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# GUNNERY INSTRUCTIONS *and* EXERCISES

DISTRICT NAVAL FORCES, VESSELS IN CONVOY,  
TRANSPORT FORCE, NAVAL OVER-SEAS TRANS-  
PORTATION SERVICE, AND ARMED  
GUARD MERCHANTMEN

—  
1918  
—

UNITED STATES NAVY



WASHINGTON  
GOVERNMENT PRINTING OFFICE

1918

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# CHURCHY INSTRUCTIONS and EXERCISES

FOR THE  
USE OF THE  
SCHOOL

1884

NEW YORK



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## CHAPTER I.

### HANDLING MEN.

"Historically, good men with poor ships are better than poor men with good ships."—Mahan.

1. Importance of proper handling of men.—Of far greater importance to officers than any material or tools committed to their charge is the *personnel* with which they are concerned. The spirit and training of the men has always been a more important factor in winning battles than the characteristics of the ships or of the weapons employed. Success in training and in the cultivation of this spirit depends to a very considerable degree on success in handling men.

2. Self-training on the part of officers.—It is not fair to the ship or to the men under the control of an officer to make them bear the brunt of personal deficiencies existing because of a neglect of *self-training*, which is incumbent on all officers. If satisfactory results in handling a command do not appear to be forthcoming, an officer should make a study of himself, his methods, bearing, and attitude. The cause of the difficulty may be discovered.

3. Force of example.—Men will take just as much interest in their duties and work just as hard as *the officers* who are placed over them. Example appeals strongly to men, and officers must bear in mind that their bearing, manner, and language in dealing with seniors, as well as juniors, are all copied by their subordinates. An officer must at all times set an example of industry, zeal, initiative, and punctuality, as well as neatness of dress and correctness of bearing, if he is to expect these from his men.

4. Criticism of superiors.—Hostile criticism of authority will ruin any organization and completely destroy unity of action. A subordinate is seldom in a position to judge of the actions of his superiors intelligently and should not be prone to criticize until aware of all circumstances and facts. Destructive criticism which is born in *officers' messes* is contagious, and will soon spread through the ship and completely kill ship spirit. Coop-

eration is essential on the part of all hands. Each individual must be assured that his own part and task are thoroughly accomplished and in a way which will best assist others working toward the same end and while yielding unqualified support to authority. This is essential to success in any organization, where many men are employed, as a fundamental of discipline.

**5. First attributes of an officer.**—*Good manners, coolness, and self-control* are the first attributes of an officer and are just as important in dealing with juniors as with seniors. Leadership is an essential. It is fundamentally based on *proved superiority*. The officer must be first in everything at all times.

**6. Importance of understanding individuals.**—A most important thing is to know men thoroughly, their peculiarities, abilities, weaknesses, character, etc.

**7. Methods of handling men.**—Praise will frequently better promote interest and efficiency than censure or punishment. Be strict, but not harsh. Remember that you are dealing with individuals as sensitive and jealous of their rights as yourself. Fairness and impartiality in dealing with them are essentials. But little good and often great evil is accomplished by unnecessary shouting. Nothing is more discouraging to an individual than the finding of fault with him when he is using his best endeavors.

**8. Importance of interesting men in work.**—No one objects to useful work. Interest your men in what they are doing. Be sure that they understand what it is intended to accomplish and why. At drill, when teaching certain details, explain why these details are necessary. Point out the difficulties and the methods for overcoming them.

**9. Suggestions from crew.**—Never disregard, but welcome, the suggestions from your petty officers and men. Give all consideration, and if suggestions are not practicable explain why. Such an attitude on the part of an officer will always help to promote and encourage a live and personal interest in their work on the part of the crew, and frequently many helpful ideas will be offered.

**10. Seizing opportunities.**—Take full advantage of opportunities as they are presented. There is too much to be done to expect *unlimited time to attend to all the details* of training and development separately. The best organization is not one in which a single individual directs all details. It must be such that subordinate leaders are given specific tasks for the accomplishment of which they are given the necessary authority and

for which they are held rigidly responsible. The leader must organize his forces and arrange his program accordingly, taking full advantage of every opportunity that occurs. Many of the complaints regarding lack of opportunity come from those who fail to recognize opportunities as they occur and do not fully avail themselves thereof. Facilities, conveniences, and opportunities are seldom the best, but be sure to make the most of such as are presented.

11. **Petty officers.**—Petty officers are indispensable assistants. They must be able to realize and to exercise their responsibilities. Expect the same loyal support from them that you afford your superiors. Endeavor to handle the junior ratings of your division through their own petty officers, and train your junior ratings to obtain information and instruction from their own petty officers.

12. **Smartness and cleanliness essential.**—A division that is smart in infantry, boat, and other drills is more apt to be smart in gunnery than one that is generally slack. Cleanliness of uniform, person, and of ship are all important. No one is proud of a dirty ship or a dirty shipmate.

13. **Competition.**—Stimulate competition by all legitimate means. Arouse a desire to beat the other fellow, but only by *honest and fair* means. Analyze and post all records and scores.

14. **At quarters and drills.**—At quarters set an example yourself in military form and manners and your division will imitate you. Do not hold men at "attention" longer than necessary; but when the command is "attention," enforce it.

15. **Inspections.**—At daily inspection at quarters avoid arguing with or questioning the men while in ranks as to delinquencies in uniform. Make a mental note of each case and overhaul the man about it after quarters. The best form is to inspect your division without allowing yourself directly to address a man in ranks about deficiencies in his personal appearance. To call a man down in the presence of others about his personal appearance does not nourish his self-respect, which, if destroyed, ends his usefulness.

16. **Particular care with young men.**—Many young men are discharged as undesirable or with bad-conduct discharges who might have been saved to the Navy had they had more official interest and encouragement bestowed on them by the division officers. Youngsters who are inclined to be shiftless require forethought on the division officers' part to keep them from de-



linquencies. The more a young man is inclined to be delinquent in petty matters the more often a cheering encouragement will bear fruit. When a man is bracing up, commend him.

**17. Commendation, censure, and reports.**—Commendations might well be heard by others and when merited should be prompt. Censure should not be public. *Reports of a trifling nature are undesirable.* Never report a man unless there is ample and good reason for believing that he has intentionally committed an offense deserving of punishment.

**18. Giving commands.**—Much depends on the manner in which a command is given. The voice and tone employed and method of expression are of importance, as well as the character of the command. All *uncertainty* is to be avoided, and the manner should carry with it the impression that obedience is expected. Clearness to the person to whom the command is given is essential. No command should be given unless it can be obeyed, and when given it must be obeyed. The giving of unnecessary commands should be avoided.

**19. Comforts of men.**—Carefully look out for the comforts of the men. The successful ship is the happy ship, and the men must feel that their ship is their home. The Navy owes every man reasonable comfort in a place to sit, to eat, and a billet that will afford a night's rest. Look out for these. Details; often trifling, in controlling the uniform, berthing, messing, and living arrangements may greatly contribute to their welfare and contentment. It is an essential part of an officer's duty to care for such details. On Saturday, Sunday, and holidays, and after working hours, initiate recreation for your division, such as sailing parties, swimming parties, and the like.

**20. Avoidance of petty annoyances.**—Guard your people from petty annoyances, such as interference with meal hours. If any are away at mealtime, be sure they are provided for on their return. When men have been exposed to bad weather or have had unusually hard work, as is not uncommonly necessary on board ship, be sure that their well-being is looked out for.

**21. Importance of minor details.**—These small matters have a great influence. Once the men of a ship realize that the officers have their interest at heart the success of the ship is assured. In no other way can a strong ship spirit be developed, and a slight effort in this direction on the part of officers will accomplish great results.

## CHAPTER II.

### GENERAL PRINCIPLES OF TRAINING.

30. **Character of system.**—The system of training herein prescribed begins with the selection of the *units of the gun crews* and describes the training necessary to render each expert in his individual duties. The gun crew is then perfected as a team. and when this is accomplished the training is for the development of the ship's battery as a whole, and finally for the collective fire of the batteries of more than one ship.

31. **Permanence in stations.**—The skill of the ship in gunnery depends directly upon the skill of each officer and man in his individual duties. Neither officers nor men can reach their maximum skill if they are frequently shifted from one station to another. Members of crews should, however, be exercised in stations other than those they habitually fill, in order that casualties to personnel shall not silence the fire.

32. **Casualties.**—Any training that does not prepare for and fully anticipate casualties to both personnel and material is incomplete. It should be remembered that in preparing for casualties no methods or devices should be allowed that would not be practicable in action. Many casualties probable in battle can not be ordered at the time of target practice without introducing an element of danger or interfering with competitions. These must be prepared for at other times.

33. **Service conditions on drill.**—In conducting drill the regular battle system of communications should always be employed. The conditions during drill should be made harder than they would be at target practice and, if possible, as difficult as would be the case in action. Then when unforeseen contingencies arise men and officers will be schooled in steadiness. Though dummy charges are used, the safety orders must be carefully observed. A carelessness on the part of officers, begotten by either ignorance or failure to appreciate their duties, is immediately copied by the men.

34. **Investigation of unsatisfactory performances.**—An unsatisfactory performance at drill should always be carefully investigated and the cause definitely determined and removed.

## CHAPTER III.

### GENERAL PRINCIPLES OF NAVAL GUNNERY.

#### PROFICIENCY WITH GUNS (FIRED INDIVIDUALLY).

40. **First essential.**—It is imperative that each ship be able to hit, with rapidity, a target under favorable conditions. To make this possible when all guns are firing it is necessary that the vessel be able to do so first with each individual gun firing singly.

41. **Analysis of principles.**—An analysis of the principles of naval gunnery must therefore first reduce itself to an analysis of the principles involved in excellence with the individual gun.

42. **Excellence, how measured.**—Excellence in gunfire is measured by rapidity of hitting. It is evident that however large a percentage of hits a gun may make, if these hits are not made with the *greatest possible rapidity* the gun will have failed to attain its highest efficiency. Rapidity of fire with inaccurate pointing is useless and demoralizing and entirely prevents control of the fire of the gun when fired individually and makes impossible the successful control of a group of guns when fired collectively. The following may be regarded as the two essential elements of excellence in gunfire: (A) *Accuracy of fire*; (B) *Rapidity of fire*.

43. (A) **Accuracy of fire.**—This depends upon:

I. *The accuracy of pointing.*

II. *Satisfactory sight setting.*

III. *Elimination or reduction of errors of gunfire.*

I. **The accuracy of pointing depends upon:**

1. The skill of the individual pointer, which is developed by—  
(a) Continued practice at his own gun or type of gun with mechanical targets, in port or at sea, when other methods are not available.

(b) Using a check telescope at sea.

(c) Firing with subcaliber.

(d) Actual firing at target practice.

2. The condition in which the sight, the gun, the mount, and the various appurtenances which effect accurate shooting are kept, together with the degree of excellence in their design and



manufacture. Unless the design is satisfactory, and unless the gun, mount, sights, and accessories are maintained in such condition that the difficulties in aiming and firing are minimized, the accuracy of pointing will be affected. This applies to the facility of operation, and to the proper functioning of each individual part. A neglected mount renders pointing difficult and hence conduces to inaccuracy. Neglected sights always invite failure. If they are out of adjustment they insure great dispersion and misses. If they are weak and liable to derangement, they may jar out of adjustment while firing is taking place and thus invite disaster. Neglected firing connections, locks, etc., promote hang-fires, misfires, or prolong firing intervals, all of which militate against good pointing and are serious hindrances to rapidity of hitting.

#### II. Satisfactory sight setting depends upon:

(a) The adjustment of the sight. The sight must travel with the gun at all angles of elevation. Lost motion is almost sure to appear in time in the older types of sights, and careful supervision and frequent checking up of the adjustment thereof are essential. (See art. 222 on boresighting.)

(b) The accuracy and precision of the orders given to the sight setter concerning the setting of sights. This depends upon (1) the accuracy with which the sight-bar range has been determined, which may be regarded as the most difficult problem in naval gunnery; (2) the arrangement and condition of the system of communications, together with the skill with which it is used.

(c) The promptness and precision with which these orders are obeyed. It is manifest that however perfect the gun, the mount, the crew, and the ammunition, unless the sights are correctly set the projectile will certainly miss the target. Great care must be exercised in the selection and training of sight setters, and the accuracy with which the setting of the sights is accomplished should be carefully checked up after and, if possible, during each run at target practice.

Whatever the form of firing, the sight setter's duty remains the same. It is to set the sight as accurately and as quickly as possible, both laterally and in elevation, each time a new deflection or range is ordered. The pointer always aims at exactly the same place, and all errors are corrected by altering the sights.

#### 44. (B) Rapidity of fire.—This depends upon:

1. *The rapidity of loading.*

*II. The promptness with which the pointer fires after the gun is ready, or the firing signal has been given; or, briefly, rapidity of pointing.*

*III. The facility with which fire may be controlled.*

**I. Rapidity of loading** with modern guns depends upon:

(a) The rapidity with which each member of the gun crew performs his duty.

(b) The precision with which each one performs his allotted portion of the drill.

(c) The "team work"; that is, on each member of the gun crew performing his duty at exactly the proper time and in exactly the proper sequence, and the elimination of interferences between individuals of the crew.

Accuracy and thoroughness in every detail are requisites to rapidity of loading. Eagerness for excessive rapidity may result in interference, confusion, and casualties that can be avoided only by precision in every movement. Certain of these delays, such as the raising of a burr, the jamming of a cartridge case, or the breaking of a powder bag may more seriously interfere with the rapidity of fire than the deliberation necessary to surely avoid them.

**II. Rapidity of pointing**, like accuracy of pointing, depends upon:

(a) The skill of the pointer.

(b) The condition of the material.

A skillful pointer will, under ordinary conditions, keep a gun of intermediate or secondary caliber, on a modern gun mount installed in a vessel that is a good gun platform, practically continuously pointed at the target, provided the mount is maintained in a perfect condition. The gun is therefore aimed and prepared to fire shortly after the instant the pointer is notified that the gun is "ready." If to this degree of skill of the pointer and excellence of mount is added a firing mechanism in such efficient condition that the gun will fire when the pointer presses the firing key, ignoring for the moment questions of fire control, the rapidity of aimed shots is made practically equal to the rapidity with which unaimed shots may be fired. So long as this degree of rapidity is possible with any gun, it is evident that any time which elapses between the word "ready" and the firing of the gun, when not firing on order or on salvo signals, is a loss. A lack of adequate rapidity of pointing may result in a failure to fire when the signal is given, which lessens materially the fire delivery of the ship, on the efficiency of which depends

the value of the vessel as a battle unit. It must be remembered that rapidity of pointing is never to be obtained by the sacrifice of accuracy.

**III. Facility of fire control.**—At short, measured ranges, when firing guns singly, the spotting of shots other than the first shot in a string should be unnecessary. At long ranges the delays incident to spotting are of greater moment, as the time of flight and intervals of time necessary for the spotter to decide on his correction and to have this correction appear on the sights are all appreciable. Effort should be constant to lessen these delays.

