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British Tank Hauls in Captured German Naval Gun at Cambrai

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Signal Service in the Theater of Operations

By MAJOR-GENERAL G. S. GIBBS

BEFORE proceeding to a discussion of signal communication, I should like, first, to define my terms, and, second, to outline the headings or topics under which I shall conduct my discussion. The terms I shall use are as follows:

"Signal communication" comprises all the means employed to transmit telephone conversations and message matter. "Message matter" includes field messages, orders, reports, maps, and documents that are normally handled by the most rapid means possible. It does not include matter properly carried by a postal or mail service. The Signal Corps is that branch specifically charged by law with the handling of signal communication. "Signal personnel," however, includes all those of whatever branch who are engaged in handling signal communications. The "signal system" includes the entire plant and personnel, of whatever branch, involved in the duty of transmitting telephone conversations and messages.

My discussion will take up, first, the task involved; second, the equipment utilized in the operation; third, the personnel assigned to the equipment; leading to the equipment and personnel team, which goes to make up the signal system.

The size and importance of the task of handling signal communication in the theater of operations is one which needs little explanation before a body of military men. The military art as applied in this day and age has availed itself of the most modern means of transportation. The surprise element has become more and more a factor in the movement of large masses and in the concentration of troops at the point of attack. We know that the exercise of command places a vital reliance upon signal communications; that the command post of the higher unit has become a center of signal communication; and that the commander can not properly function if he divorce himself from those means by which he receives his information and makes known his will. Only by the rapid transmission of information can

the commander of large units expect to keep himself cognizant of the situation. Time was when the mounted courier could move faster than any of the forces at the command of the enemy. Today large bodies of troops can be moved by rail or by motor truck much more rapidly than any messages except those transmitted by lighter and faster motor-driven transportation or those messages transmitted by electric means. Intricate means and paraphernalia of war have been followed by an increase in the staff organization of commanders. This, in turn, has resulted in an increase in the number of messages which must be transmitted in order to coordinate the forces which are brought to apply. It is only by the most efficient and rapid electrical means of transmission of intelligence that the commander can hope to make timely disposition for the coordination of his aerial combat forces or for meeting the moves of enemy air forces.

The traffic diagram showing the telegraphic activities in the entire theater of operations is very complicated. The channels which are most frequently used have, by our experience in France, been readily grouped into several families. In the base section, we find a group of channels which radiate from the general depot and from the headquarters of this section. In the intermediate section, we find a group of channels from the headquarters intermediate section to the branch depots of that section. In a similar way, we find the headquarters of the advance section furnishing considerable traffic to the branch depots of that section. Then, superimposed upon these channels, we find the traffic between the general depot and the branch depots of both the intermediate and advance section. The central records office furnishes considerable traffic both to General Headquarters and also to the various hospitals and replacement centers in the rear areas. Of course, each field army with its various depots and army troops forms a group of channels as well as does the Army corps with its depots and corps troops.

But the heaviest traffic is of particular interest to us. We have been accustomed to consider traffic in terms of peak loads. The peak load is that load of messages here considered as averaging 60 words each, which in our experience has been the largest for any one 24-hour period. You can readily see that the plant and the operating personnel must be designed and organized with a view to carrying this peak load.

A peak load of 1000 messages in a given 24-hour period was found between headquarters of a base section and headquarters of the intermediate section. A similar peak load was found between the general depot in the intermediate section to the headquarters advance section

and to the headquarters intermediate section. The maximum traffic between general headquarters and the central records office was 1000 a day and the maximum traffic between general headquarters and the seat of government (Washington) was approximately 10,000 a day.

A peak load of 1500 messages per day was found between headquarters base section and general depot base section; between headquarters communications zone and the headquarters of the three subordinate sections, advance, intermediate, and base. But the largest traffic of all was between general headquarters and headquarters, communication zone. Our experience in France showed that the maximum or peak load for 24 hours might be as great as 10,000 messages.

As compared with the rear areas, the forward or combat areas carry fewer messages but under an increasing difficulty, which entails a diversification of the means for transmitting the messages. The hazard of maintaining equipment in the field with mobile units under combat conditions and of keeping channels open by which not only routine business but messages of the most urgent kind can be transmitted, oblige the signal service in the forward areas to duplicate each channel with as many alternate channels and methods as human ingenuity can devise.

The tendency of modern military art has been to deepen the zone of combat. The future will undoubtedly see a further deepening of aerial contact. The fighting zone has increased from the firing line to a broad zone and may even go so far as to include practically the whole theater of operations. This means an increase in the urgency of the messages throughout the theater of operations. It means an increase in the hazard of maintaining signaling equipment throughout the theater. It has also brought about another curious development. In former days a large portion of the communications or messages were of a local nature only. The future is going to bring about a demand for a still more unified system of signal communication. Messages relating to actual combat must be transmitted not within a limited strip of ground, but throughout the whole theater.

We have seen the beginning of this in the necessity for transmitting rapid information with reference to enemy aerial attacks to pursuit squadrons located more than 10 miles back from the front line, and to antiaircraft organizations located in the communications zone. We have seen the beginning of this in the demand for communication with moving tanks and with widely dispersed motor transport columns. The element of mobility has thus introduced an increased strain upon the communication system.

The equipment with which the signal system handles the business which is intrusted to it has become more and more electrified. The mere existence of telephone wires from point to point is only a small portion of the whole story. Terminal equipment must be devised which will handle a greater volume of business with greater rapidity than heretofore attempted. The number of telegraph operators required for handling 10,000 messages over a single channel between two major headquarters in 24 hours presents a most serious problem. Modern science has provided mechanical electrical means for automatically transmitting these messages. Such equipment is now feasible only in the quiet areas where little movement occurs, where semi-permanent installation may be made and where there is small chance for damage. In areas which are subjected to enemy attack and in areas where headquarters are rapidly shifted from one point to another, it is necessary to provide lighter and simpler equipment. This does not necessarily mean antiquated equipment, but, in the present state of the art, it does mean equipment which is lacking in the automatic feature and which uses primarily the intelligence of a highly skilled and trained operator to manipulate it. The telegraph still remains the principal means by which messages of comparative urgency are transmitted in the areas to the rear of the Army corps headquarters. Telephonic communication in this area exists but handles only about one-tenth as many messages as does the telegraph. The messenger on a motor-propelled vehicle is utilized for conveying messages of a slightly less urgent nature or those messages which, by their bulk or composition, are not susceptible to electric transmission.

In contrast to this, in the forward areas there are many added means of transmitting messages. The radio is utilized to furnish channels between points which can not well be connected continuously by wire service. The most important and vital utilization of the radio is between plane and ground and between plane and plane. The next most important is in the Cavalry organization where extreme mobility precludes the laying of wire lines between the various headquarters. Radio is next of importance in those forward areas which are subjected to constant harassing by enemy bombing and shell fire; where wire lines are frequently broken, both by shell fire and by the movement of friendly troops, and repair operations are costly in human life and the periods of interruption a serious menace to the success of the movement. The radio in this area is unsuited to carry a heavy traffic. The bulk of traffic must be carried by the telephone system as long as it lasts. When it fails, the radio, the messenger, the pigeon, and the visual signaling devices come into their own. Some

particular messages are best transmitted by pyrotechnic signals. These signals are messages in themselves.

Electric signaling equipment made great strides during the World War. Since the World War we have seen the perfection of many of the devices which were started during the war, and the introduction of several new signaling means. The future extends to us a prospect that messages may be transmitted by wire or by radio in the form in which written. It is not unbelievable that the next war may see entire typewritten papers, with the signature affixed, transmitted by wire with great rapidity. The transmission of maps, showing situations, will be just as easily accomplished. The last two decades have seen the development of electrical means by which more than one telephonic or telegraphic channel may be placed on a single pair of wires. It is highly probable that in the future this number, which now in the rear area stands at about 12 messages on a wire, may be increased, or that the apparatus involved may be made lighter and more mobile so that a duplication of messages over a single pair of wires may be effected in the forward areas.

I may be permitted to mention that television, as a scientific accomplishment, is already with us. What its practical military application will be, no one has yet dared to forecast.

Please understand that I am not holding out the promise of early use of the latest of these developments in the forward areas where only the lightest and simplest devices can be carried. Some of them, however, are entirely ready for use in protected and stabilized areas. In 1918, between Chaumont and London, we worked six channels of automatic printing telegraph on a single wire—three channels in each direction, each transmitting 45 words a minute. For a considerable period we averaged 17,000 ten letter code words sent every night from Chaumont via London to Washington, beginning about 9 p. m., and usually cleared by 2 or 3 a. m.

Telephone vacuum-tube repeaters were used for the first time in war in the American expeditionary forces. Most of you are familiar with the long-distance telephone circuit set up over the American system in France. I shall never forget the astonishment of Marshal Foch when he talked for the first time from Treves to Paris and then to London and to Brest.

The trend of development in electric communications leads us to believe that we may look to the future to give us greater speed, greater accuracy, but not great simplicity.

The tendency now is to remove the human factor, which is usually a factor for error. That does not mean that the machines will them-

selves operate without human care or the watchfulness of highly trained technicians. It does mean that the operator is being gradually dropped and is being replaced by a mechanical brain. We find this in commercial electric communication. We find the automatic telephone gradually replacing the manually operated telegraph. These newer types of equipment are faster, more accurate, and more satisfactory to the user. But it must be remembered that the actual regulation, operation, and care of the new equipment requires a higher degree of skill than that which was formerly demanded by the older types.

All innovations which have come to pass in the commercial electric-communication world are not applicable to military use, nor are all adaptions or machines which are used in the field the direct counterparts of those used in commercial life. To a large extent the Army may depend upon civil experts and technicians who will be available in time of war and who may continue on exactly the same type of machine in the service of the country. On the other hand, there are many types which will be developed and which are now developed with solely a military purpose in view. These require a high type of Army training and a high type of Army personnel, together with a system by which technicians from civil life may be rapidly trained to handle Army equipment.

I can hold out no promise for foolproof signaling equipment. Each increase in service, each increase in speed and accuracy, and each decrease in weight and bulk brings with it an additional complication in parts and an additional delicacy of operation. One often hears the request for an instrument as foolproof as our modern desk telephone. The desk telephone has behind it a mighty system of maintenance, repair, operation, research, each in its separate way demanding the highest type of technical training and ability.

Those of us who have as our principal duty the preparation for future needs in national defense should always bear in mind that systems of equipment and organization of men should and must be built with a view to their use in war and not with a view to their satisfying the simpler demands of peace. The technical demands upon signal communication at large must be met in time of peace. The Army must prepare to utilize each and every modern means that is adaptable to military tactical use in order that the sudden demand for these machines may not result in a hiatus of their employment or a serious handicap to the commander on the field of battle. Troops must learn how to handle and use that equipment.

To sum up the equipment situation, the progress of development leads me to state that equipment as it now stands is well ahead of the

ability of the average personnel in the Army to use it. Repeated investigations of alleged failures of modern signaling equipment, notably radio equipment in the hands of troops, has usually led to the final discovery that officers and men charged with using this equipment were unable to understand or operate the same in a satisfactory manner. Such results, when placed on paper in an official report, seem to indicate a criticism of the commanding officer or of the Army or of the service to which this equipment has been entrusted. As an implied criticism it has brought about a certain amount of resentment and a defensive counterattack in the nature of a complaint that the equipment is too complicated and unfit for use in the hands of troops.

Not so many years ago a board of United States Army officers solemnly recommended against the adoption of the magazine rifle because it was too complicated and could shoot too fast. I do not believe that our Army officers of today are going to deny to our Army the use of any new equipment of proven worth and tremendously increased advantage simply because more skill and training—and, incidentally, hard work—are required to operate it.

The task of designing, testing, manufacturing, and distributing signaling equipment to the Army is a responsibility of the Signal Corps. By the nature of the task the agency which accomplishes it must necessarily be a highly centralized one. Nothing but confusion could be expected of a signaling system in the field whose equipment was not absolutely uniform and invariable in its characteristics. The Tower of Babel could easily be duplicated in modern life by a large radio system whose component radio sets were not perfectly calibrated so as to insure working contacts at the right points and absence from interference at other points. Infantry forces have been known to succeed in attack where two or more kinds of rifles firing two or more kinds of ammunition have been used in the same firing line. The signal system can never succeed unless each component part is carefully designed and manufactured in accordance with the general plan which dominates the entire system.

What a different picture we see in the case of the personnel operating the signaling system in the field, as these duties are now assigned in our Army. Ten per cent of the military force in the theater of operations is engaged in maintaining and operating the signal communications system. When we consider a force of 2,000,000 men, such as existed in France, we must remember that approximately 200,000 are engaged in operating some sort of signaling equipment.

Now let us examine this 10 per cent who are engaged in signaling. One-fifth of this 10 per cent, or 2 per cent of the whole Army, belong

to the Signal Corps. Another one-fourth of the 10 per cent, or 2½ per cent of the Army, belong to what might be termed the artillery fire-control system. That is to say, they are primarily personnel trained as artillerymen who operate signal communication as part of their artillery duties. The signal communication connected with artillery fire has customarily in our service been considered a separate and distinct function from that of communication in the command system. Now three-fifths of the 10 per cent, or 6 per cent of the Army, is made up of soldiers and officers of combat branches other than the Signal Corps and exclusive of the fire-control personnel.

In one Infantry division at war strength there are 18 officers and 872 enlisted men who belong to the Infantry and who are engaged in operating signal communication. In case of the division under consideration this represents 59 per cent of the 35 officers and 1497 enlisted men who are engaged on signal communication duty. This does not mean that this quota of Infantry signalers are doing part-time duty with the communication system. In the Infantry regimental communications platoon of 36 men the only enlisted men who carry a service rifle are three mounted messengers.

That portion of the signal system from brigade headquarters, inclusive, forward to the company, inclusive, is operated by signal communication units that are permanent elements of the Infantry commands.

No replacement system has been either provided or projected that is calculated to insure a continuity of the highly trained and skilled operators and mechanicians that are required for the operation of the more complicated forms of equipment. The replacement for any job in a regiment must come from the regiment—and does come from the regiment. If you were to examine carefully the situation in our regiments today you would find that many of them have succeeded in training a radio operator for each radio set with which they are supplied. Some few sets have even two competent operators. In some of these units the training has reached a very high state and in field exercises they give a good account of themselves. In other units quite the reverse is to be found, but that is a matter that permits of correction, and I wish to make no point of it. What I do wish to point out as plainly as possible, is that whatever may be the state of peacetime training of the few key individuals that are required for the most difficult technical tasks, there are no trained men anywhere to take

the places of the one man or two men in each unit that can not be spared and that anything may happen to.

There is no reservoir of trained radio operators in the arm and no provision for creating one.

Likewise, there is no plan of functional replacement from the larger to the smaller commands.

This arrangement has never been tried out in war. It was devised and prescribed for the Army in 1920, after the World War. What will happen to it when the strain of war is put upon it you can conjecture as well as I can.

Perhaps some of you are expecting that I am leading up to a proposal to turn over all signal communication duties to the Signal Corps. I am not going to propose anything of the kind. I am going to try to picture the situation to you as I see it, and suggest that you apply your own common sense to the problem and seek a solution for it. Some of you will probably be faced with that duty sooner or later.

If I were charged with such a task there are certain rules that I would follow that seem to me almost axiomatic. They are:

First. Any communication system that operates as a single system with all of its stations interconnected must be under a single control and management, and that control must extend to the ability to do anything with either equipment or personnel that may be necessary in order to make the system work. The men so employed must belong to a single branch having a functional replacement system extending from its base training reservoir clear to the most advanced unit of the general system, so that replacement is unfailing and practically automatic.

Second. The signal system of small units that are not connected to the general system are local in character and should be managed by the troops of the arm and unit concerned. The methods and equipment which they employ should be limited to the simple forms and should not depend upon such experts as code operators, whose exclusive training requires many months.

Third. In general, the operation of channels that require those experts, such as radio intercept and radio compass work, radio intelligence observation, and all similar work, should be a responsibility of the same service that operates the division and corps and army and larger net and maintains a large personnel for the purpose.

Fourth. There are, perhaps, some permissible exceptions to this rule. If, for example, a radio operator of an airplane must be a pilot, then it follows that pilots must be made to become operators. If an operator who works a radio set with artillery to communicate

with an airplane should be an artilleryman, because radio channels are parts of the fire-control system, then it follows that that branch must establish a system of technical replacement that will assure dependable continuity of operation under war conditions. The same thing applies to the Cavalry and to the Infantry.

If we continue to have profound peace the lack of a dependable system for war will never be found out. A single, lone individual can be trained to put up a marvelous exhibition at a parade ground exercise, and can actually give his unit a good reputation. What will happen or what is likely to happen in war under such conditions you are as able to conjecture as I am.

The application of these rules will picture to you a lateral line across the combat zone which marks the forward limit of the general communications system, all elements of which are interconnected and which should be under common control and management.

This line also marks the rear limit of those communication systems within units that are local in character, that serve the unit and its subordinate elements, and that do not have to be connected into and become a part of the general system.

Again, I am not going to point out where I believe that line to run. The rule has been clearly stated. If the rule is sound, and you believe it should govern, you are perfectly capable of arriving at the answer.

Let us now look for a moment at some of the things that have a profound effect upon the communication system in the theater of operations.

Please remember that the users are a very real part of the system. They produce the volume of the traffic load. They, and they alone, are responsible for the quality of the matter handled. They are the ones served, and their efficiency in doing their military tasks affects directly the burden placed upon the communication channels.

The better trained and more efficient commanders and their staffs became, the smaller becomes the volume of communication traffic handled by them. This means a faster and better service.

The more experienced and capable officers become, the more able are they to foresee and plan and arrange ahead. They are likewise more able to state correctly in the first message what they want to say and avoid the three to five messages that frequently have to be handled to complete an understanding.

The supreme example of this sort of prevision that has come under my observation was the movement of the United States Fleet from New York to Narragansett Bay last May during the joint exercises. For two days and nights, or until after contact was made with the

enemy, an absolute radio silence was maintained in order to avoid detection and location. On 50 complete radio nets within that vast aggregation of vessels not a signal was made. This meant that the fleet movements, directions, and changes of direction all had to be arranged beforehand and carried out according to schedule, and it was done just that way. "Fleet formation No. 3" and "Fleet formation No. 5," published in printed form and distributed and understood, were carried on without fuss and without noise.

Another important matter is discrimination in choosing the means of transmission. If messages are written and filed at a message center, they immediately get into the hands of those who know best what routing should be given to them. The telephone is neither as fast nor as accurate as the telegraph for ordinary message matter. This disparity is accentuated when it comes to handling requisitions and the like. For quick consultation, involving a rapid exchange of thoughts or of questions and answers, the telephone is in a class by itself. The average American of today doesn't need to be urged to use the telephone. He does need very badly to be taught when not to use it, and how to use it expeditiously and get through so that some one else can get a circuit. This is a very delicate matter. Officers do not like to be taught telephone manners any more than they like to be taught grammatical construction of English.

The only effective measure that we could find in the American Expeditionary Force was to build more circuits and then more circuits.

Another American tendency is to want the allocation of individual facilities. The commercial counterpart is the private wire of the brokerage houses and simlar exclusive services. In the American Expeditionary Force we were importuned constantly for the allocation of exclusive circuits. In the early days specialized armies within armies were appearing with remarkable frequency. I remember well an officer who came forward with a demand for an antiaircraft artillery plan that called for exclusive wire and radio nets, covering the whole eastern end of France.

It is just as true in the Army as it is in the commercial world that one great unified system, with fast channels and covering the entire area of activities, can generally give better service to everybody. A multiplicity of circuits insures continuity of operation, and the heavy demand insures the highest type of skill. You travel on the mainline express instead of a local.

Exception is sometimes advantageous in the case of an activity whose business will utilize the entire traffic capacity of a circuit 24 hours in the day. Other exceptions have to be made for certain

activities that occupy a circuit on the alert for occasional service that must be instant.

Even these cases are of doubtful value unless the circuits themselves parallel the channels of the general system.

What I have tried to point out to you indicates, I believe, that we have a very serious personnel problem on our hands in connection with signal communications in the Army. If that personnel be organized, trained, and coordinated in accordance with the experience of the past and the best deductions we can make for the future, then we can face the future with confidence that we are as fit and ready as we can be made.

The old conditions of branch jealousy and selfish contention have largely disappeared. We should be able now to look these problems squarely in the face and seek a solution with but one end in view, the ultimate success of the Army as a whole—as a fighting team.

MAXIM LXVIII

There is no security for any soverign, for any nation, or for any general, if officers are permitted to capitulate in the open field, and to lay down their arms in virtue of conditions favorable to the contracting party, but contrary to the interests of the army at large. To withdraw from danger, and thereby to involve their comrades in greater peril, is the height of cowardice. Such conduct should be proscribed, declared infamous and made punishable with death. All generals, officers, and soldiers who capitulate in battle to save their own lives should be decimated.

He who gives the order and those who obey are alike traitors, and deserve capital punishment.
—*Napoleon's* Maxims of War.

The Tactical Handling of A. A. Units in the Field

A Lecture delivered at the Royal Artillery Institution, Tuesday, 18th October, 1927

By CAPTAIN K. M. LOCH, M. C., R. A.

Colonel H. W. Hill, C. M. G., D. S. O., in the Chair

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CHAIRMAN: The many and various problems connected with Air Defense are of such importance that they merit the most careful study by officers of all arms. Unfortunately, at the present time there is but a limited amount of authoritative literature on this subject, with the result that the basic principles which ought to be observed have not as yet been fully recognized. This applies most particularly to "The Tactical Handling of A.A. Units in the Field." Captain Loch, who is lecturing tonight, has special knowledge of A.A. requirements. In France he commanded an A.A. battery—the first that was formed. Since then he has devoted considerable attention to technical problems and has recently passed out of the Staff College. He is therefore fully acquainted with antiaircraft requirements and with the means by which these requirements can best be carried into effect. I will now ask Captain Loch to give us his lecture.

CAPTAIN LOCH: Gentlemen, despite, or because of what the Chairman has just said, I have been asked to talk to you about "The Tactical Handling of A.A. Units in the Field." The subject is a big one, and accordingly I propose confining myself to the larger aspects of the problem, instead of going into what we might call the housekeeping details of the various A.A. units. These latter are discussed at some length in the A. A. Manual. As regards my lecture, my general premises are, that we are confronted with an enemy possessing sufficient strength in the air materially to interfere with our plans and that the ground operations are on a fairly large scale. If we can get a clear picture of what happens with a large force, we can then easily cut our A.A. coat to suit our purse on lesser occasions.

Much of what I say is, I am afraid, an expression of personal opinion and I hope not entirely for that reason controversial, but I think you will agree that in a new subject, within limits, controversy

is all to the good. When I say a new subject, I would point out that we have now had A.A. units in the army for just 13 years, almost to the very date. The child is growing up; in fact it has left its preparatory school and on the whole is now getting fairly good reports. Be that as it may, I feel that the subject of the tactical handling of A.A. units is best approached by a short discussion on air defense in general, the problems involved, and the means and organization at our disposal for defeating the problem.

Now, first of all, what are we contending with? What are the nature and habits of our adversary—the airplane? Air activities are of two kinds: direct in the form of bombing and sometimes of machine gunning; indirect in the form of reconnaissance and direction of artillery fire. Further, either form of air action is characterized by its speed and, for the most part, unrestricted movement in three dimensions. Another point is that the airplane is unique in the possible radius of its direct action. If reports on a battle-front indicate a new enemy battery or brigade or even a division, whatever the final purport of this information may be, it cannot re-act directly on a place a hundred miles away within an hour's time. On the other hand if I, in the front line, sight a number of bombers crossing overhead, I can be filled with a moral conviction that someone in the back areas is in for trouble and that in a very short space of time, and also that the trouble may have far-reaching effects. This is all very obvious, but its significance, when it comes to our air defenses, is often lost sight of.

