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An Austrian 305-cm. mortar in position in the Dolomites during the World War

The Coast Artillery Journal

Vol. 62 No. 3 MARCH, 1925 Whole No. 223

Military Frontiers

By Colonel S. C. Vestal, C. A. C.

THE first care of every nation desirous of preserving its national liberties should be the possession of strong natural frontiers. Such frontiers largely discount the necessity for the maintenance of armies and the expenditure of funds upon fortifications, which become obsolete with time and the change of weapons. The main objective in military operations is the enemy's main army; but the main objective of a nation actually at war is, or should be, the attainment of a secure natural frontier. A reasonably well-selected boundary line with defensive possibilities will appeal to an aggressor far more effectively than all the moral principles that may be deduced from the rights of humanity. Weak indefensible frontiers are a temptation to aggression. It is fitting that an aggressor should be rendered as harmless as possible through the arrangement of strategic frontiers. The chance of active aggression is almost in exact proportion to the facility with which it can be carried out.

Boundaries should be barriers, if not geographical and natural, then they should be artificial, and as strong as human device can make them. This is desirable not only from the military point of view, but also for the enforcement of the domestic laws in each state, as is well illustrated by the conditions that have arisen in the enforcement of the 18th Amendment to our Constitution. Our exclusion laws also bring out this principle. The great object in selecting frontiers is to divide self-governing states into separate geographical units in such a manner as to set definite military barriers between countries liable to mutual aggression.

The natural instinct of a nation leads it, consciously and unconsciously, to expand in its continent or island until it reaches natural frontiers. Thus the United States in less than 60 years after her government was well established, expanded by conquest and by purchase, which is a peaceful method of conquest, from the Atlantic to the Pacific. On the north and on the south, her frontiers border on weak nations, which are in a certain sense, buffer states. While Canada is a part of the British Empire, no power of Britain could prevent the United States from overrunning a great part of Canada at the outbreak of war.

The English expanded to the limits of the island of Britain. The Castillians (or Spaniards) on one side and the French on the other absorbed intervening peoples until they reached the Pyrenees beyond which neither has been able permanently to effect a lodgement. Most of the Latin-American peoples, former colonies of Spain and Portugal, have expanded until they have reached mountain chains or impassable forest regions. The effect of the natural frontiers in Latin-America was pointed out by Baron von Humboldt whilst Spain and Portugal still ruled from California to Tierra del Fuego.

Physical geography should rank first in the selection of boundaries, and the distribution of races should be a secondary consideration. In the days which follow the cessation of hostilities, demands are insistent that frontiers shall be arranged upon ethnological and historical grounds only; when peace comes, men soon begin to realize that economic considerations should be taken into account; when war clouds reappear, men see the tremendous importance of secure, defensible frontiers. The three sets of factors are not always in irreconcilable conflict. Happily for the solution of the problem, economic and military considerations largely run hand in hand, and either of them is more important than ethnological and historical factors. With time a natural frontier hardens into a racial frontier. Nothing else is so important to a nation as to secure sound defensible lines within which the great body of the people may find peace and security. Greece has learned this lesson at an appalling cost. The inevitable result of weak frontiers is free emigration back and forth across the frontier; hence intermixture of races and demands for a rectification of boundaries based upon race distribution *ad infinitum*.

If a nation is invaded, the main blow comes across its weakest frontier; if the nation invades its neighbor, it invades across the enemy's weakest frontier. The weak frontier of one nation often coincides with the weak frontier of its neighbor. The exception is

when a nation possesses deploying ground on the other side of a good defensive barrier and good communications across the barrier, a condition which is illustrated by the position of the Austrian forces in Galicia, north of the Carpathian mountains at the beginning of the World War.

It is mainly along its weak frontiers that a nation constructs its main network of strategic railways. These railways point to offensive as well as defensive strategy. In a crowded continent, made up of separate nations of comparative equal strength, every adjustment and change of boundaries is followed by the development of such railways. We have never built strategic railways in North America owing to the fact that the great inequality in the strength of the nations on this continent have made such railways a luxury rather than a necessity.

Straight-line boundaries are almost the rule in North America and Australia; they are the exception in the rest of the world. An English Geographer, Colonel Holdich, declares that nothing but the necessity imposed by ignorance can justify the adoption of the straight line; and he gives many reasons for following natural features.

Nothing can be more futile as a frontier than a long weak line of demarcation in a low country.

There are many kinds of frontiers; but the frontiers which have proved most effective have been those secured by strong natural geographical features. The best frontiers in nature are the sea, mountain ranges and deserts. In the interior of a continent, mountain ranges are the best frontiers. The whole strength of the Russian Empire was insufficient to push a military force across the Carpathian mountains in the World War.

A sea frontier is better than a mountain frontier; but the sea is a highway as well as a barrier. It is a barrier only when a nation can command it by means of a fleet, or can make landings difficult by means of coast defenses and supporting troops; so that the fleet and the army, and not the sea, are the real barriers. The strength of sea frontiers comes from the fact that the weakness of the offense is greatest from debarkation to landing, at the same time that the power of defense is greatest.

Of all natural features, a watershed marked by a conspicuous mountain ridge, or range, is undoubtedly the most lasting, the most unmistakable, and the most effective from the military and economic point of view and, in many cases, from the ethnographical and historical side. Even where the mountain range is lacking, the watershed between any two water courses, rather than the water courses themselves, are the most suitable for national boundaries.

Boundaries are not set up to unite peoples, but to divide them.

Great altitude becomes an effective barrier during many months of the year. Roads may be built across the mountains; but no method has yet been devised for dealing with heavy snowfall and ice-covered slopes at great altitudes. A great mountain range is a protective barrier to the nations upon each side of it. Thus the Andes protect Argentina as well as Chile; and the Pyrenees protect France as well as Spain. The Pyrenees are a world-old political boundary. Owing to their flat-topped formation and the steepness of their northern slopes they are a most effective barrier; no railway crosses them and they can be flanked only at the extremities, along the Atlantic and the Mediterranean. Mountains, swamps, and desert wastes constitute the greater part of India's northern frontier, leaving only about 300 miles of Afghan frontier which requires careful watching by India's foreign rulers. For 1500 miles the peaks and snow fields of the Himalayas shut off India from all possible enemies on the north. This wall or mountain is the ideal type of frontier, a barrier which no possible combination of enemies can penetrate.

In mountain frontiers, the political boundary should follow the main divide. One country should not hold both sides of the main range. The great desideratum is to give neither nation a post of aggression against the other. Italy has, in the Alps, one of the best natural frontiers in Europe; but, since the fall of the Roman Empire, the Italians have not been masters of the southern approaches to their crests. The Alps, therefore, have been good offensive and defensive frontiers for the nations on their northern and eastern flanks; but they have not been a defensive frontier for Italy. Still less have they been an offensive frontier for her. This condition on her northeastern frontier was altered by the World War.

To sum up: a mountain barrier is the most effective that geography can offer in the interior of a continent; but, where mountains are lacking, there are lesser altitudes. If there are no hills, there must be at least a divide or water-parting. If the Andes and Himalayas are not at our beck and call, the Carpathians are almost as effective. If there are no Carpathians at hand, a few heights like those above the Meuse or a few hills like "60" will be invaluable assets in our barrier.

Deserts are most effective barriers. Many deserts present impassable obstacles to sudden attack. Egypt has owed its national existence for long periods to its desert protection. Its invaders have generally come from the sea or have operated with the assistance of naval forces. The modern light railway and pipe lines are detracting from the value of deserts as barriers against invasion.

A buffer state may be an effective barrier when the nature of the country makes the passage through it a difficult matter, as is illustrated by Afghanistan, which lies between Russia and India. When the violation of the boundaries of the buffer state becomes the signal for war; when the buffer state is warlike and ready to protect its independence and the communications across it are difficult, as in the case of Afghanistan, then, and then only, is a buffer state a wise political device. The real buffer is not only the trackless desert but the armed forces of the buffer state. When the communications through the buffer state are excellent, as were the roads and railways in Belgium, and the buffer state is not prepared for war, it merely becomes an easy avenue of approach for the nation that chooses to use it.

Rivers constitute weak frontiers. The best natural frontier in the vicinity of a river is not the river itself but the high, sparsely settled country, where the communications are poorest, which will usually be found either on the near side or beyond the river. The best natural frontier between France and Germany is not the Rhine, but the high ground either west of the river or to the east. The Allied High Command showed its appreciation of this fact very tardily, when in renewing the armistice it insisted on pushing the neutral zone to the high ground east of the river.

In ancient times rivers made excellent frontiers when held by civilized nations against barbarians. Thus the Rhine and the Danube were, for centuries, the barriers which sheltered the Roman Empire from its most formidable enemies; and nothing shows the military acumen of the Romans more than the fact that when they had annexed Dacia, which lay beyond the Danube, they still recognized the Danube as their real military frontier. But we must not be misled by these ancient examples into the belief that rivers make good frontiers today. River valleys in modern times are the most populous and wealthy parts of the world's surface, and the rivers themselves are lines of communication rather than barriers of separation. No one would select a railway line as a boundary between two nations. Most of the reasons which apply to the railway, apply to the case of the navigable river. Aside from questions of defense, it would be extremely inconvenient to have the frontiers of two friendly nations with different laws and with custom houses passing through populous areas.

One of the great lessons of the World War is that rivers are a feeble check to armies as compared to mountain heights or mere watersheds. The Danube was not a serious obstacle to the Germans in their campaigns against Serbia and Roumania. The Rhine is no

barrier from the military or political point of view. Its banks offer no serious means of defense. Of course a broad deep river used as a wet ditch in front of a defensive position affords ideal conditions for passive defense; but good defensive lines are to be found, not along the water courses, but on the divides between them, on the heights above the Meuse, not on the Meuse itself. If a stream marks a political frontier, the divides on either side are the natural military frontiers or barriers; but no rich populous river valley should lie between the defensive frontiers. Rivers are usually in the bottoms of valleys. In view of the great range of artillery and small arms today, no one would think of placing his main line of resistance in the bottom of a valley, even if by so doing he could secure a wet ditch in front of his lines.

What do the French mean when they demand the Rhine as a frontier? This is an interesting and important question. Judging by the utterances of Marshal Foch before the armistice (and even afterwards), and by the original terms of the armistice, the Rhine itself was contemplated as the line of demarcation. By the original armistice terms, the possession of the farther bank of the river was given to the Allies, still the river itself rather than a defensible line beyond the river was to be the battle position in case the armistice was broken. Subsequently the armistice terms were modified so as to give the Allies control to a distance of fifty kilometers from the river on the right bank. This gave them the only eligible position for a battle and for a frontier in peace. We should avoid an undue application of logics; but it seems incomprehensible that the frontiers of two great nations should follow the middle of the populous Rhine valley.

The peace, safety, and welfare of human society demand that France and Germany be separated by the best frontiers that can be found. The choice therefore lies between the high ground west of the Rhine and the high ground east of the Rhine. As the potentially weaker state, France should be given the advantage in frontier, where it is not possible to lay out a frontier that is strong for both parties. The objection raised against giving France a good frontier at the expense of Germany is that the Allies should not create a new Alsace-Lorraine. It may be noted that Alsace-Lorraine was not even remotely the cause of the war of 1914, which began, not in the aggressions of the nation that had lost Alsace-Lorraine, but by the aggressions of the victor, who wished to increase his conquests.

Statesmen have tried to offset the advantage of superior power by giving the weaker nation the advantage in frontiers. Where from the nature of things the possession of the actual barrier must

be given to one nation or the other, it is best that the barrier be given into the hands of the weaker nation. Thus in the settlement of the Swiss frontiers, it would have been an unjustifiable procedure to have placed her mountain barriers in the hands of France or Italy or Germany. The frontiers of Switzerland are ideal in many respects. The country is too small for it to be dangerous to any of its neighbors and there is therefore no objection to giving it the strong frontier when the choice lies between it and its more formidable neighbors.

In 1815 the nations feared France. The German states were therefore given the strongest frontier which could be selected to the west of the Rhine. When these states became united in the German Empire, Germany possessed an incomparable position for aggression upon the left bank of the Rhine. The danger in selecting any frontier in this manner is that conditions may change so that the weak power is the stronger when the next test of strength takes place. We cannot tell what may happen in the world in the years to come. All false calculations must be paid for; and dearly has France paid for the false calculations of 1815.

As a continent, South America has the best frontiers. Ecuador, Peru, Columbia, and Venezuela find their defensive strength in the difficult nature of their country on the side of their land frontiers; Paraguay is isolated amidst tropical forests; Chile and Argentina are separated by the colossal range of the Andes, which gives them the inestimable gift of a strong natural boundary. Everything makes for separation in South America—mountains, forests, the rank tropical vegetation, which makes the construction and maintenance of roads difficult, and even the rivers, which by their breadth, give to Uruguay, Argentina, and Paraguay some of the advantage of a sea frontier.

Much has been said about the fine spirit displayed by Chile and the Argentine Republic when they agreed to settle their boundary differences by arbitration in 1906. It may safely be asserted that there was never any danger of real war between them. Neither country was equal to carrying war into the other's territory across the Andes or by naval expeditions around the south end of South America.

Africa comes next after South America in the strength of her natural frontiers. The Sahara put an effective barrier to Persian, Carthaginian, Roman, Mohammedan, and Turkish conquests in North Africa; Egypt owed her separate national existence for ages to the surrounding deserts; Abyssinia is indebted to her strong natural frontiers as well as to the warlike nature of her people for

her independence. Africa, south of the Sahara, is the last great area to come under the government of the civilized nations, not on account of the fighting ability of the native inhabitants, but on account of the difficult nature of the country.

Three-fourths of the population of the globe lives in Europe and Asia, which together constitute one vast continent. This continent lacks natural frontiers. It has, indeed, many good military frontiers, such as the Carpathian and Himalayan mountains; but the continent is so vast and the natural lines of travel from north to south and from east to west, and *vice versa*, are so good, that no power when it has once begun to expand has ever been able to find a place to stop, a secure frontier which will afford protection against the hostile nations living around the outskirts of the expanding state. It is far easier for a state to reach frontiers beyond which it cannot pass, than for it to find frontiers which the people on the other side cannot pass with comparative ease. Every new addition almost invariably makes the question of defense more difficult by increasing the length of the frontier. The Assyrians, the Persians, and the Romans found this to be true in antiquity; the followers of Mohammed and the Moguls found it to be true in the Middle Ages; and the British in India, and the French under Napoleon, and the Germans quite recently have found it to be true in modern times.

A continent whose communications lend themselves to political unity, but which is too vast for political unity and which, moreover, is inhabited by many races each possessed of national consciousness and a desire for territorial expansion, such a continent is, in the nature of things, bound to be the seat of innumerable wars.

Europe, which has the greatest number of warlike states, has the smallest number of scientifically selected frontiers, if I may use the expression. Central Europe is filled with irregular, unscientific, and indefensible boundaries.

In Europe we see many countries whose territories are closely interlocked, all trying to expand, all hating each other, all military, and all necessarily warlike. Could the present generation have prepared a more cruel inheritance for posterity than the system of weak frontiers devised at Versailles?

We might be indifferent to European wars and their causes, if the events of the World War had not shown us that we may no longer pursue a policy of peace and non-intervention pushed to the extreme. A national debt of 23 billions and an estimated pension expenditure of 75 billions are mute testimonials to our interest in the military and naval situations which arise in the European-Asiatic continent.

At Versailles, each European nation, almost without exception, clamored for boundaries which would make it weaker in the next war. If France, with true military foresight, demanded a good military frontier along her eastern border, she asked and secured territories in Syria with indefensible frontiers where she has already met with disasters. England, though she has a long record of avoiding insecure frontiers in various parts of the world, sought and accepted patches of territory in Mesopotamia and Asia Minor with indefensible frontiers and from which she has had to withdraw in many instances. Poland secured 1500 miles of absolutely indefensible frontier.

Before the war the Hungarian Kingdom constituted a geographical unit. It was the one country in Europe whose boundaries included all the geographical units which, theoretically, a country should possess. The Hungarian frontiers now are no stronger than the boundaries of the state of Kansas. In no direction can she find the solid support of nature upon her frontiers.

There was a strong party at Versailles devoted to the promotion of the League of Nations' idea, which desired systematically to weaken the frontiers of nations in order that an interest might be built up in favor of an all-protecting super-state. To this party the boundaries of our American states which follow meridians of longitude and parallels of latitude were ideal frontiers. They dreamed of a time when national frontiers will no longer exist. When men of this type assert that there are more armed men in Europe today than there were in 1914, they should be told that the weak frontiers traced out by the Peace Treaties are largely responsible for the increase of armaments.

Lack of formidable barriers conduces to union, when once an area has been united under one government. Mr. Bryce notes the absence of natural boundaries such as mountain ranges and deserts, as one of the fundamental reasons for the continuance of the immense area of Brazil under one government.

The same reasoning applies to the North American continent north of the Mexican border. Almost the only possibility of a good frontier in this area will be found in the arid regions of the Rocky mountains. Many writers have drawn attention to the fact that a foreign power in possession of our Pacific coast states might effectively block our efforts to recover those states by holding certain passes in the Rocky mountains.

In 1860 and 1861, two Americans discussed the question of secession from the point of view of establishing secure frontiers for the prospective new nation—William T. Sherman and Abraham

Lincoln. Sherman, who was an instructor in a military school in Louisiana, told his southern friends, as is recorded by one of them, that secession could not succeed, because of physical and economic geography. In his first inaugural address, Mr. Lincoln said: "Physically speaking, we cannot separate. We cannot remove our respective sections from each other nor build an impassable wall between them. A husband and wife may be divorced and go out of the presence and beyond the reach of each other, but the different parts of our country cannot do this." Mr. Lincoln was discussing the possibility of establishing a frontier between the north and the south, but his remarks have a general application to continental conditions north of the Mexican border. A year and a half later he said: "There is no line, straight or crooked, suitable for a national boundary. Trace through, from east to west, upon the line between the free and slave country, and we shall find a little more than one-third of its length are rivers, easy to be crossed, and populated, or soon to be populated, thickly upon both sides, while nearly all its remaining length are merely surveyors' lines, over which people may walk back and forth without any consciousness of their presence. No part of this can be made more difficult by writing it down on paper or parchment as a national boundary." I venture to say that if a Lincoln could have taken a leading part in the Treaty of Versailles, the frontiers of the new Europe would have been a guarantee rather than a threat to the future peace of the continent.

The position of the United States on the southern half of the North American continent is the strongest for defense ever occupied by any nation. On every frontier we touch the ocean or the frontiers of less powerful nations. The Monroe Doctrine is the work of a people who do not desire powerful neighbors.

The justifying reason given by Mr. Monroe for his doctrine was that it was "impossible that the Allied Powers should extend their political system to any portion of either continent without endangering our peace and happiness." Did he fear the example of their system would contaminate our pure republican doctrines? Or was it a more material fear of the presences of powerful neighbors as endangering our peace and happiness?

The Monroe Doctrine, in its original form, was practically a guarantee of South American liberty as against Spain and a prohibition to Europe to plant new colonies in this hemisphere. Nearly all of our publicists ascribed this doctrine to the necessity of protecting American republics against European monarchies; and books have been written in recent years recommending that we drop

the Monroe Doctrine because monarchical government, so-called, has largely ceased to exist in Europe.

Before we agree to this view, we should take account of the fact that the greatest and most successful colonizing nations have been more republican than monarchical in their form of government; and that we are no more willing to see republican France or republican Germany absorbing American territory than monarchical France or monarchical Germany. Whatever the origin of the error may have been, it is certain that it has received the approval of our historians, and that they never open their lips on the subject except to give it fresh confirmation.

Many writers assume that most international wars are caused by boundary disputes. The hidden, secret, unavowed cause of most international wars is indeed the desire to effect conquest of territory; but very few wars have really been started by "boundary disputes" as the term is used by so many writers. The United States would never have fought the war with Mexico, if the reward of victory had been limited to a strip of territory between the Nueces and the Rio Grande. A boundary dispute may be the pretext but it is rarely the real cause of a war.

The whole tendency of modern historical development is toward the creation and fostering of the spirit of nationality. We are not concerned with the question as to whether or not this is good or bad in itself; but we are deeply interested in the bearing which it has upon the subject of national defense, not only for ourselves but for other countries. It is desirable that the world be divided into highly developed, strategically defensible, self-sufficient, industrial states.

Nothing is more important than that self-governing nations should occupy separate geographical units so that definite military barriers lie between countries liable to mutual aggression. It is of the utmost importance that boundaries should be difficult to violate and as strongly defensive in character as nature and art can make them. Other factors being equal, the chances of aggression are directly proportional to the ease with which aggression can be carried out. The great requisite of a frontier is that it may easily be made strong enough and secure enough to prevent it from being violated.

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The Austro-Hungarian Artillery in the World War

By Lieut. Colonel Ludwig Elmannsberger

Editor's Note: *The* Journal *is especially indebted to Colonel George Ruhlen, U. S. A., for having brought to its attention and translated the following interesting parts of a study on the above subject published in the* Technische-Mitteilungen *at Vienna.*

While this article deals primarily with the Austro-Hungarian artillery during the World War, it contains in addition a wealth of valuable information covering the cooperation and lack of cooperation of the artillery with the infantry and the consequences thereof. It is by an author who very evidently is a most thoughtful student of military affairs. He pictures vividly the difficulties encountered by the State due to the rapid expansion of its artillery both in materiel and men; difficulties that every nation must encounter in a war of any magnitude. It would be difficult to find a better word painting of the part played by artillery in war than is here presented. The article is well worth reading.

THIS study has not for its object a resurrection of that which has departed with a view to furnishing an obituary of the Austro-Hungarian artillery in its final struggle; necrologies over deceased loved ones are usually dictated by the heart and frequently will not bear the test of critical scrutiny. This study has an entirely different purpose; it is intended to present a faithfully true, temperate and unvarnished picture of our artillery as it entered the World War and as it solved the combat problems assigned to it, so that the future may profit from its experience and make a study of it.

For the very reason that the Austro-Hungarian Army belongs to history and has no longer any secrets, it is possible to present a communication of this kind. It is, perhaps, also needed to prevent the slime with which domestic as well as outside influences have attempted to besmirch the armies of the Danubian State, from adhering and being, in course of time, taken as historical facts.

Artillery can develop its greatest service in a campaign only when it is on the one hand thoroughly educated, that is when it is capable of utilizing to their fullest extent the technical properties of its implements, and on the other hand when the leadership and the infantry have correct knowledge of the adaptability of this arm and are therefore able to make use of it to its best advantage.

Let us submit a condensed view of the army of the Danubian monarchy in the summer of 1914: a first-class infantry, schooled to a certain extent in the partial rushing system of attack; fully conscious of its merits; an artillery small in numbers, with high standing in firing technique, tactically in a state of transformation, with partially antiquated implements, which admitted and had been trained to acknowledge the preeminent standing of "the queen of

arms," and to subordinate itself to its requirements. Both arms—each in its own way—thoroughly trained. In respect to cooperation much had been written, but, notwithstanding, much remained for argument, as was the case with all other armies.

War experience was wholly wanting; the last large campaign dated back to 1866 and since then there had been no opportunity to acquire direct experience even in colonial combats. Many tactical plays took place, in summer and in winter, perhaps too many. The fighting rules were diffuse; each leader had his own peculiar views concerning the combat. The spirit of the army was excellent, officers and men ready for sacrifice and resolved to risk everything in support of the existence of the empire. Thus the Austro-Hungarian army entered the combat.

The World War is the first great field campaign which the Austro-Hungarian army carried through as a national force—as an army subject to universal service. The mobilized army embodied, as representative of the monarch, the highest war lord, the concentrated might of the Danubian state. When, after the sanguinary encounters of the first year of war the best portion of the peace army lay under the sod, it came about that in the sparingly trained replacement reserves, the frame of mind of the remote interior regions came more and more to the front, and the peculiarities of each race and its bearing toward the war asserted itself. Necessarily the fire of battle sifted out from this conglomeration of races those less willing to fight and those less capable of resistance, thus imposing upon the tougher contingent heavier burdens and making greater demands upon their qualities of endurance, and so loosening up, to an extent, the frame work of the whole army. In a time of unusual service army and nation became one. But even in respect to culture and technique Austro-Hungary was anything but homogeneous; one could, in regard to this, call it really the land of contrasts. It comprised land areas with industries as productive as any in Europe, and again there were areas in which the cultural and industrial conditions were shockingly backward. All this should be taken into consideration by him who undertakes to judge the task accomplished by this great nation in the war.

Now then, to the actual subject of the Austro-Hungarian artillery. Before we discuss its employment in the fighting it is necessary to show how the Army Supreme Command in combination with the Military Central Authority of the Interior and its industries transformed the weak, antiquatedly equipped artillery of the summer of 1914 into the powerful organization represented by the Austro-Hungarian artillery at the end of the war. This study can describe that gigantic task only in outline.

The types of guns at the outbreak of the war ready for mass construction were: the mountain guns, the light and heavy field

howitzer, and the 10-cm. long cannon; the orders for manufacture could therefore be made at once. The necessity for introduction of other types of guns of field artillery during the progress of the war did not become apparent; the field howitzer was arranged for transportation with carts and issued as mountain howitzers.

In 1916 the infantry received a portable 37-mm. gun which it could apply to the independent discharge of lesser tasks, especially in contests with sharpshooters firing from behind cover of shields. Later in the course of the war arrangement was made to convert the field gun, which ceased to be a single firer, into a special arm with high trajectory and correspondingly increased range.

As in all field campaigns heretofore held, one experience in this was also that, in contrast with views prevailing in times of peace, the troops were more concerned with the range than the mobility of their guns. In consequence the automobile gun and automobile howitzer were introduced in 1916, and the 30-cm. mortar was also improved in its dispersive effect and range. About the end of 1915 the so-called heaviest guns were sent to the front. In the spring of 1915 a 42-cm. howitzer intended for the port at Pola was made mobile; in 1916 there followed the 38-cm. howitzer and the 24-cm. cannon, the latter as a bombardment gun with a range of 30 kilometers. The transportation of these gigantic pieces was satisfactorily accomplished with the use of the electric carriage with multiple driving wheels. It must not be passed over in silence that these super guns, with the exception of the 24-cm. cannon, intended for very special work only—rapid destruction of permanent fortifications—justified the impediment to traffic caused by their transportation, but their moral effect suffers in a tendency toward over-estimation. The backbone of the artillery is the lighter calibers, up to and including the field howitzer.

The requirements of the early established trench warfare gave rise to a new supplement to the artillery: the trench artillery, as it is called by the Frenchman. The mine throwig appliances were charged with throwing projectiles with large explosive charges for short distances; since longer ranges were dispensed with this apparatus could be made comparatively light and simple.

In Austro-Hungary to avoid overburdening the industries, it was possible to proceed with the manufacture of mine throwers of the modern type only after the artillery had been provided for. Armament consisting of a heavy, medium and light mine thrower, became a part of our equipment only in the spring of 1918.

But the burning problem at the beginning of the war was not the manufacture of guns but to make provisions for the enormous quantities of ammunition used up in continuous actions. The entire metal manufacturing industry not already engaged in other pressing war needs, had to be impressed to make ammunition. Several

months passed before this became manifest at the front and there resulted, late in the fall of 1914 the well known "munition crisis": the peace time stock on hand had been consumed and the war manufacturing plants had not yet reached their full capacity. Every one who took part in the war will recall this critical period, when the deliveries of ammunition consisted of ten shots per day per piece, frequently less. This crisis exerted no great influence upon the course of the war because it came to all participating states simultaneously, an instance of the difficulty of tracing the influence of a thought to its remotest consequences, as was that of the introduction of the recoil gun. In order to be able to produce the shell needed on the front lines in adequate quantities it became necessary to reduce the quality of the ammunition; thus came about the cast iron shells of the winter of 1914-15. In the spring of 1915 the critical situation had been overcome and from that time on no further crisis in the supply of ammunition occurred; but the Danubian armies were never able to expend ammunition on the scale that prevailed with the Germans for example.