The above remarks refer to day firing. They apply, however, equally well at night. Gunnery at night is further complicated by—

- (a) The necessity for illuminating the target.
- (b) The difficulties of properly controlling searchlights.
- (c) The annoyances incident to blast of guns and glare or lights, which are increased by the gases of discharge.
- (d) The difficulties incident to setting sights with artificial illumination and of working about the guns under unfavorable conditions of illumination.

**45. Necessity for cooperation.**—From the above it is apparent that skill in gunnery depends not upon the pointer alone, but upon every person participating in the practice—on the ship-control, fire-control, and searchlight-control parties, the division officer, the gun captain, pointers, the sight setter, and on each individual member of the gun crew. The greatest rapidity of hitting can be attained only by the united efforts of each person concerned, working in complete harmony with every other member of the crew. A failure in the slightest detail on the part of any one participant may materially reduce the rapidity of hitting, and thus nullify the greatest possible excellence on the part of others.



## CHAPTER IV.

### DETAILS OF TRAINING—INDIVIDUAL GUNS.

50. **Ordnance pamphlets.**—Attention is invited to the numerous pamphlets published by the Bureau of Ordnance containing descriptions of material and methods of operation.

51. **Ordnance instructions.**—Particular attention is called to chapter 26, Ordnance Instructions, Navy Regulations, and Naval Instructions, 1913. These instructions must be understood by all officers in any way concerned with the ordnance outfit.

52. **Stationing the gun crew.**—The division officer should first select the gun captain and members of the gun-pointer group and then the others of the crew, taking into consideration mental and physical qualifications and the requirements of the respective stations. This first assignment is, of course, tentative and subject to change when qualifications are better known. Attention is invited to article 2501 (2) (3), Naval Instructions, regarding the selection of gun pointers and the stationing of gun captains and pointers.

53. **Selection of gun captain.**—The general requirements for a qualified gun captain are thorough practical knowledge of the gun, mount, and various appurtenances, also of the drill gun, and a system of training, together with the executive ability to drill and command the crew. He should be a man of resource and quick action, for in battle he may be called upon to act upon his own responsibility. The man's executive ability and general intelligence should be given the greatest weight, as these, combined with zeal, will quickly develop the necessary knowledge. As a rule, petty officers, being initially a class selected for these qualities, will be the men best fitted for these positions. A seaman who is qualified for gun captain generally possesses the qualifications that entitle him to promotion to petty officer, third class.

54. **Selection of gun pointers.**—Men with the proper qualifications may be trained as gun pointers quickly and easily. In selecting gun pointers, division officers should give weight to the man's ability to shoot straight, as indicated by his record with small arms, in connection with good eyesight, nerve, and a cool, nonexcitable disposition. The importance of these latter qualities may not appear in preliminary training, but they are essen-



tial and should receive first consideration. Men whose nerve and physical training will withstand the exhaustive tests incident to battle are those to be desired. A man's rating, general knowledge, or executive ability should not be allowed to have weight in his selection as a gun pointer.

**55. Selection of sight setter.**—The requirement that the sight setter receive regular training and act as second pointer for turret guns necessitates that the same care be exercised in the selection of candidates for this position as for pointers.

**56. Spare set of pointers.**—A spare set of pointers and sight setters will be kept in training for each gun at all times.

**57. Bunching of shot.**—The value of a pointer should be judged by the way he bunches his shots. A man may show aptitude by bunching, while another may demonstrate by scattering his shots that he has not profited by training and is undesirable as a pointer. In forming his judgment the division officers should be sure that the scattering of shots has not been due to inaccurate sight setting or to other causes.

**58. Training pointer.**—The training pointer occupies a most responsible and difficult position, and particular attention should be given to the development of men for this station.

**59. Devices for training.**—The following mechanical devices are used for training members of gun crews. Success attained with them depends to a considerable degree upon the accuracy with which the apparatus is installed:

1. The dotter.
2. The Morris tube.
3. The check telescope.
4. Subcaliber attachments.
5. The loading machine.

Having developed skill individually, the following develops the skill of the crew as a whole:

6. Drill at gun.
7. Target practice.

The individual function of these will be explained in the order mentioned. This explanation is made in considerable detail for the benefit of inexperienced officers.

**60. Features taught by training with mechanical targets.**—The following features of training gun-pointer groups are particularly developed with mechanical appliances:

(a) *Position of pointer at the gun.*—Unless the pointer assumes an easy position at the gun, the best results will not be forthcoming. Pointers will sometimes select cramped positions,

with wrong eye at the telescope, hands improperly placed on the elevating wheel, etc. All of these must be corrected. It may not be sufficient for the pointer to say that his position is the easiest for *him*.

(b) *Continuous aim*.—Continuous aim does not mean that the line of sight is necessarily held on the target during the *complete roll* of the ship, but it means that the gun is held accurately pointed throughout the firing interval; that the wires are on the point of aim and not *moving across* it when the firing key is pressed. This is essential to accuracy whenever a gun is fired from a rolling platform. The feature of maintaining the aim during the complete roll is an element affecting *rapidity* but not *accuracy* of fire. An expert pointer will usually hold the horizontal wire of intermediate and secondary guns on the target while the gun is being loaded, and will be ready to fire the moment he receives the signal. The necessity of attempting continuous aim must be impressed upon all pointers, together with the difference between maintaining the aim during the *complete roll* and during the *firing interval* only.

(c) *Sight setting*.—Hitting is impossible unless the sight setting is accurate; rapidity of fire is also impossible without promptness in sight setting; hence, it is essential that careful attention be given this matter. In setting sights there should be no wasted effort or time due to the sight setter raising and then lowering the sight, and vice versa. The correction should always be started and completed in the direction in which it has been ordered. When a correction to the sight has been accomplished it has been found advantageous at elementary practice to have the sight setter call out "set." In all exercises of the pointer group, sight setting and range transmitting should be practiced and the sights should be changed without the knowledge of the pointer.

(d) *Joint training of members of the gun-pointer group*.—In view of the fact that two men are required to point each broad-side gun of 3-inch caliber and above, and three men constitute a set of pointers for a turret, it is important that these men receive as much practice as possible when working together.

61. *Advantages of the mechanical devices*.—Guns rigged with mechanical targets generally work with greater ease and nicety of movement than others. Several mechanical targets should be rigged for each caliber, and these should be shifted from one gun to another. In some cases the difference between a mount which has had considerable mechanical target work and others is so

great that the exercise loses much of its value when the trained pointer fires his own gun on which a mechanical target has not been rigged. In so far as practicable, a pointer should receive all training at his own gun. It should be borne in mind that the continuous use of one gun for the dotter and mechanical targets will be apt to eventually produce lost motion in the gears.

**62. Advantage of one device over another.**—Officers generally express a strong preference for one or another of the devices herein mentioned for training gun pointers. The strong arguments that are heard in favor of each show conclusively that there are good reasons for the employment of all of these devices. There are many times, however, when one may be utilized to far greater advantages than another. The value of any of these methods depends on the intelligence with which it is used.

#### **DISADVANTAGES OF TRAINING WITH MECHANICAL APPLIANCES.**

**63. Pointers trained with mechanical appliances failing on target practice.**—Some pointers who consistently make good scores with the Morris tube and dotter sometimes fail to make good scores at practice. This is due to a variety of reasons, and these should be carefully considered by the division officer in deciding whether or not the pointer should be continued in his position.

These reasons may be enumerated as follows:

**64. Failure to follow through.**—It is frequently the case that a pointer who practices successfully with mechanical targets will, when firing, follow only until he wills to fire, and fail to follow throughout the firing interval, thus insuring a miss when there is any considerable motion. A delayed action in the firing circuit will assist to correct this fault. This delayed action should be variable.

**65. Extreme accuracy in pointing.**—Attention is again particularly invited to the necessity for carefully training pointers to the highest possible degree of accuracy in pointing. Unless the pointers have been so trained that we can always rely upon them to hit within a small space when all of the conditions are known, it will be impossible to develop an accurate fire under battle conditions, where we may have to depend very largely upon the accuracy of the pointers to determine the most difficult of all of these conditions, viz, the sight-bar range of the enemy.

**66. Result of firing when not on.**—The pointer should be made to realize that if he fires when not exactly "on" and following, he will certainly miss, causing a delay until the gun is



reloaded, and giving the spotter an incorrect impression. When the gun is finally reloaded it will then be in exactly the condition as it was before he fired. The pointer has, therefore, lost the entire time required to load, aim, and fire one shot, not to mention having wasted the ammunition, and interfered with fire control.

**67. Necessity for skill with mechanical targets.**—Until a man has acquired skill through practice with mechanical devices, there is little use in his attempting to fire from a rolling platform. Progress must be judged by results and not by the hours of training. Some men acquire expertness quickly, while others soon show that it is a waste of time to attempt to train them as gun pointers.

**68. Necessity for accurate mechanisms.**—Accurate, quick work with mechanical targets is impossible with faulty mechanism; division officers should devote the greatest attention to eliminating the lost motion in their mounts and sights. Before attempting drill it is essential that the adjustments be exact. Gun should be weighted at breech in order to compensate for the absence of the weight of the projectile and charge. Otherwise undue load is thrown on the elevating gear, which results in wear, and the pointer may be improperly instructed in the manipulation of his mount. (Placing a projectile in the gun is sometimes an easy way to overcome this difficulty.)

**69. Progressive training.**—The dotter and Morris tube are intended to train men to a high degree of manual dexterity in handling their guns. The motion given to the target should always be kept slightly in advance of the skill of the pointers until they have attained proficiency. It must, of course, be slow and regular in the beginning, but before a pointer is expert he should be able to make a good score on a target whose motion is both irregular and rapid.

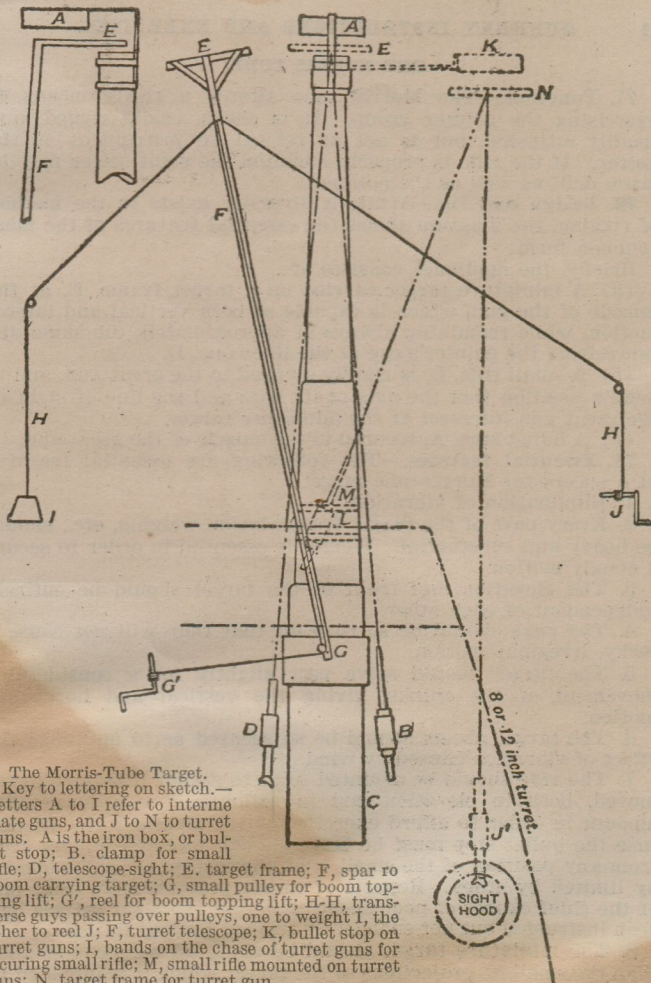
#### THE DOTTER.

**70. Advantages of the dotter.**—The advantages of the dotter as an instrument for the training and practice of gun pointers are:

1. Training with it may be carried on at practically any time, especially in port (or at sea when check telescopes can not be used, see art. 67).

2. Small inaccuracies in aiming are made apparent because of the size of the impression made by the dot.

3. If well designed and made, the instrument is exceedingly accurate.



The Morris-Tube Target.

Key to lettering on sketch.—  
 Letters A to I refer to intermediate guns, and J to N to turret guns. A is the iron box, or bullet stop; B, clamp for small rifle; D, telescope-sight; E, target frame; F, spar boom carrying target; G, small pulley for boom topping lift; G', reel for boom topping lift; H-H, transverse guys passing over pulleys, one to weight I, the other to reel J; F, turret telescope; K, bullet stop on turret guns; I, bands on the chase of turret guns for securing small rifle; M, small rifle mounted on turret guns; N, target frame for turret gun.

## THE MORRIS TUBE.

**71. Function.**—The Morris tube affords a ready means of exercising the pointer group. It is cheap, easily rigged, and readily adjusted, but is not as refined an instrument as the dotter. If the rifle is properly mounted the sight setter may be given drill as well as the pointers.

**72. Design and rig.**—While a diversity exists in the method of rigging, the diagram shows the essential features of the most common form.

Briefly, the appliance consists of:

(a) A miniature target carried on a target frame, E, at the muzzle of the gun, which is capable of both vertical and lateral motion, while remaining always at approximately the same distance from the pointer's eye at the telescope, D.

(b) A small rifle, B, is rigidly secured to the great gun, and in such a position that the axis of its bore and the line of sight of the great gun intersect at the miniature target.

(c) A bullet stop, A, secured to the muzzle of the great gun.

**73. Essential features.**—The following are essential features of a successful Morris-tube target:

1. Elimination of vibration.
2. Every part of the target frame, boom, weights, etc., should be heavy and substantial. Weight is essential in order to secure a steady motion.
3. The elevation and train of the target should be entirely independent of each other.
4. The guys should be so rove off that they will not cause a jerky, irregular motion.
5. The target should move very slightly for a considerable movement of the cranks, giving the vertical and horizontal motion.
6. The target sheets should be so secured as to minimize the effect of vibration caused by wind.
7. The rifle should be mounted so as to permit it being quickly moved, both in elevation and in azimuth, a certain definite amount in order to afford exercise for the sight setter. In this case the bullet stop must be large enough to catch bullets fired from any position of the small rifle, the motion of which should be limited by stops. Reports of target practice show that one of the chief causes of poor shooting is that the sight setters had been instructed but not sufficiently trained in their duties.
8. The miniature target should be about 25 per cent smaller than the smallest projections of the target which it is intended to represent.



## THE CHECK TELESCOPE.

**74. Advantages of check telescope.**—The check telescope is a most excellent means of training and of discovering the abilities of gun pointers. The advantages of this method are that—

(a) It may be utilized at sea if ships are cruising in company.

(b) No special apparatus has to be rigged.

(c) By observing the principles carefully a division officer should be able to find out fairly exactly the abilities of his pointers and what he may reasonably expect them to do at target practice before a shot is fired.

**75. Check telescopes in connection with mechanical targets.**—Training at Morris tube and dotter may be regulated at will to simulate, to some degree, any desired condition of motion. With check-telescope training, only the motion on a particular day is available. As on many days at sea there is practically no motion in big ships, every opportunity for rough-water check-telescope work should be taken advantage of. Telescopes with check eyepieces are very valuable when used together with the dotter. By utilizing the check sight the division officer is enabled to watch and control the operation of the dotter and to study the methods and progress of his pointers.

