of these highly critical papers appeared to present a reflection of the condition of the nation in somewhat sharply drawn portraits of the several States, reviewers kindly fore-warned those who might wish to cherish snugly sentimental illusions. The same consideration might be shown those who may chance upon this Second Series, for the treatment is entirely similar in tone.

The key-note of the complete series might well be found in William Allen White's "What's the Matter with Kansas," and the editor may possibly have had

that suggestion in mind in opening the first volume with a contribution by the analytical Kansan. "Kansas: A Puritan Survival," leads the way, followed by "Maryland: Apex of Normalcy," by none other than the celebrated Mr. Mencken, in what is probably the most normal of his published essays. "Mississippi: Heart of Dixie," "Ohio: I'll Say We've Done Well," by no less an analyst than Sherwood Anderson, and others in their turn more or less spectacular, comprise the First Series, which appeared about a year ago.

It may be possible that the editor felt some twinge of conscience at the shattered story-book and school-history images of the various commonwealths exhibited in the first volume, for his choice of an introduction to the second is "Virginia: A Gentle Dominion," a comparatively softened treatment of this, as it is called, "garden of memories," in the Corot manner. Sinclair Lewis offers a rather colorless portrait of "Minnesota: the Norse State," and others, perhaps less widely known, contribute "Florida: The Desert and the Rose," "West Virginia: Mine Field Melodrama," "New Hampshire: Not Yet Abandoned," "Wyoming: the Maverick Citizenry," "North Carolina: A Militant Mediocracy," "Oklahoma: Low Jacks and the Crooked Game," "Kentucky: Where Men Die Standing," and "Indiana: Her Soil and Light," by Theodore Dreiser, but lacking, strange to say, the Dreiser touch. Montana, Illinois, Idaho, New York, Washington, New Mexico, Rhode Island, Missouri, North Dakota, Georgia, the District of Columbia, Alaska, Porto Rico, and Hawaii are all portrayed through the favorite spectacles of their investigators; why the Philippine Islands has been omitted is not explained, but certainly not because material for the most caustic word-artist is lacking.

It may be observed that the sub-titles tagged to the States are arresting. So are the articles. Few lack the cynic's touch, or perhaps it would be more charitable to say that the portraits have emphasized the warts, according to the angle of the artist's point of view. To Army people, who may be said to pride themselves upon seeing things as they are, a reading would be more convincing than refreshing; to any one possessing a good digestion and a well-balanced critical sense, the book would be productive of a far clearer vision of these United States than any premeditated investigation from the window of a Pullman car, or even, perhaps, from the hurricane deck of the family Ford.—K. S. P.

Einstein's Theory of Relativity (Third Edition)... By Max Born. Translated into English from the German by Henry L. Brose, M. A. E. P. Dutton & Co., N. Y. 293 pp. \$5.00.

This is an excellent popular work on relativity. Its purpose is to give a reader having a knowledge of mathematics limited by elementary algebra, an outline of Einstein's theory on space and time. The method used is the semi-historical one. In the first two-thirds of his work the author endeavors to prepare the reader for an understanding of the theory by presenting the fundamental conceptions and facts of physics in popular form. It is by stressing the physical basis that he leads up to relativity. He explains how it was necessary for relativity to be developed in order not to hinder the development of physics.

The material appearing in the book was first brought out as an elaboration of a series of popular lectures on relativity which Professor Born gave in Germany during the winter of 1919-20. At that time the English astronomical expeditions had just confirmed one of the predictions of the theory of relativity, thus giving a sudden impetus to public interest in the theory. In this, the third edition, the treatment of Einsteinian relativistic dynamics has been simplified to a certain extent.

The book may be classed between those works which avoid all mathematical explanation and those which include too much mathematics for even the reader who has had a scientific training. It will be most interesting to one who is fresh from a college course in physics, or to one who on account of the scientific or technical nature of his work is compelled occasionally to use his knowledge of physics. It must be read slowly and perhaps two or three times to get its full value, but the time will be well spent. The theory of relativity is the greatest scientific achievement of the age. It is the final picture of the world presented by science at the present day. It is a guiding thread in the most important regions of physical research. It has an interest reaching far beyond mathematics and physics into realms of philosophy. Anyone who is interested in science should desire to have a glimpse of these new and broader concepts of the universe and reality.

The translation is good and the illustrations sufficiently numerous. The first five chapters give a very good review of physics and its unsolved problems. The last two chapters which are devoted entirely to the new ideas introduced by relativity are not very easy to absorb at first reading, because of the detailed logical reasoning. The material in the book is a fitting sequel to a course in physics of the junior or senior college year. Whether or not a complete understanding is obtained from the book—this can hardly be expected—nevertheless one cannot escape many of the conceptions of space and time which in themselves are the important and interesting things connected with the theory.—P. S.

The German Secret Service. By Colonel W. Nicolai, Chief of the German Intelligence Department during the World War. Stanley Paul & Co., London. 5 $\frac{3}{4}$ " x 9". \$2.50.

This book is a clear and concise account based on the author's experience of the activities of the German Intelligence before, during, and after the war. Disregarding the propaganda features, it is an interesting narrative. Beginning with the historic development of Espionage, the author then takes up the preparation for war insofar as they relate to the training of the intelligence officer and of the Intelligence Service. In showing what the Germans had to combat, he describes the French, Russian, and British Intelligence Services and freely states that France and England had better organized and functioning services before the war than did Germany. Succeeding chapters deal with the Outbreak of War, the Eastern Front, the Western Front, Secret Service in neutral countries, and an interesting chapter on Espionage in the Homeland, in which he sadly states the large number of Germans employed as spies by the Allies, chiefly by England, to operate in Germany. The concluding chapter shows the breakdown of this service after the war, and the author deplores the fact that Germany learned little of the value of intelligence as a political and economic asset, as in her post war organization it plays as small a part as it did before the war.

Germany seems to differ little in this respect from our own government.

The book is of special interest to any one who is a student of the subject, and it is very interesting for the general reader.—W. W. H.