XBAA

CONFIDENTIAL

1
5

Year 1909

No. 103

Author Russell, John H. Major, U.S.Marine Corps.

Contents An Outline Study of the Defense of Advanced Naval Bases.

AN OUTLINE STUDY

of

THE DEFENSE OF ADVANCED NAVAL BASES

Prepared by

Major John H. Russell, U.S.M.C.

GENERAL PRINCIPLES

The United States by its acquisition of territory, just prior to and at the close of the Spanish-American War, jumped, at once, from the position of a slumbering nation to that of a World Power with its colonies separated from the Mother Country, in at least one ocean, by a wide expanse of water.

Having assumed the role of a parent the necessity for protecting the child is obvious and a study of the methods to be employed to assure such protection develops the fact that the strong arm of the Mother Country must not only be capable of repelling an invasion of the colonies but must also be able to insure communication with them in order that the military forces may, at will, be concentrated at any threatened point.

It may therefore be safely assumed as a general principle that a nation desiring to safeguard the integrity of her colonies must preserve her supremacy by sea in the entire theatre of operations.

No state can maintain supremacy in an ocean without a sufficient number of footholds or stepping stones in the ocean. Such footholds or points d'appui, are called fortified naval bases.

The concensus of opinion of Naval and Military Authorities at the present time, makes the Navy's objective, in time of war, the enemy's fleet and therefore if a nation does not possess a naval base in the theatre of actual warfare a port or harbor must, of sheer necessity, be seized and defended. The limited radius of action of torpedo boats, destroyers, and submarines, makes the possession of such a base essential, otherwise these ships cannot be used offensively against an enemy, and in the case of a fleet blockading a port it is imperative that there should be some haven of refuge - some secure port - where vessels can take on coal, supplies and ammunition with facility and despatch and if crippled retire for temporary or minor repairs.

The strategical conditionsof the late Russo-Japanese War were such at the very outset of hostilities as to force Japan to seize the Elliott Islands and make use of them as an Advanced Naval Base in the theatre of actual operations. Again the seizure of Guantanamo Bay during the Spanish-American War, although it was not fortified and secured, exemplifies the necessity for a base at the front. Key West was less than 700 miles away but it was imperative that a base should be established in the immediate vicinity of the operations and the necessity for fortifying it would have been equally apparent had Spain been a powerful and aggressive nation.

These deductions lead to the belief that when two nations, widely separated by intervening water, are at war, the stronger of the two will, in order to carry on offensive operations, be forced to establish an Advanced Naval Base in the scene of actual hostilities.

For the United States, isolated from the Great Powers as it is and thereby realizing that any large war in which it may become engaged to be aggressive must be fought by its fleets at a distance from its permanently fortified bases, the importance of having in a constant state of readiness the means for defending a seized harbor or port is obvious.

The question naturally arises as to the kind of defense required. Should it be of a permanent or semi-permanent character? The very nature of the work eliminates the first or permanent defense as time alone would not permit of the construction of extensive fortifications. As the importance of the base increases, other things being equal, the time allowed for preparing the base for defense decreases. For important and far distant harbors or ports selected as Advanced Naval Bases the element of time becomes a most important factor in the defense.

If the supremacy of the sea in the vicinity of an Advanced Base is lost by the defender and his ships driven from the scene of operations then the necessity for the Naval Base ceases to exist and it will eventually fall. It may therefore be safely asserted that the first defense of an Advanced Naval Base is the Defender's own fleet.

Keeping in mind the general principle heretofore stated that the Navy's objective is the enemy's fleet it may be assumed that no nation will risk her heavily armored ships (battleships) in a perhaps ineffectual bombardment of a port until she has obtained supremacy of the sea. Neither side can chance the loss of a battleship unless in return it can disable one of the enemy's. History furnishes abundant proof of the futility of ships bombarding shore batteries, and, with the introduction of the sub-marine boat and offensive mines, it would be perilous to run the attendant risks with a ship of the first class. Temporary local sea supremacy might permit of a blockade and land attack against an Advanced Base or the planting of offensive mines or obstacles outside of the harbor entrance but no nation until she has obtained a decided superiority at sea could afford to send ships of the first class, which if once lost take years to replace, against shore batteries no matter how inferior they may be, the risk run from mines and submarine boats in order to get within range of the shore is too great, while the damage inflicted from sea bombardments has always been small and such bombardments are not in accordance with the teachings of modern strategy or tactics.

It is therefore obvious that the defense of an Advanced Naval Base need only be such as will resist a cruiser raid.

By a cruiser raid is meant an attempt to seize the port or harbor occupied as a base by a few cruisers, or, ships of light protection not capable of lying in the battle line, accompanied perhaps by one or more transports with troops, or an attempt to destroy shipping therein.

It will readily be seen that guns of an intermediate calibre are capable of refusing the harbor to ships of the cruiser class and especially so when such guns are well placed and masked. A further consideration governing the selection of this calibre for the main batteries of the defense is the facility with which the guns can be transported and mounted, thereby reducing the time of preparation for defense which as has been already stated is a most important factor. Such guns of the 5" or 6" type should, however, be of the latest pattern and highest ballistic qualities and will hereafter be referred to as main battery guns.

At least some main battery guns should, if practicable, be well advanced from the entrance of the harbor in order to prohibit the effective use of offensive sub-marine mines and to prevent an attack on the shipping in the harbor by bombardment. The use of offensive mines will depend greatly upon the depth of water and tide outside the entrance and if submarine boats formed a part of the defense the planting of these mines by an enemy would be made extremely hazardous.

It has been already stated that the final object of attack, in Naval warfare, was the enemy's fleet and to this end all the floating forces of a nation should be employed. The defense of an Advanced Naval Base must not contemplate the landing of a gun from a ship, even though that ship convoy the transport carrying the Advanced Base Outfit, neither should any plan of defense consider the use of any ship, other than available monitors, for the defense of the port or harbor.

The strength of the force used in connection with the defense of an Advanced Naval Base must of necessity be small and the subdivision of such a force into smaller and widely separated detachments permits of its being beaten in detail and therefore in the defense of an Advanced Naval Base the preeminent principle of concentration should be adhered to.

It must be admitted, however, that there are many cases where the tendency not to concentrate is strong but the failure

not to do so will invariably constitute a grave error.

Take, for example, the extreme case of an island. It will, unless it is very small, be found almost impossible to defend the entire island with the means at hand, in fact such is not desired, usually the defense of only one port or harbor in the island being required, and this defense would be much better undertaken by concentrating the forces at hand around the harbor to be defended rather than by distributing them at various bays and bights of the island thus permitting them to offer only a weak resistance to an attacking force.

For the main land the same reasoning would hold good only in a lesser degree, the favorable points of landing being probably fewer.

