

THE COAST ARTILLERY JOURNAL

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CONTENTS

SEARCHLIGHT BATTERY PARK, 64th C. A. (AA).....	<i>Frontispiece</i>
A TRIP TO HAWAII.....	<i>By</i> COL. H. E. CLOKE, C. A. C. 475
PROTECTION OF INFANTRY AGAINST AIR ATTACK By CAPT. JAMES E. WHARTON, Infantry	489
THE SOLO ROLE OF ANTI-AIRCRAFT ARTILLERY IN AIR DEFENSE	497
THE FUTURE OF AIR WARFARE.....	<i>By</i> A. E. BLAKE 504
THE ATTACK OF DAYLIGHT BOMBING FORMATIONS By AIR COMMODORE C. R. SAMSON, C. M. G., D. S. O., A. F. C.	514
ELIZABETHAN COAST ARTILLERY.....	<i>By</i> J. R. CLEMENS 518
EDITORIAL—THE COAST ARTILLERY JOURNAL—THE ORGAN OF THE COAST ARTILLERY CORPS.....	522
COAST ARTILLERY ACTIVITIES	525
<i>Inspection visits by Officers on Duty in Office of Chief of Coast Artillery—Test of Harbor Defenses on Caretaking Status—Special Course at Chemical Warfare School—Air Corps Maneuvers, Mather Field—Selection of Reserve Officers to Attend C. and G. S. School—The Coast Artillery School—Harbor Defenses of Honolulu—The 11th C. A. (HD)—The 51th and 52nd C. A.—The 61st C. A. (AA)—The 62nd and 69th C. A. (AA)—The 64th C. A. (AA).</i>	
PROFESSIONAL NOTES	538
<i>Changes in T.R. 435-55 (Target Practice Regulations)—The Use of Chemicals Against Aircraft—Artillery Observation and the Motorized Balloon—Trefoil Hangers for Water Sterilizing Bag—Automatically Controlled Parachutes.</i>	
COAST ARTILLERY BOARD NOTES.....	546
YOU TELL EM	548
<i>Major Clark's Letter—Onagarchus Onagain—Belated Honor (Ye Ballade of Ye Anciente Cosmoline)—Foreign Demand for Mathematics.</i>	
COAST ARTILLERY ORDERS.....	554
INDEX	561

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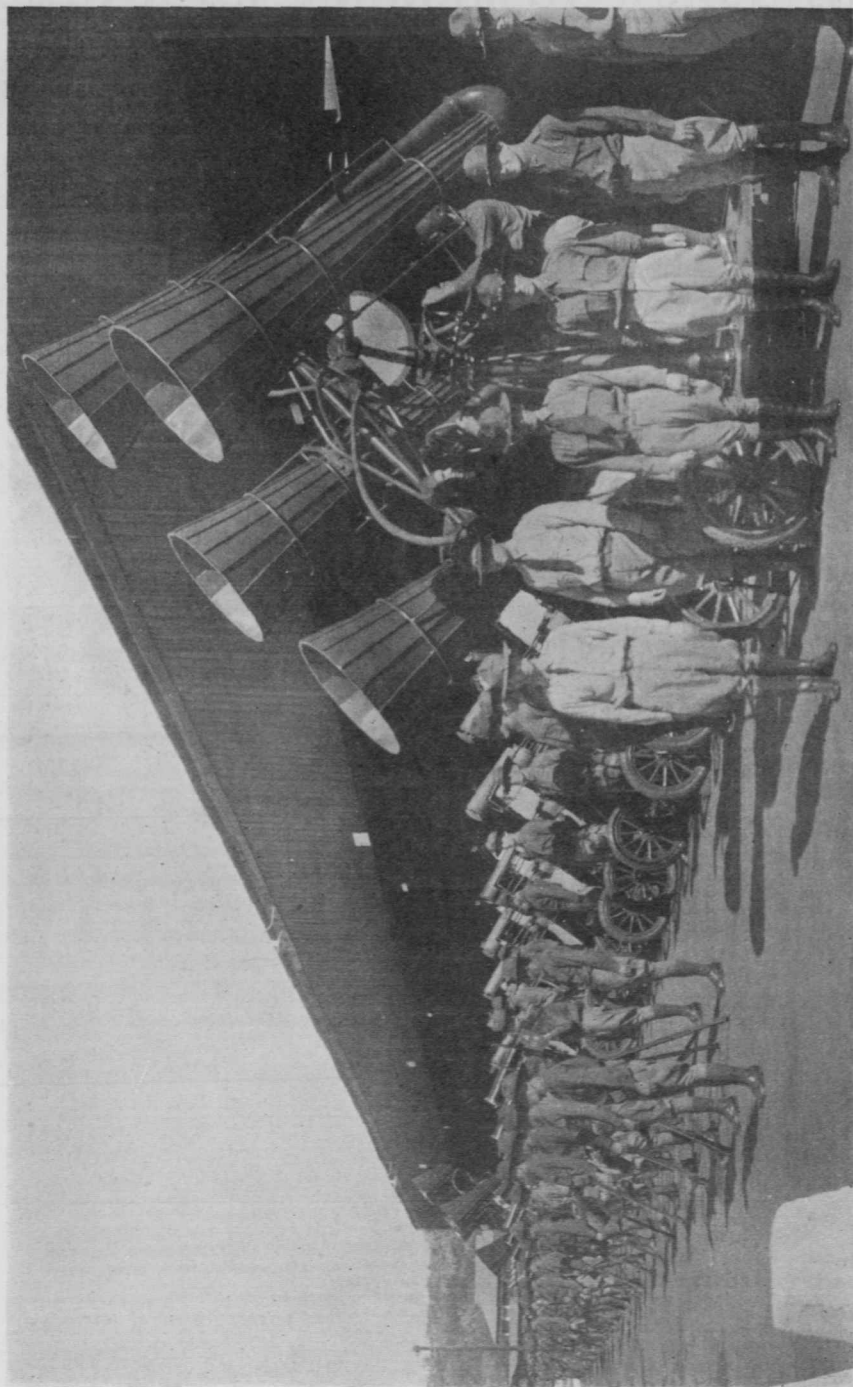
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SEARCHLIGHT BATTERY PARK, 64TH COAST ARTILLERY (AA), FORT SHAFTER, T. H.

A few minutes before inspection by Brig. Gen. R. E. Callan, U. S. A. Officers, left to right: Capt. Nyal L. Adams, Maj. T. M. Chase, 1st Lieut. Joseph E. Harriman, 2nd Lieut. Paul A. Jaccard, 2nd Lieut. August W. Schermacher

THE COAST ARTILLERY JOURNAL

Volume 72

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Number 6

A Trip to Hawaii

By COL. H. E. CLOKE, C. A. C.

WHEN you see your order in the paper and you grab the phone to call your wife and tell her to "pack up the old kit bag" for you're going to Hawaii, a big thrill shivers your timbers. Everyone has heard of Hawaii but few know much about the inside story and the intimate details of personal concern.

The Editor of the JOURNAL has so pestered me with duns (Ed. Note: We learned it from him) for this article that I have finally succumbed. I wouldn't have done that if he hadn't been an old friend.

Let us start from New York and "shoot the whole works" all the way from Manhattan to Porto Rico to Panama to Corinto to San Francisco to Honolulu. This plan, if I do not dub, slice or fail to keep my eye on the ball, should give us a good perspective of the whole six holes, not to mention the scenic beauty of the fairways.

The immediate problem, on completing the agony of packing up and checking the bank balance, is to decide where to stay in New York. There are only about a million places there, to be sure, but we always found the Holley at Washington Square the favorite. (So decided due to low cost). The Hostess House at the Brooklyn Base (Transport Docks) is also very good. But if you want to have a little fun, such as a theater or two before you sail, taxis or street car fares will bring expenses up too high, if you stay at the Base. Prior to sailing I visited the Brooklyn Army Base, registered and obtained my stateroom assignment, also paid for subsistence in advance. About ninety dollars (wife and two boys).

When the transport sails you get many thrills and I must add many regrets. Three years away from the old U. S. A. is a *long time*.

PORTO RICO

San Juan is sometimes the first stop. Here you have an opportunity to take a jitney ride across the island on the old Spanish Highway. Abanito, the mountain pass where the Spanish Regulars entrenched themselves during the latter part of the Spanish War, is a very attractive and picturesque place for any traveler. Then comes Coamo with its famous Banos de Coamo, then Ponce, on the southern shore. You will profit by this trip and also be greatly interested in the natural resources of the country.

PANAMA

This is the "big shot" on the whole trip. Everyone is listening attentively to the "oracles of information" on deck and in the saloon, on Panama. Much has been written and much said about this remarkable place.

Sailing into Limon Bay, we see the coast forts on either side—Fort Randolph at the left side and Sherman, right. Fort DeLesseps is directly adjacent to the Washington Hotel and is Harbor Defense Headquarters. Many people are at the dock to greet the transport and there is usually a band. Everyone gets a pass. The first place most everyone finds is Front Street with its wonderful Zone Commissary where Minton china and



DIAMOND HEAD

delectable linen can be purchased far below States' prices. Then, also, here are the Indian stores. Don't buy anything unless you have a friend stationed in Panama who knows the ropes; then go the limit for you'll never get such an opportunity to get wraps, shawls, etc., at such low prices again.

There is good draught beer in Colon! Colon is foreign territory.

The next morning we sail through the Canal. It is a great trip and most instructive and intensely interesting.

On passing by Flamenco, the big fortified island on the Pacific side, most everyone goes to their stateroom for a nap, others (neurasthenics), play bridge. The trip from now on is quite interesting in spots. The volcanoes of Nicaragua and Mexico are actively interesting and weird.

The stop at Corinto to let off Marines, Army Engineers, and mules,

is quite an exciting event, especially the unloading of the mules. The harbor here is far from safe and there is considerable swell. Anyone can imagine the difficulties attending unloading with but a winch, boom and a rope net.

SAN FRANCISCO

If your wife comes from San Francisco, do not say anything about "Golden Gate" if you enter the harbor in a fog.

It has been my observation that this gate is foggy about ninety-nine per cent of the time. As to the "golden" part of this gate, well, there is a rainbow frequently seen near Oakland.

When you do finally break through the foggy, foggy dew, the great

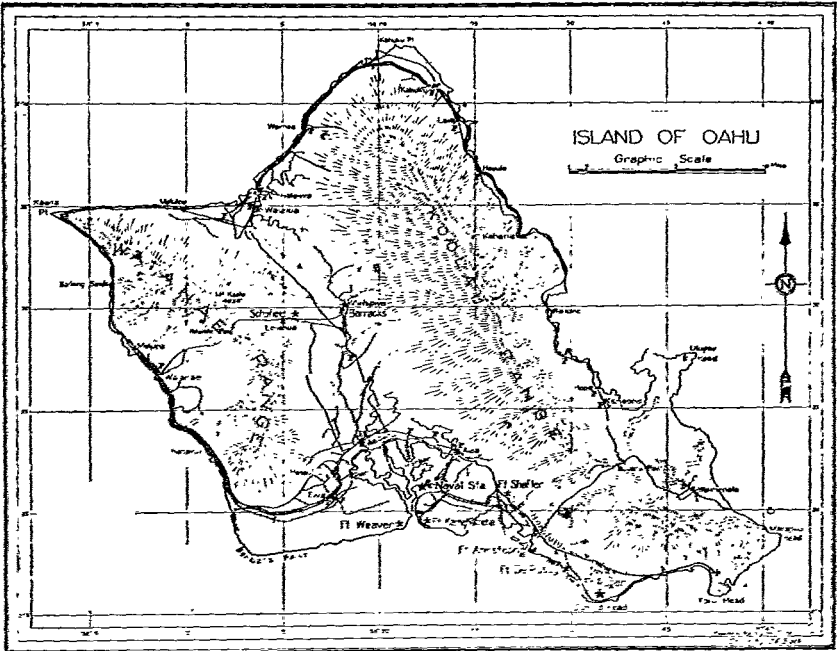
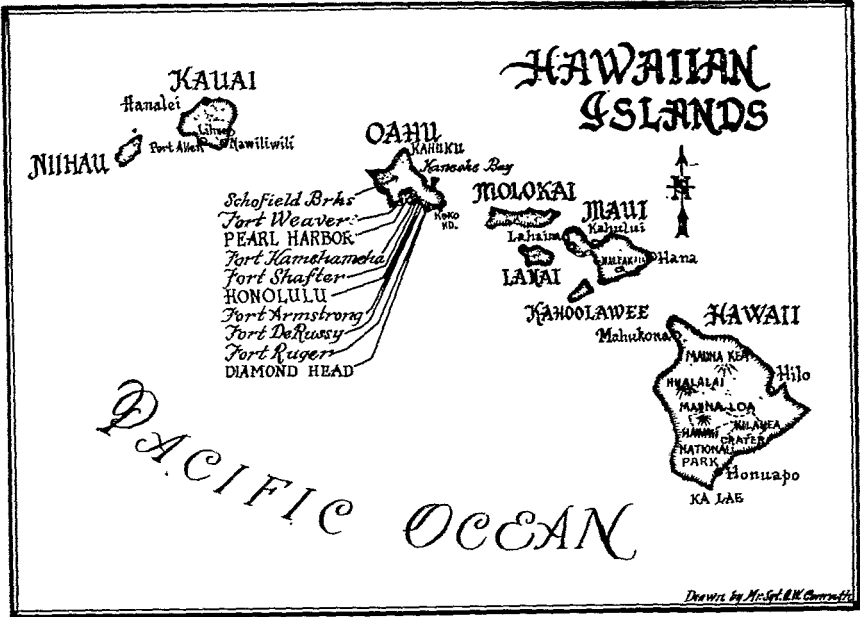


HONOLULU "HULAS"

metropolis of the West gives you a great thrill. Everything and everybody seems to be fairly tingling with life and energy, and it is most contagious. You just naturally swing in with the crowd and step right out. The flowers, the drives, the very air makes you love it. We all have a delightful five days here. There are many good and reasonably priced hotels which make special offers to service people.

On the way at last for Honolulu. The ups and downs of the famous San Francisco bar put a "kibosh" on all loquacious passengers of the transport. Very few go to the table that night. Some member of the crew invariably gives the command "Heave" without authority.

Usually the trip from now on is quiet, restful and most acceptable. Six days pass quickly.

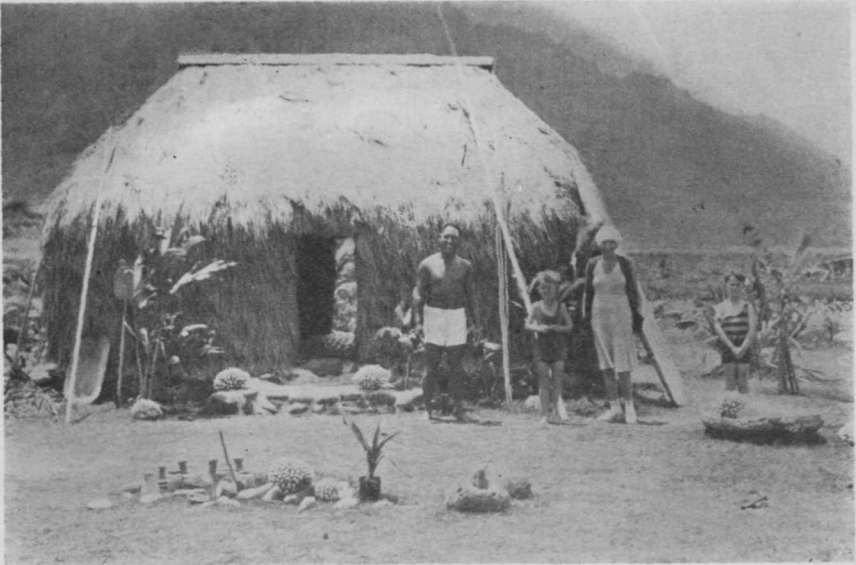


HAWAII

Land ho! Molokai is sighted. Everyone peers anxiously for Oahu. Finally we see Koko Head. Then the full island itself. A weird, magnificent, inspiring picture. We pass Diamond Head, slow down and enter the harbor of Honolulu.

Before going further I will try to give you a general description of the Island of Oahu.

The sketch map shows the Hawaiian Island group. As the transport nears its destination a faint outline of Molokai can be seen. Finally Koko



NATIVE HUT

Head on Oahu comes into view and from now on a constantly shifting scene of tropical grandeur, strange, weird volcanic shapes, startling and vivid coloring greets the eye. These islands are all of recent volcanic origin, geologically speaking. Originally, that is when the Polynesians or Hawaiians first came here in their outrigger canoes, they were entirely barren. These people brought their animals and many varieties of seeds with them. As time went on shipping brought to the soil here all manner and form of tropical fruits, trees, and plants. Practically everything grows here. Water seems to be about the only requisite for any flourishing vegetation. Soil is good and there is plenty of water available.

On the second sketch map it will be noticed that the Island of Oahu is shaped like a parallelogram, one large flat plateau in the center with two mountain ranges on the flanks. A mere glance indicates the sensitive points, i. e., Pearl Harbor and vicinity and Waialua and vicinity. The mountain ranges are so steep on the seaward sides as to be impassable.

The largest fort or post is Schofield Barracks, located in the very heart of the pineapple-growing area. All along the road from Honolulu to Waialua, pineapple and sugar-cane plantations extend for miles.

The next largest Army post is Kamehameha, Coast Artillery. The other large Coast Artillery commands are Fort Ruger and DeRussy (one command) and Fort Shafter (AA and Department Headquarters).

The roads around Oahu are all excellent. A drive from Honolulu over the Pali to Kaneohe to Kahuku to Haleiwa to Schofield to home is a nice day's run allowing plenty of time for lunch. The road from Honolulu to



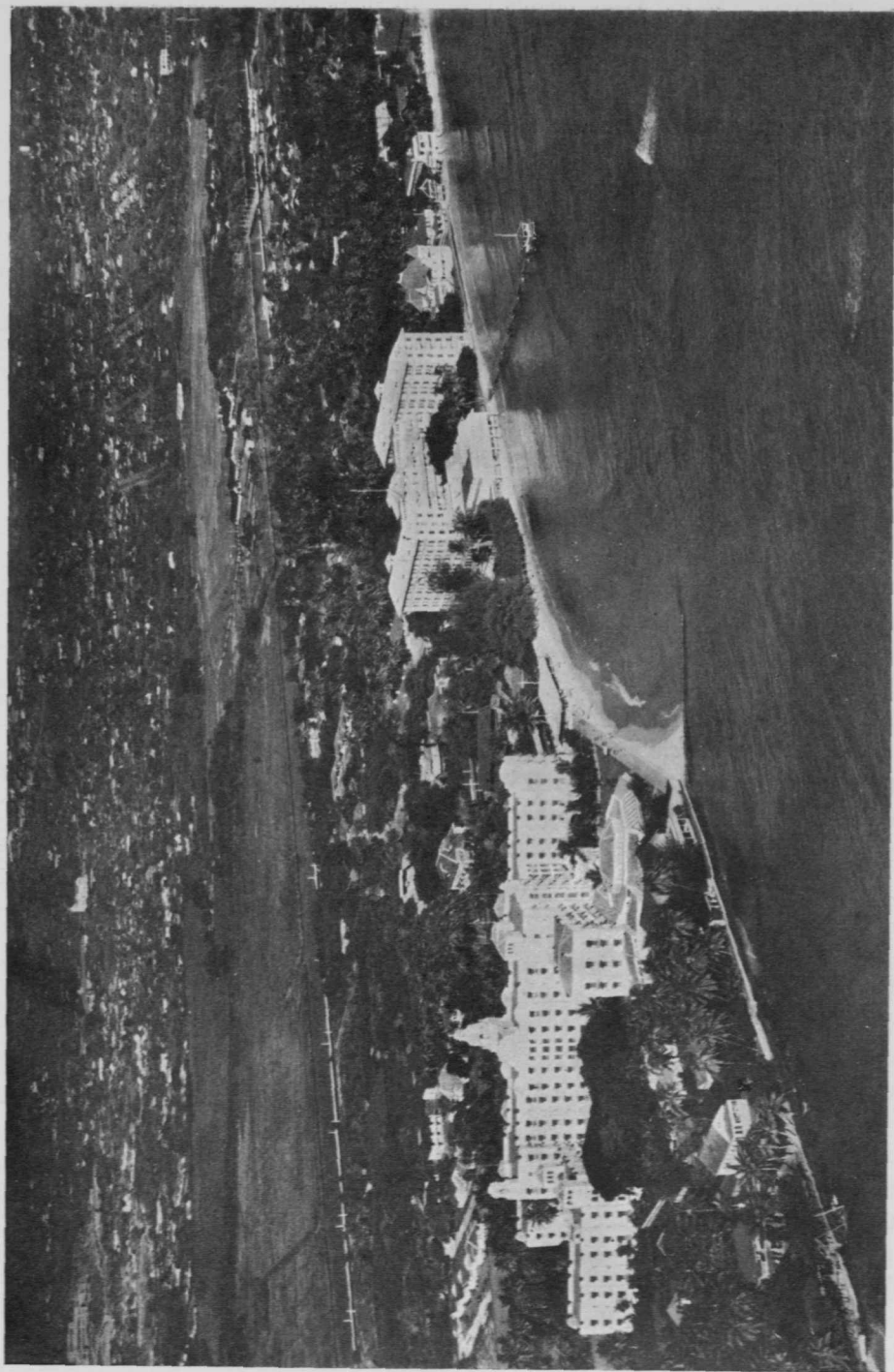
Waianae passes through mile after mile of sugar plantations. The beaches along the Nanikuli shore afford very good places for picnics or week-ends. The beaches on the east shore, such as Waiamanalo, also offer attractive swimming and picnic places.

The climate of Oahu is, generally speaking, June weather of the Middle Atlantic States. It is cooler at Schofield, in fact, no trouble occurs here in growing strawberries. At Kamehameha, it is perhaps more humid but cool and plenty of sunshine.

Fort Ruger is about three hundred feet above sea level and is cool and desirable.

As to the general question on "what to bring in the way of furniture and clothing."

Practically everyone agrees that your furniture, rugs, pictures, etc., do not seriously deteriorate over here. Many people bring everything they have and enjoy it. We brought everything, even the washing machine, and now we are enjoying our good judgment.



WAIKIKI BEACH, HONOLULU, T. H.

Clothing. Many Army people bring all their clothes, winter and summer. I believe this is wisest. You certainly need most of it going and coming. You will also need winter clothing when you go to the Army Rest Camp at Hilo on Hawaii. There are no post commissaries. All commissaries are consolidated into one which is in Honolulu.

The servant question is not so very difficult. Almost anything can be obtained in this line. I know of one couple (lieutenant) paying five dollars a week for a Jap girl. Others pay one hundred dollars a month and more for Jap couples. So it goes.

Housekeeping is not difficult. Markets everywhere. Piggly Wiggly's, Chinese markets, fish markets, and back-door hucksters. All quarters have gas ranges. Oil burners in some barracks. Good ice boxes and good ice delivery.

As to uniform. I would, if I had to do it over again, get all my uniforms here from the local post tailor. There are plenty of tailors everywhere here. Officers are allowed plenty of time to get uniforms. Most of us wear our gaberdeens or heavier States uniforms frequently. Khaki is worn for inspections and ceremonies. White for evenings, and frequently, mess jackets. Civilian clothing is worn a great deal. Blue serge coats, white flannel or gray trousers. Tuxedos are in great demand for dinner parties.

If you like golf there's plenty of it here and a good golf suit will be handy. A light sweater also is handy. There are two splendid eighteen-hole courses here: the Oahu Country Club, nine dollars and fifty cents a month for the services and Waialae Club, twelve dollars and fifty cents per month. There is also a good eighteen-hole course at Schofield Barracks and a fair nine-hole course at Shafter. This latter costs but two dollars a month.

TACTICAL NOTES

There are two harbor defense systems here: Harbor Defenses of Pearl Harbor and the Harbor Defenses of Honolulu. The former is located at Fort Kamehameha while the latter consists of two posts, Ruger and DeRussy. DeRussy is headquarters for the Separate Coast Artillery Brigade and is manned by Batteries A and D, 16th C. A., and the Recruit Training Center. DeRussy is a sub-post of Ruger.

The largest garrison here is at Schofield Barracks.

Fort Shafter is really divided into two parts: The Department Commander's Staff and Special Troops and on the east side of the gulch, the 64th Antiaircraft Artillery. The quarters for the former are excellent, while for the latter, they are old temporary shacks, somewhat remodeled. Most officers stationed with the 64th are on a commutation status.

The keynote to good health for all personnel here is plenty of *exercise and work*. If you fail in this, you will fail in everything else.

So much for my general summary of the situation over here.

Several officers from different posts have contributed short screeds on their particular situations. They are attached hereto with the belief that they will be of interest to those figuring on being ordered here.

Master Gunner O. W. Conrath has furnished most of the photographic talent in this article.

HARBOR DEFENSES OF HONOLULU

By CAPT. FRANCIS L. CHRISTIAN

The Harbor Defenses of Honolulu consist of Forts Ruger and DeRussy, garrisoned by the 16th Coast Artillery and the 2nd Battalion, 55th Coast Artillery.



SURF RIDING, WAIKIKI BEACH

Situation: Fort Ruger is located six miles from the center of Honolulu, just under Diamond Head, at an elevation of about three hundred feet. It is the coolest post on the island of Oahu and is a very desirable and sought-after station for both officers and men.

Fort DeRussy is on Waikiki Beach, three miles from town.

Quarters: Officers' quarters at Fort Ruger—eighteen. (Including one set for four bachelors). Four sets are now being used for field officers. There are one single and three double sets of concrete quarters, the balance are of frame construction, and all are two-story. All are in excellent condition.

Officers' quarters at Fort DeRussy: ten. Five sets are now being used for field officers, three of which are assigned to Headquarters Hawaiian

Separate C. A. Brigade—Commanding General and two of his Staff. All are of frame bungalow type and single sets and very desirable quarters.

N. C. O. quarters at Fort Ruger: sixteen. All double sets. Three sets are concrete, balance are of frame bungalow type. All are occupied by enlisted men of first three grades.