Bombing requires targets of a fair size, and when I say this I am in no sense wishing to belittle the very great progress, which has been made as regards the accuracy of bombing. When we consider the extent of the preparations behind the lines necessary to give effect to a commander's plan and to get a force into the field at all, it is, I think, obvious that it is in the back areas that the bomber will find his most remunerative targets—base ports, railheads, etc. On the other hand the bulk of indirect activity, reconnaissance and direction of artillery fire, will take place in the forward areas. Successful bombing implies an attack in force, whilst reconnaissance is largely a matter of individual machines. We may therefore expect in general the bulk of our A.A. defenses to be concentrated around vital points in the back areas, with just sufficient strength forward to cope with our reconnaissance and artillery machines. The problem, however, is not quite as simple as all that. In mobile warfare the relative value of the forward and back areas is constantly changing from an A.A. point of view. For instance, the success of an operation may depend upon troops crossing a river in face of air opposition. Such an operation calls for the

concentration of the air defenses at the period of the crossing. This is only a minor example of a much wider truth—I almost said truism. Let us consider how best the enemy can defeat our efforts by air action at various phases of the campaign. How about interference at the outset, when we cross the seas and try to land? Is it not worth launching a maximum air effort at a time like this? However, let us assume that we survive the landing; there are still plenty of tempting targets —base ports with quantities of stores, railheads, dumps, and finally, on the day of battle, masses of reserves coming up. This picture can be developed to embrace the whole theater of war or only part of it. I think, however, enough has been said to show that the center of pressure of direct enemy air effort, and hence the concentration of our defenses, may change from day to day with the military situation. Our antiaircraft parish, or better perhaps, diocese, covers the whole theater of operations.

This leads up to the first point I want to make as regards the tactical handling of A.A. units. They should, I think, be kept centralized under the control of the highest formation possible, that is G. H. Q. or army control, then to corps, and only very rarely to divisional control. In peace time conditions will necessitate A.A. units training under the equivalent of corps control, and in war a corps would certainly have its quota of A.A. units, but I submit that it is illogical for a corps to regard a certain scale of A.A. units as its rightful portion or to resent their being withdrawn for more important concentrations elsewhere. If we consider carrying out a move of troops on a large scale such as the march of the German 1st and 2nd Armies through Aix-la-Chapelle in 1914, the very highest possible concentration of A.A. defenses of all descriptions would be called for during those 48 hours. Anything less than Army control of the A.A. units would, I think, be untenable.

As to the means of air defense at our disposal: they may conveniently be divided into two categories, active and passive. The active means are:

(1) The airplane.

(2) The gun.

(3) Small arm and light automatic fire.

(4) The A.A. searchlight and its adjunct the sound locator. In addition we must remember communications and their bearing on the employment of our active means of A.A. defense.

The passive means are concealment and protective dispositions and also certain psychological factors, of which more anon. Discussing these a little more in detail:

The airplane.

With certain provisos the airplane is the best means of countering the airplane. Admittedly the major operations of an air force are likely to take the form of a vigorous offensive over the enemy country. This offensive may help us directly by attacking enemy airdromes, but where the enemy has any latitude in choice of airdromes, such attacks will scarcely guarantee us immunity from hostile machines. Personally I think the possibilities of this form of attack have perhaps been a little over-rated. However, in fact, a greater or lesser portion of the enemy air force will eventually have to be met in the air, and the problem is where? Now the trouble of all airfighting is to find your adversary, especially if he is trying to avoid a fight. The ground antiaircraft organization can in certain conditions provide the necessary information as to the whereabouts of the enemy. The question arises at once as to whether there is not a case for using aircraft defensively. Many people object to the term "defensive" being applied to aircraft, so if it is preferred let us use the phrase—aircraft used for local protection. The actual fight in the air is much the same all the world over. There must clearly be occasions in a campaign when immunity from air attack in force is essential, as in the case, already mentioned, of the disembarkation of a force. The Manual of Combined Operations expresses itself in no uncertain manner on the subject. It says: "Lack of antiaircraft measures in a combined operation may jeopardize a whole campaign." If, therefore, our air defensive cannot guarantee us immunity from an attack and the enemy has to be met in the air, is it not better for our aircraft to fight under the advantageous conditions of a prepared battle-ground?

An adequate scheme of air defense should provide these advantageous conditions in the sense of the support of antiaircraft guns and searchlights, and what is perhaps of greater importance, it should include an observer system capable of giving continuous information as to the strength and whereabouts of an enemy. Now what are the limiting factors in the employment of aircraft for local protection, introduced by the necessity of a warning system? Where the aerial activity consists of single machines, as in the forward areas or in night attacks, which at present are not carried out in large formations, aircraft can be used in continuous patrols, that is, if local protection is sufficiently important. In this case the warning need not be so long, and in general the ordinary cooperation between the Royal Air Force and antiaircraft ground units should suffice. In the case of daylight attacks, in the back areas, the raids will be in force and must be met

by force. Here again, if the situation justifies local airplane protection continuous patrols would be extravagant to a degree, and hence our warning system must give the airplanes sufficient time to get off their airdromes and climb to the position indicated. This implies a network of observers some 50 miles round the vital point. Now in an allied country organized on modern lines, this may not be so extravagant a demand as may appear on first sight, and in no sense need the organization be so complicated as that used in home defense, but similar to that of home defense it should be largely a question of utilizing the civil telephone system. Naturally any antiaircraft defenses in the forward areas would assist this organization as much as possible. Unfortunately for various reasons the contents of Chapter III of the Antiaircraft Manual, which deals with the tactical handling of antiaircraft units have been taken to imply that the moves of all antiaircraft units in the forward areas are "cribbed, cabined and confined" by the needs of a vast network of intercommunication. This is not the case, but the more advanced the unit, the greater its potentiality for getting information, and minutes are often vital in antiaircraft defense. The fact that units by nature of their moves and the general conditions in the forward areas will be out of telephone communication for a period is fully recognized. The need for economy and local conditions in the field do not permit of communication to the same degree as at home, but if the need is sufficiently vital, we must be prepared to use aircraft in our scheme of defenses, and with them an adequate warning system. I may say that it was done in France with remarkable success, and although it may seem reiteration *ad nauseam*, I submit that in the case of disembarking an expeditionary force at a port within air range of the enemy, every possible means of air defense must be exploited—they are not a luxury, but a necessity. In recent staff exercises, where airplanes were employed on local protection in this manner, by agreement with the Army and Air Force authorities, the squadrons so allotted came under the tactical control of the air defense commanders.

The A. A. gun.

Our next means of defense is the antiaircraft gun. The antiaircraft gun in use in the field is the 3-inch 20-cwt. gun firing a 16-lb. shell, and capable of engaging aircraft up to about 15,000 feet at a radius of three miles round the gun position. The gun is mounted on a lorry or on a trailer. The lorry gun is restricted to good road surfaces, but the trailer mounting with a satisfactory towing vehicle will, it is hoped, give us the measure of cross-country mobility which we require. It may be said that the 3-inch 20-cwt. gun represents the limit of weight con-

sistent with mobility, but in defenses of a more or less fixed nature, heavier guns could be used with advantage. This is not the time or the place for a detailed discussion as to the effect of modern antiaircraft fire. Suffice it to say that the guess-work conditions of the war have largely given place to instrumental calculations of the elements we require. What this precisely means when translated into the casualties we expect to inflict is difficult to say. Considerable attention has been and is being given to the subject of antiaircraft gunnery, both at home and abroad, and I see no reason for pessimism as regards the progress which is being made. A small point worth remembering—the gun, once it is got into position, a matter of a minute or so, can engage a target in a few seconds, and is perhaps the means of air defense least dependent upon the help of others. Further, when conditions of visibility fail, a gun can always do barrage work, a procedure, despicable from a gunnery point of view but curiously successful in actual practice.

Small arm and light automatic fire.

Now turning to our next means of air defense, the fire of small arms and light automatic weapons: This form of fire is our main weapon against low-flying attack, the main difficulty being to guard against surprise. As you know, practically all units have their own antiaircraft Lewis guns, but in addition we have a number of antiaircraft Lewis gun sections, forming an integral part of our antiaircraft organization. Although it is arguable whether at the outset of a campaign either side will be likely to have sufficient air craft to fritter them away on low-flying attacks, occasions may however arise when an operation has to be delayed at all costs, or when a particularly tempting target may offer itself on the ground. In these circumstances we may expect low-flying attacks. For troops at the halt, or in the defense of bridges and places where traffic congestion is likely to occur, well coordinated antiaircraft Lewis gun and rifle fire is likely to be extremely effective. For troops on the line of march the consensus of opinion seems to be in favor of controlled rifle fire as opposed to Lewis gun fire—possibly with a more handy light automatic this view might change. However, there is no magic or mystery about hitting a low-flying machine; they are often very easy targets. Their strong suit, as I said, is surprise. Apart from surprise really low-flying attack should be, as a French writer puts it, "une mission de sacrifice." To ensure the "sacrifice" being one-sided, we must, however, pay great attention to the training of troops in this form of firing and the development of suitable mountings for the guns. Also we must face the fact more than ever today, I suppose, that the long lines of transport are the Achilles heel of a modern army.

The A.A. searchlight.

The antiaircraft searchlight in its mobile form, as used in the field, is at present the 90-centimeter light carried on the petrol electric lorry. The light in action is used away from the lorry, and the lorry provides the necessary current. Depending upon the nature of the ground, about an hour is required to get the light into action. As searchlights are only used in back areas, this is not such a disadvantage as would appear at first sight. Each searchlight has a sound locator to assist in obtaining the initial direction in which to open the beam.

Passive means of defense.

As to the passive means of air defense: Concealment speaks for itself, and, as you know, considerable attention is given to it during the years of training. In passing we may regard camouflage as a special case of concealment. Now protective dispositions imply avoiding offering massed targets to the hostile airplane. From an air defense point of view we should like every formation to move with protective dispositions and every railhead, dump, etc., to be laid out on these principles. In practice this is not possible, but foresight can do much to eliminate occasions when remunerative targets are offered in the forward areas. In the case of the transportation of a force overseas, and its disembarkation, little can be done in the way of concealment or protective dispositions, hence the onus of protection is thrown on to the active means of defense, and concentrations are necessary. As against that, troops billeted by night should by the nature of their concealment and dispositions be so protected from aimed bombing as to relieve the guns and searchlights to a very great extent.

Now a short word as to what I have called the psychological factors of air defense. Perhaps psychological is the wrong word. However, they lie between two somewhat conflicting extremes, on the one hand increasing the knowledge of the individual about what aircraft can do, whilst on the other preserving in him such beliefs which, however fallacious, subscribe to a sense of security. By spread of knowledge, I mean what an airplane can see, what generally is the effect of low-flying attack against dispersed targets, when is a machine overhead in a position to drop bombs, and when is the trouble all over. I would carry this a bit further. As I shall have occasion to point out, one of the main difficulties facing an air defense commander is not to give way to the demands for protection everywhere. The mere fact of troops being in an area does not imply the necessity for antiaircraft guns in that area.

As regards the other side of the picture: By all means under due control let the individual soldier use his rifle against the low-flying

machine. He then takes to himself, very rightly, a share as regards the responsibility for success or failure. I am not saying for a moment that the material results of such fire may not be considerable as well. When hostile machines have been very active over a certain sector, it may be advisable to make a temporary concentration of our defenses. One hostile machine observed falling in flames is far more stimulating to the local troops than any newspaper reports of successes, however striking, elsewhere. There is one final point in air defense, though I do not know quite under what heading it comes, and that is, that I think it is for consideration whether air attacks have not increased the necessity for the employment of repair units, such as railway and road breakdown gangs.

I have felt it necessary to discuss the means of air defense at some length, so that you may see the whole in true perspective. In peace time we are apt to get into water-tight compartments—guns and searchlights, etc., owing to lack of opportunity for cooperation. Air defense is not a matter of airplanes, guns, or searchlights considered severally. Each means of air defense is complementary to the others, and assists in their working, or may work in conditions unsuitable for the others. Thus well directed gun fire will break up a squadron in close formation, thereby enabling our machines to attack it in detail. Good concealment renders air reconnaissance difficult. The machines have to come nearer, and are thus an easy prey to the guns. However, there are any amount of instances one can quote, but the moral is that all means of air defense must cooperate. Now if in the course of this lecture we boldly take our gun sections into splendid isolation, right up into proximity of the enemy, and away from our other antiaircraft supporters behind, let us remember that our duties do not end in the protection of these forward areas. We must do what we can to warn the back areas, where in all probability the decisive air action, if any, may develop.

Organization.

Ground antiaircraft units are organized into air defense brigades. The Air Defense Brigade consists of a headquarters, two A. A. brigades, R. A., a searchlight battalion, R. E., and an antiaircraft signal company. The artillery brigade consists of three batteries each of eight guns, organized into four sections of two guns each. In addition, each battery has a mobile antiaircraft Lewis gun section of eight guns.

The tactical unit of antiaircraft artillery is the section of two guns; it is a self-supporting unit, and has transport to carry personnel, instruments, and a supply of 240 rounds per gun. The lorry guns, which are still in the service, enable the unit to travel at about six miles per

hour, or possibly ten miles an hour for short distances. The new trailer mounted gun can travel faster. An average say of ten miles with perhaps 20 miles for short distances. The unit consists of about eight large vehicles with a road space of some 160 yards. In action the guns are used in sections, not in single guns, or if not in sections, in four-gun positions if the number of guns available permits. Normally gun stations are about 4500 yards apart. It takes about one or two minutes to get the guns into action from the road. The Lewis gun sections form part of the battery, but as the method of their employment tends to separate them from the battery, they will very often be used under brigade control.

The searchlight battalion consists of four companies, each of 24 lights. The company being divided into four sections, each of six lights. The lights are used singly in stations about 3000 yards apart, a company thus being able to illuminate about 50 square miles or a four-mile radius round a point. Their primary role is clearly to illuminate the target continuously over the area, but in addition they act as posts for the collection of information for section and company headquarters and for the calculation of gun barrages. The company is the tactical unit, and be it noted, a vulnerable point cannot be given an all-round night defense with less than a company of lights. The guns wish to engage the targets at long if not maximum range, and hence illumination must be obtained at the long range plus say at least a mile for the calculations of the data for opening fire. Even a four-mile radius hardly suffices, and to use a few odd lights round a vulnerable point, as was perforce done in the war, is useless, to my mind. Far better to rely on concealment and have done with it. Incidentally, when you cooperate with aircraft by night, a rather greater depth in illumination is required than with the guns.

The antiaircraft signal company consists of sections to assist the artillery and searchlight units, those for the artillery probably being on a despatch rider basis. The company in the main is responsible for telephonic communications between searchlight sections and companies and also batteries to brigades. Clearly the degree to which intercommunication will be possible, depends on the nature of the operations. Our total in the air defense brigade is 48 guns, 96 lights, and, incidentally, 48 Lewis guns.

Employment of A.A. units.

The problem now arises as to how best to use these units. Air defense, as I have already stated, is an area defense, but clearly an area will rarely be of equal value from an air defense point of view.

In one place will be points requiring special protection, whilst elsewhere natural features may make protection unnecessary. Further special antiaircraft protection may be required constantly or only for stated periods, as, for instance, when troops are actually crossing a defile. In the forward areas the problem becomes the protection of a moving area. The distribution of the defenses in the back areas calls for little comment. All that is required is a correct appreciation of the points, the bombing of which will most interfere with the plan of campaign. Where the danger lies there should the defenses be concentrated. The air defense commander must insist on this concentration at the few vital points, even at the expense of leaving other points unprotected. In practice this is no easy matter, and calls for considerable firmness, even to obstinacy. The defense of a moving area is a more complicated problem, and in general the active means of air defense will be confined to guns, Lewis guns, and rifle fire. For the moment we will leave it at that.

Command.

The air defense commander comes under the Royal Artillery commander of the formation to which he is attached. He commands his units and acts as technical adviser to the Royal Artillery commander on A.A. matters. In return he should be kept informed of all operations and the policy of the commander in so far as they affect the dispositions of A.A. units. This may conveniently take the form of short operational instructions from the artillery commander. He should, however, be given a free hand as to his dispositions to cope with the situation. Now under the heading of the information he requires, it must not be forgotten that he is interested as much, if not more, in the arrangements for administrative services as for the fighting troops. In addition there is constant need for liaison with the Royal Air Force, but more of that later. Lastly, but by no means least, he must be kept informed as to the antiaircraft dispositions of neighboring formations.

The control of antiaircraft units should not in fact give much trouble to the artillery commander. Once he has issued his instructions to the air defense commander for a given operation, he should rarely be worried further. His staff may have to assist in certain details as regards arranging ammunition refilling points, for the section of the ammunition columns, which provide antiaircraft ammunition. As regards routine, the main requirement from the air defense commander are his activity reports, both as regards our own and hostile machines. Comparative data as regards air activity and, incidentally, antiaircraft activity, are often a valuable clue to future enemy ground

operations. That was proved on several occasions in the war. The air defense commander, in his capacity as expert adviser, should in close cooperation with the Royal Air Force, do everything in his power to provide the staff with these data.

Advance of a corps.

The protection of an area of movement is, I think, best illustrated by a specific instance. We will assume in this case that a corps is advancing at dawn on a two divisional front, and that contact may be made with the enemy in the course of the march. We will further assume that the corps has been allotted one antiaircraft brigade, Royal Artillery, and one antiaircraft searchlight company with appropriate signals. I do not suggest that in view of the demands of back areas for protection it will often be possible to allot to a corps so many units, but the example will serve to illustrate the principle. Field Service Regulations, Volume II, section 64, lays down that in mobile warfare it will be usual for the army to lay down a line in front of which from a named hour, antiaircraft gun defense will be provided by the corps. This line may or may not put the onus of protecting corps, dumps, etc., on to the corps. I can see occasions when that would be done by the army. Here we will assume that it does, and that the demands of back area defense absorb one battery and the antiaircraft searchlight company, leaving two batteries for the defense of the move. Before leaving the question of back area defense in a corps area, I would like to mention one point. In arranging the lay-out of railheads, dumps, etc., the administrative staffs should bear in mind the needs of air defense. Viewed from this standpoint the realheads, etc., should be sufficiently concentrated to allow of their being covered by the maximum gun density possible, whilst sufficiently dispersed within that area to make unaimed, random bombing unproductive. In other words, protective dispositions should be aimed at. In practice this may be a counsel of perfection, but this in itself is no reason for not attempting to approach the ideal.

The air defense commander.

Returning now to the advance, let us see what happens by way of a preliminary. The C. C. R. A. informs his air defense commander, in this case the artillery brigade commander, as to the scope and nature of the advance, issuing instructions as regards any special points which the staff may have indicated as requiring special attention. The air defense commander, who, by the way, will normally have his headquarters near to that of the corps, then proceeds to make his plan,

usually having told his battery commanders to meet him. Unless there are marked differences between the areas through which the divisions are marching, he may allot a battery to cover each of the divisional areas, but be it noted he does not attach them to the divisions. In addition he has to consider the needs of corps troops. A definite attachment of antiaircraft units to a division will be normally confined to division operating independently at a distance from other units. Now returning to this advance from the map, the air defense commander makes out a general plan to cover the beginning of the advance and roughly indicates the layout at various stages of the advance, with due regard to points requiring special attention. He should avoid, however, interfering with the initiative of his subordinates, only indicating actual gun positions in so far as one battery may be supporting the other. I think it is clear that the protection of a given point in one divisional area may be supplemented by fire from guns situated in the area of the other division, or even of another corps, without weakening the defense as a whole. Having made his plan and explained it to the battery commanders, brigade orders can be written to put it into effect. Incidentally the employment of the antiaircraft Lewis gun sections should not be forgotten.

The battery commanders.

The battery commanders should visit the divisional headquarters with whom they are working, and find out if they have any special requirements as regards air defense. Should these requirements materially alter the brigade commander's proposals, the matter should be referred to him. So much for the preliminaries to the advance. Naturally, had it been an advance out of touch with the enemy, the problem of moves of sections is very much simplified, and much can be done beforehand in the way of reconnaissance of routes, etc. However, whether interference with the enemy is expected or not, I think there is a case for the air defense commander being told early what he has to do. A small point: In the case of a move at dawn I think it is advisable to get your guns into the preliminary positions the evening before.

A. A. paragraph in formation orders.

Before leaving the preliminary arrangements, there is just a word I should like to say about the air defense paragraph in formation orders. It ought to be very simple, and as regards corps orders I would suggest something as follows: "O. C. 1st A. A. Brigade, R. A. will detail two batteries to cover the advance of the First and Second

Divisions. He will continue to provide day and night defense of the railhead at X." As a result we might find in First Division orders, under information something to this effect: "The advance of the division is being covered by the 1st A. A. Battery, R. A. The A. A. Lewis Gun Section of the 1st A. A. Battery, R. A. is covering the bridge at Y during the passage of the main body." In all cases avoid filling up formation orders with long lists of gun positions; they are of no interest to anybody and are probably inaccurate.

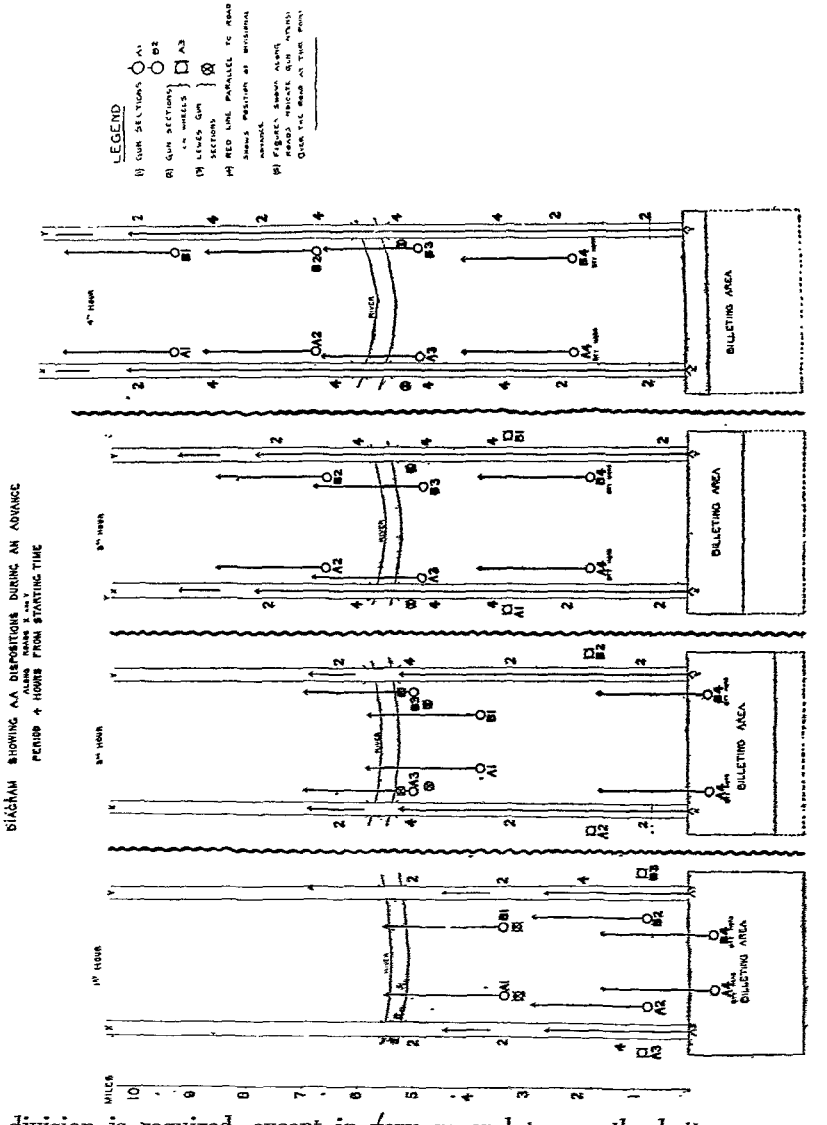
The advance.