There are many tactical considerations governing the selection of a harbor for an Advanced Naval Base the most important being the following -

If possible there should be only one channel entrance to the harbor as this greatly simplifies the defense.

If the entrance to the harbor is formed by one or two narrow peninsulas an enemy might be able to maintain a cross fire on them.

For the purpose of defense it is important that the entrance of the harbor selected as a base should lead or open directly into the sea and vessels bound for it should not be forced to pass along and close to a coast; up an unprotected river, bay or sound; or over channel shoals or through straits, unless the latter are well guarded. The greater the depth of water directly outside the entrance of the harbor the better. These considerations are necessary in order to prevent an enemy from planting offensive submarine mines beyond gun range and outside the entrance to the harbor.

A narrow entrance while easy to defend might be blockaded by sinking a merchant vessel in it and it must be remembered that in the last two wars this method of blocking a harbor has been seriously attempted although the results have been poor and even if

successful it could only be a temporary sealing of the entrance. On the other hand if the entrance is too wide the defense, with the calibre of guns selected, may be impracticable. It may therefore be assumed that the many apparent advantages to be derived from a narrow entrance make it preferable.

The tidal current in the entrance may be so great as to prohibit the use of submarine mines, or the depth such as to make their planting an arduous and long task.

The entrance to the harbor may be so situated as regards the prevailing winds as to make the port unsuitable as a base during certain seasons of the year.

A slight current or set outside and past the mouth of a harbor is beneficial, rather than otherwise, to the defense as it precludes the use of mines, unless anchored.

If possible there should be high solid ground at the entrance to permit of batteries placed there delivering a plunging fire.

The harbor itself while apparently sufficiently large in size may be too deep or have many shoals and thus give very little anchorage room, or again the bottom may be such as to make poor holding ground.

The surrounding country should admit of a strong defense by land.

There should be no possibility of over land bombardment of the harbor at easy ranges from the sea.

The surrounding hills, within easy range of the harbor, may command it and be impracticable to defend.

The resources available in a port or harbor would also play an important part in its selection as a base and would properly be considered under the head of tactical considerations.

All tactical considerations must be weighed most carefully when selecting a harbor for an Advanced Naval Base but, of course, they may be entirely outweighed by strategic considerations such as the situation of the port and its proximity to the enemy's port or territory, being the best port, under the conditions,

available.

A study of the lessons of war teach us that land operations are generally necessary in order to seize a naval base, no matter how insignificant the defenses may be, and therefore in the selection of a base the greatest consideration should be given to the feasibility of defending it against a land attack.

The growth of navies has been so rapid and the fleets of the great powers are assuming such immense size that it is fairly questionable whether in the event of hostilities between any of them, one Advanced Naval Base would be sufficient for the aggressor considering the swarms of torpedo boats, destroyers, and submarines which it might be desired to use offensively against men-of-war, docks, or floating material in a blockaded port.

It is therefore possible if not probable that a naval base, distinct from the one used for the main fleet, but close by it, might be established for the use of a mosquito fleet and certain auxiliaries.

Such a secondary base would have to be defended with as great care as the primary one. In the selection of such a base, however, while the same considerations, in the main, govern as those used in the selection of the primary a few differ.

As a rule the anchorage room need not be so great, nor need there be so much water, but on the other hand it is more essential that the harbor should be landlocked.

Again it may become necessary to seize and defend certain points in order to prevent an aggressive enemy from making use of them, or to strengthen weak points in a line of communication.

A war between the United States and a powerful European state might cause the former nation to seize and defend any important harbor in the West Indies that might be of especial strategical advantage to an enemy as an Advanced Base.

After the completion of the Panama Canal it is apparent that the United States must be prepared to defend harbors in the immediate vicinity of the Canal Zone that might be employed by an

enemy for the purpose of landing troops to raid and attempt the destruction of the canal.

Such harbors would include Chiriqui Lagoon, Porto Bello, and other nearby ports.

Further, in order to strengthen the lines of communication from the canal to Honolulu and Samoa, or to prevent raids it might, in the event of a war in the Pacific, become necessary for the United States to seize and defend all islands in that ocean, possessing sheltering harbors, within striking distance of the Canal.

In general an efficient defense of an Advanced Naval Base should include -

1. The complete refusal to an enemy, by means of gun fire and obstructions, of all water approaches to the harbor leaving free ingress and exit for friendly ships.
2. It must provide for the protection of all obstructions.
3. Security should be provided against land attacks.

G U N S

MAIN BATTERY - In determining the number of main battery guns to be used in the defense of an Advanced Naval Base not only the strength of the force (personnel) employed in the defense but the local conditions must be most carefully considered. Such local conditions would include, for example, the condition of the roads and trails, the nature of the soil and vegetation, the physical effect of the climate on persons not acclimated, the season of the year, whether dry or rainy, hot or cold, the heights to which the guns would have to be transported and the local assisting resources.

All these conditions, it will be seen, effect the time required to transport guns to their selected positions, and the time allowed for this purpose must of necessity be short.

It should be remembered that while it is a comparatively simple matter to determine on gun positions it may be an extremely difficult task to transport guns to the positions and mount them.

As a rule a harbor rather than a port will be selected as an Advanced Naval Base and the local resources will amount to little or nothing.

Again in all probability the urgency of the defense would demand that the planting of submarine mines, with their attendant protection, and the preparation of defenses against land attacks should be carried on simultaneously with the installing of the main batteries.

If the strength of the force of troops employed in the defense approximates the strength of a regiment, this being the body of troops which especially adapts itself to the defense of a base, it will be seen that the work cut out for it, must, in any case, whether or not in the general plan of defense, the guns, land defenses, or mines, preponderate, tax the endurance and strength of the force to its utmost in order that the work may be completed in the shortest possible time and the base be thus made self defending.

As a rule, with the defense, the balance of work will remain approximately the same. For the defense of one harbor more mines, or more extensive land defenses and fewer main battery guns may be used than in the defense of another but the total amount of work required of the force remains about the same in any case.

Further the number of main battery guns to be kept in a state of readiness for use at any selected Advanced Naval Base, assuming the force to be employed to have the strength of a regiment, should be reduced to a minimum in order that the weak point in the defense could be strengthened and protection against land attacks thus insured.

A careful study of all governing considerations leads to the belief that twelve (12) high powered intermediate calibre guns are the greatest number of guns of this calibre that could be efficiently handled in the defense of an Advanced Naval Base and that the supply and use of a greater number would not only materially increase the time necessary to prepare a defense but would weaken more likely points of attack.