**76. Types of check telescope.**—In the later ships the pointers' telescopes are provided with eyepieces, to be used in checking the pointer's work. In older ships attachments have been secured to the sights and auxiliary telescopes mounted for use on the larger guns. With the secondary guns it is sometimes necessary to use bore sights for checking purposes.

**77. Necessity for firing signal.**—It is desirable to connect a buzzer in the firing circuit which the pointer sounds when completing his contact on firing and when properly laid on the target. Signals to fire should be given at proper part of roll. When there is an excessive roll, it is not possible to be "on" at all times with present gear, but there will come a time of comparative easy motion when the signal should be made. Signals should not be given at regular intervals of time and should not be given oftener than the time required to load the gun. The interval between stand-by and fire should not be constant.

**78. Conducting exercise.**—In conducting the training with check telescopes vessels should steam on parallel courses, each hoisting a target of predetermined size laid out in rectangles. The division officer, by carefully observing the work of his pointers and by assigning a definite value to certain rectangles

in the pointer's target, is able to assign definite scores to his men. Individual score cards should be kept for each man, the result of his strings accurately recorded, and results, with a mark of efficiency, posted on the bulletin board.

**79. Necessity for keeping scores.**—By keeping scores carefully, like batting averages, and by posting them on the bulletin boards, interest and competition are stimulated, and a very good idea may be gained of the work of the pointers and what may be expected of them with the ship rolling and pitching under various conditions of sea and weather.

### SUBCALIBER PRACTICE.

**80. Value of subcaliber practice.**—This practice is of great value after a certain amount of skill in pointing has been attained. If carried out with untrained pointers, it will be found of less material benefit than otherwise. Subcaliber is a method supplemental to and advanced beyond those previously described, but, as mentioned above, it is an essential part of battle training. Subcaliber furnishes an agency permitting practically a dress rehearsal of a battle practice, exercising simultaneously the fire-control parties, spotters, sight setters, and others concerned, as well as the gun pointers. Casualties may be simulated and drill made very realistic. This practice can be held at any time two or more ships find themselves together at sea, practically without regard to weather or speed.

**81. Necessity for accuracy in adjusting pieces.**—A first essential in subcaliber work is that the smaller pieces should be accurately bore sighted with the larger ones to which they are attached.

**82. Firing connections.**—The subcaliber pieces should be fired by direct attachment to the ordinary firing connection. If this is not possible, a reliable, quick means of giving the firing signal to the man firing the piece should be arranged.

### DRILL AT THE GUN.

**83. Joint exercise of crew.**—As the members of the gun crews become skillful in their individual duties, the entire crew must be exercised at its own gun.

**84. Lost motion in training gear.**—It frequently happens that the lost motion in the training gear of guns of intermediate caliber is so great that in closing the breech the plugman throws

the pointer's aim off the target, thus delaying the fire. This lost motion should be diminished as much as possible, and the pointer should accustom himself to it by frequently requiring the plugman to open and close the breech plug after each shot at Morris-tube practice. The plugman should be trained to close the plug with the least possible derangement to the train of the gun.

**85. Necessity for giving accurate ranges.**—Though for the purpose of instruction fictitious distances may be necessary in connection with the objects used as a target, they should never be employed if their use can be avoided. The valuable power of judging distances comes and improves with practice, and officers should seek to improve their powers in this direction, as well as to instruct the men by estimating the correct distance of the moving objects employed as targets.

**86. Point of aim.**—The point of aim communicated to the gun pointers should be well defined and thoroughly understood by all concerned. Such a point is the intersection of the horizon and the stem or stern of the enemy. These points should be generally plainly visible to all guns. It is desirable to standardize the point of aim, and in firing at ships, unless another point is designated, the intersection of the stem with the water line will be considered as the point of aim. Pointers must be carefully instructed not to fire wildly if they have lost the object, but in the case of firing at an enemy who is enshrouded in smoke the horizontal cross wire of the pointer's telescope can be kept on the horizon and the vertical wire kept on the center of the cloud of smoke, or on a mast if one is showing above the smoke.

**87. Necessity for actually laying gun and setting sights.**—When at drill, men must never be allowed to pretend to lay a gun. Correct sight setting is of the first importance, and accuracy in setting sights must be given great attention.

**88. Gravity of mistake in target.**—Officers must bear in mind, and must impress upon the men, the gravity of the mistake of aligning the sights of a gun on a wrong target.

**89. Target practice—Function in the system of training.**—Target practice at short ranges, while necessary to the final development of a gun crew, must be regarded as a test of the proficiency which has been attained rather than as a method of training. It is a method only in the sense that after a thorough preliminary training experience at actual firing is necessary. It is quite possible for crews which have received thorough training to make a perfect score at their first short-range battle practice. Until target practice has been held the pointers and the members



of the crew have not had the experience requisite for their assurance under service conditions. Division officers should take advantage of firing to note the men who become unduly excited, who appear gun-shy, etc., with a view to assigning them to duty where failings will have the least detrimental effect. The first short-range battle practice after commissioning should be of great value in removing from the gun men who are so affected. Especial attention should be given to the demeanor of the pointers.

**90. Short-range battle practice.**—Short-range battle practice is held at short ranges with screens of such size that all properly directed shots will hit. The practice is a test of the fire control and of the entire gun's crew, and to a considerable degree measures the organization and efficiency of the ship. Spotters, other officers, and members of the crew are given experience and a practical demonstration of fire control in its simplest form. Material, communications, and efficiency of gun crews are tested under conditions more severe than is generally the case at longer ranges.

**91. Unsatisfactory performances.**—The cause of every unsatisfactory performance at target practice should be definitely determined. Only by such investigations may the sources of trouble be discovered and eliminated and progress assured. Further progress in gunnery depends, to a considerable degree, on the seeking out and eliminating of errors heretofore, perhaps, neglected as unimportant. Information regarding shots that miss the target is as important as that regarding those that hit, provided the amounts by which they miss are definitely ascertained and the causes of failures to hit determined. (See U. S. Navy Regulations, 1913, art. 1609b.)

## CHAPTER V.

### GUN DRILLS.

(See "Ship and Gun Drills, 1914," and Ordnance Pamphlets.)

#### GENERAL NOTES.

**101. Instructors.**—The duty of a drill officer or an instructor is to impart to the crew a sound knowledge of the gun, mount, and drill. Practical results are sought. The first requisite is to get the framework of the instruction into the crew's minds, then the details can gradually be built up. The crew should always understand why each detail of the drill is necessary. A rapid and accurate fire is required; this being thoroughly understood by the green crew, special drills to develop the fine points of loading, sight-setting, and pointing are in order. All explanations and instructions should be made as clear, concise, and emphatic as possible. When the crew is drilling as a unit the instructor should command "Silence" when he corrects a mistake, in order that the whole crew may have their attention drawn to it.

**102. Assignment of stations.**—The members of the gun crew are assigned to stations. The titles of the stations are, in a general way, explicative of the duties to be performed.

**103. Falling in for muster.**—Crews of broadside guns, when falling in for muster abreast the guns, should fall in, in single rank, facing inboard, by size, gun captain on the right.

**104. Manner of giving commands.**—Officers and instructors must be careful to give commands in a clear and distinct manner.

**105. Commands used.**—The following commands are used:

1. Stations!
2. Load!
3. Commence firing!
4. Silence!
5. Carry on!
6. Cease firing!
7. Unload!
8. Secure!

1. *Stations!*—At this command, which may be given at any time or in any formation, the crew go at once to their gun, take their respective stations, and await further commands. The gun is supposed to be ready for the exercise required when this command is given.

2. *Load!*—The crew, being at their stations, go through the operation of loading the gun.

3. *Commence firing!*—This command may be given either before or after the gun is loaded. If given before, the gun will be loaded at once. The target having been designated, the firing and service of the gun are started, the pointer firing when the firing signal is given, or when on the target, depending upon the nature of the practice being held. The gun will be loaded as soon as fired, and firing will continue until the ammunition is exhausted or until the command "Cease firing!"

4. *Silence!*—This command is given when, for any reason, it is necessary to temporarily stop the service of the gun. It may be given by the division officer or by any member of the crew noticing something requiring immediate attention. When it is given, every member of the crew ceases all operations and stands in his tracks and awaits instructions. If a member of the crew calls "Silence!" he will point out to the division officer or gun captain what he has observed.

5. *Carry on!*—After the command "Silence!" the defect having been remedied, this command is given, at which the crew resume the operation in which they were engaged when the command "Silence!" was given.

6. *Cease firing!*—The service of the gun is stopped and steps are taken so that the gun can not be fired.

With R. F. guns (guns using powder in brass case containing the primer) remove case, *i. e.*, unload.

7. *Unload!*—With R. F. guns the plug should be opened cautiously.

8. *Secure!*—(a) At this command the ammunition will be returned to the magazine; spare parts returned to their places; unnecessary gear stowed away and guns secured.

(b) If the gun has been fired, as soon as possible after the firing has ceased the gun should be thoroughly washed out, dried, and oiled. If practicable, this should be done while the gun is still hot.

106. *Details for providing.*—The detailing of the members of the crew for the performance of the individual duties in getting the battery ready is left to the discretion of the division officer



whose duty it is to see that his battery is ready, in all respects, as expeditiously as possible for the drill or exercise that is to be carried out.

**107. Division officers responsible.**—Division officers, being responsible, must assure themselves, either by personal inspection or through reports from their gun captains, that their battery is, in all respects, ready for the exercise required before reporting ready to the fire-control officer.

**108. Casualties to material.**—1. *Casualty drills.*—The attention of all officers is called to the absolute necessity of drilling the gun crews at casualty drills; i. e., casualties to both men and material. No matter how efficient the crew may be at loading, sooner or later a breakdown or interruption may occur. Then it is of vital importance that the crew be prepared to remedy the defect in the shortest possible time, in order that the services of the gun may not be lost to the ship. To this end officers must not only explain to the crews what to do in case of any probable casualty, but must actually drill them in doing it. To neglect this is fatal.

2. *List of casualties.*—Study reports of target practice and see what has happened to others; make notes of what happens during drill. Any of these things may happen during practice.

**109. The following are only some of the casualties that may occur.** Every gun captain should keep in his notebook a list of all casualties that occur on his gun with the remedies taken and also a list of the casualties happening to other guns that he may hear about.

**1. Misfires and hangfires.**—(a) *Definition of misfire.*—A misfire occurs when the pointer attempts to fire the gun and the charge fails to explode.

(b) *Classification.*—Misfires may be divided into two classes:

(a) Primer misfires, when the primer fails to explode.

(b) Charge misfires, when the primer explodes, but the charge fails to explode.

(c) *Definition of a hangfire.*—A hangfire occurs when there is an appreciable interval between the attempt to fire and the explosion of the charge. It is evident that a hangfire can occur only after an apparent charge misfire.

(d) *Calling misfire.*—Too much emphasis can not be laid upon the necessity for the pointer immediately calling "misfire" as soon as he realizes that his gun has not fired.

(e) *Procedure in battle.*—Where the possible chances of serious danger due to misfires may be overbalanced by the more

important consideration of battle, the commanding officer may, at his discretion, decide what interval shall intervene between the occurrence of a misfire and the opening of the breech [I 2865 (5)].

(f) *Procedure during target practice.*—When a misfire occurs during target practice, 30 minutes must elapse from the last trial to fire before opening the breech.

2. **Misfires.**—Misfires may occur from a variety of causes, some of which are as follows: (On 5 inches, 6 inches, or 7 inches.)

Pointer fails to press firing key.

Broken firing connection.

Firing wire cut on recoil or counter-recoil of gun.

Plugman fails to prime gun.

Fuzed or split primer.

Primer vent foul.

Faulty firing connections or plug not fully closed.

**Remedies.**—If firing electrically, hook lanyard and fire by percussion. If this fails, reprime, examine primer, make sure firing pin is intact. Repeat until gun fires. During following load inspect vent and firing connection.

3. On 3-inch or 4-inch gun—Failure of gun to return to battery causing trigger arm to fail to engage the sear bar—

**Remedy.**—If not more than about 2 inches, plugman sings out “fire by lanyard”—try to fire by lanyard. If more than 2 inches, try to jar gun back by striking breech with heavy weight.

4. **Broken firing pin or weak spring—Remedy.**—Try to fire gun again using lanyard. If not able to do so, remove firing pin and examine same, replacing spare part if necessary.

5. **Block jams in closing—Remedy.**—Plugman close block, using hand pressure on bottom. If block still fails to close, extract shell, using operating lever; examine bore for obstruction or burrs.

6. **Block jams on extraction—Remedy.**—Remove empty case, operating block with operating lever.

7. **Friction disk slipping—Remedy.**—If friction disk slips, allowing breech to drop toward deck, loosen friction disks, raise breech to normal position by man power, and set up on disks again.

8. **Hangfires.**—Hangfires occur principally from two causes: *Powder charge loaded wrong end toward breech. Powder charge too far in gun.*

**Remedies.**—Report to battery officer and receive orders. If you are senior man on board, proceed as follows: Insert new primer and fire again. Repeat this procedure until gun fires.

On extracting primers from a hangfire examine carefully to make sure they have fired.

**9. Broken powder bag—Remedy.**—Throw overboard. Use new charge. Get all slivers of powder that may be on deck away from the gun.

**10. Plug will not close—Remedy.**—Inspect screw box and remove any slivers of powder or other foreign articles that may be in there. Back out hinge pin, clean off, and oil.

**11. Plug will not open—Remedy.**—Extract old primer, if on a 6-inch or 5-inch gun. Examine salvo latch and make sure that it has tripped.

**12. Gun fails to return to battery—Remedy.**—Elevate and depress gun through full arc a number of times. Hit breech above plug with end of rammer or piece of wood.

**13. Cross wires of telescope jar out—Remedy.**—Have pointer coach trainer on.

**14. Sight lights fail—Remedy.**—Use flashlight.

**15. Range dial pointer jars loose—Remedy.**—Use range scale on sword.

**16. Deflection drum jars loose—Remedy.**—Set up on drum and have spotter bring gun on target again.

**17. Shell will not seat—Remedy.**—Gun using fixed ammunition place cartridge to one side, inspect gas check slope and remove burrs. Try another cartridge.

**18. Gun returns to battery slowly—Remedy.**—Oil slede and inspect for burrs.

**19. Gun will not train—Remedy.**—Wipe off training rack with dry rag and set up on friction discs.

**20. Gun will not elevate or depress—Remedy.**—Set up on friction discs. Inspect to see that all gear is properly connected up.

**21. Gun firing before breech is locked—Remedy.**—(a) Projecting primer; examine all primers beforehand and reject those projecting from the base of the case.

(b) Powder residue caused by blow-backs on face of plug or dirt on primer. Have plugman feel face of plug after each shot; also wipe all primers thoroughly just before firing.

**22. Jammed breech plug—Remedy.**—(a) Deformed or dirty cartridge case. Try all cartridge cases in guns beforehand in three different positions, fully closing the plug each time; also clean all cases thoroughly just before firing.