N. C. O. quarters at Fort DeRussy: nine. All are single sets, and of bungalow type. Eight are occupied by enlisted men of first three grades and one by a warrant officer assigned to duty with H. S. C. A. B.

There are excellent post exchanges at both Ruger and DeRussy.

Servants. Japanese maids may be obtained at wages of thirty-five dollars to sixty dollars per month, depending on the degree of training. As a rule these maids do all work except washing.

Automobiles. An automobile is almost a necessity. A bus line, connecting with a street car, runs through the post, but distances in Honolulu are so great that the officer and his family are greatly handicapped without a car. There is a garage for each set of quarters. When you arrive, turn your car over to a service station agent who will be at the dock.

Recreation. Fort DeRussy has the best swimming in the world. A practice golf course is being laid out at Ruger. In addition, Ruger is only ten minutes' ride from the Waialae Golf Club where the annual Hawaiian Open Championship is held. Green fees in this club are two dollars per week days and two dollars and fifty cents on Saturdays, Sundays and holidays. The Oahu Country Club is open to service membership. Dues are nine dollars and fifty cents per month. The Coast Artillery posts near Honolulu usually have one dance each every month and a bridge party about once every two months.

Uniforms. There is a standard cloth in use in the Hawaiian Department that differs somewhat from that in general use throughout the Army. If you are ordered to Hawaii and there is sufficient time before you sail it might be well to have a friend send you a supply of this cloth if you have your uniforms made on the mainland. A mess jacket is necessary. A wool uniform will be very comfortable during the winter months, especially after your first year.

Civilian clothes. Worn almost entirely when off the post, linen suits in summer and white trousers with odd coats in winter.

School bus. The posts operate school busses which take children back and forth to the different schools in the city.

Most officers send their children to Punahou School. The tuition here is one hundred and fifty dollars a year. The public schools are crowded with mixed races.

A number of officers here are on a commutation status. They rent houses near Ruger and DeRussy at reasonable rates, less, generally, than commutation allowance.

There are excellent tennis courts and athletic fields at both Ruger and DeRussy.

FORT KAMEHAMEHA AND FORT WEAVER

By CAPT. WALTER R. GOODRICH

Situation: Fort Kamehameha is situated on the Island of Oahu at the entrance of Pearl Harbor, an important naval base, about nine miles from the city of Honolulu. It can be reached via automobile only. The road is paved, and the journey is made in about twenty minutes from the center of Honolulu.

Quarters: The officers and noncommissioned officers' quarters and the barracks for enlisted men are of the bungalow type. There are four field officers' sets—thirty-three company officers' sets and a bachelor officer's



set. The field officers' sets contain four bedrooms, 2 baths, a large lanai, living room, dining room, kitchen and servant quarters with bath. The company officers' sets contain three bedrooms, one bath, living room, dining room, lanai, kitchen and servant quarters with bath.

It is unusual for officers to be on commutation from this post. In the bachelor officer's set a small mess is operated by a caterer. This provides excellent service at reasonable expense to the individual.

There are twenty-five single sets and one bachelor set for the noncommissioned officers of the first three grades. There is no noncommissioned officers' mess operated at the present time.

Troops. There are stationed at Fort Kamehameha the following troops:

15th Coast Artillery

41st Coast Artillery

55th Coast Artillery (less 2nd Battalion)

Detachments of Medical, Ordnance, and Quartermaster, and Signal Corps

Subposts. Fort Weaver: There are no officer quarters at Fort Weaver. An outpost guard only is maintained for safety of Government property. The Officers' Club maintains a delightful bathing beach and picnic grounds at this post, which is accessible by a short boat trip of about five minutes from Fort Kamehameha.

Sports. Baseball, basketball, volley ball, boxing, track and field, bowling, tennis, swimming, football.

Library. There is an excellent library room in conjunction with the enlisted men's Service Club.



Post Exchange. The Post Exchange on this post has a complete line of staple articles. In connection therewith is an excellent restaurant, gasoline filling station, barber shop and tailor shop. Splendid motion pictures are furnished daily.

Schools. During the school season busses are run each school day, transporting the children of the post to and from the schools in Honolulu.

FORT SHAFTER

By 1ST LIEUT. R. E. STARR

Fort Shafter is about three miles from the center of Honolulu and on the main road leading to Schofield and Kamehameha. It was formerly an infantry post. It is now occupied by the 64th C. A. (AA), Tripler General Hospital, and in addition, is the headquarters of the Hawaiian Department.

Officers' quarters are available on post. Headquarters Area (Staff post):

Ten large, two-story, wooden sets, of the type found at most Coast Artillery posts. These quarters are occupied by the Commanding General and such of his staff as he determines upon, they being assigned through Post Headquarters on information received from Department Headquarters. Four small, two-story wooden sets, which at one time were noncommissioned officers' quarters, but are now occupied in accordance with assignment orders as above. These quarters are very comfortable. One large, two-story set, assigned permanently to the Commanding Officer, Tripler General Hospital.

Regimental Area (64th): Five field officers' sets. These are not of a standard pattern. In general they are one-story bungalow type, with three bedrooms, besides maid's room. All quarters in this area were at one time the quarters of civilians employed in building the Headquarters Post, but have since been remodeled and enlarged so as to make them presentable and fairly comfortable. Fourteen sets of battery officers' quarters. These are of the same type as the field officers' sets, but with the exception of two they have only two bedrooms, exclusive of maid's room. As in the case of the field officers' quarters mentioned above, these are fairly presentable, and comfortable, their main disadvantage being the insufficiency of bedroom space and the fact that they are temporary quarters.

Noncommissioned officers' quarters. There are thirty-four sets of noncommissioned officers' quarters in the regimental area, Fort Shafter. These are assigned to enlisted men of the first three grades only. They are occupied almost exclusively by noncommissioned officers of the 64th Coast Artillery, the exception being four new sets occupied by key men of the 9th Signal Service Company. With the exception of these four new sets, the noncommissioned officers' quarters at Fort Shafter are very unsatisfactory as to condition.

All quarters (officers' and noncommissioned officers') are equipped with gas ranges.

Garages. There are garages located conveniently to all quarters at Fort Shafter.

For those officers, warrant officers and noncommissioned officers, who are required to live on rental allowance, but who are on duty at the post, thus being required to commute back and forth by automobile, there is an utterly inadequate number of garages. Applicants are placed on a priority list maintained at Post Headquarters, but in some instances, garages have not been available until a year after request.

Miscellaneous. Commissary—none at post, daily service from General Sales Store, Honolulu, T. H. An excellent Post Exchange is conducted as well as a branch fruit and vegetable store.

Medical service. Small dispensary for first aid treatment. Post surgeon. All serious cases evacuated to Tripler General Hospital.

Troops. One regiment, 64th Coast Artillery (AA), three battalions, each with one searchlight battery, two gun batteries and battalion headquarters detachment; also headquarters and service batteries.

Miscellaneous troops. Provisional Battalion, Department Headquarters Detachments, Military Police Company and 9th Signal Service Company; Quartermaster, Medical and Ordnance Detachments.

Recreation. Nine-hole golf course. Three tennis courts. Fresh water swimming pool. Riding horses, with access to good bridle paths in the cane fields.

Schools. School bus service operated between post and schools of Honolulu.

Rental allowance. Approximately ninety per cent of officers and non-commissioned officers on duty at Department Headquarters live on rental allowance status; while in the 64th Coast Artillery this figure is approximately twenty per cent.

Any traveler to Hawaii cannot fail to be impressed by the perfect climatic conditions which exist nearly the entire year round. There is a so-called rainy season but it is nothing compared to the rainy seasons in Panama and the Philippines. This offers an exceptional opportunity for training as well as a recreation and amusement. Many places of interest can be visited on Oahu. Hunting is not one of the active sports although goats and pigs, originally domestic, may be had by the incurable hunter.

The islands are known for the diversity of races. Americans, Hawaiian, Chinese, Japanese, Filipinos, Portuguese, Russian are here in considerable number, as well as a goodly sprinkling of other races. Hawaii is sometimes called the "Melting Pot of the World" although its tourist promotion committee bears heavily on their phrase, "The Paradise of the Pacific." It deserves both names.

Interesting trips may be made to other islands. Hawaii, the largest island of the group is about two hundred miles from Honolulu. Here may be found more of the tropical foliage and jungle growth that the visitor might have expected on more civilized Oahu. Here also is located the world's largest active volcano. It is the most interesting sight in all Hawaii and is nearly always obligingly and harmlessly active. Near the volcano on the mountain called Moana Loa is located the Hawaiian Department rest camp, the Baguio of Hawaii. Here pleasant outings may be arranged with a taste of cool weather. The top of Moana Loa is snow capped. It rises over fourteen thousand feet above the sea and is said to be the highest peak in the world. Mountains that take their rise from a tableland many thousand feet above sea level are not considered real mountains in Hawaii.

Hawaii is a pleasant place. It has something of the mysticism of the Orient, much of the languor of the South Seas, a more attractive climate than California, and with all this, its metropolis, Honolulu, has the hustle, bustle, and push of a city in the States.

Protection of Infantry Against Air Attack

By CAPT. JAMES E. WHARTON, Infantry

SINCE it is generally conceded that the airplane will play a much greater rôle in the next war than it did during the World War, the protection of troops and installations against attack from the air has become a problem of considerable importance. The Coast Artillery Corps, charged with the operation of the general antiaircraft service, and the Infantry, which will operate in such positions that it must furnish its own local protection, appear as the two branches of the service most vitally interested in the development of an active fire defense. Two questions are asked repeatedly: "Is attack aviation effective against Infantry? Is its effectiveness increasing or decreasing?" The object of this paper is to point out the elements of the problem, as they affect the Infantry, and the steps taken in solving it. The consensus of opinion is that experimentation has not yet reached a point where a definite answer can be given. The study of the problem is still in a more or less embryonic state, particularly the tactical phase which deals with the use of cover and formations to minimize losses. Hence, any discussion of the problem is largely one of personal opinion, based on such experiments as have been conducted.

The airplane did not reach its greatest use before the end of the World War. The great development of the plane as a weapon since that time and the study and development of antiaircraft measures present a contrasting picture, much changed in every respect from the conditions which existed at the close of 1918. This development precludes finding the final answer to the question of the effectiveness of attack aviation against Infantry short of an actual clash between our Infantry and an enemy air force. Many Air Corps officers state that Infantry need not concern itself greatly with the prospect of aerial attack, especially in the early stages of a war, because the shortage of planes and the existence of more remunerative targets will obviate the allotment of planes to a mission of attacking Infantry. Meantime, the Infantry is engaged in perfecting means of placing such attacks in the realm of hazardous undertakings on the premise that the enemy may view the matter differently.

The capabilities of attack aviation are appreciated fully. Various tests in which aviation has attacked enemy columns represented by appropriate field targets, delivered under favorable conditions and without the danger of retaliation on the part of the Infantry, have shown what havoc such attacks might hold for Infantry unprepared to fight back. Naturally, the best protection against enemy aircraft is our own Air Corps. However, with a force so highly mobile as the Air Corps, it would be a difficult matter to maintain "air superiority" over an extended front at all times when confronted with a formidable air force, and, even then, it

it not easy for pursuit planes to pick up and meet low-flying attack formations. It is then that the Coast Artillery antiaircraft defense must come into play, assisted by the weapons of all other branches in executing their local defenses. To understand best the Infantry rôle and the steps undertaken in the solution of the problem, a study of the special Infantry equipment is necessary.

Antiaircraft protection naturally divides itself into two classes: the active and passive defense. The former comprises those measures taken to fight back against enemy planes, while the latter includes formations and cover intended to minimize losses as the result of aerial attacks. Infantry



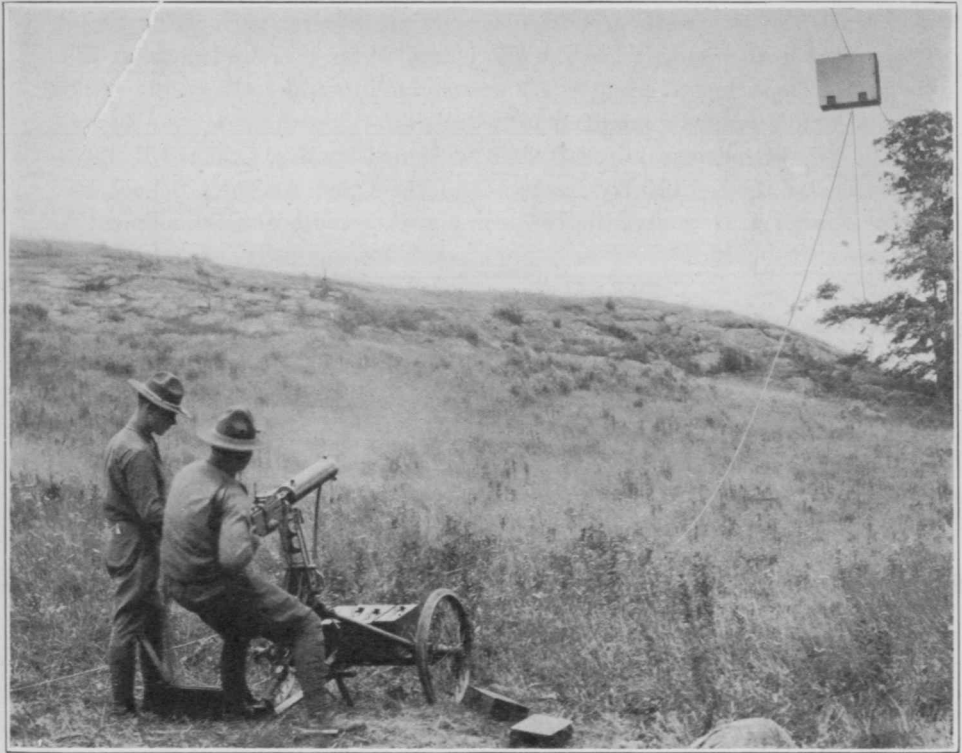
LEAVING THE ROAD PREPARATORY TO TAKING UP CONCEALMENT FORMATION DURING ATTACK BY AEROPLANES

inherently leans to an active effort and Infantry agencies have given a great deal of time and effort to solving the problem of placing the fire of its weapons on aerial targets. In the maintenance of a high state of morale for Infantry troops it is an important consideration that they be provided with the proper materiel and trained in the proper methods of returning the fire from enemy planes. Aerial targets are much less likely to develop against Infantry so prepared than was the case during the World War. Frequent and inevitable casualties among attacking formations may serve to convince the enemy that his remunerative targets are to be found elsewhere.

An Infantry battalion has several weapons which may be used for its defense and the training should include all of them: rifles, automatic rifles, pistols, and machine guns. All of these weapons have the required range and power to inflict damage to low-flying attacking planes. The first three named do not require special equipment for making them suitable as antiaircraft weapons. The machine gun has been provided with trailer mounts, adapters, and sights, all of which are now in an experimental stage but have met nearly all of the requirements placed upon them.

In considering equipment for making the Infantry machine gun flexible enough for use against aircraft and at the same time permitting it to

execute its primary function of firing against ground targets, the question of also increasing its mobility was a vital one. The result of the efforts of the Infantry Board and the Department of Experiment is the wheeled machine gun mount, M-1, designed originally by Lieut. Herbert F. M. Matthews, Infantry. The mount consists of an axle carrying a permanent



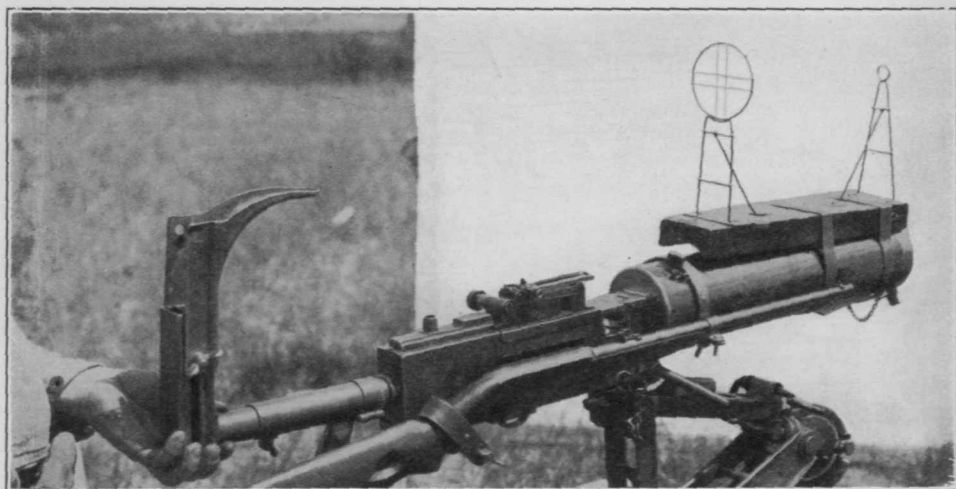
FIRING ON PLUNGING TARGET

metal T-base which acts as the frame and coupling of the vehicle. The regular tripod is mounted on the frame, which has detachable wheels. The gun may be transported in either the ground or antiaircraft-firing position. It may be placed in action on or off wheels, but is normally fired on wheels against aerial targets. The mount is limbered behind the ammunition cart in movement, but may be drawn by hand. Easy and rapid conversion from the ground to the antiaircraft position, and the reverse, is possible. The change from ground to antiaircraft position can be made in eight seconds and the reverse in twelve seconds. The mount, in addition to providing the means of firing against aerial targets, greatly increases the radius of action of machine guns when employed against their normal ground targets. When an attack from the air is at all probable, machine guns are habitually carried in the antiaircraft position, half

loaded. Guns are employed against aircraft by unlimbering the trailer mount, dropping the trail in place, pulling the bolt handle once, and firing—an elapsed time of from two to five seconds.

Two adapters, one designed by the Department of Experiment and the other by the Ordnance Department, have proved satisfactory. The Department of Experiment adapter may be placed on the tripod without any modification of the cradle and thus becomes an integral part of the tripod. It is nested in the cradle when the gun is used against ground targets. The Ordnance Department adapter is likewise an integral part of the tripod but the cradle must be modified to install it.

The Boyd-Greene antiaircraft sight, designed by Maj. Leonard R. Boyd, whose next duty is Infantry instructor at the Coast Artillery School, and Lieut. Joseph I. Greene, 24th Infantry, on duty with the Department of



THE BOYD-GREENE ANTI-AIRCRAFT SIGHT MOUNTED ON THE GUN. THE CALIBER 22 RIFLE ATTACHED TO THE GUN IS FOR SUB-CALIBER TRAINING

Experiment, is the result of three years of research by the Department of Experiment. A sufficient number of the sights are being manufactured to equip all Infantry machine gun units for the service test.

This sight is designed to enable the gunner to place fire on the target instantly. It is zeroed at the average Infantry effective slant range of six hundred yards, but is effective to a maximum slant range of one thousand yards. The design of the sight provides for speeds to one hundred and seventy miles an hour, though the speed bracket may be increased by shortening the distance between the front and rear sight members. The four elements of flight (speed, range, altitude, and angle or approach or departure) are reduced to a minimum. The sight has both a basic and advanced-training use and all men of an organization are given the basic

training. The gunners and other men who show proficiency in its basic use receive the advanced training wherein an estimate of the speed of the target and the angle of approach or departure enables the gunner to diminish the lead.

The results of tests in the use of the Boyd-Greene sight have been far more satisfactory than firing by means of tracer ammunition. If the new sight is finally adopted the latter will become an alternate method of fire to be used in the absence of sights. The fly-through or zone method of fire, by which the guns are laid ahead of the plane in such a position that the plane must fly through the sheaf of fire, has proved less effective than keeping the plane under continuous fire by use of the sight or tracer ammunition. Tentative Training Regulations No. 300-5 have been issued for use in the training of rifle companies. The training methods prescribed by this regulation have been tested in the service for the past year and have been pronounced sound, but the test has been extended for another year for further development work. A similar regulation covering machine-gun-company training will follow shortly. Meantime, a great deal of attention is being devoted to antiaircraft training in all Infantry regiments, both in the technical and tactical phases. As an example, combat-practice problems have had situations covering attacks from the air introduced into them.

Infantry is concerned particularly with its own defense in the forward areas in combat, in bivouacs and on the march. During combat troops are dispersed to the extent that they offer unremunerative targets. They are in their best position to repel aerial attacks. Attacks at this time probably will be rare.

Troop bivouacs will be placed in woods which offer cover from the air, whenever practicable. Air guards, with a large proportion of machine guns, will be placed at convenient points sufficiently distant from the bivouacs to engage attacking planes and to give timely warning of the approach of hostile formations.

The greatest danger to Infantry from aerial attacks exists when the former is spread over a great length of road on the march, with its transportation. Night marches will no doubt become even more necessary in the next war, and movements by motor transportation will be used to a greater extent. Observation planes sent out by the enemy will thus be unable to report the position of the column in sufficient time to permit attack aviation to reach them while on the road. In a conflict with an enemy who has a plentiful supply of aircraft, Infantry will no doubt be forced to motorize its trains. The foot column may then march by itself, while the trains cover the day's march in one jump. A speedy movement, under cover of darkness where necessary, will enable the most vulnerable part of the Infantry column to elude the enemy aircraft frequently.

The aerial attack against marching troops will probably develop by

sending several formations of three planes each to hit the column at the same time. The attack may come from the flank or the rear, usually at a low altitude, under such cover as the surrounding terrain offers. The position of the column will be reported by observation planes at a certain hour. Knowing the rate of march of the column, its position at any time thereafter may be plotted accurately. The leading plane of each formation will follow the road, the flank planes covering a lane on each side of the road at a few yards. The duration of the attack will be not more than thirty seconds. Each plane, with four forward machine guns, firing at the average rate of one thousand one hundred rounds a minute, will deliver two thousand two hundred rounds distributed over a distance of something more than a mile during a thirty-second attack. It is evident from this hasty calculation that the fire from aerial machine guns lacks the density to make it highly effective and must depend largely upon its moral effect to keep the Infantry down.

The fire from such guns, however, is intended to cover the approach of the planes and to neutralize the fire of the ground troops so that they may



PARALLEL MOVING TARGET

drop their bombs, from a low altitude, with safety. The real danger to Infantry comes from the bursting bombs. However, the bombs dropped from airplanes are little more to be feared than artillery shells. Infantry habitually deploys to the sides of the road on the approach of a hostile attack formation, not primarily to escape these bombs, but to secure better positions from which to concentrate their fire on attacking planes. Infantry soldiers can soon be impressed with the small probability of casualties from the aerial machine guns and with the fact that the danger from aerial bombs does not exist until a few seconds after the enemy formation has actually flown over them and the bombs have reached the ground.

The few seconds between the sounding of the alarm for an attack and the actual dropping of the bombs enables Infantry units to deliver their full force of fire power against planes. Having done so, they take such cover as the ground affords, exactly as is done when an artillery shell drops nearby.

All Infantry machine guns are being equipped to fire against aircraft and none should be held out when the target is within effective range.



FIRING AT THE SWINGING TARGET

Likewise, all riflemen and automatic riflemen should fire whenever the target is within their effective range, in preference to placing too much dependence upon the effectiveness of the fire of designated units. Infantry protection against aircraft will be complete and formidable only when every Infantryman understands how to hit aerial targets with the weapon with which he is equipped and has the confidence that his weapon can inflict damage. When this condition exists an enemy attack will cause far less concern to the veteran division than having to march through a rain of artillery projectiles from an unseen enemy.

In the few tests thus far held, the chief difficulty of getting into the proper formation to repel aerial attacks arose from the lack of a suitable signal by which the troops might be warned at the instant it was determined that an attack was imminent. Whistles and bugles serve many purposes and their use to warn of aerial attacks proved too slow. Signal rockets were much too late in transmitting this information. When air guards were used on the flanks of marching columns, sound signals did not reach the column sufficiently in advance of the attack to permit the desired de-

ployment. During marches it is imperative that air guards and air observers be placed at strategic points on both sides of the route of march. The guards will consist largely of highly-mobile, motorized machine guns, which may go out one thousand yards or more to the flanks. They will remain in place until the column passes, when they will rejoin the tail of the column, press forward during halts, and go out again as required. Accompanying them, or organized into similar units, must be air observers whose only duty will be to give timely warnings to the column. Such observers must be equipped with a means of transmitting signals instantly. The simplest form of radio transmitting sets may be used to send pre-arranged signals of one or two letters. These signals will be picked up by receiving sets placed at appropriate places in the column. Equipment of this type is now under test with a view of putting it to this purpose.

In order to eliminate unnecessary deployments, with the attendant delay of the march, which often amounts to a partial accomplishment of the enemy's mission, only designated officers (possibly rifle company commanders and machine-gun platoon commanders) should give the signal for leaving the road. The receiving sets, mentioned above, should be operated by men who remain constantly with the designated officers. Such an instantaneous signal, given when the enemy formation is still a half mile or more distant, would give the column ample time to deploy into proper formations on whistle or bugle signal from the column.

The American soldier is admittedly a good marksman. He has often shot birds on the wing. Both marksmanship and hunting are excellent forms of sport, in his estimation. Combining them, as in firing at airplanes on the wing, is a still more fascinating game and the Infantryman has found antiaircraft his most interesting form of training. Given the proper equipment, the development of capable antiaircraft sharpshooters will proceed at a rapid rate.

Our own pursuit aviation will always form a first-line defense against enemy attack formations. The enemy, eluding them, must then run the risk of being shot down by the Coast Artillery batteries. Then, to attack an Infantry battalion successfully, he must drop to a low altitude and expect to pass through the concentrated fire from rifles, automatic rifles, and machine guns delivered at the rate of fifteen thousand rounds a minute, or a total of seven thousand five hundred aimed shots during his thirty-second attack. Knowing that enemy aircraft must evade successfully these three defenses before he can inflict any real damage, the Infantryman may reason quite properly that, after all, an attack from the air, where he can see his adversary and fight back effectively, isn't so demoralizing as passing through a shell-swept area. And the world knows with what facility he side-steps bursting projectiles and with what dogged determination he pushes on to his objective.