The employment in the defense of 6" Howitzers firing 120 lb projectiles, would unquestionably have many advantages being capable, as they are, of use soon after reaching the shore and while using indirect fire being able to cover all arcs and reply to similar fire used by an enemy. It must however, be remembered that the strength of the defending force is limited and that the introduction of the howitzer will mean not only different calibre and ammunition, but the training of men for this particular work and must necessarily lead to a slighting of some other part of the defense. For the immediate defense, on landing, it is thought the 3" field piece capable of using indirect fire would be sufficient while the mining of the channel and the covering of the mine field by 3" field pieces until others are mounted, would refuse the entrance.

As a rule guns are mounted singly or in groups of two or three and if mounted in the latter way they should be sufficiently far apart and separated by traverses so as not to permit of two adjacent guns and their crews being disabled by a single shell.

To a large extent the grouping of guns will depend upon the terrain and the facility for communication but ordinarily two guns to a group are most satisfactory for advanced base work.

In locating positions for the main batteries a careful examination of the ground should be made and firm ground

always selected.

In some places, especially in the tropics, landslides are frequent and ground at a distance apparently firm is often found on close inspection to be unstable.

It is perhaps unnecessary to state that, in locating battery positions, while the sky line should be avoided, as it clearly defines an object silhouetted against it, on the other hand a hill or cliff as a background permits of sight correction for all "overs". The best position is at the military crest, the ground behind the natural crest sloping well to the rear.

There are however some advantages to be derived from a choice of the natural crest. Time is of the utmost importance and the selection of a battery position at the natural crest permits of adequate protection being given to the ready magazine and reserves with very little work. The sky line should,however, be broken by the planting of trees, bushes, and other means and the position of the battery well concealed, the parapet being oiled and covered with vegetation.

In general it may be said that the following considerations should govern in the selection of main battery sites -

(1) Main batteries should be located at least 100 or 200 feet above the sea level thus permitting of a plunging fire upon the unprotected deck and upper works of a vessel and greatly increasing the difficulty of gun fire from ships.

(2) They should, if practicable, be placed in advance of the harbor entrance in order to increase the scope and power of the guns and prohibit the bombardment of the harbor from the sea, or the planting of offensive mines by an enemy outside and within gunrange of the entrance to the harbor.

(3) The field of fire should be clear and include as large a sector as practicable.

(4) If possible there should be no dead areas but if such

areas cannot be avoided they should be covered by the guns of another battery close at hand.

(5) The facility of construction of emplacements and the proximity of available sites for ready magazines should be carefully considered in the selection of gun positions.

(6) Adequate protection for the gun's crews should be provided and the greatest care devoted to making the works as invisible as possible. All the natural features of the surrounding country tending to promote invisibility should be used. The Japanese in their late war at times even went so far as to daub or paint their field works, with good effect, the prevailing color of the surrounding country.

(7) Main batteries should be sufficiently dispersed to force a divergent fire from an enemy while being able to deliver a convergent one.

(8) Batteries should be capable of mutually supporting each other.

(9) Batteries when widely separated are hard to control and as fire control is essential this point should be carefully considered.

COMMUNICATIONS

Good roads must lead to the battery sites and from each battery to its ready magazine, while trails to all important and nearby points, such as signal or observation stations, should be cut.

SHELTER

At some protected point in the immediate proximity of each battery, quarters should be provided for the gun's crews Care being observed to screen them in such a way so that the tents or other shelter will not be visible from approaching ships. Good roads should lead to the battery and latrines, close at hand, be provided.

MAGAZINES

Ready Magazines - Close to each main battery, on the reverse

slope, and if possible, well protected from gun fire, there should be a ready magazine with easy and, if possible, covered communication to its main battery in order that the supply of ammunition to the guns may not be checked. A simple method of supplying ammunition might be by using low platform trucks, the deck of the truck being ribbed by small strips or battens and the ends built up to a height of two feet, cartridges being placed on the truck cross-wise, shells pointing alternately in opposite directions. If the cartridge case is separate from the shell, separate trucks could be used for cases and shells. This system will save a considerable number of men passing or carrying ammunition in case the distance from magazine to battery is sufficiently great. Twelve (12) trucks would be ample, for this purpose, for the main batteries.

Main Magazine - The main magazine should be located at some well protected point central to all batteries and should have good road connection with all ready magazines and with some protected landing point in the harbor for the purpose of replenishing its ammunition supply. Short lines of the Sectional DeCauville narrow guage railway or trucks similar to those suggested for the ready magazines would answer for this purpose.

Drainage - In the construction of all magazines the greatest importance must be attached to their proper drainage, every effort being made to keep them dry, for although the modern cartridge case is supposed to be hermetically sealed if it is kept for considerable periods in damp places the ballistic qualities of the powder will change and verdigris collect on cases and shell, unless constantly attended to, prohibiting quick fire.

The ground over the magazine should be well drained to prevent seepage and the magazine itself well drained and lined with boards and tar paper and good ventilation provid-

ed to prevent sweating.

High temperatures effect the ballistic qualities of powder and should be carefully guarded against, great care being exercised to keep the temperature low and even (not above 90° F.).

Lighting - It is necessary that some adequate means be provided for lighting all magazines and to this end light boxes should be made in each magazine and some reliable lanterns with reflectors used for this purpose, they being inserted in the light box, if practicable, from the exterior of the magazine, the light box having a vent for the escape of gases. For the necessary light around the batteries the ordinary oil battle lantern should be used. The gun sight being illuminated in the prevailing manner by an electric current supplied by a battery attached to each gun and separate from the firing battery but so arranged that in the event of the firing battery getting out of order it could be used as an auxiliary.

SECONDARY BATTERY - The secondary battery is used in the defense of Advanced Naval Bases for the protection of the mine field and to assist the main battery guns in preventing the forcing of the channel by torpedo boats or other light craft,at night, or in a fog, mist, or falling snow.

In order to cover a wide field of fire with the greatest possible danger(~~o~~s) space and to obtain a flanking fire upon an enemy engaged in a run past, or counter mining operations, guns of these batteries should be placed near the water's edge on the flank of the obstruction or channel they cover, thus permitting of an enfilade fire. These guns should be mounted singly in order to increase the dispersion of an enemy's fire, and located at about 100 yards interval. A ready magazine could be used for every three guns, being situated at some protected point in rear and close to the center gun of the group.

A 3" high powered gun gives a much flatter trajectory, greater range, penetration, and effect, and can be fired almost as rapidly as guns of a lower calibre. It seems to be, therefore, the ideal gun for the protection of a mine field and should alone be used for this purpose.

In providing for the means for defending a base the simplification in the plan of defense by the reduction in the number of calibres used and consequent variety of ammunition to be handled becomes a factor of decided importance.

Twelve (12) 3" R.F.Guns, of the latest type, with pedestal mounts would be adequate.

RANGE FINDERS

For the main batteries range finders should be employed, one for each battery, being located about 100 feet on a flank in some well screened and protected position.