(b) Brass shavings or burr in screw box. Clean screw box and have file handy for removing burrs. If extractor is shaving slivers from the cases, remove and replace extractor.

(c) Failure of the plug locking plunger to function. Have plugman feel the plunger after each shot. If it is jammed, close breech with the plug held in hand in proper position.

(d) Cartridge cases slipping by extractor, due to broken or bent extractor. Use hand extractor and replace extractor.

**23. Failure of gun to fire after pulling trigger—Remedy.—**

(a) If the firing pin has fallen, pointer calls "missfire," plugman recock and snap several times; strike firing pin smart blow with empty case. Failure to fire will then probably be due to one of the following causes:

(b) Sunken primer. Examine all primers beforehand and discard those that are sunken.

(c) Short firing pin. Examine all firing pins beforehand with breech plug revolved and point of pin projecting through face of plug.

(d) Trigger jammed or held back by pointer so that firing pin is eased down. Release trigger and recock and fire.

(e) Weak spring, broken or bent firing pin. Replace. Powder residue in firing case. Remove firing pin and clean.

**24. Firing pin failing to fall—Remedy.—**(a) Shield sprung so that trigger will not engage sear bar.

(b) Broken or bent firing pin.—Replace.

(c) Dirt in firing case. Remove firing pin and clean; failing in this, fire gun with lanyard.

**110. Casualties to personnel.—1. Casualty drills.**—In case of injury to any member or members of the crew, the gun crew must be drilled so that those remaining will continue the service of the gun. It is to be expected that, in this case, the service will not be as efficient as before the casualty; but it must be distinctly understood that no gun is to be abandoned, even by the last remaining man, as long as it can be loaded and fired. For the above reason every man in a well-trained gun crew should be familiar with the duties of every other station, and should be prepared to perform them without hesitation.

**2. Removal of personnel casualties.**—The removal of casualties is a matter to be specially provided for in each ship. It is the duty of the gun crew to continue the service of the gun and to overcome every obstacle which interferes therewith. The gun crew will therefore not cease their operations of loading, but two men nearest to the wounded man should, without orders,

place him in any convenient position clear of the working of the gun, whence he will be given first-aid treatment, then removed, as elsewhere specified. The operations of loading or firing will never be discontinued for the purpose of removing personnel casualties, except in cases of absolute necessity.

#### NOTES ON SIGHT SETTING.

**111. Necessity for accuracy.**—The proper setting of the sights of a gun is absolutely essential to accuracy of fire. No matter how efficient the rest of the crew may be, the accuracy of the gun can be ruined by poor sight setting.

**112. Selection of sight setter.**—The sight setter should be carefully selected. For broadside guns he is an additional man. He need not be a large man or a man of great strength, but he must be steady, attentive, and not gun shy.

**113. Method of training.**—After the sight scales have been explained to the sight setter and he has been shown how to manipulate the mechanism, he must be drilled at sight setting. He should be trained to approach the setting slowly and not pass it and have to come back to it. This drill should be carried out daily for 10 or 15 minutes until he is proficient, and then often enough to keep him so. The orders for the setting—*i. e.*, the actual ranges and deflections—should come over the regular fire control system to accustom the sight setter to its use. This may not always be practicable, but should be done if possible. The setting should be carefully checked by a responsible person, preferably the division officer himself, or, if this is not possible, the gun captain. Accuracy should first be insisted upon, and, when this is acquired, speed should be developed. Many shots miss the target because of slow or inaccurate sight setting.

#### NOTES ON LOADING.

**114. Rapidity of loading.**—Rapidity of loading depends upon:

1. The rapidity with which each member of the gun crew performs his duty.
2. The precision with which each member of the gun crew performs his allotted portion of the drill.
3. The teamwork of the crew as a whole; that is, upon each member of the crew performing his duty in the service of the gun at exactly the proper time and in exactly the proper way and without interference with other members of the crew.

**115. Accuracy.**—Accuracy and thoroughness in every detail, even though it may require slightly more time, is an absolute requisite to real rapidity of loading. Eagerness for excessive rapidity may result in serious delays caused by interference, confusion, and casualties that can be avoided only by precision in every movement. It must be remembered that these delays may more seriously interfere with the rapidity of fire than the deliberation necessary to avoid them.

**116. Movements required in loading.**—In devising a drill for a gun it should be borne in mind that the less movement required of the members of the crew the less liable they are to interfere with each other, or to be in one place when they should be in another. This is especially true of broadside guns to which the ammunition must be brought by hand. For this reason it is very much better to have one man, the first shellman, load all the shells, and have the other shellmen keep him supplied therewith, than to have them alternate in loading the shells, each providing shells for himself. The less movement required the better.

**117. Development of loading drill.**—The aim of every division officer should be to so drill his gun crews that they will work with the precision and certainty of a well-regulated machine. In order that this may be accomplished it is necessary that each man thoroughly understands his duties and the best way of performing them. To this end the man should first be told exactly what his duties are and how to perform them; then he should be drilled in their performance. The drill will have to be slow at first, gradually developing speed, but not at the expense of accuracy. When the division officer is satisfied that the crew has reached a satisfactory state of efficiency only enough drill is necessary to keep it from going backward.

**118. Amount of drill.**—The exact amount of drill necessary will depend upon the type of gun and the individual men. No definite rules can be laid down. In order to stimulate interest and to arouse a spirit of competition among the crews it has been found advantageous to keep the times of a certain number of loads for each crew and at the end of the drill to post the average on the division bulletin board. It is surprising how rapidly the crews will develop when a spirit of friendly rivalry exists among them. This rivalry must never be permitted to go beyond the friendly stage, however.

**119. Carelessness in loading.**—Careless loading may easily put a gun out of action for a considerable time. For instance, if the screw box is burred badly, the plug will not close. It is



therefore necessary that the crew reach a high state of efficiency in respect to care of material.

**120. General rules in loading.**—A few general rules, applicable to nearly all guns, are here given:

1. *Handling ammunition.*—For R. F. guns the shellmen should provide themselves with knives for cutting the lashings on the boxes and with waste for wiping off the cartridge cases. Before target practice rapid-fire ammunition should be gotten up, thoroughly cleaned, and tried in the gun, but if at any time the ammunition to be used has not been cleaned and wiped off, the above precautions are necessary. Care must be observed that no waste falls in the screw box or gets in the bore. Sometimes when handling rapid-fire ammunition the projectile starts from its seat in the case. This should be looked for and shell reseated before attempting to load, or the breech will not close.

2. *Firing pin.*—When firing R. F. guns, while plug is open the plugman should pass his hand over the face of the plug to insure himself that the firing pin is housed properly. This is to guard against having a projecting firing pin strike the primer as the plug swings shut, thus causing a premature explosion and possible disaster.

3. *Ammunition supply.*—The prompt and regular supply of ammunition is essential to efficiency, therefore, actual exercise in that feature is as necessary as is exercise at the gun. Rapid loading, without a corresponding rapid ammunition supply, is without value, and this supply includes every operation from taking the ammunition from the magazine and unboxing it to loading it in the gun. Especial attention should be given to providing for the disposition of cartridge boxes in such a manner as least to interfere with rapidity of serving the gun.

### GUN DRILLS—GENERAL INSTRUCTIONS.

**122. Stationing of the crew.**—All members of the crew must be trained to perform all duties at the gun. Promptness in opening fire is essential, and this must not be delayed to get absentees to the gun.

**123. Preparations for firing.**—The stations for the members of the gun crews are given in the order of their importance. In case you have not enough men in your crew to fill all stations, start at the top of the list and fill as many as possible, then apply to the captain of the ship for men to fill the remaining positions or stations. Do not forget that these green men will require all the training possible, and use every opportunity you can get for training them.

## STATIONS AND DUTIES OF 6-INCH GUN CREWS.

(Same for 5-inch.)

## STATIONS.

125. **Battery officer.**—Commands. Goes wherever he may be needed. Supervises service of guns.

(b) *Gun captain.*—Commands during the absence of the battery officer. Stations himself where he can best supervise the working of the crew, hose led out and everything properly provided. Reports to battery officer when ready.

(c) *Pointer.*—At pointer's sight. Sees buzzer in place. Takes off sight cap. Provides lens paper. Checks up with trainer.

(d) *Trainer.*—At trainer's sight. Removes sight cap. Provides lens paper. Checks up with pointer.

(e) *Sightsetter.*—At sight. Wears 'phone. Tests out sights.

(f) *Plugman.*—Commands in absence of gun captain and battery officer. At operating lever of plug. Provides primers and belt and sponge for wiping off mushroom head. Tests plug and gas ejector.

(g) *Trayman.*—At left of breech. Holds loading tray. Fills gun tub.

(h) *Rammerman.*—In rear of breech. Holds rammer. Provides sponge rammer.

(i) *First shellman.*—In rear and left of breech. Provides bucket of sand.

(j) *Second shellman.*—At shell supply, in rear of first shellman. Provides knife for cutting slings from shell. Connects up and leads out fire hose. Opens cover of shell hoist.

(k) *First powderman.*—In rear and right of breech. Provides drinking water.

(l) *Second powderman.*—At powder supply, in rear of first powderman. Provides spanner wrench for opening tanks. Opens cover of ammunition hoist.

NOTE.—If there are any more shellmen or powdermen detailed with the crew they take stations at the ammunition supply and keep the gun supplied with ammunition.

## LOAD.

(m) *Gun captain.*—Supervises work of loading. Sees safety precautions carried out. Sees powder bag loaded with red end aft. Watches to see that the gun returns to battery after each shot. Watches salvo latch to see that plugman does not trip it.

(n) *Pointer*.—Brings cross wires on the target. Coaches trainer on, if necessary.

(o) *Trainer*.—Keeps vertical wire on target.

(p) *Sightsetter*.—Sets sight as ordered. Repeats all orders coming over phone or voice tube. Sings out "Set" when range and deflection have been put on sight.

(q) *Plugman*.—Opens plug, wipes off face of mushroom head. Inserts new primer. Sings out "Ready" as soon as breech is closed.

(r) *Trayman*.—Inserts tray as soon as breech is opened. Closes air valve after "Bore clear" has been called.

(s) *Rammerman*.—Inspects bore and calls "Bore clear" as soon as it is free from gas. Rams shell home, making sure to seat it. Steps back quickly after withdrawing rammer.

(t) *First shellman*.—Receives shell from second shellman and as soon as bore is clear throws in shell. Gets another from second shellman.

(u) *Second shellman*.—Picks up shell from shell supply, removes slings, and passes to first shellman.

(v) *First powderman*.—Loads in powder, red end aft, as soon as rammer is withdrawn. Steps clear and gets new charge from second powderman.

(w) *Second powderman*.—Removes covers from powder tanks, extracts powder charge and hands to first powderman. Is careful to see that not more than one tank is open at a time.

#### COMMENCE FIRING.

(x) This order may be given either before or after the gun is loaded. If it is given before, the gun will be loaded at once. The firing and service of the gun are started, the pointer firing when he is on and the firing signal ringing. The gun is reloaded as soon as fired, and firing continues until ammunition is exhausted or until the command "Cease firing."

#### SILENCE.

(y) This command is given when for any reason it is necessary to temporarily stop the service of the gun. It may be given by the division officer or by any member of the crew noticing something requiring immediate attention. When it is given every member of the crew ceases all operations and stands in his



tracks and awaits instructions. If a member of the crew calls "Silence!" he will point out to the division officer or gun captain what he has observed.

#### CARRY ON.

(z) All hands go ahead with the work of loading and firing the gun.

#### CEASE FIRING.

(aa) The service of the gun is stopped. If the gun is loaded the plugman pulls lever far enough to break the firing circuit, and then extracts the primer. If the gun is unloaded plugman opens breech and crew stand by for orders.

#### UNLOAD.

(bb) Gun captain removes primer. Plugman opens breech. First powderman removes powder and places it in tank of distilled water unless otherwise ordered. Shellman removes shell.

#### SECURE.

(cc) The members of the crew, under the supervision of the gun captain, return everything that has been provided and secure gun. Gun captain reports "Secure" to division officer.

NOTES.—*In case of misfire.*—Pointer sings out "Misfire," shifts his switch from motor generator to battery and tries again. Gun captain sees firing connections intact and plug fully closed. If misfire a second time pointer again sings out "Misfire." Plugman takes strain on firing lanyard and at pointer's command "Fire" releases lanyard quickly. If primer misfires by percussion the gun captain extracts old primer and inserts new.

*In case of hangfire.*—Pointer sings out "Misfire," the gun captain having noticed that the primer has exploded sings out "Silence" and reports facts to battery officer and receives orders.

#### FIRE.

(dd) Second powderman replaces cover on open tank and both powdermen remove powder to place of safety. In case first powderman has a charge of powder in his hands, he will put same in gun if possible—otherwise in the nearest tank of water.

Shellmen man nozzle of fire hose and turn water on fire. Remainder of crew assist as directed by gun captain. At fire in action only enough men will be detailed by gun captain to fight the fire, and the remainder of the crew will keep up the service of the gun as soon as possible. All hands return to their stations and resume service of gun as soon as repair party reports.

#### MEN WOUNDED OR KILLED.

(*cc*) When man is wounded the two men nearest carry him clear of the gun. Gun captain applies first aid. Crew continue service of gun with reduced crew. If man is killed, carry him clear of gun and resume duties.

At the command "Stations" each member of the gun crew tests out the gear he is to work with and immediately reports anything that is out of order.

#### STATIONS AND DUTIES OF 3-INCH GUN CREWS.

##### STATIONS.

126. At this command, each member of the crew goes to his station and tests out the gear with which he is to work.

(*a*) *Battery officer*.—Commands. Goes where he is needed. Supervises service of guns.

(*b*) *Gun captain*.—If a separate member of crew, stands where he can best supervise the working of the crew. Sees ammunition provided, spare parts and tools at hand, and hose led out. Sees tompion out and bore clear. Reports to battery officer when ready. If not a separate member of crew, takes station operating lever of plug. Commands in the absence of the battery officer.

(*c*) *Pointer*.—At elevating wheel. Sees buzzer in place. Takes off sight cap and provides lens paper. Checks up with trainer. Tests elevating gear.

(*d*) *Trainer*.—At training wheel. Removes sight cap and provides lens paper. Checks up with pointer. Tests training gear.

(*e*) *Sight setter*.—At sight. Wears phone. Tests out sight.

(*f*) *Plugman*.—At operating lever of plug. Tests plug.

(*g*) *First loader*.—In rear of breech. Provides loaders' gloves for himself and second loader. Leads out fire hose.

(*h*) *Second loader*.—In rear and right of breech. Provides bucket of drinking water.

(i) *Third loader*.—At ammunition supply. Provides knife for cutting lashings on ammunition boxes and waste for wiping off cases. Keeps first loader supplied with ammunition.

(j) *Gunner's mate*.—Provides spare parts and tools and prepares to repair any casualty likely to occur. Inspects all guns just prior to firing.

#### LOAD.

(k) *Battery officer*.—Commands. Supervises work of battery.

(l) *Gun captain*.—Commands in the absence of the battery officer. Supervises service of gun. Watches to see that gun returns to battery and that plugman does not trip salvo latch.