To give a measure of the demands upon ammunition manufacturing industries it is mentioned that at the 11th Isonzo battle between August 12th and September 6th, 1917, there were expended, by 1454 guns, 1,600,000 rounds weighing 33,230 tons, a mass that required for its transportation 6700 railway cars. During the war the monarchy produced 83 million rounds for artillery. It is self-evident that by reason of the limited capacity of the Austro-Hungarian industries the burning question became the adjustment of the artillery and its provision with adequate supplies of munitions, so that other matters had to be put in the background. Among those was the production of modern trench warfare material, already referred to, also the introduction of antiaircraft guns and the like.

The struggle against shortage of raw material is a chapter in itself that became constantly more and more pressing. Powder, that in times of peace was made from cotton and glycerin, had to be manufactured from wood and sugar, and nitric acid produced from the air. The trinitrotoluol explosives were diluted with ammonium nitrate and the bronze gun barrels were replaced—on account of want of copper, and for that reason only—with steel and the shrapnel received bullets of iron instead of hard lead, and such like.

The Austro-Hungarian army was mobilized with 571 batteries, which had, inclusive of its ammunition personnel, 206,000 artillerists. In April, 1918 there were 1931 batteries; at the end of 1917. the artillery had used up, in replacements, and new organizations, 535,000 men, among them were 182,000 convalescents. To solve such a gigantic problem during the progress of a war, as is shown by the almost complete renewal of the artillery of a national army,

could be accomplished only by the most rigid centralization, far-sighted action, energy and consciousness of purpose. The measures that the army command had to take to attain its ends under continually increasing want of personnel, horses, and raw materials were more and more pressing. In the spring of 1917 Army Headquarters took upon itself the allotment of the most important elements of materials of production, coal and iron; shortly after, the cavalry divisions were dismounted and organized on foot in order to release horses, and finally there followed repeated and material changes in make up and diminution of batteries and their columns in order to gain men and officers. This is the brief history of the mighty Austro-Hungarian artillery that had to be created during four years of war.

Before entering upon a relation of the events of the war I will discuss separately the experiences of our arm:

It should be noted that after each rearmament with new types of weapons there is need of a certain period of time before the troops become familiar with their implements and before the leaders can form a judgment of their capability.

During the war there was no time for this; with the exception of certain batteries all received new equipments and went with them, even under the most favorable conditions, at once before the enemy. It was therefore inevitable that the expenditure of apparatus, especially of gun barrels, would be very marked. The recoil gun, a complicated firing mechanism in its form and construction, demands care in its operation and has, besides, the peculiar qualification of permitting a greater rapidity of fire than the mechanism can permanently endure, and the sensitiveness of the gun increases with its muzzle wear. Due to ignorance of the troops on the one hand and the excessive demands of the leaders on the other, it occurred that the economical rapidity of fire was greatly exceeded and the mechanism suffered in consequence to the extent of becoming unfit for use. It required frequently repeated orders from army headquarters to induce the troops to appreciate its implements; material improvement came about only with time and a rigid course of instruction in proper handling of the materials.

A second experience that peculiarly manifested itself was the quality of the fire. One would have thought that the several years of war would greatly improve the experience gained in firing exercises in peace, but the exact contrary was the result. The reasons for this are manifold:

The war losses and enormous increases of the artillery brought about a transfer of all the officers who had been trained as battery commanders during peace, to staff positions; again, in the later years of the war the battery was very seldom brought into action as a single unit, it was mostly combined with great masses which made it difficult to supervise closely its fire.

Finally: firing became more and more difficult and made constant demand for a closer insight into the theory of firing; the wear and tear of the various implements used required attention, the variation in ammunition (projectiles and their cases) had to be considered, also the influences of temperature and pressure and heating of gun barrels by continuous firing.

In connection with all this comes a human mental factor; the officer who had done his duty in a dozen battles and acquired rich war experience gained the impression that he no longer needed the instruction and guidance of the unit troop commander in regard to the manner in which he should fire and frequently failed to accept such instruction with a willingness that would have been useful. Experience in war is certainly very useful to the soldier, but this applies more to tactical than to technical firing questions. While the firing exercises in peace times have for their purpose the accomplishment of a specific mission end in the shortest possible time, and with the least possible expenditure of ammunition, the problem to be solved by the battery commander in action is to bring about a definite result; there is no time to question how many rounds were fired for the purpose and whether or not it could have been brought about sooner. However incredible as it may sound, it is an undeniable fact that in a prolonged war the firing training of the artillery deteriorates.

Firing was advanced by means of graphic tables of fire which became extraordinarily trustworthy and, after the autumn of 1917, with the effect of the recognition of the influence of weather conditions as promulgated by the weather observation service; also, later, by institution of firing exercises in rear of the front lines; at the beginning of 1918 the artillery school of fire was again established at Spilembergo, at the boundary of the north Italian plains. The fortification artillery also exercised a favorable influence upon the firing technique; this arm, cut off in times of peace from all opportunity of tactical exercises by want of means of transportation, was accustomed to firing methodically at fixed targets. When its personnel had learned to appreciate the value of time in war, their steadiness had a quieting effect upon many field artillerists who, with erroneous conception, frequently showed a tendency toward cloud bursting displays.

In order that what has preceded may not lead to incorrect conclusions, it must be noted that there are abundant reasons for the belief that up to the end of the war the Austro-Hungarian artillery exceeded in firing technique all others with whom they came in contact. The thorough peace time training of the young officers in firing instruction was amply repaid; officers and men answered their requirements; the reserve officers who at the close of the war came into command of batteries, rendered very distinguished service.

If one were to cite a distinction of merit among the artillery itself, it would be necessary to say that in the march and in action the heaviest tasks came to the mountain artillery and that for this reason the preference belongs to the Austro-Hungarian mountain artillery.

And now to the events of the war:

The autumn of 1914, with its sanguinary battles, may be regarded as the heroic time of the Great War; the Austro-Hungarian infantry carried out the work assigned to it in conformity with its training, by going ahead with determined alone, when that seemed necessary; it always attacked the stronger opponent wherever it found him; took wire protected machine gun positions; overran front line batteries; the defense only, it found difficult. It was a time of unheard of deeds of heroism, but the losses also were unheard of; by the end of the year a very considerable part of the trained combatants were resting under the sod.

In those days the appraisal by the infantry of the artillery was not of a high degree; it was justified in its impression that the burden of carrying on the fight had fallen to it almost exclusively. Even the first contests indicated that the artillery was unable to silence the enemy's batteries; neither did assistance of the infantry's breaks of the enemy's lines succeed, since batteries in such actions were soon beaten down by the enemy's fire. The artillery was, therefore, compelled to content itself by accompanying the attack by fire under cover, a task less difficult that brought to it less casualties than were suffered by the infantry. At this time it was the general opinion throughout the army that the enemy's artillery was superior to ours in its equipment as well as in its application. Was this impression justified? Absolutely not, in respect to equipment when comparison is made with the field guns only; the fabulous reports of the greater range of the Russian guns were not correct. But since the Russian infantry division had at its disposal more guns than ours and the Russians always brought into action forces superior in numbers, the comparison in regard to numbers engaged was always against the Austro-Hungarians. Furthermore, every participant in the war became cognizant of a new experience which had, perhaps, escaped his recollection since his childhood; that a blow received makes an impression quite different from one given. The effect of the enemy's artillery only was perceived, that of our own was felt only by the enemy. As far as concerns the application of artillery fire the answer is given by that which has been heretofore alluded to in this study: where leadership and the infantry had only a dim perception of the working capacity of the artillery disappointment on the one hand and inadequate methods of employment to the best advantage on the other were unavoidable.

The higher leadership disposed fundamentally of operative units and did not comprehend the necessity of sending to decisive points strong artillery reinforcements which could have been withdrawn from less important sections. But within the divisions themselves the artillery forces were seldom concentrated; this was due no doubt to the fact that in the moment of advance to the fight each column was given a detail of artillery and held to it during the fight when its employment under the direction of the artillery brigade commander would have been far better. It was thought at this time that by such a method one could utilize more fully the combination of the two arms, a misconception that ceased to prevail only at the end of 1916. For want of appreciation or understanding of the functions of the artillery by minor leaders, infantry units were, without cause, frequently unwilling to wait until the batteries at their disposal had prepared for the attack. The spirit of cooperation of the two arms was at this time in a generally unsatisfactory phase, and mostly without fault on the part of the artillery which held the tragi-comical position of an uninvited assistant. At the beginning of an action the artillery received either none or only meaningless orders and then, as the fight progressed, usually nothing more. Such is the record of the shortcoming of the leadership and the infantry.

A portion of the failure also certainly belongs to the artillery itself; it also was devoid of war experience, it also had to learn anew because the combat brought out conditions different from those that had been accepted in peace; such learning over cannot come about without friction and occasional misfires. The capacity to grasp more or less rapidly that which is at the instant most expedient is in the end a matter of aptitude; as an illustration it may be stated that even in October, 1914 the taking of the Serbian position on the Danum highway in the Paraznica, was prepared with a regular heavy bombardment; the attack, which had been arranged to the hour, succeeded almost without casualties. Such examples of exemplary instances of proper cooperation were, however, for that time exceptional; as a general thing even the weak artillery available was not fully utilized. One of the consequences of this was the enormous losses. Where the mechanical apparatus was missing the infantryman had to jump into the gap. It was recognized by all that such a system of leadership would soon result in bleeding to death, and the demand for a stronger artillery with many howitzers and a far better equipment of shells became pressing. But one extreme replaced another. There arose a tendency to overestimate the artillery and its capacity. At any rate the experience gained up to that time succeeded in distinctly impressing upon the artillery, the leadership and the infantry, the importance of big guns and from that time on the necessity for cooperation of the two principal arms was

striven for by the infantry. This gave rise to an immediate improvement and facilitated a mutual understanding and greatly enlarged the opportunities for useful employment of the artillery.

Late in the fall of 1914 greater and greater sections of the front became embraced in the torpidity of the trench warfare; the rifle, continually greatly improved during centuries back in range and accuracy, suffered in opportunities for its advantageous employment and this gave impetus to all the weapons that would make it possible for the infantry to work under cover: hand and rifle explosive shells, shell and mine throwers of all kinds and calibers. The artillery of the defense was therefore charged with the duty of seeing that the enemy, when he left his trenches for the attack, should be shaken up to such an extent before he could reach our trenches that his attack could be repulsed. Whether this defensive fire should be directed against the enemy's trenches or over areas between the trenches was, at that stage of the war, left to the judgment of the commanding officers directly concerned.

Of the artillerymen the solution of this problem required, in addition to an accurate knowledge of the front to be covered, an exact estimate of the striking precision of his weapons in order to organize his defense so that his own infantry would not be jeopardized by his fire. Furthermore, the short interval between the two trenches made it necessary that the effect of the artillery should be as immediate as possible; this necessarily anticipated a careful organization of the means of defense with all available appliances and a good liaison with the infantry. This last appeared to become as insoluble a problem as the quadrature of the circle. To the infantry commander, for instance, it appeared more advantageous to make the connection by transferring the point of observation of the artillery commander to the trench. In that way the quickest, because oral method of conference, was established. This method was well justified during periods of comparative quietness, but when the enemy took occasion to attack in earnest his fire usually destroyed not only the trench, but also the observation position and more certainly the means of communication with the battery, thus depriving both the observer and the battery commander of the use of the battery at the most critical moment. A result of such experiences—and such experiences in war time always signify effusion of blood—gave convincing evidence that the points of observation of battery directors did not belong in the trench, except when the terrain made this unquestionably necessary, but at least so far to the rear as to be out of reach of the fire aimed directly at the places attacked. For direct connection the observer had to remain in the trench irrespective of other means of communication at hand. The institution of so-called flanking or attack repulsing guns in the trenches was soon discontinued, because such guns were disabled by the enemy's fire

before they could come into action, and at any rate machine gun fire was better adapted for such purposes.

The trench after the Russian pattern soon became the trench system: it made provision for graduation in depth. In this entanglement of defensive ditches the ways of communication and obstructions were concealed, also the fighting personnel and the first reserves and the various weapons as mine throwers, shell throwers and above all the most effective defensive weapon, the machine gun. A strong barbed wire obstruction in front of the trench was intended to protect against surprises. In the attack of a front so protected it was assumed that the artillery had succeeded in removing the obstructions at numerous places and to demolish the trench and the remaining means of defense, but especially the machine guns; but since the defender, on the other hand carefully concealed his means of defense nothing remained but to break down all defensive appliances. The work of the attacking artillery had become so manifold that the division artillery organization became wholly inadequate for its accomplishment especially since the greatest number of the objects to be obtained could be reached only by means of high angle fire.

Such an attack therefore rendered necessary the combination of great masses of artillery at the front involved, in which the principal gun was the 15-cm. field howitzer. And even these masses were unable to produce a destructive effect upon the defenses occupying large areas except by a firing prolonged for hours. The preparation of the necessary apparatus in addition to the heretofore unheard of quantities of ammunition required weeks of excessive service of the railways and the organization of an attack became an accurately thought out gigantic enterprise directed from a single source, which left very little room for the initiative of a single battery alone.

The principal part of destructive work against the enemy was to be done by mechanical appliances, the combatant was only to march on to complete the penetration of the lines. That purpose was, however, never attained. The position penetrating infantryman always found a sufficiency of bloody work left over for him.

The first attack of the Austro-Hungarian front arranged as above outlined was that at Gorlitz, May 2, 1915, but all similarly arranged attacks succeeded when the leadership had succeeded in bringing the forces at its disposal into harmony with the extent of the area attacked, when we succeeded in surprising the defender and when complete penetration was within the range of the main mass of the artillery engaged. Examples of this are: the capture of Belgrade, October 24, 1915, and the Russian penetration of the Oartio Hyam positions at Luck, June 4, 1916. Giving the numbers of guns employed in those various undertakings has been avoided be-

cause a purely statistical treatment of fighting events might lead to erroneous conclusions as long as the fundamental feature of the action, extent of areas of attack, tasks assigned to the several groups, terrain, strength and condition of the enemy, cannot also be considered.

If the defender could reestablish himself in a rearward position out of range of the attacking artillery, the attacker's stand became difficult, because his artillery superiority had ceased to exist. As an instance of this may be adduced the Austro-Hungarian offensive against Italy in the summer of 1916, the so-called Tyrol offensive. There the Italian was surprised by the attack and had lost his defensive position. But since the Austro-Hungarian troops did not succeed in breaking through to the valley while pursuing the fleeing Italians they (the Italians) were able to reestablish themselves in a position beyond the range of the attacking artillery. A better application of the abundantly available mountain artillery could probably have prevented this. The extremely difficult country almost devoid of roads prevented the transportation of adequate heavy artillery forces—above all of their ammunition supplies—and this gave the Italian time to bring up sufficient forces to resume his defense. The occurrences in East Galicia did not permit continuation of the attack; it would not have had much chance for success since the element of surprise had been lost. Penetration of the enemy's lines was thereby prevented notwithstanding the brilliant initial success of the attack.

The entente attack in the second half of 1916—the battle of the Somme—compelled the leaders of the German forces to recognize the fact that the obstinate defense of lines had become impossible, because the enemy, with an unlimited superiority of mechanical equipment and ammunition, demolished everything that was in his way as a means of defense. The result of the recognition of this fact was the well known "fundamental principles for conducting a defensive action" which were issued in December, 1916, and which call for "an active defense with capacity for mobility in the terrain covered." These principles were adopted by friend and enemy during the further progress of the war; it is an intolerable thought that German mental activity, taken advantage of by the enemy, assisted him so materially in repulsing the attacks of 1918. On the Austro-Hungarian front these principles, like all other experiences of the battles in France, could be applied only in part and for this reason: because on the one hand the requisite means in respect to troops and material were never available and the conditions governing fighting in the mountain country were entirely different.

In the autumn of 1917 it became apparent that the Isonzo front could be no longer held permanently by defensive methods alone. It was therefore decided to attack the Italians. The attack-

ing group at Fritsch and Tolmein was under German direction, the materials were contributed in approximately equal parts by each side. The result of the attack begun October 24 is well known. The Italian was, in a continuous movement, forced back to the Tagliamento and after a short resistance to the Piave. This attack, the so-called 12th Isonzo battle, presents a landmark for that period of the war in that it brought out a fundamental progress in the use of artillery: the first prominent use of gas projectiles by the Austro-Hungarian on their front. Without intending to discredit the efforts of troops and leadership, the complete, almost unresisted evacuation by the Italians of positions requiring years to build up, is incomprehensible except on the assumption of a general panic, because reserves were always abundantly available. The progress of events in the areas attacked had remained the same that had prevailed throughout former periods of the war; the Italian defensive works consisted of trenches with advanced wire obstructions. Rear positions with obstructions had been built up at intervals. Large portions of the Italian artillery fired from caverns, important heights along the highways were supplied with usual skill with completely concealed cave systems that could be reached only by direct loop hole hits; even guns of the heaviest caliber could not penetrate the rock covered positions. Gas had not yet been used extensively on this front by either side; gas masks were issued to the Austro-Hungarian forces only in 1917. On the Karst plateau gas was once tried against the Italians in the autumn of 1916 with pronounced success, however, only as an experiment, because no other attack was to follow. The Italian was very poorly equipped with gas masks in the fall of 1917. It was only a sort of face cover with impregnated cotton cushioned cover. On October 24, 1917, at 2 o'clock in the morning, therefore in complete darkness, began the four-hour fire with gas projectiles—poison and erosive gases from all German guns. The Austro-Hungarians also fired gas projectiles but in diminished quantities. All battery positions, all barracks, camps and other places of resort and cross roads were repeatedly strewn with gas. That not only a moral but also a physical effect resulted was proven by gas killed corpses after the attack.

At the infantry attack proper at Tolmein, the resistance of the Italian artillery was unimportant; the silence of most of the concealed cavern batteries was peculiarly observed. The 12th Isonzo battle was probably the only great fighting action in the whole World War in which an army with fully equipped gas firing apparatus met an enemy who was not properly equipped with appliances for meeting the attack. Gas firing presents a further development of the capacity of artillery, especially in its relation to action against the enemy's batteries, which will be more fully discussed in what follows. Except in case of specially protected batteries, all

enemy batteries fire from positions under cover; their locations must, during wars of position, be ascertained by all available means of observation—fliers, sound and plane tables, survey, observations from elevations—in order that they may then be reached by firing by the map. If only slight errors in locating batteries have been made, or the battery commander failed to take accurate account of atmospheric conditions, which is usually the case in mountainous regions because he cannot know what are those conditions at the point aimed at, the center of gravity of the impact will lie outside of the point aimed at and the effect of hours of firing with dispersive shell ammunition may amount to nothing. The effect of high explosive shells is only momentary and confined to the immediate vicinity of the point of impact. Otherwise with gas firing: with that the result of the same kind of fire would be a gas cloud of high concentration which, while it may not at once cover the point aimed at, will be shifted according to conditions of the wind, and may after a period of delay still attain such a degree of efficiency as to compel the opponent to resort to his gas protectors. Furthermore, it is a fact, that even the best protected structures that can furnish full shelter against splinter projectiles, may become untenable against gas fire if they cannot be hermetically sealed against it. When all enemy battery positions are simultaneously overwhelmed by the attacking artillery with gas fire, there originate numerous clouds of gas which will at least compel the serving personnel to have recourse to gas masks which greatly hampers work with the guns and the directing service.

The 12th Isonzo battle again gave the Austro-Hungarian army proof of the superior equipment of the German forces. The army of the Danubian state had been trained to ideas of moderation and prudence in peace times; it was accustomed to improvisations of all kinds. But now it became clearly obvious to its perception how technical superiority prevented effusion of blood. An instance is given to make this plain: one of the most important fundamental preliminaries to every fighting situation is the preparation of a plan on a scale map I—25,000 of the enemy's position with all his combat, storage and communicating dispositions. The observation service flights of the Austro-Hungarian fliers had furnished the principal material for this by months of work with heavy losses, because an insufficient number of fighting fliers were available for protection of the observers. The German army headquarters which directed the attack wanted to test and finally complete this plan during the preparation for the attack. German aircraft with built-in picture taking devices took up, in a minimum number of flights, the entire area of the attack to places far in rear of the enemy's front; this apparatus with a focus over one meter permitted them to go to an elevation of 5000 meters where they could work with complete

security from the enemy since at this time the average flying elevation on the Isonzo was 2500 meters. Superior technique made it possible to solve in a few days and with a few flying craft a problem for which the Isonzo army with numerous flyers, had required months of labor.

The collapse of the Russian campaign finally brought reinforcements. It became possible to place entire batteries, even mountain batteries, in rear of the immediate front and school them as batteries to assist infantry. Heretofore the progressive steps in conduct of fighting had been imparted to the troops from time to time in a theoretical thesis only. Now, however, there came into play the proverb "trying is superior to studying." Especially as applies to war and without combined exercises the difficult cooperation of infantry and artillery in penetration of a fixed position cannot be learned.

In the spring of 1918 there were initiated the preparations for the great offensive which Austro-Hungary undertook with the remnant of its entire strength against the Italians and which in time coincided with the second German offensive on the West front. The attack was to follow on the German system; after adequate preliminary artillery work the infantry, accompanied by batteries, was to penetrate the enemy's positions. The infantry, thoroughly trained in storm attack tactics, fully displayed its new power, ready for any sacrifice and eager to begin the attack; it could in no way be blamed if the attack did not succeed.

At last there were available to Austro-Hungary, as a result of the Russian collapse, adequate forces to have at its disposal attacking divisions even with artillery held in readiness; it became practicable to train artillery unts in exercises with infantry, in order to become again accustomed to a war of movement after four years of war in position. Conditions in relation to supply of horses were improved, the interference with the production of ammunition had not yet made itself felt to the troops. In point of numbers of combatants and munitions the Austro-Hungarian forces had never been stronger—but too late. In mid-September the Balkan front collapsed. September, 1918, Bulgaria signed the articles for cessation of hostilities and thereby stepped out of the ranks of those engaged in the war. Furloughed men and newspapers brought peculiar news from home. October 24th, the south Slavonian national council assembled at Agram; others followed. From this time on it occurred to the soldier in the trenches to ask himself what he was really defending? Notwithstanding this, the attack of about October 24 against the mountain front between the Brenta and Piave was repulsed in the customary manner. Then came what the Italians call the victory of Vitorio-Veneto, which, however, was not a victory but a collapse of the Austro-Hungarian army.

Gradually but slowly the veil that has heretofore concealed the internal conditions of the enemy's armies during the changing vicissitudes of the war are being disclosed. We learn what Jean de Pierrefeu relates in reference to the temper of France in those June days of 1918, when the second German attack proceeded as far as the banks of the Marne at Chateau Thierry:

> "Just in the hour of our greatest extremity the Americans arrived. They passed by in endless columns, crowded into motor wagons, nearly all without head covers, with exposed bosoms, all singing. The appearance of these glorious boys from beyond the sea, these clean-shaven twenty-year-old youths, who in their new equipments radiated force and health, brought about a truly wonderful effect. They presented an impressive contrast to our regiments with their uniforms worn out with years of service in war, to our emaciated, hollow-eyed soldiers who had become mere bundles of nerves which a heroic will still held in tension. Every one had an impression that he was an eye witness to a magical transfusion of blood. A hot wave of living force came up to refreshen France's body which had then bled from countless wounds. And in those days of the heaviest trials, when the enemy had again reached the banks of the Marne and could believe that we were discouraged, the hearts of the French were filled with renewed confidence, the force of which it was almost impossible to appreciate."

But the Austro-Hungarian army had no possibility of a transfusion or accession of new blood. On the contrary, while in a really heroic struggle the resources of almost the entire world were at the disposal of France who never experienced want of care and equipment, the mixed population of the Danubian monarchy fought from the very beginning under pressure of a blockade becoming more and more unbearable from day to day. And so the Austro-Hungarian army, insufficiently provisioned and scantily clothed since 1917, finally broke down in the fateful days of November, 1918 and dissolved into its national units. The present judges according to the ends attained and their political aims; writers of future history will form a more objective estimate of the superhuman attainments of this army and give it the justice which the present denies.

Notes on the Dardanelles Campaign of 1915

By Major Sherman Miles, G. S.

Editor's Note: *This is the final installment of this article. The first installment appeared in the December, 1924, issue.*

SURPRISE was the keynote of a message sent General Hamilton by Lord Kitchener early in July—"The only way to make a real success of an attack is by surprise." The attack on Sari Bair was based on this principle. To a certain extent, also, the Suvla landing may have been influenced by it. Putting an Army Corps ashore on the flank of the Turkish Northern Group was unquestionably a strategic surprise. But the value of strategic surprise depends on ability to "cash in" on the tactical field of battle. The Suvla Corps was held down by its primary mission of securing a base. Its possible tactical value in the coming battle was a secondary consideration.

It is true that Suvla Bay was needed by the Allied Army as a base. The menace of enemy submarines had not been lifted since the sinking of the *Triumph* and *Majestic* late in May. The open beaches at Helles and at Anzac were very unsatisfactory from several points of view. Bad weather was coming on.* "We can run a light railway line (from Suvla)," writes General Hamilton, late in June, "and more effectually feed the troops holding Sari Bair than they could be fed from the bad, cramped beaches of Anzac Cove. This will be the more necessary as the process of starving out the Turks to the south must take time."

But still, after all possible allowance is made for Suvla as a much needed base, the deflection of first 15,000 men, and later 30,000 for its capture would not appear to have been justified at that critical moment of the campaign. The essential point was to win the battle; that won, Suvla could probably have been had for the taking.

The landing of the 9th Corps at Suvla with the double mission of securing a base and supporting the Sari Bair attack was a violation of the principle of simplicity. It was also an unnecessary dispersion of troops much needed elsewhere, a violation of the principle of economy of forces which requires "the conservation of men, materiel and supplies in order that superior fighting power may be available at the decisive point and time." Too great a dispersion of

*Note by General Hamilton: "With a change of winds which would render Anzac Cove useless."

troops ruined the Allies' chances of success in April. The same fatal mistake was repeated in August.

The explanation of the Suvla landing lies in the fact that General Birdwood asked for only one division to take Sari Bair, and Suvla presented a promising means of employing the other two divisions. General Birdwood got two brigades in addition to the division he originally asked for, and these reinforcements brought his strength up to 36,000 rifles and 72 guns. But when the battle was planned, he felt sure he could take Sari Bair with an additional division. The whole plan, General Hamilton says, was based on that. On the other hand, General Birdwood was not at all sure that he could land in secret more than a division behind his lines before the attack began. He did not believe that the Turks had entrenched the upper crests of Sari Bair, at least beyond Chunuk, or that they held them in force. Surprise was the great aim. Secrecy was of the utmost importance. But the cramped and shallow foothold at Anzac, almost everywhere under the eyes of the Turks on the crests above, made secret preparations for a great attack on Sari Bair extremely difficult. As it was, the secret landing of five brigades behind the Anzac lines on the three nights preceding the attack was a very notable feat.

There was also another consideration that influenced General Birdwood. The terrain itself argued against the employment of too many troops in the Anzac area. The attack was cramped. The entire front of the proposed advance, from The Nek through Chunuk, Koja Chemen and down Abdel Rahman Bair, was but 5000 yards in length. The attack had to be developed from a jumping-off line only 1000 yards in length—the northern end of the Anzac position. Furthermore, there were but three feasible routes of approach to the crests of Chunuk Bair and Koja Chemen Tepe. These routes ran up the steep and narrow gullies of three dry water courses, the Aghyl, the Chailak and the Saxli Beit Deres. Up these gullies only thin columns of troops could make their way. Up them also all the ammunition and water had to go, and down them the wounded had to be carried. The water question was particularly difficult.