The Barr and Stroud 9 ft. range finder or an instrument equally accurate should form a part of the defense. Twelve (12) of these instruments would be sufficient for the entire defense of the base.

For the secondary battery covering the entrance or mine field, one range finder should be placed near the center or directing gun of each group of three and connected by telephone with the other two guns of the group. It would, of course, be necessary for the flank guns to make the necessary correction to each range.

FIRE CONTROL

The control of the mine field, search lights, automobile torpedo battery, and covering secondary guns, should be under the direct command of one officer stationed in a bomb-proof observation or lookout station.

The control of the main battery guns should be obtained from a centrally located bomb-proof lookout or observation station situated at some commanding point but well screened,

The control of the land defenses should be placed directly in the hands of one officer whose station would be in a bomb-proof lookout or observation station at some commanding point near the defensive field works.

The control of the complete defense of the base being in the hands of the regimental commander stationed in a lookout station erected at such point as he may deem proper and in telephonic communication with all unit commanders and other necessary stations.

Each fire control station should be directly connected by telephone, on a battle circuit to be used for no other purpose, with the sub-units under its control such as the mine observation station, batteries, automobile torpedo battery, etc., but such fire control should not be absolute but only general in its application, the absolute control being left in the hands of the battery commanders.

AMMUNITION

Considering the question of the kind of ammunition to be employed by the main battery guns of the defense the choice lies between armor piercing and high explosive shells. With high explosive shell the thickness of the walls of the shell may be reduced to a minimum and the size of the bursting charge consequently greatly increased. With a sensitive percussion fuze such a shell will not only have a much greater effect, in the shape of general wreckage, on a ship than an armor piercing shell but will also tend to destroy the morale of the personnel.

Lieutenant-Colonel Whistler, U.S.Army, in his paper on "Battle Tactics for Coast Artillery", states as follows - "The explosion of such charges between decks will undoubtedly disable the guns, prevent the use of ammunition hoists, destroy the interior of the ship, open the seams, cause enormous loss of life and unquestionably be more effective than

the racking effect of a projectile striking the side. It would also have a more demoralizing effect upon the crew and all this would be equally true whether the shells did or did not perforate the protective deck, or reach the vitals."

The battle of Tsushima has conclusively shown the terrific effect of such shells on both ship and crew.

From the above, together with the fact that the penetration of an armor piercing shell from a 5" or 6" R.F.Gun at a range of 5000 yards is not sufficient to pierce the side of a lightly armored cruiser, it is apparent that the high explosive shell is the one best suited for use by the main batteries of an Advanced Naval Base.

For guns of the secondary battery, covering the mine field, high explosive shell and shrapnel should be on hand.

Tracer shell should be provided for night work.

SUBMARINE MINES

In selecting the position of the mine fields it is well to remember that their principle use is to so delay the advance of an enemy as to detain him for the longest possible time under the fire of the guns of the main and secondary batteries, it will therefore be seen that the mine field must be so placed that it is in easy range of the fire of these guns.

Submarine mines may be divided into two classes. Mechanical mines, now out of date and controlled by some simple mechanical means, or electrical mines. Electrical mines may be subdivided into controlled and non-controlled mines. Controlled electric mines are planted in groups of four or five mines to a group and sown across the entrance to a harbor in at least two lines. An opening being left in the lines of mines at some part of the channel for the pas sage of friendly vessels, but the lines should, however, be made to overlap, a vessel entering the harbor on a certain

bearing. The mines forming a group are connected with a distribution box and these boxes are connected, by a multiple cable, with an observation station on shore located at some well screened and protected point near the beach.

Non-controlled mines include those in which the electric firing battery is thrown overboard after the mine is anchored and also those in which the electric firing battery is carried in the mine itself, the latter being sometimes called blockade or offensive mines and they may or may not be anchored.

The controlled mine has unquestionably the advantage of shore supervision, being fired when the enemy's ship strikes it, but its marked superiority over all other classes of mine lies in the fact that the entire mine field can be tested at any time to determine if it is in working order and the location of any defective mines ascertained. It can therefore be relied on for defense while if non-controlled mines are used there is no means of testing them as when once planted they are equally dangerous to friend or foe.

Mines are moored at such a depth as to be just below the surface at low water. Up to a depth of about thirty-four (34) fathoms, with modern planting appliances and little or no current, mines can be moored with facility but beyond this depth the difficulties of anchoring increase rapidly.

When the mine lies in a strong current some means, such as increased buoyancy, must be employed to make it maintain its proper position. Increased buoyancy can readily be obtained by increasing the size of the mine but this would necessitate having mines of different sizes for various Advanced Bases and for obvious reasons would be impracticable. The same result, however, can be arrived at by lashing some buoyant material to the mines planted at points where the current is strong.

Non-controlled mines explode automatically when the mine

comes in direct contact with an object such as the skin of a ship, the electric circuit being closed by the heeling over of the mine due to the shock of contact and, as previously stated, when once planted become dangerous to all. Not being able to test non-controlled mines is a serious fault and to this must be added their dangerous character.

The type of mine case usually employed is spherical in shape, made in two sections, on account of better stowage, and clamped together and made watertight by rubber gaskets at the equator. The leads to the firing battery are made watertight by the use of a stuffing box. In the preparation of this class of mine the greatest care must be exercised to prevent leakage, all clamps being well set up under equal stress.

In selecting the type of mine most suitable for use in the defense of an Advanced Naval Base the factor of time again enters as one, if not the most important, element to be considered. The operation of planting controlled mines, if all appliances, including mine planter, distribution vessel, and marker launch, are available, is not a simple task but with little or no facilities for handling mines, distribution boxes, and cable, and with green or untrained men the task becomes Herculean for even a narrow entrance and average depth of water.

On the other hand non-controlled mines can be readily sown from a launch or towed scow and when once planted require no further care or preparation but become immediately an effective obstacle at that point, and are especially useful at places where it is desired to permanently close a water approach. Both classes of mines restrict the area of navigation but this is necessary in order to close the water approach.

No conclusion regarding the type of mine to be used in th

the defense of a base can be properly reached, however, without first considering the use of submarine boats and their suitability as a part of the defense of a Naval Base.

SUBMARINES - The advantages to be derived from having a submarine boat form a part of the defense of an Advanced Base are manifest. One or two small or defensive submarines could be easily transported on board a specially prepared vessel for use as a part of the defense and the mere knowledge of the presence of such vessels in a harbor would limit the range to which an enemy would bring his ships or blockade a port. Again if a landing was attempted in the vicinity of the defended port or harbor, a submarine would be a dangerous weapon to use against transports or other vessels attempting to land, or assist in the landing, of troops.