Now we come to the advance itself. Our guns cannot accompany the columns and drop into action at a moment's notice; hence our system must be one of picketing the route as opposed to escort work. Now assuming a column advancing at a rate of two and a half miles per hour and that an A. A. gun covers about that amount, we are faced with a move of one section or other once per hour. I would ask you to look for a moment at the diagram. It shows the advance of the corps along two parallel roads and the A. A. dispositions to cover it at various phases of the advance; that is to say, four phases are shown, covering four hours. The corps starts off from its billeting area and gradually marches along two parallel roads, and about five miles from the start we come to a river which has been indicated as requiring special protection. If we were marching out of contact with the enemy it would be perfectly easy to establish a strong protection at those bridges straight away. As it is we cannot go in front of the advance guard, and so we have to use the gap between the advance guard and the main body; but judging from the number of people who want to do the same, I doubt rather there being a gap there at all. However, what happens is that the sections move up successively, and in that diagram we had a bit of luck because in the fourth hour they get into the same order as they started with. I think it is clear that a certain number of guns will always be on wheels, and I think with a good A. A. plan there is no reason for there to be more than a quarter of the guns on wheels at any given time when protecting a column moving at 2½ miles per hour. So much for the diagram.

Moves of A. A. units.

Let us consider how the moves are put into effect. As a result of hearing the brigade commander's plan and a subsequent visit to the divisional headquarters, the battery commander can issue order for the advance to the section commanders. The advance begins, and the sections gradually move forward. The battery commander should, in

general, keep in close touch with the divisional headquarters, particularly as regards getting leave to move his sections. If the advance proceeds according to plan, it will be rare that any ruling from the



division is required, except in very general terms; the battery commander must, however, insure that none of his moves is in any way likely to interfere with the moves of the main column. The moves can be carried out in four main ways: (a) by utilizing alternate routes;

(b) by passing troops on the march if it is a two-way broad road; (c) by utilizing the hourly halt to get forward, and (d) on rare occasions to form part of the column for short periods. If we can use alternate routes, there is no need to worry the division about moves other than as affected by changes in the situation. If roads are broad, only the general consent of the division is required. This also applies to utilizing the hourly halt. Troops will be accustomed to seeing A. A. sections passing them and, after all, it is a comparatively rare spectacle. In an advance of 10 miles there would only be about three occasions when a section goes by; it does not take very long. On rare occasions it may be necessary to insert the sections into the line of march for short periods, such as possibly the crossing of a narrow bridge. This needs careful coordination with the staff of the formation concerned, and really the solution nearly always lies in utilizing the period of halt. Once the advance has started, the battery commander communicates with his sections by dispatch rider. As regards the rear sections, he will generally be able to order individual moves or control them by a timed program. The forward section commander, however, requires more latitude in this respect. He knows his battery commander's plan and is in touch with the situation in front which may be changing very rapidly. The ideal for the battery commander, as I have already said, is so to arrange not to have more than a quarter of his guns out of action at any given time, and as a general rule the positions in front will later be occupied by sections coming up from the rear.

A. A. section officers.

A word as to section officers. There are two officers on the strength of a section, and when we consider the nature of their command, the necessity for these two officers becomes apparent. An A. A. section is a very independent command; it may be separated by a considerable distance from its headquarers. In fact, the section of A. A. guns corresponds in a sense with the battery of other types of artillery, whilst the A. A. battery headquarters corresponds in the same sense to, say, a brigade headquarters, in that it has to look after four separate units separated by some distance. Further, the hours of duty in a section are long; in summer daylight lasts roughtly from 2 a. m. to 10 p. m., and you have got to be, in fine weather, on the alert the whole time. Experience in the last war showed that one officer could not carry on satisfactorily for this reason alone, apart from his many other duties. I only mention this as in the nature of things, as time goes on, there are fewer and fewer people who have had war ex-

perience of an A. A. section, and the difficulties of the subaltern are apt to be forgotten.

A. A. reconnaissance.

Returning to the question of moves of sections, one of the most important duties is that of reconnaissance. A section arrives in a position, and at once what we may term local reconnaissance is carried out—that is to say, alternative positions are found, so that they can be occupied if you are shelled out of the first one. Then follows the more distant reconnaissance of the next position forward. This implies the selection of the position itself and the routes leading up to it; also positions should be looked for *en route* in case the section cannot get forward according to plan; it may find that it has to halt, but it must get into action. In general it may be said that by the time the distant reconnaissance is complete it is usually time for the section to move. Hence considerable practice is needed in such duties, to prevent waste time. There is no time here to go into the numerous other duties of the section officers, occupation of positions, fire control, ammunition supply, keeping in touch with the battery commander; they are all dealt with in some detail in Chapter III of the "A. A. Manual." Suffice it to say that I am convinced that the success of A. A. operations lies very largely in the hands of the section officers and, as stated above, the section is a peculiarly independent command.

A. A. units in a retirement.

The procedure during a retirement is much the same as in the advance. The feature of a retirement from an A. A. point of view is the possibility of traffic congestion at more or less unexpected places in the forward area. The enemy may launch air attacks in considerable force against these congested areas with a fair chance of wide-reaching effect. Such a possibility may justify a considerable concentration of A. A. guns in the forward areas. The R. A. commander should issue instructions governing these special dispositions.

A. A. Lewis gun sections.

A. A. Lewis gun sections are designed to supplement the A. A. Lewis guns of units or to provide defense against low-flying aircraft in areas otherwise unprotected. In the example I have shown of the corps, we actually put our A. A. Lewis guns at the bridges straight away, and that may perhaps give a wrong impression. As you see, they are shown as part of the battery organization, but they are a very mobile unit, and for that reason may be employed in several places in one day, often covering considerable distances. They will frequently, if not normally, be separated from their parent unit, and hence will

often be brigaded under the A. A. brigade commander. Now in action the A. A. Lewis guns are used away from the vehicles, and the vehicles must stop, and the detachments dismount. The Lewis guns are thus virtually used in the same way as the A. A. guns, *i. e.*, to picket the route. Therefore, we are only a little way on the road to an antiaircraft escort for our columns. I submit that there is a case for a multiple mounting on the vehicles themselves, capable of holding, say, four guns. On this basis, in general terms, you can double your gun power, whilst actually reducing your personnel. In addition, the firing and sighting is facilitated, and, with such vehicles, you could accompany the columns on the road and be a more efficient weapon when employed at the halt in defending bridges, dumps, etc. It is significant, I think, that such mountings have undergone a successful trial abroad, and I would point out that in this case the time of coming into action is merely the time required for bringing the vehicles to a halt—a most valuable consideration where seconds are important. Given this, we are on a fair way to our antiaircraft escort.

Communications.

Before entering on this vexed question, I would remind you of an earlier part of my lecture, in which I said that all means of air defense are complementary in helping each other. In the advance which I have described we have largely talked of guns. When we consider the importance of back areas, base ports, etc., and the speed at which air attacks develop, the need for communications is immediately apparent. Not only is this necessary to help the active means of defense, but it enables a great deal to be done in warning civilians and in the control of back area traffic, that is, in enabling the adoption of protective dispositions. At home we can afford to have an elaborate system of communications, each individual gun and light station being connected up to its parent unit. In passing, be it noted, however, that the object of being able to talk to such and such a gun or light is only in a very minor degree due to the hope of being able to help its individual activities in action. It is all dependent on this need for information and warning.

In the field we cannot hope for, nor do we attempt an elaborate system of communications unless static conditions prevail; but the general need for warning is perhaps just as strong. The moment we get a chance, we should tend to link up our defenses, and it is only in the case of a rapid move that the advance elements of the defenses should not be able to contribute their quota towards the general information required. During an advance it should be possible, I think, for

brigade headquarters at least to act as a forward post for collecting information for the benefit of the back areas. It may be that the air activity in front of the brigade headquarters can only be judged generally by the shell bursts of the advanced sections, but even this may give the few extra minutes warning which are so vital. Common sense can, I think, discriminate between local air activity and that which is obviously directed against objectives in the rear. The extent of communications is clearly bound up with questions of practicability and economy. Each set of circumstances requires its own solution, and our present signal organization gives us, I think, the required elasticity to meet the variety of circumstances. My own feeling is that the scope of A. A. communications should be a matter for G. H. Q. instructions and, be it remembered, that what we spend on communications we may, I think, hope to get back several times over in orderly working of the back areas.

A. A. problems of the future.

Finally, a few words as to the future. What I have described up to now has been the protection of a body of troops moving at two and a half miles per hour. There are, I think, two problems which confront us in the future: (1) the protection of a mechanized force; (2) the protection of operations under conditions such as mountain warfare. I do not pretend to offer a final solution; I only hope to indicate some of the problems involved. Taking, firstly, the defense of a mechanized force, or, as far as we are concerned, the protection of a rapidly moving force, we have seen that with an A. A. battery we can cover about 10 miles of column which is moving at two and a half miles per hour if we keep a quarter of our guns out of action. If we double the rate of the columns of the main body, five miles an hour, we have 50 per cent of our guns out of action, and only cover seven miles with a battery. If we go up to 10 miles an hour, the whole question of being able to protect that column by successive picketing falls to the ground with a crash. In the case of fast moving columns, therefore, all we can hope to do with A. A. guns is to protect the passage of the columns through defiles or when at their assembly point. The main thing, of course, is to establish the defenses at the right place at the earliest opportunity. Unless the guns can go in the columns themselves, this may produce a need for further means of local ground protection for the A. A. section, but I think that is another story. Before passing on I would suggest to you the possible value on such operations of multiple antiaircraft Lewis gun mountings on self-propelled vehicles.

A word as to mountain warfare. This generally presupposes comparatively small air forces, and these operating from known airdromes. Thus at once intensive offensive operations of aircraft against these airdromes would seem to be our main A. A. action. The back areas may, however, need the ordinary A. A. perimeter defense of guns and searchlights, as apart from the actual results from air attack by individual machines, bombing may have an especially important bearing on prestige and morale. The advance of a force in the mountains in the face of the enemy can hardly be supported by pickets of A. A. guns, nor can an illuminated area be made round the camps. I am inclined in general terms to have a few A. A. guns, plus a searchlight or two, for use in the camp itself. One of the most lowering effects on morale is an air attack without any local counter measures at all. This was proved time and again during the war.

I am afraid I have already taken up a lot of time, but custom has it to close down on some sort of conclusions derived from what has gone before. I think there are a few points to which I should like to give special emphasis, which, to use a musical expression, should be the *leit motifs* or recurrent themes in all A. A. operations, and these are, I think:

(1) Consider the needs of the theater of war as a whole, bearing in mind how these needs change from time to time.
(2) Utilize all means of air defense at your disposal and to their mutual advantage.
(3) Go for concentration at the vital points, and as a corollary avoid dispersion at all costs.

CHAIRMAN: Gentlemen, are there any questions to refer to the lecturer on the many interesting points he has raised?

GENERAL ASHMORE spoke shortly on the air defense at home and the work of the Observer Corps. He suggested that, in view of certain eventualities, regular air defense units should be conversant with their methods.

COL. COMDT. S. W. H. RAWLINS: I should like to touch upon one point the lecturer made. He stressed at the beginning of his lecture the importance of centralized control, a principle with which everybody must necessarily be in agreement; I am. But I am not sure that he really quite appreciated or at any rate, if he did appreciate it, that he impressed sufficiently on his audience the very close touch between A. A. and divisions that must exist in the defense of a corps in movement. This year maneuvers were extremely interesting; unfortunately they were cut short, but this was the first occasion on which I believe,

at any rate in peace, A. A. batteries worked under C. R. A.'s, and as far as I know they worked very successfully. But I think that the modern tendency, with the progress of mechanization and the power of the machine gun, is to use as many roads as possible, and that has a twofold effect, upon both of which points the lecturer touched; I only want to stress them. Firstly, while the corps will issue the orders for the movement of divisions and the C. C. R. A. corps and the A. A. commander can get out their general orders, there will probably be some considerable time before not only the division but brigade groups have got out their orders and before anybody can say what roads will be free or otherwise for A. A. movement and what are the vital points in which not only divisional commanders but possibly brigade groups commanders are interested. Therefore this touch with the division must, I am sure, be very close and continuous. In this connection, I remember that the lecturer several times spoke of touch between the A. A. battery commander and the division. I take it that, in view of recent ruling, he envisages touch between the battery commander and the C. R. A.

CAPTAIN LOCH: That is what I meant to imply if I did not say it.

COL. COMDT. S. W. H. RAWLINS: One other matter. I had very little experience of A. A. work this year, but there is the question of A. A. battery movements, and I want to stress what the lecturer said with regard to the matter of a gap. He is perfectly right; everybody who has got an awkward unit to put into that gap is going to do so—the A. A. units and divisional headquarters and anything else that is out of the immediate picture and that has not got its proper place. I doubt whether side roads will be available as a rule or whether any gap will usually be available. I think the answer must be that, as a rule, A. A. units will have to move during the hourly halts.

COL. COMDT. E. O. LEWIN: I would refer to a remark made by General Ashmore with regard to the regular antiaircraft units at Aldershot, and then to certain remarks by the lecturer on the subject of control and communication. If we could picture our army going into a continental war on the scale of the last war in a highly civilized country with large numbers of civil communications, it is quite practicable and very possibly advisable to introduce the system of control that is being used by General Ashmore in the defense of London, but you cannot prepare and train a small portion of your regular army for one type of war, what I call static continental warfare, and the rest of your army for highly mobile warfare in semi-civilized countries. Therefore at Aldershot we are in process of trying to find out what part of the system in use at present in the antiaircraft world is suitable

for really mobile warfare. Let me take one example—I do not want to go into technical details: The system in use by the searchlights in the Territorial Army is certainly not applicable to conditions in the field owing to its dependence on elaborate communications. We are in process of evolving a system which will be, I hope, as efficient but will not necessitate these communications. We have got to picture many weeks of war, I think, before we shall settle down to a condition where we can think of communications from individual searchlights to a center and possibly even from the section center to a company; but I do not want to go into elaborate details with regard to communications. I will only say with regard to them that from our experience this year —and we have tried several forms of withdrawals on a corps front, advances and so forth—we are convinced at Aldershot that for many weeks of war and for the opening phase at any rate we must rely almost entirely on the D. R. service. We can only use cables where the general signal service will admit of it. In the picture the lecturer drew of the corps advancing, I visualize the battery commander at divisional headquarters close to the C. R. A., and at the corps headquarters the A. A. brigade commander sitting alongside of the C. C. R. A. There is one other point, if I may go a little farther, with reference to control. The lecturer pictured the A. A. brigade commander giving general indications to his battery commander and giving him a very free hand as to the positions of the sections and their movement. Earlier in his lecture he stressed very rightly the fact that this defense is an area defense. Now in our opinion at Aldershot—and I think Colonel Rawlins will agree with me in this—it is rightly an area question and you cannot leave too much freedom to your battery commander in the forward areas as to the sites that are to be occupied by the guns; the whole corps area must be organized on an area system, and that can only be done at headquarters. When there is movement going on, what you leave to the battery commander is exactly when the move takes place. Where he goes is part of your plan and is worked out at headquarters; 200 or 300 yards this way or that way is of no great matter. He is told to go to a certain area and to that area he must go if he is going to fit his guns into their proper places in the scheme of defense. Now with regard to when to move and by what route, Colonel Rawlins said the A. A. battery commander must go to the C. R. A. and I entirely agree. The lecturer drew attention to the fact that there were several alternatives given for the movement of guns, and I think he put first, as is put in the book, that side routes must be used. Our experience on maneuvers this year was that if you adopt that as your first line of advance for your A. A.

units, you are going to have a far bigger percentage out of action at any one time than you can afford, and we are convinced that we ought to regard these antiaircraft guns, particularly as they are small in number, in the light of fire engines and that they must be given priority along the main roads if the army is going to be properly protected against A. A. fire.

I have a number of points that I would like to have spoken about, but I only want to deal with perhaps two more. The first is that the lecturer said he did not regard it as right or sound to protect with searchlights a vulnerable point using less than a company. Now for two and a half years, I think I am right in saying, during the war there was in the first army area a most important steelworks called the Isbergue Steelworks, and they were protected throughout that time by a very small number of searchlights and a very small number of guns and were never hit by bombs. I quite agree with the lecturer that if you are designing the defense of a railhead on broader lines you want a full company of 24 lights, but I think it is quite likely as part and parcel of your searchlight scheme of defense you may protect certain very vulnerable points by a very few searchlights and a very few guns.

The other point was the question of antiaircraft Lewis guns. I gathered—I may be wrong—that the lecturer regarded the duties of these A. A. Lewis guns which form part of the A. A. batteries as available for the protection of units and formations in the forward area as one of their tasks. That is true; but their primary task, in my opinion, is the protection of those troops in the corps area that have no other means of protection against low-flying aircraft, and I would like as often as I can to give a warning with regard to the forward area that owing to the small number of these A. A. Lewis guns they will rarely be available for the protection of troops who have their own means of protection, and attention must be concentrated on the organization of these means in the belief that there will be very few of the A. A. Lewis guns of A. A. units available when they come to warfare, because they will be wanted for protecting ammunition columns and other columns in the back area.

COLONEL NIVEN: On that last point about the control of the antiaircraft Lewis gun sections, I understand that they are under corps control. I should think that as they would be bound to be cooperating with Lewis guns of other arms, they should not be under corps control, but under local control.

COLONEL E. O. LEWIN: Our recommendation, I think, this year is that all these antiaircraft Lewis guns when we go to war will be brigaded under the brigade commander and that they will be taken

away from batteries; and they will be left only with those guns that they require for their own immediate protection. They would be disposed under corps arrangements; if the needs of cooperation demand it they can be placed under the lower formations.

GENERAL ASHMORE: On the question of communications Colonel Lewin went into, I quite agree with him that in such a war as he depicted in a savage country, a wild country anyhow that has no great capital to be defended and has no great munition areas on which the war and the subsequent peace may depend—in such a case there will be no great target for bombing, apart from the army. Therefore the army will be able to give its whole antiaircraft strength to self-protection. But, on the other hand, if you are taking part in a great European war, with a vital capital and with great industrial areas that need protection, then I think it will be absolutely necessary to have such a system of communications, and that the army in the field should come into that system. The targets will induce bombing, and there will be a great system of air defense. I cannot see any government hampering its air defense by allowing the zone of the armies to be blank as far as information about raiding is concerned.

CHAIRMAN: Well, gentlemen, there are only a couple of remarks I would like to make, and the first is about the air defense commander. In war he has a very, very full-time job. One of his duties is to keep in touch with corps and divisions. Keeping in touch is, on occasions, a highly exciting occupation, as for example, immediately after the corps commander's pet dump has gone west. At all times he has an immense amount of work. A. A. dispositions have continually to be modified to meet changing conditions, and much depends on his system of obtaining and rapidly distributing to the proper centers all air intelligence. The other point is that at the present time very great uncertainty exists as to the correct procedure in the tactical handling of A. A. units. There is too much diversity of opinion as to when A. A. units should be allotted to formations. The basic principle might be that either (*a*) A. A. units will remain under the air defense commander for as long as he can reasonably command them, or (*b*) A. A. units will be allotted to other formations at the earliest possible date. This is a question for the General Staff to decide and when once decided very good reasons would have to be adduced to warrant deviations from that ruling.

It now remains for me to move a hearty vote of thanks to Captain Loch and to congratulate him on his extremely interesting and entertaining lecture.

Recent Developments in Antiaircraft Artillery

By LIEUTENANT COLONEL W. S. BOWEN, *Coast Artillery Corps*

1. MATERIEL AND METHODS

a. Guns—For antiaircraft guns, the main problem is to determine the future position of the target and then to burst a sufficient number of shells in that immediate vicinity to ensure at least one hit. The target's "future position" may be stated as the point in space to which the rate of travel of the airplane will take it, on its present course, in the time of flight of the projectile plus the dead time of observing, calculating, loading, and firing.

The 3-dimensional motion and the very high speed of the target, together with the short time available in action, put the problem of AA gunnery in a class altogether different from ordinary "flat" gunnery. The triangles to be solved, for example, are spherical triangles.

The three elements that fix the future position of the target from the gun are the lateral deflection, the vertical deflection, and the fuze range. Laterally, if the target is found to be traveling 4 mils in a second and the time of flight plus dead time is 20 seconds, the deflection for travel is 80 mils. Vertically a similar deflection is obtained. These deflections are corrected for wind, drift, density of the atmosphere, and variations in muzzle velocity, and the gun is laid accordingly. That fixes the *path* of the projectile. Fuze range is the time of burning of the time-train fuze and varies with the altitude. When determined, the point on the trajectory at which the shell will burst is fixed. So we have the three elements that fix the future position, and the ballistic corrections to burst the shell there.

Time is of great importance. A target flying 100 miles an hour travels 1000 yards in 20 seconds. Up to this past year we have used 8 seconds to read the scales of the computer, telephone the deflections and fuze range to the guns, set them off there, cut the fuze, and load and fire. Those things that operate to reduce the predicting interval result in a triple gain in the probability of hitting. First, measured rate of travel is multiplied by a smaller number. There may be some error in measuring the rate, and the less we multiply it the better. I mentioned a travel of 4 mils per second for 20 seconds; if that 20 seconds can be reduced by cutting down the dead time, the multiplier is reduced. Second, the opportunity for the target to change course is reduced as the time is reduced. Third, the smaller the time the projectile is in the

air, the smaller are the corrections for wind, density, and velocity; and being smaller there is less result from any error made in observing these conditions or in calculating their effect.

By the use of electric data-transmission dials instead of the telephone, dead time has been reduced from 8 seconds to 1½ seconds. In the case of the target flying 100 miles an hour, the future position is 675 yards ahead of the present position instead of 1000 yards.

There is also a gain in the use of the Case III follow-the-pointer system, in the fact that the gun is fired at the instant for which the data are computed. The 8 seconds of dead time formerly allowed was an average; the gun might be fired in 6 or not until 10 seconds. The variation of a second or two from the predicted time might involve an error at the target of as much as 100 yards. With the follow-the-pointer system the gun is always laid, and there is no appreciable variation from the 1½ seconds of dead time allowed, because the operations of loading and firing follow each other smoothly, and are so brief.

A third gain this past year is in muzzle velocity. The new 3-inch gun has an initial velocity of 2600 feet per second, as compared with 2400 foot seconds for the previous model, designed during the war. At a slant range of 6500 yards, as an example, the time of flight is 16 seconds for the new gun and 17½ seconds for the old, a reduction of about 10% in the time that the projectile is in the air. By this increase in velocity, the accuracy is increased; and in the case of the target traveling 100 miles an hour the future position is again brought closer to the present position. It is now 600 yards ahead instead of 1000.

The gain in accuracy resulting in reduction of dead time, use of the follow-the-pointer, and increase in muzzle velocity resulted in doubling the average percentage of hits obtained in 1926 over 1925, although the ranges fired at were longer.

A new development this year in the direction of increased accuracy is the device known as the torque amplifier, by the use of which the battery is operated automatically from a distant station. The torque amplifiers are driven by small electric motors and keep the gun set continuously at the proper elevation and azimuth. The importance of this development is in reducing the chance of personnel error. The pattern of the bursts is noticeably more uniform than the pattern made when firing with the follow-the-pointer system, and this is a better pattern than when sights are used.

Next in importance to accuracy comes *volume* of fire because it is desirable to be able to engage a second target before it can arrive at a point where it becomes dangerous. Development of the continuous fuze setter and of the automatic breech mechanism of the gun have increased the rate of fire over one and nine-tenths times. The average in 1925 was 43.4 rounds a minute from a 4-gun battery; in 1926, with the new materiel, it was 76.6; in 1927, the average rate of fire was 91.8 shots a minute. The rate has gone as high as 110 rounds per minute; 84 rounds is easily maintained and is now regarded as a standard rate. Stated otherwise, in 1925 a 4-gun salvo was fired each 5½ seconds; in 1926 each 3 seconds; and now one is fired each 2.9 seconds.