The Solo Role of Antiaircraft Artillery in Air Defense

IN OUR consideration of the tactical use of antiaircraft artillery in air defense the most common conception is one of joint action with friendly air forces. This conception is a proper one and it is not the purpose of this article to recommend a departure from it. It has been stated that antiaircraft artillery bears the same relation to air forces that seacoast artillery bears to naval forces. In either case the rôle of the Coast Artillery is to furnish a close defense of an important establishment or area, leaving our more mobile naval and air forces free to go forth and seek decisive action with the main hostile forces of the enemy—either air or naval. Or (to make a comparison to infantry operations) we may consider that the mission of the Coast Artillery is to provide strong points in a system of defense, to support offensive action by more mobile forces or furnish a permanent or semi-permanent resistance point behind which the mobile offensive forces may rally, if defeated, or if too weak to take the offensive.

The World War furnishes little precedent in the most efficient use of air forces or antiaircraft artillery. It is true that both were used to some extent but the surface of possible employment was barely scratched. The development of aviation was very rapid and its World War uses did point the way to probable employment in future wars. During the war, air forces did not follow the fundamental principles of warfare which, if they *are* principles, apply to combat in the air as well as on the ground or sea. In those days air combats were single combats, romantic perhaps but reminiscent of the individual encounters between mailed knights of the time of Richard III. Coordination, mass, and shock action were little considered although before the end of the war Richthofen had pointed the way to organization and the beginning of the tactics of air fighting. As for the antiaircraft artillery its development has been mostly post-war. It would not be fair to judge its efficiency today by its accomplishments during the World War.

Wherever possible it is the best policy to base our doctrines upon demonstrated facts. Actual experience is one of the best teachers and is the foundation of correct principles for future guidance. Lacking actual experience, as a precedent, it is the privilege of anyone to theorize and make use of the imagination to evolve principles which may or may not be proven correct when actually tested. This is particularly true when air forces are considered since the proper tactics of air forces today are largely a matter of theory. Likewise the tactics of joint air defense. Joint exercises are of great value in developing these tactics but actual combat is the final testing ground on which their efficacy will be proven.

While appreciating the desirability of joint air force-antiaircraft artillery action, this article will attempt to show some uses of antiaircraft artillery in an independent and separate rôle and presents a number of situations in which joint action cannot be accomplished. There is no doubt in the minds of anyone that the most effective air defense is a joint defense. On the other hand, conditions will exist where it will be impossible to employ joint action. In what cases will it be necessary for the antiaircraft artillery to furnish the sole defense against air attacks?

General Ashmore, in his book, "Air Defence," sets forth a number of principles in combating air attacks. That one which he emphasizes again and again is the necessity of an intelligence or information net whose duty is to give warning of the approach of hostile air forces in order that the defending forces may be prepared to meet the attack before it reaches its objective. He states, repeatedly, that time and distance are the two most important considerations in successful air defense. It is not the antiaircraft artillery that needs that time. Elements of antiaircraft artillery, while considered mobile, for all practical purposes are fixed during the active phase of an attack. They do not require any considerable warning because fire can be opened within a few seconds after the target is located. The time necessary is only that needed to identify the target and start the operation of the fire control system. In most cases this can be accomplished before the hostile aircraft are within range of the guns. Who requires the advance warning? The friendly air forces.

Friendly air forces require a considerable warning interval to permit them to take off, climb to the proper altitude, and travel to a favorable point of contact and combat. This point of encounter should be at a considerable distance from the defended area. The hostile air force ought to be defeated before it can enter the decisive zone. If all goes well, the antiaircraft artillery, concentrated near the defended area, may not be called upon to fire a shot. But even if the enemy is defeated a few hostile planes may be able to elude the defending fighters, arrive over the defended area and accomplish their mission as satisfactorily as if the entire force had met with no resistance in the air. In this case they will be opposed by the antiaircraft artillery as a last resort, an ace in the hole, the last line of resistance capable of turning back the hostile attack.

This intelligence service or net work for collecting information is not a new conception. Information is required by the commander of ground combat units in order that he may be able to estimate the probable lines of action which the enemy will follow. Having this information he can make his dispositions and issue his orders to defeat the opposing forces. With ground forces, days or weeks may be required in collecting information upon which the commander may feel justified to act. For the same reason air forces require information upon which to base a line of action. The only point of difference is the manner of obtaining the information.

Due to the mobility of the opposing forces the time element enters strongly and minutes and seconds become important. The intelligence observation net is the principal agency for collecting information a sufficient time in advance to enable the defending air forces to formulate their plan of action and to meet the impending attack. The ground information net is the principal intelligence agency because information can not be obtained with sufficient accuracy and certainty by air patrols. It is probable that a certain amount of air patrolling may be done but the best location from which to locate hostile airplanes is from the ground. The pilot, when in the air, may be in an excellent position for ground observation but his ability to locate other planes is peculiarly (and surprisingly) limited. This may depend upon the design of the plane which does not favor all around observation, it may depend on the fact that the ground observer is able to use his ears as well as his eyes, or it may be due to other considerations, but it was shown conclusively during the London air raids that the pilot in the air very rarely made contact with the hostile raiders. So far as powers of observation are concerned conditions have not changed greatly since the war. It is almost an axiom, then, that the hostile air forces must be discovered by observers on the ground who report the course, number, type, altitude and such other pertinent data as will enable the defending air forces to attack at some predetermined point. If it is accepted, that this net must operate and furnish advance information before defending air forces can be used effectively, situations may be considered where it will be impossible to maintain the necessary observation and where defending air forces will be handicapped by a lack of information.

The first situation which comes to mind is that which exists at night. While night bombing and air attacks present many difficulties the advantages are many and all nations consider the hours of darkness most favorable to carry out certain air missions, particularly those of bombardment and especially where the bombardment objective is of considerable size. It is a certainty that night operations will be ordered in the future. No air defense measures would be complete unless night operations were given consideration. It is obvious that darkness will be a serious handicap to any observation system. Serious as it may be for ground observers it is even more so for air observers. The likelihood of air patrols locating an approaching air force at night is so improbable that it may be removed from consideration. It is probable that the observation net will be able to operate to some extent. The approaching bombers may be located by sound if not by sight and the observers of the future may be so well trained that they will be able to identify approaching hostile formations and transmit this information to the information center. Listening devices may be furnished these observers to make location less difficult and identification easier. Sight observation might be possible on moonlight nights but hostile air forces will probably not choose such nights for their operations.

The searchlight is the main reliance of the antiaircraft gunner at night and a great assistance to defense planes but it is not reasonable to suppose that the necessary searchlight system could be installed at any great distance from the objective. Attacks may be expected from any direction and a searchlight installation covering an area of even a fifty-mile radius would be enormous and altogether preposterous. Searchlights will probably be installed comparatively near the objective and even beyond the range of the antiaircraft guns but the distance would be insufficient to permit the necessary time for defending planes to take the air. The defending planes, naturally, would give such assistance as they could but it is very probable that the attack would be delivered before they could oppose it and that their efforts would be confined to a pursuit and attack of the home-bound raiders on their return flight. Who, then, will oppose the night attacking bombers as they near their objective? This is one of the situations when the entire defense will be furnished by the antiaircraft artillery.

Weather conditions unfavorable to visibility such as fog, rain, snow, haze, clouds are similar to night conditions and while the observation net may operate with more efficiency than at night the same disadvantages will exist, even if to a less extent. On the other hand, weather unfavorable for ground observation as well as darkness will not prove the handicap to raiding bombers that it was in the World War. Air navigation has improved enormously since that time. Radio direction for planes is possible and practicable. The mechanical pilot will prove a great assistance to the aviator in maintaining his course. It is not anticipated that raiding formations will lose their way so frequently in future operations although the use of radio direction equipment will be dependent upon the ground situation of the opposing forces. These recent developments are an assistance to the attacking planes rather than those of the defense. For them their task is made more difficult. When weather conditions are unfavorable the observation net is affected unfavorably and the operations of the defending air force considerably limited.

Another situation suggests itself wherein the efficient operation of an extended observation net will not be possible. This will occur after opposing ground forces have made contact and are confronting each other along a line of contact. In this case the observation net may extend to the flanks and rear as far as desired but it will be limited to the front to the terrain held by the ground forces whose protection is sought from air attacks and observation. In this case air attacks will be delivered with startling suddenness and the element of surprise so desirable in an attack of any kind can be employed because the extension of the observation net to the front will not provide for the necessary time for defending planes to take the air. In this case combat troops in close contact, rear area establishments, rail heads, and vital industrial establishments close to the

front, will be subject to sudden raids. The only defense practicable will be furnished by the combat troops or by the antiaircraft troops covering these sensitive areas. Again the operations of friendly air forces will be confined to pursuit of the raiders and an effort to inflict losses on them before they can reach friendly territory.

Very similar to the situation near the line of contact of opposing ground forces is the situation along the seacoast prior to a hostile landing. Combat troops and establishments can endure a considerable amount of bombing but this is not the case with coastal cities, harbors, and other important industrial and commercial establishments. A casual examination of the map is sufficient to determine the importance of the seaboard cities along the Atlantic coast of the United States. Assuming an air attack from the sea, how can a system of observation be established off the coast which will keep the defending air forces informed of an imminent air attack? It would not be correct to assume that no observation system of any kind will be attempted. Naval coastal patrol vessels will be available and so located as to furnish some valuable information. Friendly commercial vessels will likewise furnish information. Our own naval and Air Corps patrols will be used to locate hostile carriers and air forces and, if able, will destroy the hostile base, whether floating or on land, before a hostile attack can be launched. This, of course, assumes that air supremacy can be maintained by the defense.

The term "air supremacy" is used instead of the term "command of the air" because the latter term cannot be given the same exactness of definition that applies to the term "command of the sea." An absolute command of the air will never exist. A situation may exist where a temporary command of the air may extend over a relatively small area but, at the present time, this is the best that can be accomplished. Discussion of this situation might be extended indefinitely. This article will confine itself to that phase of it which concerns the antiaircraft artillery of the land forces. The subject of overseas expeditions and joint defensive action by air, land, and naval forces deserves the deepest study in which Unity of Command and Paramount Interest will be constantly recurring phrases. The landing of a hostile expeditionary force will probably follow the gaining of command of the sea. It would hardly be attempted by any expeditionary force not supported by an air force sufficient to enable it to obtain and maintain air superiority within the area selected for debarkation. An enemy having command of the sea and being superior in the air (within the area) will be able to eliminate such seaward observation systems (either afloat or in the air) as may be established. When this has been accomplished air attacks may be launched against harbors and cities within the radius of action of their bombers. This radius, now, is only a few hundred miles but progress in aviation indicates that in the near future it may be doubled or trebled. Lacking an effective system of

observation, what is there to meet this air attack from the sea? A land-based air force possibly sufficiently strong to give combat if supplied with definite information as to the point selected for attack, but handicapped by the absence of the information, it would not be able to oppose the hostile bombers until they had reached their objective. Again the antiaircraft artillery will be called upon to oppose the hostile raid at close quarters assisted by such belated help as may be given by friendly air forces. General Ashmore, with the geographical location of Britain always in mind, believes that hostile raiders cannot be prevented from crossing the coast line and that defending air forces should be based inland at a considerable distance from the coast. He does not imply that provision should not be made for the defense of coastal cities by means of antiaircraft artillery but he is convinced that defending air forces concentrated on the seacoast are almost useless in preventing the entry of hostile formations into the interior. In the United States many of the most important cities are on the seacoast. Following his line of reasoning, if it is impossible to prevent hostile formations crossing the coast line then all our seaboard cities are without air defense—except such as may be furnished by antiaircraft artillery.

There is another situation in which the antiaircraft artillery will probably play an important part in any future war. This has to do with the high state of development being reached by bombardment aviation. The bomber of today can carry enormous loads as compared to the war-time ship. Four thousand pounds of bombs is not an unusual load. Enormous transport planes capable of carrying scores of passengers have been flown successfully and are an indication that the weight carrying capacity of planes of the bombing type has by no means been reached. This increased capacity is being utilized commercially by increasing freight and passenger loads. It has enabled the military ship to increase its bomb capacity and, consequently, the efficiency of the bomber as a military agency of destruction. More important still it has enabled the designer to provide for the bomber a more efficient defense against air attacks by increasing the number of men in the crew and providing additional defensive weapons, principally machine guns. Although not considered with favor at present the bomber of the future may be provided with armor over its vital parts. Certainly every effort will be made to seek material for its construction which will be unaffected by incendiary bullets.

Ship for ship, the bomber will be more than a match for the pursuit plane. It is certainly not its equal in maneuverability. However, this same maneuverability and speed is obtained at the expense of protection and decreased fire power. Fire power is the decisive factor in ground combat between infantry troops. While speed is important fire power will be important also in air combat. There is every reason to suppose that a modern bomber, fully machine gunned, will be a formidable antagonist

for the fighter. It is not unreasonable to assume that a well conducted bombing formation may, by its superior fire power and protection be able to beat off any pursuit attack launched against it and proceed serenely to its objective in the face of pursuit opposition. Under this condition what will be left to oppose the hostile bombers? Only the antiaircraft artillery will stand between them and their objective. The greater power of high explosive shell will be effective where the friendly pursuit ships may be unable to cope with the situation.

As stated in the beginning of this article it is not its purpose to belittle the use of air forces in air defense. It is most desirable that air forces be used to defeat the hostile attack before it approaches within gun range of the objective. It would be less serious to the defense if the hostile attack could be decisively defeated by air forces alone without the firing of a shot by the antiaircraft artillery. On the other hand it is believed that situations will arise in which air forces will be insufficient if not altogether ineffective and that the main or sole burden of defense will fall upon the antiaircraft artillery. It is desired, furthermore, to emphasize the fact that antiaircraft artillery is not a side line in the consideration of effective air defense measures but of importance equal to that of air forces and, upon occasion, capable of assuming the entire defensive rôle.

THE NATIONAL GUARD TO TOW ITS OWN TARGETS

Heretofore the towing of targets for target practice by the National Guard antiaircraft regiments has been done by the Regular Army Air Corps. Believing National Guard Aviation has now reached the stage of development where it can do the necessary towing, the Militia Bureau has issued instructions that hereafter wherever practicable such missions shall be performed by the National Guard squadrons.

These will include flying planes for sighting practice and observation of long-range firing by harbor defense units of the Coast Artillery, as well as strictly towing missions.

This change is made in the interest of increased training for National Guard Aviation and the conservation of Militia Bureau funds.

The Future of Air Warfare

By A. E. BLAKE

EDITOR'S NOTE: The following article by a British writer which appeared in the January number of the Fortnightly Review is published, not because it reflects the views or opinions of any individual other than Mr. Blake, but because it envisages a future for air warfare, philosophically and calmly presented, even if, as some of us may think, optimistically so. It is obvious that the author writes from a British viewpoint, that the geography of western Europe is subconsciously in his mind. His optimistic conception of the capabilities of the air forces of the future are justified, somewhat, by present day developments and is shared by many. His pessimism concerning the development of defensive agencies is not consistent with his optimism for the other side. Antiaircraft, Artillerymen will not agree with him nor will Airmen who have faith in the efficiency of an aggressive offensive-defensive. The article is not presented as an argument but as a viewpoint.

FEW subjects lend themselves so readily to exaggerated and ill-informed alarmism as that of air warfare, and the pendulum of public opinion, so easily swayed from extreme to extreme, now tends to depreciate the prophecies so freely made a few years ago that the aeroplane had revolutionised warfare, and that the next war will be unprecedented in ferocity and slaughter. People are inclined to agree with the dictum that the next war, though it begin in the sky, will finish, like the last, in the mud.

It is true that we are not yet well-equipped to deliver judgment on the question, and we can only summarise the arguments of both sides, but it is impossible to escape the conclusion that the aeroplane, in conjunction with the other inventions which received their baptism of fire in the last war, has radically changed the nature of warfare. Whether or not this transformation is likely to intensify the horrors of war or to limit its duration and its cruelty is still a problem that remains to be solved—it is to be feared—by the test of experience.

What is the nature of this change? It is a change that may be expressed in many ways. One might say that the offensive arm has once more asserted its superiority over the defensive; that mobility has been restored to the armed forces, and that the war of action and manœuvre has superseded the war of attrition; or that the distinction between combatant and non-combatant has been swept away. But perhaps the most apt description of the change would be to say that the aeroplane has revealed war for what it is—a contest, not between armies and navies, but between peoples. It has disclosed the object of war to be the imposition of one people's will upon another, not the destruction of the army of that people, except as it may be necessary for the attainment of that aim. Hitherto the opponent's army has not been only a weapon whose thrust had to be parried but a shield which had to be battered to pieces, and the experience of modern history indicated that, as soon as a nation found itself unprotected by the shield of its fighting forces, it made haste to capitulate, to assent to the will of the victor. But the aeroplane is a weapon which

makes its thrust above the shield and enables a stroke to be made at the vital nerve centres and arteries of the enemy's economic and political body.

It must be acknowledged that the employment of aircraft in the last war was not, save for episodes of its closing stages, of a nature which alone justifies the sweeping contentions made in the foregoing paragraph. It was used chiefly for reconnaissance, artillery cooperation, "dog-fighting" with the enemy's planes and, in general, as an auxiliary to the military and naval arms. As an independent weapon of offence it was not used—as in the case of the tank—to anything like the extent its potentialities justified. The cause was, of course, to be found in its comparatively imperfect technical development. Indeed, when it is remembered that, at the outbreak of war, the margin of lift of the few aircraft possessed by the British Army was insufficient not only for an effective load of bombs and machine guns but even for a camera, it is the more surprising that by the end of the war giant aircraft of great range and capable of carrying three thousand pounds of bombs should have been produced in such quantities and used with such effect.

Nor should the achievements of the Gotha raids be underrated. The opinion is often expressed that the damage done by the raids was not commensurate with the cost to the raiders, in material and personnel, and that the recruiting reaction to this "frightfulness" is sufficient reply to the claim that such invasions affect the people's morale and will to win. This opinion may be based on nothing more than the impression created by war-time counter-propaganda, but a little consideration will demonstrate not only the effectiveness of the German and British raids in the 1914-1918 war but also the potentialities that are suggested by the technical improvements of the last decade.

During the war, England was subjected to fifty-one airship and fifty-seven aeroplane raids. The resulting casualties comprised two hundred and ninety-six soldiers and sailors killed and five hundred and twenty-one wounded, and one thousand one hundred and seventeen civilians killed, two thousand eight hundred and eighty-six being wounded; a total of four thousand eight hundred and twenty. Fifty casualties per raid is not, it is agreed, a very significant loss in time of war. Nor was the two million pounds worth of direct damage achieved in the London area a very substantial return for the three hundred tons of bombs dropped or the cost of the thirteen airships and one hundred and twenty-eight aeroplanes employed. But these are petty items on the credit side of the raiders' balance.

To provide a defence against the visitations it was necessary to ring every menaced town with artillery capable of sustaining as nearly as possible an impenetrable barrage of shells to force the raiding aeroplanes to maintain a height at which accuracy of bombing would be impossible, and to equip the defences with countless searchlights, wire 'apron' screens sus-

pended from large and costly balloons, elaborate sound detectors and mobile trolley guns. Aircraft units, too, had to be diverted from the battle fronts. In other words, an enormous expenditure of men and materials had to be made in order to safeguard—and that imperfectly—huge areas against attack by a relatively insignificant force whose strength lay in the ignorance of the defence as to where and when the next blow would fall.

Nor was the creation of a military diversion the sole result. Industrial disorganisation was no less the aim and the achievement of the raiders. Who can estimate the effect on production of the almost sleepless nights spent by so many city dwellers, or of the nervous strain imposed by prolonged bombardment? It was only necessary for Zeppelins to approach the Cleveland district in thirteen weeks of 1916 to reduce the year's output of pig iron by one-sixth of the normal production. The quality and precision of the work correspondingly deteriorated from the same cause.

All these results were achieved by a mere handful of aircraft, obsolete according to modern standards, unprovided with any means of securing precise results, and experimenting with a strategy entirely new to warfare. Their engines were not silent, their ceiling comparatively low, and the bombs they carried few in number and of a pattern and power now regarded as primitive. What consequences would follow a raid in one of the wars which, ever and anon, threaten to spread like fire in a powder magazine from any of the dozen potential war centres of Europe today? An even more disquieting question would relate to the near future, when the researches now proceeding arrive at fruition.

Major Oliver Stewart writes, in his *Strategy and Tactics of Air Fighting*:

With the most elaborate anti-aircraft system that has ever been evolved in operation, the Gothas came and went suffering small loss. But the Gothas carried in petrol and oil more weight than they carried in bombs. Therefore, their bombs were necessarily small and ineffective. Already developments are in progress which, by the use of gears between aero engine and airscrew, by the use of variable pitch airscrews, by engine-supercharging, by the use of stratified charges and by variable stroke devices like the Damblane, will permit longer distances to be flown with smaller engines and much less fuel.

Captain Rene Fonck has estimated that five hundred aeroplanes could destroy a town one kilometre square in one night, and a town of the size of Paris in two or three weeks. That, however, is a sum in practice rather than in politics. It is unlikely that any foe would engage in so needlessly expensive and unscientific an annihilation. The whole purpose of warfare would be more economically gained by the concentration of the attack on the vital nodes of the country's economic and political complex—railway termini, junctions, bridges and lines, harbours, docks, aerodromes, arsenals, important manufacturing and commercial centres, mine pit-heads.

the centres of government and administration, wireless stations, central postal sorting offices, banks, military concentration camps and dumps, naval bases, shipping and the like.

As you read these pages the military experts of all great powers—honest, hard-working, conscientious and able men—are, no doubt, working out their twofold problem: (1) how to defend their countries from air attack, and (2) how to deliver repeated blows at their country's potential enemies in a manner that will beat down their defences, paralyse their economic life and destroy the resistance of their citizens.

The nature of the projectiles which will be used affords an opportunity for interesting speculation. The ordinary type of bomb, dropped as nearly as possible vertically upon a surface objective, is notoriously inaccurate owing to such factors as velocity, air currents and visibility. The projectile of the future is likely to be in the nature of a miniature aeroplane—as, in fact, is the so-called aerial torpedo—or a miniature (and not so very miniature) glider, in the form of the gliding bomb which has already been the subject of experiment. The gliding bomb, actuated only by its own momentum, will travel a mile for every one thousand feet of altitude at which it is released and thus enable a target at a considerable distance to be attacked with a moderate degree of accuracy and in greater security. The directing force might be either gyroscopic or wireless energy.

Mr. Elmer A. Sperry, the American gyroscopic engineer, is the inventor of an aerial projectile which, after being shot from a catapult, rises to a predetermined height and is then directed by wireless towards an object up to thirty-five miles distant, upon which it drops with a margin of error expressed by a fraction of a mile. Mr. Sperry avers that there is no technical obstacle to the trebling of this range. Such a projectile could be charged with sufficient explosive to destroy utterly a small town.

Some device even more assuredly accurate would be required, even at the risk of sacrificing valuable man-power, to attack objectives whose size precluded the certainty of their demolition at long range. For this purpose some form of air-borne artillery would seem to be needed.

“I think it is necessary to realise,” said Group-Captain W. F. MacNeece, in his reply to the discussion provoked by his paper on air defence read before the Royal United Services Institution on November 4, 1925, “that nobody is going to make serious efforts at making any structure bomb-proof against the largest bombs of the future.”

The extent to which high explosive will be superseded by poison gas is not yet determinable with any accuracy, but one may controvert the popular opinion that gas is likely to add substantially to the terrors of aerial bombardment of civilians. Mr. J. B. S. Haldane, in *Callinicus*, advances as “reasons why explosives are more likely to be effective than poison on a town” that “houses are far more vulnerable to explosives than earth works, and do far more damage to their occupants in collapsing,” are

inflammable, and "contain far more refuges which are nearly gas-proof," while civilians would be able to evacuate the gassed area.

Mr. Haldane gives the following interesting comparison of the potentialities of high explosive and gas in such circumstances:

On the nights of March 11 to March 14, 1918, just before the great offensive of March 21, the Germans fired one hundred and fifty thousand mustard gas shells into the villages and valleys of the Cambrai salient, an area of about twenty square miles, the same as that of central London. This caused four thousand five hundred casualties, of whom only fifty died (all of them because they took off their respirators too soon). The area was not evacuated. In central London, if the population had had gas masks, the casualties would have been perhaps ten times greater. But we have to compare the hypothetical air raid not with any raid that actually occurred, but with a bombardment of one hundred and fifty thousand high explosive shells or their equivalent in bombs. This would hardly have left a house in central London untouched, and the dead would have been numbered not in hundreds but in tens of thousands. Such an attack would have required the visits on repeated nights of something like one thousand aeroplanes. Such a number is not yet a practicable possibility. We are, perhaps, inclined to underestimate the potentialities of town-bombing with high explosive and incendiary bombs. In London, for example, there were never too many big fires started at any given time for the fire brigades to deal with. An attack by ten or twenty times as many aeroplanes as ever bombed London simultaneously might well ring round a given area fairly completely with wrecked streets or burning houses, in which case most of the buildings and a good proportion of the inhabitants would perish.

Major Stewart speculates positively on the fighting plane:

The fighting machine of the future will be a very small, all-steel monoplane mounting a one thousand horsepower gas turbine engine and possibly incorporating a form of jet propulsor. It will have a capacity of four hundred miles per hour on the level and will have a terminal velocity in the dive of eight hundred miles per hour. In other words, it will be able to travel faster than sound.

The sting carried by this mechanical wasp would, Major Stewart believes, be a gun with a bore smaller than that of the present-day machine gun, would comprise several barrels and would be able to "eject bullets so rapidly that the effect will be a whiplash of lead," which, "when it cracks across the wing of another aeroplane, will cut it like butter."

Imagine, then, our fleet of raiders in the year—shall we say, 1950? So great will be the armada—five hundred, perhaps one thousand strong, for metal aircraft will be the cheapest form of war-weapon ever evolved—that the element of surprise is unlikely. But the fleet's speed will serve it. If the aircraft are detected by observation posts an outer ring of anti-aircraft artillery may endeavour to embarrass the raiders, but this is doubt-

ful owing to the appalling cost of any barrage making a pretence to effectiveness.

Even during the primitive raids of the first world war it was not uncommon for the London anti-aircraft guns alone to fire a quarter of a million pounds' worth of ammunition in a single night. An improved form of wire "apron" defences suspended from small balloons able to endure rare atmospheres might be used to force the attackers to fly as high as possible, but except for a few planes with specific objectives, they would probably require no such encouragement.