The question now arises as to whether a mine field would hamper the action of submarines to such an extent as to prohibit their use? While a mine field would unquestionably hinder, to some extent, the ingress and exit from port of submarines, confining them to the open channel, it is hardly conceivable that this interference would be sufficient to in any way prohibit their free use.

On the other hand the submarine is in no way a substitute for the mine field with its practical certainty of action in fog, mist, rain, or falling snow, or darkness due to the failure of search lights, for some cause, to operate and further in the event of the submarines being used offensively the harbor, unless mined, might be unprotected or inadequately protected.

Continuing the consideration of the best type of mine to be used for the defense of a naval base it may now be stated that a reliable modern self depth regulating non-controlled electric mine, with the battery either distinct from the mine itself or forming a part of it, is the best form for use in the defense of an Advanced Naval Base and that such mines

should be most carefully planted at an interval of about 75 feet(the radius of action of a mine is about 50 ft, and the usual distance,heretofore, for planting has been 100 feet but the introduction of submarine boats has necessitated a closer sowing,in two distinct but overlapping lines, in order to prohibit their entering the harbor) leaving an opening in the channel for friendly vessels, but that this opening should be guarded by both submarine boats and an automobile torpedo battery, although the submarines must be used offensively when the opportunity serves. Care in planting should exclude the possibility of a mine of this class breaking loose from its mooring, but in the event of its doing so, if the battery is separate from the mine it would be rendered harmless and if a part of the mine some mechanical means must be employed to attain the same result. In preparing for the defense of an Advanced Naval Base this mine should alone be considered and the defense thus simplified and not hampered by the addition of unwieldy controlled mines with their attendant parts and cables.

The connecting of two mines with each other by a rope has afforded good results; a vessel running the mine field strikes the rope and the mines swing in against her sides. One Russian battleship was sunk by this method.

AUTOMOBILE - TORPEDO BATTERY - The use of an automobile torpedo battery for the protection of an open channel, if the battery is properly located and protected against gun fire, is excellent.

A barge or scow can be used as a firing platform and admits of being towed to any point to permit the recharging of air flasks and also of being moored in water of sufficient depth to insure a proper run being made. This depth should be between five and six fathoms.

Regarding the protection of the scow there is usually some projecting point in the entrance of a harbor where such

a scow could readily find protection, either natural or artificial, and with the long range of the modern torpedo an open channel could be easily covered and further in case of fog,mist, or darkness, the scow could be towed to the inner entrance of the channel to guard it.

A scow containing two torpedo tubes, eight torpedoes of the very latest type, and torpedo directors together with the necessary air compressors should be provided for the defense.

OFFENSIVE MINES - The use of non-controlled mines for offensive purposes received a great impetus during the Russo-Japanese War, the Japanese not only laying mines in front of the entrance to Port Arthur and then by offering a bait in the shape of a weak naval force, enticing the Russians to come out of port, but they also used floating mines. These latter, however, were a source of great danger to friend an enemy alike.

The Hague Peace Conference of 1907 has placed a limitation on the use of submarine mines prescribing that anchored mines should become harmless in the event of their breaking adrift and that floating mines should be so constructed that one hour after leaving the control of the sower they become innocuous. Automobile torpedoes must be rendered powerless at the end of their run.

COUNTERMINING - Countermining is an exceedingly dangerous and tedious operation, being slow under the most favorable conditions and is not recommended, the removal of mines being much more easily effected by dragging, using a weighted bight of rope or a chain. This operation, however, must be executed at night and will always be dangerous.

Floating mines may be caught in the bight of a rope or net towed by launches or tugs. In the British service the North Sea type of fishing trawler has been found most serviceable for this class of work.

OBSTRUCTIONS - Other obstructions have been recommended for closing a water approach among them the most notable being

the boom defense, having an opening or gate abreast the channel and being intended to completely refuse the harbor to a raid by torpedo boats or other light and fast craft, but recent experiments, made by the British Government, seem to have proven the inefficiency of this means of defense, a torpedo destroyer, with a slight additional strengthening of its bows and running at a thirty knot speed, succeeded in cutting in two a spiked boom defense without any injury to itself or crew or a material reduction in its speed.

The labor and time required to construct this system of auxiliary defense, when considered together with the space required to stow it in transportation, its inability to refuse the harbor to an enemy's submarine boats, and the doubtfulness of its efficacy against destroyers and torpedo boats, precludes its use as a means of defense for an Advanced Naval Base.

Fire ships can be best dealt with by an expenditure of ammunition and the oiling and the setting on fire of the oiled water on an inflowing tide would require ideal conditions of wind and weather and can best be met by preparing the defense to prohibit the close approach of all but friendly ships.

FIELD FORTIFICATIONS

Field fortifications will be most extensively employed in the preparation of an Advanced Naval Base against land attacks, their nature differing for each particular base and depending greatly on the topography of the country.

In recent years great strides have been made in the developement of modern field entrenchments which have been forced to keep pace with the evolution of field artillery.

The two general principles to be kept in mind in the construction of trenches is that (1) the target should be made as small as possible and (2) that invisibility should be promoted.

It will therefore be readily seen that the old style of skirmish trench for the lying or prone position, including considerable depth of ground as it does, is unsatisfactory and trenches are now, if time permits, in accordance with the first general principle stated above, made deep and narrow thus affording shelter for the man and reducing the size of the target. Military observers of the Russo-Japanese War state that the prone trench was rarely if ever seen in Manchuria.

It is essential in the taking up of a defensive position to especially guard against shrapnel fire and this can be obtained chiefly by a reduction in the size of the target, the standing trench, man deep, and exceedingly narrow meeting the requirements. Such a trench does not take long to construct and if head cover and protection are added it becomes very formidable.

It is stated that a man deep trench with the excavated earth thrown naturally over the ground is practically invisible at 200 yards, such trenches having been used by the Russians in Manchuria. This method is open to the objection that the scattered earth is readily distinguishable from elevated points at a distance and must necessarily extend over a belt of great depth and at a cost of considerable labor and time, while a compact parapet admits of being easily screened by the surrounding vegetation and may be made to afford head protection.

In the selection of a defensive position for a line of trenches the military crest should be occupied and good communication obtained with the rear and flanks, while the field of fire to the front and flanks must be clear.

Time permitting, all trenches and communications should be made bomb-proof or at least splinter proof, have good drainage and ventilation, and, if necessary, traverses constructed in them at certain points to limit the area of action of explosive shell.

The class of trench to be employed in the defense of a Naval Base will depend on the time allowed for preparation, the length of the entrenchement, the character of the soil, and general lay of the land, but every line of entrenchments must have openings for permitting the defenders to take the offensive and make a counter-attack if the opportunity offers.