(m) *Pointer*.—Brings cross wires on target. Coaches trainer if necessary.

(n) *Trainer*.—Brings vertical wire on target and keeps it there.

(n) *Sight setter*.—Sets sights. Repeats all orders coming over voice tube or 'phone. Sings out "Set" when range and deflection have been placed on the sight.

(p) *Plugman*.—Opens plug. Passes hand across face of plug to see that firing pin is housed. Sings out "Ready" when gun is loaded and plug closed.

(q) *First loader*.—Receives fresh cartridge from third loader and places same in gun, being careful not to burr screw-box.

(r) *Second loader*.—Removes empty case as soon as plug is opened. Steps clear of third loader.

(s) *Third loader*.—Removes cartridges from box, wipes them off, and hands them to first loader.

(t) *Gunner's mate*.—Wherever needed.

#### COMMENCE FIRING.

(u) This order may be given either before or after the gun is loaded. If it is given before, the gun will be loaded at once. The firing and service of the gun are started, the pointer firing when he is on and the firing signal ringing. The gun is reloaded as soon as fired, and firing continues until ammunition is exhausted, or until the command "Cease firing."

#### SILENCE.

(v) This command is given when for any reason it is necessary to temporarily stop the service of the gun. It may be given



by the division officer or by any member of the crew noticing something requiring immediate attention. When it is given every member of the crew ceases all operations and stands in his tracks and awaits instructions. If a member of the crew calls "Silence!" he will point out to the division officer or gun captain what he has observed.

CARRY ON.

(w) All hands go ahead with the work of loading and firing the gun.

CEASE FIRING.

(x) The service of the gun is stopped. If the gun is loaded, the plugman opens the breech and first loader withdraws the loaded cartridge case.

UNLOAD.

(y) This command will only be given after the gun is loaded and before the command "Commence firing." Procedure is the same as at "Cease firing."

SECURE.

(z) The members of the crew, under the supervision of the gun captain, return everything that has been provided and secure gun. Gun captain reports "Secure" to division officer.

FIRE.

(aa) Third loader covers ammunition boxes and, if necessary, removes same to place of safety. Remainder of crew assist as directed by gun captain. If in action only enough men will be detailed for fire fighting to keep it from spreading. The remainder of the crew will maintain the service of the gun as efficiently as possible.

MEN WOUNDED OR KILLED.

(bb) The two men nearest the wounded man carry him clear of the gun. Gun captain applies first aid. Remainder of crew carry on service of gun. If man is killed, carry him clear of gun and resume duties.

NOTES.—*In case of misfire.*—Pointer sings out “Misfire.” Plugman immediately recocks and sings out “Ready.” Above procedure repeated until gun fires. In case after repeated efforts gun refuses to fire, report to battery officer and receive instructions. Do not open the breech under any circumstances except on direct orders from the battery officer or until 30 minutes have elapsed since the last attempt to fire.

# 127. Drill of 6-pounder and 3-pounder semiautomatic guns.—

## 1. Titles and stations of gun crew:

Title.	Station.
Plugman (gun captain) .....	To left of breech.
Pointer .....	At sights.
Sight setter (second pointer) .....	At sight scales.
First shellman .....	At left and rear of gun.
Second shellman .....	In rear of first shellman.

NOTE.—The number of shellmen required is dependent upon the method by which ammunition is supplied.

## 2. Commands:

(a) *Stations!*—At this command the crew go to their stations preparatory to loading and firing the gun.

(b) *Load!*—Plugman opens breech if gun has not been fired, then exercises supervision over other members of the gun crew. Recocks gun in case of misfire. Pointer keeps line of sight on the target preparatory to firing when order is given. Sight setter sets sights as ordered. First shellman aligns cartridge case with bore and shoves home the cartridge case. (These duties may be performed by the plugman when short of complement.) Second shellman passes shell to the first shellman. (Acts as sight setter in case of casualty.)

(c) *Commence firing!*—(See art. 105, par. 3.)

(d) *Cease firing!*—The service of the gun is stopped. If the gun is loaded, the plugman opens the breech and the first shellman withdraws loaded cartridge case.

(e) *Unload!*—Command given only when gun is loaded and before “Commence firing!” Procedure is the same as at “Cease firing!”

(f) *Secure!*—The members of the crew, under the supervision of the gun captain, return everything that has been provided and secure the gun. If the gun has actually been fired, the crew assist the gunner's mate in washing out and oiling the bore. The crew fall in for muster.

128. Service rifle, revolver, and machine guns.—Rifles, revolvers, and machine guns are furnished armed-guard crews for possible use against submarines close alongside the ship and for protection and possible destruction of submarines when crews are in open boats. A well-directed fire against a submarine close alongside on the surface with her crew on deck would undoubtedly seriously injure her and might cause her to sink. This fire would, however, draw the fire of the submarine and should not be resorted to unless there is a chance of keeping the submarine crew from manning their guns.

129. Drill for Colt automatic gun (mounted on board ship or in a boat gun crew).—

Title.	Station.
Pointer-----	In rear of gun.
First loader (second pointer, acting gun captain)-----	On left of gun.
Second loader-----	Rear of first loader.

(a) *Pointer—Commands.*—Removes gun cover, if gun is kept mounted, otherwise brings case containing gun and, assisted by first loader, mounts the gun. Tests mechanism by throwing back gas lever, letting it go, and pulling the trigger. Sees the bore clear; sees mount is in working order. Takes station in rear of gun. If the gun is mounted aloft, pointer goes aloft, sends down whip for ammunition and other articles. Receives articles whipped up by first loader and second loader.

(b) *First loader—Commands.*—If gun is not mounted, assists pointer to bring case containing the gun; and then mounts the gun, assists second loader to bring ammunition; takes station on left side of gun; when all is ready, reports to division officer.

(c) *Second loader.*—Provides ammunition and places it on deck to the left and to the rear of the gun, takes station at the ammunition boxes; if the gun is mounted aloft, first loader and second loader whip the articles and ammunition to the top before going aloft, and then secure the whip and net under the top.

(d) *Load.*—Pointer grasps the pistol grip, and as soon as the gun is unclamped lays it in the direction of the target, plants his feet firmly on deck to resist the motion of the ship.

(e) First loader loosens clamp; shifts box containing the ammunition belt on left side of the mount and enters end of the belt in the loading slot; throws back the gas lever smartly to its full extent and releases it, noting that the belt is held, a cartridge withdrawn, and that the gas lever is closed; sees that the belt



feeds fairly; performs the duties of second loader during his absence, and when necessary goes for more ammunition.

(f) *Commence firing.*—Pointer adjusts the sight for the designated range; grasps the pistol grip firmly with both hands, aims, presses the trigger with the forefinger of right hand, and continues the fire until the command "Cease firing" is given.

(g) First loader ships new boxes containing ammunition belts when necessary, enters the belt fairly into loading slot, taking care not to touch the hot barrel with his hands.

NOTE.—A slight tension on the belt, from left side, helps it to feed fairly and smoothly and prevents jamming.

(h) *Cease firing.*—First loader clamps piece.

(i) *Unload.*—Pointer presses back the knurled head on the right side of gun.

(j) First loader clamps piece if not already clamped, withdraws ammunition belt, throws back the gas lever smartly, and ejects unfired cartridge, releases the gas lever and replaces the cartridge in the belt, unships box and hands to second loader.

(k) Second loader takes box from first loader and coils the ammunition belt clear for running; places cover box.

(l) Pointer pulls the trigger, snapping the lock.

NOTE.—The piece must not be left loaded, the officer of the piece will make a personal inspection to this end.

(m) *Change stations.*—To be used frequently at drill in order to familiarize the men with all the duties of the gun. At this command, the first and second pointer change stations.

(n) *Secure.*—The members of the crew return what they provided and secure what they cast loose, and then form for muster.

(o) *As riflemen.*—If during action the piece jams permanently, or is otherwise disabled beyond immediate repair, the crew are called away as riflemen. At this command they put on belts and arm themselves with rifles and, when ordered, open up a rapid fire at the enemy.

(p) *Notes on the Colt automatic gun.*—Success with this gun can only be obtained by a perfect knowledge of the mechanism and of the precautions to be observed in its use. This is exemplified by the recent great improvement which has been attained throughout the service since regular practice with these guns has been carried out.

(q) By far the most common cause of an interruption of automatic fire has been found to be due to a jam in the feed. This is sometimes due to a cartridge fitting too lightly in its pocket

in the belt, so that the cartridge extractor can not draw it out. This is frequently caused by the belt being damp. Jam in the feed is, however, more frequently due to uneven loading of the belt. Even the machine-loaded belts are not always loaded with sufficient evenness to fire a complete string.

(r) After the belt is loaded it should be stretched out along the deck and the bases of cartridges should be made perfectly even by use of straightedge. Jams in the feed can usually be cleared through the hole in the right side plate.

(s) In general, when a jam or stoppage occurs, due to any cause, the first thing to do, after waiting long enough to see that it is not a hangfire, is to release the trigger, then work the gas lever gently by hand, observing the mechanism meanwhile to see what the cause of the stop is. Jammed cases or cartridges may be removed through the gas-ejection opening with the blade of a knife or the point of a screw driver.

**130. Machine guns.**—(a) These guns are very delicate instruments and easily get out of adjustment. You will have special instruction before leaving on armed-guard duty and the points learned then must be remembered and followed closely.

(b) In firing watch the loading closely as the shells will jam if they do not enter at just the right place. When firing at an object close aboard do not bother to look over the sights. Keep your head well up and note the splashes when by swinging the gun slowly you can bring the splashes on the target.

(c) During the trip across keep the gun mounted and on deck where it is readily accessible. It may come in very handy if a submarine should come up close alongside. Take it in the boat with you if you are forced to abandon ship, but throw it overboard in case you are captured and taken aboard an enemy vessel.

(d) The safety precautions for the rifle and revolver also apply to machine guns.

**131. Service rifles.**—(a) Before and after all drills and exercises, open the chambers and inspect the pieces to see that none are loaded.

(b) Never point a rifle, loaded or unloaded, at any living object, unless it is desired to kill it.

(c) Never point a loaded rifle in any direction where it could do any damage if it went off, remembering the long range of the service rifle.

(d) Never load a rifle at practice until ready to commence firing.

(e) Never carry a rifle with a cartridge in the chamber, except in exceptional cases, which must be especially ordered by the officer in charge.

(f) Never allow water to get on the rifle. Keep all parts well oiled.

(g) Be careful of the sights. A light blow may throw them out of adjustment.

**132. Service revolvers.**—(a) Never point a revolver, loaded or unloaded, at any living object unless it is desired to kill it.

(b) Never point a revolver in any direction where any damage would result if it went off.

(c) Never touch the hammer or trigger when the revolver is not pointing up or at the object aimed at.

(d) Remember that nearly all accidents occur with a revolver that was "not loaded."

(e) Never allow water to get on the revolver. Keep all parts well oiled.



## CHAPTER VI.

### TO PREPARE YOUR GUN FOR ACTION.

141. The following are essential and must be attended to:

(a) As soon as you report on board, go to the gun assigned you and see that it is ready for firing. Do not take anyone else's word that the gun is all right. Unless the gun is ready you will not be able to use it when called on and might far better have stayed in the United States.

(b) The following is a list of the most important items to be seen to. Check each one off as you finish it; otherwise you may miss some:

Boregauge gun.

Clean and oil slide. (Run in gun if there is time.)

Mark gun so you can tell that it returns to battery after each shot.

Oil trunnions.

Try out loaded gun for balance.

Test training gear; see all parts well set up. (If there is much lost motion, report it at once.)

Test elevating gear and see all parts well set up. (If there is much lost motion, report it at once.)

Provide material for wiping of sight lenses and clean sights. See eye buffers in good shape.

Clean range dials and dry same.

Clean deflection dials and dry same.

Take out parallax and boresight, then see sights set up for a full due (boresight for a range of about 2,000).

Adjust cross-wire illumination.

Recharge battery.

Clean and set up on friction discs. (Wash off in alcohol or lye water.)

Inspect thoroughly breech mechanism, screw box, and plug.

See all parts well set up; inspect for and remove burrs.

Adjust gas check pad and split rings.

Clean primer vent and seat.

Inspect and clean firing lock or firing pin.

Clean all contacts, then tape and secure same.

Test out all breast lamps and sight lights.  
Test out all battle lanterns.  
Examine and clean all primers.  
Fire primer by battery and percussion.  
Swab out gun.  
Set up on all bolts and nuts.  
See all split pins in place and secure.  
Inspect rammer and loading tray and see in good condition.  
Rope off deck around gun.  
Test fire-extinguishing system.  
Provide and fill gun tub.  
Fill recoil cylinders (inspect every morning).  
Paint safety circle on deck. (Recoil circle.)  
Overhaul and test salvo latch.  
Remove tompion.  
Inspect and test all ammunition.  
Test out voice tubes, buzzers, and sight lights.  
Provide loose canvas for sights and keep them covered when not in use.  
See that the following are provided and keep them near the gun at all times. See that all the crew know their location. Do not allow anyone to remove any of these articles from their usual places except for use on the gun:  
Lens paper.  
Sponge.  
Sponge rammer.  
First-aid packet.  
Tools.  
Spare parts.  
Primers.  
Cotton for crew.  
Jackknives.  
Binoculars.  
Police whistle for use of gun captain.  
Gloves for all loading crew.

(c) *Care of guns, sights, etc.*—It is imperative that the gun, sights, ammunition, etc., be kept in the most perfect condition. Bright work should be wiped with an oily rag—not shined.

(d) Just before leaving port inspect thoroughly.

(1) See all gear, working parts, bore, etc., thoroughly oiled and greased.

- (2) *Bore sight* the guns.
- (3) Prepare sight covers for protection against salt water *that can instantly be removed*; also, small bag to hold tools for each gun.
- (4) Fill recoil cylinders.

## AT SEA.

(e) Inspect daily and test all working parts, cleaning and oiling as necessary.

(f) *Before reaching "Danger zone"* keep a few rounds of ready ammunition at hand.

(g) *After entering "Danger zone"* twenty (20) rounds at each gun should be kept ready for instant use. Tompion out and gun loaded ready for instant action.

(h) *Work every working part* or piece of gear about the *battery* in your charge, at least once a watch. These guns are exposed to all kinds of weather. They stiffen up on even the fairest days *if they are not kept after*. *Keep after this feature of your work*.

(i) Work your *range dials and azimuth drums* twice daily.

(j) Tools, spare parts, and accessories. Have them at the guns in bags and boxes. You have no time to run to a store-room for this stuff when you need it.

(k) Keep telescopes off guns in port *only* if apt to be fouled by cargo hoisters. Tag each telescope when you remove same.

(l) In the war zone keep the guns loaded at all times. Keep sights set. Range 800 scale 50 on mid-ship guns; on starboard guns scale 55; port guns scale 45.

(m) Keep out tompions.

(n) Make some protection for fire-control telephones for use in damp weather. A canvas bag or small box with door located near each gun would do. In danger zone keep telephone leads plugged in at all times with telephone in bag or box when not being actually worn.

(o) Lay out spotting range on deck and drill at spotting daily. When passing vessels, hold sight setting and aiming drill.