The accuracy of fire being doubled and the rate of fire being increased over 1.9 times, the result has been that the number of hits in a given time was 3½ times as great in 1926 as in 1925. The 1927 results show no marked changes in accuracy from the preceding year; we have about stabilized in the average percentage of hits. The average in 1925 was two hits per battery per minute. In 1926 it was 6.9. In 1925 there was a hit each 30 seconds; in 1926 there was one hit each 9 seconds.

I should like to point out what these figures mean in comparison with what we saw in France. The batteries there were of two guns, and as the guns used in the Fort Tilden firings in 1925 were manufactured during the war, we may take the rate of fire developed during that extended test as representing about what was attained during the war. This rate at Tilden was 43.4 shots per battery per minute, or 11 per gun per minute. With the 2-gun batteries of the war, this would give 22 shots per minute. The present rate is 84 shots per minute. The percentage of hits at Fort Tilden was 4.67; at Aberdeen last year it was 9.15. Taking the Fort Tilden rate and accuracy of fire and applying it to a 2-gun battery, we get one hit per battery per minute of fire, as against 7½ hits per battery per minute with the present 4-gun battery.

In any system of target practice we must have a target. In antiaircraft target practice this target is a cloth sleeve towed at the end of an 1800-foot cable. This sleeve is used merely as a reference point, a point moving in space, and bursts are scored as hits if they occur at the proper distance from this reference point.

Fragmentation tests were held in 1925 against live planes with engines running, placed at varying distances from the point of burst of the shells, and screens also were so placed as to catch the fragments and determine the pattern of the burst. This determined the size and

shape of the hypothetical target. There has been a good deal of public discussion of hypothetical hits and a tendency to picture them as something less real and substantial than a hole in the target. We use shrapnel in target practice but shell in war, and so we use the puff of smoke of the shrapnel as showing the point of burst and use the danger space of the shell, measured from that point, as the target.

It has been said that the human race began to make rapid progress when they began to make precise records. For over two years we have been working to develop photographic means of determining the deviations in target practice, in order to have an absolutely reliable record of the results obtained. There has been the feeling that if deviations in target practice could be measured accurately, improvement might be expected. A moving picture camera is mounted parallel to a telescope whose cross-hairs are held on the target. One such camera is used at the battery, and one posted several miles away to take photographs approximately at right angles to the plane of fire.

The 105-mm. gun was fired for the first time last year. It is suited to fixed defenses rather than for mobile use. The projectile weighs 33 pounds as compared with 15 for the 3-inch gun, and this large amount of metal gives a danger volume 1.8 times that of the 3-inch shell. The rate of fire is yet to be determined but enough is known to base an expectancy of 14 rounds per minute. The 3-inch gun fires 21; so that the volume filled with fragments from a 105-mm. battery at 14 rounds per gun per minute would be 1¼ times that from a 3-inch battery. The range of the 105-mm. gun is 14,000 yards vertically and 20,000 yards horizontally, but is limited at present by the time-train fuze.

The accuracy of the gun is naturally greater because of the heavier shell and because the velocity is 2800 foot seconds as compared with 2600. The probability of hitting is also increased with the decreased time of flight. In the case spoken of before, where the slant range was 6500 yards, the time of flight for the old 3-inch gun was 17½ seconds and for the new 3-inch gun 16 seconds; the time of flight for the 105-mm. is 11 seconds. The target that could fly 1000 yards during the predicting interval with the old 3-inch gun, could fly 575 with the new 3-inch. With the 105-mm. gun the distance is only 375 yards.

b. Machine Guns.—With machine guns, some progress has been made this year. Since the war, four successive tripod mounts for AA machine guns have been developed. The first model was light and permitted too much vibration. The next was made quite low in order to eliminiate excessive vibration, but it was found inconvenient for the gun pointer. It was found that to hold accurately on a target moving

100 miles an hour or more, at short ranges where the angular velocity is great, the gun pointer can not be placed in a crouching or kneeling position; he must stand and the mount must be entirely convenient for him. The third mount was high enough for him to stand but vibrated too much. Then a truss was built across the legs of the tripod and this made a highly satisfactory mount for the .30-caliber gun. It was not satisfactory for the .50-caliber machine gun, still vibrating excessively. This year a tripod mount was designed especially for the .50-caliber gun, and so far as tests have progressed it appears to be rigid and satisfactory.

Similarly, a long series of models of machine-gun sights underwent test and rejection, until last year when for the first time one was designed that met requirements. By the end of 1926 we could say that fire up to about 500 to 700 yards was very effective. At 700 yards, for example, the platoon of four guns had an expectation of getting 60 hits on an enemy attack plane in 30 seconds. At these shorter ranges, tracers are used to direct the fire.

The guns are perfectly capable of effective fire up to about 2000 yards; but even with officers and men of long experience, antiaircraft machine-gun fire always fell off in accuracy as the range increased beyond about 500 to 700 yards. It was realized two years ago that instrumental control was needed to make the guns effective up to the full range of which they are capable.

A machine-gun data computer was therefore designed, and was tested in 1926 but found unsatisfactory. By the end of that year, however, the basis of design of the needed computer was understood, after the period of experimenting which unavoidably had to be gone through.

There are now under test two new computers which promise to improve the hitting at the longer ranges. One is the Frankford Arsenal Machine Gun Data Computer with Sperry Data Transmitter. The sight on the gun has two deflection scales, one for lateral and one for vertical deflections. There is a follow-the-pointer dial for each one, moved by the data computer. The other new instrument is the Vickers Machine Gun Data Computer, which uses its own data transmission system.

At the shorter ranges, within which no computer is needed and tracers are used to control the fire, the rate of hitting is substantial. The progress that is being made consists in pushing further out the point at which accuracy falls off rapidly. The target is taken as the area of a pursuit plane less the wings.

A new development in 1926 was the multiple mount for either caliber .30 or caliber .50 guns. The mount was a first approximation and is unnecessarily heavy. There is less dispersion in firing from this mount than from the tripod; the cone of bullets is more concentrated. The four guns fire 1700 rounds a minute.

It is quite probable that the multiple mount may displace the tripod entirely both for use in the field and in fixed antiaircraft defenses. Mounted on a trailer, with the computer and height finder in the towing truck, this unit can take its place in a motor column, and with about two such units in a mile of motor transport, there should be provided a reasonable defense. An animal-drawn cart and trailer should be practicable for use with field trains, since the weight can be less than that of the 75. At present, each machine gun is carried on a truck, ready to fire. Trial has shown that no damage results from road-hammering; and dispersion tests show no difference in dispersion when fired from the truck.

c. Searchlights.—For firing at night, the 60-inch searchlight is used to illuminate the target. Four lights are placed at the points of a square around a gun battery, about 1500 yards out from the guns, and the sound locator is paired with two out of each four lights to direct the beam.

The searchlight is carried in a light truck which also carries the crew and enough telephone wire to connect the light with the gun battery which it serves, although this connection is not essential. The engine of the truck drives the generator which supplies current to the light. The progress made during the past two years consists (1) in securing two successive models of searchlight; (2) in obtaining two successive greatly improved models of sound locator; (3) in electrically connecting the sound locator and light; (4) in the adoption of the single-station method of sound locating; and (5) in the development of precise methods in aerial sound ranging.

The searchlights used during the war were very good lights of an open "dish-pan" type. The barrel or drum type was found better and the first of these was delivered in April of 1926. These new lights, which use 150 amperes of current, are much more powerful than the dish-pan lights, and they are equipped with distant electrical control—that is, there are small motors in the base of the light, and an operator at a distance of 100 yards or more handles the controller. The importance of the distant electrical control is in the fact that the beam dazzles an operator standing close to the light. In one test using hand control,

the observers in the airplane reported that the searchlight was on a number of times, but the operator at the light did not know it. *Now*, when the beam touches the plane, the distant operator sees it and has no difficulty in keeping on.

There was also delivered last year a 250-ampere 60-inch searchlight, of the same type as the model just mentioned except that the lamp itself, the carbons, are of greater capacity. This is a very powerful light. It has ten times the area of effective illumination, at any given distance, of the 1925 light. As fast as procured, it is planned to use these 250-ampere lights as pilot lights to pick up the target and the older model as illuminating lights to take over from the pilots while they search for hostile planes.

The new T-3 Sound Locator now being tested is a more precise instrument than the T-2 and is more rugged. The flat surfaces of the rectangular horns cause less wind whistling. The Sound Lag Corrector Tl, built into the sound locator, corrects for the known variables affecting sound; it carries out for the searchlight the functions performed by the computer for the guns.

Electrical connection between light and sound locator was provided in 1926. As the horns move, the beam moves. No calling out of azimuths and elevations is necessary as was the case; and the dead time involved in reading and setting data is eliminated. The same gain is obtained in the use of this electrical connection as was obtained for the guns by the use of the follow-the-pointer dials.

The fourth advance is the adoption of the single-station method of using the sound locator. Up to August of 1925, when some trials at Camp Dix showed the system to be too slow, two sound locators were used at the ends of a baseline, and azimuths and elevations were telephoned in to a central point each ten seconds. At this central point the course of the target was plotted and a prediction made of its future position. The lights were laid on this predicted point and turned on; but so long a time was consumed in these operations that the plane often had changed course, and only its general location was obtained. The method was accurate, but too slow. In that month, the single-station method was adopted.

To locate the target by the single-station method, the altitude is estimated (as being in a zone "high," "medium," or "low") and the angle of elevation is read from the sound locator. That gives a right triangle. The azimuth is also read from the sound locator. Both elevation and azimuth are corrected at the horn, and the searchlight is turned on. If the system were perfect, the target would always be seen

in the beam when the lights come on. As it is, the target is either in the beam or near it; and as there are two pilot lights working together, an intersection is formed which defines a point and the searching lights locate the target by searching in the vicinity of that point.

The fifth accomplishment in searchlight work has been the intensive study of aerial sound ranging. It was thought practicable to direct the searchlight beam on sound-locator data, corrected for atmospheric conditions, just as a heavy gun is fired on position-finding data, and with similar accuracy. A year's work has shown that certain meteorological conditions only need be corrected for. These have been evaluated; and now an automatic computer has been designed, to provide *corrected* elevations and azimuths. As the horn moves, the computer is actuated, and precise data now go instantly and silently to the light.

That has been a very interesting development. The result should make it unnecessary to use a number of lights searching the sky; one pair of pilot lights should always pick up the target within a few seconds after being turned on.

Firing at night has been slightly better than by day.

2. Tactical Employment

Based on work of the previous four years in the Schools, a new study was completed a year ago of the Tactical Employment of Antiaircraft Artillery and tentatively approved as a training regulation for trial during the following summer. Maneuvers were held on Long Island with an AA regiment, in the course of which the ideas laid down in the study were given a very good threshing out. The Plans and Training Officers and both battalion commanders were Leavenworth men, as were all three umpires, one of whom was an instructor in the subject at Leavenworth and another at Fort Monroe.

The problems that were used were normal problems involving the landing of large forces on Long Island and the defense against these forces. The question in each case was how best to use the antiaircraft regiment. There was a maneuver every other day for five weeks, somewhat over half being at night.

The regiment marched over 60,000 truck-miles and we learned a great deal of detail about rates of march, the employment of communications, and the times required for going into and coming out of position. There was a definite understanding reached as to the dispositions to be made of the guns and machine guns of a corps on the march, in combat, and in such a situation as covering a landing on hostile shores.

The regiment consists of a gun battalion of three batteries of four 3-inch guns, a machine-gun battalion of four batteries of 12 guns each, and a battery of twelve 60-inch searchlights. The lights are organized in three platoons, one of which always operates with a gun battery, normally the same one.

The regiment furnishes the antiaircraft component of a corps and extends its defense up into the rear portions of the divisional areas, to about 4000 yards from the leading elements—up to about the zone of the corps artillery. That includes the area within which many activities are located, such as ammunition and ration distributing points, tank parts, and heavy concentrations of motor transport. It gives the guns (but not the machine guns) a reach out to or beyond the front line. It is backed up by the army antiaircraft regiments, which push up into the rear of the corps and cover railheads, airdromes, and important ammunition dumps.

It covers these activities *incidentally* to its defense of the *area* in which located.

The typical arrangement of the gun defense places the batteries about 5000 yards apart, at the points of an equilateral triangle. Such an arrangement across the front of an army would give a double line of batteries.

These batteries have the mobility of cargo trucks. Light tractors, carried on trailers, allow of placing the guns a short distance from the roads. In occupation of a position, one hour is a good allowance of time, from the arrival of the trucks near the position until the battery is ready to fire. In the daytime, the work is done a little more quickly.

The machine-gun batteries, whether of the corps AA regiment or in the Zone of the Interior, are employed by platoon of four guns. In the rear areas they would be placed close to the objective. In the forward area, where the defense is an *area* defense, the platoons are placed approximately 1500 yards apart, covering the area, and only incidentally covering the troops and activities which are within the area.

In the case of a corps moving into position for a daylight attack, the machine-gun battalion is dispersed to cover the activities and installations generally in rear of the divisional artillery. The machine-gun battalion commander is guided in locating his units by information obtained from corps and later divisional administrative orders, and he places his twelve platoons so as best to cover the most congested area.

The conception is that these platoons would be unavoidably encountered by low-flying hostile planes, in whatever direction they might

be going; that they form machine-gun nests which attack aviation must encounter just as those which an infantryman must encounter in the attack of an organized position. They can not be avoided because they can not be seen.

In the Zone of the Interior or in the Communications Zone, protection is contemplated for only those places and activities which are of real importance to the success of operations. In the forward area, there is a double band of gun batteries across the front; the defense is an *area* defense. In the rear areas, the vital point itself is protected.

The disposition of the gun batteries is made so as to provide the greatest volume of fire within this Decisive Zone and the approaches to it. The size of the defended area and amount of artillery available for its protection of course govern the placing of the batteries; but in general it takes three batteries to make the necessary all-round defense, and with three, an activity of some size can be covered with a very good concentration of fire.

MAXIM LXXV

A commandant of artillery should understand well the general principles of each branch of the service, since he is called upon to supply arms and ammunition to the different corps of which it is composed. His correspondence with the commanding officers of artillery at the advanced posts should put him in possession of all the movements of the army, and the disposition and management of the great park of artillery should depend upon this information.—Napoleon's Maxims of War.

Industrial Preparedness for War

By MAJOR W. P. CHERRINGTON, C. A. C.

AS its name implies, industrial preparedness for war is the effort made to plan ahead, in time of peace, for the coordination of our wartime industrial effort, to enable us to procure and manufacture without unnecessary delay and at a minimum cost the materials essential for carrying on a war.

The mechanism of supply of troops is more or less familiar to all of us. But what of the actual production and procurement of these vast supplies demanded by the fighting men, and without which he is helpless? What is being done to assure ourselves that we may get them without confusion and fatal delay?

In a well-disciplined and well-organized country such as our own, a million men may be drafted in ten days. Producing the supplies, particularly munitions, to equip great armies is a question of months.

Consumption of supplies, particularly munitions, has greatly increased in the past fifty or sixty years. At the battle of Gettysburg the Union Army expended 32,781 rounds of artillery ammunition, each round averaging about twelve pounds. At the battle of the Somme the British artillery expenditure was 4,000,000 rounds averaging about forty pounds. A weight ratio of about 300 to 1. The relative cost of this ammunition reveals a much greater difference. The Union ammunition at Gettysburg cost about $65,000, while the Somme expenditure was about $200,000,000 (See Figure 1.)

Other factors being equal, victory during the early days and months of war may rest with the nation with the adequate supply of munitions. The early stabilization in the World War was largely due to mutual exhaustion of supplies. It required months for the British Empire to secure supplies for its first major offensive. Even under the best conditions the supply of ammunition is always a source of great concern.

Our own country is one of great natural resources and immense manufacturing capacity. We are capable of a tremendous effort in an emergency. On the other hand, our industries are given over to the manufacture of non-military supplies; the great muntions factories of the world are in Europe. The size of appropriations does not permit the building up of an adequate war reserve; the reserve on hand is being used, is deteriorating, and some elements are becoming obsolete. Our dependence then must be placed with commercial manufacturers,

whose plants are engaged, up to the time of the emergency, in the manufacture of peacetime commercial products.

Industry receives a serious shock at the outbreak of a great war. Millions of men are withdrawn from productive labor and immediately become enormous consumers. Thus, just when maximum production is required, an initial crippling blow is received by the industries on which we rely for our supplies. Industry must carry on with many green workmen, at the same time changing their product and increasing their output to maximum.

The foregoing should be sufficient to indicate the necessity of careful planning and organization of industry if it is to withstand the initial blow received and at the same time start the immediate production of the needed war supplies. The haphazard methods or lack of methods of past wars will not suffice for any future emergency.

Like so many institutions in our army, industrial preparedness for war is required by the National Defense Act of 1920. It places the responsibility for the organization of industrial effort on the shoulders of one civilian: the Assistant Secretary of War. It provides in part: "The Assistant Secretary of War, under the direction of the Secretary of War, shall be charged with the supervision of procurement of all military supplies and other business of the War Department pertaining thereto, and the assurance of adequate provision for the mobilization of material and industrial organizations essential to war time needs . . . Under direction of the Secretary of War, Chiefs of Branches of the Army charged with the procurement of supplies for the Army shall report directly to the Assistant Secretary of War regarding all matters of procurement." (See Figure 3.)

Coordination with the Navy is assured by the Army and Navy Munition Board. This board is the result of agreement between the War and Navy Departments. It operates through committees. Recommendations by *Secretaries, and in some cases by the President. This Board is concerned with the materials of war which are required by both the Army and Navy, such as aircraft, medical supplies, artillery, and ammunition.

In carrying out the mission assigned by the National Defense Act the Assistant Secretary had available the records and experience of the War Industries Board. As this board was effective in mobilizing American industry during the last war it was expected that the present organization would parallel its methods in many of its features.

In supervising the procurement of munitions and in planning therefor, the Assistant Secretary's Office exercises supervisory and controll-

*They are advisory only, and become operative after approval by both.

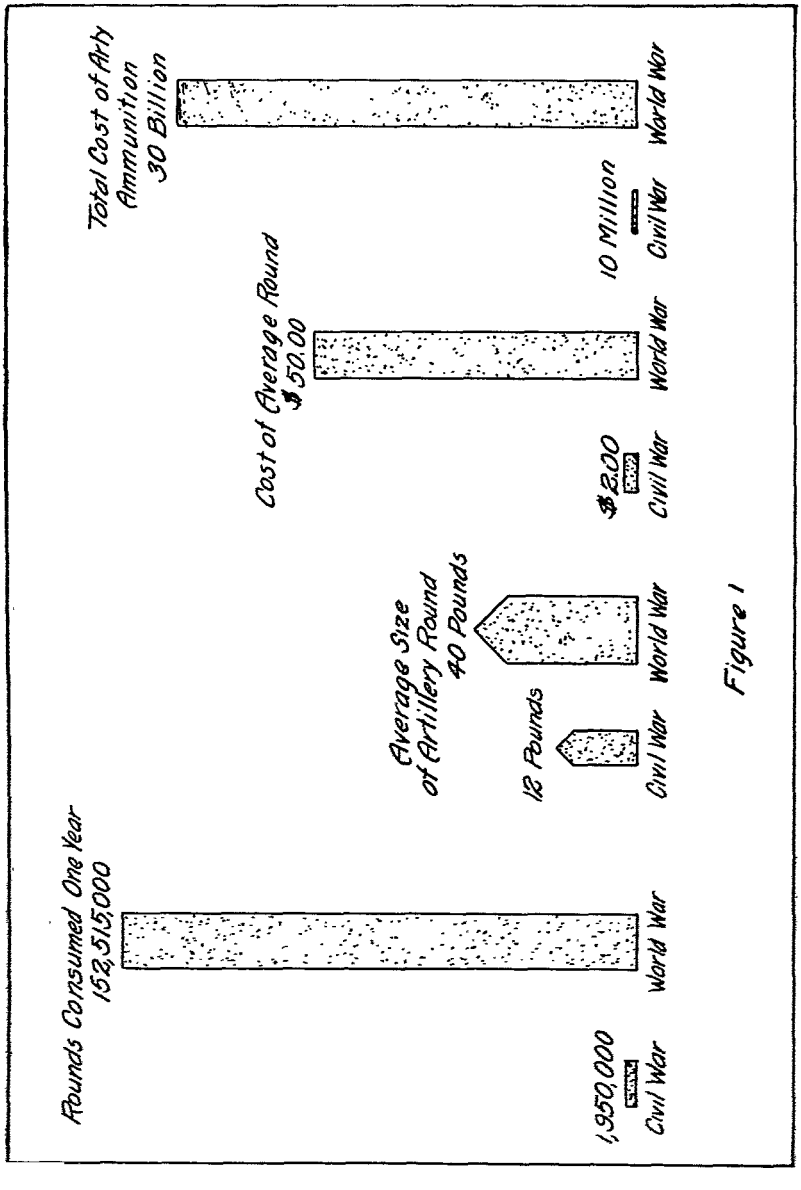

Rounds Consumed One Year
152,515,000
1,950,000
Civil War
World War
Average Size
of Artillery Round
40 Pounds
12 Pounds
Civil War
World War
Cost of Average Round
$50.00
$2.00
Civil War
World War
Total Cost of Arty
Ammunition
30 Billion
10 Million
Civil War
World War

Figure 1

ing functions only. The actual operating agencies are the seven supply branches of the Army: The Quartermaster Corps, Medical Corps, Ordnance Department, Engineer Corps, Air Corps, Signal Corps, and Chemical Warfare Service.

Procurement is to be decentralized. Based on its industrial capabilities the United States has been divided into procurement districts. Eighteen thousand industries contained in these districts have been allocated according to their product, or the contemplated wartime product, to the various supply branches. Of course the number varies due to changes in industry and consequent revision of the list.

Each district has a District Chief, who is a civilian, prominent in the industrial world, working on a voluntary basis, without compensation. He is assisted by an advisory board, consisting of prominent industrialists in his district. Many of these men are reserve officers, and will remain on this duty when mobilized.

To each district the supply branches send a representative if they so desire. He is, of course, a regular army officer. Figure 2 shows the situation as to headquarters established by the various branches.

A district headquarters in time of peace consists of the District Chief, his advisory board, and such regular army officers as may be detailed by the various supply branches. A clerical force is employed. In time of war this organization will be expanded as recommended by the District Chief. Additional personnel may be either civilian or military or both.

Executive assistants (as the regular army officers are designated) visit as many of the allocated industries as possible, and new ones as allocation is received. He is frequently accompanied by the District Chief. After consultation with the producer a production schedule is agreed upon, showing the item, amount, and rate of delivery required. At the same time the manufacturer is given drawings, specifications, and all available manufacturing information. When plant alterations are required for the production of non-commercial articles such as artillery, military airplanes, etc., a plan, termed a "factory plan" is formulated and agreed upon. Tentative orders are actually placed with the producer.

The goal sought is a system which will work about as follows: Initial telegrams will be sent from the War Department to the headquarters of each procurement district. From these headquarters radiate the thousands of telegrams to producers putting into effect the prearranged plans for the production of war material and giving the effect of final approval to contracts agreed upon previously.