If the harbor is seized and the enemy driven from the beach it may,at first, be possible only to employ, while advancing, hasty entrenchments but this should and must only be a question of a short time, every effort being made to at once attain the desired defensive position and upon arrival there to immediately begin the construction of entrenchments of a more permanent nature. Such trenches can always be constructed under cover of darkness if not in daylight.

In exceptional cases where standing trenches cannot be constructed, a kneeling trench should be made, the earth being thrown up to the front and made in wave form so that the troughs are available as loop-holes.

Both head protection and covering should be given men in trenches, if possible. Sand bags piled uponone another betray the location of the trench and must be most carefully covered with earth and masked.

The bomb-proof covering to afford the protection against high explosive shell should be arranged with a steep slanting roof, covered with earth to a depth of about eight or nine feet. If there is any old scrap iron or boiler plate available it will, if placed on the roof, permit of the use of a much smaller quantity of earth.

All trenches of the man deep type should be provided with a small berm or elbow rest about ten (10) inches from the top, in order to steady the firer, and should have natural or artificial traverses at about every twenty (20) yards the natural traverse,with a narrow communicating passage around it,being preferred.

This arrangement or division of the trench into sections would permit of the assignment of a squad to each section.

In order that the men firing may have a reserve supply of ammunition recesses are cut in the front wall of the trench, at regular intervals, and ammunition stored there.

It is considered important that the walls of the trench should be as nearly vertical as possible in order that the width at the top of the trench may not be unduly increased. This will depend greatly on the nature of the soil and the amount of revetting material available, but every effort should be made to prevent an excessive angle of slope, measured from the vertical.

Every effort must be made to make the line of trenches as invisible as possible, the vegetation of the country being used for this purpose. Some authorities even recommend the placing of curtains or blinds at the loop holes so that when not firing there will be no chance of the loop hole openings outlining themselves against the background.

A formidable trench for a defensive position should be bomb-proof, have head protection and elbow rest; traverses, natural or artificial, about every 20 yards; be of the standing type with vertical walls and exceedingly narrow, the width at the bottom being not less than one pace; be well drained, permit of men not firing sitting against the back of the front wall, have ammunition recesses at regular intervals for ready ammunition, a clear field of fire to the front and flanks, no dead angles, openings at certain points for the making of counter-attacks, lookout stations and good communication with the rear.

Observation or lookout stations must be provided in all covered trenches in order that an advance of the enemy may be promptly detected and the works manned.

In constructing trenches they must not be made too deep as dead angles increase with the depth.

In order to facilitate the construction of trenches steel plows would be of the greatest service and six (6) should be provided as a part of the material needed in the preparation of the defense and in addition to the entrenching tools carried by the troops.

If possible ranging points to the front should be carefully marked and the men in the trenches made familiar with them.

As a rule the artillery or field pieces will not be placed in the trenches but will be behind some natural cover using indirect fire and being capable of such movement as may be necessary. The use, however, of a few small pieces such as 6 pdr. R.F.Guns on pedestal mounts, in the trenches would be of great service in delaying the advance of a sap-head in the event of sapping operations.

In this connection search lights in the trenches would be of the greatest value and should form a part of the defense, being placed in such positions as not to mark out the line of trenches but at the same time being capable of searching the ground to the front and flanks and of being easily moved, if necessary. Search lights to the number of three (3) and of the portable type should be provided for this purpose.

In considering the selection of positions of defense the direction of the front of the entrenchments, as regards the sun, should be considered; a front directed towards the South is clearly lighted by the sun and is therefore difficult to mask as well as having the light in the eyes of the firer.

The necessity for a supply of wet gun-cotton, primers, detonators, and magneto firing battery, to be used for demolitions and land mines, is obvious.

Emplacements for machine guns should be made and these guns used at necessary salients or projecting points, to one side of search light positions, and also to cover the most

likely field of approach but they should be capable of being readily shifted to other positions, being mounted on tripods and field mounts. The number that could be efficiently used would be twenty on tripod mounts and twenty on field carriages. At least ten (10) belt loading machines as well as spare parts for the guns, should be supplied. For this class of work the importance of machine guns cannot be over-estimated.

The rapidity of fire of modern weapons permits the reduction of the number of rifles in the first line of defense. Therefore in preparing positions two to three paces may be allowed in the first line for each rifleman, the remainder of the force being kept in reserve to reinforce the trenches or make offensive movements.

OBSTRUCTIONS or OBSTACLES - It is most important that the advance of an enemy making a land attack should be delayed, while under fire at close range, and to this end obstacles are used to impede an enemy's advance and break up his formations. The obstacles most suited for use in the defense of an Advanced Naval Base are high barbed wire entanglements, abatis, and land mines.

Of the obstacles mentioned above barbed wire is the most effective, being almost insurmountable, withstanding artillery fire exceedingly well, and being easily constructed, as an entanglement, in quincunx or other shape. If steel rails or sections of pipe are at hand their use instead of posts for the high wire entanglements would prevent their possibility of being destroyed by fire. The braiding of bushes and running of barbed wire in woods and clumps of trees sometimes gives good results. Bells, tin cans, and similar articles, when hung on wire entanglements, will give an indication when the wires are moved.

Search lights should cover the approaches to obstacles at night.

The placing of obstacles should be such as not to prohibit the use of offensive movements, if desired, by the defenders.

All obstacles should be inspected each night and repairs made when necessary.

Obstacles are generally placed at a distance of about one hundred yards from the trenches but this distance would vary according to the position of the defensive line and the topography of the country.

If the terrain is suitable land mines can be made effective and have considerable moral force. They should be so placed on reverse slopes, in advance of the position, as not to be endangered by the enemy's artillery fire and for the same reason the firing wires leading to the firing batteries in the trenches should be placed well underground.

FIELD ARTILLERY

In Advanced Base work field artillery must play an important part and therefore the greatest consideration must be given to this arm.

The governing principle in the determination of the calibre of gun most suited for this work is that the gun must be a generally useful field piece of high ballistic qualities have protection for the gun crew, sufficient mobility, and be capable of using both direct and indirect fire.

The 3" (approx) calibre gun generally used by nations to-day as the mobile field piece gives a shrapnel range of between 6500 and 7000 yards and a shell fire of over four(4) miles, it has protection against rifle fire in the shape of shields for the gunners, has a weight behind the team of less than 4000 lbs., panoramic telescopic sights and quadrant, and slight shock of recoil and is thus capable of either direct or indirect fire.

It will be seen that this piece meets all the requirements of Advanced Base work and eight (8) of these pieces

(two batteries of four each) should form a part of the defense of a base.

In this connection too much stress cannot be laid on the necessity for this piece being capable of using indirect fire and possessing the very highest ballistic qualities.