General Hamilton says that water was the crux of the whole matter. "The precious fluid," he writes, "had to come all the way from the Nile," (why, one wonders, was it not distilled at Mudros?)* "and one lucky Turkish shell might sink a ship-load of it. There never was such a gamble with fate as the Anzac water question." Water runs all the way through the British accounts of Anzac—the Turks say nothing about it. This is very significant, and the reason is simple: the Turks had plenty of it. The whole of the

*According to Admiral Wemyss' diary, a distilling plant was erected at Mudros, but not, apparently, in time to serve for the August attack.

southeastern slopes of the Sari Bair ridge, almost up to the crests, was well watered. There is a well to this day within a few hundred yards of the crest of Chunuk Bair. It is hardly possible that the British failed to get this essential fact from their Turkish prisoners —a bit of information which even the most ignorant prisoner must have known. Granted that the water question at Anzac was acute so long as the Anzac troops were confined to their cramped lines: what bearing has this on the August plan of attack, the paramount feature of which was to break through into a well watered area?*

The fact remains, however, that secrecy, the cramped terrain and water all weighed on the minds of the Army chiefs. So when a man of the capacity of General Birdwood, who had commanded at Anzac since the first landing and whose staff originated the August plan, asked for only a third of the reinforcements he knew to be available, it is not surprising that other missions were assigned to the remaining forces.

Yet the unavoidable lesson of the great attack in August lies in the fact that the British failed to make good their assault on the key position of Chunuk Bair. They failed to bring against their main objective both a sufficient number of troops and sufficiently good troops. And while they failed there, 15,000 fresh troops accomplished nothing at Suvla Bay, and their best trained divisions were further depleted in an equally vain attack at Helles.

Accepting General Birdwood's estimate that the number of troops in the Anzac area on the night of August 6th was the maximum number usable, the question naturally arises of further reinforcements on the 7th and even on the 8th. Granted that the terrain was extremely difficult and that the question of supply most serious, the fact remains that the crests of Sari Bair, less than a thousand feet above the sea, were nowhere more than two miles from the beach, and that, although the approaches might be difficult, there was plenty of room on the crest and beyond the crest for the deployment and employment of large bodies of troops. The objective of the attack was both vital and near. The question of water supply should not have been unsolvable, considering the two months of preparation, the short distances, the short period of time involved in the attack, and above all the intent to break through into an area which should have been known to be well watered.

Furthermore, it was not only a question of breaking through the Turkish lines north of the Anzac position, but also of shoving through that break a force sufficiently strong to turn and sweep the whole Northern Group of Turkish divisions off the lower reaches

*Note by General Hamilton: "I have little to say here. Water was distilled at Mudros directly I got a competent Commander for the Lines of Communication. I think the plant was working by July. But the quantity required was so enormous that it still had to be supplemented from the Nile. As to the implied criticism on Birdwood, certainly he knew perfectly well that if he succeeded and got through he would have water in abundance. But suppose he did not get through? Suppose 10,000 men died raving mad with thirst? That was the chance he was up against if he took too many reinforcements."

of the Sari Bair ridge and then off the waist of the Peninsula. It was not only a break in the Turkish lines of investment that was planned, but a break through with force sufficient to roll them up. The attack therefore needed strong backing—and it did not get it.

The attack was made by 20 battalions of infantry and four mountain batteries—about 16,500 rifles and 16 guns. Behind it was held the Corps reserve, for both the Anzac front and the attack, of nine infantry battalions—about 6,500 rifles. Considering the cramped nature of the attack, its very short jumping off line and the relatively short front of the first objective, as well as the extreme difficulty of the terrain to be traversed, it is not surprising that this was considered the maximum force usable. But in reality the terrain over which the attack was to be made, from the jumping off line to the upper slopes of Sari Bair, represented a defile, very difficult and cramped at its lower end and constantly broadening as the attack advanced. At the crests of Sari Bair the defile ended, the terrain broadened out immensely and there was room and need for all the troops that could be had.

So it really came down to forcing a difficult defile and of passing rapidly through it as many troops as possible. The 16,500 rifles assigned to the attack, backed by troops from the Corps reserve, were thought to be sufficient to overcome the initial difficulties, and about all that could find elbow room. But it would appear that the very nature of the problem called for a second force to leap-frog the first if the first was held up before clearing the crests, or in any event after the crests had been reached.

Had the Suvla landing not been attempted, a second force, at least equal numerically to the Suvla Corps, might have been put ashore between the mouths of the Azmak and the Saxli Beit Deres after the assaulting columns from Anzac had moved off. This force might have been landed so as to form several successive waves. It might have leap-frogged the first attacking lines had they failed to carry the crests, or relieved them when, exhausted, they had reached the heights—and so carried the attack to victory. The tragedy of Sari Bair lay in the fact that during sixty critical hours the Turks had time to bring divisions all the way from Jambax Dere to Koja Chemen and from Bulair to the Anafartas while the British failed to reinforce their main attack by troops landed on the beaches only two miles away.

The battle will go down in military history as one of those rare cases in which the general entrusted with the principal attack asked for less troops than were given him, and much less than he might have had for the asking or than he could have profitably used. Even at the crisis of the battle, on the afternoon of August 9th, he refused General Hamilton's offer of the last reserve, the 54th Division. He said he could not water it!

As to the quality of the troops employed in the August attack, it should perhaps be noted that in one respect only the newly arrived divisions were superior to those which had been for some time on the Peninsula. Dysentery had raged among all ranks during the summer. General Hamilton says that hardly a man was free from it. Yet there is no suggestion that the new divisions were used in preference to the old for that reason.

They were, however, all used either at Suvla or in the main attack on Sari Bair. Of the three new divisions, but one, the 13th, had had any battle experience, and that only for a short period of time in the Helles trenches. The 29th, the 42nd, the 52nd, the Royal Naval and the 1st and 2nd French Divisions, all veteran troops of the campaign, totalling 45,800 rifles, remained at Helles during the attack.*

Secrecy was of course essential; and the withdrawal of several divisions from the Helles area might have indicated an attack farther to the north. But on the other hand the 13th Division was actually put into the trenches at Helles late in July, relieving the 29th Division. The 29th Division was therefore more available to be sent to Anzac than was the 13th. And even if all of the three new divisions had been landed at Helles, and an equivalent force withdrawn from the six veteran divisions there, how much more would the Turks have known than they actually did know? The presence of the new divisions in the neighborhood of the Dardanelles could hardly be kept from the enemy in any case. In point of fact, they were all landed at Helles or on the nearby Greek islands before being sent to Suvla and Anzac. Even if the Turks had been ignorant of the departure of these divisions from England for the Eastern Mediterranean, their presence could scarcely have been concealed once they had been disembarked from their transports. Had they relieved veteran troops in the Helles area, and had the latter been sent back to the islands for a short rest and refitting, the Turks would probably have known nothing more than they knew before—that a big attack was to be expected, but at a time and place unknown.

The movement suggested would have involved a little more work for the naval transport—that of landing two more divisions at Helles instead of on the islands and of withdrawing their equivalent from Helles to the islands. Time was pressing and naval transport scarce.† But it would seem that the great advantage of having experienced troops under tried commanders‡ at the critical point

*Note by General Hamilton: "There is a great deal to be said on this. The main point (I make you a present of it) is that—*as it happens*—the Suvla attack would, under your suggestion, have had real live generals and staffs to handle them instead of 'duds.' The Suvla *troops* were all right. They only wanted to be commanded; and beyond the rank of Brigadiers they were not commanded."

†Note by General Hamilton: "The Navy had a great strain on them then, and were against the double shifts."

‡Note by General Hamilton: "I agree. But no one could have known that the two divisional and corps commanders had gone to pieces. The divisional commander of the 13th Division was quite all right."

of the attack would have more than compensated, even for a short delay. It might have been worth much more than timing the attack on the dark of the moon.

The suggestion that others might have done better is not intended as a criticism of the New Army divisions, or a reflection on their courage. As a matter of fact, the 13th Division fought well, and lost more than 50 per cent of its strength, including 10 out of 13 battalion commanders.* The point is one of training and battle experience. The Australasian and Indian contingents in the assaulting columns at Sari Bair were veteran troops; but the 10th, 11th and 13th Divisions had just come out from England. They had been raised the previous winter, they had but two months' training as divisions, and they knew neither modern war nor the terrain of Gallipoli. Their commanders were inexperienced, and, as it turned out, inert. They might well have held the Helles lines, or even have made a demonstration there to prevent the enemy reinforcing Sari Bair.† But they could not have been expected to carry out the Sari Bair or the Suvla attacks as well as veteran troops under more experienced commanders.

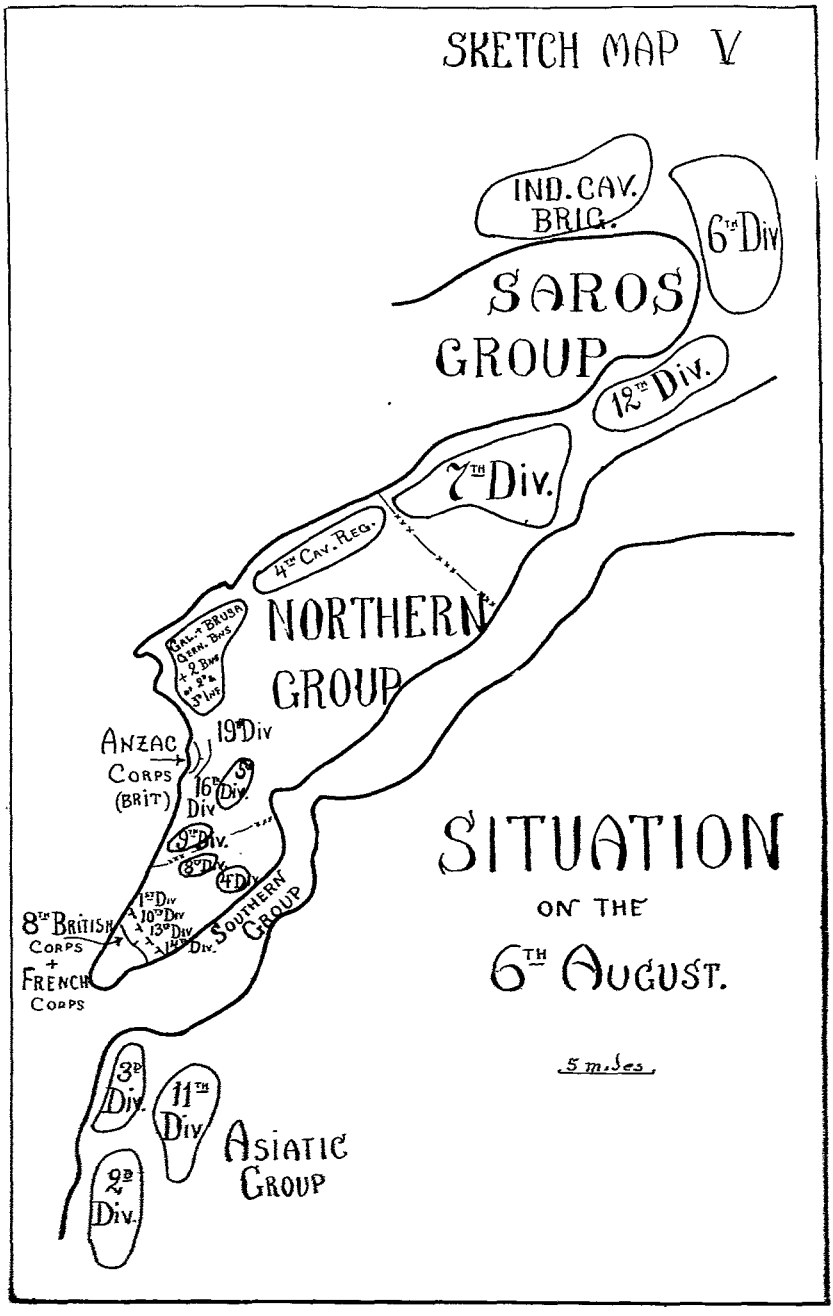
It may be noted that the 29th Division was brought around later from Helles to Suvla, for the forlorn hope of the 21st of August. It may also be noted that General Hamilton expected (and actually received) two more divisions from England (the 53rd and 54th) shortly after the attack began on August 6th. It is true that these divisions were not up to war strength and that they lacked artillery. Nevertheless, their expected arrival might have been considered a still further justification for the use of the most seasoned and dependable troops in the great attack.

* * * *

One more point concerning the British plan remains to be noted —the timing of the containing attacks at Helles and Lone Pine. The Helles attack was made at 4:00 p. m. on the 6th of August, and that at Lone Pine an hour and a half later. The object in both cases was to draw in and hold the Turkish reserves. It may be questioned whether these two feints were not made too early. The British ran the risk of having the Helles attack fail before the main attack was launched, and so release the Turkish reserves at the critical time. The Lone Pine attack might have been expected to set in march, while daylight still lasted, the Turkish reserves to the south of Gaba Tepe. On the other hand, it was hoped that both of these attacks would draw to themselves the Turkish reserves behind

*Note by General Hamilton: "Its commander, Shaw, was a sound, brave average commander; that's why, mainly, and also because they had a little more practice."

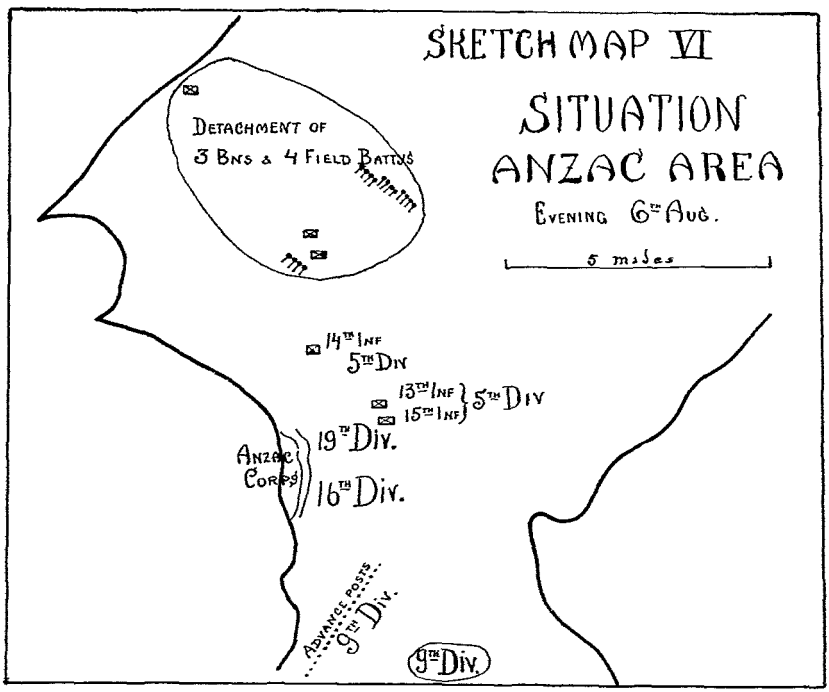
†Note by General Hamilton: "Just about all they were fit for. But how could I have known it? The poor old 29th Division had been twice virtually killed off and reconstituted. The other troops were worn, *ill* Territorials. The new 'K' Army Corps were the pick of England's youth, and there was no reason, *bar bad commanders*, why they should *not* have covered themselves with as much glory as the troops of the first landing. They had very little against them, and what they had were not entrenched and wired as at the first Helles."


SKETCH MAP V
IND. CAV. BRIG.
6TH Div
SAROS GROUP
12TH Div.
7TH Div.
4TH Cav. Reg.
NORTHERN GROUP
Gal. & Brush Gen. Bde
2 Bns
2 Bns
3 Inf
19th Div
ANZAC CORPS (BRIT)
16th Div
3rd Div.
9th Div.
8th Div.
4th Div
1st Div
10th Div
13th Div
14th Div.
SOUTHERN GROUP
8TH BRITISH CORPS + FRENCH CORPS
SITUATION ON THE 6TH AUGUST.
5 miles
3rd Div.
11th Div
2nd Div.
ASIATIC GROUP

the Helles and Anzac fronts. The Lone Pine attack actually did absorb two regiments of local reserves, but it also considerably hastened the arrival at Chunuk-Koja Chemen of four reserve regiments from the south, while the Helles attack failed to hold the reserves of the Southern Group.

* * * *

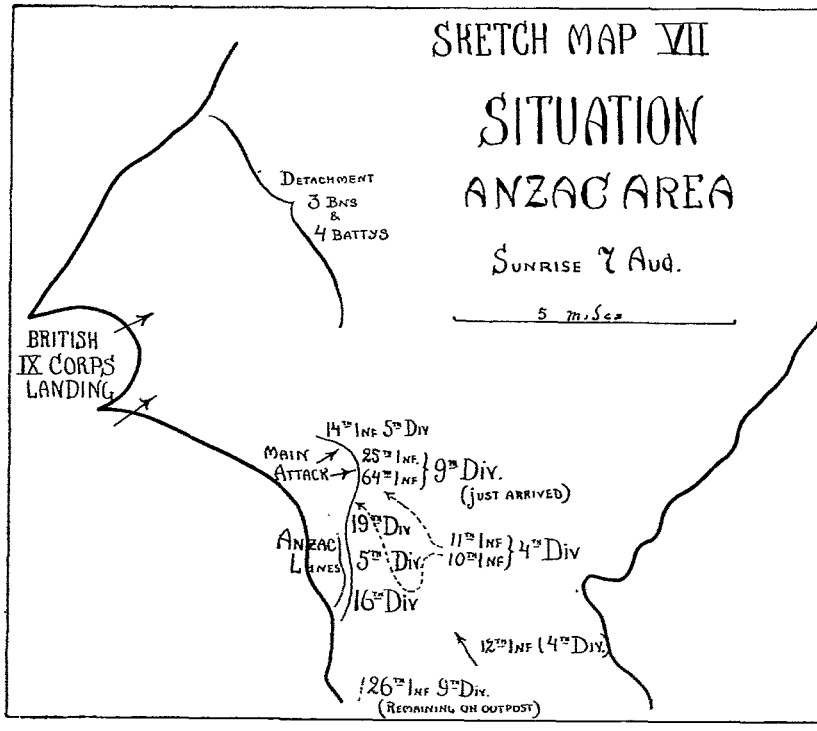
Now let us turn to the Turkish defense. "In the second half of July," says General Liman von Sanders, "information flowed in of a new and powerful debarkation." News of the British reinforcements was telegraphed from the German Imperial Headquarters on



the 22nd of July, according to the account of the Turkish General Staff. General Liman thought that there were some slight indications that the blow would fall on the Anzac front, though Essad Pasha, who commanded there, did not believe it. The two Generals held opposite opinions on the probability of a landing at Suvla, Essad Pasha believing it probable. Helles and the Asiatic shore were not considered probable by General Liman; Bulair was thought "not impossible." "The gravest preoccupation of the 5th Army," according to the German General, "concerned the open space between the fronts of Ariburnu (Anzac) and the South (Helles), because a strong debarkation on that part of the coast would have

immediately permitted (the enemy) to take in reverse the Turkish positions of the Southern Group.*

The dispositions of the Turkish four divisions of the "Northern Group" on the evening of the 6th of August are shown on Sketch Map No. 6. Just southeast of the 9th Division were two divisions of the Southern Group, in reserve—the 8th south of Ayerli Tepe and the 4th in the Jambax Dere. These two divisions were well placed to support the Helles front, held by four divisions (1st, 10th, 13th and 14th), or to move quickly to Gaba Tepe or Anzac. Three

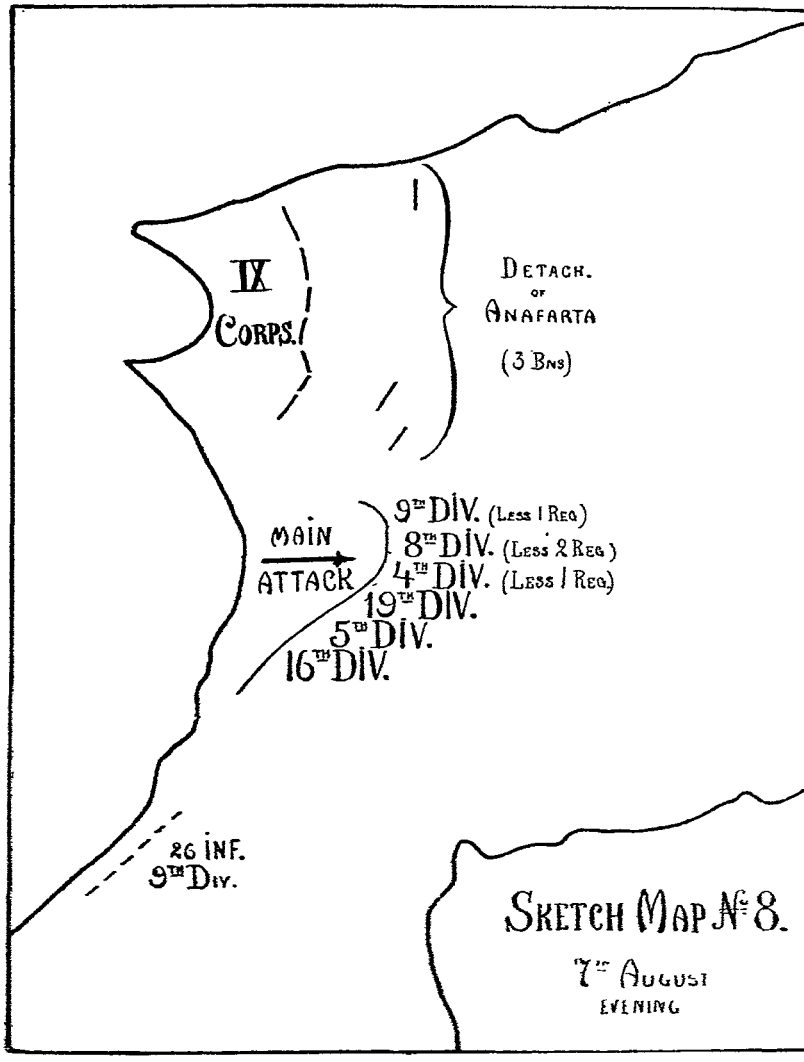


divisions (2nd, 3rd and 11th) were on the Asiatic side, between Erenkeui and Besika Bays. Three more divisions (6th, 12th and 7th) and the Independent Cavalry Brigade formed the Saros Group, guarding the Isthmus of Bulair. The 4th Cavalry Regiment (Mixed) watched the coast between Ejelmar Bay and Bergaz. In all, there were therefore 16 infantry divisions, an independent cavalry brigade, a cavalry regiment and three battalions of gendarmes. The average strength of the Turkish infantry battalions was then

*Note by General Hamilton: "You see, we did not dare reckon on swift and complete victory. Failing that, how could troops landed on this open space be supplied? There was no harbor, not even for a steam launch."

about 600 rifles. There were usually three battalions to the regiment and 3 regiments to the division.

When the attack came the Turkish reserves once more saved the day. The 16th and 19th Divisions bore the brunt of the Lone



Pine attack, and promptly drew in two regiments of the 5th Division which lay behind them in local reserve. The remaining regiment of the 5th Division, the 14th Infantry, had previously been posted on the spur that runs out to the north-northwest from Hill Q. With this detached regiment, and lying just behind the crest of the Abdel

Rahman spur, were a battalion of the 32nd Infantry (8th Division) and a mountain battery.

The Lone Pine attack had the effect—apparently unforeseen by the British*—of drawing north immediately two regiments, the 25th (three battalions) and the 64th (two battalions) of the 9th Division. They came up behind the Anzac front late that afternoon, and from there it was easy for them to reach the vital Chunuk-Koja Chemen crests by dawn on the 7th. This small force, assisted by the fire of the left battalion of the 14th Infantry, and also by that of a field and a mountain battery just behind Hill Q, checked the British advance.

The Lone Pine demonstration also had the effect, in spite of what was going on at Helles, of inducing General Liman to draw in two regiments of the 4th Division from their reserve position in the Jambax Dere. This order was given at 11:00 p. m. August 6th. The 11th Infantry of that division, plus 12 machine guns, reached Chunuk during the day of the 7th. Another regiment of the 4th Division, the 10th, and a battery, after a long march and countermarch, came in line that same day on the left of the 11th Infantry. The remaining regiment of the 4th Division, the 12th Infantry, reached the Anzac front at 9:00 p. m. August 8th.

On the 7th of August the 8th Division, near Ayerli Tepe, was also ordered north. The 24th Infantry of that Division marched all day of the 7th and at sunset reached Chunuk Bair. Another regiment of the 8th Division, the 23rd, reached the front and went into reserve during the night of the 8th-9th.

The remaining battalion of the 64th Infantry rejoined at dawn on the 8th. The 33rd Infantry, transferred from the 11th Division in the Asiatic Group, reached the Anzac front at 11:00 p. m. August 8th, and was assigned to the 9th Division. That same evening a battalion of the 14th Infantry was moved down to Chunuk from the north and two companies from the 72nd Infantry (19th Division) were moved up from the south.

The 7th Division, marching down from the Gallipoli area, attacked the left flank of the British advance early on the morning of the 9th. During that day the 23rd Infantry was gradually fed into the line near Chunuk, and that night the 28th Infantry (10th Division, Southern Group) reached Chunuk. Early on the morning of August 10th the 41st Infantry (also from the Southern Group) came up behind the Chunuk front and formed the reserve for the attack of the 23rd, 24th and 28th Regiments which finally drove the British down the steep slopes of Chunuk.