Before 1950 some as yet unconceived invention may help to redress the hopeless inadequacy of ground defences against attacking aircraft but, as far as can now be determined, the only effective defence will be to attack the raiders as far as possible from their objective, to break up their formations and concentrate a preponderance of fire on the scattered units with the object of forcing them down before they can effect any harm even by their involuntary crashing in defeat.

But how hopeless a task it seems. It will be guerilla warfare in three dimensions, with mists, fogs, clouds, and night-time to furnish natural screens behind which to lurk and, no doubt, artificial smoke-screens to supplement them. Even in a clear sky there is nothing more difficult than to detect and to maintain under observation a high-flying aeroplane, moving with incredible swiftness through a medium that, by its uniformity, affords no "landmarks" by which a particular patch in which the aeroplane was once perceived may be remembered.

It is almost inconceivable that the whole or, indeed, any substantial portion of such a formidable fleet as could comparatively cheaply be despatched, could be forced down before doing damage, even if a greatly preponderating defending force is assumed. The memorandum drawn up by the British Air Staff in France, in September, 1916, which expressed the opinion that it is utterly impossible to prevent hostile machines from crossing the line "simply because the sky is too large to defend," is confirmed for existing circumstances by a remark in a paper read by Squadron Leader B. E. Sutton before the Royal United Services Institution in 1922. "The impossibility of preventing single machines or even all hostile patrols from crossing the lines," he said, "cannot be realised without comprehending the immensity of the air and the difficulty from the air of seeing other machines in it." Nothing which has been disclosed in the technical development of the last seven years gives reason to reconsider these judgments.

All factors indicate that the attackers would be able to inflict more loss than they themselves would risk, besides immobilising a vast defensive organisation. If a clear preponderance of air power were not possessed by the defence there would then be nothing to prevent the raiders from proceeding methodically with their plan of operation. Each unit would

complete its allotted task, the while maintaining wireless communication with the directing "flagship," for the fleet would be flexibly centralised if hostile "jamming" could be prevented. In all directions they would speed on their missions, each unit accompanied by its protective fighting planes.

And soon the sky would be red with the light of a thousand fires and the shattering roar of explosions would, for a while, be almost continuous. Every now and then a machine would streak across the sky in flames. Then, most of its objectives reached, the units would reform into a solid, if diminished phalanx, the course would be shaped for home, and the raiders, flying the higher for the loss of their loads, would fight their way out again.

It is clear that the only defence that exists against such an attack is the unchallenged mastery of the air. The enemy's aircraft must never be allowed to leave their hangars.

This is not a counsel of hope. No nation in the world has the power of achieving such a predominance and, unless some new factor enters to simplify the problem and to restore some kind of balance between the aerial offensive and the surface defence, the outlook seems to be one in which the establishment of aerial supremacy will be a painful one both to victors and vanquished. It is not extravagant to contemplate the capital cities of two combatant powers being shattered and set unquenchably on fire in the same night by fleets which pass each other, with or without hostilities, on the outward and homeward flights, leaving the question of predominance still to be decided.

The argument of the younger school of military experts is that the consequences of the introduction of such new weapons as the aeroplane, poison gas and the tank will be that the future conflict will march to a rapid conclusion and will, hence, be less bloody and destructive than the wars of the "Napoleonic" era which ended with the war of 1914-1918. But the argument appears to be based on the assumption that the predominance of one of the combatants will rapidly make itself apparent, and there is little to justify the assumption. The new weapons, and in particular, the aeroplane, increase immeasurably each nation's striking power, but leave it comparatively helpless before its opponent's attack.

Group Capt. MacNeece, in the paper on air defence which has already been quoted, emphatically asserts that:

No matter what are the defensive arrangements, there can never be a question of a guarantee of immunity from air attack. In future wars, one side or the other will have superiority in the air . . . but there will not be anything so definite as a supremacy of the air. . . . It follows that victory will come to the nation which in an air war in the future has not only the strongest striking force but which shows the greatest stoicism and ingenuity in meeting strange and devastating terrors.

So, to your gas-proof dug-outs, O Israel, there to don your gas-mask which we hope, though without much confidence, will be proof against the gases of high penetrative power now being brewed for your discomfort.

The wars of the future may be shorter than those of the past, but they will be wars of attrition, nevertheless. The difference will be that collapse will be quicker to arrive and more utterly complete, and the industrial life of the vanquished nation will be so irreparably smashed and that of the victor in a condition so little less parlous that world trade will be disorganised far more completely than at the end of the first world war. It is not unlikely that fewer people will be killed in actual hostilities. Several authorities have contemplated the possibility of the civilian population itself being a major bombing objective, and so cautious and orthodox a veteran as the late Marshal Foch has given it as his opinion that:

The potentialities of aircraft attack on a large scale are almost incalculable, but it is clear that such attack, owing to its crushing moral effect on a nation, may impress public opinion to the point of disarming the Government, and thus become decisive.

But it is usually the soldiers of the old tradition, the men of blood and iron, who, having once shifted their mental focus so that they may envisage a radical modification of military strategy through the employment of aircraft, are incapable of conceiving its employment except in terms of slaughter.

A better understanding of the aeroplane's potentialities would reveal that that same "crushing effect on a nation," both moral and economic, could be produced indirectly, while at the same time destroying the social edifice by a concentration on purely industrial objectives. Except, perhaps, for an occasional special raid to terrorise enemy citizens in key towns into clamouring for peace or in order to provoke revolution, it seems unlikely that the combatants would waste precious explosive that might be disintegrating the industrial system which keeps those citizens alive and enables them to continue to resist.

The loss of life from indirect causes may be expected to be on at least no lower scale than that set by hostilities in the last war. Interrupted food supplies and crippled industrial output mean malnutrition and, later, starvation, with pestilence in its train; and the nervous condition occasioned by incessant bombardment, unnatural life, loss of sleep and lack of food will lead to waves of madness, revolution, civil war and anarchy.

Exaggeration? Well, perhaps. It is so easy to exaggerate when speculating on the possible consequences of a hypothetical war some scores of years ahead, with existing developments projected into the future. The special circumstances of the specific war will, of course, largely determine its variations from the lines of prophecy. The interposition of some great geographical barrier, such as an ocean or a high mountain range, the prevalence of peculiar climatic conditions or factors limiting hostilities to

a sparsely populated area would, of course, modify the methods of air warfare. But the world has become so small a place and the great powers brought into such close contact and friction, that it is difficult to imagine any set of circumstances in which two or more great powers could become embroiled in war that would prevent an air attack on the centres of industry and population of one or both of the combatants.

It may be advisable to conclude this necessarily incomplete and superficial survey of the future of air warfare by reviewing a few of the objections that have been made to the conclusion that aircraft is destined to play an increasing and decisive part in international conflict.

One is that the air weapon is so barbarous that the nations will agree, before hostilities, to forego its use for offensive purposes, or to limit it, on the lines of conventions already concluded under the auspices of the League of Nations and the older international bodies. In reply, one can only say that history affords no precedent for such an abstention. When a nation is fighting desperately in the belief that its existence is at stake it will resort to the use of any weapons that lie to its hand, and will find no difficulty in justifying its action before its nationals.

Nor is the objection to such weapons logical on any ethical ground except that of uncompromising opposition to war of all kinds. If it is legitimate to kill men at all, it is legitimate to kill them as quickly, as effectively and in as large a quantity as possible. The contention most indicative of muddled thinking is the belief that, while it is legitimate to kill a man under arms, it is wrong to kill a civilian. Yet a man or, for that matter, a woman or child, engaged in industry or commerce is as essential to the life of the nation and as much a participant in the war as the man at the front. This identity of responsibility in soldier and civilian will be much more closely established in the next war.

Until it is clearly recognised that war is a conflict in which a nation seeks to impose its will on another, that every citizen of that nation is responsible for the collective decision to resort to war, and that the army, navy and air force are simply means for the attainment of that end which have in the past been found useful—then there will be no peace in the world. War is a dirty business, and the only way to humanise it is to abolish it. And, lest the last sentence should be considered to dismiss the problem too summarily and to treat mankind's oldest affliction without the awe its difficulty should inspire, let it be understood that it is recognised that the abolition of war implies a change of social organisation far more profound than a universal repudiation of war as a means of settling international disputes which the great powers have recently made.

“War,” as Clausewitz says, “is a continuation of political commerce.” “It may even reasonably be said,” suggested William James, “that the intensely sharp competitive preparation for war is the real war, permanent, unceasing, and that battles are only a sort of public verification of mastery

gained during the 'peace' intervals." Until a means has been found of rendering superfluous this confirmation by ordeal, war must be regarded as a natural form of political and economic intercourse.

A third objection to the contention that the aeroplane may be expected to exert a decisive influence in warfare of the future is that its success in the latest stages of the first world war represented a temporary superiority of the offensive over the defensive arms, and that the swing of the strategic pendulum will soon restore the equilibrium. But it is a fallacy to assume that this opposition of offensive and defensive arms leads to stalemate or a reversion to the status quo ante. Always the development of the offensive arm, though countered by a corresponding evolution of the defence, removes the conflict to another plane. It is conceivable, though not, I think, probable, that the next war will reveal such an improvement in anti-aircraft defence that the aeroplane, as we know it, will be rendered impotent. But the result would not be the abandonment of three-dimensional warfare, but its further development in speed, immunity and striking power.

But until the defence can assert that superiority it seems probable that the world will have to pass through a cycle in which the offence has, if only for a brief period, secured predominance. We can only hope that that period will be brief enough to enable civilisation to attain to a maturity which shall be untroubled by the growing pains of its bellicose adolescence.

The Attack of Daylight Bombing Formations

By AIR COMMODORE C. R. SAMSON, C. M. G., D. S. O., A. F. C.

EDITOR'S NOTE: *The following short article by a British officer recently appeared in the Journal of the Royal United Service Institution to whom we make our acknowledgments. Some of the difficulties of pursuit attacks against bombardment formations are covered briefly. The article is published as having general interest for the Coast Artillery officer and as a contribution to his knowledge of Air Corps tactics.*

THE problem of how to attack bombing formations is obviously a very important one, especially in connection with Home Defence. Yet there are very few actual data to guide us in its solution, and remarkably few practical trials have been carried out of late years. But, as the result of experiments with which the present writer was closely associated over a period of two years, certain methods were devised.

Before proceeding any further, however, it is necessary to note some general aspects of the subject. Firstly, in the present state of the Royal Air Force, pilots are constantly being moved from squadron to squadron; thus they never settle down for any length of time. Some of the pilots have a great deal of experience, others have none. Flights are commanded in many instances by pilots with only eighteen months' service. The same thing will, of course, happen in war time after the first few days of fighting owing to casualties and the rapid expansion of the service. Therefore our combat tactics must be simple in order that newly joined pilots can rapidly become useful members of the squadron.

Then it must be borne in mind that the present day single-seater fighter (S. S. F.) provides a very obstructed arc of vision for the pilot. This must be taken into account when devising tactics demanding close formation work. Again, our combat tactics must be based on close-order flying, otherwise our assaults will tend to be indecisive and our squadrons will split up. The provision of a free field of fire for each aeroplane and lack of mutual interference is highly important. The size of the formation and sub-formation that can be handled is another factor. Lastly, intercommunication between the leader, sub-leader and other pilots needs consideration.

Up to date, our tactics have been forced to follow the design of our S. S. F.; surely this is quite wrong. The correct method would seem to be to design the fighter so that it can comply with the main requirements of our tactics. The ideal situation is reached when the weapon, i. e., the fighter, is constructed and armed so as to provide the maximum efficiency in the best form of assault.

When we come to consider the bombing formation that has to be at-

tacked, it is as well to proceed on the assumption that, aeroplane for aeroplane, the bomber has greater gun power; also, individually, their speed may be nearly as high as the fighter. The speed of a formation, however, is a good deal lower than that of a single aeroplane, and the larger the formation the slower will be its speed. It is possible for aeroplanes of inferior speed to attack those of superior speed, but they must approach from a direction before the beam. The greater the speed superiority of the attacker, the larger the number of assaults that can be delivered in a certain period. Speed superiority also permits of the attackers getting to close quarters from a rearward position.

Certain gunnery features of bombers merit consideration. It is a well-known fact that it takes a considerable time to train a gunlayer of average ability to handle his weapon properly when standing up in the full blast of the slip stream. The rear top gunlayer in a bomber is generally so exposed when he is standing up that in many cases he will be a negligible factor. This means that an attack from below will probably suffer less from gunfire than an attack from above. In the latter case the gunlayer of the bomber is crouched down in a sheltered position, well braced up, and therefore able to produce well-aimed fire. The provision of gun turrets will, of course, greatly improve the gunlayer's efficiency.

The nature of the formation used by the bombers must to a certain degree affect our tactics. We must also bear in mind that the armament of the bombers may vary according to their position in the formation. But these features should not prevent us from following certain main lines; in any case, it is evident that we cannot have a different scheme of attack to deal with every formation of the enemy, for the training of our pilots, under the present system, precludes efficiency in more than two or three methods of attack. Special squadrons with pilots of high individual capability, who have been together for a long time, doubtless will be able to assimilate quickly any new method; but the average squadron would undoubtedly fail if too much were asked of it.

The size of the bombing formation is another factor. I, personally, hold the view that the bigger the formation the easier it is to attack it, for the following reasons: To begin with, there is more battle room for our fighter squadron; secondly, the enemy is slower and less manoeuvrable; thirdly, his leader is more out of touch with what is happening to his flank aeroplanes.

Now our tactics must be based on a standard system. In this, the flight is the lowest unit. So many flights make the squadron. When two or more squadrons are present they work together, synchronising their assaults. Each flight acts as cover for the other flights. Each squadron acts as cover for the other squadron. Every aeroplane in the whole force is providing and receiving cover. In fact the principle is to attack and make off in reciprocating cover. In other words, a fighter squadron may

be likened to a boxer with three or four hands, each hand being a flight. In the light of experience there can be little doubt that the correct number of aeroplanes in a fighter flight is three. Properly trained, they can work practically as one aeroplane; their manoeuvres are rapid, and they can produce a heavy and well-aimed fire. Any greater number would only reduce the manoeuvreability of the unit. In the air, the squadron should consist of four flights, thus providing a reinforcement by throwing in the fourth flight to replace casualties in the first assault.

The correct procedure must undoubtedly be for the fighter to endeavour to secure fire superiority against a portion of the bombers' formation, with the object of destroying the formation in detail. To obtain this we must attempt to get practically simultaneous fire from each aeroplane of each flight against one bomber. It is impossible in practice to obtain simultaneous fire from three aeroplanes on one but we can attain something approaching it. Therefore, we must attack with each flight simultaneously on certain bombers, preferably with a view to facility of manoeuvre, selecting the wing bombers.

In each flight the aeroplanes attack, one or two from above, and one from below; or vice versa; and practically simultaneously. This method provides each fighter with sufficient space and time for a well-aimed burst of fire. Well-aimed fire is all important. At present, until further improvements in guns and sights are made, deflection shooting must not be attempted. Against certain types of aeroplanes and various formations a flight may attack two bombers at once, but as a general rule, only one is attacked.

Under this system, then, we have the whole squadron of nine aeroplanes attacking three bombers. This seems, on the face of it, a wasteful procedure; but it will be found that, in practice, we are following sound principles, for we are attempting to destroy the enemy in detail, and concentrating a superior force against an inferior one. Also by this method we are maintaining the cohesion of our flights and squadron, and thus preventing the combat from degenerating into an indiscriminate mêlée.

After each assault, the flights break off, reform, and repeat the attack without loss of time. The number of attacks are, of course, governed by the speed superiority of the fighters, ammunition supply and fuel capacity. One advantage of this type of attack is that it prevents waste of ammunition at long range, which is liable to happen with inexperienced pilots.

Without going too closely into the actual details of the assault it seems that the fourth flight can be used either to attack with the other three flights or to act as follows:

- (1) Feint attack on enemy leader;
- (2) Provide cover in case the enemy are escorted;
- (3) Deal with aeroplanes broken off from the main formation;
- (4) Replace casualties in the flights.

Having dealt briefly with the nature of the attack, it is as well to consider from which direction it should be launched. There can be no doubt but that, whenever possible, it should be from a position above and ahead of the enemy. Unless we have enormous speed superiority, attack from astern is fatal, as we then have a slow approach generally ending in a flat dive, coupled with exposure to maximum fire. From ahead, the fighters have the advantage of initiative air room and air speed; also, as a general rule, they will be less exposed to the bombers' fire, because the fixed front guns of the bombers cannot bear on the fighters unless the bombers carry out complicated manoeuvres. Added to this is the advantage of the fighters being between the bombers and their objective: either the target or their home.

Another factor affecting the problem, but which it is not proposed to discuss in detail, is the natural reluctance of the bombers to manoeuvre, because every manoeuvre will delay their mission, and also tend to break up their formation. The advantages of attacking the flank bombers first are that in this area is found the least fire, as the opposite flanks are at too long range for effective shooting. Again, the whole fire system of the bombers may be put out of action, as each fighter flight is engaging simultaneously, and human nature will make those bombers which are attacked fire at the actual aeroplanes that are attacking them to the neglect of those that are attacking their fellows.

In conclusion, it may be remarked that any attack which may be devised for fighters against bombing formations appears simple enough on paper, or when worked out on a blackboard; yet, when it is tried in the air, many difficulties are soon discovered. It is only by constant experiment and practice that success can be assured.

Elizabethan Coast Artillery

By J. R. CLEMENS

FROM 1540 onwards to Cromwell's time English artillery was designed so that it could be used either afloat or ashore, on ships or in coast forts, as it was from the sea alone that the enemy attacked. In England's wars on the continent it is surprising to find behind the gabions of her half-moons in the field not mobile light ordnance, but the same heavy ordnance that was used on ship and fortress—the cannon, demi-cannon, culverins, demi-culverins, and sakers. The weights of these pieces varied from six thousand to one thousand four hundred pounds; their calibres from eight to three and one-quarter inches; their range from two thousand five hundred to one thousand seven hundred paces; their charges of powder (corn powder) from twenty-seven to five and one-third pounds; and the weights of the balls from sixty to five and one-third pounds. When planted in the field it required:

- 24 horses to remove a canon;
- 18 horses to remove a demi-canon;
- 14 horses to remove a culverin;
- 10 horses to remove a demi-culverin;
- 7 horses to remove a saker.

The demi-culverin was most in demand for fort, on ship and in the field alike. The English ships were over-armed and carried three tiers of heavy ordnance in the frail, lofty poops. A ship of five hundred tons carried forty-two guns, comprising cannons, demi-cannons, culverins, demi-culverins, sakers, minions, falcons and basils; a ship of eighty tons carried three sakers, four minions, three falcons and four falconets.

The guns were made of brass or of iron, but most commonly of cast iron; "and all sea-faring men agree that they never see no cast ordnance of iron but such as be made in England" (John Borral to the Earl of Essex, 1598), and so, in conjunction with the excessive charges of powder used, it is not surprising that English cannon had an unenviable reputation for bursting.

Breech loading cannon were not unknown. Petition of Capt. Peter Cannon: ". . . he has spent much time and money in inventing iron and brass ordnance to be loaded at the briteche, as others are now at the mouth; in this way they may be loaded and discharged much oftener than others and are more secure by sea and land to the saving of gunners killed in loading and sponging other ordnance at the mouth."

Sir John Davis sends to the Earl of Essex in the year 1598, a letter, "On the perfection of artillery" and deals principally with the following

points: the true mixture of metals and the convenient length. For the mixture, for every one hundred weight of brass, five of latten and twenty of tin are recommended. For the proportion: "For every pound weight of the bullet from falconet to culverin, to allow at the least two hundred and sixty in metal, or rather three hundred from the culverin to cannon, two hundred and five; and from cannon of sixteen to one hundred and twenty for every pound of the bullet to allow one hundred and twenty in metal. To all artillery so metallled may safely be given of good corn powder the weight of the iron bullet. Now they make their ladles less by a quarter of a bullet than they ought, and yet are fain for fear of breaking their ordnance to use weak serpentine powder, yet drive the bullet not above two-thirds of the way as was shown by their continual shooting short at Calais. As to length, formerly eighteen or twenty bullets was held convenient, but now, especially by the Venetians and those other princes of Italy which spare no cost to discover the wonderful effects of artillery, they are increased to thirty bullets and to thirty-six and lately by the invention of Guibio Savorgnano, to forty. (Eight and one-half feet was the standard length for all heavy ordnance from cannon to demi-culverin.)

A master gunner and fireworker qualified for making all sorts of fireworks and ordering all sorts of batteries, understanding all works relating to fortification of camps, approaches, galleries and mines with the use of all sorts of cannon, and mortar pieces.

The following order of the Privy Council is interesting as bearing on the equipment of a coast battery:

"July 28, 1599. These shall be to require you to deliver or cause to be delivered unto the said Lord Hunsdon for the better supply and defense of the Isle of Wight these parcels of iron shot and munition following: that is to say, round shot for demi-culverin, six hundred; for sakers, fifty; and for minion, thirty; long pikes, two hundred; match, six thousand weight; ladle-staves, forty-eight; heads and rayners (?rammers), forty-eight; wadd-hookes staved, twelve; black bills, one hundred; lead for shot, two tons; copper plate, one hundred; sheepskins, twenty-four; ginne complete, one; ginne reepe spare (sic), fifty pounds weight; draught rope, four coils; shovels and spades, two hundred; pickaxes, fifty; and crows of iron, twelve."

Attention is called here to the great number of balls (six hundred) for the demi-culverins in excess over those assigned to the other guns. This is in proof of the statement made previously in this paper that the demi-culverin was the favorite arm of Elizabethan artillery.

The following entry concerning the equipment of a battery enters more into detail:

“1587, Nov. 23. Receipt given by Roger Papworth for the receipt of ordnance, powder, etc.:

Sakers of cast-iron—2
 Falcons of cast-iron—2
 Minions of cast-iron—2

“In all six pieces well mounted upon carriages, with wheels, shod with iron.

Ladles—9
 Sponges—6
 Axletrees—6
 Spare wheels, shod with iron—3 pair
 Bullets of iron for the said pieces (sorts twenty)—120
 Powder—78 barrels
 Match—8 ‘fates,’ 1 barrel
 Lead in pigs—16
 Whetstone of lead—20.”

There was a famous huge piece of ordnance in Edinburgh castle that commanded the district: “the porter had our swords to keep until we came back again out of the castle. There were about some twenty pieces of ordnance ready mounted, brass and iron, one piece of ordnance there were bigger than any else in the munition house or any other which I saw, to be about four yards long, and the diameter twenty inches, there being a child was put in it as by all reported, the bullet of stona she shooteth is of weight of two hundred and eighty-eight pounds.”

In defense of Dartmouth it was ordered “to finish and garnish with guns, artillery, and other ordnance, defensive and sufficient, a certain tower and bulwark then in building for the safeguard of the said town and to find a chain sufficient in length and strength to stretch and be laid athwart the mouth of the haven of Dartmouth from one tower to another.”

It has been said that soldiers in peace time are like chimneys in summer, but the truth of this adage certainly did not apply to artillerists in Elizabeth’s time as they were very enthusiastic in the practice of their chosen arm and throughout the length and breadth of the land “gun clubs” flourished, and it is to be noted the word “gun” in the phrase “gun clubs” meant heavy ordnance. Members of these clubs bought up land, enclosed them with high walls, and indulged in their target shooting to their hearts’ content, despite the indignant protests of the aroused neighborhoods: “1595, June 6. Petition to the bailiff from five persons, who having a special care and love towards the maintenance of artillery, as a game not only allowed by the laws of the realm of England, but also most laudable to be exercised by all men did, of their own proper costs and charges, erect for the parish of St. Julian’s in the common lane near to the Hermitage in the liberties. a pair of butts, complaining that one

Thomas Griffiths (son of Griffith Lewis, the common apparitor or somner for the diocese of Coventry and Lichfield whose house called the Hermitage is accompted a house to retain people of bad behavior) did pull down and subvert the said butts, to the only intent to suppress the good exercise and to maintain bowling; they pray that he may not only receive condign punishment, but may erect the butts again." Here is a report of a later "gun" club of the seventeenth century: "Yesterday Sir William Compton was at the Gun field to try an experiment of a Grenado shot from a demi-cannon against a butt, by a little Frenchman who is said to have been recommended for his skill by Prince Rupert, the effect of which was he could not hit the butt, though he shot twice and the shells broke both times as was expected. However, a second essay is intended in another place, but no more there for fear of mischief, which some passengers but narrowly escaped."

There is a record of a sporting trial match between English and Dutch mortars when the English outshot the Dutch by one thousand six hundred yards.

Inventors were not lacking. A Captain Peake, Master Gunner of England, cast a mortar piece with twenty-eight cylinders, throwing as many bombs at once, each shell being thirteen and one-quarter inches diameter and carried them one and one-quarter mile, one elevation serving the whole. They were kindled with their own flash and could be discharged eight times in an hour.

EDITORIAL

The Coast Artillery Journal— The Organ of the Coast Artillery Corps

IN AN article appearing in the Journal of the United States Artillery in 1913, Gen. John W. Ruckman, the first editor, described the early beginnings of the JOURNAL and the plans for its publication which were considered by the group of officers interested in establishing a professional magazine devoted to the interests of the artillery and the dissemination of artillery knowledge. It was decided that the JOURNAL be published at the Artillery School in spite of the objection raised by some "that independence of action and speech would be restricted by the school authorities and the publication thereby rendered useless and a failure." It is further stated that the "fear of restriction proved to be wholly imaginary."

Nevertheless, when the JOURNAL files are examined it is discovered that the various editors since have had occasion to mention this subject again and again and inform the readers that the JOURNAL pages are open to all for the free expression of thought and opinion on artillery subjects.

The JOURNAL is no longer published under the supervision of the Coast Artillery School. Little more than a year ago its editorial office was removed from Fort Monroe where it had been since the beginning and located in Washington. The reasons for this change were sound and sufficient. While Fort Monroe offered many advantages it was felt that a better perspective of the entire Coast Artillery would be obtained in Washington. Many believed that proximity to the Coast Artillery School might cause the JOURNAL to become too theoretical or even pedantic. Others believed that undue weight might be given to local activities and that important happenings elsewhere might not be given sufficient attention. In Washington the editor has access to the files in the office of the Chief of Coast Artillery and can keep in close touch with all matters which concern the Corps.