The advantage of indirect fire is not only due to the natural cover it affords and the uncertainty of its position but also to the fact that great care and deliberation can be exercised in determining the range and in opening fire.

These pieces would not be placed in the line of trenches but should be located, if possible, behind natural cover and use indirect fire, if, however, they are forced by the nature of the ground or for other reasons to use indirect fire they should be well screened and covered without interfering with their fire. The interval between guns should be about 25 to 40 paces. In indirect fire the now well known system of aiming at some auxiliary point should be used, special observation stations with telephonic communication with the battery being employed.

Every means should be used to mask the position of the battery. The Japanese in their late war, at times when the wind was favorable, covered their exposed batteries by clouds of smoke. Imitation guns were also cleverly used to deceive the enemy and draw his fire.

AMMUNITION - The two kinds of ammunition now generally used by field batteries are shrapnel and high explosive shell and this ammunition should unquestionably be provided for the use of field guns utilized in the defense of an Advanced Naval Base. The high explosive shell should constitute about one-third or one-fourth of the entire ammunition allowance.

In attacking trenches the Japanese usually fired, it is stated, a salvo of high explosive shell and almost immediately followed it with several salvos of shrapnel and this seems

to-day to be the generally accepted method.

PERSONNEL

The force used to defend an Advanced Naval Base must be one especially trained for the purpose. Its duties are strictly military but are of an exceedingly high order and include a thorough knowledge by both officers and men of not only guns of intermediate calibres, mines, search lights, automobile torpedoes, and field defenses, but also an absolute appreciation of the natural defensive features of the terrain The turning of a flank, inability to comprehend the significance of the enemy's movements, or even the simple posting of a picket on the wrong side of a road, may cause the fall of the base and consequent withdrawal of the fleet from the scene of operations.

The fleet must have its base for offensive work and, against an active enemy, the base must be scientifically defended by stout hearts as the preponderance of force, probably great, will be with the enemy and a weak point in the defense against land attack made the objective.

The work to be performed by the personnel in the preparation of the defense includes the transporting of guns and material to shore, the planting of mines and construction of field works, and perhaps a landing in force in order to seize the port or harbor intended as a Naval Base.

It is clearly apparent that such a force must not only receive the highest order of military training but must also have a sufficient naval education. No soldier and landlubber could efficiently perform the task but the man who accomplishes it must be above all a soldier, possessed with a certain amount of useful naval knowledge and so affiliated with the Navy, its traditions, its officers, and its men, as to make him an essential part of the Navy.

The base is essential to the fleet for the carrying on

of aggressive operations. The fleet is essential to the base. They are interdependent.

The necessity for the base being under the command of the Commander-in-Chief of the Fleet and of the defending force being under his direct control is apparent.

The strength of the force to be used in connection with the defense of an Advanced Naval Base must not be so large as to make it unwieldy and yet at the same time it must have sufficient resisting strength.

The defense may be divided, for convenience in work, into three parts - (1) Gun defense of all water approaches - (2) Mine defense or water obstruction - (3) Land defense, mobile or not as the case may be.

The regiment especially adapts itself for the purpose of the defense of an Advanced Base, it is flexible, easily handled and administered, is divided into three battalions thus permitting of the assignment of work by units, each battalion being carried on a separate transport with all the stores and material necessary for it to carry out the particular work of defense to which it has been assigned and allowing the landing at the base to be greatly expedited and further its rationing and water supply does not become the serious problem which it might with a larger force, especially when we consider the remote harbors that will be used for Advanced Bases and the fact that, in many cases, the water supply must be most carefully considered.

It is evident, however, that the regiment must have its full strength, every man in it will be needed, and in no case must the strength of a company fall below 150 enlisted men.

SIGNALS

WIRELESS - Wireless communication is essential in order that a base may keep in constant communication with the fleet and a wireless set should be installed (erected) at some prominent point within the defensive post

some prominent point within the defensive position.

There is, nearly always, at least one other point surrounding a harbor where it is essential or desirable to establish a signal station and no better means of communication than by wireless could be obtained. It is therefore apparent that at least two wireless sets should form a part of the defense.

FLAGS - Flag hoists, semaphore, and wig-wag signals should be available for such signalling as they may be needed.

TELEPHONES - In the defense the telephone must play a most important part.

If efficiently served a telephone system can be made an indispensable adjunct to the defense but if poorly served it can become the greatest detriment and source of danger. All battle circuits should be entirely separate from any others that may be erected for routine business.

Where exposed to artillery fire telephone lines must, if possible, be laid about three feet underground in pipe or other conduits.

Great care must not only be devoted to the installation of the system but the men who are to use it trained at their stations and duties.

The ideal telephone would be, of course, a wireless telephone and as soon as this instrument is developed sufficiently to insure its efficiency under all conditions of weather and service, at short distances, it should be adopted for general use in the defense, while in order to familiarize the personnel with its working and limitations a certain number should be at once introduced for experimental purposes.

A general scheme of telephone systems to be used in connection with the defense of a base is given below, but is only general and additional communication would invariably be needed.

MINE COMMANDER	(Mine covering guns - range finder. (Mine covering ready magazine. (Main magazine. (Mine field search lights. (Automobile torpedo battery. (Mine store house. (Advance Base Commander's Station.
MAIN BATTERY COMD'R.	(Main batteries - range finders. (Main batteries ready magazines. (Main magazine. (Advance Base Commander's Station.
FIELD WORK COMD'R.	(Each battery of field artillery - observation station. (Points in trenches at regular interval (Land mine firing positions, if not near telephone station. (Reserves. (Ready magazine. (Machine gun positions. (Search lights. (Detached posts or outposts. (Advanced Base Commander's position.
ADVANCED BASE COMD'R.	(With all unit commanders. (With main magazine. (With wireless station in defensive position.

Central stations would be necessary for all units and switch boards should be provided for this purpose.

HELIOGRAPHS - Heliograph outfits form an important means of communication under certain conditions and should be included in the defense material to the number of ten (10).

ACETYLENE LAMPS - These lamps might often be needed for night signalling either to ships when the wireless was not working or between certain shore stations having no other means of communication or the communication being temporarily interrupted. Ten (10) lamps with about thirty (30) cartridges are deemed sufficient.

TRANSPORTATION OF GUNS

In the defense of an Advanced Naval Base the transportation of guns from the ship to their selected position on shore is no easy task under any conditions, but it is imperative that it should be accomplished in the very shortest possible time and it is consequently exigent that every

possible preparation be made in advance to facilitate such work.

The transportation from ship to shore with the assistance of cargo booms for hoisting out of the hold and lowering over the side into launches or scows, to be towed ashore and then jacked up and rolled or skidded onto the beach, is comparatively simple but the hard and tedious work now commences.