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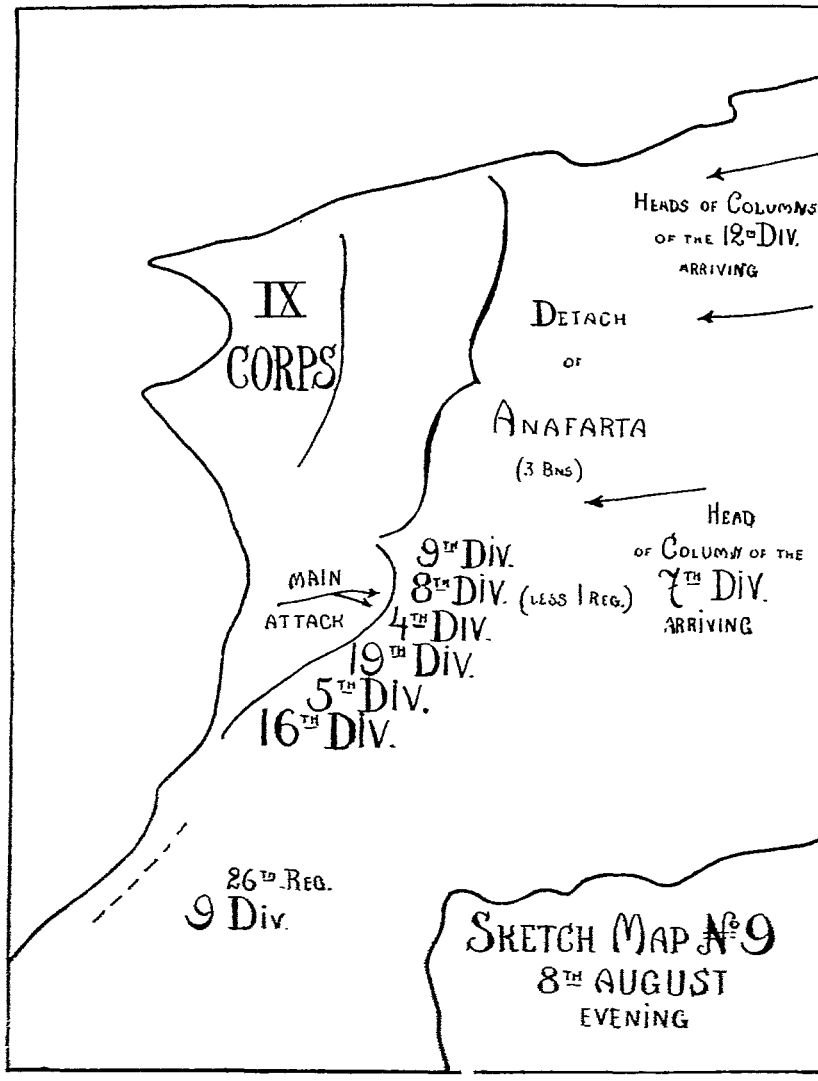
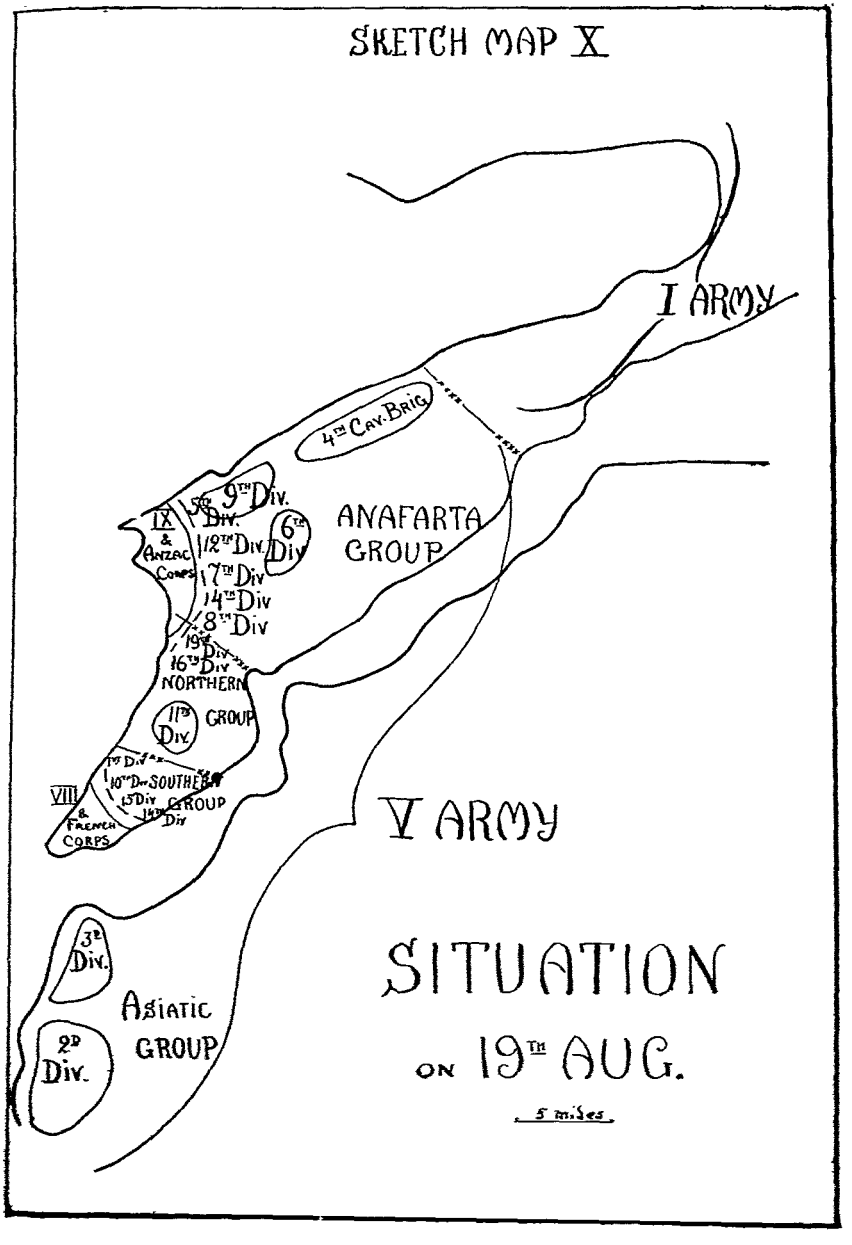
*Note by General Hamilton: "*Naturally* unforeseen! Had Lone Pine failed and the Helles attack succeeded the reverse would have happened. These things lie on the knees of the Gods. Among the answers to the Official Historian by the Turkish General Staff is, 'Your Lone Pine attack accomplished its objective well as most of our troops were sent there to reinforce. We threw in regiment after regiment into Lone Pine. Had you gone on another 20 yards there another division would have been switched off from its march towards Chunuk Bair.' "

So were built up, piece by piece and in the face of the British attack, the Turkish forces on the vital line. At dawn on the 7th, when the British expected to capture Chunuk and Koja Chemen, the Turks had there two regiments of infantry (five battalions), just



arrived from the south, and a field and a mountain battery. By dawn on the 8th, when the British attacked again, the Turks had brought up 10 more infantry battalions and another battery. By dawn on the 9th, when the British made their final attack, the Turks had brought up ten and a half more infantry battalions. By dawn



on the 10th six more infantry battalions had arrived. In addition to these forces, the Turks had at the beginning of the attack four infantry battalions and a mountain battery on the left flank of the British line of advance, and this flank detachment was increased

by one battalion on the 8th and by an entire division on the morning of the 9th. The British attack, which was to have swept around the Turkish right flank, was itself checked and turned, until it formed a sharp salient the point of which fell short of the vital crests. And, as the successive increments to the Turkish line show, it was all a matter of time.

The movements of the Turkish Divisions on the Anzac-Suvla front on the 6th, 7th and 8th are shown on Sketch Maps Numbers 6, 7, 8 and 9. It is notable that the Turkish force of a little over three divisions which the British attacked at Anzac and Suvla on the evening of the 6th, was increased to five divisions on the 7th, six divisions on the 8th and nine divisions on the 9th—an excellent example of the use of interior lines. Again General Liman practically stripped the Isthmus of Bulair of troops, while from his Asiatic Group of three divisions he took but one regiment. From the Helles front he took two regiments and two reserve divisions. These two divisions, with the 9th, constituted a well placed reserve group which really saved the day.

* * * *

On the British side, interest centers in the main attack on Sari Bair. The greater part of the ascent was made on the night of the 6th-7th, against appalling difficulties. On the 7th the troops, still some distance from the crest and checked by the fire of the enemy, prepared to renew the attack the following night.

Soon after dawn on the 8th two New Zealand battalions captured the Rhododendron Spur of Chunuk Bair and dug in just below the crest of that hill. About 20 of their men actually pressed forward to the crest and maintained themselves there for a few hours. They were decimated and finally driven back by fire from Hill Q and Koja Chemen—but three of them rejoined their battalions unwounded. The two battalions were relieved at dawn on the 10th by troops of the 13th Division. The latter were overwhelmed at 5:30 that morning by the attack of three Turkish regiments.

In the early hours of the 9th a battalion of Lancashiremen (13th Division) and one of Gurkhas stormed the crest of the ridge just north of Chunuk Bair. In the moment of their victory, when the Narrows lay before their eyes, six big shells burst among them. The Turks counter-attacked, and the British retired to their trenches below the crest.

History, which always loves the dramatic, will probably make much of those shells, fired by British guns, which fell among those gallant troops at that critical moment. So striking an incident can hardly fail to be seized upon as the cause of failure. But Chunuk Bair has a far deeper meaning. A few shells, fired 56 hours after

the attack began, did not decide the fate of that famous hill. The British failed because they did not "git thar fustest with the mostest men."*

RETROSPECT

The Dardanelles Campaign was lost to the Allies when their exhausted battalions were driven off the crests of Sari Bair. A brilliant strategic move, perhaps the most profound conception in grand strategy of the whole war, ended in a great tactical defeat. Such was the story of the Allied expedition against the Straits.

Like the Opening of the Mississippi and the March to the Sea, the Dardanelles Expedition was conceived to cut through a weak flank of the enemy's position, to link the encircling forces in closer union, to confine the enemy within narrower limits and to complete the blockade. Had it succeeded, in all probability it would have strengthened and saved Russia, swung the Balkans to the Allied side, relieved the Allies from danger in the Near East and in India, confined the Central Powers between the Carpathians and the North Sea and shortened the war by one, if not two years. But it failed before the very outposts of the great Turkish fortress.

Nevertheless, the capture of those outposts would probably have been as decisive as Vicksburg or Atlanta. It is true that Gallipoli is really two peninsulas and that that greater one, above the Gaba Tepe-Kilia isthmus, is by far the more defensible of the two from the standpoint of land operations. But the lesser peninsula, which the Allies came so near mastering, alone covered the mine-fields, and the mine-fields were the real defense of Constantinople.† They were the defensive factor which prevented the Fleet from forcing the Straits. Fortress and Army existed only to defend them.

So the capture of the Narrows would really have given the Allies control of the Dardanelles. The passage of the Dardanelles would have meant the elimination of Turkey and the opening of the Bosphorus. Constantinople is quite indefensible in the face of a naval attack from the Marmora. Weak as Russia was after the 2nd of May, her Black Sea Fleet was unimpaired and an attack on Constantinople would have brought out her cooperation. The city would certainly have fallen. And, as an observant German remarked, "Constantinople was Turkey."

In short, Gallipoli was a tragedy in which the dramatic climax was enacted on the crest of Sari Bair. Outpost of the Dardanelles Fortress, it was nevertheless the key to Constantinople. Success or failure in the campaign balanced on that ridge. As General von Sanders says, in the August attack "victory several times hung by a thread."

*Note by General Hamilton: "I think that is probably so. Still, had they *got there*, they would have been 'fust' for the moment and the 'mostest men' might have been supplied, for there was not room for many."

†Note by General Hamilton: "Correct."

The British failed because they blundered repeatedly. "Muddling through" is an Anglo-Saxon vice in the conduct of war—we also have sometimes exhibited that inherited trait! This time the British muddled true to form—but they did not get through.

And when we Anglo-Saxons muddle in war we usually blame our civilian statesmen and politicians, sometimes with reason. But let us be fair—in the Dardanelles Campaign it was not the civilians who blundered most. A civilian did conceive the campaign and pushed it with all his energy. That was not a blunder, though his enthusiasm sometimes led him at too fast a pace. And, besides, that civilian himself had been a soldier and had had considerable war experience. The rest we must lay at the doors of generals and admirals.

The long weeks of hesitation about sending a military expedition; Lord Fisher's vacillation; the silence of the naval experts in the discussions of the War Council; the theory of an attack with limited commitment; the launching of the naval attack before the Army was ready; the renunciation of the naval attack at the first serious check and the appearances of the Army; the failure to renew the naval attack when and after the Army landed; the utter lack of staff studies or plans at the War Office; the eleventh-hour designation of the Commander-in-Chief; his hasty departure from England without information or plans and with but half his staff; Lord Kitchener's insistence that the expedition should not land without the belated 29th Division; his categorical refusal to send aeroplanes; the confusion and mismanagement in the loading of the transports; the delays and even failure throughout the campaign in the sending of replacements and munitions; the divided command; in all these matters the responsible hand was that of a general or an admiral. Whatever we may think of General Hamilton's plans or the execution of those plans, there is no denying the fact that the real causes of failure lay much farther to the rear, and in men who wore the King's uniform. On the Turkish side the defense was not brilliant, but it was sound and methodical. Also it was ruthless. The German commander and his German-trained subordinates did not hesitate to throw their battalions time after time on the Allied trenches. Heavy as were the Allied losses—in round numbers 31,000 killed, 79,000 wounded and 10,000 missing—the Turks suffered very much more—76,500 killed by the enemy or by disease, 100,000 wounded, and 10,000 missing. And in the last analysis it was the stubborn fighting qualities of the Turkish soldier, his great endurance and unflinching morale, that brought him victory.

APPENDIX I.

INFORMATION RECEIVED FROM THE HISTORICAL SECTION, BRITISH GENERAL STAFF, FEBRUARY, 1924

1. Q. What organizations (British and French) of the Mediterranean Expeditionary Force had reached the Dardanelles on March 18, 1915? What was the strength of these organizations in rifles and guns?

A. On March 18th no troops were nearer the Dardanelles than Lemnos, where one French Division and the Royal Naval Division had arrived and were still on board their transports. These divisions had not been embarked with a view to immediate operations and were soon despatched to Egypt to be rearranged in their ships. The only other troops at Lemnos on this date consisted of one Australian Infantry Brigade with its complement of Engineers, etc.—about 5000 men in all. No guns. This Brigade was at the call of the Navy for minor landing operations.

2. Q. What was the strength in rifles and guns of the Mediterranean Expeditionary Force (British and French) on April 25, 1915? If possible, please give these strengths by divisions.

A. Approximate strength of M. E. F. on 25th April, 1915:

29th Division	18,200 rifles,	56 guns
Royal Naval Division	11,000 rifles,	8 guns
A. and N. Z. Corps	38,000 rifles,	54 guns
	67,200 rifles,	118 guns
French Division	18,000 rifles,	32 guns
	85,200 rifles,	150 guns

3. Q. Approximately how many men and guns were landed on the Helles beaches (General Hunter-Weston's command) by noon on April 25th; by nightfall April 25th; and by noon on April 26th? Same figures for the Anzac landing (General Birdwood's command). If figures have not been worked out for these specific hours, any statistics as to the rate of landing of General Hunter-Weston's and General Birdwood's commands on the 25th and 26th will be appreciated.

A. At Helles beaches the Covering Force—about 7½ battalions with R. E. and Medical personnel—were to land at five different points. The first landing took place about 6 a. m. (2 battalions). Soon after 8 a. m., the Covering Force was practically all ashore. Between 10 a. m. and 4 p. m., a considerable portion of the main body (29th Division) landed, but it was not till next morning that its disembarkation was completed. One field battery and two sections of Mountain Battery (four 10-pdrs. and four 18-pdrs.) landed at night too late to go into action before dark.

At Anzac landing the Covering Force—1 infantry brigade with R. E. and medical units, say 4000 in al—started towards the shore at 3:30 a. m. At 5:50 a. m., a report reached Anzac Corps Headquarters, to say they were all ashore.

By 6 p. m., the following tropos had been landed: 4 Infantry Brigades, ½ section Field Battery, Casualty Clearing Stations, 2 Mountain Batteries, 3 Field Hospitals (bearer subdivisions only), R. E. and other details, 42 mules.

By next morning another infantry brigade had landed. Also some field howitzers were landed during the night of the 25th-26th.

4. Q. What was the strength in rifles and guns of the reinforcements (42nd Division, Indian Brigade, etc.) which reached the Mediterranean Expeditionary Force between April 25th and the arrival of the 10th, 11th and 13th Divisions? Please give these figures by divisions or independent brigades or replacement units.

A. The following formations arrived *after* April 25th and *before* the advent of the 10th, 11th and 13th Divisions:

29th Indian Infantry Brigade	2,500	
42nd (E. Lancs) Div.	13,000	42 guns
3 Battalions to join R. N. Division	3,000	
Additions to A. N. Z. A. Corps (corps troops)	4,500	
52nd (Lowland) Division	10,600	20 guns
The Second French Division	8,500	30 guns
	42,100	92 guns

5. Q. The strength of the Mediterranean Expeditionary Force in rifles and guns on August 6, 1915. It is requested that these figures be given by divisions if possible and that they include the 10th, 11th, 13th, 53rd and 54th Divisions. It is particularly desirable to have the strength of these latter divisions and also of the two Australasian divisions at Anzac.

A.

29th Division	10,200 rifles,	57 guns
R. N. Division	5,100 rifles	
42nd Division	7,000 rifles,	42 guns
52nd Division	5,500 rifles,	21 guns
1st Australasian Division	10,400 rifles	
N. Z. and Aust. Division	9,500 rifles,	71 guns
Anzac Corps Troops	3,000 rifles	
1st French Division	7,500 rifles,	32 guns
2nd French Division	10,500 rifles.	30 guns
10th Division	7,000 rifles,	34 guns
11th Division	10,000 rifles,	18 guns
13th Division	10,700 rifles,	52 guns
	96,400 rifles,	357 guns

The following were not on the Peninsula at this time. They arrived later in August and their approximate effective strengths in rifles were:

53nd Division	7,500 with 20 guns
54th Division	8,000
2nd Mtd. Division	3,500
	19,000 with 20 guns

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EDITORIAL

DEFENSE AGAINST AIR RAIDS

NOT so many years ago this country had no antiaircraft guns with which to protect our principal cities and important military and economic areas. At that time enemy planes could have flown over any such activities, many of which are vital to our national existence, and bombed and machine gunned at will. Of course, such an attack could not of itself have caused the surrender of such areas or activities, but sufficient damage could have been done to them, in a material way, as well as to the morale of our troops and civil communities, to have had a very decided, if not vital, effect on the outcome of any war in which we might have been engaged.

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

For years competition between battleship armor and projectiles went on apace. At one time a ship would be launched carrying armor that no projectile could penetrate. At another time a projectile would be developed that could penetrate the armor of any ship. A competition in many respects similar to this one exists between aircraft and antiaircraft weapons. For a long time the aircraft had all the best of it, for great difficulty was experienced in overcoming the mechanical difficulties permitting the rapid serving and firing of a gun pointed in an almost vertical direction and in de-

signing a gun that could fire a projectile to the elevation at which a plane could fly. Today, however, antiaircraft guns are being built with a straight-up range far in excess of that to which any loaded bombing plane so far developed can reach. Should this country be invaded tomorrow and such guns be furnished for the defense of our principal cities, the inhabitants thereof would be adequately protected from the horrors of a bombing raid.

SUB-AQUEOUS SOUND RANGING

The following letter from Colonel R. S. Abernethy, President of the Coast Artillery Board, is a sharp reminder that experimental work in sub-aqueous sound ranging is still being carried on and that it holds great possibilities as a most valuable means for tracking targets and adjusting fire, for fog, rain and darkness in no way affect the efficiency of its operation. Colonel Abernethy's letter reads as follows:

> "In a number of articles written for the COAST ARTILLERY JOURNAL on the general subject of adjustment of fire, it seems to have been taken for granted that sub-aqueous sound spotting is very far from developed.
>
> "While the Sub-Aqueous Sound Ranging Development Installation has tried not to be immoderate in its claims, I think it fair to point out that sound spotting has been used successfully in six target practices for adjustment of fire and that splashes have been spotted in the case of more than 20 service practices. Sound spotting was used successfully in the case of a hypothetical target moving at 26 knots on a sinuous course. Sound spotting has been used successfully at ranges up to 15,000 yards."

ARTILLERY PIONEERS

Unquestionably there has been a greater development in artillery and artillery ballistics in this country during the past ten years than during any other corresponding period of its history. It is not necessary to seek far in order to account for this for the World War made it necessary to assign great numbers of officers and to appropriate immense sums of money to this particular field of endeavor. Everyone knows of the great progressive strides made by these investigators, but contemplation of their deeds should in no way cause officers of the present generation to belittle the works of

those who have gone before. Such an attitude would savor of ingratitude. Names such as Whistler, Harlow, Birnie, Rodman, Pratt and Ingalls, and many others should have a permanent place in the history of the development of artillery and ballistics in this country. The way towards accomplishment lies not in forgetting such pioneers as these, but in remembering them always and in putting forth the same persistent and intelligent effort that characterized their work. If this is done, the future development of artillery is assured.

GENERAL SUMMERALL

[Reprinted from the *New York Times*.]

Major General Charles P. Summerall, who comes to Governors Island to command the Second Corps Area, will soon speak for himself. He never evades his duty as a liaison officer between the Army and the community. One of the General's rules of conduct is that his military household shall cultivate harmonious and helpful relations with civilians. He appears to think more of his citizenship than of his military status. When General Summerall was about to leave the Hawaiian Department, in August, 1924, a representative business man in a letter of farewell uttered the general belief when he said that "the high standard you have maintained in the service, the sincere interest you have always taken in our affairs, and the hearty cooperation you have shown in all civic matters have been a real inspiration." A first-class fighting man in war, General Summerall, who abhors war, is a pattern of good citizenship in peace. Ex-Secretary Baker, writing about the unveiling of a World War monument in the General's state of Florida on Armistice Day, paid him this tribute: "It was my good fortune to see General Summerall, often and under varying conditions, and I am happy to testify to his splendid gifts as a soldier and his humane and gracious qualities as a man. He fought relentlessly, so that he was sometimes called the Cromwell of the American Army, but he added to this stern quality a consideration for the welfare, physical and spiritual, of his men, which made him an ideal commander."

As a soldier in France, Summerall was more like Jackson than Cromwell. His attitude to war resembled Jackson's. On the offensive he struck hard, believing that fighting must be done with every fibre in one's body, that one's soul must be in it until there is a decision. Summerall was terribly aggressive and persistent. Men sometimes murmered when one day was like another, nothing but fighting, always the call to press on, no matter what the casualties.

"Whatever the obstacles," said the General, when the monument to the First Division was unveiled in Washington, "the division took pride in executing its missions according to schedule." It was the first to go to the front "and the last to return." It had the heaviest losses. It did not fight according to any rule, except the rule to take the enemy's works. When Summerall commanded, no one was spared, officer or man. He certainly did not spare himself, often going under fire to reconnoitre and to lead. If before an advance the General tried the nerves of his men by making them see that fighting was all in the day's work, he was the most popular of commanders when his troops gained their objective. Like Jackson, General Summerall has a religious fervor in battle. It may not be heard in prayer, but it steels him in his purpose. There is really something, too, of the preacher in him. Duty is the star by which he finds his course. In talking to young soldiers he exhorts them to live a clean life and without sentimentality instills ideals and stirs patriotic impulses.

General Summerall does not relish being posed as a hero. Flag-waving he is not given to. He has been a worker all his life. Before going to West Point he taught school and was principal at Leesburg, Florida. In a competitive examination for a cadetship at the Military Academy he stood first. When he graduated he, like Pershing, was First Captain of the Corps. In the Army they will tell you there were two officers who stood out as fighting commanders. Summerall was one, the other was the present Chief of Staff, Major General John L. Hines.

WHY WARS

[Reprinted from the *Boston Transcript*.]

"If men want war, they will have it, and if they want peace, they will have it." This sounds well. But, in the idiom of the day, "It don't mean anything."

For neither peace nor war is the product of the wishes of humanity. There is nothing clearer from a careful reading of history than that peace and war come from a multitude and a complexity of reasons. No war in history, if, perhaps, we except those fought simply for conquest, between kings and princes who used their subjects as so many slaves, was ever a product of the desire of "the people."

Wars result because people are born into the world with fists bent and striking feebly out at the world. Wars result because little boys fly at each other's throats over the disputed ownership of a

peach. Wars result because little girls bite and scratch over a fancied insult to one's doll. Wars result because men become bitter arguing over the boundary line between their properties. Wars result because one man resents the way another looks at his wife. In a word, wars come, not because people will them to come, but in spite of the fact that people will them to stay away, because our emotions of love, hate, jealousy, rage, envy and greed get the best of us. Just as long as we need police to protect individuals and property, there will be wars. When human nature changes, when the impulse to inflict bodily hurt upon our enemy dies out, then there will be the possibility of universal peace.

Meanwhile we can do our best to make wars as unlikely as possible. But, the sad fact is, this is about all we can do, and we are only fooling ourselves when we think that we can make war "forever impossible," by any patent device, while the human heart remains unchanged.

Coast defenses are an indispensable requisite to protection, especially of the larger seaports. One hears considerable these days about the efficiency of other means of defense, and the possible abandonment of heavy artillery protection, but we should not be led away by theory, and should follow only the lessons of practical experience. We know that fleets cannot successfully attack coast defenses where there is anything like a parity of armament, and to be safe the wise thing then would be to outrange them. Modern guns, together with improved system of fire control, should therefore be installed to protect our coast cities of great wealth and population. In this connection, every consideration should be given to the possibilities of long range railway artillery.—*Final report of General John J. Pershing.*

PROFESSIONAL NOTES

The Fuzing of Seacoast Projectiles

By MAJOR F. A. GREEN, C. A. C.

1. The emergency which the Coast Artillery Corps was designed to meet is most likely to arise during the first two months of a war. Its missions in connection with our armies in the field, while they must develop in the later stages of a prolonged struggle, will be of very minor importance in the early stages thereof. In any war in which our seacoasts are threatened, the expansion of the Corps must be particularly rapid; existing plans call for more than twelve times the present number of units for the harbor defenses of the United States alone. Under such conditions, every available officer of Coast Artillery will be required for several months to assist in training National Guard and Reserve units, and to place in fighting trim the many batteries which cannot now be manned.

2. Our peacetime instruction and target practice afford us preparation for these duties, except in one respect: in war we will employ an unfamiliar projectile which in the majority of cases must be assembled at the battery by battery personnel. Technical supervision will be hard to obtain, and each officer will find himself thrown upon his own responsibility. An explosive projectile may consist of as many as seventeen separate components; a long series of operations is involved in the assembly of each; there is a confusing multiplicity of types; an ignorant or slipshod work may involve consequence of the gravest character.

3. The fuze is the critical element about which everything else centers. As artillerymen, it is not essential that we have a detailed knowledge of the interior construction of our fuzes, but it is certainly imperative that we understand how to fit them into our projectiles. Over a long period of years, we have been accumulating a reserve supply of battle ammunition. During this period, there has been a progressive development in the design and manufacture of fuzes. For the projectiles now on hand, five distinct types of fuzes have been employed. Of these five types, two are obsolete and a third is obsolescent. But *each of our projectiles was made to fit the type of fuze in use on the date of its manufacture.* The complications which result from this situation are evident.

4. In order to fuze a particular projectile, it is necessary to determine for which of the five types of fuze it was made. Accordingly, the five principal stages of fuze development, insofar as they relate to projectiles still in service, will be indicated.

5. The oldest reserve projectiles of caliber above 6-inch were bored to receive a fuze of which the head diameter was 3¼ inches. This fuze has now been obsolete for many years, but the projectiles made to take it remain in our galleries. Before they can be used, they must be adapted to take fuzes of more modern pattern.

6. The next pattern of fuze employed was the so-called base detonating fuze, modified Pierce stock, which had a head diameter of 3 inches. Up to about six years ago, this type was still assigned to certain projectiles, but it was then declared obsolete. Many service projectiles were made for this type of fuze, and still form a part of our battle reserve.

7. The Frankford Arsenal base detonating fuze, M-1906, was the next type, and is the pattern familiar to the greatest number of officers. It was the standard type up to the time of the World War. Projectiles made for this fuze can be identified by a 2.16-inch counterbore, in which the fuze head was to seat. Most officers will recall the system under which this fuze was formerly used: shot took delay action fuzes, shell took non-delay fuzes, major-caliber projectiles took major caliber fuzes, and medium caliber projectiles took medium caliber fuzes. Such a system was simple and easy to remember, but it is no longer in effect.

8. During the war, there was developed a base detonating fuze which was bore-safe and was much more certain in action than any previous type. This was called the Mark V base detonating fuze, and must not be confused with the Mark V point fuze used in 75-mm. shell. The head and thread dimensions of the Mark V base fuze are identical with those of the corresponding F. A., M-1906

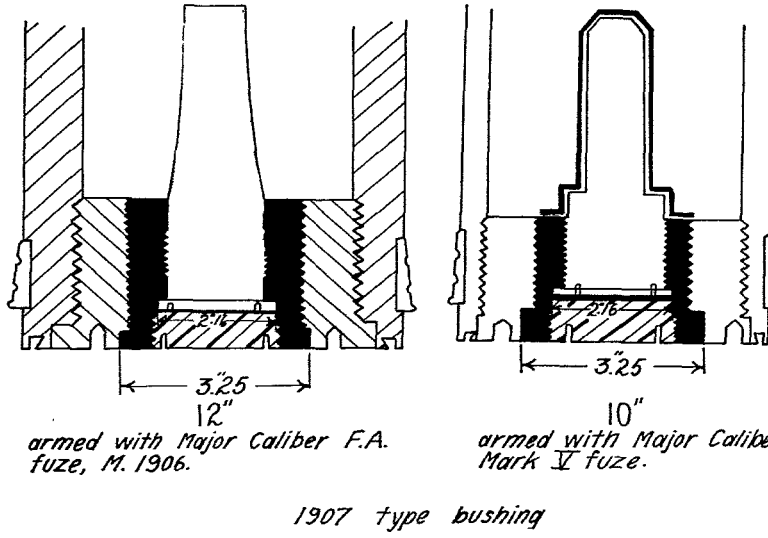


FIG. 1

types, so that it will fit in the same projectile without any modification of the base-plug. (As will be shown later, its stock dimensions are very different, so separate fuzing tools are required, and cavities formed in the explosive for one type must be re-formed to fit the other.)