With the removal of the JOURNAL to Washington murmurs have again been heard to the effect that censorship would be applied and that free expression of opinion would be restricted.

It is true that the Editor, being a Regular officer, has a superior. Under the hierarchy of military organization it is difficult to see how this could be otherwise. This superior happens to be the Chief of Coast Artillery. Perhaps it is only natural, then, that a few officers should state that the JOURNAL is, in fact, the organ of the Chief of Coast Artillery and that opinions contrary to his policies will be suppressed.

The Chief of Coast Artillery wishes to remove this thought from the minds of any officers who may hold it. He has given a great deal of con-

sideration to the manner in which this may be done. The letter published below indicates the method which will be followed in deciding the editorial policy of the COAST ARTILLERY JOURNAL.

The members of the editorial Council are well known to nearly all officers of the Coast Artillery. Without any wish to embarrass them, it may be said that they are officers of sound judgment, and considerable professional attainment. The Editor will confer with his Council frequently and will seek its advice and assistance. In case of doubt as to the publication of any article the Council will make the final decision. It cannot be promised that all articles submitted will be accepted and published. But it can be stated, in general, that an article will be rejected only for a few obvious reasons—lack of merit, lack of interest, or failure to observe good taste.

It is believed that the new arrangement will react to the benefit of the JOURNAL. Your wholehearted support is necessary for its success. The Council and the Editor will make every effort to merit your support by making the COAST ARTILLERY JOURNAL what it was intended to be—*The Organ of the Coast Artillery Corps.*

War Department
Office of Chief of Coast Artillery
Washington

May 2, 1930.

Maj. Stewart S. Giffin, C. A. C.,
Editor, the COAST ARTILLERY JOURNAL,
1115 17th Street, N. W.
Washington, D. C.

My dear Major:

I have discovered that a feeling exists among some Coast Artillery officers that the COAST ARTILLERY JOURNAL is for no other purpose than to serve as the organ of this office and that the publication of professional articles not in accordance with the policy of the office is not encouraged.

While the Editor of the COAST ARTILLERY JOURNAL performs his duties under my jurisdiction, the JOURNAL, itself, should not be considered the official or semi-official organ of the Chief of Coast Artillery. On the contrary, it is the organ of the entire Coast Artillery personnel—Regular Army, National Guard, and Organized Reserve—and is published exclusively in its interests.

It is my belief that the JOURNAL should be the agency for the free expression of personal opinion and the discussion of any matters affecting the efficiency of our arm. In this respect it is anticipated that individuals

will not always agree with the policies of this office. A free and open expression of honest opinion is the surest road to progress. Courtesy, good taste, and the customs of the service should be sufficient guidance in such expression of opinion.

With the above in mind I have decided to vest general supervision of the publication of the COAST ARTILLERY JOURNAL, hereafter, in an advisory council of representative Coast Artillery officers on duty in Washington but not assigned to duty in the office of the Chief of Coast Artillery. The following have consented to serve and are so designated:

Col. Samuel C. Vestal, C. A. C.
 Lieut. Col. William H. Wilson, G. S. C.
 Lieut. Col. Frederick H. Smith, C. A. C.

With the counsel and cooperation of the above officers and with the efficiency you have shown in the management of the JOURNAL in the past I am sure that we can look forward to a wide field of interesting topics of professional interest and an enlarged field of usefulness.

Sincerely yours,

JOHN W. GULICK,
Major General,
Chief of Coast Artillery.

PRESSURE-COOKERS TO BE INVESTIGATED

The present rolling kitchen is not adapted for cooking while under way. Some time, therefore, must elapse upon arrival of the rolling kitchens before food can be prepared. At times, this condition results in confining the meal to foods which can be quickly cooked. The pressure-cooker of familiar commercial design with its clamped-down lid, pressure gauge, and safety valve can materially shorten the time of cooking. For instance, the pressure-cooker can bake beans in fifty minutes whereas the ordinary cooking method requires eight to twelve hours. Similarly, meats and vegetables can be cooked in from fifteen minutes to an hour, the longer period being required for only the toughest meats.

The Chief of Infantry has recommended that the pressure-cooker idea be embodied for experimentation in a newly designed kitchen which is being made for test by the Infantry Board.

COAST ARTILLERY ACTIVITIES

Office of Chief of Coast Artillery

Chief of Coast Artillery
MAJ. GEN. JOHN W. GULICK

Executive
COL. H. L. STEELE

Organization and Training Section

MAJ. S. JARMAN
MAJ. E. W. PUTNEY
MAJ. J. B. CRAWFORD
CAPT. J. H. WILSON

Personnel Section

LT. COL. H. T. BURGIN
CAPT. H. N. HERRICK

Plans, Finance, and Materiel Section

MAJ. J. H. COCHRAN
MAJ. C. H. TENNEY
CAPT. F. J. MCSHERRY

Intelligence Section

MAJ. S. S. GIFFIN
CAPT. H. N. HERRICK

Inspection Visits by Personnel from Office, Chief of Coast Artillery

The personnel in the office of the Chief of Coast Artillery has taken up march order in the past few months and has traveled extensively and widely throughout the United States and even overseas. No method of transportation has been slighted—motor, rail, air, water have all been used.

No. 1 traveler is Maj. Gen. John W. Gulick, Chief of Coast Artillery. He has made several visits to Aberdeen Proving Ground inspecting the newly organized 69th and to observe during the joint Antiaircraft-Air Corps exercises. He has visited Fort Monroe and Fort Eustis. Fort Totten has also been inspected as well as Fort H. G. Wright. On May 16, he inspected the 61st, en route to Fort Sheridan, at Richmond, Va., and in company with the Governor of Virginia, reviewed the regiment on the steps of the Capitol. At this writing he is attending the 10th Annual Dinner of the Coast Artillery Reserve officers of New York. On May 27, he will be present at the R. O. T. C. graduation exercises at the University of Delaware, Newark. On June 18, he will again visit Fort Monroe to be present at the graduation exercises at the Coast Artillery School.

Record for distance is held by the personnel officer, Lieut. Col. H. T. Burgin, who has just returned from a trip to the West Coast which included Lawrence and Manhattan, Kansas; Logan, Utah; Fort MacArthur and San Francisco, Calif.; Fort Worden, Wash.; Minneapolis, Minn.; and Lansing, Mich. Colonel Burgin's visit to these places was concerned with personnel at R. O. T. C. units.

Captain F. J. McSherry was present at Mather Field during the Air Corps exercises held there during the month of April. Captain McSherry made the trip in a transport plane from Langley Field. He reports considerable nervousness on several occasions en route but no serious consequences.

Major C. H. Tenney has been inspecting Coast Artillery armament and fire control equipment all along the east coast and the gulf coast as far as Fort Crockett, Atlanta, Ga.; Fort Moultrie, S. C.; Fort Screven, Ga.; Key West, Fla.; Fort Barrancas, Fla.; Fort Morgan, Ala.; Fort Crockett, Texas, were all included in one visit during the latter part of May. In April he visited Fort Monroe and Fort Eustis. Prior to that he had inspected forts in New England and in the vicinity of New York. He reports no rust.

Major Sanderford Jarman, on April 20, began a trip which lasted for three weeks and was on business pertaining to Reserve and R. O. T. C. training. He visited Columbia and Charleston, S. C.; Atlanta, Ga.; University, Ala.; A. and M. College, Miss.; New Orleans, La.; Galveston, Tex.; St. Louis, Mo.; Indianapolis, Ind.; Cincinnati, Ohio; and Pittsburgh, Pa. Major Jarman has also been a visitor at Aberdeen and accompanied the Chief to Richmond, Va., for the review of the 61st.

Captains J. H. Wilson and H. N. Herriek are the only overseas travelers. They are now in Panama witnessing the long-range aerial position-finding tests now being conducted there.

Major J. B. Crawford recently was present on the *Lexington* during the recent air demonstration for a Congressional Committee. He reports it well done and without mishap. In April he was a visitor to Fort Totten and Fort Hancock in connection with radio intersection tests.

In addition a number of officers have been visitors at the Chief's office—some officially, others casually. Capts. D. M. Griggs and I. H. Ritchie, students of the Advanced Course, have just completed a tour in the Gunnery Section of the office of the Chief of Coast Artillery, Major Crawford in charge.

Major General H. D. Todd and Colonel Kimmel are occasional visitors conferring on matters connected with the Coast Artillery School.

Major C. W. Baird has visited Washington on business of the Submarine Mine Depot. Maj. R. B. Colton conferred on subaqueous sound-ranging developments.

These frequent visits and inspection trips bring about closer cooperation. The Chief of Coast Artillery intends to keep in close touch with all activities in which the Coast Artillery is concerned. He looks forward, with confidence, to the future of the Coast Artillery Corps and he believes that the most may be accomplished when unity and solidity are obtained in the Corps. Officers visiting Washington either officially or on leave are *expected* to visit the office of the Chief of Coast Artillery. The Chief will never be too busy to receive them.

Test of Harbor Defenses on Caretaking Status

Under the present plan of organization of the Coast Artillery many of our harbor defenses are in the hands of caretakers. This does not indicate that these harbor defenses are unimportant in our coast defense system or that the materiel at these places will be permitted to deteriorate. In case of emergency these posts will be garrisoned by National Guard harbor defense organizations and at all times must be kept in condition to be taken over by the Guard on short notice.

In general, the caretaking personnel has been increased in numbers. The officers for this duty will be selected with considerable care. Caretaking duty is by no means an unimportant one. The officer so selected may consider himself complimented because to him fall many of the duties of a harbor defense and post commander. In addition, he performs most of the duties of the harbor defense commander's staff. Some of the duties incident to caretaking, such as the preparation of war plans, are ordinarily intrusted to officers of much higher rank. The caretaking officer may consider himself fortunate because he has this opportunity and responsibility which would not fall to him at a fully garrisoned post. His detail is an indication that his superiors have confidence in his ability to handle the situation and that he can be depended upon to perform important duties without direct supervision. In posts occupied by other arms of the service considerable tact and diplomacy are often required in the performance of garrison duties under the post commander and, at the same time, performing the Coast Artillery duties in which the post commander may not be particularly interested.

The War Department has directed that a test of a harbor defense on caretaking status be conducted during the month of June to determine the condition of the armament and communication system and the state of readiness existing. The Harbor Defenses of Portland were selected, more or less at random, but with the idea of their importance in mind. The harbor defense commander is Capt. Harry R. Pierce. He will not be informed of the test until June 1 when he will be directed to prepare to turn over the harbor defenses to the National Guard under the assumption that an emergency exists. All materiel will be prepared for service under the existing war plans. The land installations, only, of the mine command will be made ready for service. Mobile artillery will be prepared for service but will not be placed.

One month will be permitted for these preparations. At the end of June the Commanding General (Brig. Gen. W. E. Cole), 1st Coast Artillery District, will inspect to determine if the state of readiness is satisfactory and if the caretaking detachment is adequate. Personnel from other harbor defenses in the First Corps Area will not be used in preparation for the test. During the course of preparations the Chief of Coast Artillery will visit the harbor defenses and observe the preparations.

Special Course at Chemical Warfare School

During the period July 7-August 1 a special course for field officers will again be conducted at the Chemical Warfare School, Edgewood Arsenal, Maryland. Although it is called a field officers' course senior captains are eligible to attend. The following have been selected from the Coast Artillery, most of them being recent graduates of the Advanced or Battery Officers' Course, Coast Artillery School.

Maj. Reinold Melberg
 Capt. Nelson Dingley
 Capt. Elvin L. Barr
 Capt. Clare H. Armstrong
 Capt. Thomas R. Bartlett
 Capt. Earl R. Reynolds
 Capt. James R. Townsend

Air Corps Maneuvers, Mather Field, California

By CAPT. F. J. McSHERRY, C. A. C.

"Your airplanes don't fly, they hop," complained the natives of Sacramento, California. A judge, whose veracity is not open to question, announced that his imported Jersey cow had duplicated the feat of the animal in Mother Goose rhymes, jumped clear over the moon, so startled was she to behold a squadron of roaring monsters where the buttercups ought to be.

We can sympathize with that cow. There were several occasions when we would have preferred to be much nearer the moon. Of what use are parachutes when you are in a plane that is flying in close formation with fifteen to twenty others, whizzing along at one hundred miles per hour, knocking buds off the trees and shearing sheep in its progress? An adverse wind current, or the slightest error in judgment, and you would be face to face with your Maker. Such was the daily routine of the elements, squadrons and groups constituting the 1st Provisional Wing.

The 1st Provisional Wing, Air Corps, came into existence at Mather Field, Calif., the latter part of March, 1930. It was composed of the 2nd Bombardment Group from Langley Field, Va., 7th Bombardment Group, Rockwell Field, Calif.; 3rd Attack Group, Fort Crockett, Texas; 1st Pursuit Group, Selfridge Field, Mich., and the 91st Observation Squadron, Crissey Field, Calif.

The personnel of this wing consisted of approximately two hundred commissioned Air Corps officers and two hundred and seventy-five enlisted men. The officers in it were a splendid group of highly skilled, serious-minded, well-disciplined, cheerful men, striving to obtain all possible knowledge from the maneuvers. The fact that approximately ninety-seven per cent of all planes at Mather Field were ready for service at all times indicates the skill and industry of the enlisted personnel.

The following is a list of the principal planes utilized in these exercises :

- 11 B-2 Bombing planes (Curtis Condor) capable of carrying four thousand pounds of bombs.
- 12 LB-7 Bombing planes (Keystone).
- 28 A-3B Pursuit planes.
- 22 Observation planes.
- 9 Transport planes.

The purpose of the exercises was as follows :

- a. To train the elements, squadrons and groups operating alone and in conjunction with other units, in formation flying, ground and air discipline.
- b. To develop air tactics and to solve elementary tactical wing problems.
- c. To hold aerial demonstrations and reviews for publicity purposes.

The results obtained in training were excellent. The fact that one hundred or more planes, operating from the same field, flew one or two missions daily, always in formation, often in wing formation, without serious accident is indicative of the teamwork obtained. The development of tactics and solution of tactical problems was limited. Demonstrations and reviews were held at Mather Field, Sacramento, San Francisco, Los Angeles and San Diego. Hundreds of thousands of civilians witnessed these demonstrations and were deeply impressed with the possibilities of aircraft. A considerable number of newspapermen, feature story writers, camera men and motion picture camera men were present during the entire period of the maneuvers. A great amount of publicity was obtained for the Air Corps and indirectly for the Army at large.

Observers from the General Staff, Infantry, Field Artillery and Coast Artillery were present during the exercises. They were accorded the most courteous and considerate treatment at all times by the Air Corps personnel with which they came in contact. It was the unanimous opinion of these observers that they obtained a broader understanding of the possibilities and limitations of aircraft from the maneuvers.

Even the briefest article on the maneuvers should mention the generous hospitality of the California people. We were lavishly entertained on all possible occasions. California hospitality is one feature of the place that can not be overadvertized.

Among the officers present were the following of the Coast Artillery :

- Maj. H. R. Oldfield, W. D. General Staff
- Capt. M. G. Armstrong, 51st C. A., Fort Monroe
- Capt. F. J. McSherry, Office, Chief of Coast Artillery
- Lieut. Col. A. L. Fuller, Hq., 9th C. A. District
- Lieut. Col. C. W. Waller, Comdg., 63rd C. A., Fort MacArthur
- Maj. F. E. Gross, 63rd C. A., Fort MacArthur
- Capt. C. S. Harris, 63rd C. A., Fort MacArthur
- Capt. E. L. Supplee, 63rd C. A., Fort MacArthur
- Capt. A. L. Parmelee, 63rd C. A., Fort MacArthur
- 1st Lieut. H. W. Ulmo, 63rd, C. A., Fort MacArthur

Selection of Reserve Officers to Attend Command and General Staff School

Each Corps Area Commander will submit to the Adjutant General, in time to be received not later than November 1, 1930, the names of two officers as principals and at least two and not more than four as alternates of field grade designated in order of preference, he desires to recommend to take the three months' course for Reserve officers at the Command and General Staff School, Fort Leavenworth, commencing about March 15, 1931. From this list selection will be made by the War Department of those to attend. The number selected will depend upon the funds available. Priority in making recommendations for this purpose will be given to Reserve officers who have creditably completed the Command and General Staff Extension Course, and next, to those who have creditably completed the first four sub-courses thereof. Principals and alternates will be chosen only from those who have completed satisfactorily at least the first four sub-courses of the Command and General Staff Extension Course. Recommendations should be restricted to Reserve officers who are not members of the National Guard. Reserve officers recommended for this detail are not to be more than forty-five years of age. Only under very exceptional circumstances will this age limit be waived by the War Department. In no case will an officer be detailed to take this course who is more than fifty years of age.

All applicants for detail to take this course will be informed by the Corps Area Commander as to the mental, mounted and field work required during the conduct of the course and that they must be physically qualified in all respects in order to receive favorable consideration. The fact that good physical condition is essential for the successful completion of the course should be impressed upon all applicants. It is desired that each application for such detail be accompanied, when forwarded to this office, by a report of physical examination on Form 63, preferably by a medical examiner from the Regular Army, containing a statement by the medical examiner that the applicant is considered physically fitted to meet the requirements of the mental, mounted and field work. Applications and recommendations will not be given favorable consideration or forwarded to this office unless this requirement is met.

The Coast Artillery School

During April the practical work on Antiaircraft Materiel and Gunnery for the Battery Officers Class under the Department of Artillery was completed. In order to supplement the instruction given last fall, the Advanced Class joined the Battery Officers' Class in this part of the course. The entire group of seventy-five officers was divided into small sections

and instruction given, in rotation, on the various combinations of equipment consisting of

- 4—M3 3-inch AA guns with Sperry T-4 Director
- 1—1918 3-inch (Trailer) AA gun with Vickers Director
- 2—M3 3-inch AA guns with Vickers Director
- 2—3-inch 1918 (Trailer) AA guns with RA Corrector, Case 1½
- 8—30 caliber machine guns.

These sections fired many trial shot and burst problems. Each student solved the problems on his own chart after which critiques were conducted by an instructor. These preliminary firings were followed by target practices at towed targets in which the student officers manned practically all the materiel, as well as performing the duties of battery commander, range officer, battery executive. Special emphasis was placed on the adjustment of fire, using the unilateral and bilateral methods.

Machine gun firings were also conducted against towed targets. In these firings all student officers were given an opportunity to serve as gunner. Tracer ammunition was used.

Night practices by guns were fired against towed targets on two nights. The results of these practices were very satisfactory. On both nights the sleeve target was brought down. During one of the afternoon practices a part of the sleeve was shot away.

The increased instruction in Antiaircraft Artillery as given at the school is due in large part to the training of the entire Coast Artillery in the operation of antiaircraft materiel. The School's part in the additional Coast Artillery mission has been to train the students in the present courses so that they may be competent to act as instructors at stations where Antiaircraft training is new. All types of equipment have been used in the School because the officer sent to troop duty will find all kinds of equipment at the various posts. Training will be initiated in Antiaircraft Artillery with the training year beginning July 1.

June 18 has been designated as Graduation Day at the School. It is expected that the Chief of Staff will attend with the Chief of Coast Artillery.

Harbor Defenses of Honolulu, Fort Ruger

Battery "C," 16th C. A., commanded by Capt. Lucas Schoonmaker, fired its annual record practice at Battery Harlow (12-inch mortars) on April 10. Twenty-three shots were fired at an approximate range of eleven thousand yards. Five four-gun salvos were fired at a rate of forty-five seconds per salvo. Eleven hits were made.

The personnel at both Ruger and DeRussy were entertained by a minstrel and vaudeville show. The talent was both professional and local. This is the first of a number of entertainments being planned for the near future.

The 11th Coast Artillery (HD), Fort H. G. Wright

Beginning on May 24, joint Coast Artillery-Navy maneuvers were held in the Harbor Defenses of Long Island Sound. Air forces of both the Army and Navy participated in the attack and defense as well as the Coast Artillery and Naval forces. The problem involved the defense of the eastern entrance to Long Island Sound.

The Air Corps sent 35 planes to assist in the air defense operations. This force was about the same as that used in the air defense exercises at Aberdeen Proving Ground a few weeks before. It was made up of eighteen pursuit, nine bombardment, thirteen observation, and two transport planes.

Colonel C. H. Hilton was in command of the entire defense while Lieut. Col. Gerald C. Brandt, A. C., commanded the Air Corps units.

The 51st Coast Artillery (TD) The 52nd Coast Artillery (RY) Fort Monroe, Va.

The abandonment of Fort Eustis, Virginia, has begun. During the month of May the second detachment of the 52nd left the post for its new station at Fort Monroe, Virginia. The first detachment had previously departed for Fort Hancock and has been settled at that post for some time. At about the same time the 51st moved to Fort Monroe and took up its station.

This marks the end of Fort Eustis as a Coast Artillery station. This war-time camp has been occupied by troops since its construction in 1917. The quarters and storehouses have literally fallen down over the heads of the occupants. And yet life at Eustis was not so bad. Many officers preferred it before its more swanky neighbor, Fort Monroe. Eustis was out in the sticks. Its immense reservation permitted one to stretch out and carry on field operations not possible at Monroe. The wilds of Mulberry Island presented real problems for the tractor-drawn artillery. Targets could be fired upon either on land or water. The thick growth of trees and underbrush was a challenge to the officer looking for a suitable O. P. If he tired of this he might undertake the emplacement of his battery in the swamps of the island and rack his brains to figure out the best way to get it there (or to get it out of there). Then there was also the interest which comes from serving with other arms of the service. Eustis was also the home of the 34th Infantry. The infantry were a fine bunch and, in general, relations were very cordial. Of course, there were those times such as when a .155 shell landed in the middle of the machine gun range, that relations became a little strained. Perhaps they lacked a sense of humor because it did not help to tell them that the artillery was only introducing realistic conditions for their benefit. Although it was not

intentional there was an amusing justice in it. It was a partial payment for having to listen to those stories where jump-offs were made at dawn midst (or amidst) a hell of bursting shell.

Then there were experiences to be had as members of unusual boards of officers. Considerable research would be required and the expert testimony of a veterinary and neutral dairyman would be required to determine whether a bursting shell would dry up a Mennonite cow. (There are no neutral dairymen.)

But the greatest interest was centered in construction work. If the battery commander's quarters fell down he sent for the battery and had it set up on its legs again. Or perhaps he built it over more to his liking. It was not unusual to have the under pinning give way in the midst of the most promising party. This did no great harm because the resulting undulations of the floor only furnished an opportunity to display expertness in negotiating them. One should not forget the rainy days. Then the occupants of quarters were reminded of the leaks that should have received attention after the last rain. Then began the game of setting out pans to catch the water dripping through the holes in the paper. Some were easy. Some were more difficult and perhaps the baby's bath tub would have to be pressed into service. It was difficult to secure a perfect score, but this only added to the piquancy of the game. Enough of this. Eustis is no more, so far as the Coast Artillery is concerned. The 51st and 52nd will miss these adventures. The Army may not be a highly paid profession but it has lots of fun.

Lieutenant F. R. Chamberlain, Jr., led the way to Fort Monroe with Battery "B" of the 51st and the heavy column of Battery "A." This was on May 8. This detachment was followed, on May 14, by the headquarters battery and the remainder of Battery "A." Capt. M. G. Armstrong commanded this column. The tractor column included eight .155-mm. guns which the regiment took with it to Fort Monroe. Maj. E. K. Smith commands the regiment.

The two motor columns of the 52nd left Eustis on May 15. One of these was commanded by Capt. A. W. Gower and the other by Lieut. J. W. Dwyer. There was also a railway movement consisting of two 8-inch railway guns, two 12-inch railway mortars, ammunition and fire control cars. This movement was in charge of Capt. H. M. Cochran. Maj. Eugene B. Walker commands the 52nd.

Altogether fifteen officers were involved in the movement of these two units to Fort Monroe as follows:

Maj. E. K. Smith, 51st C. A.
Capt. M. G. Armstrong, 51st C. A.
Capt. H. P. Detwiler, 51st C. A.
Capt. T. P. Walsh, 51st C. A.
1st Lieut. F. R. Chamberlain, Jr., 51st C. A.
1st Lieut. R. H. Krueger, 51st C. A.

2nd Lieut. M. H. Harwell, 51st C. A.
 2nd Lieut. W. A. Weddell, 51st C. A.
 Maj. E. B. Walker, 52nd C. A.
 Capt. H. M. Cochran, 52nd C. A.
 Capt. A. W. Gower, 52nd C. A.
 1st Lieut. N. A. Burnell, 52nd C. A.
 1st Lieut. J. W. Dwyer, 52nd C. A.
 2nd Lieut. H. L. Hughes, 52nd C. A.
 2nd Lieut. W. K. Stennis

The 61st Coast Artillery (AA), Fort Sheridan, Illinois

When you read this the 61st will have just completed its long march to its new station. The road distance as paced by the 61st was eleven hundred and twenty-five miles.

As this is written the regiment has reached Lynchburg, Va. It is understood that on the second day it traversed a bad stretch of road in the vicinity of Providence Forge, Va., and carried with it into Richmond a considerable amount of the mud which would otherwise have clouded the waters of the Chickahominy. Their arrival at the race track in Richmond was therefore a little belated. However, our informant, Maj. Sanderford Jarman, tells us that everything was spick and span on the morning of May 16 when the Governor of Virginia and the Chief of Coast Artillery reviewed the entire outfit from the steps of the Capitol. This review was arranged through the interest of General Sales, the Adjutant General of Virginia, as a farewell to the state in which the 61st has been stationed so long. The Chief of Coast Artillery, Maj. Gen. John W. Gulick, accompanied by Major Jarman came from Washington at the Governor's invitation to be present for the review. General Gulick inspected the regiment in camp and expressed his satisfaction with the appearance of the troops and materiel and the efficient manner in which the movement was being conducted. Upon his return to Washington, he sent the following telegram to the Regimental Commander, Maj. James H. Cunningham:

A review of your regiment by Governor Pollard and myself at Richmond yesterday was very satisfactory. I wish to congratulate the 61st Coast Artillery on the excellent appearance of all the equipment and the soldierly appearance of the personnel. Please convey my congratulations and best wishes for continued success on your long march to the officers and men.