(p) In bad weather keep a light canvas muzzle bag on the gun, but do not allow ice to accumulate on the bag. In case of emergency the gun can be fired without removing the muzzle bag if there is no ice on it.



## CHAPTER VII.

### SPOTTING.

146. The object of these rules is to give each gun captain a uniform method of controlling the fire of his gun together with the greatest chance of hitting the target in the least possible number of shots. Gun captains should study these rules until they become second nature and must use them at all times, no matter how near the actual range is known.

147. The following system of spotting has been found to be the only practical and reliable system for armed guards to use when engaging enemy submarines at ranges outside of point-blank.

It is sound, easy to master, and will invariably result in finding the range with relatively small expenditure of ammunition.

1. It is, of course, desirable to destroy a submarine, if possible. An armed guard commander's first consideration, however, must be to drive the submarine off. His job is to get his ship and cargo into port.

2. It is important to get a shot over the submarine as soon as possible. German submarines, as per their instructions, are extremely gun-shy. If you show them your gun can range with theirs, they will probably pack up and make off, and you have accomplished your mission.

3. If in doubt about estimating the range put maximum range on sight. If shot as hereinafter described proves to be falling short, run gun to maximum elevation, have trainer keep on, and fire every time at top of roll or pitch. This procedure may enable you to get a shot over, and the submarine commander won't know of your emergency method and will immediately be very careful about closing further.

4. Initial deflection must be estimated and put on sight. Shots fired singly on order to "fire when on."

5. After each shot pointer must call either "Good" or "Bad." "Goods" will be promptly spotted. "Bads" ignored.

6. If the first good shot falls to the right, sight bar range 7,000 yards, scale 55, it is a practical impossibility for any man to say whether it is over or short. Immediately give 16 knots left or scale 39. Second good shot falls to the left. Right 8

knots or scale 47. You have determined scale within 16 knots. Third good shot falls to right. Left 4 knots or scale 43. You have scale within sight knots. Fourth good shot directly behind submarine; you only see extreme top of splash. You have determined the deflection and ascertained you are over. Down 2,000, range 5,000 yards. Fifth good shot falls short—splash in front of submarine. You have range within 2,000 yards. Up 800, range 5,800. Sixth good shot falls over; you see top of splash. Down 400, range 5,300. You have range within 800 yards. Seventh good shot falls short. Up 200, range 5,600. You have range within 400 yards. Eighth good shot hits with a flash, and you immediately give the order "Rapid fire! Fire at will." Watch closely. If several shots drop short, up 400 and let him drop back into the zone of fire. If he turns away to his starboard hand left 8, and if he turns to his port hand right 8, and let him run into your shells. Always apply your spots mentally and give ranges and deflections to gun. Have a range and deflection peg board made and train some one to use it to keep track of current range and deflection.

7. Fire deliberately and coolly.

8. Give your spots promptly and decisively as soon as you see splash.

9. This method will absolutely:

(a) Determine if you can range with the enemy.

(b) In seven or eight shots drop a shell so close to him that burst will sweep his deck.

10. A hit in seven shots is excellent work at ranges over 5,000 yards.

11. The following rules are given for different ranges:

(a) For over 5,000 sight bar range use a 16-knot bracket in deflection. First spot in range. Up or down 2,000. After that use an 800-yard bracket in range.

(b) Between 5,000 and 2,000 use an 8-knot deflection in bracket and an 800-yard range bracket.

(c) For ranges under 2,000 use a 4-knot deflection bracket and a 400-yard range bracket.

148. Thumb rule for deflection.—(a) Target bearing from zero to  $2\frac{1}{2}$  points on the bow or stern deflection is one-third speed of own ship. In firing to starboard, move scale to left—to port, move it right.

(b) Target bearing from  $2\frac{1}{2}$  points on bow or stern to 3 points forward of abaft beam; deflection two-thirds speed of own ship.

(c) Target bearing from 3 points forward to 3 points abaft beam; deflection full speed of own ship.

(d) In case the target is coming directly toward you, bring your shots short and keep the range until the target is seen to run through the splashes. At first overdrop range 500 yards and repeat.

(e) In case the target is going directly away from you reverse the above.

(f) Never spot a bad shot. It is very easy to tell whether or not a shot has been correctly pointed. In case of bad shots, leave sights set as they were and fire again as soon as possible.

(g) Never try to rush your pointers. You will not only get them rattled, but will lose valuable time. The first thing to do is to get pointers on target, then fire slowly and carefully until you get the range and deflection, and then speed up and put the shots in as fast as the guns can be loaded and aimed.

(h) In case you once get on the target and then get off again slow the fire, drop or raise the range 500 yards to bring the next shot on the opposite side of the target from the last and then repeat the procedure for originally finding the range, raising or lowering the sights by one-half the previous amount each time. The same applies to deflection but make your first change 5 knots instead of 20.

(i) Always keep a record of the ranges and deflections sent to the guns. Carry a pencil and a pad for this purpose and no other.

(j) If the target is a long way off, 3,000 yards or above, try and send your first shot over. This will show the submarine she is within your range and may scare her off. Fire slowly and deliberately. If the submarine is close aboard have your first shot short and keep as many short as possible. At short range a short shot may throw water on the periscope and will in any case confuse the enemy. A shot going over does no good except for spotting purposes. Fire as rapidly as possible.

(k) Be careful about your deflection, especially with guns mounted to fire on either side. A large number of misses have been made due to the deflection being set on the wrong side of 50.

(l) When firing abeam the ship's roll can be used to increase the range of the firing when the ship is at the extreme point of the roll away from the target. Likewise when firing ahead or astern the pitch of the ship can be used in the same way.

(m) If the gun you are using is mounted close to the water, it may be that the pointers can not see the target while it is per-



fectly visible to you in a higher position. In this case have the pointer *keep his horizontal wire on the horizon* and the trainer *keep the gun trained* on the number of degrees (relative bearing) that you give him. In spotting a shot in this way raise or lower the range as usual, but instead of sending down deflection in knots, order the trainer to put the gun on a certain number of degrees on azimuth circle on mount. The first change should be 10 degrees right or left, depending on whether the first shot was to the left or right of the target.

(n) The above standard rules should be followed by gun captains in spotting, as this will insure the best results due to the fact that they must be quickly and intensively trained. The following notes give more detailed explanations of the different methods of spotting and explain the theory of deflection, etc., and may be of use to petty officers of armed-guard crews. Spotting should be practiced at every opportunity on board ship.

(o) From time to time different types of projectiles and guns will be used. In getting a maximum use out of the projectile furnished, the Bureau of Ordnance emphasizes that the shots should fall not beyond 5 yards from the periscope to get the greatest effect, and it is preferable in all cases to have the shot fall short. A shot with a blunt projectile falling in a band 5 yards short of the periscope may disable, bring the submarine to the surface, or sink her. To be prepared for a sub close alongside, in a fog, or at night, where guns can not be depressed, a 1-pounder machine gun, rifle, hand grenades, or depth charges must take the place of antisubmarine battery. Such instances have happened.

(p) Vessels can increase their effectiveness by a skillful use of range keeper and zigzag and by taking advantage of the roll or pitch to increase the elevation of guns.

**149. Opening fire.**—When an object resembling a periscope is sighted inside of 4,000 yards, even if there is some doubt as to whether it is one or not, fire should be opened immediately. The point of aim should be in the center of the water line; but sufficient latitude should be permitted from this point of aim so that fire will not be unduly held up waiting for the pointer to get on the target. For example, if in a moderate sea, the ship is yawing heavily, at least 4 feet above or below the point of aim would be satisfactory for this condition. It must be realized that holding the pointer down to a small point of aim will prevent obtaining the rapidity of fire which is necessary in operation against submarines. The only parts of a submarine

that will usually be seen above the surface will be the top of the conning tower and probably only the periscope.

While passing through the danger zone the spotter must be at the gun at all times ready with glasses and the firing must be taken up instantly the submarines are sighted and it must be controlled from the gun instead of from a distance. The spotter should stand as near the gun as practicable, at about the same or slightly greater elevation and where the smoke and flame will not interfere with his vision; he must also be where he can easily shift his position. If he can sit down he will find it much easier to keep his glasses steady.

**150. Spotting direct flight.**—In controlling the shots at ranges up to 2,000 yards firing abeam, a position may be taken 15 or 20 feet aft of the gun to spot the projectiles in direct flight. With a little practice this can be readily done with all projectiles from 3-pounders up. With a good pair of binoculars, the spotter assumes a sitting position, with elbows on knees, or even sitting on a chair resting the glasses on the rail or anything at hand, the spotter will be able at a position abaft the gun to observe the projectile and tell exactly how much to the right or left the projectile actually missed a periscope or the conning tower of the submarine. In calculating the exact distance to stand abaft the gun, the speed of the ship in yards per minute and the time of flight for a mean range of 1,000 yards must be considered.

**151. Vertical splash method.**—Vertical or "splash" method can be used very seldom. This method is employed at short ranges when projectiles have not been seen in direct flight and at all ranges greater than 4,000 yards. The spotter from an elevated position, the higher the better, observes the slick formed when the splash subsides or the base line of the splash. This slick is pictured in the same vertical plane as the target, and an estimate is made of how much above or below the water line it appears. Having calculated for various ranges how much "short" or "over" splashes must be to appear at certain vertical distances from the water line, the proper correction can be applied to the sight bar. The change of range in the interval of time between shots must be combined with spotting correction, and this is discussed later.

**152. Zone method.**—Another method of controlling the fire is known as the "zone" method. When the range is decreasing; that is, the submarine is drawing closer to the ship, estimate a range which is sure to be less than the actual range, and keep

firing at that range until the submarine enters the zone of fire. Shots MUST be ON in deflection to score hits by any method. If the range is increasing start with a range greater than the actual one, keeping that until the shots begin to fall short. This is the best method of control for long ranges where no range finder is used.

**153. Bracket method.**—This is a form of “halving” method and in the zone method class, i. e., no attempts are made to estimate how far short or over the splashes are. This method is recommended for use by British Admiralty at long range against a sub on the surface. It is the one given in standard rules at the beginning of this chapter.

(1) Fire shot over—be sure range is greater than estimated distance.

(2) If splash is right, move 16 knots left and fire again.

(3) If second shot is now left, move 8 knots right and fire again.

(4) Continue over shots with same range until “on” in deflection.

(5) Then spot in range “down 2,000” if maximum range has been put on and fire.

(6) If it falls short, “up 1,600.”

(7) If the next shot falls over, spot “down 500,” and it should be near.

(8) At ranges between 2,000 and 5,000 yards, an 800-yard bracket in range is recommended, and 16 knots in deflection.

(9) If range is estimated beyond 5,000 yards, put maximum range on sight, fire and, if over, spot range “down 2,000.”

(10) As soon as “on” at any range, “rapid fire at will.”

**154. Initial range.**—As an aid to setting the sights for the first shot the following table should be referred to. It gives the distances to the horizon as seen from the different heights of eye on a clear day.

Measure the height of the different spotting positions above the water, then refer to the following table and find the distance to the horizon. When upon sighting a submarine notice whether or not she is nearer or farther than the horizon. If she is nearer than, or on the horizon, her water line will be in sight, otherwise part of her hull will be below the horizon :



Height of eye.	Distance to horizon.	Height of eye.	Distance to horizon.	Height of eye.	Distance to horizon.
<i>Fect.</i>	<i>Yards.</i>	<i>Fect.</i>	<i>Yards.</i>	<i>Fect.</i>	<i>Yards.</i>
1	2, 200	13	8, 400	24	11, 200
2	3, 400	14	8, 600	25	11, 400
3	4, 000	15	8, 800	26	11, 600
4	4, 600	16	9, 200	27	12, 000
5	5, 000	17	9, 400	28	12, 200
6	5, 600	18	9, 800	29	12, 400
7	5, 800	19	10, 000	30	12, 600
8	6, 200	20	10, 200	35	13, 600
9	7, 000	21	10, 600	40	14, 400
10	7, 200	22	10, 800	45	15, 400
11	7, 600	23	11, 000	50	16, 200
12	8, 000				

**155. Laying off arc of train and deflection.**—If the gun mount is not fitted with a training arc graduated in degrees, this arc should be painted on deck, with  $0^{\circ}$  ahead,  $90^{\circ}$  on starboard bearing, etc. The indicating pointer should be attached to the carriage. The graduations should show every  $5^{\circ}$  of train. In addition, every  $15^{\circ}$  of train should be marked with the deflection to be set on sights when firing on that bearing, assuming that the target will be stationary and that your own ship will be making her best speed. An officer, of course, must calculate these deflections; but once painted on the deck, the gun captain or even the sight setter himself can find the proper deflection by reading the number nearest the indicating pointer.

**156. Securing position of gun and sights.**—When not in use, the gun should be left in the middle of its arc of train, and the deflection found there should be set on the sights.

**157. Rate of change of range.**—When a range keeper is provided, the change of range due to speed and course of ship can be accurately kept.

6 knots—200 yards per minute.  
 10 knots—333 yards per minute.  
 12 knots—400 yards per minute.  
 15 knots—500 yards per minute.  
 18 knots—600 yards per minute.  
 3 knots—100 yards per minute.  
 (A speed of 1 knot equals 33 yards per minute.)

**158. Deflection.**—In setting the sights for initial deflection, the control officer must consider the effect of bearing of target. For example, on a vessel carrying two guns on the forecastle—one gun on the starboard side and the other on the port side—the ship making 15 knots, submarine ahead, initial deflection would, of course, be “50.” With submarine sighted  $45^\circ$  on the starboard bow, steaming directly toward or away from the gun, the initial deflection would, of course, be 15 times 45 degrees equals 11, and the deflection would be 11 right or “61.”

(a) Many misses in deflection have been made and will continue to be made unless great care is exercised in calculating the deflection to be used.

(b) The armed-guard commander should make out a table showing:

For different speeds of his own vessel, considering submarine stationary or heading toward the vessel, what deflection would be set on the guns' sights for bearings through which the guns can train; furthermore, considering that the danger zones are on the bow and on the quarter, he should keep the sights of guns set for the first shot accordingly.

**NOTE.**—A thorough discussion and analysis of deflection is made below in order to explain the “whys and wherefores” to personnel who have not studied ballistics.

(c) *Explanation of deflection.*—By control of deflection is meant the control of the shots as they strike to right or left of the target. Attention is particularly invited to the fact that in any operations against submarines there is little or no danger space in azimuth; under exceptional circumstances action may take place between a submarine on the surface astern and an armed vessel, and even under these circumstances the beam of the submarine would be the greatest battle danger space, for example, 20 feet; but under most circumstances in firing against a periscope the danger space would be practically nil. Consequently, in the control of guns operating against submarines, whether using common, high explosive projectiles, the special type of explosive projectiles, or even the high-capacity charge from howitzers, the vital question in getting on and holding on is the actual determination of the deflection and the actual fall of the splash in deflection. Many spotters, and even experienced spotters, are often fooled in estimating the distance right or left of the splash from the periscope. When spotters control by the splash method a diagram must be drawn to show how the splash should appear. If the spotter is right behind

the gun or well forward of the gun the splash will be displaced to the right or left, and if he does not consider this displacement, he will give a correction in deflection for a perfectly good shot. If he stands abaft of the gun 20 or 30 feet, depending upon the caliber and velocity of the gun, he will almost see the splash in the line of fire and not be misled. In firing ahead or astern there is little or no lateral displacement.