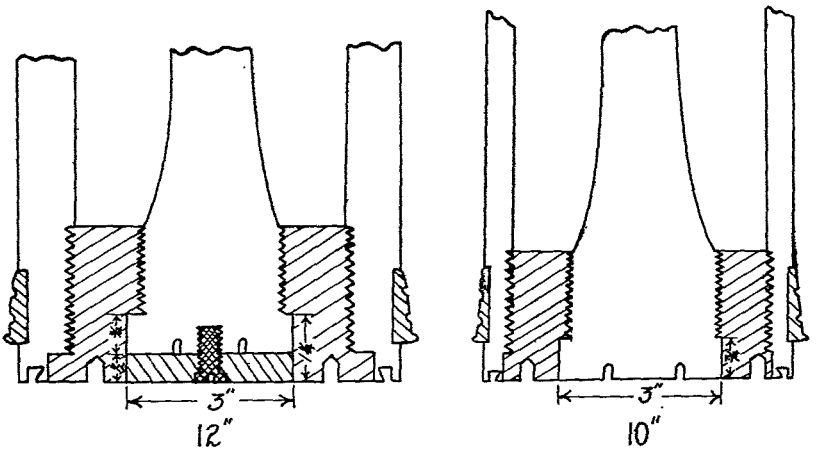
9. Comparison of certain characteristics of the fuzes mentioned in pars. 7 and 8 have shown that the Mark V base fuze, while admirably suited to use in projectiles of 10-inch and less caliber, is unsuitable for projectiles of 12-inch and greater caliber.

10. During the past two years, the Ordnance Department has perfected and commenced the production of a new fuze which is ultimately to be assigned to all projectiles of 12-inch or greater caliber. This fuze is known as the Mark X. While it will eventually be the standard for major caliber ammunition of every type, there are two factors which limit its immediate availability: first, the manufacturing and technical difficulties encountered in its quantity production, which are but gradually being brought under control; and second, the problems which have arisen from its external dimensions. In shape and size, this fuze is radically different from any of the preceding types; its head diameter is greater than that of any previous fuze. As a consequence, it cannot be assigned to any particular projectile until the base-plug thereof has been removed and the fuze-hole ma-

chined to fit the fuze of these new dimensions. This means, of course, that sooner or later every major-caliber projectile which is to be retained in battle reserve will have to be modified; it will take considerable appropriations and years of time to complete this work in all Coast Defenses.

1. Pending the completion of this work, a fuze of older pattern has been provided for each major caliber projectile as a *temporary* assignment. This fuze is normally the F. A., M-'06 of certain characteristics; in a few cases, Mark V base fuzes have been substituted. In either case, this assignment is a transitory expedient to tide things over until a Mark X fuze is available for the projectile in question, and until the projectile itself shall have been modified to take this new fuze. This is the situation of most of our 12-inch and 14-inch projectiles at batteries today.

12. 10-inch projectiles can no longer be considered as effective against capital ships. 10-inch and 8-inch projectiles will function satisfactorily with the Mark V base fuze, as stated in par. 9, and accordingly have such fuzes for their



FORMER METHOD OF ASSEMBLY FOR ARMOR-PIERCING, BASE-DETONATING FUZE, MODIFIED PIERCE STOCK

FIG. 2

permanent assignment. For 6-inch projectiles the Mark V fuze is also satisfactory, and here the situation is simplified by the fact that the great majority of projectiles of this caliber were made to take the F. A. M-'06 fuze, medium caliber. Since this has the same head diameter (1.8 inches) and the same thread dimensions as the Mark V medium caliber fuze, it has been possible to substitute the latter for the former without any modification of the projectile itself. There are still on hand a limited number of 6-inch projectiles made to take the old siege base detonating fuze, modified Pierce stock, which had a head of greater diameter; to adopt such projectiles to take either of the other fuzes, a simple unthreaded adapter is provided.

13. Summing up, the essential points are these:

(a) The rate of production of armor piercing projectiles is limited both by manufacturing facilities and by annual appropriations. Necessarily, these costly projectiles can be accumulated but gradually, and remain on hand almost indefinitely. Many projectiles of our present battle reserve were originally made for one of the several types of fuzes which has long since become obsolete. To render them available for present use with more modern types of fuzes, such projectiles must be provided with a bushing which permits them to be armed with fuzes of modern pattern and of *less diameter* than the fuze for which such projectiles were initially made.

(b) Since the Mark V base fuze gives satisfactory action in projectiles of 10-inch and less caliber, it has been assigned to all such projectiles for their permanent assignment.

(c) All gun and mortar projectiles of 12-inch and greater caliber are *ultimately* to have the Mark X fuze. Until a fuze of this pattern is ready for any individual projectile, and until the base-plug of the latter shall have been machined to receive this type, a fuze of older pattern and reasonably satisfactory characteristics (usually a F. A. M-'06 fuze) is *temporarily* assigned.

14. Bearing in mind these principles, the artilleryman is prepared to understand the conditions which he is liable to encounter in assuming command of a particular battery. The following sketches are not to scale, but serve to diagram some of the various situations which arise. In Figure 1 is represented a projectile made for the 3¼-inch fuze described in par. 5. If of 12-inch caliber, it will normally take a F. A. fuze, as per par. 13 (c), for temporary assignment; if of

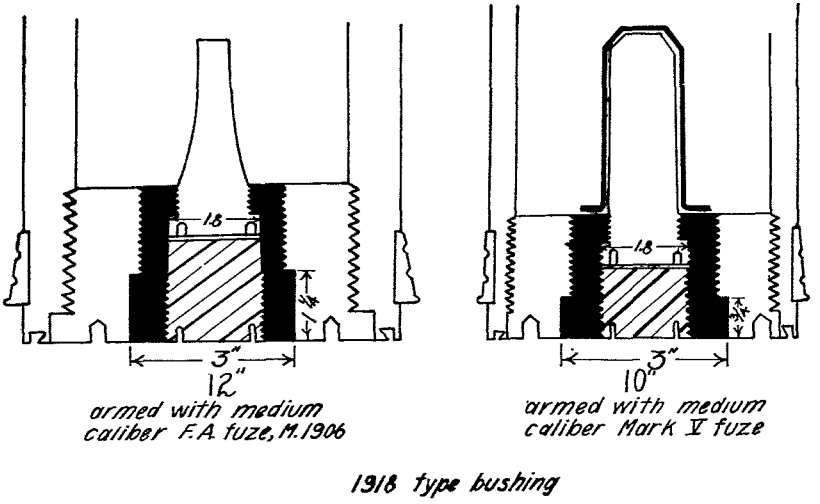


FIG. 3

10-inch or less caliber, it will take a Mark V fuze, as per par. 13 (b), for permanent assignment. The two sketches illustrate successively the necessity for a bushing, the bushing with the F. A. fuze, and the bushing with the Mark V fuze. The bushings are identical in either case. This type of bushing was introduced in 1907. The steel plug at its base is provided to close the bushing and support the head of the fuze.

15. Figure 2 shows the former method of assembly into projectiles of the fuze mentioned in par. 6—the modified Pierce stock fuze, now obsolete. In general, this fuze was seated flush with the base in 10-inch projectiles; in the 12-inch type it was usually countersunk a half-inch, presumably because of the thicker base-plug, and a steel plate was used to fill the cavity. For this reason, most 12-inch projectiles will now be found to have a 1¼-inch depth of counterbore, and 10-inch projectiles a counterbore ¾ of an inch deep only. Hence, as shown in Figure 3, there are two different kinds of bushings provided to adapt such projectiles to fuzes of modern pattern: one type of bushing has a 1¼-inch collar, and the other has a ¾-inch collar.

16. Figure 3 shows how the two projectiles illustrated in Figure 2 are bushed. The type of bushing here illustrated was introduced in 1918. The fuze-holes of projectiles of this type were not sufficiently large to allow of the insertion of a substantial adapter around a major-caliber fuze; consequently, due to lack

of space, *medium* caliber fuzes have been assigned to these projectiles, thus providing room for ample metal in the bushing. The F. A. M-1906 fuze is used for *temporary* assignment, for 12-inch projectiles (pending modification to take the Mark X fuze) a F. A. medium caliber fuze forms the *temporary* assignment; projectiles of 10-inch and less caliber receive the medium caliber Mark V fuze as a permanent assignment. It should be noted that the difference between the bushings used in these two cases is not because of any difference between the fuzes themselves, but because of the difference in the dimensions of the fuze-seats: the space formerly occupied by the half-inch steel plate is now filled by providing an extra half-inch in length for the bushing head.

17. In the previous paragraph, it was explained that certain major caliber projectiles had been adapted to medium-caliber fuzes from necessity; there are also certain major-caliber projectiles which were originally made for a medium-caliber fuze. Some 12-inch projectiles of both the 900-lb. and the 1070-lb. pattern are so constructed. The left sketch in Figure 4 illustrates such a projectile.

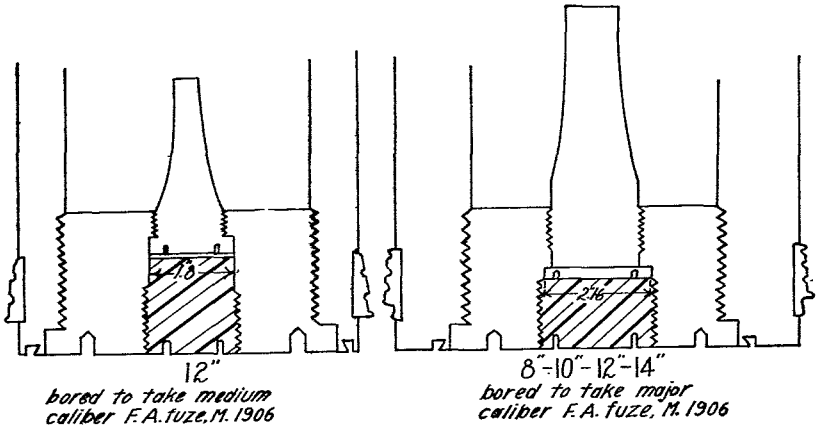


FIG. 4

18. As no 14-inch projectiles were produced until after the M-1906 fuze had become standard, no bushings are required for any projectiles of this caliber. There are also many 12-inch and 10-inch projectiles similarly bored. 14-inch projectiles of this type, like the corresponding 12-inch projectiles, have the F. A. M-1906 fuze for a temporary assignment until Mark X fuzes become available and the base-plugs are machined to fit them. The temporary assembly is shown in the right sketch of Figure 4.

19. Figure 5 illustrates the fuzing of 6-inch projectiles. That on the left is the more common type, designed for the medium-caliber F. A. fuze. The less common type on the right was made to take the siege base detonating fuze, modified Pierce stock. To all these projectiles Mark V medium caliber fuzes are now assigned. These seat exactly in the ordinary type of projectile, since the head and thread dimensions of the F. A. and Mark V medium caliber fuzes are identical. For projectiles made for the siege B. D. F. modified Pierce stock, an unthreaded annular steel adapter of L-shaped section is required to lift the head of the fuze flush with the base of the projectile, and to support it circumferentially. In connection with the use of this adapter, two points must be borne in mind: unlike all others, it is unthreaded, and it has no closing plug. It cannot be inserted in the projectile while in storage, because if the bushing is inserted, the fuze-plug cannot be screwed home firmly enough to exclude the air. In most 6-inch batteries there will be found a box containing some of these adapters; it is

often much more difficult to find anyone who knows what they are for. The projectiles for which such adapters are required can be identified by measuring the seat for the fuze head; the projectiles which require an adapter have a seat diameter of 2.01 inches, while on all others it is 1.8 inches.

20. Aluminum fuze-seat liners are a recent development. A liner serves two purposes: (1), it protects the explosive from possible contact with the fuze stock; and (2), it expedites fuzing. Officers who have fuzed projectiles without these liners will remember that it was necessary to paint the fuze-stocks with rubberine at least twenty-four hours before insertion, to minimize the possibility of the formation of sensitive salts by contact of the Explosive D with the steel, but even then some of the paint might be scraped off if the stock of the fuze were too tight a fit in the recess formed for it. The aluminum lining positively prevents the possibility of such contact, and consequent risk of a premature burst from this cause. No less important is the gain in speed in fuzing: formerly it was impossible to drill and form the fuze-seat until just before fuzing, due to the risk of its crumbling, but the drilling and forming of the fuze-seat was a laborious and slow

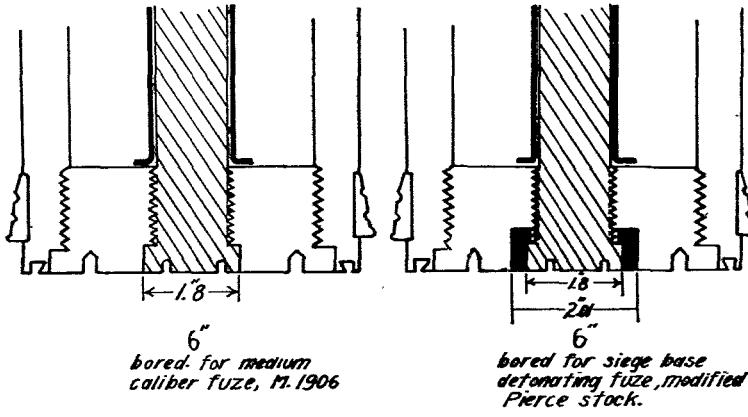


FIG. 5

process, for which time, tools, and sufficiently experienced personnel might not be available in an emergency. Now the seats can be drilled and formed in advance, and the walls are secured against crumbling by the support given by the liner. Projectiles which have been properly lined can be fuzed with great rapidity; it is necessary only (1) to withdraw the fuze plug, (2) screw home the fuze, (3) replace the fuze-plug when used (generally in calibers above 6-inch, and (4) apply the base-cover. No particular skill is required, and the only tools needed are a couple of wrenches (for fuze and fuze-plug), and a screw-driver and hammer for attaching the base-cover.

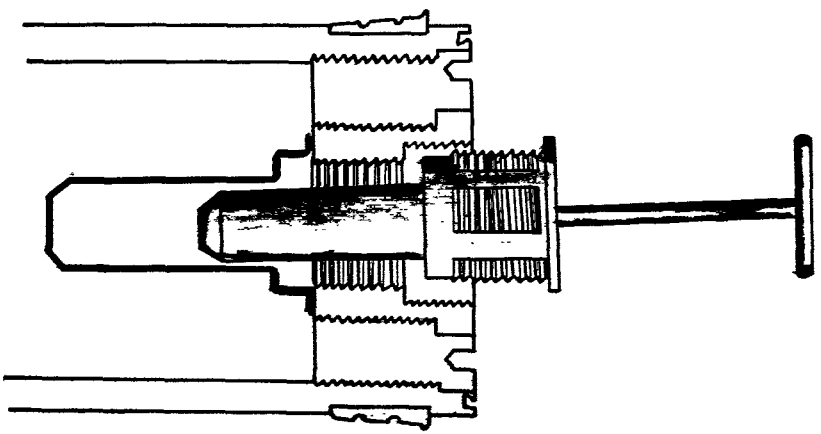
21. Liners should now be in all projectiles to which a fuze has been *permanently* assigned; this includes all projectiles from 6 to 10 inches in caliber, inclusive, since Mark V non-delay fuzes have been permanently assigned to such projectiles. (Projectiles of 12-inch and greater caliber, until modified for the Mark X fuse, have the F. A. M-1906 fuze for *temporary* assignment only, and hence are not lined. Presumably they will be lined to fit the Mark X fuze at the time their base-plugs are modified.) The position of the liner in projectiles to which it is assembled can be seen from Figures 1, 2, 3, 5, and 6.

22. The importance of care in lining cannot be too strongly emphasized. If the liner is eccentric with respect to the fuze-hole, or is inclined with respect to the axis of the projectile, or is too small, it is evident that the projectile is thereby rendered wholly unserviceable; such a projectile cannot be fuzed without remov-

ing the base-plug, which is a slow business, especially if some misguided predecessor has used rubberine on the base-plug threads. The liner must be of proper form; there are for the Mark V fuze seven different kinds of liners. Those in current use are:

Assembly Number	For Projectile	Fuze	Length
1	8″ shot and shell	Major	4.72 inches
4	6″ shell	Medium	3.78 inches
5	6″ shell	Medium	3.98 inches
6 & 7	10″ shot and shell	Medium	4.23 inches
9	6″ shot and shell	Medium	3.98 inches

Beside these, there are two other types no longer used, and several types made for the F. A. M-1906 fuze. It is evident that care must be used to select the



FUZE GAUGE AND REAMER, IMPROVISED

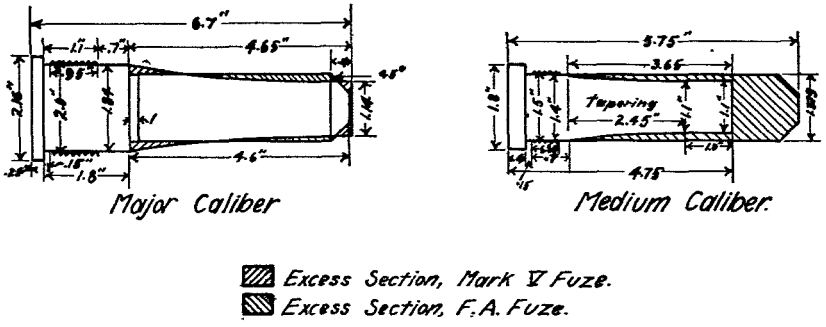
FIG. 6

proper liner for each individual projectile, since different projectiles of the same caliber have base-plugs of different thickness, and accordingly allow different lengths of fuze-stock to protrude into the bursting cavity. Reference to Ordnance Drawing 75-14-90 will show the proper liner for any projectile armed with the Mark V fuze.

23. Reference to the above sketches will show that after a recess has been drilled for the liner, the latter is placed therein and the base-plug is screwed home against its flared base. During this operation, it has been found that occasionally a liner will be buckled; this will almost invariably happen if the hole is drilled a fraction of an inch too short, and it is unsafe to attempt to guard against this by deepening the hole due to the involved risk of either a premature or a dud. The need for some means of detecting any of these defects—eccentric or inclined liner, liner too short, or liner deformed after insertion—is evident; any one of these conditions will render a projectile useless, and since the clearances allowed in designing these liners were distressingly small, the existence of any of these faults to even a slight degree will prove fatal. It is essential to have some means for testing after lining to assure oneself that there is room for the fuze to be entered and screwed home. To test, it is necessary only to construct a gauge as shown in Figure 6. This is simply a piece of steel, accurately machined to the external dimensions of the fuze to be used (major or medium caliber, Mark V), and provided with a cross-barred handle. After each projectile has been lined

and its base-plug seated, the gauge is inserted and screwed home. If it seats flush with the rear face of the projectile, or at the proper depth therefrom, (according to the type of projectile under test), one can feel assured that no difficulty will be encountered when circumstances required the projectile to be fuzed. It will be well to provide the gauge threads with longitudinal slots, so as to form reamer teeth; fuze-seats are often found dirty or rusty and the female thread for the fuze can thus be cleaned at the same time that the projectile is being gauged.

24. Not infrequently there will be found at a battery a considerable number of projectiles which have at some time in the past been fuzed, but which were subsequently unfuzed. The presence of such projectiles is a matter of no small consequence, for the following reason: when the cavities were drilled and fuze-seats formed in the bursting charge, the recess was formed for the particular dimensions of the stock of the fuze in use at that time. If now some emergency should demand that these projectiles be fuzed at once, it would probably be found that the cavity previously formed was too big for the stock of the fuze now used, and to avoid danger of premature burst or the probability of a dud, it



COMPARATIVE DIMENSIONS, F. A. AND MARK V FUZES

FIG. 7

would be necessary to refill the base part of the projectile and then to form a new fuze-seat. This operation, involving the removal of the base-plug, would be a very slow one, and the operation of fuzing would be very greatly delayed. If conditions such as these are encountered while lining projectiles, it is annoying but not serious; if, however, such conditions exist in projectiles which are not being lined (i. e., projectiles of 12-inch or greater caliber), immediate corrective measures are necessary so that if fuzing were ordered, it could be completed within a reasonable time.

Figure 7 shows the superimposed sections of the F. A. M-1906 and Mark V fuzes, and illustrates that a fuze-seat formed for either of these is unsuitable for the other. Still more unsuitable for either of these fuzes would be fuze-seats formed for the larger fuzes described in pars. 5 and 6. In the case of projectiles equipped with the 1907 bushing, it has been found possible to remove the bushing and stem in enough Explosive D with a tapered rammer to fill the old seat with sufficient firmness so that a new fuze-seat of less dimensions could be drilled; in other cases, removal of the entire base-plug for this purpose will generally be found necessary.

25. Examination of Figure 7 further illustrates the necessity for wholly separate fuzing tools for each kind of fuze. Generally speaking, projectiles at batteries of 10-inch or less caliber will now be found to be lined; for such batteries, all that is required for fuzing are a few wrenches for the fuze-plugs and for the fuzes. For any battery, it will usually be found that several sizes of tit-wrenches

are required to fit the various types of fuze-plugs; at batteries of 8-inch or 10-inch caliber, it is probable that wrenches for both major-caliber and medium-caliber fuzes will be needed. Tit-wrenches made to fit the head of the fuze, with handles like those of the fuze gauge, can be made in the machine shop and will be found very convenient. If at any battery of 10-inch or less caliber, it is found that all projectiles have not been lined, a complete set of fuzing tools for Mark V fuzes must be obtained to complete this work. The Mark V fuze requires drills of greater diameter and depth than the F. A., and for the major-caliber Mark V special cutters for the shoulder of the fuze are also needed.

26. For batteries of 12-inch or greater caliber, where the projectiles have a temporary fuze assignment only, a complete set of fuzing tools for the F. A. fuze is needed; at 12-inch gun and mortar batteries both the major-caliber and medium-caliber sets are usually required. Instructions for the use of these tools may be found in Ordnance Pamphlet No. 1727.

27. To check up all the components required to complete the fuzing of the projectiles of even a single battery is a work involving many details. For each projectile there must be a fuze of proper pattern (type, size, angular velocity of arming, and delay), all necessary tools for fuzing, and sufficient lead filling-plugs, caulking wires, and base-covers. The last three items require extensive checking to determine their sufficiency and suitability. The F. A. fuze, M-1906, is usually packed in a can containing not only the fuze but also two lead fillers for the fuze-head or fuze-plug, but Mark V fuzes are not packed with fillers. Also it will be found that the base-plugs of projectiles of different models require filling plugs of different shape and dimensions. Most bushings require additional lead fillers. In checking base-covers and caulking wires, care must be taken to eliminate any which have been rendered unserviceable either by accident, or by having been once applied to projectiles which were subsequently unfuzed. Having verified the presence and serviceability of these items, it is convenient to pack and seal them in packing boxes or chests painted a distinctive color, and marked with metal tags stamped with a list of their contents. Fuzes should be similarly packed. All boxes should be stamped to show to which type of projectile their contents pertain.

28. No less care should be given to the condition of the projectiles. Fuze-plugs should be withdrawn; if the projectile has been lined, the liner should be gauged; if the projectile is of a type not to be lined at present, the intactness of the paraffin seal should be verified. This examination may very possibly reveal the presence of either projectiles which have been fuzed, but are not so marked as to indicate the fact, or else of projectiles which have at some time been fuzed and were later unfuzed. In the latter case, the remarks in par. 24 apply. Before replacing the fuze-plugs, the threads should be cleaned bright and lightly greased, so that in emergency the fuze-plugs can be readily withdrawn for fuzing; at one battery it was discovered that more than half of the projectiles were unserviceable because their fuze-plugs were rusted home too tightly to be removed by the battery personnel.

29. Some battery commanders stack their projectiles according to band-width, and often without regard to lot. It is better to arrange them according to the type of fuze and fuzing-tools required, so as to minimize confusion during the operation of fuzing at the outbreak of a war. If fuzing is systematically performed it can be rapidly carried to completion, and there will be ample time to sort out projectiles according to band-width long before firing starts.

30. The emplacement book of each battery should contain detailed written instructions for the use of the fuzing tools provided, and exact directions as to how each type of projectile stored at the battery is to be fuzed. In the preparation of these instructions, all data furnished by the Ordnance Department should be consulted. Considerable assistance may be obtained during visits of the ammunition foreman now provided for each Corps Area and Department.

31. The initial organization of material and data requires much time and hard work, but once completed it requires no further attention, except that at weekly artillery inspection (a) the fuzing tools should be exhibited on a display board, so that the shortage of any component can be detected; and (b) the mobility of a few fuze-plugs, chosen at random, should be tested to see that none have stuck to their seats. A battery so organized and maintained can be prepared for action in the very minimum time without outside technical supervision; also, every projectile in its galleries can be fired with the greatest probability of destruction to the enemy.

Coast Artillery Officers Testify Before House Committee

On February 18, Lieutenant Colonel H. C. Barnes and Captain Aaron Bradshaw, both on duty in the office of the Chief of Coast Artillery, appeared before the special committee of the House investigating the advisability of organizing a separate department of aeronautics, and testified regarding the value of antiaircraft artillery fire against planes.

Colonel Barnes testified in part as follows:

"Certain witnesses have appeared before you and expressed opinions regarding the value of antiaircraft artillery as a means of defense against aircraft attack. They have expressed the opinion that antiaircraft guns and searchlights are useless, or at least are of very little value, for this purpose. They believe that the only defense against air attack is by means of airplanes.

"It is a principle, well known to all persons who have made even a superficial study of military matters, that the best defensive against any form of attack whatever is the offensive-defensive. In other words, if an enemy is proceeding to attack our country by water, our best defense lies primarily in our navy taking the offensive and destroying the enemy's navy. Similarly, if he is proceeding to attack us by air, our best defense lies primarily in our Air Service taking the offensive and destroying his air forces.

"It has always been considered necessary to fortify our important harbors, placing in these fortifications guns, submarine mines, etc., designed to prevent enemy ships from taking possession of these harbors or from destroying important military, naval or commercial activities located therein.

These fortifications have been considered necessary, not only to give the required protection, but also to the end that the ships of our Navy may be free to assume their offensive role. Without the fortifications, the Navy would be unable to do this. Our ships would be immobilized, as it were, and tied down to a purely defensive role.

"To my mind, if we depend entirely upon airplanes to defend our important cities, vital commercial areas, concentration and shipping points, naval vessels, etc., from air attack, we will immobilize our airplanes to exactly the same extent as we would the ships of our Navy, if we did not provide fortifications for the protection of our harbors.

"It seems clear to me that the same relation which exists between the fortifications and the ships of our Navy should exist between the antiaircraft service and the air forces—both the Army Air Force and the Navy Air Force.

"No officer of our Navy, so far as my information goes, has ever claimed that the only defense against an enemy navy lies in the ships of our Navy and that, therefore, fortifications were unnecessary. On the contrary, I feel confident that the officers of our Navy appreciate fully the necessity for the maintenance of our harbor defenses and would be among the first to oppose any movement to abolish them.

"I feel, and I am confident that I speak General Coe's sentiments in this respect, that our Air Service—both Army and Navy—is and should be just as

dependent upon the antiaircraft artillery as are the ships of the Navy upon the fortifications in our harbor defenses.