GULICK.

At Richmond the regiment suffered the first casualty in the form of a detachment when Lieut. I. H. Ritchie and five enlisted men were directed to leave the column and proceed to Aberdeen Proving Ground for a demonstration firing to be held on May 31. This party was transported in one truck, towing an Instrument Trailer M-1 carrying a T-4 AA Director (Sperry). A stereoscopic height finder was also taken to Aberdeen.

The reason for making the detachment was to permit the use of the Sperry Director at Aberdeen in connection with the torque amplifier system of fire. The 61st has the only instrument of this type in the hands of troops. (General Gulick and a special party will witness this demonstration. Upon the completion of this duty Lieutenant Ritchie will proceed to Fort Sheridan direct. (Books are now being opened to record bets as to whether Lieutenant Ritchie will beat the regiment to Sheridan.)

The itinerary for the trip differs somewhat from the one which appeared in the last number of the *JOURNAL*. The one previously given could not be corrected before going to press. The route was the same as far as Huntington, West Virginia. At this point the entire regiment passed through Kentucky as follows:

<i>Mileage</i>	<i>Place</i>	<i>Date of overnight stop</i>
517	Huntington, W. Va.	May 28
533	Ashland, Ky.	
574	Olive Hill, Ky.	May 29
595	Morehead, Ky.	
631	Mt. Sterling, Ky.	May 30
647	Winchester, Ky.	
666	Lexington, Ky.	
686	Frankfort, Ky.	June 2
709	Shelbyville, Ky.	June 3
741	Louisville, Ky.	
744	Jeffersonville, Ind.	June 4
773	Scottsburg, Ind.	
782	Crothersville, Ind.	
797	Seymour, Ind.	June 5
817	Columbus, Ind.	
840	Franklin, Ind.	
851	Greenwood, Ind.	
860	Indianapolis, Ind.	June 6
875	Brownsburg, Ind.	
887	Jamestown, Ind.	
902	Crawfordsville, Ind.	June 9
917	Hillsborough, Ind.	
931	Covington, Ind.	
943	Danville, Ill.	
967	Hoopston, Ill.	June 10
979	Milford, Ill.	
991	Watseka, Ill.	
1010	Saint Anne, Ill.	
1024	Kankakee, Ill.	June 11
1047	Wilton, Ill.	
1062	Joliet, Ill.	
1090	La Grange, Ill.	June 12
1106	Des Plaines, Ill.	
1119	Half Day, Ill.	
1125	Fort Sheridan, Ill.	June 13

At Louisville the Camp Knox detachment left the main body and proceeded (thirty-two miles) to that station. The change in the itinerary was due to the desire to visit the Q. M. Depot at Jeffersonville, Ind., to obtain some additional equipment. Much interest was aroused by the regiment along the entire route. Some members of Congress requested that the route be so arranged that their constituents would be afforded an opportunity to see the antiaircraft artillerymen on the move.

The 62nd Coast Artillery (AA)
The 69th Coast Artillery (AA)
Aberdeen Proving Ground

Since the last issue the big battle of Aberdeen Proving Ground has taken place. It is hoped that the results will be covered in more detail by an article which has been requested for publication in the JOURNAL.

The 69th arrived at Aberdeen Proving Ground from Fort Totten on April 11. The trip was made without incident, the time on the road being cut down four or five hours as compared to previous trips. The faster time was due to the replacement of thirty war-time trucks by newer transportation. The preliminary training in road work near Fort Totten also had much to do with the decrease in time.

Although the 69th is under canvas at Aberdeen they are very comfortable. Tents are provided with floors and mess halls, kitchens, latrines were constructed by the advance party which came to Aberdeen for that purpose about a month in advance of the regiment.

After arrival, in addition to its other drills and preparations for the joint exercises the regiment was occupied with the making of an anti-aircraft training film. Maj. C. M. Thiele and Capt. A. P. Fox, S. C., are the joint directors of this film. It will tell the complete story of an anti-aircraft regiment going into position for the defense of an area. It contains side-shots and close-ups of important operations in approved movie style.

On April 14, the Corps Area Commander, Maj. Gen. F. W. Sladen, reviewed the provisional anti-aircraft brigade, made up of the 62nd and 69th Coast Artillery. The motor parks were inspected as well as both regiments on the march. The guard of honor was furnished by the 62nd and consisted of the Band and Battery "B" under command of Capt. M. W. Handwerk. The guard of honor occasioned favorable comment.

The First Class of Cadets from the United States Military Academy visited the post on May 4, 5, and witnessed numerous demonstrations of ordnance equipment. All types of cannon were fired as well as machine guns. Searchlight drill was conducted for their benefit by the 62nd. The regiment messed half the class during their short stay. A dance and reception was held for them just before their departure.

At the present writing the joint exercises with the Air Corps have been completed and intensive training for service target practices has begun.

The 64th Coast Artillery (AA), Fort Shafter

The JOURNAL is sorry to lose its excellent correspondent, Capt. J. T. deCamp, whose tour has expired. Captain deCamp will attend the next Battery officers course at the Coast Artillery School. Captain deCamp is a born correspondent. He is turning over the pen pushing to Capt. Nyal Adams.

Captain deCamp reports that activity in the 64th is more or less routine during that season of the year. Preliminary training looking towards the coming target practice season is being conducted. Captain Riggs has been in charge of machine gun practice with two hundred and forty men to qualify. Machine gun firing during April was held at Ahua Point, against balloon targets. Major Chase is on the job and is satisfied that the machine gunners will punch the sleeve with the same regularity as they down the balloons.

From time to time when not patching leaks on the roofs, the 64th works on its athletic field. This is being constructed in a natural amphitheatre near the cantonments. The field itself except for the cinder track is about completed. Concrete seats are being built in the slope around the field. Colonel Sevier, the regimental commander, is greatly interested in having the finest athletic field in the Islands. He has given this project his personal attention.

Lieutenant Peirce, the communication officer, has been on detached service working with the Air Corps for a period of fifteen days during their tactical maneuvers. He had just completed a course in communications as instructor of three officers and fifty enlisted men before leaving for duty at Luke Field. The closest cooperation exists between the Air Corps and the 64th in developing efficient communication. Lieutenant Peirce deserves much credit for the interest which he has taken and the hard work he has put in along this line.

PROFESSIONAL NOTES

Changes in TR 435-55, Coast Artillery Target Practice

After the articles entitled "Comments on the Revision of TR 435-55" had been prepared and sent to the JOURNAL the galley sheets were received from the printer. In the meantime, the rough draft of the text had been used at the Coast Artillery School. By means of problems and other classroom exercises, interpretations and criticisms of the new TR 435-55 were obtained from the instructors and student officers. Numerous corrections were found necessary, and these corrections were made in the galley sheets.

These corrections affect the text of Parts I and III of the Coast Artillery Board articles appearing in March and May as follows:

March issue.

Page 202. Table I has been revised. The P. E.'s given in the revised tables are based on firings for the past three target practice years.

Page 206. In the denominator of the B component, $d =$ mean of actual range deviating record fire, *including* wild shots. The K factor for 14-inch turret gun is changed from eighty to sixty.

Page 207. The penalty for each wild shot is reduced to one point.

May issue.

Page 388. $S =$ total number of rounds in entire practice. This will never be taken as less than fifty except as provided in paragraph 35 n (4) below.

Paragraph 35 n (4), change "notes" to the following:

"(4) (a) *Number of courses.* As stated in paragraph 34 a (4), the battery will fire on every course for which clearance has been given by the safety officer. Any course having a clearance will be considered as a course in computing the score. If the battery does not fire on a course the score for the course is zero. Except as stated in (c) below, not less than two, or more than four, courses will be flown during a record practice. A record practice begins when the battery commander reports himself ready. He is then given the opportunity to fire eighty rounds. The battery commander may fire all his ammunition on two or more successive courses in which case the practice ends. When, however, he has not fired all his ammunition at the end of four courses the practice also ends, except as provided in (c) below.

"(b) *Shots to be disregarded.* On any course on which the target is shot down, these rounds which burst afterwards may be disregarded in computing the score provided the total number of rounds fired during the practice is fifty or more. In this case the value of S used in computing the score may be less than fifty.

“(c) *Supplementary courses.* If the total time for the practice during which the field of fire is safe, and the target is on its course, is less than eighty seconds, and the total number of rounds fired is less than fifty, the battery will be allowed to fire not more than two (2) supplementary courses. Supplementary courses will be counted as a continuation of the fourth course in scoring. Supplementary courses will be terminated when the fiftieth round has been fired or when the total time during which the field of fire is safe and the target is on its course is eighty seconds. If more than fifty rounds are fired, those fired on a supplementary course after the fiftieth round will be disregarded. The battery commander, in his narrative report, and the regimental commander, in his indorsement, will explain fully the conditions making the supplementary courses necessary.

(d) Except as noted in (b) and (c), no shots will be disregarded in computing the score.”

The Use of Chemicals in Defense Of, and in Attacking Antiaircraft Weapons

By CAPT. JAMES E. TROUPE, C. W. S.

Chemical agents are undoubtedly of greater value as a weapon for airplanes than as a defensive weapon for the protection of the elements of antiaircraft defense. The use of smoke for purposes of concealment might be used as protection against attack planes when they are not acting as escorts to bombers. Air Corps tactics include this use of attack planes to conceal the position of bombers at night, by drowning the exhaust. Inasmuch as the sound is the only means at present of locating planes at night, these tactics are most effective. Local defense other than smoke, is essential under these circumstances, and all elements of antiaircraft warfare are provided with machine guns for this purpose. During the day smoke might be used to good advantage, to protect against raids by attack planes. As the effectiveness of machine gun fire is a matter of conjecture, smoke candles could very well be provided.

The use of toxic gas in shells is hardly feasible because of the speed of a plane and the difficulty of building up a sufficient concentration over a large area. The high mobility of a plane would enable it to avoid clouds of gas unless they were practically invisible.

As to the use of chemical agents by planes, they are peculiarly well adapted to each other. This does not apply to pursuit ships as it does to bombers and especially to attack planes. The machine gun is undoubtedly the weapon for pursuit. For bombers we have to consider the tactical use of chemical agents and their comparative effectiveness under prevailing conditions. Inasmuch as their mission is usually demolition, which calls for HE, their use of chemical agents would be of a more special nature.

WP might be used to excellent advantage as an incendiary on an object sufficiently inflammable. Bombers are not concerned with the attack on anti-aircraft weapons, this mission being assigned to attack planes.

This is an exceedingly interesting phase of warfare and of greatest importance. The sound locator is the only element which does not require visibility. While it is of considerable assistance in the locating of bombers, it is by no means essential and some experts consider it to be so inaccurate as to be superfluous. A well-trained searchlight battery can do approximately as well without the use of a sound locator.

The searchlights, guns, and range-finding apparatus all require visibility. At night, searchlights are easily spotted, and when attacked their tactics require that they be extinguished. An attack plane can circle the normal disposition of searchlights with comparative safety from machine gun fire. However, if they are depending on the sound locator for data, and as this element would probably not be discovered by a plane, the use of smoke is apparent. Very little obstruction to visibility is sufficient to damp a searchlight beam. This is even more true with the guns and range finder. An occasional cloud will cause the target to be lost.

The gun battery can be located at night without great difficulty, especially if there has been opportunity for daytime observation. It is located approximately at the center of the searchlight disposition.

During the day a higher course is required by the greater effectiveness of the machine guns. An attack plane preceding a bomber at a lower altitude, or a sub-flight of attack planes, releasing smoke when within range of the battery, might effectively conceal a bomber. No experiments have been conducted along these lines as yet.

Personnel of anti-aircraft batteries can perform their duties when they are masked. This has been demonstrated in target practices fired by various Coast Artillery batteries, which have approximately the same problems of observation and communication. Hence, the use of toxic agents would be less effective than smoke.

—*From Chemical Warfare.*

Artillery Observation and the Motorized Balloon

Observation has always been one of the most important considerations in artillery fire. Its difficulties are many. In modern times with the introduction of artillery of extremely long range it has become one of the major problems. In many respects the improvement of the gun itself has gone far beyond the limits of the observation system.

Observation is important both to artillery firing on moving targets and to that firing on fixed targets. Although not entirely true, moving targets may be considered synonymous with water or air targets and fixed targets with land targets. Up to the present time land targets have obligingly stood still but it can be expected that in the future land targets, too, may

acquire more mobility than heretofore and that a different conception of artillery fire may be forced on the land artilleryman.

Land targets, even when immobile, present difficulties. Terrain over which military operations are conducted is bound to contain irregularities favoring concealment. Woods, ridges, and accidents of the ground are always utilized to escape hostile artillery fire and to effect concealment and surprise. In the World War, due in great part to the nature of the warfare, the field artilleryman found that his visibility was limited in most cases to the small section immediately in front of his own front lines. Targets farther in rear were very difficult to observe. These rear area targets were extremely important to the heavier field guns since they included hostile artillery, concentrations of reserves, headquarters, dumps, railheads, and arteries of communication. Several expedients were attempted but map firing was the one mostly used. Observation was obtained when possible but it was not often possible. Methods were employed calling for dispersion of fire so that the target desired would certainly be included in the area. This method is extremely wasteful of ammunition and not always fruitful of results.

The use of the balloon to extend the area of vision was well known at this time. Balloons had been used in previous wars. But at this time a new instrument of warfare was being introduced—the airplane. Airplanes were used against the opposing balloons with considerable effect. Then it was proposed to use the airplane itself as an observation post. It had the advantage of being less vulnerable than the balloon and in addition it was mobile and could attain a position immediately over the target. While it possessed these advantages it brought with it disadvantages, too. Its means of communication with the firing battery were by no means efficient and certain. Its mobility, while enabling it to attain a position nearer the target, introduced problems in orientation which offset the advantage to a large extent. It met with antiaircraft fire and was subject to the same attacks by hostile planes as were the balloons.

The problem of observation for moving water targets differs greatly from that for the fixed land target. No great experience was gained from the war to assist in its solution. The terrain of the seacoast artilleryman is the water area in his front (neglecting any casual islands that may be thrown in to make it more difficult). This would seem to be easy of solution. However, the moving target itself introduces his main difficulty because it must be "tracked." In other words, its past course must be known in order to estimate (call it "guess," if you wish) where it will be at some time in the immediate future. This requires that the water target be kept under continuous observation by the most accurate instruments. Why is this difficult?

"Observation" while it has a broader meaning than "vision" really means the same to the artilleryman because it is by the sight that he is able

to collect the data with which to fire the guns (The ear may be important in the future but so far the main reliance is on the eye). Unlike the land target the water target is more difficult to locate with respect to known landmarks and even if it were practicable to do so its mobility would enable it to constantly change this relation. What affects visibility? Naturally, darkness affects visibility. This was solved by the searchlight. Atmospheric conditions, after darkness, have the greatest effect on visibility. Searchlights are of no assistance in fog, rain, or haze. As the range to the target is extended the effects of unfavorable atmospheric conditions are intensified until the instruments for observation are unable to penetrate and discover the target. This is very undesirable from the artilleryman's viewpoint because he wishes to use his gun up to the very limit of its profitable (effective) range.

But atmospheric conditions are not the only handicap of the seacoast artilleryman. Strange as it may seem that smooth terrain which he views to his front is not a flat surface but an immense hill—the earth itself. At the extreme range of the modern gun the earth's curvature must be considered. Disregarding any correction which must be made in the firing data the most important consideration is the fact that his target may slip below the horizon—out of sight—and thereby throw a wrench into the functioning of the position finding system. The curvature of the earth is more important for batteries having observation stations near sea level than for those located on high ground. Unfortunately those located on heights are more subjected to fog and other unfavorable atmospheric conditions.

In addition to the above difficulties the enemy can be expected to introduce several more. We may leave gas out of this discussion, but its brother, smoke, certainly will enter into it. Smoke may be used in a number of ways to hide the hostile target and otherwise making it difficult for the seacoast gunner. The hostile naval commander may send his planes to spread a smoke screen before the battery. This may not be so serious if only the guns themselves are covered. In fact, the battery commander may decide to do that himself. But it will become serious if the airman locates the battery observing stations and lays his smoke screen there. One answer to this is antiaircraft artillery but it is only a partial answer. But perhaps the opposition will decide to lay his smoke screen before his fleet. He may do this by planes or by destroyers. Planes would appear to be the most logical method. In this case the seacoast artilleryman will be unable to see his target from the ground stations and will consequently be unable to fire upon it.

The above has been the subject of discussion for many years among Coast Artillerymen. The solution has been sought in several methods of aerial observation including balloons. During the month of May extensive tests were conducted in Panama to determine the practicability of

using planes for position finding for long range guns. It is expected to publish information on these tests in the JOURNAL. The airplane has been used successfully for observation of fire but, to date, its use in obtaining firing data has presented greater difficulties. Communication between airplanes and the ground present no great difficulties but the continuous flow of data required for the moving target is not capable of easy solution. There are also other considerations which may prevent the adoption of the airplane system, to the exclusion of other systems.

In the meantime the Air Corps, our allies in observation for seacoast artillery as well as in air defense, have been making studies of the observation balloon with a view to making it more useful in observing for artillery. This is the same old "Caquot" or observation balloon used during the war—but with a difference. To keep in step with the rest of the army it has become motorized.

Those familiar with the use of the observation balloon during the war appreciate its disadvantages. To bring it into position a bed had to be prepared, cylinders transported, personnel to handle it provided, winches moved over the best roads, and the balloon itself maneuvered into position by hand. The Air Corps believes that it has the answer to these difficulties in the motorized captive balloon.

This balloon will be nothing more than a small airship of approximately eighty thousand to one hundred thousand cubic feet capacity, and will have a radius of action of about one hundred miles. Its ceiling will be about that of the present standard balloon and it will carry a crew of two or three men.

For the Field Artillery it will have several advantages. It can be based some distance behind the front. A series of winches will be distributed along the front, with a minimum number of men stationed at each. The balloons can be flown to the winches where a line will be dropped and hooked to the winch. It then becomes a fixed observation balloon. This procedure should decrease the personnel required to operate, relieve traffic congestion in a crowded area, facilitate maneuvering over unfavorable terrain, and will speed up observation for the artillery.

It is obvious that the motorized feature is of more importance to the Field Artilleryman than to the Coast Artilleryman. Our armament, once emplaced, is fixed so far as one particular phase of a naval attack is concerned. Mobility may be important to advancing batteries of light guns but it will have limited application to the seacoast artillery.

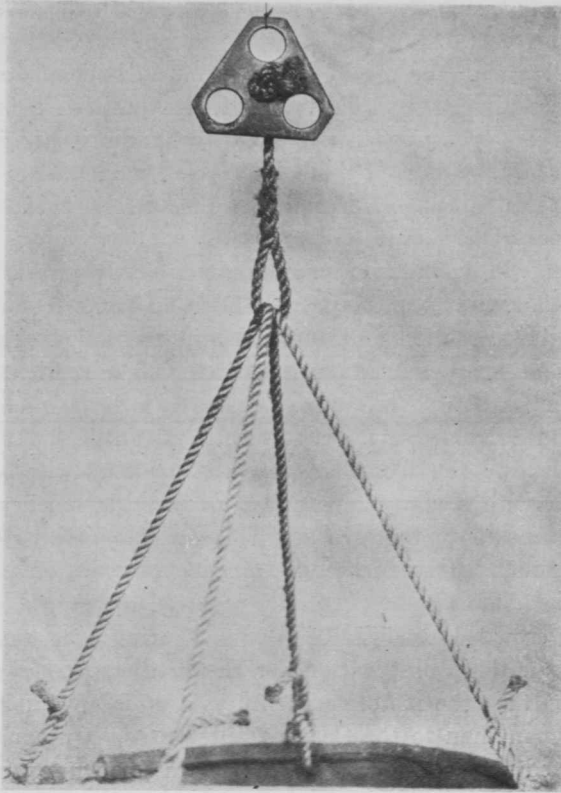
More important to the Coast Artillery is the fact that observation balloons in the future may be filled with the noninflammable helium gas which will render them almost invulnerable to airplane attacks. A difficult target for the airman at any time, it will be almost impossible to bring one down unless the sustaining gas can be ignited.

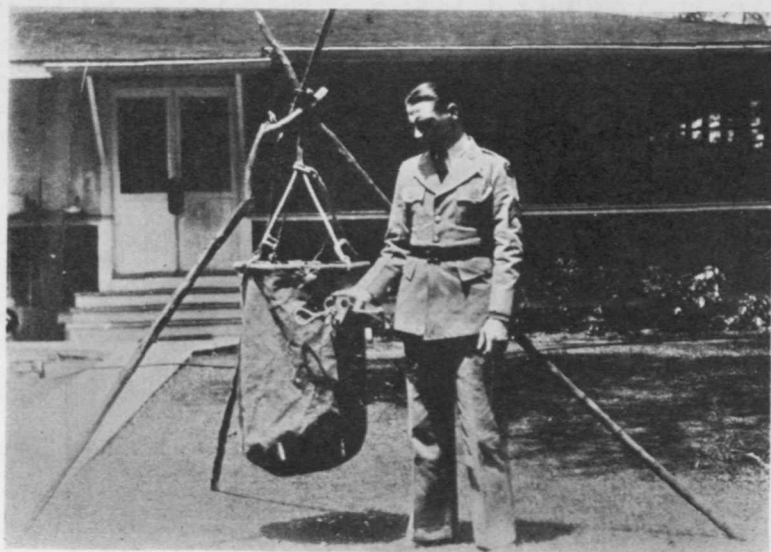
Experiments with this new type of balloon have been carried out at

Langley Field. A new design has been completed and if the funds can be found the ship will be built in the near future. If developments proceed as contemplated it will no doubt receive a test under Coast Artillery conditions when its usefulness can be fully appraised.

Trefoil Hangers for Water Sterilizing Bag

The trefoil hanger for the Lyster water sterilizing bag is the invention of Maj. M. L. Todd, M. C., now stationed at Fort Kamehameha, T. H. This hanger was approved for issue in 1922, and may be obtained from the Quartermaster. The illustrations show the manner of its use.





Automatically-Controlled Parachutes

Experiments are being conducted by the Royal Air Force with automatically-controlled parachutes and containers for dropping supplies and ammunition. The aim is to obtain an apparatus which can be launched with accuracy like a bomb, but which for the last part of its descent will fall slowly, so that its contents are undamaged. Two devices which are under test are thus described by the aeronautical correspondent of the *Morning Post*: One is a high velocity "dropper," which is opened by clockwork after it has fallen a predetermined time. The parachute is kept closed for as long as possible to increase the accuracy of aim. The other device is the Holt "dropper," which is designed to open its parachute automatically at a certain height above the ground. It actually measures its own height from the ground by a length of cable. Both these devices can be used for mail dropping.

—*The Army, Navy and Air Force Gazette.*

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. J. C. Ohnstad, Lieutenant Colonel, C. A. C., President.

Projects Completed During April

<i>No.</i>	<i>Title</i>	<i>Action Taken</i>
726	Dummy Projectile for 3-inch A.A.	Recommend bases of naval brass or manganese bronze.
731	Lighting Devices of Panoramic Sights, Scales, and Aiming Rules, Ry. Arty.	Recommend Ord. Dept. provide installation suggested; to be tested by 52nd C. A.
743	Service Test of Ordnance Caterpillar Tractor "20."	Recommend that it be adopted as substitute standard.
752	"Stephens" Xylonite Plotter for A.A. Target Practice.	Recommend that it be adopted as standard and issued to service.
758	Comments on Basic Field Manual Transport, Volume V.	Comments submitted.
769	Gasoline Tank Truck (300-gal) for A.A. Artillery.	Recommend improvised truck be not standardized.
776	Supplementary Instructions, and Ammunition Allowances for TP Year 1930-31.	Draft prepared and submitted to Chief of Coast Arty.
777	Continuous Graphic Method of Adjustment of Fire.	Offers no improvement over present methods.
778	Comments on TR 1370-D, Drill Ammunition.	Comments submitted.
783	New Type Tow Target for A.A.	Recommend ten be secured for test 1930 Aberdeen A. A. exercises.
784.	Two-Station Height Finding System with Electrical Data Transmission.	Not believed of value to our service.
785	Antiaircraft Machine Gun Training Methods.	Comments submitted.
786	TR 435-55, "Service of the Piece, 3-inch Mobile A.A. Gun, M-1, M-3 and Modifications.	Recommend be approved, printed and distributed.
787	Confidential.	

Projects Under Consideration

<i>No.</i>	<i>Title</i>	<i>Action Taken</i>
609	Comparative Test of Self-contained Range Finders.	Expect to hold test in May.
681	Test of Fast Towing Target (Navy Design).	Awaiting Result of study by Navy Department.
689	Special Seacoast Target Practice for Training of Aerial Observers.	Awaiting reports of practices.
694	Test of Erosion Charts	Awaiting return of Jekaduma Chronograph from Panama.

<i>No.</i>	<i>Title</i>	<i>Action Taken</i>
700	Test of Stereoscopic Trainer, T-1.	Report in preparation.
701	Comments on Target Practice Reports.	Comments are submitted as reports are received.
702	Test of Headset, Type HS-17.	Awaiting reports of test from HD of Pearl Harbor and Manila and Subic Bay.
712	Conduct and Adjustment of A.A. Fire.	Draft of bulletin prepared.
722	Tow Chains for Tractor Artillery.	Under test by 51st C. A.
723	Study of the Causes of Misfires.	Under study.
727	Standard Single Conductor Mine System.	A continuing study.
750	Faster Loading for Coast Artillery.	Under study.
753	Test of 8-inch Howitzer Firing Platforms for use as semipermanent Firing Position, 155-mm. Guns.	Awaiting report from 51st C. A.
761	Test of Experimental Reel Cart, Type RL-23.	Under test by 51st C. A.
764	Reminder List for A.A. Target Practice.	Under study.
772	Test of Motor Vehicles as Prime Movers and Cargo Trucks, A.A.	Test completed; report delayed pending receipt of report of dynamometer tests conducted at Aberdeen Proving Ground.
780	Gages for Seacoast and Railway Artillery Propelling Charges.	Under test.
781	Tables of Organization for A.A. Regiment.	Under study.
782	"Brown" Antiaircraft Spotting and Graphical Plotting System.	Under study.