The experience of the Boer and Russo-Japanese wars have abundantly demonstrated the feasibility of transporting guns of medium weight for comparatively long distances on improvised carriages or by other means. The roads were not any too good and, in some cases, are stated to have been bad while the rate of travel was in all cases excellent.

The British, in the Boer War, designed a special traveling carriage for their 4.7" naval guns consisting of a double 14" timber trail fitted with plates and bearings to carry the cradle of the ordinary ships mounting. The carriage wheels were made of steel with broad tires held by curved angle iron and were of large diameter.

In this war these guns were transported on shore to considerable distances, using oxen teams for hauling power.

The Japanese in the Russo-Japanese War transported 28c.m mortars to selected positions in front of Port Arthur and also South of Mukden.

These guns weigh about ten (10) tons and were hauled on low trucks or timber dollies, by man power. It is stated that 150 or 200 men would walk away with a truck and gun.

The accompanying sketches illustrate the type of truck and the method employed.

This system appeals especially to the transportation of guns in advanced base work and would generally necessitate but little clearing or work on roads. In the event of heavy roads, due to rain or loose sand, planks could be

placed in advance of the truck wheels for them to run on.

It will be noticed that with trucks of this design the centre of gravity of the weight carried is low and the truck not likely to capsize.

Fifteen (15) of these trucks should be furnished with the material for the defense of an Advanced Naval Base.

It is not claimed that this system is ideal but it has been tried out and found to answer, in time of war, for the apparently rapid transportation of much heavier weights than would be transported in the defense of an Advanced Base.

Perhaps the ideal method would be the use of a Decauville Sectional narrow guage railway made with especially heavy cross ties, or more of them, and having strong platform trucks for transporting heavy weights. The rails, it is thought, are sufficiently heavy and the addition in the number of steel cross ties or in their strength would prevent the spreading of the rails when carrying heavy weights.

As a truck advances a rear section of the track would have to be fleeted forward.

Twelve sections of track as well as twelve trucks would be required for advanced base work and could later be used to supply ammunition to the ready magazines.

GUN MOUNTINGS

In the Boer War the British mounted their 4.7" naval guns on platforms made of four (4) heavy 12" x 12" pieces of timber fifteen feet long. The four timber pieces were placed crosswise, on each other, two transversely and separated about two or three feet, and two underneath longitudinally and separated, and all strongly bolted together, well placed in the ground and firmly set by the use of cement

This mounting allowed firing up to ranges of 12,000 yards, was simple of construction and thoroughly secure, and admits of being prepared in advance and easily stowed.

Sufficient material for platforms for all guns of the main and secondary batteries should form a part of the material to be employed in the defense of an Advanced Base.

MOTOR CYCLES

The use of a few motor cycles (muffled engines) by orderlies for the transmission of important orders or messages and for other work in connection with the defense of an Advanced Naval Base would, at least, be worth a trial, and it is thought the results would warrant their retention as a part of the defense.

GRENADES

Various forms of grenades were used in the Russo-Japanese War and in many cases were formidable.

Such weapons in connection with the defense of the field works of an Advanced Base might, if further developed, be of considerable use and therefore their evolution should be carefully noted.

WATER SUPPLY

In connection with the defense of an Advanced Base it is highly probable that either the water supply will be insufficient or that it will not be potable unless boiled, requiring considerable additional work and care.

Wherever there is an advanced base it would seem that the necessity for a distilling ship at the base would exist in order that fresh water might be available for visiting ship's boilers, all vessels, in time of war, using greatly increased quantities of water due to cleaning the guns, constant steaming, etc.

Such a vessel should be capable of furnishing drinking water for at least the greater part of the force on shore, those stationed at a distance from the harbor sufficient to prohibit, on account of difficulties of transportation, the

use of distilled water, distilling or boiling water from nearby streams for their own use.

It has been found in practice that wooden barrels were not very satisfactory for transporting water, generally giving out around the bung and causing great inconvenience. It has been suggested that iron barrels with a screw plug and raised bands would be much more efficient, lasting much longer and the raised bands acting as wheels when the barrels were rolled.

Some receptacle that could be used for boiling water in case it became necessary should also be provided. Galvanized iron cans (new garbage cans) have been found to be entirely satisfactory for this purpose, they are light, heat quickly, and hold together well.

GENERAL STORES.

Among the large quantity of general stores necessary there should be included four (4) three legged shears with the accompanying gear. Differential chain pulleys as well as an adequate supply of "jacks" would be of great assistance and would permit of the releasing of a number of men for other work.

A blacksmith's forge and outfit are necessary for many details of the work of defense but especially for bolting the timbers together in preparing the gun platforms.

AIRSHIPS

The feasibility of the employment of Airships in connection with the defense of Advanced Bases must shortly be considered if these ships of the air continue to develope in the remarkable manner in which they have during the past few years. A small dirigible balloon or aeroplane might be of great service in obtaining information or locating mines

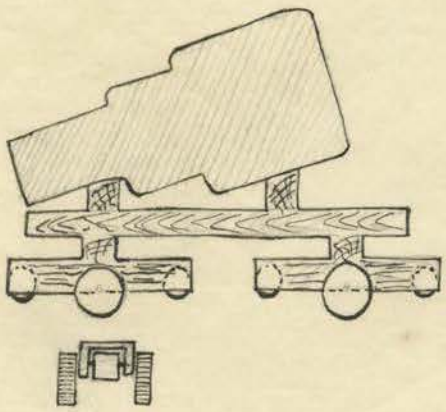
or defenses in a nearby enemy's port, even if not put to a more extended or warlike use.

John H Russell

Major, U.S.Marine Corps.

Newport, R.I.,

September 30, 1909.



Sketch showing method of transportation of 28 cm mortar by the Japanese in the Russo-Japanese War.

Weight of mortar ---- 10 tons (approx)

Diameter of trucks -- 6 inches.

Copied from Major Kuhn's report and Journal U.S.Artillery.

LIST OF BOOKS AND PAPERS CONSULTED IN THE PREPARATION OF THIS

PAMPHLET

Field Fortification ---------- Clarke

Applied Principles of Field Fortification
for line officers ----------Woodruff

Notes on Field Fortifications in the
Russo-Japanese War ----------Van Toepper

Report of Practical Instruction in
constructing rifle trenches ----------Harllee

Epitome of the Russo-Japanese War ----------M.I.D., U.S.A.

Reports of Military Observers attached to
the Armies in Manchuria during the
Russo-Japanese War ----------M.I.D., U.S.A.

Military Operations and Maritime
Preponderance ----------Callwell

War and the World's Life ----------Maude

Journal U.S.Artillery -

Journal U.S.Infantry -

Foreign Service papers, periodicals, and magazines -

Submarine Boats, Mines, Torpedoes ----------Sueter

Aerial Warfare ----------Hearne