"If it be admitted as correct that this relation should exist between the antiaircraft service and the air forces, the question may then be asked—'Can the antiaircraft artillery play this defensive role and release the Air Service to take the offensive?' We Coast Artillerymen believe that the Antiaircraft Artillery of the Army can do this for the Army Air Service and I am going to request that you gentlemen permit Captin Bradshaw to present to you certain data in support of this position. Captain Bradshaw served for about seven months with our antiaircraft troops in France and participated as an antiaircraft officer in both the St. Mihiel and the Meuse-Argonne offensives. Since the war he has commanded a battery for a period of about three years in the first antiaircraft regiment organized in the Regular Army. He is now on duty as an assistant to the Chief of Coast Artillery. I feel sure that you will receive his statements as coming from an officer experienced in antiaircraft work.

"From tables published by the Statistics Branch, General Staff, I get the following data, in round numbers:

AMMUNITION EXPENDITURE BY A. E. F., TO NOVEMBER 11, 1918

Small arms	606,000,000
Artillery	8,000,000
Grenades, 37-mm., and trench mortars	6,000,000
Total	620,000,000

"Assuming that the British, French, and Italian expenditures of ammunition were at the same rate as ours and were for four years instead of one, the expenditures by these four allies (United States, Great Britain, France, and Italy) would amount to 13 times 620,000,000 or 8,060,000,000 rounds.

"The casualties suffered by the Central Powers are reported as 7,000,000 in round numbers, including killed and wounded.

"This means one casualty for something over 1100 rounds of ammunition expended.

"Making every reasonable allowance for inaccuracies in these estimates, it would appear that, from a standpoint of accuracy, antiaircraft fire compared favorably with the fire of other weapons.

"In this connection, please remember, gentlemen, that the value of antiaircraft artillery does not lie wholly in its ability to bring down airplanes. One of its greatest values lies in the fact that it will drive airplanes to higher altitudes, thus rendering it exceedingly difficult, if not impossible, for them to accomplish their purposes. Especially will this be so in the case of bombing planes, since their accuracy in bomb dropping is very materially affected by the altitude at which they are permitted to fly.

"Before introducing Captain Bradshaw, I would like to submit for your consideration certain conclusions arrived at by a Board of Officers convened in the Hawaiian Department to investigate, consider and report on the powers, limitations and combined training of the Coast Artillery Corps and Air Service.

"This Board was requested by the War Department to answer, among others, the following questions:

'Within what vertical range can aircraft approach Coast Defenses armed with the latest existing antiaircraft devices for the purpose of bombing without being subjected to effective firing?'

'Can aircraft bombing at an altitude beyond the effective range of existing antiaircraft devices put out of action coast defenses to the point where they will not be able to function effectively against an enemy fleet?'

"The answers submitted by the board to these questions were as follows:

'58. The Board's conclusion with reference to antiaircraft firing is as follows: Efficient listening devices, adequate searchlights and a sufficient number of guns properly placed afford a highly effective defense against bombers, if seen, and one which is relatively unassailable. Such a system is to the bomber what the shore gun is to the warship. It is doubtful whether a bombing attack would be attempted against localities so protected.

'The answer to the question by the War Department quoted in par. 33, *b*, (the first question quoted above), is that the bomber is outmatched by the antiaircraft artillery at all altitudes which can now be reached by service bombers, provided that the target can be seen. It is highly important that this proviso be met.

'With reference to the question by the War Department quoted in par. 33, *c*, (the second question quoted above), the fire of antiaircraft artillery at present reaches to the greatest altitude attainable by bombers; therefore the answer to the preceding question is applicable.

* * * * * * * * *

'The antiaircraft artillery on land is a thoroughly effective means of defense against the bomber, provided it is available in adequate quantity and that searchlights and listening apparatus are capable of detecting and illuminating the target.'

"It is submitted that the report of this Board and its conclusions comprise the latest and most unbiased opinion on the efficacy of antiaircraft artillery which is obtainable at this time.

"The Board which conducted this investigation was composed of one General Staff Officer, detailed on the General Staff from Field Artillery, two Coast Artillery Officers, and one Air Service Officer. It would seem that the composition of the Board was such as to eliminate any thought that branch jealousy had any influence in determining its conclusions.

"Major General C. P. Summerall, who was in command of the Hawaiian Department at the time these experiments were made, forwarded the proceedings of the Board to the War Department, approved.

"Permit me to say that I do not desire—and I am sure General Coe would not desire—to detract in the slightest degree from the importance of the Air Service. He and I both realize to the fullest extent its importance. We believe, however, that, for either the Army or Navy Air Service to carry out properly their principal mission—offensive action against the enemy air force—they must have the support of an adequate antiaircraft service, which latter I feel confident will be supplied for the Army by the Coast Artillery Corps, if Congress sees fit to make adequate appropriations for its proper development and if the necessary personnel is provided.

"In view of the large amount of theoretical discussion which has taken place regarding antiaircraft artillery and its possibilities, the Chief of Staff has authorized me to extend to this committee an invitation to visit Fortress Monroe and witness an actual demonstration of antiaircraft fire against a moving aerial target. Your attention is invited to the fact that Fortress Monroe is but an overnight trip by boat from Washington. If, after you hear Captain Bradshaw, you feel you would like to accept this invitation, we would be very glad to arrange for such a demonstration."

Captain Bradshaw testified in part as follows:

"Reference the statement that antiaircraft guns are not an effective means of defense against airplane attacks and that the results obtained by antiaircraft guns during the late war were negligible, the following facts are presented.

"Notwithstanding the deficiencies as to materiel and personnel of the antiaircraft services of the various nations engaged in the late war, the results obtained by these antiaircraft services are not negligible. The tabulation below

shows the number of planes brought down by the antiaircraft services of several nations as compared with those brought down by the aviation services of the same nations.

Nation	*Planes Brought down by Aviation Service on all fronts.*	*Planes brought down by antiaircraft.*
Italy	540	129
Germany	6554	1520
France	2000	500

(Authority Official Italian Report "Minestro della Guerra, Commando) (Superiore d'aeronautica, G-2 No. A-5256W.)

"In considering the above figures, it should be borne in mind that the antiaircraft service is a defensive one and the number of its targets are limited. And we must also bear in mind that to honestly appraise the work of antiaircraft arms, that it is not only by the number of aircraft brought down that their efficiency can be determined.

"The fact of compelling an airplane to fly very high, to change its route, to increase the distance traversed, to carry on a bombardment from a high altitude in the continual danger of being reached by the antiaircraft fire, hampering its work of reconnaissance and still more its bombardment are the positive results obtained and are far from negligible.

"If this threat of a ground offensive should be lacking, it is a logical assumption to admit that the aviation arm would accomplish the greater part of its missions, at those altitudes at which the efficiency is greatest, and would accomplish them with so much greater effectiveness, the greater the impunity of which it would avail itself.

"The best proof that the action of antiaircraft arms is not negligible is given by the fact that the aviation services of all nations are continuing with diligence, their studies, their researches, as to the possibility of flying at greater altitude, the possibility of extending continually its limits of photographic observation, as to muffling the sound of the engine as to protecting the aircraft with armor, concealing aircraft with clouds, etc.

"These are improvements which even if they are not entirely the results of the danger of fire from the ground still serve to diminish the consequence of it.

"In the year 1918, a total number of 483 German planes were dispatched to raid Paris, only 37 penetrated the antiaircraft defenses of Paris and of these 37, 13 were brought down by antiaircraft fire.

"I was present at the raid of September 15th, when 50 planes attempted to reach Paris. Of the 50, 47 planes were turned back by the antiaircraft artillery and of the three planes that penetrated the inner line of defense, two were brought down by antiaircraft artillery fire.

"This raid was preceded by five raids where no German planes penetrated the antiaircraft defense and it marked the end of air raids on Paris. The antiaircraft defense of Paris consisted almost exclusively of guns, searchlights, and antiaircraft listening devices.

"During the war, the French antiaircraft artillery brought down, in 1916, 60; 1917, 120; 1918, 220. To obtain these results, 11,000 shots were fired in 1916 for each airplane brought down. 7500 shots were fired in 1918 for each airplane brought down, according to the statistics covering all materiel employed. But if we considered the work of only the antiaircraft artillery guns firing, these figures are reduced to 3200 per plane. This efficiency is comparable to that of the French Field Artillery. The British report the following, as the average number of shots that were required by the antiaircraft artillery to bring down a plane: Prior to 1917, no record; 1917, 8000 rounds; 1918, 4550 rounds; last part of 1918, 1500 rounds.

"The antiaircraft defense of London was quite different from the defense of Paris, mainly in that six squadrons of 18 airplanes were used in conjunction with the antiaircraft searchlights and guns. In the last raid on London 34 planes took part. Of the 34, three were brought down by antiaircraft artillery, three were brought down by the air service working with searchlights, one was forced to land on account of engine trouble and three more were shot down by antiaircraft artillery on their way home across France.

"The American antiaircraft service, although in action only four months, and having only two skeleton artillery battalions and two machine gun battalions to get into action, has quite a remarkable record, as they are officially credited with bringing down 58 enemy planes. The official reports of the American Expeditionary Forces give 605 as the average number of shots required to bring down each plane. (Authority—Report of Chief of Artillery, A. E. F.)

"Reference the assertion that searchlights cannot hold a plane in its beam, the following might be offered.

> 'During the St. Mihiel operations the 26 lights of Companies 'A' and 'B', 56th Engineers, illuminated 54 hostile aircraft for an average period of 2.5 minutes each. From these illuminations and from data secured from the operation of sound locating devices, it was possible to plot the course of enemy planes. A composite chart made from observations during the St. Mihiel drive proved the efficiency of searchlights as defenses, for it was found that hostile planes either avoided the defended area or, when illuminated, became confused and turned back." (Extract War Department Document No. 907.)'
>
> 'Searchlights along the Army fronts for antiaircraft service have been a demonstrated success. . . . It has been evident that they have a great moral effect on the enemy aviators, not only because of the probable fire that will follow, but also because of the effect of light itself." (Extract Official Report of Chief of Antiaircraft Service, A. E. F.)'
>
> 'The action on enemy planes was most successful, as no enemy planes succeeded in penetrating the area covered by the lights." (Extract from Operations of Company "E", 56th Engineers.)'

"In the St. Mihiel Sector on several different occasions, I saw enemy planes turned back by searchlights alone. I saw on one occasion at Vigneulles an enemy pursuit plane caught in a searchlight beam and the pilot failing in many efforts to get out of it, finally flew down the beam and failing to put out the light, crashed.

"Experiments have been conducted at Fort Monroe in regard to illuminating airplanes with searchlights. I was present at several tests and no difficulty was experienced in keeping targets within searchlight beams. The Coast Artillery Board has continued this work and they have also experienced no difficulty in keeping the planes within searchlight beams.

"I was charged with making some of the arrangements for night flying for the 61st Coast Artillery. In my talking with the Air Service representatives at Langley Field I was always impressed by them with the danger of their flying in searchlight beams and it was with difficulty that successful arrangements were made. The impression I obtained from those aviators, most of whom had flown in France, was to the effect that searchlights were difficult to avoid, that they tended to confuse the aviator, causing him to lose his sense of direction and making it impossible for him to see landmarks. The bombing of a specific object is impossible while in a searchlight beam.

"If there is doubt as to whether searchlights can keep airplanes within their range, illuminated, it might be suggested that this point could be decisively settled by a test at Fort Monroe which could be carried out at no expense to the Government. The results of such a test could be known within a few hours."

Infantry and Coast Defense

By Col. H. S. Wagner, *Inf.*

[Reprinted with permission from the *Infantry Journal.*]

Referring to the pamphlet, "Joint Army and Navy Action in Coast Defense," published by the War and Navy Departments, we find the following definition of coast defense:

Coast defense includes dispositions and operations having for their object the repulse of a hostile attack upon any portion of the sea coast of the Continental United States, the Panama Canal, or the insular possessions, or upon naval vessels or merchant shipping in or off harbors or in coastwise sea lanes.

With this principle in mind, we must consider the elements which enter into the whole plan of coast defense. Referring again to the same pamphlet, we find that these elements are:

a. Naval forces:
  1. The United States Fleet and other fleets and detachments.
  2. The Naval Coast Defense forces.
  3. The Marine Corps.

b. Military forces:
  1. The harbor defense.
  2. The mobile forces of the Army.

In a discussion involving the matter of coast defense from the viewpoint of the Infantry, we must neglect any consideration of the details of naval action, especially in a paper as limited as this one must needs be, and assume that an enemy intent upon invasion, has defeated or eluded our naval forces, and has actually prepared for debarkation upon our shores. It might be well here, to invite attention to the fact that the Navy is our first line of defense, and that it must be defeated or out-maneuvered before any successful attempt at invasion can be made.

Important links in the chain of coast defense, are the harbor defenses designed to deny to an enemy limited portions of our coast, to guard the harbors which provide bases and shelter for our naval forces and merchant shipping, and to protect important cities and the water approaches thereto.

An interesting example of the need for such defenses occurred in this vicinity. In 1814, a British expeditionary force, convoyed by a strong naval fleet, sailed up the Chesapeake Bay, entered the Patuxent River, threatened the American flotilla so that the vessels were destroyd by their own crews to prevent their capture, and debarked at Benedict about 40 miles from Washington. At Bladensburg, the British defeated an insufficient and hastily organized American Army, inefficiently commanded, and marched on to Washington, burning the capitol, the White House and other public buildings, to the everlasting disgrace of the American people.

Unless the enemy fleet can out-range and out-gun the harbor defenses, it is extremely unlikely that any landings will be attempted within the range limits of their armament. In addition, it would be a bold enemy indeed who would brave mines and other submarine appliances, to force these harbor defenses. I believe that we may consider the harbor defenses as strong points, to be contained or turned as in field warfare. With fixed and mobile armament—the former consisting of guns, howitzers and mortars permanently emplaced, and the latter, of similar character weapons on movable mounts, as railways and tractors—the harbor defenses exert a considerable influence on the plans of an invading enemy and, to a great extent, control his choice of landing places. We have seen that it is unlikely that direct attacks for the purpose of landing, will be made on the harbor defenses; we must presume, therefore, that our enemy will look for other landings along our coast, where he may obtain shelter, where he may have sufficient maneuvering room, both at sea and on shore, and where he may establish bases for future operations.

WHAT FORTIFICATION IS THIS?

This is a reproduction of a photograph that has been in the archives of the Coast Artillery School Library for many years. No one who has seen the photograph is able to identify the fortification, nor does it bear a title of any kind. It is estimated to be fifty years old. Should any JOURNAL *reader identify the fortification, it is requested that he notify the Librarian of the Coast Artillery School in order that the photograph may be properly legended and filed in the historical section of the Library.*

It must be borne in mind that the nature of the terrain along the coast is a great factor in landing operations, and that, while it may not be necessary to actually defend the entire coast line against invasion, all of this coast line must be kept under observation. The enemy may land at unlikely points either through design or accident, as did the British at Gallipoli Peninsula, and gain at least a "toe hold" which may turn to his advantage.

The whole sea coast is divided into sectors which usually include defended and undefended areas. The limits of the defense sectors are prescribed by the War Department. These are further sub-divided into major sectors, minor sectors and sub-sectors. Briefly speaking, they are so designated as to indicate the character of the defense to be expected of them and the size of the command assigned to them. To illustrate: A major sector requires a reserve of a division or more, a minor sector reserve may be less than a division, while a sub-sector furnishes its own reserve. Corps Area and Department Commanders are sector commanders, and are responsible for the defense of their sectors.

In certain vital areas containing large cities, manufacturing or railway centers, agricultural sections, etc., there are points possessing greater advantages to the invader than others, and it is these critical points that our armies, consisting largely of Infantry, must defend.

An inspection of the coast line of the United States, on both the Atlantic and Pacific sides, discloses several vital areas. These include:

a. From Portland, Maine, inclusive, to the Chesapeake Bay, inclusive

b. Southern California from San Diego, inclusive, to Los Angeles, inclusive

c. The San Francisco Basin

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

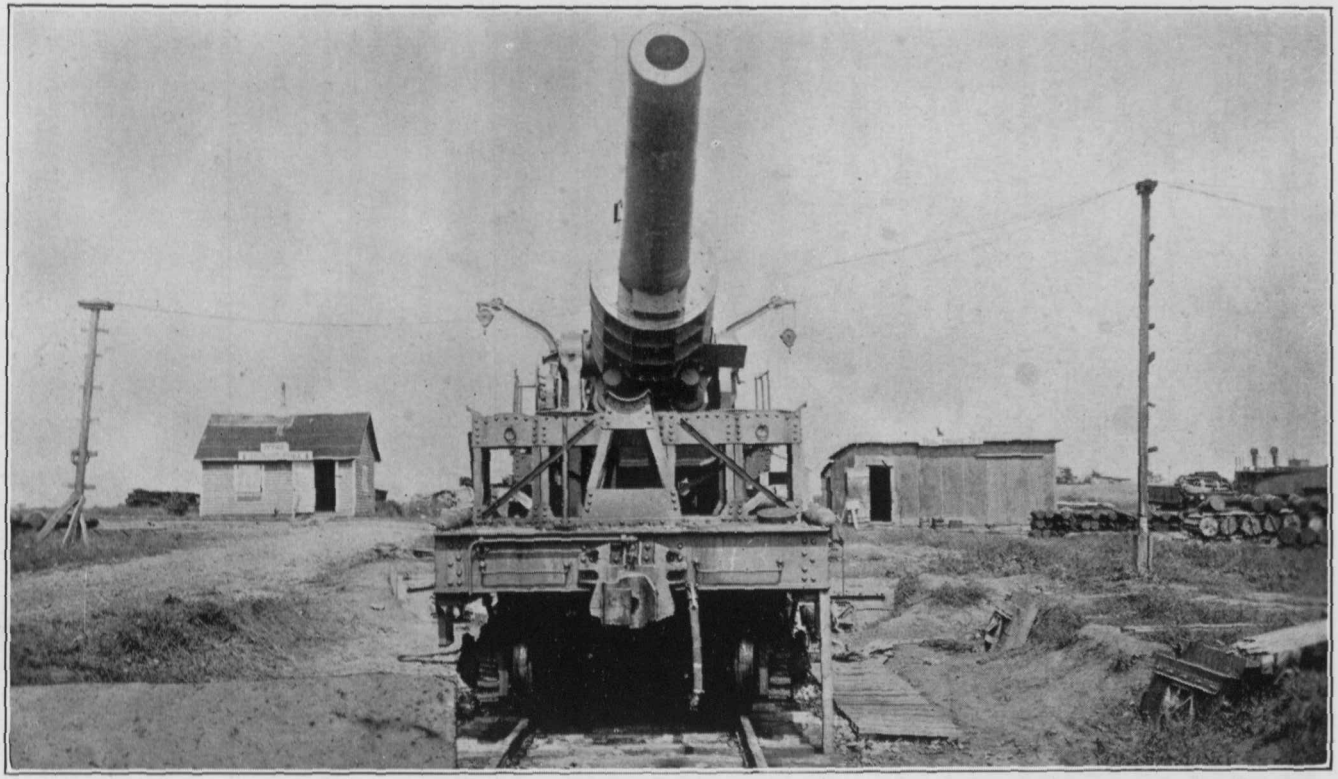
To these may be added the Panama Canal Zone, especially vulnerable because of the islands to the east and northeast of it, controlling as they do the approaches to it, and to the Gulf of Mexico. The majority of these islands are owned by foreign powers, and, in the event of war with those powers or with nations allied with them, a menace to us is constituted, which cannot be ignored. While not a portion of the United States coast line, any project for the defense of that coast line, must include an offensive-defensive against them. The same menace obtains, to a less degree, in the Pacific.

It might not be out of place, at this point, to examine into the nature of the armament of the forces charged with coast defense. Reference has been made to the fixed and mobile armament of the harbor defenses. Fixed armament, permanently emplaced, is classified as major, intermediate and minor, depending on its caliber. Major armament consists of 8, 10, 12, 14 and 16-inch guns, 16-inch howitzers and 12-inch mortars. Intermediate armament consists of 5 and 6-inch guns, while minor armament consists of 3.4 and 4.7-inch guns. The mobile armament is classified as primary and secondary, depending on its caliber, the former consisting of 12 and 14-inch guns, 16-inch howitzers and 12-inch mortars, on railway mounts, while the latter consists of 7, 8 and 10-inch guns on railway mounts, and 6-inch, 155-millimeter and 7-inch guns, 8 and 9.2-inch howitzers on caterpillar mounts, or tractor drawn.

Supplementing this armament are antiaircraft weapons (3 and 4.7-inch guns), on fixed and mobile mounts, submarine mines, coast defense aircraft, searchlights, radio, fire control installations, etc.

The infantry weapons consist of the rifle, the bayonet, the automatic rifle, the automatic pistol, the grenade, both hand and rifle, the machine gun, the one-pounder, the trench mortar, light and heavy tanks, the former equipped with one machine gun, or one one-pounder, and the latter with two six-pounders and five machine guns. Supplementing these weapons, are the necessary signal equipment, wire, radio, visual, etc.

It appeared to me necessary, in the preparation of this paper, to discuss the foregoing that you might be able more readily to grasp the discussion which follows. The infantry portion of my audience, for the first time in an artillery



THE LATEST TYPE OF RAILWAY HOWITZER

Proving ground test completed. To be sent to Fort Story, Virginia, for service test in the near future. Caliber, 12 inches; length, 20 calibers; muzzle velocity, 1950 f.s.; range at 45° elevation, 21,600 yards; weight of projectile, 700 pounds; weight of powder, 95 pounds. Firing angles from 20° to 60°, with a 360° traverse.

garrison, is probably not aware of the project of coast defense, and this general exposition may be of value in coordinating their ideas on the subject.

It is well for the artillery, in turn, to realize that the infantry rifleman will seldom function entirely alone. In fact any military operation, to be successful, must contemplate a combination of forces and of weapons, under the same principle that a good mechanic uses the tools in his kit, each for its appointed purpose. He would not drive spikes with a tack hammer nor would he use a cold chisel on a fine piece of woodwork. In a similar manner, the various infantry weapons are used each in accordance with the purpose for which it is intended, and all supported by the heavier and more far reaching weapons of the artillery. It is axiomatic that infantry and artillery are inseparably linked in their operations. It is equally true that both arms must rely on the Air Service for the successful accomplishment of their missions. This triumvirate, propertly coordinated, must furnish our line of defense.

It may thus be seen that it is difficult to discuss infantry without considering the supporting weapons, and I will therefore ask you to accept the infantry division as the basis of the infantry combat organization.

It might be well here, to again invite your attention to the fact that we have assumed that the enemy has command of the sea, having defeated or eluded our naval forces, and that therefore we leave out of consideration the naval actions which must be preliminaries to any invasion. You must realize, however, that these actions will occur and that no enemy is likely to omit from his offensive plans one or more combats with our Navy.

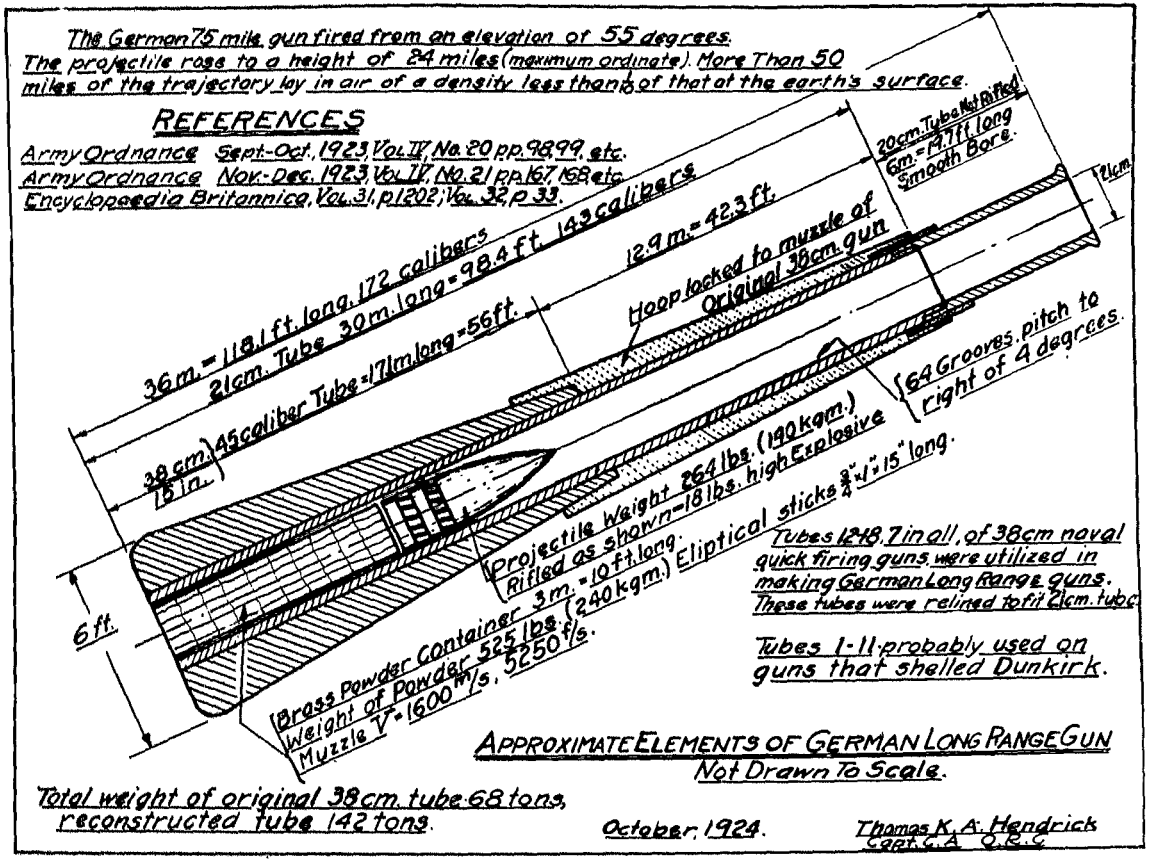
Let us examine the frame work of a possible defensive scheme. While it is probable that our prospective enemy has charts of our coasts, it is unlikely that he will have them in sufficient number or in sufficient detail, to give him exact soundings close in shore, of all places which might appeal to him as attractive landings. He must more or less grope his way when he comes to actual debarkation. The advantage must lie with the commanders of the various sectors, who are familiar with every foot of shore line in their sectors.

Bear in mind that the enemy, to be successful, must land where he can most quickly build up sufficient strength to establish and hold a bridgehead, so to speak, behind which he may debark his main forces. Infantry, with its own weapons, and light guns, will compose this bridgehead, supported by the guns of the fleet. It might be well to state here, however, that naval guns, designed primarily to engage ships and being required to pierce thick armor plate, are necessarily of high velocity and flat trajectory which handicaps them for any but direct fire targets. Their assistance to their landing forces therefore is limited, as overhead fire except against defenders occupying high positions cannot be effectively employed to assist troops landing on a beach. In addition it must be realized that artillery fire, to be effective, must be observed. Low visibility and inability to obtain aerial observation will further handicap the enemy artilllery in its action. Subject to these same conditions, ships may be held at long range by our artillery.

Against this infantry landing must be opposed infantry. Entrenched behind wire entanglements along the beach extending into the water and across the mouths of coves and bays, must be machine guns capable of barrage fire and the laying down of bands and belts of fire, all supported by riflemen, to deny to the enemy even a foothold on the shore.

Plans for the erection of the defenses for these possible landing places, must be made in time of peace, and arrangements completed for the procurement of the necessary material. It is not essential that the defenses be constructed until war is imminent, when the garrison, assisted by civilian labor, will have ample time for the work. In many instances, trenches need be outlined only. Actual construction may not be required at all points.

It is not contemplated, as has been pointed out, that all possible landing places in the various sectors will be lined with infantry, awaiting an attack which may never come. In the defensive plan the Infantry must be so disposed along



The JOURNAL *is indebted to Capt. T. K. A. Hendrick, C. A. C., for the above drawing showing the characteristics of the German gun that fired into Paris*

outpost positions, as in all warfare, with its supports and reserves properly placed, as to not fritter away fighting strength and reduce troops to immobility.