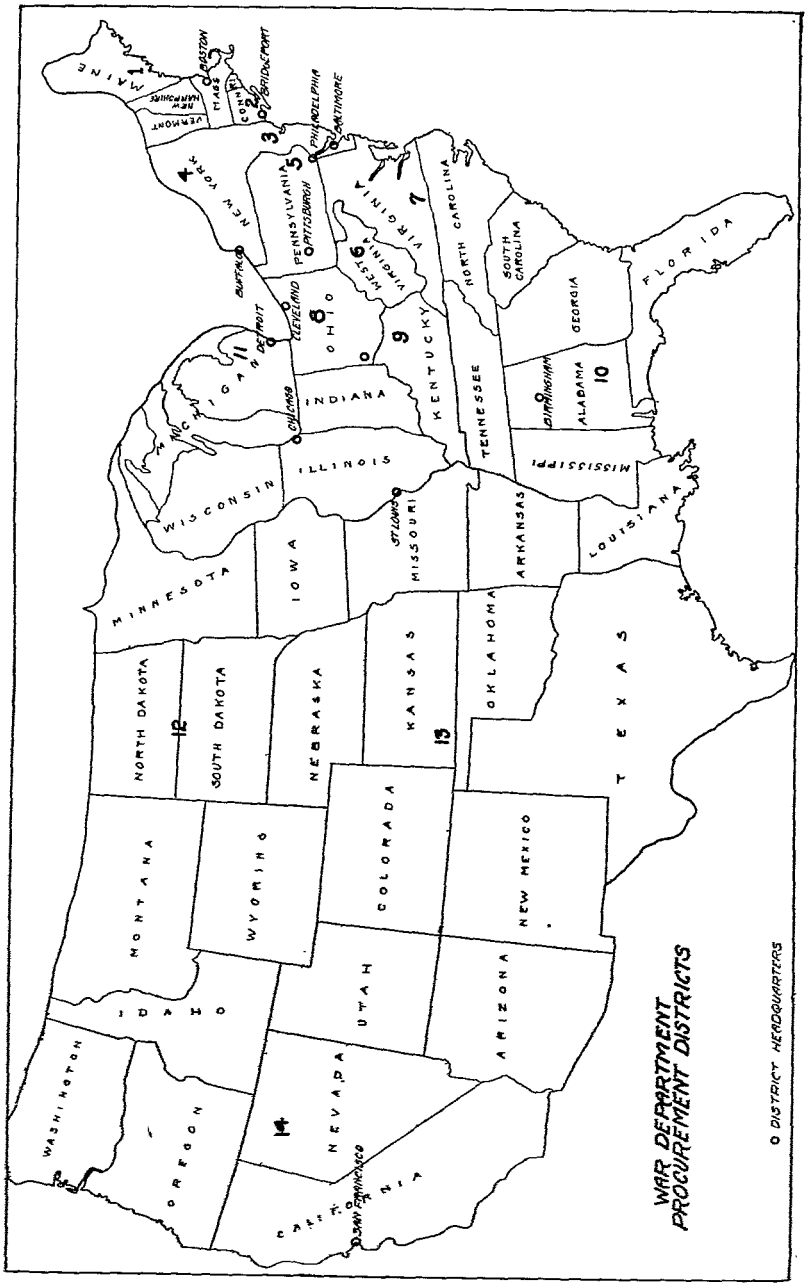

WAR DEPARTMENT
PROCUREMENT DISTRICTS
O DISTRICT HEADQUARTERS
MAINE
VERMONT
NEW HAMPSHIRE
MASS.
CONN.
BOSTON
BRIDGEPORT
PHILADELPHIA
BALTIMORE
NEW YORK
BUFFALO
PENNSYLVANIA
PITTSBURGH
WEST VIRGINIA
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
CLEVELAND
DETROIT
OHIO
KENTUCKY
TENNESSEE
BIRMINGHAM
ALABAMA
MISSISSIPPI
LOUISIANA
CHICAGO
INDIANA
ILLINOIS
WISCONSIN
MICHIGAN
MINNESOTA
IOWA
ST. LOUIS
MISSOURI
ARKANSAS
OKLAHOMA
TEXAS
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
MONTANA
WYOMING
COLORADO
NEW MEXICO
IDAHO
UTAH
ARIZONA
WASHINGTON
OREGON
NEVADA
CALIF.
SAN FRANCISCO
1
2
3
4
5
6
7
8
9
10
11
12
13
14

Fig. 2

Raw materials, the supply of which presents a problem, are divided into strategic and critical materials. The distinction is that strategic raw materials cannot be produced in this country in sufficient quantity, whereas critical raw materials are those capable of being produced in sufficient quantities, but which due to some unforeseen contingency might become strategic (*i. e.*, insufficient)

WAR ORGANIZATION CHART

Office of the Assistant Secretary of War

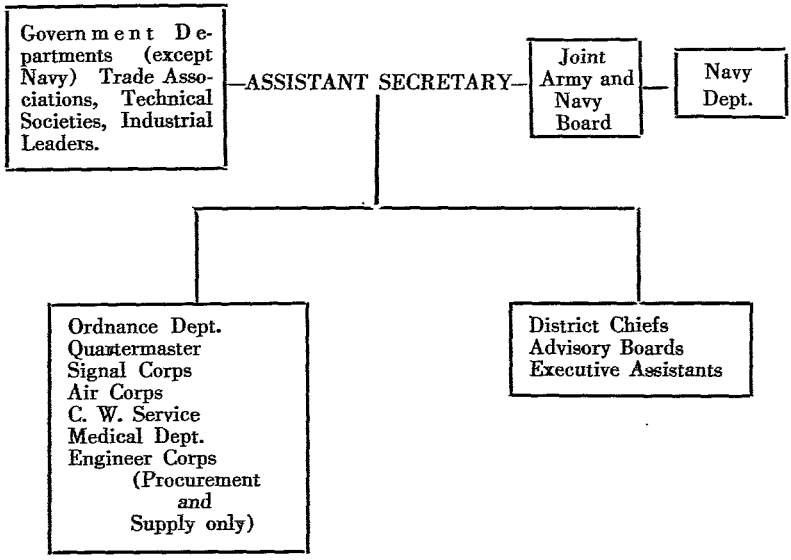


Fig. 3

Requirements are figured for production and procurement from tables of organization and allowances. Estimates are made for a war requiring our maximum effort. We know the number of units we will want to place in the field in this event. Supplies required for initial equipment are then figured. To this total is added normal rates of consumption and replacement, experience in the World War being used as a basis for the computations. From the amounts thus reached as being necessary are deducted supplies in war reserve and a final figure

of actual requirements is reached. As stated above these amounts are for our maximum effort. Requirements have also been computed for certain specific cases which would require less than our maximum effort.

The Assistant Secretary of War will recommend certain legislation to go into effect at the commencement of hostilities as facilitate production and procurement. In general, it will provide for such matters as removal of the restriction as to competitive bids and the eight-hour law, the immediate availability of funds for the purchase of supplies, creation of a food administration, and perhaps wage limitation and price fixing.

Transportation in the zone of the interior will be left in the hands of private operation. Railroads are, of course, the principal means. The present trend is to have a coordinating office in the War Department which will work in cooperation with the American Railway Association (which has its governing body in Washington). No difficulty is expected in this direction. If properly handled, the war load is not so much of an addition to the work the railroads are performing every day as is the usual opinion. Much of the confusion during the last war resulted from lack of coordination in the army itself. Possibility of this condition occurring again is remote.

Concrete results have already been accomplished in industrial preparedness.

CONCLUSIONS

1. Planning in time of peace for production and procurement in time of war will enable the manufacturers of the country to start their part of our war effort at once, instead of waiting for orders and coordination after war is under way. This will reduce by many months the time required to reach our maximum productive effort.

2. Confusion will be materially reduced by previous organization of procurement districts and the presence in each district of a skeleton organization already familiar with the problem and ready to function.

3. System and organization always reduce costs. The national bill for the war will therefore be less.

4. Transportation, being left in the hands of those who understand their business, will operate much more smoothly and no breakdowns in the system are to be expected.

5. The question of strategic materials remains a serious one, particularly in the event of a war with a great sea power. However, we may conclude that this situation will at least be improved by realizing and facing the problem beforehand and making all possible efforts and solve it.

The Military Situation of China

By 1ST. LIEUT. J. H. FEATHERSTON, C. A. C.

CHINA has a territory of more than 4,000,000 square miles and is about one-third larger than the United States. This vast tract of country contains some 440,000,000 people.

The topography of China varies. The terrain around Peking is a flat plain irrigated by many rivers. In summer it is extremely hot, and the plain is covered with a thick mud in the rainy season. In winter it is extremely cold, and the cold winds cover the plains with a yellow dust.

Shanghai is located in a country covered with lakes, canals, and rivers. The climate is characterized by mild winters, moist unhealthy summers, and fine autumns.

The central region around Hankow is the most important part of China. This region has a great artery of communication, the Yangtze River with an important network of rivers flowing into that vast stream. It has a temperate climate and is not subject to great variations during the year. It is hot in summer but does not have extreme cold in winter.

Canton is situated in a delta tract, which is surrounded by a mountainous region. It enjoys a dry and cool winter and in summer the heat is prolonged and moist.

The sanitary conditions of the probable theaters of war in China are such that it would be detrimental to the efficiency of any nationality other than Asiatic. This should receive special consideration in planning an expedition into China.

POPULATION AND SOCIAL CONDITIONS

The population of China is estimated at about 440,000,000. The congestion along the east coast has led to the popular delusion that China is overpopulated, but there is ample room and resources to support a much greater population.

The written language of China is the same throughout the country but there are hundreds of spoken dialects which differ materially. Ancestor worship and the philosophy of Confucius exercises a profound influence over the people. Buddhism and Taoism people the universe with numerous spirits, making the people superstitious and susceptible to propaganda.


CHINESE REPUBLIC
MILES
0 100 200 400 600 800
SIBERIA
MANCHURIA
MONGOLIA
CHINESE REPUBLIC
TIBET
INDIA
SIAM
INDO CHINA
SOUTH CHINA SEA
YELLOW SEA
KOREA
BORNEO
HAINAN
Urga
Harbin
Mukden
Kuija
Urumtsi
Kashgar
CHINESE TURKESTAN
Kokand
Lassa
GREAT WALL
Peking
Tientsin
Port Arthur
Tsingtau
Yangtze
Hankow
Nanking
Shanghai
Foochow
Canton
Hongkong
Yungan
Wuchau

Only about two and one-half per cent of the population of China are educated. Standards of living are very low, and practically no idea of sanitation exists. There are no public lighting, water, or sewerage systems, and most of the ordinary conveniences of life are lacking. Many diseases are prevalent and hundreds of thousands perish in time of famine and plague.

The Chinese are patient, industrious, peaceable, and respectful of authority. As laborers they are excellent, particularly the types found in the north, who are more vigorous and reliable than those of the south. Their endurance and immunity to many diseases make them good raw material for military purposes and when well trained and led they make fair fighters, but they are lacking in initiative and leadership. The Chinaman is an individualist; he minds his own business and takes no interest in things which do not concern him or his family. Until very recently patriotism has been a feeling practically unknown to the average individual. Agitation by the student group and activities of the Soviet propagandist have recently aroused considerable hatred of foreigners and there has been a growth of "China for the Chinese."

With the overthrow of the Manchu dynasty in 1911 a republic was set up which was very similar to our western form of government. Almost immediately this attempt to graft Western government into a civilization whose mental processes tended toward the clan family system produced trouble. China split not on the basis of parties and principles but into cliques and special interests. The multiplication of cliques produced chaos. The principle cliques centered around some strong leader or War Lord. The stronger the leader the closer he sticks to the clan system.

The cliques have plunged China into a welter of civil wars until there is no government in China today. The government at Peking is scarcely recognized outside of the Forbidden City.

Economic Situation

China is essentially an agricultural country. Land holdings are very small and the methods of farming are primitive. All forms of farm products are produced and all are sufficient for home consumption except rice and sugar, which are imported. It is believed that China can produce enough food stuff for her need and so can subsist without outside aid.

The raw materials produced are silk, camel, goat and sheep wool, cotton, vegetable oil, and great varieties of medicines. This country

is lacking in rubber and timber. Coal and iron ore are produced, but no steel is made in China.

There are a large number of arsenals scattered throughout China, but as a whole these are small, poorly equipped, and have been established in the various provinces with the idea of supplying only the local leaders. There is little or no cooperation between these various plants. The output of the arsenals together is 235 rifles daily, 51 machine guns monthly, 5 field pieces monthly, and 240,000 rounds of small arms ammunition daily. The output represents many different models. Ammunition made in one arsenal cannot be used in the rifles made in another. Most of the ordnance made would be considered out of date in an European Army. Chang-Tso-Lin has an arsenal at Mukden which does produce modern equipment, even manufacturing trench mortars, and he has hired foreigners to run these plants for him.

Transportation

There are very few roads suitable for motor or even horse-drawn vehicles except in and around certain large cities. There are several very good railway nets in North China. There is no rail connection between Canton and North China. On account of the roads, armies operate almost exclusively along the railways, using the railways as their lines of communication. This constant war along the railways means that in a few years China will have no railways. Water transportation is very good, and for a long time was the only means of transportation used in the country.

Communications

A fairly efficient telegraph system exists throughout the country, but there are no telephones except in the large cities. Radio stations owned and operated by foreigners are found in various parts of the country. There are many good ports but a shortage of wharfage. The financial condition of China is poor. Very little of the taxes collected ever reach the Central government. There is no standard currency—the local banks owned by foreigners issue their own currency.

The present military situation is so chaotic that it is necessary to go back to the days of the Empire in order to get any picture of her probable effort in time of war. Her strength lies in her potential manpower rather than her economic condition, strategic location, naval strength, or her value as a source of military supplies.

China planned to use her war power by voluntary enlistments organized into thirty-six divisions. The higher units were not organized.

Training was left largely to the individual provincial governors and varied greatly according to the abilities of the governor and means of carrying it out. The means to carry on the training was meager and insufficient. The enlisted men received some instruction in close order drill, musketry, physical training, and hygiene, but there his schooling ended. The common soldier, if properly equipped, trained and led, renders a good account of himself in battle. The lack of trained officer personnel has always been a weak point of the Chinese Army. An attempt has been made to eliminate the political appointees with but little result, and an efficient officer personnel has never been developed.

Of rifles China has a supply of about 1,250,000 but they are of all types and all conditions. There are some 2000 machine guns of all kinds and makes, and 3000 pieces of all types of artillery, principally Krupp-built 75's. Chemical warfare and tanks do not exist, although Chang-Tso-Lin is attempting to use gas. Field equipment of all kinds is lacking and very primitive. The medical service is inefficient. There are no reserve stocks of arms, munitions, or military equipment.

Because of the scarcity of artillery the Chinese place their chief reliance in the infantry and base their tactics upon the mass attack. The Camel, native carts, wheel barrows, mules, ponies, and coolies are used in the field.

The Navy consists of 54 vessels, mostly light gunboats and torpedo crafts of all descriptions. China's permanent fortifications are as obsolete as her Navy and would offer no effective difficulties to a modern sea force or modern artillery. They are located principally at the mouths of the important rivers.

At the present time it is estimated that 1,100,000 men are under arms in the contending armies. This 1,100,000 does not take into account the many organized bands of brigands who infest the country in considerable numbers.

With the fall of the central power of the Republic, the local military leaders rapidly seized the reins of the government by appropriating the military forces of their command for their own purpose. The result is that today there is no national military force or authority. The military force and authority is now in the hands of several War Lords.

The forces of the War Lords are about as follows:

General Chang-Tso-Lin with a force of about 170,000 holds the region around Peking, Tientsin, and Kalgan. He also holds with an additional 80,000 men the Manchuria area with the center at Mukden.

Chang-Tso-Lin allies are Chang-Tsung-Chang 90,000 and Sun-Chawn-Fong with 40,000 both operating in the province of Shantung.

Loosely allied against General Chang-Tso-Lin and his allies are the following:

a. The Nanking Group who control the territory along the Yangtze River with centers at Shanghai and Hankow. They have a force of about 200,000 operating against Shangtung.

b. General Fung-Yu-Shiang, the Christian General, with about 90,000 men is operating against Shantung from the province of Howan.

c. Yen-Hsi-Shan with 90,000 men is operating against Chang-Tso-Lin from the province of Shausi.

Of the 440,000,000 population of China there are but 15,000,000 potential soldiers. This appears to be a very low estimate, but it can be accounted for by the fact that many thousands are underfed and below physical standards as well as by the fact that millions of Chinese live in regions so remote from any possible theater of war as to render them wholly beyond effective reach of any central authority.

The Chinese race is homogeneous, being all of Mongolian stock. Five elements are represented, which are symbolized by the five stripes in the Chinese flag: Chinese (Red), Manchu (Yellow), Mongol (Blue) Mohammedan (White), Tibetan (Black).

There does not exist nor has there ever existed any systematic method of raising troops by means of the draft. The Chinese rely on the volunteer system, but military service has always been looked down upon by the Chinese and even now a certain form of draft is used by the War Lords to recruit their armies. China's maximum effort is not based on man power; she has plenty of this. It is believed that she could not equip and train from her own resources more than 2,000,000 men and it would require four years to reach that figure. With the assistance of an ally the size of her armies would be limited only by the ability of that power to equip her.

MAXIM XXVII

When an Army is driven from a first position, the retreating columns should rally always sufficiently in the rear, to prevent any interruption from the enemy. The greatest disaster that can happen is when the columns are attacked in detail, and before their junction.—Napoleon's Maxims of War.

Movement of 14-inch Railway Gun from Aberdeen Proving Ground to Fort MacArthur

By LIEUT. R. A. KNAPP., C. A. C.

IN the event of war with an Asiatic Power, it would probably be necessary to move a great many of our railway guns from the east to the west coast as rapidly as possible. With this idea in mind, it was decided to send a 14-inch gun, Model 1920, Mark II, mounted on a model 1920 railway mount, from Aberdeen Proving Ground, Maryland, to Fort MacArthur, San Pedro, California, in order to give the mount a thorough test under service conditions and in order to determine how the railroads would handle such an enormous shipment. The gun and mount weighed 730,000 pounds, distributed over twenty-eight wheels, and constituted the heaviest weight ever moved as a single unit.

Two officers, two enlisted men, and a civilian ordnance machinist were detailed to accompany the convoy, which left Aberdeen at 3 P. M. on October 19, 1925, and arrived at its destination November 27, 1925, after covering 3721 miles. The trip would ordinarily have been made in a much shorter time, but due to numerous requests from the public to have the mount placed on exhibition, the trip was greatly prolonged. In all, more than 200 stops were made, varying in length from five minutes to ten days.

On regular railroad equipment, all bearings are fitted so that at least 75% of the surface of the bearing bear on the journals and even then the cars are run slowly for several trips. This gives a load on heavy locomotives of about 320 pounds per square inch, and the railroads consider 400 pounds per square inch the absolute maximum limit of safety.

The bearings on the gun mount, however, had never been properly fitted, and did not have a bearing surface of more than 20 or 25% when it left Aberdeen. This meant that they were supporting a pressure of from 1360 to 2040 pounds per square inch. In addition, the journals were not true and had never been properly packed, and they began to cause trouble before the convoy got out of the state of Maryland. One by one the bearings heated up and had to be repacked, causing some delay and a great deal of worry all through the trip, as a bad "hot box" might mean a broken wheel or axle and cause a wreck.

The convoy consisted of a locomotive, two Pennsylvania Railroad steel underframe gondola cars carrying parts for the permanent emplacement, parts for the field platform, spare parts and accessories, and a supply of oil, grease, gasoline, and kerosene, one Ordnance Department ammunition car partly loaded with tools and also intended as living quarters for the personnel, besides the gun itself.

There is so much overhang of the gun in front and of the outriggers in the rear of the mount, that it is necessary to have a flat or gondola car between the mount itself and the cars ahead and behind.

The car for the personnel was fitted up as follows. The doors at the sides and ends were pushed back and wooden doors with small panes of glass in the upper sections were substituted, the trap door in the top of the car was removed and replaced by a window. This was directly over the range and furnished light for cooking. There were four kerosene oil car lamps for illumination, four double deck bunks and one single Quartermaster bed, a kitchen table, and five chairs. A toilet was installed in one corner. There were two sets of shelves near the stove for food and dishes, and a small cabinet of drawers for other supplies. A 50-gallon tank suspended from the roof furnished water to a small sink.

The space between the overhead steel beams and the roof of the car was fitted with loose boards so as to make improvised shelves, and was filled up with slickers, rubber boots, raincoats, and other articles of personal equipment. The personnel suffered a great deal from cold and lack of sleep. It was impossible to heat the car with the one stove and the sway of the car made it almost impossible for the personnel to stay in the bunks. The car was so cold that a pail of water within ten feet of the red hot stove had nearly one-half inch of ice on it.

When the convoy finally started, two idler steel frame flat cars were put between the locomotive and the first gondola car in order to give added breaking power and also to distribute the weight of the locomotive and gun over a reasonable length of track. When crossing the Sierra Nevada Mountains it was necessary to add eight more flat cars to get the necessary breaking effect. A railroad caboose was also carried at the end of the train.

All through the trip a daily journal was kept. This covered among other things, the mileage covered, speed, weight of the rails passed over, the type of rails and ties, the curvatures, any damage done to the track or the roadbed and any delays due to track, roadbed, bridges, and tunnels, the condition of the gun and mount, and the behavior of the bearings and journals.

At each stop, an inspection of the running gear and gun was made and on long hauls, inspections were made every ten miles.

Due to the conditions of the bearings, it was found that for the first part of the trip, a speed of from seven to twelve miles an hour was all that the convoy could stand. Later, however, as the bearings became better seated and the journals properly packed, a speed of as high as thirty miles an hour on level tracks with only slight curves was negotiated without difficulty. At one time, through some misunderstanding, the convoy was put on a block just ahead of the 20th Century Express, the fastest train on the Pennsylvania Railroad, and, for a short distance, traveled at a rate of forty miles an hour. After about five miles at this rate, the officer in charge succeeded in getting it slowed down, and they traveled about four miles to a siding at eight miles an hour, where an inspection was made and the journals were found to be dangerously hot. Incidentally, the 20th Century Express was twenty-five minutes late at its next station.

The convoy passed over rails varying from 62 to 130 pounds and as far as could be ascertained, no damage was done to the right of way, nor were any special preparations made for the convoy in so far as roadbed, bridges, tunnels, etc., were concerned, nor were any serious delays experienced due to poor conditions of tracks, roadbeds, bridges, or tunnels.

The mount was designed to take curves of not over 20° (a 20° curve means that tangents to the curve, 100 feet apart, form an angle of 20°) but at one time it successfully passed around a curve of 23° 10′, 49 feet long, although it was at a speed of only one or two miles per hour and only after the inside rails, and the inside of the flanges on the inside wheels were heavily oiled.

As a result of the trip the following recommendations were made by the officer in charge.

a. That the journal bearings be at least 75% fitted before the car goes on the road. This will permit an average speed of about eighteen miles per hour on a level track with only slight curves and a maximum speed of 30 miles per hour on long straight tracks, 15 to 20 miles per hour on slight curves, 12 to 15 miles per hour on curves of from 13° to 18°, 5 miles per hour on 18° to 20° curves, and 1 to 2 miles per hour on curves of 20° to 23°. On no account should curves of more than 23° be attempted.

b. That the gun travel with the muzzle to the rear instead of in front as at present.

c. That a ratchet and pawl system similar to that used on disappearing type coast defense guns be installed as a safety precaution in the elevation system of the top-carriage between the traveling and the firing positions, in case either or both top-carriage raising screws should break.

d. That the normal makeup of a train should consist of the locomotive, at least three steel underframe flat cars (seven where extreme grades are to be expected) and in any case a sufficient number of cars between the locomotive and the gun so that both would never be on the same bridge span at once, the gun, a gondola, tool and material cars, and the personnel cars.

e. That only one gun be placed in a train.

Throughout the trip more than 200 stops were made for exhibition purposes. Railway officials furnished advance information as to the probable hour of arrival at the different cities and towns and great interest was shown by the civilian population. Even in small villages where stops of only five or ten minutes were made, between 50 and 75 per cent of the population turned out to see the gun, and in some cases waited up as late as 2 A. M.

In Denver, it was estimated that 50,000 people were awaiting the arrival of the convoy and that during the two days stop, fully 250,000 people witnessed the demonstration. The enthusiasm seemed to increase as they traveled west, due probably to the increasing amount of the advance publicity both in the daily papers and to that furnished by the railroads. The movement of the gun to the Pacific Coast was primarily a test of its mobility and of the ability of the various railroads to handle such an enormous weight, but it was also of great educational value to a large part of the population of the country.