(d) Deflections drums are graduated from 0 to 90 in two ways:

(a) in knots, (b) in arbitrary scale, with 50 being the point of no deflection. When set greater than 50, the sights are set to shoot to the right, when less than 50, to the left. (In all cases, in speaking of right and left, one should imagine himself behind the projectile of gun and facing the target.)

**159. Deflection in knots.**—(a) If the ship and target are both at anchor the proper deflection is 50.

(b) *Motion of target.*—When the target is moving at an angle to the line of fire, the sights must be set for the distance traveled during the time it takes for the shot to travel from the gun to target. For each knot made by the target at right angles to the line of fire, the correction is one division, so with the ship at anchor and the target making 12 knots at right angles to the line of fire, the correction for deflection is 12 divisions and the sights should be set at 62 if the target is moving to the right and 38 if moving to the left. When the target is moving at an angle to the line of fire that is not 90 degrees the speed she is making must be multiplied by the sine of the angle, which means to multiply by 0.96 for 75 degrees, 0.86 for 60 degrees, 0.7 for 45 degrees, 0.5 for 30 degrees, and 0.25 for 15 degrees.

(c) *Motion of ship.*—When the target is at anchor and the ship moving, the headway will throw the shots to the left on the starboard side and to the right on the port side, so on the starboard side the deflection would be set to the right, or greater than 50, and on the port side to the left, or less than 50. One division on the deflection scale, graduated in knots, is a little too much to correct for 1 knot speed of the firing ship, but unless one is familiar with range tables it is best to consider that such is the case. The full correction of one for each knot is true only when the target bears a beam. Multiply the speed when on the bow or quarter by 0.7 and when 30 degrees on the bow or quarter multiply by 0.5.

**160. Rules when both ship and target are moving.**—(a) *Consider each separately and combine the deflection due to each.*



Target to starboard going in the same direction, subtract one from the other and correct in the direction of the greater; in this case the deflection will be greater than 50, except when the target is making greater speed at right angles to the line of fire than the ship is, because the correction for the target is to the left while the correction for the ship is to the right.

(b) Target to starboard going in the opposite direction, add the two results. In this case the deflection is always greater than 50 for both corrections are to the right.

(c) Target on the port side going in the same direction, subtract one from the other, and correct in the direction of the greater; in this case the deflection will be less than 50, except when the target is making more speed at right angles to the line than the ship is, because the correction for the target is to the right, while the correction for the ship is to the left.

(d) Target on the port side going in the opposite direction, add the two results. In this case the deflection is always less than 50, for both corrections are to the left.

(e) *Deflection in arbitrary scale.*—The remarks made in "Motion of target" and "Motion of ship" in explaining "deflection in knots," also apply on the arbitrary scale.

(f) The arbitrary scale is so graduated so that one division corrects 1 yard at a range of 1,000 yards, 2 yards at 2,000 yards, 3 yards at 5,000 yards, 10 yards at 10,000 yards, and so on up.

(g) It does not automatically correct for drift as the knot scale does.

(h) It is, therefore, necessary to consider the effect of three things—drift, motion of ship, and motion of target—the drift is always to the right of the line of fire, so to correct this sights must be set to the left.

(i) The advantage of the arbitrary scale is in the simplicity of sight setting; there are no drift lines to follow. And to the fact that when dealing with yards, the spotter has better conception of the value of one division, while the range is 5,000 yards, the fall of shot will be moved 5 yards; if two divisions, 10 yards; four divisions, 20 yards; if the range were 7,000 yards one division would change 7 yards, two 14, three 21; and so the spotter knows that "right 1" or "left 1" will correct 1 yard for each thousand yards of range. If the range were 6,000 yards, and the shots were estimated 30 yards to the right of the target, the spot would be "left 5."

## THUMB RULE.

161. A thumb rule for obtaining the initial reflection in knots is as follows:

(a) Corrections for ship's speed equals product of speed of ship in knots times three-fourths times natural sine of angle between course and bearing of target. This correction in knots applied to right, firing to starboard; left, firing to port.

(b) Correction for target speed equals plotted or estimated speed of target in knots times natural sine of angle between course and bearing of target, applied in proper direction.

(c) Correction for wind equals one-half force in knots by beaufort scale times sine of angle between direction of the wind and bearing of target. (This is for the true wind.)

(d) Which way to apply deflection for correction to speed of own ship and target and how to roughly calculate is shown below:

	Firing to starboard.	Firing to port.
Own ship.....	Right.....	Left.
Target .....	Same direction, left... Opposite direction, right.	Same direction, right. Opposite direction left.

## CHAPTER VIII.

### MINES—SMOKE BOXES—DEPTH BOMBS.

171. Mines.—(a) Mines are filled with a high explosive and when first put in place are so anchored that they are held at a certain distance below the surface of the water. It is intended that they shall remain invisible and be exploded when struck by any vessel that may come in contact with them. They are called submerged contact mines.

(b) Such mines may be removed by various methods of dragging or sweeping, such as by sinking a long cable each end of which is attached to a tug, and thus dragging a suspected locality. This should only be done by persons who have experience in work of this nature.

(c) If, due to stormy weather or for any other reason, a mine becomes detached from its anchor, as is often the case, it comes to the surface, and for an indefinite time may be carried about by various currents, and continues to be a danger to navigation, because of being as destructive afloat as submerged. Likewise floating mines are often cast upon the beach and should be carefully avoided.

(d) Under any conditions whatever, a mine floating, stranded, or anchored, should be approached only with the greatest caution. If possible, the mine should be destroyed by rifle or gun fire.

(e) It is very desirable that the kind of mine be determined by those who may discover it before they destroy it or leave the vicinity; that is, whether it is English, French, or German make.

(f) If, under very favorable conditions of weather, it is possible to approach a floating mine in an effort to identify it, the greatest care must be exercised not to do so when any other floating object is likely to touch it, and not to permit any part of your own vessel to come in contact with it; a floating mine is generally harmless unless it touches some other object.

(g) If an attempt is to be made to destroy a mine by gunfire, those who have not had actual experience in such work should not open fire at a shorter range than 200 yards.



(h) Whether or not an attempt be made to destroy a mine, the fact of its discovery and a report of all circumstances in the matter should be made to the Hydrographic Office, the collector of any port, any officer of the Navy or the Army, or to any other Government officer at the earliest possible moment.

(i) Report the presence of any floating object that may resemble a metal ball or cylinder in order that proper investigation may be made.

(j) If all people along the coast or at sea keep always on the lookout and bear in mind these instructions, a great loss of life and property may be avoided and service of the greatest importance to the Government will be rendered.

**172. Smoke boxes.**—(a) Smoke-producing apparatus is supplied to assist ships in escaping from hostile vessels by making a smoke screen to render invisible the ship itself and its movements. Behind such a screen the ship may maneuver to avoid gunfire and to effect its escape. The following instructions in regard to the use of smoke boxes are general. Full description of the care and operation of smoke boxes are contained in Bureau of Ordnance pamphlet No. 540-A.

(b) Two types of apparatus are supplied:

(a) The fixed type, or smoke funnel, for use on board ship.

(b) The floating type, or smoke box, for throwing overboard, or, if desired, for burning on board the ship.

Of each type there are two varieties. The early or Mark I smoke funnel, using phosphorus, has now been superseded by a Mark II funnel using gases without the evolution of heat and danger of fire. The Mark I smoke box, a rectangular box filled with combustible material, has been superseded by the Mark II box, of much greater efficiency, consisting of a metal canister loaded with smoke-producing material and provided with a circular band flotation chamber to keep it afloat.

(c) The object of the smoke boxes is to spread and keep a screen between your ship and the enemy. The maneuver necessary to accomplish this will depend largely upon the relative positions of your ship and the enemy with reference to the wind.

(d) Always endeavor to enlarge the screen by dropping a new series of boxes near the edge of the original cloud. Use two, three, or four boxes to a series. It must be realized that the smoke screen will not generate at the instant the apparatus is put in use, therefore the first alterations of course should be small so as to be sure and maintain the source of smoke between

yourself and the enemy until such time as a screen of sufficient height is formed to allow of greater freedom of movement.

(e) In all cases, although increasing to the utmost possible speed, the greatest care must be taken to make as little boiler smoke as possible, as it is found that the smoke from the ship's stacks is liable to show up the position of the ship in the smoke screen, as the smoke screen is either white, gray, or yellow.

(f) It is very unlikely that the submarine will follow you into the smoke screen, but will very probably make for the weather corner of the screen and to windward of you.

**Importance of smoke screens.**—Reports from abroad indicate that smoke screens, when used, have proved of very great service in permitting the escape of vessels. If a vessel is endeavoring to escape, the smoke screen should be at once started when the vessel is attacked or when a submarine is sighted either upon the surface or submerged. It may well prove that not only gunfire but torpedo attack is effectually prevented by this smoke screen. The objection will, of course, be apparent that the use of smoke apparatus is a hindrance to the offensive gunfire of the vessel. If endeavoring to escape, such hindrance must be accepted.

When a vessel is endeavoring to engage the enemy rather than escape from him, the advantages of the smoke screen lie in the ability to screen maneuvers for a superior tactical position or to obstruct the enemy's gunfire when in an inferior tactical position.

**174. Depth charges.**—(a) Depth charges are used when either the wake or the periscope of a submarine is seen, and the ship maneuvers to pass over or ahead of the wake. All depth charges should be dropped from the stern of your ship and timed so as to hit the water just ahead of where the wake of the submarine will pass.

(b) Depth charges Mark I, containing 50 pounds TNT, are issued to slow and small vessels. Heavy vessels carrying depth charges Mark II, containing 300 pounds of TNT. Ordnance pamphlets descriptive of both types are issued with the depth charges.

(c) If the submarine forces you to stop by gunfire and then comes close alongside, the depth charge may be dropped overboard, when the submarine is close aboard. This will, of course, result in serious injury to your own vessel as well as the submarine, but will be necessary and advisable under the circumstances. This procedure must not be carried out, however, if there has been evidence or indication of surrender.

175. Safety precautions—**Mark I charge.**—(a) Never release the charge from any other position than the stern of the vessel.

(b) Always have 5 knots or more headway on before releasing the charge; at 25-foot setting 7 knots or more is preferable.

(c) Remember that the charge, though insensitive without detonator, is most sensitive with detonator, and must not be roughly handled when detonator is in place.

(d) Keep charge at all times away from fire.

(e) Never take lock pin out until ready to fire.

(f) If in danger of rear-end collision and detonator is in place, throw charge overboard, retaining lock pin in place.

(g) With detonator in place, detachment of buoy and pulling on cable will fire charge. Do not overhaul charge in this or any other manner when detonator is in place.

(h) Do not expose charge to blast of guns, especially when detonator is in place.

**Safety precautions—Mark II charge.**—(i) Never release the charge from any other position than the stern of the vessel unless projectors are supplied.

(j) Always have at least 10 knots headway on before releasing the charge.

(k) Keep charge at all times away from fire.

(l) Do not expose charge to direct blast of guns.

(m) In rear-end collisions do not remove safety fork. If safety fork is removed, keep nearby, with instructions to replace, if practicable, after collision, if ship is in sinking condition.

(n) In launching, launch broadside on.



## CHAPTER IX.

### ORDNANCE, AMMUNITION, AND EXPLOSIVES—CARE AND PRESERVATION OF ORDNANCE OUTFIT.

#### GENERAL ROUTINE AND CLEANING.

**186. Routine.**—In order to prevent deterioration, the following routine is prescribed for the gunnery department of a vessel in commission:

The bores of guns shall be kept thoroughly clean and coated with oil. They shall be examined frequently and the coating renewed whenever necessary.

Before testing any apparatus the oil cups and grease cups shall be examined to see that the bearings get sufficient lubrication.

The frictionless bearings, sword, sword box, etc., shall be vaselined and covered with a piece of muslin.

The breech mechanism shall be vaselined and kept in place, and the muzzle closed with tompon and bag.

The training gear of the gun should be carefully tested, cared for, and operated sufficiently to keep it in perfect condition. If a periscope is picked up and the gun has to be trained, much time will be lost with a gun the training gear of which is not in perfect condition.

**187. Cleaning.**—As the satisfactory performance of breech-loading rifles, rapid-fire and machine guns depends in a great measure upon the condition in which they are kept, it is directed that the greatest care and attention be given to keep all parts clean, properly lubricated, and in thoroughly good working order.

All breech mechanisms must be cleaned daily, avoiding the use of any gritty substance. The breech plug must be frequently removed from the tray, in order that the bottom threads may be reached for cleaning (when reaching port).

Brick dust or gritty substances must never be used on any part of the gun.

The parts of the mechanism must never be scraped with knives or metal scrapers, or be defaced or roughened in any way.

All bare metal parts of the gun and mount must be kept lightly oiled as a protection against rust.

Particular attention should be given to keeping the slope and the origin of rifling well oiled and free from rust.

Keep rapid-fire and machine guns covered whenever there is a chance of getting coal dust, grit, or salt water on them. Inspect and recoil the guns once a week. In recoiling first wipe off all the old oil, which may have become clogged with dust and grit.

If the guns are closed by tomponions, these should be withdrawn every fair day, and the compression slopes cleaned and recoiled.

The ball bearings and friction rollers of R. F. mounts should be kept clean and lightly oiled, in order to prevent rusting. The oil channels in the slide of a R. F. mount must be kept clear of dirt, and should be filled with oil before the gun is fired.

**188. Painting.**—Guns are not to be painted in rear of slide over that portion passed by the strengthening band in firing, as in the case of the 4-inch and 5-inch guns. The roller paths must be oiled once a week, and the top carriage raised and rollers taken out and cleaned at least once a quarter. Oil holes must be kept clear and closed in wet weather. Training and elevating gear must be kept clean, and all steel parts well oiled. For this purpose they must be removed at least once a month.

**189. Friction disks.**—Friction disks should be kept clean and perfectly free from oil or other lubricant. Washing in lye water and then thoroughly rinsing in fresh water will remove all oil and grease. In disks of the multiple type it has been found that one man, using a 24-inch wrench, can set them up sufficiently hard.

**190. Material for cleaning lenses.**—For all guns using telescopic sights suitable material for wiping the lenses will be obtained. No other than the specially provided material will be used for wiping lenses; and lenses will be wiped, even with this special material, only when absolutely necessary. (Lens paper is now supplied.) *Never* use a neckerchief or silk *handkerchief*.

**191. Difficulty in opening the breech and in elevating or training guns.**—This is frequently caused by burrs on the diagonal teeth of the breech plug or on the worm gearing of the elevating or training mechanism. Undue difficulty of elevating or training any of the more recent gun mounts is due to some defect in the individual mount itself and not in the design. Frequently this difficulty is caused by a shaft being slightly bent

or out of alignment, and can usually be discovered if searched for progressively.