YOU TELL EM

The Army War College,
Washington, D. C.,
May 14, 1930.

My Dear Editor:

In browsing through the May number of the COAST ARTILLERY JOURNAL, I came upon your digest of the criticism with which the letter of an unnamed correspondent was burdened. From my own experience of more than four years as editor of the JOURNAL I know full well that brick-bats as well as bouquets will come your way, and that the editor must be thick skinned to meet his responsibilities by living up to his opportunities as he sees them. My license to horn in at this point arises from the fact that your objector "dislikes criticisms of former editors." As I am one of them, it seems to me to be only fair, and perhaps pertinent, to get the record straight that I have not had the slightest cause to feel that any feature of your editorial policy was to be considered as a criticism of my own régime. Furthermore, while I have no shadow of authority to speak for the other former editors, I nevertheless cannot doubt that their attitudes are the same as my own. There is a point right here of fundamental importance which it seems to me is worthwhile trying to make clear to all Coast Artillery officers. That point is the Coast Artillery has from its own beginnings been undergoing continual change in its outlook, its problems, and its methods of meeting its problems. Coincident with each phase of change, there has been an appropriate mission for the JOURNAL, and a correspondingly appropriate editorial method and policy. If the time ever comes when the JOURNAL can best be conducted by holding it to the exact pattern of any previous stage in its own history, it will be because the Coast Artillery Corps itself has ceased to progress—and may that day never come! Related to the viewpoint just expressed is another which I have long held, and which may as well be set down.

This second viewpoint may be questioned, but if so the burden of proof is on the negative. Briefly, here it is. While the Coast Artillery Corps is a technical arm, yet as in all other arms, its most important problems are human problems. Never forgetting the constant need to seize and apply to our problems the diverse developments of technical sciences as they occur, yet the effective synthesis of technical expedients into Coast Artillery fire power depends on the human flux—personality, leadership, initiative, loyalty, and teamwork. This being so, then in the COAST ARTILLERY JOURNAL itself the savor of human interest should be uppermost, and its pages should reflect the personality both of its editor and its readers. Which leads to the conclusion—The JOURNAL best serves the Coast Artillery by

adherence to an editorial policy which both permits and encourages the editor to give to its pages the tone of his own personality.

Having said this much, it seems also fair to say that I heartily disagree with your critic in the May JOURNAL on every other issue which he raised. Also, for your own encouragement I should like to say that my familiarity with the contents of the JOURNAL since its establishment in 1892 justifies my belief, that on the basis of meeting the contemporary situation, the JOURNAL has never been better, and in all probability, never so good.

More power to you!

Yours,

F. S. CLARK,
Major, C. A. C.

We will make no effort to conceal our pleasure upon reading the above letter. Nor will we pretend to believe that the praise which it contains is deserved. We wish to express our appreciation and remark that it only reflects the magnanimous nature of the writer and his sincere interest in the welfare of the JOURNAL which he once edited so well.

The same day that the above letter was received we received a personal visit from another distinguished ex-editor—a gentleman whom we think of as the “grand old man of the Coast Artillery Corps”—Col. John A. Lundeen. Colonel Lundeen is now approaching the age of — but we are not going to disclose his age. We intend to let him continue in his unintentional masquerade as a man of sixty or thereabouts. We only hope that when we reach his age that we may have the same energy and clearness of mentality that are his. He came to say some nice things of the COAST ARTILLERY JOURNAL and to chat awhile of former days when the Coast Artillery was not the Coast Artillery and when the science of gunnery and ballistics were in their infancy. He recounted, in an interesting manner, incidents in long ago army and navy maneuvers when the Coast Artillery improvised its own naval patrol and discovered the hostile navy creeping in, much to their surprise and mystification.

The JOURNAL of the times of which Colonel Lundeen speaks *did* have a different mission. In its broader aspects it was not different. Perhaps it would be better to say that different methods were necessary in the accomplishment. Colonel Ruckman said once in an article, “In those days no foreign people knew that the United States had such a thing as artillery, and, our own people knowing but little more, it really would not have been safe to insist on the point too strongly. Artillery sentiment was an absent quantity.” The JOURNAL of 1892 differed from the JOURNAL of 1918 as well as the JOURNAL of 1930 because the conditions were different. Regardless of what the conditions may be it should be the purpose of the JOURNAL to supply what the Coast Artillery Corps needs. If we were compelled to confine ourselves to one word to express our needs today we can think of none better than *teamwork*.—EDITOR.

Onagarchus Onagain

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

Your letter to hand. Of course I want my subscription continued and inclose check. I will hardly quit you after a quarter of a century.

In general the policies you outline are satisfactory and I feel you have done about all for the JOURNAL that mortal man could do. I like the articles and the tone of the JOURNAL better than I have for years. However, if you want the brutal truth, here it is:

The ARTILLERY JOURNAL (this goes for Infantry, Cavalry, Field Artil-

lery, and Engineers, also) has no legitimate existence. Your subscription lists are the result not of merit but of force. Your advertisements are the result of charity and the Corps does not produce ten pages of publishable manuscript per month. This is the plain and unvarnished truth and it applies with equal force to all the other service journals that I have ever seen, except the old "Service Institute" which passed ere your day. I have been a subscriber to all of them and I have dropped them all except the COAST ARTILLERY JOURNAL. The reason I keep on with that is not due to its merits but has to do with the matter of *Esprit de Corps*.

My own conviction is that what we need is not a lot of spurious, half-baked periodicals catering to the *amore propre* of the several arms but one decent journal for the Army of the United States with sub-editors for the Infantry, Cavalry, Field Artillery, Coast Artillery, Engineers, Air Corps, National Guard, and Reserve. Such a journal would have real and legitimate circulation—if well handled, probably thirty to forty thousand—and would be able to render a legitimate service worth dollars to its advertisers and could, therefore, be published at a reasonable cost.

I congratulate you on the very temperate and well-reasoned article, "Significant Figures," in the last JOURNAL. Hope some of our alleged mathematicians will apply the same to some of our practical problems.

ONAGARCHUS.

Belated Honor—Almost Posthumous

EDITOR'S NOTE: *There have been so many calls for this that it is printed here for everyone's amusement. It is embarrassing to admit that it is reprinted from our worthy contemporary, The Cavalry Journal. Embarrassing because the COAST ARTILLERY JOURNAL should have been the first to honor its own poet laureate. However, the failure to produce the laurel wreath would not cause our poet much concern. Perhaps, when he reads this his fountain pen may spurt forth again in rime and furnish us other amusing moments.*

YE BALLADE OF YE ANCIENTE COSMOLINE

By MAJ. F. M. GREEN, C. A. C.

It is an anciente Cosmoline
 Who dwellethe by ye sea,
 And, lyke ye sande-crabbe, in ye sande
 Mayntaynethe his C. P.

On wyntrie nightes, when blowe ye wyndes
 And braste ye wayvés on shore,
 He callethe uppe his progenie
 And telles his tayle once more.

"When yonge, I dyd forsake my home
 Upon ye sea frontiere,
 And voy'ged to ye interiore
 Wherein I spent a yeare.

- “A somber yeare, a dismal yeare,
A wretched yeare I knewe
Betweene two grimme and grizzlye thynges
A horse and a C. U.
- “A stranger folke live in that lande
Ye mortar wotte they notte,
Nor do they hyve that grimme devyce
That hoystes ye A. P. shotte.
- “No mynes knowe they, nor plotting boardes,
Nor antiaircrafte fyre;
Theyre customes strayinge and awe-fulle are—
I thought I shoulde expyre!
- “Amongste this companie fulle strayinge
(Including some Marines)
Ye Warre Departemente sette us downe,
Some fourtie Cosmolines!
- “Of mannie trybes this strayingere folke—
Ye Doughboye Trybe, and suche,
Ye Ordnance and ye Enginiere
(Who don't amounte to muche).
- “Ye Waggonne-Soldiere withe hys spurres,
A Doctor here and there,
A Chemiste and an A. G. D.
And Supermenne of Aire.
- “But strayingeste folke of all to us—
Hardboyled as any egges—
Was a trybe that lyked to ryde a horse,
Y'clepte ye “Yellowe-legges.”
- “Ye knowe ye horse? An evil Beaste,
From menne welle sette aparte—
One passethe 'rourke this poste eache morne
To dragge ye garbage-carte.
- “Behynde that carte a sentrie goes
Bearing a loaded gunne,
To shoote this wilde and fearsome Beaste
In case he starts to runne.
- “Ye Cavalrie dyd thynke this Beaste
An assette to ye Nationne;
They leaped uponne ye Crytter's backe
To prove their Equitacionne!

“They talked of Horse, they dreamed of Horse,
 They dwelt on horsey lore;
 They pondered equine-managemente
 Around ye stable-doore.

“One of these Beastes, of eville miene,
 Was known as Jarbelo
 And lyke the Lammbe that Marye hadde
 Wyth mee he hadde to goe.

“Daye after daye, as forthe we fayred
 To succor General A,
 On Jarbelo I needes muste ryde
 To hynder mee alwaye.

“At lengthe came thynges called ‘G. T. E.’s’
 Uponne ye whyche I wente,
 Butte eville-visayged Jarbelo
 Keppte wathe uponne my tente.

“And everie daye, when forthe I fayred
 With troubles of my owne,
 Thys Beaste and eke his sinister wayes
 Dyd cause me ofte to groan.

“Ye laste days of Ye G. T. E.’s
 Ye rayne dyd falle fulle faste
 But no manne’s spyryte dampened was,
 Because itt was ye laste.

“’Tis darkest juste before ye dawne—
 For once I played in lucke:
 Jarbelo got short-circuited
 In alle ye rayne and mucke.

“Thus Fayte was kinde; I could get home
 In comforte sweete and stronge
 By gettynge offe of Jarbelo
 And towing him alonge.

“Now Godde forbyd that ever I
 Shoulde ryde a Horse agayne,
 But shoulde emergencie aryse
 I’m going to praye for rayne.

“My center-pintle swivvle-chayre
 Is good enoughe for mee,
 And, having castors, it wille rolle
 If such a neede should be.

“Yette feele I to thys verrie daye
 A tendernesse belowe
 Where I used to hitt ye saddle
 On ye backe of Jarbelo.

“And, thankes bee to my trayning,
 I am never att a losse;
 Dydn't I gette through Leavenworthe,
 Though hampered bye a Hourse?”

Foreign Demand for Mathematics

(Shall we publish it?)

35 Rue Singer, Passy,
 Paris 16,
 France.

The Editor, the COAST ARTILLERY JOURNAL

Dear Sir:

In replying to your letter that I just received I ask you to continue my subscription as previously done.

Regarding your periodical I may tell you that some more fundamental data with mathematical calculations, etc., was and is required from your JOURNAL. The matter of general interest, as, for instance, civilian books, are not required by artillerymen; they ought to be prepared for their duty and they wished to know how far the other countries are advanced as compared with their own. That is why somebody told me here as well as in Germany, Czecho-Slovakia, Switzerland, and England, especially in France, that there is no satisfaction with the COAST ARTILLERY JOURNAL.

I have prepared, at present time, a treatise entitled “Rules for Employees—Temporary War Ammunition Breaking Down Factories,” summarizing all regulations for twelve factories in France and one in Belgium where I was Chief Technical Safety Inspector a long time. This work is about seventy-five-ninety-five pages printed by Remington portable type-writing machinery. It contains all principal rules for officers and workmen (both for explosives and gas shells) in case of emergency. If you like, I can send you one copy if you agree to print this matter in your periodical. This was done by me according to the desire of the German and French authorities. This will help gunners greatly since such kind of work never was completed.

Sincerely yours,

M. KOSTEVITCH,
 Colonel Dr. Engineer.

COAST ARTILLERY ORDERS

Col. William H. Monroe, from Philippines, to Org. Res., San Francisco.

Lt. Col. William M. Colvin, from Org. Res., Schenectady, to Org. Res., New York City.

Lt. Col. Frank Geere, 6th, Fort Winfield, to Hawaii, sailing San Francisco, September 3.

Lt. Col. Franc Lecocq, from Philippines, to 12th, Fort Monroe.

Lt. Col. Jacob A. Mack, 3rd, retired.

Lt. Col. Alfred A. Maybach, from Philippines, to Boston, as instructor, N. G.

Lt. Col. Charles H. Patterson, from Philippines to 52nd, Fort Hancock.

Maj. E. E. Bennett, from Org. Res., Hq. 3rd C. A. Dist., Fort Monroe, to Philippines, sailing New York, August 20.

Maj. Gordon de L. Carrington, 6th, Fort Winfield Scott, to Command and General Staff School, Fort Leavenworth, as student.

Maj. Willis McD. Chapin, from student, Coast Artillery School, Fort Monroe, to Panama, sailing New York, August 7.

Maj. Donald M. Cole, from student, Coast Artillery School, Fort Monroe, to Philippines, sailing New York, August 20.

Maj. Roger B. Colton, from assignment to 18th Sound Ranging Battery, Fort H. G. Wright; assigned to Fort Totten, to remain on D. S. on present duty.

Maj. Octave De Carre, 12th, Fort Monroe, to Hawaii, sailing New York, July 18.

Maj. Carl S. Doney, from instructor, California National Guard, San Francisco, to Fort Monroe, sailing San Francisco, July 12.

Maj. Frank Drake, from Panama, to Command and General Staff School, Fort Leavenworth, as student.

Maj. Ward E. Duvall, from Fort McPherson, to Command and General Staff School, Fort Leavenworth, as student.

Maj. Henry W. T. Eglin, from Org. Res., Philadelphia, to student, Army Industrial College, Washington, D. C., August 18.

Maj. Frank E. Emery, Jr., from student, Command and General Staff School, Fort Leavenworth, to R. O. T. C., University of California, Berkeley.

Maj. Philip S. Gage, from Hawaii, to 4th C. A. Dist., Fort McPherson.

Maj. Elmore B. Gray, from Panama, to R. O. T. C., Washington University, St. Louis, Mo.

Maj. Francis A. Hause, from student, Command and General Staff School, to Organized Reserves, Philadelphia.

Maj. Paul H. Herman, from Panama, to Org. Res., Hq. 3rd C. A. Dist., Fort Monroe.

Maj. Henry B. Holmes, Jr., from student, Command and General Staff School, Fort Leavenworth, to Philippines, sailing New York, August 20.

Maj. John H. Hood, from 3rd, Fort McArthur, to Command and General Staff School, Fort Leavenworth, as student.

Maj. John F. Kahle, from instructor, N. G., New York, to Philippines, sailing New York, August 20.

Maj. John B. Martin, from student, Coast Artillery School, Fort Monroe, to instructor, New Hampshire National Guard, Concord.

Maj. Kenneth McCatty, from student, Coast Artillery School, Fort Monroe, to Panama, sailing New York, August 7.

Maj. Edwin C. Mead, from 13th, Fort Moultrie, to Command and General Staff School, Fort Leavenworth, as student.

Maj. Earl H. Metzger, from student, Air Corps Tactical School, Langley Field, to Fort Monroe.

Maj. George F. Moore, from Philippines, to office, Chief of Coast Artillery.

Maj. Hollis LeR. Muller, from detail in Air Corps and Brooks Field, to 7th, Fort DuPont, instead of 13th, Fort Barrancas, as previously ordered.

Maj. Martin J. O'Brien, from Utah State Agricultural College, Logan, to Coast Artillery School, Fort Monroe, as student.

Maj. Randolph T. Pendleton, from instructor, C. A. S., Fort Monroe, to Philippines, sailing New York, August 20.

Maj. Robert E. Phillips, from the Philippines, to 11th, Fort H. G. Wright.

Maj. James C. Ruddell, from Fort Monroe, to Command and General Staff School, Fort Leavenworth, as student.

Maj. Fred Seydel, from Philippines to Organized Reserve, San Francisco, Calif.

Maj. Horace F. Spurgin, promoted to Lt. Col., March 28.

Maj. Edgar H. Underwood, from Hawaii, to student, Coast Artillery School, Fort Monroe.

Maj. Eugene Villaret, from Quartermaster Corps Subsistence School, Chicago, to Ecole de Guerre, France, sailing New York, June 18.

Maj. Berthold Vogel, from student, Coast Artillery School, Fort Monroe, to Hawaii, sailing New York, August 12.

Maj. Ralph W. Wilson, from R. O. T. C., Washington University, St. Louis, to Monett, Mo., September 1, as instructor, Missouri National Guard.

Capt. Carl R. Adams, from student, Battery Course, Coast Artillery School, to student, in Advanced Course.

Capt. Harold G. Archibald, 14th, from Fort Casey, to Fort Monroe, Coast Artillery School, as student.

Capt. Marvel G. Armstrong, 51st, Fort Monroe, to student, Coast Artillery School, August 30.

Capt. Clare H. Armstrong, from student, Coast Artillery School, Fort Monroe, to the Philippines, sailing New York, August 20.

Capt. Elvin L. Barr, from student, Coast Artillery School, Fort Monroe, to Philippines, sailing New York, August 20.

Capt. Roy T. Barrett, from New York City, to Hawaii, September 3.

Capt. Ernest R. Barrows, from 10th, Fort Adams, to Coast Artillery School, Fort Monroe, as student.

Capt. Thomas R. Bartlett, from student, Battery Course, Coast Artillery School, to student, in Advanced Course.

Capt. James C. Bates, 9th, Fort Banks, to Panama, sailing New York, September 11.

Capt. Adam J. Bennett, 7th, Fort Hancock, to 52nd, Fort Hancock.

Capt. Coburn L. Berry, 7th, Fort Hancock, to 52nd, Fort Hancock.

Capt. Ben B. Blair, 12th, from Fort Monroe, to Panama, sailing New York, August 7.

Capt. George Blaney, 9th, Fort Banks, to Coast Artillery School, Fort Monroe, as student.

Capt. Harold B. Bliss, from student, Coast Artillery School, Fort Monroe, to Panama, sailing New York, August 7.

Capt. Louis J. Bowler, from Fort Monroe, to Coast Artillery School, Fort Monroe, as student.

Capt. Aaron Bradshaw, Jr., from student, Command and General Staff School, to instructor, N. G., New York.

Capt. Clarence E. Brand, from 52nd, Fort Eustis, to student University of Virginia Law School, Charlottesville.

Capt. William R. Carlson, from student, Coast Artillery School, Fort Monroe, to Hawaii, sailing New York, August 12.

Capt. Albert C. Chesledon, 3rd, from Fort MacArthur, to Coast Artillery School, Fort Monroe, as student.

Capt. Francis L. Christian, from Hawaii, to 52nd, Fort Monroe.

Capt. Willis L. Claxton, from University of Cincinnati, to Panama, sailing New York, August 7.

Capt. Thomas L. Cleaver, from instructor, N. G., New York City, to 11th, Fort H. G. Wright.

Capt. Eugene T. Conway, from student, Battery Course, Coast Artillery School, Fort Monroe, to Coast Artillery School, as student, Advanced Course.

Capt. James L. Craig, from Panama to 13th, Fort Barrancas.

Capt. Leonard L. Davis, from student, Battery Course, Coast Artillery School, Fort Monroe, to student, Advanced Course.

Capt. John B. Day, from Walter Reed General Hospital, Washington, to army retiring board, Washington, for examination.

Capt. John T. de Camp, from 12th, Fort Monroe, to student, Coast Artillery School, Fort Monroe, Advanced Course.

Capt. Nelson Dingley, 3rd, from student, Coast Artillery School, Fort Monroe, to the Philippines, sailing New York, August 20.

Capt. George W. Dunn, Jr., from Panama, to 7th, Fort Hancock.

Capt. Valentine P. Foster, from instructor, Mass. National Guard, Boston, to Fort Monroe.

Capt. Russell T. George, 12th, from Fort Monroe, to Coast Artillery School, as student, Advanced Course.

Capt. Henry F. Grimm, Jr., from the Philippines, to Command and General Staff School, Fort Leavenworth, as student.

Capt. Vernon W. Hall, from Mass. Inst. of Tech., Cambridge, to Command and General Staff School, Fort Leavenworth, as student.

Capt. Philip W. Hardie, from R. O. T. C., Michigan State College of Agriculture, July 1.

Capt. Norman E. Hartman, from student, Battery Course, Coast Artillery School, Fort Monroe, to student, Advanced Course.

Capt. Clifford D. Hindle, from Hawaii, to 6th, Fort Winfield Scott.

Capt. Frank A. Hollingshead, from student, Battery Course, Coast Artillery School, Fort Monroe, to student, Advanced Course.

Capt. Sargent P. Huff, transferred, to Ordnance Department, April 17.

Capt. Byron T. Ipock, 12th, from Fort Monroe, to Coast Artillery School, as student, Advanced Course.

Capt. Willard W. Irvine, from Philippines, to 52nd, Fort Monroe.

Capt. Creighton Kerr, from Philippines, to 12th, Fort Monroe.

Capt. Parry W. Lewis, from student, Battery Course, Coast Artillery School, Fort Monroe, to student, Advanced Course.

Capt. Frederick Lofquist, 11th, from Fort H. G. Wright, to Coast Artillery School, Fort Monroe, as student.

Capt. Percy S. Lowe, to sail from New York, August 12, for Hawaii, instead of July 18.

Capt. LeRoy Lutes, from student, Command and General Staff School, Fort Leavenworth, to Fort Totten.

Capt. Harold C. Mabbott, from assignment, to 18th Sound Ranging Battery, Fort H. G. Wright, assigned to Fort Totten; to remain on present duties, D. S.

Capt. Robert N. Mackin, Jr., from Fort Monroe, to Panama, sailing New York, September 11.

Capt. John J. Maher, 13th Fort Barrancas, transferred to Q. M. C. and to Fort Barrancas as assistant quartermaster.

Capt. William R. Maris, 7th, from Fort DuPont, to Coast Artillery School, Fort Monroe, as student.

Capt. Bryan L. Milburn, 12th, from Fort Monroe, to Coast Artillery School, as student, Advanced Course.

Capt. Maurice Morgan, from Philippines, to 6th, Fort Winfield Scott.

Capt. Everard F. Olson, from Submarine Mine Depot, Fort Totten, to Philippines, sailing New York, August 20.

Capt. Harry E. Pendleton, from student, Coast Artillery School, Fort Monroe, to Coast Artillery School, as student, in the Advanced Motor Transportation Course.

Capt. Ernest R. Percy, from Panama, to recruiting, New York.

Capt. Earl R. Reynolds, from student at Coast Artillery School, Fort Monroe, to 11th, Fort H. G. Wright.

Capt. William Sackville, from 69th, Aberdeen Proving Ground, to Command and General Staff School, Fort Leavenworth, as student.

Capt. John L. Scott, from Virginia Agricultural and Mech. College, Blacksburg, to Command and General Staff School, Fort Leavenworth, as student.

Capt. Evan C. Seaman, from the Philippines, to Command and General Staff School, Fort Leavenworth, as student.

Capt. Edward C. Seeds, promoted to Major, April 2; from student, Coast Artillery School, Fort Monroe, to Panama, sailing New York, September 11.

Capt. Adrin B. Smith, 6th, Fort Winfield Scott, previous order to C. A. School revoked.

Capt. Lessley E. Spencer, 62nd, from Fort Totten, to Coast Artillery School, Fort Monroe, as student.

Capt. Joseph C. Stephens, from instructor, Mo. N. G., Monett, to Fort Monroe, Coast Artillery School, as student.

Capt. Edmund H. Stillman, from University of California, Berkeley, to Coast Artillery School, Fort Monroe, as student.

Capt. Frederick L. Topping, from Panama, to student, Coast Artillery School, Fort Monroe.

Capt. James R. Townsend, from student, Battery Course, C. A. S., Fort Monroe, to student, Advanced Course.

Capt. Lynn P. Vane, 14th, from Fort Casey, to Panama, sailing San Francisco, September 12.

Capt. Arthur V. Winton, from instructor, C. A. S., Fort Monroe, to Coast Artillery School, as student, Advanced Course.

Capt. George W. Whybark, from student, Coast Artillery School, Fort Monroe, to the Philippines, sailing New York, August 20.

1st Lieut. Edward Barber, from student, Battery Course, Coast Artillery School, Fort Monroe, to student, Advanced Engineering Course.

1st Lieut. Orley D. Bowman, from Fort Adams, to 69th, Aberdeen Proving Ground.

1st Lieut. William I. Brady, from 11th, Fort H. G. Wright, to Coast Artillery School, Fort Monroe, as student.

1st Lieut. Lathrop R. Bullene, from U. S. Military Academy, West Point, to student, Battery Course, Coast Artillery School, Fort Monroe.

1st Lieut. George R. Burgess, from student, Coast Artillery School, Fort Monroe, to student, Army Industrial College, Washington, D. C.

1st Lieut. James Boyce Carroll, from 12th, Fort Monroe, to Coast Artillery School, Fort Monroe, Advanced Course.

1st Lieut. Martin C. Casey, from student, Coast Artillery School, Fort Monroe, to Hawaii, sailing New York, August 12.

1st Lieut. John F. Cassidy, from University of Minnesota, to Coast Artillery School, Fort Monroe, as student.

1st Lieut. Harold J. Conway, from student, Ordnance School, Watertown Arsenal, to Fort Sam Houston.

1st Lieut. Robert W. Crichlow, Jr., from 12th, Fort Monroe, to Coast Artillery School, Fort Monroe.

1st Lieut. Frederick B. Dodge, Jr., from Hawaii, to Coast Artillery School, Fort Monroe, as student.

1st Lieut. Henry H. Duval, 7th, Fort Hancock, to 52nd, Fort Hancock.

1st Lieut. John M. England, 11th, Fort H. G. Wright, to New York for duty in connection with the pilgrimage of mothers, May 11.

1st Lieut. Gerald G. Gibbs, 7th, Fort Hancock, to 52nd, Fort Hancock.

1st Lieut. John L. Goff, 69th, Aberdeen Proving Ground, placed on flying status, April 18.