MAXIM L

Charges of cavalry are equally useful at the beginning, the middle, and the end of a battle. They should be made always, if possible, on the flanks of the infantry, especially when the latter is engaged in front.—Napoleon's Maxims of War.

PROFESSIONAL NOTES

Coat-of-Arms of the Harbor Defenses of the Delaware

Shield: Azure, three lions' heads erased *or*, 2 and 1.

Crest: On a wreath of the colors a griffin's head eared *azure*, beaked and eared *or*.

Motto: Semper Paratus.

The history of this region shows that it was colonized and occupied by the Swedish, Dutch, and English, who are shown on these arms by the three lions' heads, each of those countries having a gold lion on their coat of arms. The color blue is common to all three flags and also to the flag of the United States. The griffin's head is taken from the crest of Lord Delaware for whom the state, river, and defenses were named.

Deflection Calipers for the 155-mm. Gun

EDITOR'S NOTE: *These calipers were designed under the supervision of Major R. K. Greene, C. A. C., for use with the 155-mm. Gun, to replace the Gun Deflection Board.*

It is realized that the Gun Deflection Board is an excellent instrument although it has a few faults—mostly due to the fact that it was not designed for this type of gun whose sights are calibrated in mils. We feel, therefore, that the Deflection Calipers will fill a definite place for use with the 155-mm. Gun in practically all situations—be it motorized, emplaced, or mounted on the railway carriage. The instrument is small, compact, and simple, and may be carried with the gun and operated by one man.

General Description

The Deflection Calipers form a simple mechanical device for computing the algebraic sum of the direction corrections for the travel of the target during time of flight, for the drift of the projectile, and for the ballistic wind. It operates on the simple geometric principle of proportional triangles.

The instrument consists of a rule or scale A, fastened at its center to the arm C, and sliding up and down in the slot cut in the center of C, as shown in Figure 1.

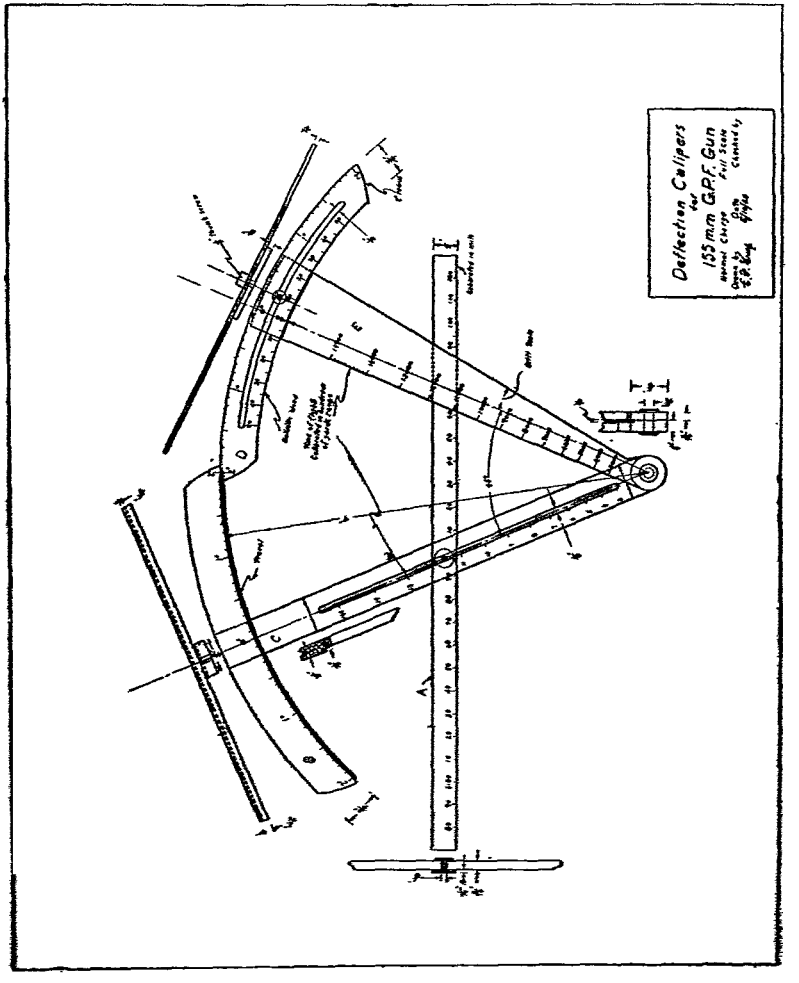
Arms C and E are movable and pivoted at their lower extremity. They may be opened and closed in the manner of a pair of scissors. At their outer extremities they have fastened to them the two tee arcs B and D.

The tee arc B is brazed or riveted to arm C making it an integral, immovable part of C. Arc B has a small groove or shelf cut in its inner edge in which arc D rides, giving the instrument greater rigidity. Tee arc D is not an integral part of arm E—merely being held in place by means of a thumb-screw which may be loosened, allowing the arc D to be moved back and forth across E within the limits

of the slot in D provided for that purpose. The arcs B an dD are merely the arcs of a circle whose center is at the pivoting point of the arms C and E.

Description of the Scales

The scale A is calibrated in mils deflection, to the right or to the left as the case might be, from zero to 120 mils and from zero to 3080 mils. These are the



readings that are to be applied to the gun. A is read on the lower edge of the scale.

The tee arc B is calibrated in degrees and hundredths of degrees, from zero to 2 degrees to the right of C, and from zero to 2 degrees to the left of C.

The arm C is calibrated in time of flight in range in hundreds of yards, from

3000 yards, which is point-blank range, to 14,900 yards, which is maximum range for the normal charge.

The tee arc D is calibrated on its outer edge in degrees and hundedths of degrees, exactly the same as B, and these two scales work in conjunction with each other. On the inner edge of D is the ballistic wind scale. This scale is calibrated for a ballistic cross wind of from zero to 50 miles per hour—either to the right or to the left.

The arm E is also calibrated in time of flight in range in hundreds of yards similar to arm C. On the right-hand side of arm E is located the drift scale. This is scaled off in mils and to the same scale as A, so that it is a measure of the drift at the various ranges in terms of mils on scale A.

Derivation and Selection of Scales

The calipers shown in the accompanying drawing are 9-inch calipers; that is, the radius of the arc is nine inches. These calipers may be made of practically any size, limited only by the ability to read the mil scale A.

An arbitrary length of approximately seven inches was taken on arm C, starting at the center of the pivot as zero range and, of course, zero time of flight, and measuring outward the constantly increasing range in time of flight to the maximum range and time of flight, which was, in this case, 14,900 yards and 48.9 seconds time of flight.

This range scale in time of flight was also laid off on the other arm of the calipers E, as shown in Figure 1.

This range scale in time of flight was obtained from the Firing Tables for the 155-mm. Gun, Model 1918, firing H. E. Shell Mark III, Table A, normal charge.

The scale on the tee arc B and the outer scale of D are calibrated in degrees and hundredths of degrees. Any convenient arc between C and E may be taken—in this case 45°—and divided into four equal parts, which would correspond to four degrees travel of the target, disregarding wind and drift. These four equal divisions are then divided into ten subdivisions so that hundredths of degrees may be read.

Now scale A may be calibrated. It is moved up arm C until its lower edge—the edge to be calibrated—coincides with the 11,125-yard range mark. At this range, the time of flight is 30 seconds and therefore the distance between the center lines of arms C and E, at 11,125 yards, is an exact measure of a travel of four degrees in thirty seconds. Four degrees equal 71 mils, so the lower edge of scale A, between the center lines of C and E, is divided into 71 equal parts—each part corresponding to one mil. Using these divisions as a measure, A was calibrated to 120 mils on one side of the center line of C, which was taken as the zero point, to 3080 mils on the other side of C. Now we have the correct measure of a mil deflection for all ranges.

It is now possible to make the drift scale. In the Firing Tables, Table I gives drift for the various ranges in mils. As we now have the correct measure of a mil we may set off, using the center line of E as zero drift, the drift for the various ranges, and, drawing a smooth curve through these drift points,

we form the right edge of the arm E. As the deflection always includes the drift, we must always read the deflection from the center line of C (or zero) to the extreme right edge of arm E.

The ballistic wind scale is next calibrated. From Table I in the Firing Tables, the deflection due to cross wind is listed. The method of calibrating may be illustrated in the following manner: The deflection due to a 10-mile cross wind at 11,125 yards is 5 mils; the deflection due to a 50-mile cross wind at the same range is 5 x 5 or 25 mils. Count off, on scale A, 25 mils on each side of the center line of the arm E. Then, from the center or pivot of the calipers, pass a line through each of the points just laid off, until it strikes the tee arc D. These two points will measure the deflection caused by a 50-mile cross wind at any range. This operation may be repeated to provide the rest of the graduations on the wind scale.

Method of Operation

First, the ballistic wind is set on D by loosening the thumb-screw that holds D to E and moving D along until the proper cross ballistic wind is set opposite the pointer at the center line of E.

Then the travel of the target in 30 seconds is set in degrees and hundredths on the scale on B and the outside scale of D. This travel of the target can be obtained from any consecutive readings of the B or BC azimuth instruments.

These two operations measure the wind effects and travel of the target.

Next, the scale A is moved up or down arm C, as the case may be, until the lower edge coincides with the range of the target on both of the arms, C and E. This range may be obtained from the plotter.

Then the deflection to be applied to the gun is read off in mils, from the center line of C, to the right-hand edge of E.

Discussion

As shown in Figure 1, the target is moving to the left at the rate of 4 degrees travel in 30 seconds with zero cross wind. This would mean that the target is traveling at the rate of 1580 yards per minute, or approximately 54 miles per hour at that range. We feel, therefore, that the 4-degree travel limit of the instrument is ample, although it could be increased if desired.

It will be noticed that, when the target is traveling to the left, the drift will be added to the deflection as the drift is always to the right. However, when the target is traveling to the right, it is reversed and the drift must not be added but must be subtracted. In case the travel is to the right, the arm E will be to the left of C, and reading from the center line of C to the right edge of E it will be noted that the drift is subtracted (as it should be). That is the reason the tee arcs B and D are calibrated on each side of the center lines. One side is used when the target is moving to the left (adding the drift), and the other is used when the target is moving to the right (subtracting the drift).

This instrument is calibrated only for the normal charge. The drift scale and the range in time-of-flight scale will, of course, be different for the super charge. Therefore, the instrument as shown in Figure 1 can not be used with the super charge. However, the arms C and E may be lengthened if desired, and

on the reverse side of the instrument a new drift scale for the super charge and a new range in time-of-flight scale can be made. The same instrument may then be used for the super charge and the normal charge. This would necessitate the lengthening of the slot in C as well, to care for the increased range of the super charge on the reverse side. The same travel scales on B and D could be used—but merely graduated on the reverse side.

If desired, the ballistic wind scale on D may be calibrated in reference number instead of in miles per hour. The same method in graduating may be used as has been described heretofore.

There is one error that enters in that can not be compensated for. That is in the reading of the drift scale. When the travel is great—say four degrees, the drift that is read by scale A is the hypotenuse of a triangle whose apex is on the center line of E, and whose base is a line drawn perpendicular to the outer edge of arm E, through the point of intersection of the center line and the lower edge of the scale A. When the travel is small—say zero degrees, then the drift that is read by the scale A is the *base* of that same triangle. Therefore, when the travel is great, the drift read will be slightly greater than its true value. However, this error will never (under the most unfavorable circumstances, when the travel is great and the range is long) be over three mils. Under favorable circumstances the error will be less than one mil and may be neglected.

Coast Artillery Resumes Training Under New Rules

The Coast Artillery Corps this year is resuming competitive gun practices under revised regulations recently issued by the Chief of Coast Artillery, and the battery attaining the highest figure of merit on the records made during this calendar year will be awarded the Knox trophy donated by the Massachusetts Society of the Sons of the American Revolution.

The new regulations are based on the consideration that it is the object of all firing problems to prepare the personnel of the corps for the most effective use, in war, of all forms of armament to which it is assigned, and that record target practice, in so far as practicable, is a comparative test of the training given. All firing problems are being carried out, as nearly as practicable, under the conditions of actual warfare, except as safety requirements dictate and as required for the keeping of records. Materiel that would not be available to a battery in time of war is not being used in practice.

Coast Artillery Rating

Prior to the World War, all Coast Artillery units were rated for excellence in the Coast Artillery office. Due to the varied types assigned to the corps since that war, and to the fact that until recently there were not sufficiently complete records for target-practice accomplishments to enable a just comparison to be made of the practice of all units manning different types of armament, it was necessary to discontinue comparative rating of the corps as a whole.

About three years ago there was undertaken in the Coast Artillery office the compilation of complete data on target practice and a detailed evaluation of results of all firings. These studies indicated that the rate of fire was less than that of prewar days without compensating increase in accuracy, with, however, a commendable increase in range. It was evident that there was no uniformity in standards of judging efficiency of firing units, as shown by the fact

that some rating officers rated as excellent units that failed to reach expectancy or speed, while others rated as only satisfactory units that had exceeded expectancy.

Firing Rules Issued

In order that more uniform methods of conducting target practice might obtain, and firing units correctly classified as to results accomplished, comprehensive regulations were issued. After trial of a year it was found that certain changes were necessary prior to final publication in the form of training regulations, with the result that the further revision is in force.

During 1913 and 1917, inclusive, there was presented by the Massachusetts Society of the Sons of the American Revolution to the battery of regular Coast Artillery attaining the highest merit the Knox trophy. Due to the fact that the regular schedule of Coast Artillery practice was discontinued during 1918 on account of the war and subsequently for some years, the competitive feature of the annual practice was eliminated; as it was desired to concentrate training on adjustment and other problems brought out by the war, the awarding of the trophy had lapsed. Renewal of the annual gift of the trophy was made in 1927 by the society and accepted by the War Department.—*Washington Post.*

Antiaircraft Exercise Program

The antiaircraft exercises of this year will be conducted at Aberdeen Proving Ground, Md., and Fort Humphreys, Va., beginning early in September. The 61st Coast Artillery from Fort Monroe, Va., will be sent to Fort Humphreys, and the 62d Coast Artillery from Fort Totten, N. Y., to Aberdeen Proving Ground, for the exercises, reporting August 31. The exercises at the proving ground will cover a period of eight weeks, and they will include tests of ordnance and certain signal corps equipment. The exercises at Fort Humphreys will run for about six weeks, during which searchlights, searchlight power plants, comparators, sound-locating materiel, and certain signal corps equipment will be tested.

The exercises will be conducted under supervision of a board consisting of Col. W. H. Tschappat, ordnance department; Major Sanderford Jarman, coast artillery; Majs. W. P. Boatwright and W. L. Clay, ordnance department; Maj. O. L. Spiller, coast artillery; Maj. W. H. Lanagan, corps of engineers; Maj. F. H. Coleman, air corps; Capt. J. H. Gardner, Jr., signal corps; 1st Lieut. F. H. Kohloss, corps of engineers, and 1st Lieut. H. L. George, air corps.

The board has prepared a detailed program for the exercises, which will be carried out to obtain a broad basis of data on the accuracy and effectiveness of the several weapons, fire-control instruments, and types of ammunition. Service conditions will be simulated to the extent permitted by consideration of safety of the airplanes employed. Normally, for gun firings, the target will be towed at altitudes not less than 2000 yards and at varying slant ranges.

During the exercises consideration of the following problems, among others, will be made: Suitability for service of all elements of the fire-control system, guns, machine-guns, and ammunition, and also searchlights, sound locators, and the means involved in their coordination; expectancy of hits with the several types of weapons and various systems of fire control; the practicability of adjusting the fire of guns as the result of observation under service conditions; efficiency of means for making photographic records of bursts; the proper use of tracers as a means of fire adjustment; the rate of fire that should be regarded as standard

for each of the weapons tested; the employment of trial "shots" for searchlights, etc. For the first time, mobile 3-inch and 37-mm. antiaircraft guns will be used in the exercises.—*Army and Navy Register.*

Names of British and American Warships

Both Great Britain and the United States restrict to a definite class group the names to be given their war vessels of a given type, thereby making it possible to identify the type of vessel from its name alone. In Great Britain, the battleships are given the names of the more famous British admirals (as *Nelson* and *Rodney*); cruisers of the "A" type take the names of counties (as *Devonshire* and *Suffolk*); cruisers of the "B" type find their names from among the cathedral cities (as the *York* class, laid down last year); flotilla leaders are named after minor admirals (as *Codrington* and *Malcolm*); destroyers are given old frigate names, alphabetically by classes (as the new *Acasta* class, which is an improved replica of the *Ambuscade* class of 1926); mine sweepers follow the names of ancient seaports (as *Sandwich*); submarines get their names from the classics (as *Odin, Oberon*); and gunboats take the names of seabirds (as *Gannet* and *Seamew*, being built). The system is too recent to apply to all vessels in each type, and the older vessels have not been renamed to conform. Thus, *Royal Sovereign* and *Queen Elizabeth* are battleships; *Hawkins* and *Frobisher* are cruisers; *Argus* is an aircraft carrier, *Castor* a cruiser, and *Erebus* a monitor; *Gnat* and *Bee* are gunboats. However, as replacement of the older vessels proceeds, the British navy is being given an orderly arrangement.

In the United States the classification by names is fully as orderly and perhaps simpler. Battleships are given the names of States (as *Colorado* and *Tennessee*); cruisers, without distinction as to type, are named from cities (as *Charlotte* and *Pittsburgh*); destroyers are named after naval officers (as *Farragut* and *Sampson*); and submarines receive an initial (common to a class) and a number (as *V5* and *S48*).

To a considerable extent, the auxiliaries are also classified by names. Fuel ships are named from mythology, cargo ships from constellations, fleet tugs from Indian names, mine sweepers from birds, etc. In the more important types, the ships have been renamed to conform to the system (as *Missoula*, formerly *Montana*, and *Pueblo*, formerly *Colorado*). There are no exceptions to the system within each combat type, but names pertaining to types (except to battleships) are sometimes employed for other types of vessels. Thus, the *Saratoga*, designed as a battle cruiser, is an aircraft carrier; the *Eagle* class are patrol vessels; *Sacramento* is a gunboat; *Nokomis* is a yacht; *San Francisco* is a mine layer; *Prometheus* is a repair ship; *Henderson* is a transport; and *Cheyenne* is a monitor. As in Great Britain, the United States will ultimately have an orderly and appropriate system of names in its navy.

Italian Naval Construction

The inspiring leadership of Signor Mussolini is reflected in the Italian program of naval construction. There is no sign of a battleship being built, such as is permitted for replacement purposes under the Washington Treaty. Italy has decided that lighter ships of high speed, in conjunction with submarines and aircraft, are best suited to her requirements. The cruisers and flotilla leaders

she has in hand are in some ways the most remarkable in the world at the present time, at any rate so far as authentic information shows. The 36-knot *Trento* and *Trieste*, nominally the fastest 10,000-ton cruisers, are being followed by four 5000-ton ships of the "Colleoni" class, in which 37 knots is estimated for. Hitherto 34 knots has been the highest designed rate for any cruiser. So with flotilla leaders. Italy began three of 34 knots in 1921, and in France a group was begun in 1923 to do 35½ knots. In 1927, France laid down a new class for 36 knots, and Italy a new group to do 38 knots. To achieve the last-named speed 50,000 horse-power is necessary. It is now stated that the Stabilimento Tecnico at Trieste is to produce the machinery plant for a flotilla leader of 100,000 horse-power. The speed of the new craft is not stated, but will probably be over 40 knots—*The Army, Navy and Air Force Gazette.*

New German Cruiser

In pursuance of their plan of naming new 6000-ton cruisers after vessels which served in the War, the Germans have given the name of *Köln* to the ship launched at Wilhelmshaven on May 23. This is the third cruiser to be named after the city of Cologne, and it is to be hoped she will have a happier fate than befell the other two, for the first was sunk in the Heligoland Bight action on August 28, 1914; and the second, after being surrendered with the High Sea Fleet in November, 1918, was scuttled at Scapa Flow in the following June. With the launching of the *Köln*, Germany has a post-war squadron of four cruisers afloat. The first of the four was the *Emden*, which was given engines of 46,000 horse-power, a speed of 29 knots, and a main armament of eight 5.9-in. guns, with four tropedo tubes. The other three show a most remarkable advance in design. By saving weight in every way, including the adoption of welding in place of riveting, the horse-power has been increased to 65,000, and the speed to 32 knots, while an additional 5.9-in. gun is mounted and there will be no less than twelve (four triple) torpedo tubes. The German naval authorities, if the actual performances justify these paper figures, will have good reason to compliment themselves.—*The Army, Navy and Air Force Gazette.*

Training a Reserve

The passage of time since the World War has served not only to dim the memory of those days, but has depleted the reserve of men capable of taking the field. The majority of the several million trained men upon whom this country could look for reserve strength have passed the age of active service. As many more have taken on responsibilities that would prevent them from responding in the event of another call to the colors. A few more years and the transformation will have become complete. The United States then will be as unprepared as it was at the outbreak of the World War.

To remedy this condition Representative Wainwright, of New York, has introduced a bill to recreate the enlisted reserve. This is not a militaristic proposal. A similar policy was approved by Congress in 1912 and 1916. The provision was eliminated in the national defense act of 1920 because it was the plan then to keep the strength of the Regular Army at 280,000 men. This expectation has not been met. There are today only 125,000 men in the regular establishment. There are only six regular infantry divisions of a strength of

6000 men each, compared to the divisions of 27,000 men which were found necessary during the World War. In the event of hostilities, the United States could not muster two war-strength Army Corps comparable to those of the first-rank European powers.

The Wainwright bill provides for the training of a reserve of 70,000 men. In previous bills Congress divided the enlistment, making part of it active service and part of it reserve. The estimated cost of the plan would be $1,500,000 annually, which means that a reservist could be trained for about one-thirtieth of the cost of maintaining a soldier in the Regular Army. The need for such a second line of defense can not be over-emphasized. The Wainwright bill would be the means of providing a nucleus of trained men around which a national Army could be built in the future. The cost when measured in the light of the benefits is infinitesimal, so that the project should commend itself to every patriotic citizen.—*Washington Post.*

The Anti-War Treaty

A great deal has been written about the Kellogg anti-war treaty as it has been undergoing the process of being whipped into shape and made as acceptable as possible to prospective adherents. Now that the document seems to be approaching a final form, readers may be interested in knowing just what it really is. The two principal articles say:

> The high contracting parties solemnly declare in the names of their respective peoples that they condemn recourse to war for the solution of international controversies, and renounce it as an instrument of national policy in their relations with one another.
>
> The high contracting parties agree that the settlement or solution of all disputes or conflicts of whatever nature or of whatever origin they may be, which may arise among them, shall never be sought except by pacific means.

The only matreial modification of this sweeping compact as far as the treaty proper is concerned is contained in the clause of the preamble which say that "any signatory power which shall hereafter seek to promote its national interests by resort to war shall be denied the benefits furnished by this treaty."

That provision is a change from the original text, which has been made largely to satisfy France, and Mr. Kellogg explains it by saying in his covering note to the powers, "The revised preamble thus gives express recognition to the principle that if a state resorts to war in violation of the treaty, the other contracting parties are released from this obligation under the treaty to that state."

There are, however, other understandings, either assumed or proposed, which Mr. Kellogg sets forth in his note and which will illuminate the text of the treaty and interpret it in case the compact becomes operative.

The Secretary of State says first of all that: "There is nothing in the American draft of an anti-war treaty which restricts or impairs in any way the right of self-defense." He adds: "That right is inherent in every sovereign state, and is implicit in every treaty. Every nation is free at all times, and regardless of treaty provisions, to defend itself from attack or invasion, and it alone is competent to decide whether circumstances require recourse to war in self-defense."