In considering the disposition of the mobile forces of the defensive, it must be borne in mind that one of the first requirements of the defense is *instant readiness for action.* This includes, among other things, the ability, by means of the reserves, to throw an overwhelming force against the invader, as reinforcements for the troops which first meet his attack. For the accomplishment of this purpose, the reserves must be so located, with reference to probable points of attack, that they may be transported by motor, by rail or by marching, to the threatened point. Good roads are of paramount importance, as forming most valuable links in the lines of communications.

An interesting example of a defensive position is given in a hypothetical situation in the pamphlet, "Joint Army and Navy action in Coast Defense." In this situation, the defense of a 20-mile beach front is assumed, and a force of 8,088 men assigned to it. To the beach cordon, or outpost line, are assigned 1500 men, to the beach supports 1500 men, and to the beach reserves 5088 men, including one battalion of light artillery and one battalion of medium howitzers or guns. These figures, of course, may be translated into terms of about a brigade of infantry, with artillery attached.

Assuming mechanical transport and a suitable system of roads, a properly organized reserve, in the situation referred to, should be able to reinforce any point on the beach within an hour and a half.

It is not difficult to visualize the action. Enemy troops debarking from their vessels into small boats and advancing over several thousand yards of open water, under fire of machine guns, rifles, one-pounders and artillery. Those able to pass this deluge must struggle through fire swept obstacles for a foothold on the beach. Such troops as might be able to land, must of necessity be disorganized and can only hope to pass the outpost positions on narrow fronts. These small columns may be dealt with by the beach supports. The reserve may be held, ready to concentrate at any point within the position where it might be needed.

This illustration applies to a front of 20 miles only. An invasion on a large scale will reproduce the picture many times. Appreciate, however, that a 300-mile sector, for instance, will not require defense along its entire front, but that favorable landing places and their proximity to useful objectives, must govern the actions of our enemy. To complete the picture, it will be necessary to visualize the harbor defenses proper, engaging with the fire of their heavy armament, the enemy warships, and holding them at such range that effective artillery support of their troops will be difficult. The whole scheme of harbor defenses or strong points, coordinated with the mobile troops defending the beaches between them, thus forms the plan of coast defense.

It is possible that landings will be attempted under cover of night or of fog, but operations of this nature presuppose a careful study of the terrain or a previous knowledge of it, on the part of the invader. Those who have participated in night attacks or even night marches, may appreciate the difficulties with which such maneuvers must contend. In addition to the bewilderment which will result in the attacking forces in their search for landing places on the beach, there is also the confusion which will exist in the various elements—men, animals, guns, etc.—even in the best disciplined units. The infantry of the outpost line must be constantly on the alert ready to open on any boats which may loom up out of the darkness, and to give the alarm which will bring down the fire of the guns on barrage lines previously determined. It must be borne in mind that night or fog makes for low visibility with reference to the guns, and that greater responsibility is therefore thrown on the infantry. Modern sound ranging appliances are of great value under these conditions.

A study of the Gallipoli Campaign of 1914-15, and the early part of 1916, is of interest. This campaign furnishes many illustrations of the principles set forth in this paper, and a brief resume of it may serve to fix in your minds the functions of the various arms in the defense of a coast line.

I commend to your attention Major General Sir C. E. Callwell's book, "The Dardanelles," for a more or less detailed story of this stirring adventure. While General Callwell deals principally with the attack, there is sufficient information given to enable us to reconstruct the actions of the defense.

General Callwell discusses the abortive attempt to force the Dardanelles by naval operations on the part of the British and French allies, unsupported by military operations on shore. The narrow waterway was so completely dominated by Turkish batteries on both the Gallipoli and the Asiatic sides, as to deny the passage to the allied fleets. In addition, Turkish mines in the Narrows, which connect the Straits with the Dardanelles proper, protected by the fire of small arms and small caliber artillery, proved a menace which could not be overcome. Allied mine sweepers were unable to function, and the warships dared not brave this dangerous channel.

When the combined naval and military expedition was finally determined upon, the Turks had sufficient warning of the impending attack, to make ample provision to meet it. It is impossible for any nation to assemble forces sufficiently great for invasion, without knowledge of its intentions being conveyed to its adversary. This was particularly true in the Gallipoli campaign, where the locations of the main bases at Alexandria, Egypt, and Malta, many miles by water from the theatre of operations, necessitated the selection of advanced bases on the Islands of Imbros, Tenedos and Lemnos at the entrance to the Straits. This, by the way, brings to our attention, the need for advanced bases when a maritime invasion of a distant country is contemplated, and emphasizes the statement, made early in this discussion, that the islands in the southeast Atlantic and in the Caribbean Sea constitute a menace to the United States in the event that they fall into the hands of an unfriendly nation.

It seemed logical to the Turkish Commander-in-Chief, Field Marshal Liman von Sanders, a German officer, to prepare *all* likely landing places against attack. Entrenchments were thrown up, wire entanglements established, gun emplacements excavated and electric communications developed. Roads were repaired and rebuilt and reserves assembled at various places ready to be thrown in at critical points.

It is not possible to enter into an extensive review of this campaign, nor to discuss the reasons of the British Commander-in-Chief for his selection of his various landing places. All that can be said is, that the task confronting him was a most difficult one. With hills which arose almost from the water's edge, lined with Turkish infantry, dominating the various beaches with rifles, machine guns and artillery, his ability in obtaining a "toe hold" on this inhospitable shore is to be regarded with admiration.

In every landing but one, the Turks opened vigorous rifle, machine gun and artillery fire on the troops in the small boats, and the survivors struggled ashore through wire entanglements, to dead spaces at the foot of the cliffs and held on with greatest difficulty against the Turkish infantry counter-attacks. In the one instance where fire was held until the British actually landed, it is believed that the Turks threw away an opportunity to annihilate the invaders while in their small boats, and permitted a landing which they might easily have prevented.

The attempts of the British landing forces to establish a bridgehead behind which the main body of the landing army might debark, were met by determined resistance on the part of the Turkish infantry. Ground was gained to the flanks rather than to the front, and it was all that the various landing parties could do to connect up and hold the narrow strips of beaches on which they found themselves. Naval artillery was of little assistance in this attempted ground gaining, as its flat trajectory precluded successful overhead fire and the searching of reverse slopes, and the ravines with which this terrain was covered. The British deplored the lack of high angle fire weapons, particularly howitzers and trench mortars, with which the Turks appeared to be amply supplied.

At no time during the ensuing months, did the British succeed in advancing their lines over a mile from the beach. All efforts on their part to secure the Sari Bair Ridge which was the key point to all positions in the southern part of the Peninsula, which dominated the Narrows and from which movements against the Dardanelles themselves could have been launched, were met by bloody repulses.

In the early winter of 1916, the attacking forces were withdrawn with practically no casualties, and the Gallipoli campaign brought to an end. It might be said here that this task was a most stupendous one, matching, I think, that of the original debarkation. That an invading army, with its guns, animals and impedimenta, could be slipped away in the darkness, in many instances from trenches within a few yards of the enemy, is almost incomprehensible.

There must be some criticism of the Turkish outposts. The Turkish infantryman must have been less alert after months of fighting than the situation demanded, and his patrolling, so necessary in all warfare, sadly neglected.

In conclusion, the lessons to be drawn from the Gallipoli campaign, which may be applied practically by us in our consideration of the functions of the Infantry in coordination with coast defense, may briefly be set down as follows:

a. The establishment of an outpost system, keeping possible landing places under observation and fire.

b. Fire should be opened by the defender, when the results will palpably insure to his benefit. It must be realized that troops in small boats subjected to infantry and artillery fire, cannot reply to it, and must suffer heavy losses.

c. The use of entanglements, in coves and bays affording possible landing places.

d. Centrally located reserves, capable of movement in any direction.

e. A system of communications, by means of which the various elements of the defense may be kept in touch.

f. A system of roads, in back areas, by means of which troops may be moved. Because of the character of the terrain on the Gallipoli peninsula, these could not be as highly developed as desirable.

g. Cooperation of the artillery, both mobile and fixed, against escorting war vessels and attempted landings.

h. Constant watchfulness on the part of the infantry, for any enemy movement, especially at night.

i. The ability on the part of the defense, to anticipate probable landings, but to be prepared to meet the attacker wherever he may be.

k. In the final analysis, it would appear that the assault of a coast line, against a prepared defense is difficult. Infantry properly placed with its own weapons and supported by artillery, can, if not surprised—and it is a crime to be surprised—withstand the attack of a force many times its strength.

An Auto Trip through Algiers and Tunis

The Editor of the JOURNAL *recently received the following letter from Major L. T. Walker, Retired, a former Coast Artilleryman, which should be of interest to anyone contemplating travel abroad.*

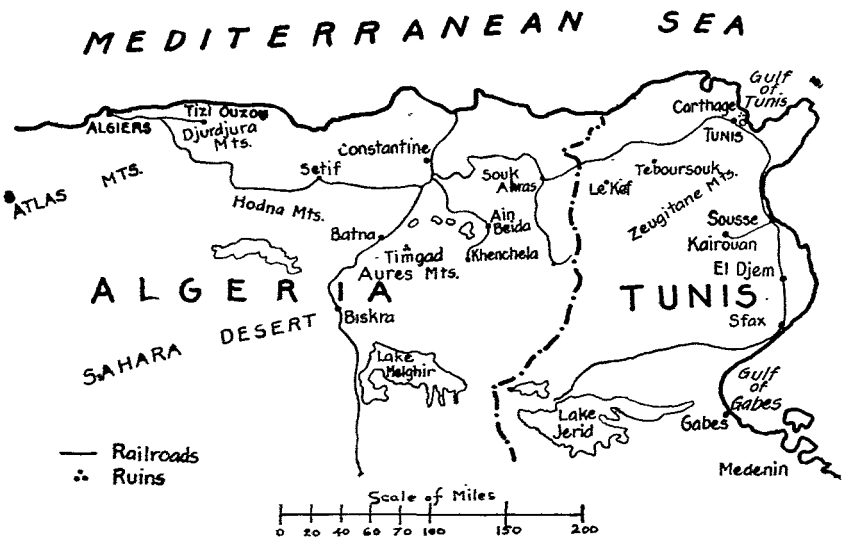
"I came back to Africa (Algiers) early in October after an exciting trip down the flooded roads in the Rhone valley and started almost immediately for a trip through Algeria and Tunisia. I went east through Tizi Ouzou, Fort National and Michelet and then over the Tirouda Pass southward. Magnificent scenery in the Djudjura Mountains, but had a more or less dangerous drive. By the way, the road from Tizi Ouzou to Fort National is 27 kilometers long and in this distance mounts 800 meters. It runs along a sharp crest and has 263 curves. It was built by troops in 28 days, part of the time under fire.

"After leaving the mountains we went east through Setif to Constantine and then south to Batna and Timgad. Great place Timgad. Roman town of political origin. All planned ahead of time and laid out by troops. All streets at right

angles, equal sized blocks, scientific paving and sewerage system and all the rest of it. Reminds you of a new western town. It has been very thoroughly cleared out so you can see just about what it was like before it was abandoned.

"Went from there to Khenchela, Ain Beida and Tebessa, where there are some more very interesting Roman buildings. Then north to Souk Ahras, where Saint Augustine was born. From Souk Ahras over the hills into Tunisia by way of Le Kef and landed at Teboursouk, where we stopped a few days. Very beautiful country, but hot in the summer and savagely cold in winter. Then on to Tunis over the worst road I ever hope to see. In general the roads here are good. They are fine broad French military macadam roads and kept in good repair. But sometimes you hit a bad stretch.

"Tunis struck me as being a dump. Small, noisy and shabby. Poor looking lot of natives. Native shops spoiled by tourists. The Bey's Palace outside the



city has been turned into a museum. But they tell me that the law says that warrants for the execution of condemned criminals still have to be signed here. So when the occasion arises the Bey and all the rest of the crowd go out there, the warrant is signed and the party of the second part is hanged on one of the trees in the garden. I don't know if it's so or not—but it makes a good story.

"Carthage must have been a great place in its day. Seven hundred thousand people in the city at the time of the Punic Wars, so they say. But there is nothing much left now except, curiously, an unbelievable quantity of projectiles for catapults and for the ballistae which gave their name to the fascinating science of ballistics. Stone balls about ten inches in diameter and quite carefully finished.

"I went to Kairoan from Tunis and found it most interesting. Unfortunately there are only two European hotels and it would take years of investigation to tell which is the worst. The town is very picturesque and is interesting as being an Arabian city and the Moslem holy city of North Africa. Some of the mosques are very fine. Beautiful tiles and carving. From here we went to Sousse, which is a delightful little port. Very pretty and interesting on account of the Roman catacombs. Then to Sfax, another port, and on to Gabes, which is an oasis on the seacoast. From Sfax southward the desert or near desert (it looks like the

Arizona deserts) runs right down to the sea. I stayed at Gabes for a few days and made one trip to Mendenin, 75 kilometers south. This is one of the most curious places in the world. It is a big town and the people all live in one-room mud huts. These huts are built one on top of another, sometimes as high as five stories. If you live in an upstairs set you reach your front door by means of projecting stones and hand holes. I judge the population must be four or five thousand.

"We went back to Sfax from Gabes and I got some very good native stuff in the markets. Tourists are pretty much unknown so prices were reasonable. I find I get my souvenirs cheapest where the sellers don't speak French or English as was the case there.

"After leaving Sfax I went north by a different route so as to visit El Djem and see the Roman amphitheatre which is the third biggest in existence, being built to seat 60,000. Must have been a big town around it once, but nothing left now. Then back to Sousse and Tunis and through six days cold rain back to Algiers. Timed it a little too fine, though I escaped the snow, which is just beginning to come.

"I don't see why this country isn't full of retired officers. It's inexpensive and there is nowhere in the world, I believe, where you can get so much pleasure out of a gallon of gasoline—properly used. The most interesting kind of history —that's what interests me—all round you, the most beautiful scenery—and I'm afraid I have to add, the cussedest weather. However, when it is good it's perfect."

The Editor might add that Algiers, in a setting of superb beauty, combines the picturesque architecture and bizarre customs of the Arabs and Berbers with the comforts and conveniences of a modern French city. There are many luxurious hotels in the hills overlooking the Bay of Algiers, frequented mainly by the English who come to escape the northern winter. A truly delightful place to spend a leave.

Value of Guard Service

EDITOR'S NOTE: *In the initial issue of the* CALIFORNIA GUARDSMAN, *an interesting journal published monthly in the interests of the California National Guard, appears the following most convincing article on the value of and necessity for our present National Guard. Its author is Col. David P. Barrows, 159th Inf.*

The publication of the *California Guardsman* begins a new period in the military history of California. It means the beginning of an influence which is to bind all organizations closely in one military corps. We now commence to think in terms of unification of forces, solidarity of interest and common loyalty to all branches.

The development of the National Guard in this state in the last four years, and particularly in the last year, encourages us to believe that the objectives laid down by the War Department will shortly be attained. More encouraging even than the addition of new units, is the change in public opinion. General indifference has given place to wide recognition of the value of the National Guard as a field for the indispensable training of California young men, if they are to be prepared to do their full duty to the state and to the nation. The guard takes the young man at the point where the high school, or the continuation school, leave him—the age of eighteen. In a true sense a three-year enlistment in the Guard is a rounding out of his education. Two and a half centuries ago the great Englishman, John Milton, gave us a definition of education which applies to what we do: "I hold that to be a liberal education which prepares a man to discharge every duty both in peace and in war," and in elaborating his plan of instruction Milton describes as the appropriate studies of a young man of his generation just about those things which are embodied in the curriculum of the National Guard—physical endurance and dexterity, the use of arms, horsemanship, endurance in the field, a knowledge of campaigns and great commanders and

above everything else, training in the indispensable soldierly virtues of loyalty, subordination to authority, resolution and courage. Milton was perhaps the most eloquent defender of liberty that the English race has produced, but he realized, what some so-called "liberals" of the present day refuse to see, that liberty can only be kept if it is guarded and if each generation consciously places it higher than peace and higher than life. American society is full of people who are determined to convince American youth that the great rewards of life may be claimed without the sacrifices inherent in securing them; that justice is secondary to self interest; that life may be pleasurably lived without recognition of the old disciplines and moralities, that patriotism is a *shiboleth.* Against these widely propagated doctrines, which would poison our ideals and destroy our manhood, the National Guard seems to me the most valuable corrective, educational agency. It puts emphasis on duty rather than on fancied rights, and it clears the mind of a lot of vague and pretentious ideas that have no basis in fact, but which are the stock arguments of pacifists and of detractors of American institutions.

The men who make up the officer personnel of the National Guard of this state are largely men who have had actual experience of military service and in many instances of combat and of campaign. They know the terrible demands which such service makes upon body and will; they have no illusions about warfare; they would be the last to provoke war and the readiest to accept honorable conditions to avoid war; they would be the first to bear the sacrifices that warfare imposes and these sacrifices, while hard for them, would be infinitely harder for the families dependent on them—but they realize that a part of the American heritage that must be passed on to the next generation is the military experience bought at so great a price in the years 1917 and 1918. This knowledge of the art of war gained at such cost, must not be discarded, and what is of equal importance is the spirit of devotion which animated the millions of men who composed the Army and Navy of the United States. It must be preserved and passed on to the young men who are to follow.

This is the great service which the National Guard is performing for this commonwealth and for this nation, and there is no educational agency which can take its place. Its success is closely linked with the preservation of what our people know to be heroic, manly and right. These are the principles which the *California Guardsman* is founded to expound. Addressed as they will be to young men, led by highminded officers and made conscious, as they should be, by every military formation, of the serious spirit in which the Guard undertakes to carry out its duties, our new publication can exert an influence second in value to nothing read or discussed within the borders of our state.

The United Services Automobile Association

Two and one half years ago some fifty officers of the Army in San Antonio, Texas, in an effort to escape the exorbitant rates, and faulty and uncertain protection offered by some certain automobile insurers in that locality, determined to organize an Army Automobile Insurance Association on the general lines of the Army Cooperative Fire Association.

This Association was launched a little later with less than fifty (policy holders) members. It now has over 3500 members, a monthly income (earned premiums) of more than $10,000 and over $75,000 in fluid assets. It has paid in losses in the past year $50,000.

It has extended its protection to include the commissioned and warrant officers of the Navy, Marine and Coast Guard, both active and retired, in addition to officers, warrant officers and field clerks of the United States Army.

The premium deposits charged by the Association are those quoted in the regular rate manuals used by the leading stock companies of America—less 20%.

This being a non-profit-making organization with neither desire nor intention of piling up a tremendous surplus, our profits are returned, as they accumulate, to our members in the form of a credit dividend on renewal policies.

We are reinsured against all but minor losses under public liability clause, and will secure similar protection against large fire hazards as soon as it becomes advisable. This eliminates the possibility of an assessment of our members and relieves us of the necessity of tying up a large reserve. However, a monthly percentage of the profits is set aside and a "Reserve for Unexpected Losses" has been built up. The interest on this reserve, and on our "Reserve for Unearned Premiums," constitutes a respectable factor in our income.

The recognized object of this Association is to furnish its members insurance at cost with full coverage, satisfactory service and speedy settlements. The spirit of willingness to meet every proper claim, fully and promptly, is behind every policy written by the United Services Automobile Association. It, however, is not an ellemosynary institution and is in no way affiliated with any charitable organization. It is a straight business of mutual automobile insurance, the success of which in furnishing high-grade protection at reasonable rates, to the property and funds of its members is based, first on the intelligent application of sound business principles; second, on the high moral standing of its members; third, on the elimination of acquisition (new business) costs.

Coast Artillery National Guard Organizations

197th, Antiaircraft, New Hampshire ..... State Armory, Concord
198th, Antiaircraft, Delaware ..... State Armory, Wilmington
200th, Antiaircraft, North Carolina (Battery G. M. G.) ..... State Armory, Raeford
202nd, Antiaircraft, Illinois ..... 5875 Broadway, Chicago
203rd, Antiaircraft, Missouri ..... State Armory, Aurora
206th, Antiaircraft, Arkansas ..... State Armory, Marianna
211th, Antiaircraft (M. G. Bn.) Massachusetts—State Armory, 130 Col. Ave., Boston
212th, Antiaircraft, New York ..... 120 West 62nd Street, New York City
213th, Antiaircraft, Pennsylvania ..... State Armory, Allentown
240th, Harbor, Maine ..... State Armory, Portland
241st, Harbor, Massachusetts ..... South Armory, Boston
242nd, Harbor, Connecticut ..... State Armory, Bridgeport
243rd, Harbor, Rhode Island ..... State Armory, Providence
244th, Tractor, New York ..... 125 West 14th Street, New York City
245th, Harbor, New York ..... State Armory, Brooklyn
246th, Harbor, Virginia ..... State Armory, Richmond
248th, Harbor, Washington ..... State Armory, Aberdeen
249th, Harbor, Oregon ..... State Armory, Salem
250th, Tractor, California ..... State Armory, San Francisco
251st, Harbor, California ..... State Armory, San Diego
252nd, Harbor, North Carolina ..... State Armory, Wilmington
260th, Harbor, District of Columbia ..... Water and O Sts. S. W., Washington, D. C.
1st Separate Battalion (Battery A), Harbor, Delaware ..... Laurel
1st Separate Battalion, Harbor, Florida ..... Florida Coast Artillery, Jacksonville
1st Separate Battalion, Harbor, South Carolina ..... S. C. Coast Artillery, Beauford

Training Principles

The following paragraphs are extracted from General Orders No. 35, Headquarters, Third Corps Area, Baltimore, September 23, 1924.

Troop training consists of three elements: Military training, which is of prime importance; educational and moral training, which constitute essential aids in the attainment of military efficiency; recreational activities, aiming at contentment and stimulation of effort on the part of those undergoing training.

The object of training is described in paragraph 28, Training Regulations 10-5. To accomplish successfully this object, the soldier should be imbued with a proper appreciation of the dignity of his position, with a desire for clean thinking

and right living, with a love of country and a knowledge of his responsibilities as a citizen.

For this purpose training must be systematic and progressive, designed to cultivate leadership and to attain a high standard of proficiency. It must be diversified in order to maintain the interest of the soldier. At the same time it must be sufficiently simple to avoid confusion in the mind of the recruit through attempts to teach too many principles at the same time. A spirit of competition and friendly rivalry must likewise be developed.

The instructor must have a thorough knowledge of his subject and know how to impart it. He must avoid harsh criticism of subordinates, nagging and unduly severe corrections.

All prescribed agencies which provide activities for the employment of the soldier's leisure time will be developed to their utmost capacity, in order that the Army may be made a comfortable home for its members, and provide wholesome and elevating environment for them. Competitive athletics is the best means of recreation and will be encouraged.

Every effort should be made to further the moral training of the soldier. Right principles will be inculcated in the recruit when he first enters the service and this teaching should continue throughout his daily life with his organization.

Battery Officers Class, Coast Artillery School, 1925

EDITOR'S NOTE: *The following was submitted for publication by the office of the Chief of Coast Artillery.*

The following policy, covering the selection of students for the Battery Officers' Class for the fall of 1925, has been approved by the Chief of Coast Artillery. The class probably will be made up of about 45 students. These are to be drawn from the grades of captain, first lieutenant and second lieutenant in about equal numbers. This is an innovation in so far the second lieutenants are concerned. Those to be selected will in general have had at least three years' service and will, if practicable, include only those who have been at their stations for two years. The selection of the students will be based, subject to the above restrictions, on their availability, those who are changing stations being given preference. It is apparent at this time that some officers may not be able to take the Battery Officers' Course before they have reached an age where this course will no longer be appropriate for them. Those who are so unfortunate as not to be selected should feel that this in no way reflects upon their efficiency, but rather that circumstances over which they have no control have operated to deprive them of this privilege.

The above policy will result in a larger number of officers of experience being available for assignment to troop duty which in turn should raise the general efficiency of all units.

Command and Staff

The mission of the Command and General Staff School is to teach the tactics and logistics of the division and the corps, the duties of division and corps commanders, the organization and functioning of division and corps staffs. Great stress will be laid upon the command side of the problems; the power of leadership, and the moral forces involved as distinguished from the technical side. The general staff has become a necessity in a modern army, but care is necessary that it does not become the controlling force and usurp some or all of the duties of the commander. As between the functions and duties of the commander and the functions and duties of the general staff, the military pendulum swings first one way and then the other. In Napoleon's time the command was everything and the weakness of his later campaigns came from a lack of a general staff. In the Six Weeks' War and the Franco-German War, so far as the German Army was concerned, command and staff occupied each its proper place. Von Moltke, tech-

nically a chief of staff, but really the commander, provided the singleness of purpose and the will to conquer. Forty years of peace in Germany over-developed the general staff at the expense of command. In the World War the Germans had no great commander. Moral forces counted for nothing in their eyes, though they are truly everything when guided by a great will. "The ablest general staff is not such a will; it is a syndicate. After all, what finally counts is the man; at need, even a shepherdess may suffice—Jeanne d'Arc."—*Address of Brigadier General H. A. Smith, U. S. Army.*

Gas Industry Pledges Aid for National Defense

The trail blazed by the manufactured gas industry of America in recovering the essential values in coal promises in a few years to free this country from dependence on foreign sources for fixed nitrogen and other by-products of gas and coke manufacture which are vital for the national defense, according to a report from the New York headquarters of the American Gas Association.

In addition, the sum represented by the saving in coal and the capture of coal tar and other products through carbonization is potentially so great that it cannot even be calculated, it was said. The elimination of the smoke evil by substituting gas for other fuels will not only rid our cities of an intolerable and destructive nuisance, but, according to the predictions of gas engineers, will mean turning to useful purposes millions of gallons of creosote, enough to double the length of life of our lumber resources and hundreds of millions of gallons of coal tar which hang today like a pall in the form of smoke over the average American industrial community.

Locked up in the nearly 600,000,000 tons of coal produced in this country every year, most of which is wastefully consumed in heating furnaces, are commercial products whose value is comparable to the total wealth of the nation twenty years ago, it was asserted.

Among them are explosives, fertilizers, dyestuffs, drugs, photographic developers, rubber substitutes, paints and varnishes, tanning material, artificial leathers, flavoring extracts, perfumes, disinfectants, printing inks, amber and horn substitutes, wood preservatives, motor fuels, soap, brake linings, linoleum, insulators, building materials and thousands of others.

Besides these items, approximately 580,000,000,000 cubic feet of gas for heating purposes are produced every year by carbonization in addition to that manufactured by local gas companies.

Public service companies and the manufacturers of by-product coke are increasingly engaged in conserving the nation's fuel resources along these lines. A large proportion of new gas works capacity installed in many cities during the past few years, it was reported, has been in the form of by-product coke ovens, the manufacture of high-grade coke for domestic purposes being an important consideration in the selection of the plant.

It was asserted that at least 20 per cent of the present water gas output will be superseded by an equivalent coke-oven gas production within the next ten years. The production of this gas, it was said, would be accompanied by a production of about 10,000 tons per year of ammonia nitrogen, useful in the making of mixed fertilizers for agriculture.

COAST ARTILLERY BOARD NOTES

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

New Projects Initiated During the Month of January

Project No. 311, Test of Type B. B.-29 Storage Batteries—In letter dated November 13, 1924 (file 412.42) the Chief Signal Officer advised the Chief of Coast Artillery that there were being shipped to the Coast Artillery Board three 4-volt portable storage batteries, Type BB-29, for test. The batteries were received on November 29th. One of the batteries was charged and turned over to the 61st Coast Artillery for test. The other two were kept dry and in the Board Room for examination. As a result of test the Board recommended that larger terminal screws and wing nuts be provided; the flexible rubber covered leads be replaced by lead straps; name plate be placed on container; a hinged cover be provided; the use of molded bakelite instead of molded composition rubber to obtain greater strength and a lighter and smaller container; and that filling holes, battery connections and terminals be more effectively sealed to prevent leakage. It was the opinion of the Board that when these changes were made the type BB-29 storage battery would be suitable for use by the Coast Artillery as a portable storage battery.