1st Lieut. Edgar M. Gregory, from student, Coast Artillery School, Fort Monroe, to Hawaii, sailing New York, August 12.

1st Lieut. James L. Harbaugh, Jr., from Fort Monroe, to Coast Artillery School, as student.

1st Lieut. John I. Hincke, from 12th, Fort Monroe, to Coast Artillery School, Fort Monroe.

1st Lieut. James L. Hogan, from New York, to Coast Artillery School, Fort Monroe, as student.

1st Lieut. William G. Holder, from Panama, to Coast Artillery School, Fort Monroe, as student.

1st Lieut. David Hottenstein, from 12th, Fort Story, to Coast Artillery School, Fort Monroe, as student.

1st Lieut. James F. Howell, Jr., from 12th, Fort Monroe, to Coast Artillery School, Fort Monroe.

1st Lieut. Frederick R. Keeler, from 12th, Fort Monroe, to Coast Artillery School, Fort Monroe.

1st Lieut. George J. Kelley, from 13th, Fort Barrancas, to Coast Artillery School, Fort Monroe, as student.

1st Lieut. David B. Latimer, from student, Battery Course, Coast Artillery School, Fort Monroe, to student, Advanced Engineering Course.

1st Lieut. Lyman L. Lemnitzer, from U. S. Military Academy, West Point, to student, Coast Artillery School, Fort Monroe.

1st Lieut. George J. Loupret, from the Citadel, Charleston, to Hawaii, sailing New York, August 12.

1st Lieut. George W. MacMillan, from 18th Sound Ranging Battery to 11th, Fort H. G. Wright.

1st Lieut. Frank C. McConnell, sailing from New York City, August 12, for Hawaii, instead of July 18.

1st Lieut. James E. McGraw, from 51st, Fort Eustis, to Coast Artillery School, Fort Monroe, as student.

1st Lieut. Ernest A. Merkle, from 12th, Fort Monroe, to Coast Artillery School, Fort Monroe, Advanced Course.

1st Lieut. Wilmer B. Merritt, 61st, Fort Monroe, to 12th, Fort Monroe.

- 1st Lieut. Samuel H. Morrow, from Panama, to 51st, Fort Monroe.
- 1st Lieut. Joe D. Moss, from student, Coast Artillery School, Fort Monroe, to student, Advanced Motor Transportation Course.
- 1st Lieut. Thomas W. Munford, 13th, Fort Crockett, to Philippines, sailing San Francisco, September 10.
- 1st Lieut. Ola A. Nelson, from 7th, Fort Hancock, to Coast Artillery School, Fort Monroe, as student.
- 1st Lieut. Arthur B. Nicholson, from 12th, Fort Monroe, to student, Battery Course, Coast Artillery School, Fort Monroe.
- 1st Lieut. George W. Palmer, 8th, from Fort Preble, to Panama, sailing New York, August 7.
- 1st Lieut. George W. Palmer, from 8th, Fort Preble, to Ordnance School, Watertown Arsenal, as student.
- 1st Lieut. Douglass G. Pamplin, from 12th, Fort Monroe, to student, Battery Course, Coast Artillery School, Fort Monroe.
- 1st Lieut. Robin B. Pape, to Coast Artillery School, as student.
- 1st Lieut. William H. Papenfoth, from instructor, N. G., Concord, New Hampshire, to Panama, sailing New York, September 11.
- 1st Lieut. James G. Renno, from student, Signal School, Fort Monmouth, to Coast Artillery School, Fort Monroe, as student.
- 1st Lieut. William L. Richardson, from 12th, Fort Monroe, to student, Battery Course, Coast Artillery School, Fort Monroe.
- 1st Lieut. Clarence H. Schabacker, from New York City, to Hawaii, sailing New York, July 18.
- 1st Lieut. Logan O. Shutt, from U. S. Military Academy, West Point, to student, Battery Course, Coast Artillery School.
- 1st Lieut. Maxwell W. Tracy, from Philippines, to West Point, August 25.
- 1st Lieut. Gustave H. Vogel, from Philippines, to student, Quartermaster Corps, Motor Transport School, Baltimore, September 10.
- 1st Lieut. Everett C. Wallace, from student, Coast Artillery School, Fort Monroe, to student, Advanced Engineering Course.
- 1st Lieut. Charles W. West, from student, Coast Artillery School, Fort Monroe, to Panama, sailing New York, August 7.
- 1st Lieut. C. Forrest Wilson, from student, Coast Artillery School, Fort Monroe, to student, Signal School, Fort Monmouth, September 13.
- 1st Lieut. Austin M. Wilson, Jr., from student, Coast Artillery School, Fort Monroe, to the Philippines, sailing New York, August 20.
- 1st Lieut. Walter J. Wolfe, from assignment, to 18th Sound Ranging Battery, Fort H. G. Wright, assigned to Fort Totten; to remain on present duties on D. S.
- 1st Lieut. Charles M. Wolff, from Fort Monroe, to student, Battery Course, Coast Artillery School, Fort Monroe.
- 2nd Lieut. Bienvenido M. Alba, Philippine Scouts, from student, Coast Artillery School, Fort Monroe, to Quartermaster Corps Motor Transport School, Baltimore, September 10.
- 2nd Lieut. George A. Chester, from student, Leland Stanford University, Palo Alto, Calif., to 6th, Fort Winfield Scott.
- 2nd Lieut. Everett C. Dunham, from Philippines, to 69th, Aberdeen Proving Ground.
- 2nd Lieut. Edward C. Franklin, 44th Ordnance Co., Aberdeen Proving Ground, to student, Ordnance School, Watertown Arsenal, June 30.
- 2nd Lieut. Robert T. Frederick, from detail in Air Corps and from Fort Sam Houston, to 13th, Fort Barrancas.

2nd Lieut. Edwin G. Griffith, from detail in Air Corps and from Fort Sam Houston, to 13th, Fort Barrancas.

2nd Lieut. Truman H. Landon, transferred to Air Corps, March 24.

2nd Lieut. Emmor G. Martin, from Hawaii, to 13th, Fort Barrancas.

2nd Lieut. William F. McKee, from 13th, Fort Barrancas, to Brooks Field, Air Corps Primary Flying School.

2nd Lieut. Kai E. Rasmussen, 62nd, Fort Totten, to Philippines, sailing New York, August 20.

2nd Lieut. Jacob G. Reynolds, from Fort MacArthur, to Brooks Field.

Tech. Sgt. James F. Mortelle, 9th, retired.

Mast. Sgt. Frank W. Hamilton, Service Battery, 64th, retired.

Mast. Sgt. William E. Mapes, retired.

Mast. Sgt. Andrew J. Underwood, Battery E, 8th, retired.

Staff Sgt. Paul A. Schwenke, Hq. Btry., 3rd, retired.

Mast. Sgt. William W. Carter, 51st, retired.

Mast. Sgt. George B. Ping, 52nd, retired.

Pvt. Fred H. Dirks, Battery G, 13th, from Fort Crockett, to 69th, Aberdeen Proving Ground.

Index to Volume 72

JANUARY-JUNE, 1930

I. AUTHORS

BARNES, G. M. Mechanized Machine Guns.....	412
BENSON, C. C. Mechanization and Cavalry (Joint author).....	334
BLAKE, A. E. The Future of Air Warfare.....	504
BORDEN, F. G. Communications to and from Airplanes in Flight.....	213
BRETT, S. E. Tank Reorganization	53
CHRISTIAN, F. L. Harbor Defenses of Honolulu.....	483
CLEMENS, J. R. Elizabethan Coast Artillery.....	518
CLOKE, H. E. A Trip to Hawaii.....	475
COAST ARTILLERY BOARD. Comments on Revision of T.R. 435-55, Coast Artillery Target Practice.....	193
COAST ARTILLERY BOARD. Comments on Revision of T.R. 535-55, Coast Artillery Target Practice Regulations.....	385
COAST ARTILLERY BOARD. Analysis of the B Component.....	256
deCAMP, J. T. The 64th Coast Artillery (AA), Fort Shafter.....	160
deCAMP, J. T. Hawaii Thrilled by Night Bombing.....	41
DUNN, J. M. March of the 62nd Coast Artillery (AA).....	12
EISENBROWN, J. D. The Value of Training a National Guard Unit in Association with a Regular Unit.....	226
ENGLEHART, E. C. The Tortoise Boat and the Flying Thunderbolt.....	238
FISHER, J. B. Buena Vista—A Western Thermopylae.....	141
FLAGG, K. P. An Antiaircraft Training Target.....	262
FULLER, J. F. C. The Last Eight Hundred Yards.....	512
GILBERT, W. J. The Battery Mess.....	357
GILL, B. D. Coast Artillery Panama.....	298
GONDOS, VICTOR. Coast Artillery—Shy Porto Rico.....	465
GOODRICH, W. R. Fort Kamehameha and Fort Weaver.....	485
HITCHCOCK, H. P. Notes on the Computation of Drift Effects on Projectiles Due to Range Wind.....	81
JENKINS, C. W. Combined Operations, Revolutionary War—Yorktown.....	315
KENT, R. H. The Drift Change Due to a Range Wind.....	82
LUCAS, COLONEL. A French Conception of Leadership.....	475
LULL, C. E. T. Chemical Warfare Tactics.....	129
MARSHALL, Otta. Recruiting, and How.....	62
MEYERS, H. F. Coaching a Girls' Rifle Team.....	511
MOSTELLER, J. W., Jr. Projectile Cleaning Machine.....	263
OOZLEFINCH. This Man's Army.....	366
OOZLEFINCH. What I Mean, We Gotta Keep Advancin'.....	49

PARMELEE, A. L. Trans-Continental Movement of a 14-inch Railway Gun	445
PATTON, G. S. Mechanization and Cavalry (Joint Author)	334
PEARCE, E. D'A. The Coast Artillery in the Philippines	134
PERLEY, R. N. That Reserve Job	459
PRENTICE, JAMES. Passive Metal Linings for Internal Combustion Engines	34
PRENTICE, JAMES. Aircraft in War in Ten Years' Time	120
PUTNEY, E. W. High Speed Targets	165
RAREY, G. H. Constructive Economy	234
ROBISON, G. B. Filters and Sound Locators	424
RUHLEN, GEORGE. Extracts from Foreign Periodicals (Translations)	275
RUHLEN, GEORGE. Thoughts of a Soldier	491
SAMSON, C. R. The Attack of Daylight Bombing Formations	514
SCHRADER, O. H. Avoidable Delays in Target Practice	151
SHARTLE, S. G. Combat Arms, Their Relative Functions	99
STEWART, S. T. Let's Get Acquainted	487
SWEET, W. H. Battery "E" Wins the Knox Trophy	291
TROUPE, J. E. The Use of Chemicals in Defense Of and in Attacking Antiaircraft Weapons	539
WALKER, C. L. Significant Figures	390
WARNER, O. C. Demonstration Shoot by the 52nd C. A. (Ry), Fort Eustis, Va., Fort Coast Artillery School Students, October 8, 1929	502
WHARTON, J. E. Protection of Infantry Against Air Attack	489
WILLINK, ARTHUR. The Robot Brothers—Gunners	231

II. SUBJECTS

Advance in Antiaircraft Methods	49
Air and Terrestrial Spotting	446
Air Corps Exercises at Mather Field	245, 348, 528
Air Corps Tactical School, C. A. Officers to Attend	245
Aircraft in War in Ten Years' Time	120
Air Defense Exercises at Aberdeen	403
Air Defense Maps	155
Air Defense, Review of Book by General Ashmore	108
Air Forces and the Weather	240
Air Warfare in the Future, Comments on	504
Analysis of B Component, Target Practice Score	256
Antiaircraft-Air Corps Exercises at Aberdeen	403
Antiaircraft Artillery for Infantry Division	72
Antiaircraft Artillery in Air Defense	497
Antiaircraft Artillery War Game	72
Antiaircraft Attack by Use of Chemicals	539
Antiaircraft Firing by Infantry	489
Antiaircraft Plotter	75
Antiaircraft Training Target	262
Artillery Observation and Motorized Balloons	540
Ashmore, General, Review of Book, "Air Defence"	108
Assignment of M-V1 Searchlights	246
Attack Aviation, Its Effect Against Infantry	242

Attack of Daylight Bombing Formations.....	514
Aviation Developments Affecting AA Tactics.....	153
Avoidable Delays in Target Practice.....	151
Ballistic Course at Aberdeen.....	244
Balloons, Motorized, for Artillery Observation.....	540
Battery "E," 63rd C. A. (AA) wins Knox Trophy.....	70
Battery "E" Wins the Knox Trophy.....	291
Battery Mess	357
B Component, Target Practice Score.....	256
Board Notes	85
Bomb-aiming Apparatus	83
Bombing Formations, Attack of.....	514
Buena Vista—A Western Thermopylae.....	141
C. and G. S. School Course for Reserve Officers.....	530
Caretaking, Tests at Harbor Defenses on This Status.....	527
Cavalry and Mechanization.....	334
Changes in T.R. 435-55.....	538
Chemicals, Use in Attacking Antiaircraft.....	539
Chemical Warfare School, Special Course at.....	528
Chemical Warfare Tactics.....	129
Chief of Coast Artillery. New Year's Greetings.....	1
Chromium, Use as Lining for Internal Combustion Engines.....	37
Cleaning Process for Used Motor Oils.....	234
Coast Artillery Board Notes	85
Coast Artillery Field Manual	363
Coast Artillery in Philippines	134
Coast Artillery in the time of Elizabeth.....	518
COAST ARTILLERY JOURNAL (Editorial).....	522
Coast Artillery Panama	299
Coast Artillery School Activities	76, 157, 246, 350, 435, 530
Coast Artillery School, Suggestions for the Officer Ordered as a Student.....	340
Combat Arms, Their Relative Functions.....	99
Combination Sponge-Rammer	365
Combined Maneuvers, Puget Sound.....	59
Combined Operations, Revolutionary War—Yorktown.....	315
Combustion Engines, Linings for.....	34
Comments on Combined Maneuvers, Puget Sound.....	59
Comments on Revision of T.R. 435-55, C. A. Target Practice Regulations	193, 385, 538
Communications to and from Airplanes in Flight.....	213
Comparison of Air and Terrestrial Spotting.....	448
Computation of Drift Effects on Projectiles.....	81
Constructive Economy	234
Control, Remote for Antiaircraft Guns	231
Corrections for Parallax, Sperry T-5 Director.....	71
Courses at Chemical Warfare School.....	246
Courses for C. A. Officers at Foreign Schools.....	245
Course in Ballistics at Aberdeen.....	244
Cristobal, Harbor Defense of, Activities.....	77

Daylight Bombing Formations, Attack of	514
Developments in Aircraft in Future.....	120
Developments in Aviation Affecting AA Tactics and Materiel.....	153
Dirigible, Observation Car for.....	169
Drift Effects Due to Range Wind.....	82
Drift Effects of Projectiles.....	81
Duties of Regimental Sergeant Major.....	163
Efficiency Reports of Officers.....	67
18th S. R. Battery Activities.....	440
11th C. A. Activities	532
Elizabethan Coast Artillery.....	518
Exercises, Air Corps, at Mather Field.....	245, 348, 528
Exercises at Long Island Sound.....	436
Exercises, Command Post, in 3rd Corps Area.....	349
Exercises, Joint Antiaircraft-Air Corps at Aberdeen.....	403
Exercises, Joint Army and Navy, for 1930.....	72
Exercises, Puget Sound	59
Exercises, Searchlight, in Hawaii.....	41
Experimental to Reorganization, Infantry Battalion.....	168
Extracts from Foreign Periodicals.....	275
Field Manual, Coast Artillery.....	363
Field Wire, New Developments by Signal Corps.....	452
15th C. A. (HD) Activities.....	78
51st C. A. Activities.....	252, 532
52nd C. A. Activities	78, 532
Figures, Significant	309
Filters and Sound Locators.....	424
537th C. A. (AA) Activities.....	254
Foch	275
Foreign Artillery School Details.....	245
Forms for Use in Target Practice.....	204
Fort Monroe Summer Training Camps.....	248
4th C. A. (HD) Activities.....	158, 250
French Divisional Artillery	276
Function of Combat Arms.....	99
Future of Air Warfare.....	504
Greetings, Chief of Coast Artillery.....	1, 381
Graph of March Table, 62nd C. A. (AA), Fort Totten to Fort Story.....	19, 32
Hanger for Water Bag.....	544
Harbor Defenses of Balboa Activities.....	437
Harbor Defenses of Honolulu Activities.....	437, 531
Harbor Defenses of Long Island Activities.....	436
Harbor Defenses on Caretaking Status, Test of.....	527
Hawaii, Coast Artillery Posts in	475
Hawaii Thrilled by Night Bombing.....	41
High Speed Targets.....	74, 165
H. M. S. Nelson.....	<i>Frontispiece, March</i>
Hurricane Relief Commission.....	349

Infantry Attacked by Aviation.....	242
Infantry Battalion, Experimental Reorganization.....	168
Infantry, Protection Against Air Attacks.....	489
Inspection Visits by Personnel of Chief's Office.....	525
I See That You Are Ordered to the School.....	340
Japanese Antiaircraft	452
Joint Antiaircraft-Air Corps Exercises at Aberdeen Proving Ground.....	408
Joint Army-Navy Exercises for 1930.....	72
JOURNAL, COAST ARTILLERY (Editorial).....	522
Knox Trophy Won by Battery "E".....	70, 291
Linings for Internal Combustion Engines.....	34
Living Conditions in Hawaii.....	475
Machine Guns, Mechanized.....	412
Machine Gun Practice of Battery "E," 64th C. A. (AA).....	29
Maj. Gen. Andrew Hero, Jr., Sketch of Service.....	287
Maj. Gen. John W. Gulick, Sketch of Service.....	382
Maneuvers, Air Corps, at Mather Field.....	528
Mapes, Staff Sergeant, Retires.....	494
Maps, Air Defense.....	155
Marches for Mobile Organizations.....	155
March of 62nd C. A. (AA) to Fort Story.....	12
Mather Field Air Corps Exercises.....	245, 348, 528
Mechanization and Cavalry.....	334
Mechanized Machine Guns.....	412
Mess Regulations for the Battery.....	357
Metal Linings for Internal Combustion Engines.....	34
Mission of Coast Artillery.....	1
Mobile Machine Guns Point.....	412
Motion Picture Films to Be Made for Instruction Purposes.....	244
M-VI Searchlights, Assignment.....	246
N. G. Training with a Regular Unit.....	226
Notes on Training.....	346
Observation Car for Dirigibles Developed.....	169
Observation, from Motorized Balloons.....	540
Oil Cleaning for Motor Vehicles.....	234
155 GPF, Change in Safety Regulations.....	264
Organizations, Coast Artillery Changes in Station of.....	1
Panama Coast Artillery District Activities.....	250
Panama, Service and Conditions in.....	299
Parallax Corrections for T-5 (Sperry) Director.....	71
Passive Metal Linings for Internal Combustion Engines.....	34
Philippines, Description of Service and Living Conditions There.....	134
Plotter, AA.....	75
Policies, W. D., Service Schools.....	70
Policy of Selection of Students for C. and G. S. School.....	166
Potential de Guerre.....	277
Practice Marches for Mobile Organizations.....	155
Principles of Air Defense.....	109

Problem, Air Defense, at Aberdeen.....	405
Projectile Cleaning Machine.....	263
Protection of Infantry Against Air Attacks.....	489
Puget Sound Joint Exercises.....	59
Radio Communication to Airplanes.....	213
Radius of Action of Aircraft.....	123
Rating of Officers.....	67
Reclaimed Oil as a Lubricant.....	235
Recruiting and How.....	62
Regiments, Coast Artillery, Changes in.....	1
Release Mechanism for Towed Targets Developed by Air Corps.....	453
Remote Control for AA Guns.....	231
Reorganization and New Training Objective of the Coast Artillery Corps.....	1
Reorganization, Tanks.....	53
Reserve Officers, Course at C. and G. S. School.....	530
Revision of Target Practice Regulations, Comments on.....	385
Road March of 62nd C. A. (AA) from Fort Totten to Fort Story.....	12
Robot Brothers—Gunners.....	231
Safety Regulations for 155 GPF Firing.....	264
Schedules for Training Discussion.....	450
School Details for 1930-31.....	432
School Details in Foreign Countries.....	245
Schools, War Dept. Policies.....	70
Seacoast Target Practice Regulations.....	193
Searchlight Exercises in Hawaii.....	41
Selection of Reserve Officers for C. and G. S. School.....	530
Selection of Students for A. W. C.....	167
Sergeant Major, Duties of.....	163
Service School Policies of the W. D.....	70
Signal Corps Develops Field Wire.....	452
Significant Figures.....	309
61st C. A. Activities.....	79, 159, 253, 351, 534
61st C. A. (AA) Itinerary of March to Fort Sheridan.....	440
64th C. A. (AA) Activities.....	160, 354
64th C. A. (AA), Knox Trophy Won by Battery "E".....	291
64th C. A. (AA), Searchlight Exercises.....	41
69th C. A. Activities.....	254, 355, 536
62nd C. A. Activities.....	253, 352, 443, 536
62nd C. A. (AA), March from Fort Totten to Fort Story.....	12
63rd C. A. (AA) Activities.....	353
63rd C. A. (AA), Battery "E" Wins Knox Trophy.....	70
Snow Problem, Chemical Warfare.....	128
Solo Role of Antiaircraft Artillery in Air Defense.....	497
Sound Locators and Filters.....	424
Spanish to Be Studied at C. and G. S. School.....	84
Special Course at Chemical Warfare School.....	528
Speed and Radius of Action of Aircraft.....	123
Sperry Director T-5, Parallax Corrections.....	71
Sperry Gyroscope Co., Officers Detailed for Duty with.....	75
Sponge-rammer Disapproved.....	365
Spotting, Air and Terrestrial.....	446

Stations of Coast Artillery Organizations.....	1
Student Officers at C. A. S., Suggestions for.....	340
Students at Schools for 1930-31.....	433
Students, Selection of, for A. W. C.....	167
Students, Selection of, for C. and G. S. School.....	166
Table, March, of 62nd C. A. (AA), Fort Totter to Fort Story.....	15
Tactics in Chemical Warfare.....	128
Tank Reorganization.....	53
Target Practice, Avoidable Delays in.....	151
Target Practice Regulations, Changes in.....	538
Target Practice Regulations, Comments on by C. A. B.....	193
Target Practice Regulations for AA Firings.....	385
Target, Training, for AA.....	262
Targets, High Speed.....	74, 165
Test of Harbor Defenses on Caretaking Status.....	527
Test of Single Conductor Mine System.....	74
Test of Truck by C. A. B.....	74
Tests, of Radio and Planes by A. C.....	168
13th C. A. (HD) Activities.....	77, 251, 438
Tortoise Boat and the Flying Thunderbolt.....	238
Tow Target Release Mechanism Developed by Air Corps.....	453
Training a N. G. Unit in Association with a Regular Unit.....	226
Training Camps at Fort Monroe.....	248
Training, Notes on.....	346
Training Objective of the Coast Artillery Corps.....	1
Training Schedules, Discussion of.....	450
T.R. 435-55, Changes in.....	538
Trefoil Hangers for Water Sterilizing Bag.....	544
Trip to Hawaii.....	475
Truck Mount for AA Machine Guns.....	412
Trucks, Test by C. A. B.....	74
211th C. A. (AA) Summer Camp.....	79
240th C. A. Activities.....	355
213th C. A. (AA) Training with Regular Units.....	226
University of Delaware R. O. T. C. Activities.....	444
University of Michigan, Course for C. A. Officer.....	246
Use of Chemicals in Attacking Antiaircraft.....	539
Value of Training a N. G. Unit in Association with a Regular Unit.....	226
Visits by Personnel of Chief's Office.....	525
Visual Instruction in the Army.....	244
von Hindenburg.....	275
Wanted: A Superior Second Lieutenant.....	67
War Game Board Suggested for Antiaircraft Artillery.....	72
Water Sterilizing Bag, Hanger for.....	544
Weather, Effects on Aircraft.....	240
What I Mean, We Gotta Keep Advancin'.....	49
Wind, Drift Effects Due to.....	82
Winter Tests of Radio and Planes by A. C.....	169
Yorktown, Combined Operations During Revolution.....	315

BOOK REVIEWS

ABDULLAH, A. and PAKENHAM, T. C. Dreamers of Empire.....	470
ALBION, R. G. Introduction to Military History.....	469
CARPENTER, A. F. B. The Blocking of Zeebrugge.....	94
CHIDSEY, D. B. Marlborough, the Portrait of a Conqueror.....	187
DARK, SIDNEY. Twelve Royal Ladies.....	188
DAVIS, BRITTON. The Truth About Geronomo: Life with the Apache Scouts	379
DUNCAN, R. L. and DREW, C. E. Radio Telegraphy and Telephony.....	91
DUNN, F. S. The Practice and Procedure of International Conferences.....	95
FRAZER, W. D. American Pistol Shooting.....	279
GOTTSCHALK, L. R. The Era of the French Revolution.....	375
JOUVENEL, H. de. The Stormy Life of Mirabeau.....	92
JONES, NORTON and MOON. The United States and the Caribbean.....	186
KLABUND. The Incredible Borgias.....	279
LAWRENCE, W. R. The India We Served.....	97
LONERGAN, T. C. It Might Have Been Lost.....	191
LEGENDRE, A. F. Modern Chinese Civilization.....	377
LOTH, David. Lorenzo the Magnificent.....	96
MARYE, G. T. Nearing the End in Imperial Russia.....	93
MORECROFT, J. H. Elements of Radio Communication.....	285
PARKER, JAMES. The Old Army: Memories, 1872-1918.....	190
PELL, JOHN. Ethan Allen.....	184
REITZ, DENEYS. Commando	472
RODICK, B. C. The Doctrine of Necessity in International Law.....	91
TAYLOR, G. K. S. English Political Portraits of the Nineteenth Century.....	284
THOMPSON, J. M. Leaders of the French Revolution.....	282
VIÈRECK, G. S. and ELDRIDGE, P. My First Two Thousand Years.....	280
VILLARI, L. Italy	376
WHEELER-NICHOLSON, M. The Corral of Death.....	186