Dealing with the league covenant, Mr. Kellogg affirms that it "imposes no affirmative primary obligation to go to war," and that such obligation is only secondary, and attaches only when deliberately accepted by a state. As everyone knows, this interpretation is not universally accepted. The senate and the ablest statemen of the nation declined to so construe it when Mr. Wilson was trying to persuade the United States to enter the league; but the decadence of the league, and its practical impotency perhaps make the point one of minor practical importance today.

Taking up the Locarno treaties, Mr. Kellogg remarks that if the parties to those pacts are under any positive obligation to go to war, "such obligation certainly would not attach until one of the parties has resorted to war in violation of its solemn pledges thereunder." And he adds the optimistic assertion, "It is therefore obvious that if all the parties to the Locarno treaties become parties to the multilateral anti-war treaty proposed by the United States, there would be a double assurance, that the Locarno treaties would not be violated by recourse to arms."

The American secretary of state is less specific in discussing treaties of neutrality because he admits that he is not informed as to the precise treaties France had in mind in mentioning them, but he insists that the matter can be adjusted.

It will be seen that while the text of the peace treaty itself is simple and plain, there are a good many related matters which are not; and that is where the rub comes.—*Detroit Free Press.*

More Than a Fighting Machine

Announcement by the War Department that new methods had been developed by which the normal life of rubber may be extended from a few years to approximately thirty-five years is of great economic importance.

This is only one of the many contributions of the Army to the industrial life of the nation. Army engineers built many of our railroads; the Army protected the pioneers and dredged our harbors. It was the Army's sanitarians that cleaned up Havana and Panama and made the tropics habitable for white men. Its chemists have adapted war gases to peace-time uses and have developed the gas mask for the protection of miners and firemen. Its Signal Corps played a prominent part in developing our telegraph system. The Army organized the Weather Bureau.

The list could be extended almost interminably, but the point is that the Army has returned to us in peace time benefits far more than it ever cost. It does many things besides fight.—*Seattle Times.*

Making a Modern Army

The coming year will see intensive experimentation by the war department in order to test out automotive and mechanical equipment and newer and more powerful weapons. The recently developed semi-automatic rifles, antiaircraft guns and howitzers, the light, medium, and heavy tanks and many types of trucks and tractors will be tried out under the hardest conditions.

* * * * *

Under only one condition can the United States afford to maintain the small regular force it does today, and that is to keep the regular army so well trained and equipped that it will have a human chance of preserving itself in case of war and to make provision for supporting the regular army with a well equipped and trained reserve and national force before the regular army is annihilated.

Mechanization is the order of the day in armies as well as in civilian life. The American army should be given the opportunity to carry its experiments and its equipment to any limit proved desirable. No other nation has advanced so far in the mechanical field as has the United States; it is plain apathy and carelessness if we allow the army to fall behind.

Perhaps the motorization of one infantry regiment is all that the war department desires at the present time, though it seems a test scarcely large enough to compensate for the lack of modernization in the remainder of the army. But should the army need more funds Congress should see that they are provided. The army is not a museum of antiques, an old soldiers' home, or a suicide club.—*Chicago Tribune.*

Laws Endanger Liberty

T. R. Preston, President of the American Bankers' Association, sounds a warning that the entire structure of American democracy is tottering toward disaster because of a desire of legislators to pass laws and create illimitable government bureaus.

"In the 140 years since the American Constitution was written, this government has enacted more laws than all the rest of the civilized world combined since the birth of Christ," he said. "New ones are proposed at the rate of 25,000 a year and about 13 per cent of these get on the statute books. It would take a man working eight hours a day seven years to read all the laws enacted last year. Yet ignorance of the law is no excuse.

"Courts are being so congested with cases that the District Attorney in New York estimates that if every defendant should demand a jury trial, the calendars there would be 500 years behind in four years.

"Americans will go to war and give their life's blood for liberty, then turn around and enact laws depriving themselves of all liberty."

The Destructive Battle

The Destructive Battle. Colonel von Cochenhausen, of the former German army, publishes in the *Militär-Wochenblatt* of January 4, 1928, a brief review of a work by Major Gunther Frantz, of the former German General Staff, under the above title, a translation of which is here given:

The "War Historical Section" of the general staff issued, some years before the war, a most excellent work under the title: *Success in Battle—By What Means Was It Achieved?* The purpose of the book was to direct and intensify the interest of the incipient leaders of troops in a proper comprehension of the really decisive battle as distinct from the ordinary victory and to show that although the methods of fighting for victory were different in each age the unchangeable truth: a decisive victory is attainable only by making the opponent completely defenseless, was established in each instance. Many officers of the old army added to their historical knowledge by the precepts advanced by that work and gained a more accurate perception of the Schlieffen thought.

The book has been out of print for some years. The battles of the World War have, of course, been critically treated in numerous publications of after-war literature. But if one eliminates all the controversially written books and such as contain only brief chronological reports, those remaining are either very voluminous or have been written for a circle of readers who have already achieved

for themselves a critical judgment by years of study of military history and by leadership of troops. The great majority of our younger officers whose time and attention is taken up by the exactions of every-day service duties are only beginners in military history. They must first learn to absorb and systematize different conceptions of the principal events of war happenings and again a correct understanding of their most important fundamental principles in their simplified forms divested of all extraneous issues.

Similar conditions prevail at all the different training schools where the scant measure of time allotted to war history does not permit study of ponderous volumes. For this reason the army inspectorship for educational and training establishments expressed the desire to resuscitate the ante-war "Battle Success" work and to include in it the principal events of the World War. Major Gunther Frantz, already well known by his activities in the government archive bureau, has devoted himself to this work with warm enthusiasm. Beginning with the day of Cannae, giving twenty-four separate representations that are illustrated with good maps, he takes the reader on through the battle fields of Frederick the Great, Napoleon, Custozza, the German union wars, on to the World War. The author has succeeded, by elimination of superfluous side issues, in painting the great eventualities of situations and of their further development in clear and vigorous strokes. By this the book achieves a centralized uniform cast and an impressive character for the special educational purpose it is intended to serve—that the consideration of each single case has its climax in leading to the question: was it a destructive annihilating battle in the Schlieffen sense of what such a battle should be? What were the causes that prevented complete success?

It is clear that the scant descriptions given in the book do not permit presentation of all the different views that have been recorded in literature. That would really have detracted from the very purpose of the book. Nevertheless, the writer has taken pains, by a thorough study of resources available to him, to give expression only to such judgment and conclusions as could be substantiated in every respect.

The book makes place, for the first time according to my understanding, for great events of former war history alongside of those of the World War. This circumstance lends to it a peculiar interest becaues even the older officers thoroughly conversant with war history will gain many valuable new suggestions by this method of side-by-side comparison of events.—G. R.

Foreign Periodicals

Rivista Di Artiglieria E Genio, May 1928

1. Considerations on Permanent Frontier Fortifications. The author, referring to ideas manifested since the time of the fall of the Belgian fortifications, confirms the necessity of the permanent fortifications on the border as an important factor for the "offensive manouvres" and points out the characteristics that they must have in order to answer this essential scope.

2. Observation from Airplanes. The author tries to solve in a practical way one of the most important problems of aerial observation: that is, the accurate indication of the ground objectives during a war of movement when aerial photographs cannot be used for the conduct of fire and when the artillery cannot make other assignment for observation to complete the adjustment of fire.

He sees in the progress of radio and radiogoniometry the solution of the problem, and points out simple and rapid methods to obtain also on the sea accurate indication of the target on the surface and situated out of sight of the terrestrial observers.

Concluding, he expresses the conviction that the preparation for the airplane observer must be done at command headquarters which must be equipped with aerial apparatus furnished from the pneumatics section and he points to a very important question: that of the great number of aeiral observations that occur in war time, that could only be reached with a decentralized preparation and in a complete tactical harmony with the other branches of the army.

3. Defense from Aerial Attacks. The army commander's defense of his own sky and of his own territory from aerial attacks could be done in several ways: with offensive aviation in direct aerial defense, with defensive aviation (direct aerial defense), with the land system (arms against aircraft, and various protective measures). With the actual means available none of these forms of defense could be sufficient by itself, so the "aerial" and "antiaerial" organizations of various countries are based on a more or less co-existence of all, always though with a marked prevalence for the defense. Evidently this is an error.

With new means already definitely in view, the aerial offensive differs from that of the past and will have better opportunity to develop all the offensive actions, while the aircraft and antiaircraft organizations can be assured of the characteristic physiognomy of all the armed forces, that is maximum offensive development and direct defense limited to the most vital and the most exposed objectives and accomplished with the most certain and the most economic means. (A. A. Defense.) Such organization, although true for all countries, is very essential for Italy, which, because of her special geographical and demographic situation, has equally great offensive possibilities and many vital areas greatly exposed to attack from other countries.

4. Artillery Fire With Airplane Observation. The author, considering that the one most important condition for a good rendition of fire with airplane observation is rapid fire, proposes a method which he believes is a satisfactory solution. It consists in firing a series of shots rather than a single shot (or group of shots) with fixed elevation from the data of shots nearest the target and using ground signals.

5. Study of the French Artillery. The author presents in a synthetic form a chronological study of the French artillery in which he explains the principal uses and technical characteristics.

He points out the modern ideas in regard to the requisites that are desired of the artillery materiel, the actual tendencies, and those that are delineated for the future.

6. The Electromagnetic Gun. The author gives a simple calculation of the electromagnetic gun of 80-mm. caliber. It shows that the construction of an electromagnetic gun in general, is still far from a practical solution, and he predicts that for many years to come explosives will continue to be the means to produce in a small space and in a very short time a great propelling force.

7. Forced Arcs. The author reports a series of new data upon the luminous intensity and upon the distribution of the flux of very intensive arcs. Numerous experiments have permitted him to construct some very interesting diagrams which permit him to explain and correct some interferences that are formed on

the glasses from the use of the forced arcs. In detail, he has acquired some information about the total flux, the medium intensity, and the principal characteristics of the projector.

8. MOTORIZING THE ARMY. The author presents a brief study relative to the modern tendencies on motorizing the army. The article sketches the particular interest of the problem of Italian mortorization, and points out the various mechanical changes resulting in the rapid transformation of the tractors to cross-country vehicles. It follows with a recitation of what actually has been done and thought in foreign countries in regard to motorization and gives a summary conclusion.

9. UPON THE ELECTRICITY PRODUCED IN FIRE ARMS AND THE FUNCTIONS OF THE MOTOR SPARK. The author presents some results from his experience with rapid fire guns, insulated from the ground, in which he has seen the effective quantity of electricty from the muzzle, projectile, and in the expansion of the gas. For analogy he thinks that such electrical discharges can be found in the motor sparks, and in laboratory experiments he has verified this phenomenon on a little two-horsepower motor. He proposes to make other experiments on large airplane motors.

Bulletin Belge des Sciences Militaires, April, 1928

1. THE OPERATIONS OF THE BELGIAN ARMY—THE BATTLE OF YSER, Journal of October 28, 1914.

2. THE ROLE OF THE FIELD ARMY AND OF THE BELGIAN FORTRESSES IN 1914. By Lieut. Col. B. E. M. Duvivier and Major B. E. M. Herbiet.

3. THE FIRE OF ARTILLERY IN DIRECT LIAISON WITH THE INFANTRY MANEUVER. By Colonel Mozin.

4. THE PLACING OF THE FIELD BATTERIES UNDER SUPERVISION. By Lieut. Col. B. E. M. Thomas.

5. THE FIGHTING TANKS. By Major Lievin.

6. NAPOLEON: HIS LIFE AND HIS WORK. By Major F. Dolvaux.

7. HOW TO CONSTRUCT A SWEDISH TABLE. By Lieut. Lambert.

Bulletin Belge des Sciences Militaires, May, 1928

1. THE OPERATIONS OF THE BELGIAN ARMY—THE BATTLE OF YSER, Journal of October 30, 1914.

2. THE ROLE OF THE FIELD ARMY AND OF THE BELGIAN FORTRESSES IN 1914. By Lieut. Col. B. E. M. Duvivier and Major B. E. M. Herbiet.

3. THE MARCH INTO BATTLE. By Col. B. E. M. Hans.

4. A METHOD OF INSTRUCTION FOR FIRING BY THE RIFLEMEN. By Lieut. Col. Demart.

5. TANKS. By Major Lievin.

Revue d' Artillerie, March, 1928

1. INFANTRY-ARTILLERY LIAISON: THE IMMEDIATE ACCOMPANIMENT, DIRECT SUPPORT. By General Challeat.

2. ADVANCE PROJECT SUMMARY OF MATERIEL. By General Charet and Captain Revers.

3. A STUDY OF THE ESTIMATE OF THE PROBABLE NET COST IN THE FOUNDARIES [OF A FUTURE WAR] AND ON THE LESSONS EVOLVED THEREFROM FOR THE PURPOSE

OF THE DISTRIBUTION OF THE GENERAL EXPENSES. By Colonel Dumouly, Retired.

4. COOPERATION BETWEEN THE INFANTRY AND ITS DIRECT ARTILLERY SUPPORT. By Lieut. Col. J. de la Porte du Theil.

5. THE MILITARY SCHOOL AND ITS EARLY HISTORY. By Robert Laulan, Librarian of the Superior School of War.

6. Miscellaneous Information—Three new arms against tanks—Swisse: Oerliken automatic gun of 20-mm.—United States: Motorization of a division—New antiaircraft gun.

Revue d' Artillerie, April, 1928

1. COUNTERBATTERY. By Lieut. Col. E. Bourboulon.

2. COOPERATION BETWEEN THE INFANTRY AND ITS DIRECT ARTILLERY SUPPORT. By Lieut. Col. J. de la Porte du Theil.

3. FIRING BY HIGH BURST RANGING. By Captain E. Brock.

4. THE MILITARY SCHOOL AND ITS EARLY HISTORY. By Robert Laulan, Librarian of the Superior School of War.

5. ARTILLERY FIRE AGAINST TANKS. By Major F. Le Nôtre.

6. LIGHT FIELD HOWITZER 10.5-CM. L/22.

Military Libraries and Book Supplies in France and Poland

In an article published in the December 25, 1927, issue of the *Militär-Wochenblatt,* Dr. Friedrich Stuhlman gives an outline of the existing systems for supplying books and libraries to the military service in France and Poland, an extract of which is here given:

The arrangements for supplying books and libraries to the military establishments vary greatly in different states. They are centrally controlled to a very slight extent only and are mostly much diversified and their practical value is, in consequence, much impaired. It is unquestionably necessary that, for successful operation the central system should be under the control of an experienced central authority as is the case in Germany. In this statement I will confine myself to giving an outline only, without going into minor details, of the methods now prevailing for supplying books and libraries to the military services in France and Poland.

France. There is no central book-supply organization like that in Germany. The army and navy each make their own arrangements. The first dates back to the 17th century and shows, aside from a book supply of about 150,000 volumes, also 145,000 charts and pamphlets. There are on hand, in addition to these, books for the military schools and for separate military establishments, officer's and noncommissioned officer's and men's libraries.

The most important libraries of the kind first named are those for the higher war schools, the polytechnic school, the military school at St. Cyr, the cavalry school at Saumur, the school for subalterns of artillery and engineer corps and of the artillery branch.

There is a distinction in libraries for officers between garrison and regimental libraries. The former, numbering about 300,000 volumes, are distributed over the entire domain of France and its colonies. They are under the control of the historical section of the general staff of the army and are intended for the use of active and reserve officers. At the beginning of 1926 they had about 220,000 volumes.

The regimental libraries are provided by the officers concerned and have to be maintained by them. Each has about 150,000 volumes. The men's libraries are in part property of the state and in part of the troops concerned. The state has provided about 450 volumes for every major unit while each company squadron and battery has furnished its own books to the number of about 300 volumes. They are intended for entertainment and instruction. The noncommissioned officer's libraries which each organization has provided to the number of about 900 volumes serve the same purpose.

Supplies of books and libraries are under the direction and control: 1. Those for the military schools and educational establishments, of the superior military authorities of the war ministry. 2. Those for the war ministry and for officers of garrisons, of the historical section of the general staff. 3. The men's libraries. under the bureau of military works in the war ministry. There is no central authority charged with supervision of all libraries.

Poland. The arrangements for military libraries in this country are similar to those that now prevail in Germany. The central military library and book supply in Warsaw has been in existence since 1917 as the library of the Polish Military Commission; it has held its present designation since 1919. It absorbed, in 1927, two other large military library systems so that it now possesses 200,000 volumes, besides charts, pamphlets, drawings, etc. In addition to this extensive library combination, there are corps libraries for each army corps with books of a technical character principally. They comprise about 55,000 works and 7000 charts and drawings. Both kinds of libraries are at the disposal of civilian and military persons and counted about 27,000 readers in 1926.

Each regiment has an officers' and a men's library and each military school its school library. At the end of 1926 the officers regimental libraries comprised 220,000 volumes, the soldiers' libraries 367,000, and the school libraries 102,000 volumes.

In addition to the foregoing there are also the libraries of the association for military science, a scientific association for active and reserve officers which showed, at the end of 1926, 26.000 volumes and 33,000 readers. In 1925 the aggregate of all military libraries registered 236,000 readers with 461,000 books. The director of the central military libraries stands at the head of the entire Polish military library organization and exercises a rigid control of the system.—G. R.

An Impressive Memorial Service in Bulgaria

The memory of the fatherland for the men who fell in the world war is celebrated in Bulgaria in an unusual but very impressive manner. On October 23, 1927, the First Infantry Division of Sofia celebrated its annual memorial service for its dead in the war with marching of troops, parades, field mass and other impressive features in which citizens and civilian societies took far greater part and interest with the army than is usually the case elsewhere.

The eve of the celebration is devoted to the fallen heroes. The entire garrison marches with appropriate music and display of flags on the main streets of the city to the front of the great cathedral, accompanied by patriotic unions and schools which never fail to turn out on such occasions, displaying flags and marching in close order with the troops. The war minister, passing along the

front of each organization, was greeted with appropriate music and saluted each unit of the troops. His salute was replied to by the men with loud return greetings.

As the evening advanced the troops and the mass of the people numbering thousands stood by in impressive silence. When the mourning fires that had been lighted in front of the cathedral were beginning to die out an offiecr of each regiment advanced to the front and in a loud voice called off the names of the men of the regiment who had died in the world war adding to each name the place of the fight in which he had fallen. After each name had been called the men of the unit of the troops to which he had belonged and the people standing by responded with bared heads by repeating the words: "died for the fatherland, died for the fatherland," while the church choirs intoned beautiful Slavic mourning hymns and the huge cathedral bell was struck once for each name.

This continually resounding murmur, which resembled a painfully sobbing cry for the deceased heroic sons of the fatherland, was heartrending and acted as a mysterious warning and proof to all that Bulgaria still cherished the memory of the heroic sons who had sacrificed their lives for their country and its cause and that others were ready and prepared to take their places when required.—G. R.

A Serious Question to Consider

The proposed law prohibiting American arms manufacturers from selling weapons to countries at war is a question of the utmost importance. Recent developments of the arms industry in a number of foreign countries indicate that such a law would only lead foreign powers to buy all their equipment elsewhere, instead of part of it in the United States.

We are a peaceful nation, not desirous of war. But unbiased parties realize that unsettled world conditions make such a contingency possible. Our own means of protection must be considered. When we embarked in the World War it was American manufacturers who provided our soldiers with their fine equipment. Obviously the arms industry, to stay in business and maintain plants suitable for quantity production, must have other than local markets for its products. The law now under consideration would to a great extent reduce American gun manufacture, with the result that, in case of necessity, we might be faced with a dangerous shortage of arms manufacturing plants.

If this law would be of material assistance in doing away with war it would be justified. But there seems to be little basis for such a belief. Guns can be bought from many leading nations. The present unwritten understanding between our government and the small arms manufacturers, by which the latter refrain from selling weapons to warring countries when our government so requests, has been respected by manufacturers even though valuable business has been lost.

To abolish war would be a great thing, or to make armed hostilities more difficult. But the law as proposed would seem to endanger our means of national defense without securing compensating benefits.

Medical Advice by Radio

Since February 4, 1922, the United States Public Health Service has been furnishing medical advice by radio to vessels at sea. The amount of this work has increased and the Public Health Service has often rendered great assistance

to vessels at sea in need of medical aid. Advice by radio is furnished from the U. S. Marine Hospitals of the Public Health Service, the Atlantic Coast being served from New York City, the Gulf of Mexico from Key West, New Orelans and Galveston, and the Pacific Coast from San Francisco. On the Great Lakes, the Marine Hospitals at Chicago, Cleveland and the Relief Station at Sault Ste. Marie give medical assistance by radio. The Relief Station of the Public Health Service at Honolulu, serves ships in that vicinity, and those near Manila radio the Relief Station there for advice.

The following example of the messages received and advice given illustrates the value and importance of this service. This message was received from a ship out at sea at a Marine Hospital at 8:44 A. M.:

> "Accident, man fell down hold, apparent injury, bruises, left temple and body, dazed condition, symptoms of concussion, require doctor's advice, if necessary assistance." (Signed) Master of Vessel.

Within twenty minutes the following message had been forwarded in reply:

> "Absolute rest in bed ice cap to head, should patient become unconscious later rush to hospital at once, patient can be taken off at quarantine station if necessary." Marine Hospital.

Instances of this kind could be multiplied indefinitely. Frequently a report is given to the hospital from day to day as to the progress of a case. "Patient much improved. Thanks," is a report which is quite frequently received. The variety of cases treated in this way is very great, ranging from toothache to the treatment of fractures of various parts of the body. One vessel sent a frantic appeal for advice as to how to handle a man with delirium tremens.

This medical advice to vessels at sea is greatly appreciated by seafaring men and many letters and radiograms thanking the Public Health Service for the advice given have been received.

The furnishing of such medical advice by radio has been made possible through the generous cooperation of the several radio companies. This service is rendered without cost to the vessel or the hospital.

MAXIM XLVIII

The formation of infantry in line should be always in two ranks, because the length of the musket admits of an effective fire in this formation. The discharge of the third rank is not only uncertain, but frequently dangerous to the ranks in its front. In drawing up infantry in two ranks, there should be a supernumerary behind every fourth or fifth file. A reserve should likewise be placed twenty-five paces in rear of each flank.—*Napoleon's* Maxims of War.

BOOK REVIEWS

Stonewall Jackson: The Good Soldier. By Allen Tate. Minton, Balch & Company, New York. 1928. 6"x 8". 322 pp. Ill. $3.50.

Stonewall Jackson has probably been placed in the proper niche in the Hall of Fame. During his all too brief career, he established his right to be classed as one of the great tacticians of all times. His record was unique, being comparable in that respect only to Nathaniel Greene but with this difference—Greene was invariably defeated tactically but had uniform strategical success, whereas Jackson had only a single tactical defeat marked up against him and that was necessary to insure Confederate success strategically in the Virginia theater of operations.

Jackson's military career has been treated adequately before this, notably by Henderson. Except as concerns Jackson's early career, Mr. Tate brings out little that is new, but he writes so understandingly and so sympathetically that his book grips the attention of the reader throughout. His characters are presented with photographic clarity, and Jackson stands out in sharp relief as a hard marching, hard fighting combination of religious fervor and of military genius (he ascribed his single defeat largely to the fact that he fought on Sunday). Perhaps the most important thing the author gives us is an appreciation of the depth of understanding which existed between Lee and Jackson. If Lee had been more of a politician and if Jackson had been spared to the Confederacy, what wonders they might not have accomplished! Seldom was it necessary for Lee to tell Jackson what he wanted done; Jackson seemed almost to divine Lee's wishes. "Such an executive officer," said Lee, "the sun never shone upon. Straight as the needle to the pole, he advances to the execution of my purpose." "I would follow Lee blindfolded," said Jackson.