Project No. 312, Miniature Antiaircraft Range and Eye Shooting.—Two articles on "Eye Shooting" and a description of a miniature antiaircraft range to train officers in eye shooting were forwarded to the Coast Artillery Board by the Chief of Coast Artillery, directing a study be made of the possibilities of eye shooting and the desirability of erecting a miniature range. After study of the subject and conference with officers of the 61st Coast Artillery, it was recommended that a miniature range be not built; battery commanders be not trained in eye shooting where estimation of data alone is to be used and that where this type of firing is required, a system for emergency conditions along the lines of the Coast Artillery School mimeograph "An Emergency Method of Fire Control for Antiaircraft Artillery" be used.

Project No. 313, Pamphlet on Cloke Plotting and Relocation Board.—The Coast Artillery Board was furnished a copy of the proposed Ordnance Pamphlet on the above subject. Members of the Board made a study of the pamphlet and submitted comments thereon, recommending corrections where deemed advisable.

Project No. 314, Azimuth and Elevation Indicator for Electric Control of Antiaircraft Searchlights.—The Board submitted comments on a proposed adaptation of the "repeat back" system now used, in conjunction with the gyro-compass, for use as a repeat back system for a 60-inch light weight barrel type Antiaircraft Searchlight.

Project No. 315, Comments on Section XIV, Training Regulations 430-85, "High Burst Ranging."—This section was transmitted to the Coast Artillery Board by the Chief of Coast Artillery. Members of the Board made a study of the training regulation and submitted comments thereon.

Project No. 316, Coast Artillery Board Universal Deflection Board.—In connection with this project the Coast Artillery Board designed a deflection board which can be improvised locally. It gives a solution of the deflection problems for 155-mm. G. P. F.'s equipped with panoramic sights graduated in mils and modified so that sight readings decrease as the line of sight is turned in a clockwise direction. The Coast Artillery Board recommended:

a. That the deflection board for 155-mm. G. P. F.'s described in Coast Artillery Board Project No. 316 be approved as a provisional board for 155-mm. G. P. F.'s pending equipment of 155-mm. G. P. F.'s with sights graduated in degrees and hundredths, and the issue of arsenal constructed deflection boards.

b. That Regular and National Guard organizations assigned to 155-mm. G. P. F.'s be authorized to improvise and use the provisional deflection board described in Coast Artillery Board Project No. 316.

The above recommendations were approved by the Chief of Coast Artillery. A description of the deflection board will be published in Coast Artillery Board Project No. 87, Deflection Board Experimental (all types of artillery). Drawings, charts, and descriptions of the deflection board for 155-mm. G. P. F.'s will be furnished by the Coast Artillery Board on request.

Completed Projects

Project No. 139, Test of Aiming Mirrors.

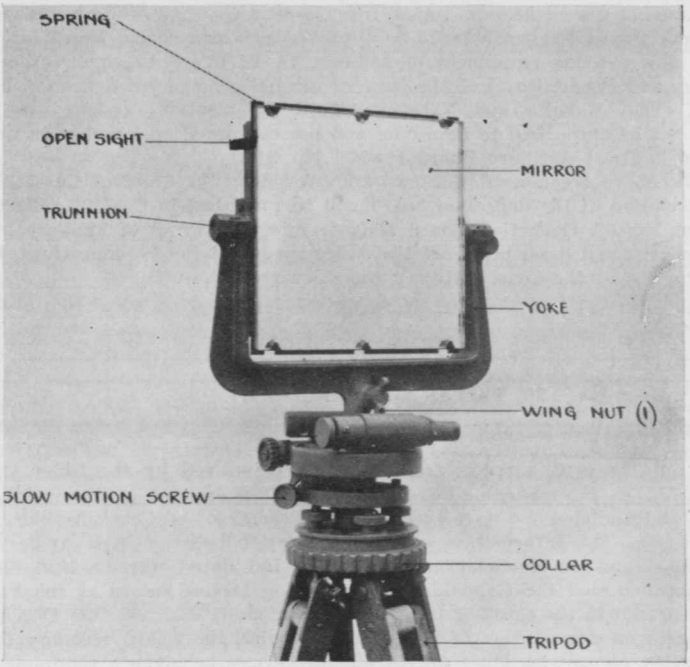
I—History of the Project.

1. *a.* In 1919, extracts from the report received by the Chief Ordnance Officer, A. E. F., regarding Mirror Aiming Devices, and a description of the Grimaldi Paralleloscope were transmitted to the Chief of Coast Artillery for his information. This information was later transmitted to the Coast Arillery Board for remark and recommendation. 3d Wrapper Ind. dated Mar. 10, 1920, file 413.68 recommended that the Grimaldi Mirror. Aiming Device known as the Paralleloscope, be sent to the Coast Artillery Board for study and test. On December 30, 1920, after an examination of the Grimaldi device, the Board recommended that this device, along with other mirror aiming devices be given a thorough test by the 30th Brigade, C. A. C., during the target practice of 1921. Two defects of the Grimaldi device were noted by the Board at this time, namely, that no azimuth circle was provided, and no means were provided for extension of the mirror laterally. The first deficiency necessitated the reorientation with a transit whenever a movement of the mirror in azimuth is desired. The second might cause a loss of aiming point due to the failure of the gun or mount to return to its original position after firing, thus necessitating a shift of the device, or rotation of the mirror, with accompanying reorientation.

b. In 1921, as a result of the study and test of aiming mirrors by the Coast Artillery Board and the 30th Artillery Brigade, two tentative sketches were submitted to the Ordnance Department, requesting the design and manufacture of one of each of the two types. After an exchange of views between the subcommittee of the Technical Staff and the Commanding Officer, Frankford Arsenal, two types of aiming mirrors were approved for manufacture, subcommittee item 2329, dated August 21, 1922, and 6th and 7th indorsements, dated September 23 and October 31, 1922, respectively. These two types, "A" and "B" were completed and shipped to Aberdeen Proving Ground for a preliminary test. In 12th Indorsement, File 00 413.68/2843, dated June 9, 1923, the Commanding Officer, Aberdeen Proving Ground, reported the material in serviceable condition, but the

test showed that the spherical level was so mounted as to increase the difficulty in leveling with the mirror in place. The test also showed that a vial level should be provided as the spherical level was not believed to be sufficiently accurate. 13th Indorsement, dated June 13, 1923, File 00.413.68/2832, directed that the aiming mirrors be shipped to the Coast Artillery Board for service test.

c. The mirrors were received by the Coast Artillery Board in August, 1923, examined by the Board and shipped to the 51st Artillery, C. A. C., Fort Eustis, Va., for service test.



AIMING MIRROR, TYPE A

II—DISCUSSION.

2. *a.* A description and photographs of aiming mirrors, types A and B, and of tripod and aiming stake mounts are attached hereto.

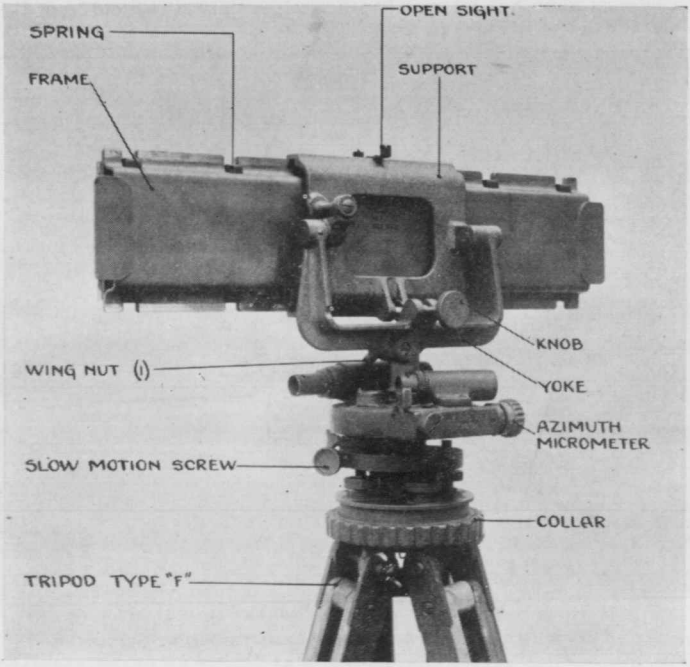
b. A study of the use of the aiming mirrors was made and a preliminary test conducted about January 24, 1924.

c. (1) The preliminary test consisted in setting up the mirrors and using them (a) in conjunction with a transit and an aiming point, and (b) in conjunction with a transit only.

(2) The transit in each of the above tests represented a sight on a gun. The two tests will be considered in turn.

(a) The image of an aiming point located so that it is invisible from the transit, but visible from the mirror can be seen readily in the mirror when the latter is set at such an angle with reference to the aiming point and transit that the image of the aiming point is reflected in the direction of the transit. With the mirror levelled both horizontally and vertically, the image of the aiming point appears normal, that is, exactly as if viewed directly. If it is necessary to incline

the mirror in order to see the image of the aiming point, the image is also inclined. Since the cross wire in a transit is vertical, accurate collimation is not always possible. Likewise placing the mirror at a lower level than the transit and observing a point at mirror level it is necessary to incline the mirror and the image of the observed point is inclined with respect to the vertical wire of the instrument. A condition like the latter would be common in guns having a high mount like the 9.2-inch and all railway guns. Since the mirror must be placed comparatively close to the side of the gun, the inclination of the mirror is considerable. The importance of this defect is minimized since it would usually be



AIMING MIRROR, TYPE B

practicable to align the vertical wire of the sight on a particular point of the image of the aiming point.

(b) The use of the aiming mirror in conjunction with the transit only, is satisfactory. By placing a wire clip shaped like an inverted Y on the telescopic sight and using the image of the clip as an aiming point, the result is the same as though the image of the cross wires could be seen. For work at night, it is believed that a small box mounted and carefully centered on the telescope, containing a light, and having a slot in front emitting a column of light, would probably give satisfactory results, provided, of course, the cross wires on the telescope are illuminated.

d. As a result of the above mentioned preliminary study the following comments are made:

(1) When horizontal level of mirror is disturbed the image of the aiming point or the transit is deflected in proportion. The present horizontal level on the mirror mount is not sufficiently sensitive to obtain accurate leveling. A small error in leveling is immaterial unless the mirror is revolved.

(2) The type "B" mirror appeared to be better adapted for general artillery purposes than the type "A" mirror because of its length and provisions for lateral adjustment. The type "B" mirror would be improved if its width were increased somewhat; also if it be made somewhat longer. The type "A" mirror can be used satisfactorily with a gun which does not change position in firing, but would not be satisfactory for sliding railway mounts or for any gun which during firing changed from the original oriented position.

3. The aiming mirrors, types "A" and "B" were given service tests during certain target practices of the 51st Artillery, C. A. C. The tripod and mirrors were set approximately 20 feet from one of the guns located in a thicket where direct vision on aiming point was impracticable. The direction from the gun to

MIRROR AIMING DEVICE, TYPE B, AZIMUTH MOUNT SUPPORT

the mirror was approximately at right angles to the direction of the line of sight. The mirror was placed on the left side of the gun. The image of a triangular aiming target mounted on a panoramic sight was used as an aiming point. The aiming target was readily seen in the mirror. When the gun was traversed considerably, it was necessary to traverse the mirror or to slide it horizontally. This was due to the displacement of the sight with reference to the pintle center of the gun. When the mirror was changed by sliding, it corrected for the error introduced by the displacement of the sight. On the other hand, if the mirror was traversed in order to see the image of the sight, an error in aiming was introduced. The type "B" mirror only was used in these tests since firing was at moving targets so that there were considerable changes in direction. The length of the type "B" mirror with the means for sliding it considerable distances appears to be satisfactory and allows traversing the 155-mm. gun through 60 degrees, which is the limit of its traverse. The mirror would not be long enough for use with railway artillery units because of the large distance between the sights and the pintle centers of such guns. The type "B" mirror would be improved if made somewhat wider, since it will then be much easier to find the image of the sight. The firing of the gun did not disturb the mirrors or tripod and the results obtained were satisfactory.

4. The type "A" mirror appears to be suitable in its present form for fixed target firing, except where considerable backward movement of the gun is expected upon firing.

5. Provisions for mounting the aiming mirrors on aiming rule stakes were tested and found to be satisfactory.

6. It is believed that the vial levels should replace the spherical levels and should be mounted in a more convenient place. With this exception it is believed that the mirrors as at present designed are satisfactory for purposes for which designed, although the type "B" mirror would be somewhat improved if made twice its present width and the length increased about 4 to 6 inches.

7. The Coast Artillery Board, in the study and test of the aiming mirrors, has been impressed with certain disadvantages atttendant upon the use of such devices. The disadvantages may be summarized as follows:

a. They are of delicate construction and more or less difficult to transport in the field.

b. They should be removed after each firing in order to protect them from unnecessary exposure to the weather.

c. They must be oriented each time set up, even if set up over a fixed stake or mark.

d. During damp weather the mirror becomes clouded and the image of the aiming point becomes obscured.

e. Frequent wiping of the mirror disturbs its orientation.

8. The Coast Artillery Board is of the opinion that mobile coast artillery batteries should be provided with aiming rules. It is further of the opinion that, except in very unusual cases, the use of an aiming rule, aiming points, and aiming stakes, will be adequate to meet service conditions. The very exceptional cases where these methods would not be equally as satisfactory as the aiming mirrors are insufficient to justify the issue of aiming mirrors to mobile seacoast artillery batteries. Under usual service conditions, the aiming rule, aiming stakes, and distant aiming points will give more satisfactory results than aiming mirrors. These accessories are less expensive than aiming mirrors.

9. Recently the Coast Artillery Board recommended the adoption of certain types of sights for mobile seacoast artillery, both tractor and railway (C. A. B. Proj. No. 131). A two or three-inch telescopic sight for direct fire and a panoramic sight for indirect fire was recommended. Experiments conducted at Fort Eustis, Va., indicate that it is feasible to mount and use a direct fire telescopic sight, instead of a panoramic sight, on an aiming rule. In the opinion of the Coast Artillery Board an aiming rule is a more desirable and economical piece of fire control equipment for mobile seacoast artillery batteries than the aiming mirror would be. It is believed that in situations where aiming stakes cannot be used satisfactorily the aiming rule should be used rather than the aiming mirror.

10. The Coast Artillery Board has been informed that the 155-mm. Trench Mortar now being developed is to be equipped with panoramic sight. Possibly other trench mortars will be equipped with panoramic sights. It is believed that the characteristics of trench mortars and the usual manner of emplacing and using them are such that an aiming mirror will be the most suitable accessory for aiming in conjunction with panoramic sights.

III—Conclusions.

11. *a.* That aiming mirrors, type "A" and "B" are suitable for the purposes for which designed, but that the type "B" mirror is preferable.

b. That if aiming mirrors are manufactured in the future they can be improved as follows:

(1) Make the width of the type "B" twice that of the present mirror.

(2) Increase the length of the type "B" mirror 4 to 6 inches.

(3) Replace the spherical level with vial level mounted in more convenient position than at present.

c. That aiming rules should be issued to mobile coast artillery batteries for use in coast defense operations, and in land warfare, and that it is not necessary to issue aiming mirrors.

d. That aiming mirrors probably should be issued to trench mortar batteries equipped with panoramic sights.

IV—RECOMMENDATIONS.

12. It is recommended:

a. That no aiming mirrors be issued to mobile coast artillery batteries except 155-mm. trench mortar batteries.

b. That aiming rules be issued to all mobile coast artillery batteries, and that in future design of sights and aiming rules consideration be given to provisions for mounting a telescopic sight on the aiming rule as mentioned in paragraph 9, above.

c. That aiming mirrors and mounts for same be tested with trench mortars equipped with panoramic sights with a view to determining whether trench mortars should be equipped with aiming mirrors.

d. That the improvements mentioned in paragraph 11 *b*, above, be incorporated in aiming mirrors manufactured in the future.

V—ACTION BY CHIEF OF COAST ARTILLERY.

Fourth Indorsement

War Department, O. C. C. A., October 10, 1924—To Chief of Ordnance:

1. Herewith are the proceedings of the Coast Artillery Board on Project No. 139, "Test of Aiming Mirrors."

2. The conclusions and recommendations contained therein are concurred in.

To the taxpayer, National Defense is a question of dollars and cents, and those of us who direct the military policy owe it to the taxpayer to give him the maximum protection at the minimum cost. Harbor defense alone is not sufficient, but dollar for dollar you can get more protection out of harbor defense than you can get in any other way. All the fortifications of New York Harbor and Long Island Sound could be torn out and replaced by the latest and best models at less than the cost of one modern battleship. A 16-inch gun and carriage of the latest model can be manufactured and emplaced for less money than the cost of maintaining a single regiment of troops for one year.—*The Mission of the Coast Artillery, by General Hagood,* COAST ARTILLERY JOURNAL, *February, 1925.*

BOOK REVIEWS

With Lawrence in Arabia. By Lowell Thomas. The Century Company, New York. 5½"x 8". 408 pp. Illustrated. Price, $4.00.

The imagination delights in the picture of military achievement as the result of sudden inspiration, of individual heroism, of picturesque stratagem, or of marvelous inventions. Only the student needs concern himself with the accumulation of materiel, the training, assembly and equipment of personnel, the collection of information, the detailed study of ways and means, and the minutiae of preparation necessarily precedent to substantial achievement in war.

The legend of Lawrence in Arabia possessed a tremendous popular appeal. It was said that he had come forth from the trackless desert as a Chief of Bedouins, that he had been lost to Europeans for years, that he had been alone and "on his own," in short that his achievement was purely a triumph of personality.

Mr. Lowell Thomas, though a sincere worshiper of his hero, is conscientious. He has drawn the veil, and in the background are disclosed a British secret corps, British munitions, and British gold. Strange to say, the story in acquiring credibility, loses little of its fascination.

The style is "popular" and somewhat reminiscent of the lecture platform, superlatives are abundant, and some chapters seem little else than series of loosely strung anecdotes, but one finds a substratum of historical fact and a study of the psychology of leadership. The reader will feel that he has never acquired real information more agreeably.

The chapter devoted to the ruined city of Petria with its temples cut in the face of solid rock, while not related to the subject, is well worth while. Unfortunately, the photographs are to be found many pages further along.

Watch the Pacific. By E. George Marks. Coles Book Arcade, Sydney N. S. W., Australia. 1924. 5"x 7". 209 pp. Paper. Price, $1.00.

Now passes across the reviewer's desk an interest-compelling book from a new source, Australia. The author is a well known Sydney writer who adds this to previous contributions on historical and political subjects.

Briefly, he feels the need of, and is advocating the development of a strong naval defense for the Commonwealths of Australia and New Zealand. He would accomplish this by encouraging the British development of the Singapore Naval Base to the maximum and by the construction and operation of auxiliary ships by the Commonwealths. He obtains his title from his deductions that the next great warlike outbreak will occur in the Pacific. Comparing the Treaty of Versailles to the Holy Alliance one century earlier, he concludes that the League of Nations will serve no more effectually in preserving the peace of the world than did that former covenant. He makes a fiery and impressive plea for the development of an Australian defense.

His book brings to mind those of Homer Lea and of General von Bernhardi; his motive is much the same; the arousing of his fellows to the crying needs of national defense and preparation. The recent action of the Assembly of the

League of Nations makes his work the more timely. Though the pacifist will term it jingoism, the book is worth the reading.

Mr. Marks is a forceful writer with an unusual, energetic style. He makes frequent use of arresting phrases, compelling paragraph heads and bold face type. One can well afford to read this small volume. There is much that will profit the reader.

Shotguns. My Major Hugh B. C. Pollard. Isaac Pitman Sons, New York. 5½"x 8½". 117 pp. Illustrated. Price, $1.20.

An interesting handbook on the shotgun, covering very briefly the history, manufacture and general use of this weapon from an enthusiastic English viewpoint.

Illustrarted descriptions of high grade English guns make the book ofo value to American sportsmen interested in securing such arms.

Hawaii, the Rainbow Land. By Katherine Pope. Published by T. Y. Crowell, New York. 5½"x 8". 358 pp. Illustrated. Price, $3.00.

The author, who has spent ten years in Hawaii, has recorded many facts and myths which the average sojourner could not obtain for himself. We are all interested in Hawaii and each reader, be he old or young, will enjoy "A Glance at the Past," "Folk Tales," "The Coming of the White Man," and "Island Life Today," whether or not he has had the opportunity of visiting the "Pacific Pearls." A great addition to the work is the inclusion of sixteen beautiful and typical illustrations.

The book is interesting and impartial. Facts and dates are recorded accurately without interrupting the story. The "Folk Tales" give an excellent view of the ancient superstitions and beliefs.

Whether you have been or are going to Hawaii or whether you must forego this pleasure, you will enjoy reading "Hawaii, the Rainbow Land."

The American Constitution as It Protects Private Rights. By Frederic Jesup Stimson. Scribner's, New York. 5¾"x 8¼". 239 pp. $2.50.

The title gives an excellent insight into the contents of this book. Though intending merely to revise an earlier volume on "The American Constitution," Mr. Stimson found it necessary not only to rewrite large portions to bring them into accord with developments, but even to add considerable material on subjects only recently grown into importance. The United States Constitution is not reproduced, but the clauses in it protecting private rights are to be found in the preface. After thus bringing these clauses to the reader's attention, a discussion of the rights so secured is entered upon.

Mr. Stimson brings forcibly to the attention the many forces in all three branches of our government, the executive, the legislative and the judicial, engaged in attempts to limit these rights. He attacks these forces fearlessly and points out their dangerous features. Finally, he charts those rights which have been expressly granted the federal government, those granted the States, and then those whose limitation is forbidden to either or both of them. The book brings to the reader a realization of much that occurs about him but to which he does not at the time attach full significance.

Woodrow Wilson: A Character Study. By Robert Edwards Annin. Dodd Mead and Company, New York City, 1924. 5½"x 8¼". 241 pp. $2.50.

This volume purposes to be an impartial contribution to contemporary history. It is not a "Life" of Woodrow Wilson, but an account of striking incidents in a distinguished career in an effort to throw a light upon the character and mentality of the subject. "The conclusion suggested is that Woodrow Wilson was a statesman of high aims and unique talents, whose life work was hindered by a faulty perspective—personal and political."

Of particular interest are the chapters on President Wilson's Princeton career. It is the only complete account known of Mr. Wilson's twenty years at Princeton. These chapters are not of interest because of the "Preceptorial System," the "Quad System," or the fight between President Wilson and Dean West over the Graduate School, but because of the light thrown on the character of a man who later became not only a national but an international figure.

The book is entertainingly written and is so arranged that each chapter is a unit which may be read by itself. Some of the chapter headings are: The Quadrangle Quarrel, Wilson and West, Civil War at Princeton, Wilson and Harvey, Mexico, The Great Indecision, Conduct of War, Wilson and Roosevelt, A Superhuman Task, The Struggle for the Covenant, Eloquence, Rhetoric and Logic, and Nemesis.

The reader will not always agree with the author; but he will seldom fail to be interested.

Pearls and Savages. By Captain Frank Hurley. G. P. Putnam's Sons, New York, 1924. 414 pp. Illustrations, plates and maps. 7¾"x 10¾". $7.50.

An excellent descriptive work wherein the author gives in great detail his adventures in the tropical interior of New Guinea, among colonies of savages who had never before seen a white man.

The author had been a member of Sir Ernest Shackleton's ill-fated South Polar Expedition, and after the crushing of their ship, the "Endurance," in the Antarctic ice, spent six months of privation in the extreme cold. It was during this time that he, with several others, planned an extended trip in equatorial latitudes, but upon their return, they were transported "from the white warfare of the Antarctic to the grim red fields of France and Flanders." Several of the original party were wounded or killed in the World War, and Mr. Hurley was forced to organize his own party.

His expedition was equipped with moving picture machines, radio, and aeroplanes, and on his journey he found tribes who were still in the "stone age." He describes at considerable length the various missionaries whom he found, and the ethnology and customs of the different tribes, including several of cannibalistic proclivities. There are very fascinating chapters on coral growth and pearl diving. The author has the happy faculty of describing what he has seen so vividly as to bring it before the reader's eyes, and the illustrations are so well reproduced as to make this book a valuable treasure in the library of every reader who enjoys a dip into the unusual.

The book is excellently bound in green buckram and the paper and type arrangement are unusually good. Nearly one hundred full page illustrations, which are excellent halftones reproduced from photographs, add materially to the attractiveness of the book.

The Foundations of the Modern Commonwealth. By Arthur Holcombe. Harper Bros., New York. 8¾"x 6". 491 pp. $3.00.

The author states in his preface that this book is an introduction to the study of the government of the modern commonwealth, which he defines "as that species of state, in which the consciousness of a community of purpose is relatively widespread and deep-rooted among the people." To paraphrase, the masses of men must *know why* they obey the authority of their rulers.

The political purpose of a people is affected by all their emotional reactions, springing from their religious, racial and social contacts. Thus we follow the author in a survey of the relations between Church and State, the growth of Nationalism, the Struggle of Classes, a chapter in which Communism is most fairly and ably discussed, to a consideration of the purposes declared in the Preamble to the Constitution of the United States. Justice, Liberty, Domestic Tranquillity, The Common Defense, The General Welfare, are all defined, each one in a separate chapter.

This ideal of the Fathers for "a more perfect union" may be secured only by a reign of law, to a discussion of which the last chapter is devoted. The author admits that "liberty" and "justice" are terms difficult to define, and more difficult, perhaps, to establish as ideals in a modern capitalistic or nationalistic state, but under a reign of law they more nearly may be secured.

To the student of the governments of today this book is recommended as a foundation for further reading and investigation.

The Art of War in the Middle Ages. By Sir Charles Oman, K. B. E., M. P. 2 volumes. Houghton Mifflin Co., New York. 6"x 9". Vol. I, 526 pp.; Vol. II, 459 pp. Illustrated.

It is extremely difficult to give a clear and comprehensive idea of this very able book in a short review.

Sir Charles Oman is a recognized authority on this and kindred subjects and much valuable information is contained in these volumes. The Art of War was first published in 1898, but Oman has rewritten and added to the original, so that it is now practically a new work. In the first edition, he carried it to the year 1375 only, this edition starts with Adrianople in 378 A. D., and continues through to the battle of Biccoca in 1522 A. D. The Wars of the Mongols, the Ottoman Turks in Europe, the Italian Condottieri and the rise of the Swiss are all new with this edition. Incidentally, he gives full credit to Sir Roger Bacon for the discovery of gunpowder and utterly refutes the claims for its discovery by the Chinese. After much research and consultation with other students of warfare, Oman has greatly reduced the number of casualties and forces engaged in most of the well known battles. The figures given being far smaller than in any other history—even those of the earlier edition of this work.

Oman's book is essentially a history of the *art of war*—not a history of battles. The battles described are those in which some new form of tactics, some new invention (either in offensive or defensive warfare) or some new strategy developed under certain leaders gave unexpected victory. The gradual rise of cavalry is shown, and the discontinuing of the infantry, until about the time of Crecy when the English began to use them both. There we are shown an unexpected victory over the French. These relying solely on their mounted knights, were unable to withstand the English infantry armed with the deadly longbow, seen on the continent for the first time.

Artillery and hand guns do not enter very much, as they were at that time too clumsy and awkward to have any real bearing on the outcome of a battle.

Fortifications and armor are each given extensive treatment. Particularly, the gradual enlargement and strengthening of castles, until it became practically impossible for an army to capture a castle except by starvation or treason.

It is hard to pick outstanding features in a book so full of interest, but the chapters on the Byzantine Empire and the Crusaders are exceptionally interesting. Oman's style is delightful, clear and intelligent to the layman, while at the same time he presents a detailed picture for the benefit of the advanced student.