Mr. Tate's style of short, sharp sentences is rather disconcerting, but perhaps it is suited to the abrupt, vigorous methods of Jackson. At West Point "he knew he had to study hard. He barely passed his first regular examinations. From these he received the rank of fifty-one in a class of seventy-two. When he arrived at the Point he was given three weeks to learn the English grammar. He learned it." And again: "All of the 12th was spent by the Federals crossing the river. Burnside was not aware that Jackson had come up. Jackson, as at Manassas, hid his men in the woods. Jackson's line was twenty-six hundred yards long. There were twelve men to every yard. The trap was set."

More disconcerting is the habitual use of conjunctions with which to start sentences. Four successive pages, picked more or less at random, show eight sentences beginning with the word "but," and two sentences beginning with "and" These same four pages have twenty sentences of a length no greater than a single line.

Himself a literary critic, Mr. Tate probably chose his style with deliberation, and with it he has dramatized the life of Jackson, giving to it much of the inter-

est of a good work of fiction. The text closes with Jackson's death, after having been wounded at Chancellorsville.

". . . At eleven o'clock Mrs. Jackson came in and sat by him on the bed. She said he could not live beyond the evening. 'You are frightened, my child. Death is not so near. I may get well again.'

"She fell upon the bed and cried, and told him again. Then he asked for Doctor McGuire.

" 'Doctor, Anna tells me I am to die today. Is it so?'

" 'Yes,' the doctor said.

" Jackson turned his head; he seemed to be thinking, thinking intensely.

" 'Very good, very good,' he said in a low voice. 'It is all right.'

"At noon Major Pendleton came to see him, and he asked:

" 'Who is preaching at headquarters today, Major?'

"The major answered Doctor Lacy, and said the whole army was praying for him.

" 'Thank God, they are very kind to me.'

"His little girl was brought in, and he brightened; then he fell into a delirium. He talked, talked. He was on the battlefield. Now he was in Lexington. Now he was praying in camp. For a long time he lay still. Then he cried:

" 'Order A. P. Hill to prepare for action. Pass the infantry to the front. Tell Major Hawks——'

"He lay still again. After a while he said in a clear voice:

" 'Let's cross over the river and rest in the shade of the trees.' "

A fitting close to a brilliant career.

Lafayette. By Henry Dwight Sedgwick. The Bobbs-Merrill Company, Indianapolis. 1928. 5¾"x 8¾". 433 pp. Ill. $5.00.

One sometimes wonders just what Lafayette's career would have been had he never come into personal contact with George Washington. The intense friendship between these two men, formed when the one was but a stripling and the other was already entering middle age, colored Lafayette's entire life. The ideals of Washington became those of Lafayette, and the Frenchman's ultimate failure to rise to the heights of power and fame probably resulted largely from his desire to superimpose those ideals of a young and unformed Anglo-Saxon nation upon the long-established foundation of a Latin civilization. The liberty that Lafayette visualized was not the liberty conceived by France. Twice he held the fate of France in his hands and twice he failed to rise to the occasion. Unable to support the old regime, he was unwilling to countenance the radicals. His middle course alienated both sides, and in the end he had to make way for others.

Mr. Sedgwick divides Lafayette's life into "episodes": first, his career in America; second, that period during the Revolution when he was at the helm and might have become master of France; and third, the period during the revolution of 1830 when again he controlled the future of France. Suitable treatment of these episodes requires more than a mere biography. Lafayette, fortunate in birth and in surroundings, was necessarily a central figure wherever he chose to go. An account of his career therefore becomes more an account of the events in which he was the principal figure. The book has therefore a much wider interest than the title might indicate. The author has been about

as impartial as is possible to a biographer, and has let Lafayette's contemporaries characterize him for us. The Lafayette we see is, for this reason, a public character. Little is said about his private life; and the periods during which he was not concerned with public affairs are passed over rapidly. His public life leads us to conclude that Lafayette does not quite belong among the really great; his private life would confirm this conclusion and show us that Lafayette was human.

Throughout the book, Mr. Sedgewick quotes freely from Lafayette's friends and from his enemies, but he never fails to give his own judgment in incisive language. He finds that Nature bestowed upon Lafayette "zeal, courage, energy, honesty, frankness, simplicity, perseverence, a flaming enthusiasm for what he deemed high causes, a disposition so graced with charm that his wife, his family, his friends adored him, and—a rare quality in ambitious men—a power of admiration, and what is perhaps rarer still, a hero to admire worthy of that admiration." In the end, we are told: "He was not a man of genius, all agree to this; but he possessed a character compounded of courage, truth, loyalty, love of country, love of liberty and love of fame, that in the history of nations is of rarer occurrence than genius. France may not hold him among her great men, but in America, it is likely that his reputation will last as long as our history."

We find Mr. Sedgwick accurate in fact, interesting in style, and impartial in treatment. His book is a timely and valuable addition to biographical literature.

Yarns of a Kentucky Admiral. By Hugh Rodeman, Rear Admiral, U. S. N. Bobbs-Merrill Co. 1928. 5¾"x 8¾". 320 pp. Ill. $5.00.

The right way to spin yarns is to spin them, and not talk about yourself or try to write history. Here is a man who can do it.

The Admiral's zest has apparently never fagged. He is as keenly interested in the old Kanaka canoe cruises to Tahiti—more wonderful in their way than the recent flight of the *Southern Cross* over the same course—as he is in that North Sea sweep which almost gave our battle squadron the honor of leading the British Grand Fleet into action. He is a hunter and a fisherman, a man of humor and insight. He has led a full life and enjoyed it to the full. And the flavor of all of this he has put into his book.—S. M.

Service Record by an Artilleryman. By L. V. Jacks. Charles Scribner's Sons, New York. 1928. 5"x 7¼". 303 pp. $2.00.

The author belonged to the 119th Field Artillery, of the 32nd Division, which saw front-line service from Belfort to Soissons and took part in the advance from Château-Thierry to the Vesle River, in the savage fighting around Juvigny in the Chemin des Dames region, and in the advance through Montfaucon in the Argonne-Meuse drive. Five months, almost to a day, this regiment was at the front, and, at the end, a careful observer accompanying the regiment had something about which to write.

The author did not join the regiment until after it had left the Belfort sector, but that was a quiet sector and he missed little. The 57th Brigade had left Belfort on July 23, headed for the vicinity of Soissons, and detrained at or near Ormoy-Villers and marched to Pte. Ste. Maxence. The demand for troops to

carry on at Château-Thierry caused a change in plans, and the brigade started overland on July 27 for that point. The author was in a group of replacements that joined just before this severe march started, and his story begins with the march—98 kilometers between the morning of the 27th and the evening of the 29th.

Any account of this type is necessarily limited to the field of view of the narrator, but the author was keenly observant and frequently came into contact with the other regiments of the brigade—the 120th, 121st, and 147th—and we are able to follow in a general way the fortunes of the whole brigade. The narrative is well written, with a trace of the dramatic in it, and it is essentially accurate. In some cases, he was not in a position to know the causes giving rise to certain situations, as when he finds "some delays" kept the battery from going into position before Juvigny on the night of August 7. The French commanding-general desired one-half of each of the regiments of the brigade to go into position that night, immediately following a hard three-day march from positions not far from Fismes on the Vesle, to St. Etienne, in the Juvigny area. The troops were exhausted and the regimental commanders of the 119th and 120th regiments claimed that they were unable to put any of their batteries in position that night—that either half of their regiments was just as tired as the other half. As a result, and at the suggestion of the regimental commander of the 147th Field Artillery, the 147th and the 121st put their entire regiments into position, instead of the half the French asked for. The other two regiments followed the next night.

The high lights of the narratives—the experiences which particularly impressed the author—seem to be the period during which a considerable part of the brigade occupied the Fond de Mezières—"Death Valley," the fighting which preceded the capture of Juvigny, the jump-off in the Argonne-Meuse drive on September 26, the opening of the final attack on November 1, the terrific marches the brigade was called upon to make (it seemed always to be needed in a hurry and during the five months it had but four consecutive rest days behind the lines, and this while it was being held more or less in reserve during the St. Mihiel affair), and the everlasting rain. The author leaves out nothing of the mud, hunger, fatigue, cooties, gas, and sudden death; yet the account has somewhat of the appeal of the 18-year old soldier who had just been brought into the dressing station in the case at Tartières with a machine-gun bullet hole in his arm. While awaiting his turn he caught the attention of a passing artillery officer and, with his eyes shining and his voice high-pitched in excitement, began a recital of his experiences with an exclamation—"You ought to have been there, Lieutenant. You just ought to have been there."

The Rise of American Civilization. By Charles and Mary Beard. The Macmillan Co. 1927. 6"x 8½". 2 Vols. 824-828 pp. $12.50.

The growth of America since the first English settlements is the theme of these two fat and delightful volumes. It is a growth marked, not by men or dates, but by the sweep and surge of great economic forces and of even greater ideas—the true development of the body and spirit of a nation, in which time is merely one dimension and leaders are accidental. This is history writ large. This is a canvas of vivid colors, bold, impressionistic. This is the mould in which our restless, energetic people have been formed, pressed here by economic needs, released there to follow the impulses of imagination.

The Beards mince no words and, what is more, they know how to use them. They strive to maintain the impartiality of the historian, and on the whole they succeed, though their bent is towards liberalism. They have unquestionably produced a remarkable and very readable book.—S. M.

Jamestown and Her Neighbors on Virginia's Historic Peninsula. By J. E. Davis. Garrett & Massie, Inc., Richmond. 1928. 5″x 8¾″. 99 pp. Ill. $1.50.

This little book consists of a collection of sketches of historic places within a short radius of Jamestown Island, the site of the earliest English settlement in America. No area within the United States is possessed of greater historic interest than this area between Richmond and Old Point Comfort, for here was the starting point of the British occupation of America. Both the Roanoke and the Maine enterprises—preceding Jamestown in point of time—failed, and the spark of life was so nearly extinguished at Jamsteown on more than one occasion that it is a matter of surprise that it survived at all. In the end, the colony became firmly established and spread over the surrounding country.

In a book such as this only the highest historical lights may be touched upon and statements must be kept general. The author has judiciously selected her subject matter and has kept it free from error. The sketches include the Kecoughtan Indians, Jamestown, pirates of the Virginia Capes, Williamsburg, the Virginia navy of the American Revolution, Yorktown, Old Point Comfort, Hampton, Richmond, the James River plantations, and other more general chapters. The book is far too brief to be of value to the student, but its brevity, pleasing style, and accuracy should give it an appeal for the general reader desiring to know somewhat of the oldest of the English-speaking settlements in America.

The Hysterical Background of Radio. By R. P. Clarkson. J. H. Sears & Company, New York. 1928. 5¼″x 7¾″. 250 pp. Ill. $2.00.

Don't blame the proof reader for the odd title; it is correct as printed, though one's natural inclination is to regard it with doubt. The book, "is written . . . more for entertainment than for instruction," but no one can read it without finding that it furnishes many leads toward additional research, as well as being "historically" correct.

Some of the chapter headings are: "Garlic and Diamonds," "A Real Kick in a Bottle," "Loose Ankles," and "From Beer Barrel Bung to Violin"; and while almost every page contains a jest, yet solid facts are given from unique points of view, which tend to fix them more firmly in the reader's mind.

Some of the interesting points brought out by Mr. Clarkson are that a murder was of great service in furthering the telegraph industry; that pictures were sent over telegraph wires in 1858, and concerts in 1877; that wireless telegraphy was demonstrated during the Civil War, and wireless telephony soon afterwards; and that garlic was at one time thought to be so powerful that it would neutralize the compass, and the steersman who had its odor on his breath would have "the hand which he most used spiked to the mast or principal timber of the ship, there to remain until he himself tore it free; What price garlic!"

The book will be a worth-while addition to the Reference Library of every one who is interested in Electricity or Radio, and will furnish as well, several hours of fascinating reading.—W. R. S.

The Restless Pacific. By Nicholas Roosevelt. Charles Scribner's Sons. 1928. 5¾"x 8½". 291 pp. Ill. $3.00.

A fairly comprehensive synopsis of the Pacific problem, written from the imperialistic point of view. The charts, largely economic, are good. The text contains little that is new, in fact or in thought, but it is well presented. The fifth section of the book, called "The Imponderables," is the best part of it.

Our indefinite retention of the Philippines is advocated from so many angles—even as a duty we owe Islam (!)—that the book may almost be classed as propaganda.—S. M.

The Stream of History. By Geoffrey Parsons. Charles Scribner & sons. 1928. 590 pp. Ill. $5.00.

"The effort in this volume has been to present the past as the rich and changing background of man's actions, potent to stir his imagination and emotions, and useful in adding to the basis of his judgment—part instinct, part logic, part guess—by which the major decisions of individuals and of nations must inevitably be reached." "There are always counter-forces present to destroy any thorough unity of design, and history remains a stream of countless currents and eddies that defy accurate measurement or description." These two quotations give a fairly good idea of the spirit in which this remarkable book has been written. It is wise, mellow, conservative; never dogmatic or propagandistic. It stimulates through the questions it raises rather than through the assertions it makes. It concerns itself with the great movements of man's development, the currents and cross-currents of the stream; and yet it is not written according to the great-man school of history, or to the economic or the geographic or the racial. The elements are weighed and set down—the answer is left largely to the reader.

The book is full of little touches of insight, such as the following:

"Thothmes III was a tyrant but an able organizer, and he brought peace and order in the wake of his sword. Akhnaton was a poet and a dreamer, and in his wake came war and chaos."

"Such devotion (to the Stuart Pretenders) needs to be remembered in a period when some historians are stressing economic causes as the sole spring of human action."

"Democracy may yet prove to be the pacificatory force that democrats assume it to be, but its record thus far is one of vigorous nationalism and, by one name or another, conquest."

A very able and readable book.—S. M.

Gorilla: Tracking and Capturing the Ape-Man of Africa. By Ben Burbridge. The Century Co. 1928. 5¼"x 7¾". 323 pp. Ill. $3.50.

Our present day world is taking a new and unusually intensive interest in natural science as it pertains to the savage members of the animal kingdom that reside in parts of the world unaccessible to the majority of us. Through the motion picture screen and the press we are learning some of the thrill that accompanies the hunt, with camera or gun, of big game animals.

Mr. Burbridge has considerable dramatic style in his narrative, and we not only see the things he saw, but to some extent feel the thrills he felt. Witness the following passage:

> It was a savage and spectacular picture that flung its outline against the gloom of the distant mountains—the elephants hovering like thunder clouds above the pool, glaring into the teeth of the roaring hippopotamuses, and the silent pithon looking on. The elephant . . . turned slowly away. As the reeds closed over their retreating forms, the hippopotamuses sank back into the dark waters of the pool, leaving but a few silvered ripples floating shoreward. Inch by inch the head of the great snake lowered to the slime and mud that half concealed its mottled coils; then slowly it wriggled into the grasses and disappeared; the stage was empty."

Not all of his descriptions terminate so peacefully, for when dealing with actors like the lion, elephant, and gorilla, tragedy and violence are ever but a second away, but whether it be tragedy or comedy, Mr. Burbridge has told his stories with such effect that the interest of the reader is not permitted to slacken for an instant.

Mr. Burbridge is now engaged in his fifth trip to Africa. The main purpose of the trip of which this book is a narrative, was to study, photograph, and capture gorillas, perhaps least known of the animals of today. In all his missions he was successful. It is certainly recommended that the description of capturing young gorillas with bare hands be read. It is something that all will admire but few envy, for a gorilla, young or old, is a furry tornado.

The title of the book does not indicate its scope. The final chapters deal with the anthropoid, as the title suggests, but in travelling to the gorilla country, we are led through successive chapters dealing with antelope, buffaloes, rhinoceroses, lions, and elephants, with many other residents of the jungle and veldt thrown in for added entertainment. With this subject matter, and with the experience and dramatic story telling ability of the author, *Gorilla* is as thrilling a book as will be found in a year's reading.—B. F. H.

Me and Henry and the Artillery. By William Hazlett Upson. Doubleday, Doran & Company, Inc., Garden City. 1928. 5"x 7¼". 271 pp. $2.00.

Me and Henry certainly had a hard time in the artillery. "Whenever we got away from our own artillery for a minute or two the German artillery would start in bothering us, but it never bothered us half so much as our own artillery did. Every time me and Henry sat down with a bottle of cognac, every time we made friends with a good looking mademoiselle, every time we got a chance to dry off—why, along came the artillery. Henry and me was the unluckiest guys in the A. E. F., but we managed to have a pretty good time at that."

The author tried for a commission which he failed to get, and then enlisted in the 13th Field Artillery, 4th Division, with which he served as a private in the A. E. F. and in the Army of Occupation until the spring of 1919. How much of his own experiences find their way into the book, one can not say: but me and Henry might almost have been any two privates in France. They got rained upon: they slept in mud: they had cooties: they liked their cognac when they could get it; they knew all the gold-bricking tricks: and they were inveterate souvenir hunters. They worked when they had to; and they took their fun as

they found it. They hated the army, and the artillery, and the top sergeant, and all the rest; but in the end they look back upon the "Good old Army. Good old War."

One of the most amusing books of its kinds.

The Familiar Guide to Paris. By John N. Ware. Robert McBride & Company, New York. 1928. 4½"x 6¾". 310 pp. Ill. $2.00.

This book is not as comprehensive as its title might lead one to believe. The author leaves to guide books of the usual type the duty of advising one where to go, how to get there, where to stay, what to do, and how much to pay. He is interested only in what you see. He does not much care where you come from, but once you have joined his party he takes you to the places he wishes you to see. Once there he does not attempt to show you everything, but he does insist that you see—and appreciate—the best. He chooses the Louvre, Carnavalet and Victor Hugo museums, the Conciergerie, Saint-Chapelle and Cluny, Les Invalides, the Rodin museum, Versailles, and Fountainebleau. The selection is excellent, if limited, and none of these should be missed. At each place, the particular items of special interest or beauty are indicated and some of the historical associations are pointed out.

Mr. Ware has accompanied numerous parties to all of these places and knows whereof he writes. There is more than a trace of levity throughout the book, evidently intended to lighten the historical information which, incidentally, is not burdened with dates and statistical data. Full benefit from the book will not be derived unless it be carried along and consulted during the several trips. The illustrations are small, but excellently chosen, even if a third do not pertain to the places visited.

Paris With the Lid Lifted. By Bruce Reynolds. George Sully & Company, New York. 1928. 5¼"x 7½". 281 pp. Ill. $2.00.

Not only different but unique.

Of the dozens of books on Paris and France which have come to hand this spring, none has attacked the problem of seeing Europe in quite the spirit advocated by Mr. Reynolds. The average guide book attempts to show as much as possible of the locality covered, but at a minimum of cost. The less the cost, the better the book. Perhaps a majority of the tourists who pour into Europe from America in a never-ending stream are in need of a book of the average type. They go to Europe for a variety of reasons, but they must count the cost and so arrive with a common aim—to see as much as possible for the money they have available. They take their vacations seriously; but there is another class which takes its vacations joyously and which has no desire to "do" Europe. It is to this class that Mr. Reynolds addresses his book.

The author's advice is to spend—spend freely and liberally, to go only to those places one desires to see, and to do only those things one desires to do. He, of course, qualifies his general advice, for who would be brave enough to return home without having seen the things and without having done the things that

the neighbors have seen and done or that they will expect one to have seen and done? To start his book, Mr. Reynolds says: "Never mind the expense. You have come for a holiday. Spend that money you worked so hard for. Every penny of it. The harder it was to get, the freer it should be spent. The only reward you ever do receive for your labor, is what your money will buy you in pleasure and in happiness. Don't try to see how cheaply you can 'DO' Paris."

Heresy? Perhaps, but it is the way to have a good time. So, if you follow the author's advice, you will dress for the evening the first few evenings and see the places you have to see, and then you will start in going to the places where good times are to be found. He gets you out of bed at about 11 o'clock, gives you an hour by hour schedule until bedtime, and puts you to bed (perhaps with the assistance of the concierge) at about 3 o'clock in the morning. The schedule is good, but you will not follow it—nor does Mr. Reynolds expect you to.

The Spell of Ireland. By Archie Bell. L. C. Page & Company, Boston. 1928. 5½"x 7¾". 317 pp. Ill. $3.75.

None of the nations of the world is possessed of a greater fascination than Ireland. Its spell is felt from the first landing in that country to the very moment of departure, and it never entirely leaves one. Of just what the "spell" consists it is difficult to say. Archie Bell feels it, but he does not entirely isolate it. Other nations have as beautiful scenery and as picturesque mementos of the past; other people are as friendly and hospitable. If we dig deep enough it is probable that we shall find the lure of Ireland to lie within the people themselves and in their background of history—that queer intricately-woven mixture of curious fact, fantastic legend, and whimsical fancy that Abbe MacGheoghan takes so seriously.

The history of Ireland is a story of civil war comparable, in that respect, only to China, but with an important difference—for whereas the Chinese take their fighting seriously and ploddingly, the Irish have always taken theirs joyously and lustily. It has been stated that every good Irishman is descended from a king. There is much of truth in this and it is from this reason that Ireland developed its taste for combat. When the sons of Milesius set up three kingdoms and a chief kingship, together with a rule that any of their descendants or those of their uncle in a direct male line had an equal claim to the throne of the *ard-righ*, they stored up trouble for Ireland. At the same time they laid a foundation of egalitarianism which gives the Irish of today much of their bearing and self-possession.

Archie Bell, however, does not go into this side of Ireland. He lands at Cobh (pronounced Cove) and makes "the ground tour." Investigating the southwest corner, he goes part way up the west coast, crosses to Dublin, and continues to the infrequently visited Donegal highlands. His itinerary includes Cork, Youghal, Blarney, Bantry, Killarney, Limerick, Galway, Athlone, Dublin, Belfast, Giant's Causeway, and Donegal. Describing with fluent pen the points of principal interest or of principal beauty, he adds bits of local history. Better still, he catches and passes on to us much of the sentimentality and the whimsicality of the people. At the end, he leaves Ireland—"one of the most beautiful corners of the earth"—without an expressed sense of regret, but we who read his book cannot help but wish the tour had been longer.

Baron Münchausen's Narrative of His Marvelous Travels and Campaigns in Russia. Edited by Steven T. Bynkgton. Ginn and Company, Boston. 1928. 4¾"x 6¾". 134 pp. Ill. $0.68.

When Baron von Münchausen, along about 1760, returned to Hanover after serving in Russia against the Turks, he began telling the impossible tales which have made his name famous and which inspired the publication of narratives credited to him. The first edition was brought out in London in 1785 by one Erich Raspe and some of the stories contained in this work probably originated with Münchausen. A second edition some years later added tales which can not be credited to the Hanoverian and which were not as good as those written by Raspe. Even worse were the stories added in the edition of 1792. Still other narratives, credited to Baron von Münchausen, were added when the work was translated into German.

The best of these narratives have been included by Mr. Byngton, who, however, has taken advantage of his privilege as an editor to exercise his blue pencil. Of the stories belonging to the first edition, he has included all but a small part which he considers of doubtful taste, and he has also included most of the stories added in the second edition. He finds little to recommend from among the additions of 1792, and he devotes only twenty-two pages to selections illustrative of these. The interest of the parts omitted lies solely to the news of the times, and their omission improves the book for reading in these days.

To increase the value of the book, the editor devotes some little space to tell us how the stories came to be written, what really happened in Russia, what was going on in England, and other matter. The book is well prepared, its typography is excellent, and its binding is well up to the Ginn standard.

Education for Tolerance. By John E. J. Fanshawe. Independent Education, New York. 1928. 5"x 7¼". 30 pp.

A plea for cooperation and better understanding between England and the United States, reprinted from *Independent Education.* The school systems of both countries constitute the medium through which such an understanding is to be brought about.

Tides of Empire. By Peter B. Kyne. Cosmopolitan Book Corporation, New York. 1928. 5"x 7¼". 397 pp. Ill. $2.00.

A spirited novel, in the author's best style, in which a young Irish adventurer takes part in the gold rush in 1849 and picks up an unusual combination of comrades.