192. Firing mechanism.—Every effort shall be made to keep the firing mechanism of every gun in thoroughly efficient condition. A defect in the firing mechanism may cause the gun to be fired prematurely.

### MISCELLANEOUS INSTRUCTIONS.

194. Miscellaneous pamphlets.—The methods of caring for and handling ordnance material set forth in the various descriptive pamphlets issued by the Bureau of Ordnance shall be closely followed.

195. After firing (if not near port).—After firing, wash the gun out with the washing hose and bristle bore sponge; then wash the bore thoroughly with fresh water and after it is dry give it a good coat of oil. The guns should be sponged and oiled once a week. Fit the bore sponge with two lanyards for hauling it through the gun; cover it with a piece of old blanket and haul it back and forth until the bore is clean and dry; then frap a piece of well-oiled blanket around a sponge cylinder and haul it through to oil the bore.

196. Material.—The use of emery cloth, brick dust, or similar polishing material should be forbidden on the following-named parts of the mounts:

Interior of valve castings.

Piston valves.

Valve faces.

Adjusting screws.

Elevating worm.

Elevating worm wheel.

Elevating pinions.

Knife edges.

Hardened plate on spring bar  
of knife edge trunnion bearing.

Telescope sights.

Telescope sighting mechanism.

Screw thread on elevating rod.

Piston rods.

### ACCESSORIES AND SPARE PARTS.

197. Allowance lists.—A list of all accessories and spare parts allowed the vessel and which are supplied upon commissioning are included in the ship's allowance list furnished by the Bureau of Ordnance.

198. Spare parts.—These are supplied to ships not only for the minor portions of the breech mechanism, sights, etc., but for nearly every principal part of the gun mount. At clear



ship for action these spare parts should be placed in a previously designated position, convenient to the battery, but so removed as to be no source of danger to the personnel. The shifting of these parts should be included in the instruction of the gun crews, and they should be drilled until proficient in rapidly replacing all parts that may be damaged in action. In case spare parts are lost or damaged beyond repair by ship's force immediate report together with request for replacement shall be made.

**199. Replacing.**—Means should always be at hand at general quarters for promptly shifting every part of the sight, breech mechanism, and gun mount, but unless the spare parts are permanently stowed near the guns they should be obtained as needed from the storeroom and returned upon completion of drill. It is preferable, however, to arrange such spare parts permanently in brackets on bulkheads, convenient to but removed from the guns. In this case they do not have to be specially provided at clear ship for action.

### RECOIL CYLINDERS, LIQUID, AND CARE.

**201. Liquid.**—The mixture used in the recoil cylinders consists of glycerin 80 parts by measure and water, 20 parts by measure. The glycerin used should be free from fatty acids, and the following tests are prescribed:

Add to a sample of the glycerin in a large test tube about equal bulk of a saturated solution of slaked lime and thoroughly shake the two together. If, after standing some time, a sediment is deposited, the glycerin contains fatty acid and is unfit for use in recoil cylinders.

Take another sample of the glycerin in a test tube and add about an equal bulk of a saturated solution of acetate of lead. If, after thoroughly mixing and standing for some minutes, a deposit appears, add acetic acid and heat the contents of the tube. If the deposit disappears, or if no deposit appears after the mixing with the acetate of lead, the glycerin is free from fatty acid and fit for use in the recoil cylinders.

Both tests should be made, as one is the confirmation of the other.

**202. Cleaning.**—The liquid in the recoil cylinders (glycerin 80 per cent, fresh water 20 per cent) becomes muddy after a time and the grooves of the cylinders may become clogged from a thick, pasty sediment, which is removed with considerable diffi-

culty. It is therefore directed that the recoil cylinders be emptied, cleaned, and refilled directly after the vessel is commissioned and at the end of each year thereafter as much fresh liquid being added from time to time as may be necessary. The glycerin must be free from fatty acids and the water clear of alkalies and mineral salts; otherwise it will corrode the inside of the cylinders. When exposed to heat glycerin expands and, if for a long time, gums, and this causes filling in of grooves, checking the equalizing pipe and gumming of the counterrecoil check, and any of these will cause a gun to function improperly and sometimes cause enough damage to disable a gun. Gummed glycerin may be removed with a strong lye or soda solution if not hard, but must be well cleaned out afterwards with clean, fresh water. When in *hot weather cylinders* that have been filled in cold weather may weep; that is, leak around bonnets, filling plugs, and stuffing boxes. This is caused by an internal pressure due to the expansion of the glycerin, and in *some of the lighter guns may fail to allow the gun to return to battery*. This is remedied by taking out the filling or air vent plug and allowing the surplus liquid to escape, relieving the pressure.

**203. Circulating pipe.**—The circulating pipe on carriages having two recoil cylinders must be carefully looked after to guard against clogging, and be thoroughly cleaned whenever the cylinders are emptied. Blow through the filling holes to see if the circulating pipe is clear.

**204. Leaks.**—As recoil cylinders occasionally leak, even when they seem quite tight, especial attention will be directed to them during the daily inspection, in order to ascertain whether there is any perceptible leak. Loss of liquid, therefore, will be supplied at once. Before every firing, unless an emergency makes this impracticable, the recoil cylinders shall be invariably examined and filled.

### FILLING RECOIL CYLINDERS.

**205. 4-inch, 5-inch, and 6-inch.**—Depress the gun slightly; remove the filling plugs of each cylinder or the air plug hole of the opposite cylinder to the one into which the liquid is to be poured. Pour until the liquid runs out of the opposite cylinder.

**NOTE**—If the filling plugs are in the front end of the cylinders, elevate the gun slightly; if in the rear, depress the gun slightly. When in any other position keep gun level.

If there is no air hole, care must be taken to pour the liquid into the funnel in small quantities. Care also must be taken to measure the quantity of liquid poured into the cylinder and to strain it through a piece of bunting or cheesecloth to prevent entrance of dirt.

**206. 6-pounder, 3-pounder, and 1-pounder.**—All hydraulic recoil mounts for minor R. F. guns thus far issued to service (except 6-pounder Mark III) have only one filling hole in the boss on the cylinder. The funnel is placed in this hole, and in all other respects the process of filling the cylinder is the same as previously described.

**207. 6-pounder, Mark III.**—In mounts fitted with the Driggs-Schroeder gun the shoulder bar must first be removed.

Keep gun level. Take out filling hole plug and side screw. Screw in filling funnel and pour slowly until liquid runs out of side screw hole. Replace both screws.

### REPLACING PISTON-ROD PACKING.

**208.** Take off piston-rod nuts, elevate gun, and let it recoil against its stops.—When repacked, depress gun and let it go out to battery. Set up on piston rod nuts as tightly as possible to bring shoulder of piston rod against oscillating slide. The shoulder inside of threaded part of piston rod must be drawn close against the inner face of the oscillating slide, so that the clearance between the rear face of piston and front face of the cylinder head shall be preserved. This clearance is from 0.10 inch to 0.15 inch, depending upon the thickness of leather packing on face of cylinder head.

### RECOIL CYLINDERS—CONSTRUCTION, FAULTS, AND REMEDIES.

**210. Cylinders.**—Those in the older type of mounts were cast in one with slide, but in the later types are made separate and strapped to the slide.

**211. Equalizing pipe.**—The equalizing pipe, in the earlier types, was cast in one with the cylinders, and is used to equalize the pressure in the cylinders on the recoil and counterrecoil and is used in any cylinder mount that has more than one cylinder that contains liquid. In some on the modified slides the equalizing pipe can be cleaned from the outside, by a hole bored in line with it, and this is closed with a screw plug. In the latest



types of slides this pipe is made entirely separate, and can be removed if necessary and can be cleaned by removing plugs that are at outside ends of the pipe; these are used as drain plugs where so fitted.

**212. Bonnets.**—These are the movable parts used to close the cylinders at both ends. They are usually threaded on their outer edges and screw into a corresponding thread in the inner ends of the cylinder, but in the heavier types, commencing with the 8-inch, they are held in by bolts. Between the bonnet and the end of the cylinder is placed a leather washer that has been oil treated; this is to make the joint tight. The bonnet through which the piston rod passes contains a stuffing box, and in the 3-inch and above some part of the counterrecoil check. (The above refers to cylinders that contain liquid.)

**213. Pistons and rods.**—These are usually made in one piece, but in some mounts they are made separate and screwed together or held together with nuts. They pass out of the cylinder and secure to the transom of the earlier types and to the yoke in the later types, usually secured with two nuts, one being larger than the other; the larger nut is to be placed next to the yoke or transom and the smaller outside for a locking nut. In the later type there is another nut that is on the piston rod between the yoke and the stuffing box. This is called the adjusting nut, and is used to adjust the gun in the slide; it also helps lock the rod to the yoke, and in the 7-inch this nut is also used as a spring compressor. In some of the types the rod extends beyond the piston and forms a plunger used for checking counter recoil, and in others the piston rod is counterbored from the face of the piston. When the cylinder is made of steel the piston is either made of bronze or has a bronze ring secured to its outer edge.

**214. Stuffing boxes.**—Stuffing boxes are the part of the bonnet that the piston rod passes through. They make it possible for the rod to work in and out without allowing the liquid to escape.

The stuffing box is a machined-out space in the bonnet in which packing is placed, and compressed by the gland that screws into the outer end of it, as the bonnet screws into the cylinder.

**215. Cup leather.**—Where cup leather is used the edge of the stuffing box does not hold the packing under compression, as there are holes drilled through the stuffing box into the cylinder, and when there is a pressure caused by recoil or counter recoil the pressure comes through the holes back of the cup and forces the edges of the packing against the metal and packs the joint. Cup leather packing is made of oil-treated leather pressed into

shape in a mold to conform to the shape of the place where it is to be used.

**216. Packing.**—Other packing used is of the Seldon type, made of rolled canvas previously treated with a lubricant. There are others of fiber, braided like square sennit, which contains a lubricant. Both of these are issued in all sizes to fit stuffing boxes and are commercial articles. Packing containing rubber should never be used with glycerin, as this liquid softens it and makes it like gum. Packing found ragged when overhauling cylinders should be replaced with new. Before cutting new packing soften it by heating it or rolling it, and in cutting cut the ends on an angle, so that they will overlap and be of the same thickness as the rest of the ring when in place. Grease each ring with Albany grease and push it home with a packing stick, and when enough is in the stuffing box for the gland to reach it, set home with gland. After the last ring is in, set up hand tight with the wrench provided for that purpose, as it can be tightened when the cylinders are filled later.

#### LOST MOTION, ELEVATING AND TRAINING GEAR, BROADSIDE GUN MOUNTS.

**217. 3-inch.**—The 3-inch training worm is split, and by setting up on the adjusting ring the two parts can be closed together tighter. This allows for wear and prevents whip. The same method can be used in the elevating gear where split worms are used. Lost motion in the training pinion can be taken up to a certain extent by calking the teeth of the pinion. The same can be done in the elevating gear pinion or arc, and in some cases the training rack can be shifted so as to shift the unworn part into use, replacing the part that has been used, as seldom more than half of the training rack is used at one time.

**218. 4-inch.**—The 4-inch of all marks can be handled similarly.

**219. 5-inch.**—The 5-inch up to and including Mark XIII has tin liners back of the training brackets and a movable section in the training arc.

#### SIGHTS FOR BROADSIDE MOUNTS.

**221. Yoke sights.**—The sights for broadside mounts of recent date are of the yoke type, the general principles of which are as follows:

Two telescopes are used, one for pointer and one for trainer. The pointer's telescope is usually located on the left side of the mount and the trainer's on the right side.

The telescopes are fitted with cross-wire illumination permitting of either day or night use. Most sights are fitted with one telescope having a checking eyepiece for use in checking up the pointer and trainer.

The eyepieces of the two telescopes are usually parallel to one another, but this need not be the case; they may be perpendicular to one another, if more convenient for the operation of the mount, as in the case of the balloon and submarine mounts.

**222. (a) Bore sighting** is the adjusting of gun-sight telescopes, when the sight bar is set for "zero" range and the deflection drum for "50," so that the lines of the sight of the pointer's telescope will meet the line through the center bore extended, at the average range at which it is expected to fire.

(b) It is made necessary because the lines of sight are off to one side of the line through the center of the bore. The telescopes are mounted some distance out from the center line of the bore, in brackets, and it is necessary to "twist" their line of sight so that instead of being parallel to the center of the bore they will meet the center line of the bore extended at the range selected for bore sighting.

(c) Range scales are marked as to give the proper amount of elevation for the various ranges, provided they are correctly adjusted. If they are not properly adjusted, the amount of elevation will not be correct but will differ from the correct elevation by an amount equal to the amount that the range scales were out of adjustment. In order to hit, the gun must be *accurately* bore sighted.

(d) The ship should be at anchor in a quiet harbor where there is no motion. At a distance from it equal to the range at which the gun will probably be used (2,000 yards for use against submarines) anchor a boat with a target. The target should be as taut as possible to make the top and sides as nearly as possible horizontal and vertical. If a prominent object with well-defined horizontal and vertical lines is available on shore at the correct distance, it may be used.

(e) The following should be used as a guide to make sure that nothing has been overlooked:

(f) Remove telescope from holders, thoroughly clean holder and bearing surfaces on telescopes, and replace with part stamped "UP" on telescope uppermost. Set up on holding-down bolts on holders for a full due.

(g) In setting up the securing nuts on the holders set up gradually on each one in succession. Never set up one screw taut while leaving the others entirely loose.



(h) Use the wrench supplied. This will give before the threads of the nut, and this prevents damaging the latter. After the telescope is in place, move the range and deflection scales through their entire throw, in order to make sure that they work smoothly.

(i) Open the plug and lash it back.

(j) Put in the breech diaphragm. Set up tight if there are adjusting screws, otherwise see that it is all the way in.

(k) Wipe off the telescope lenses with lense paper.

(l) Put the telescope in the breech diaphragm, taking care that the threads are not crossed. Do not force it. If it does not start easily wipe off the threads.

(m) Train the gun on the object to be used in boresighting, focus the telescope, and remove parallax.

(n) Put in the muzzle disc, making sure that the small hole in the center is clear.

(o) Bring the cross wires in the bore-sight telescope to the center of the hole in the muzzle disc by moving the adjusting screws on telescope. The adjusting of the telescope is done by means of four adjusting screws. By slacking one and setting up on the opposite one, the telescope may be moved as necessary for adjusting. Do not set up on these screws so hard as to distort the telescope and avoid touching the telescope after it had been adjusted.

(p) Rotate muzzle disc through  $90^\circ$  and look to see that the cross wires are still in the center of hole in muzzle disc. If they are, remove the muzzle disc. If not, adjust again and keep up the above procedure until cross wires remain in the center of hole when disc is rotated through  $90^\circ$ .

(q) Boresighting will generally be done by the commander of the armed guard, assisted by the gun captain and the pointer and trainer. The pointer should take part and check the results, as then he can not blame poor shooting on the boresighting. Set sights at zero for range and 50 for deflection.

(r) The guard commander takes station at the boresight with the gun captain at the pointer's telescope and the pointer at the trainer's telescope. The guard commander coaches the pointer to bring the vertical wire of the *boresight* on the side of the target (or on a vertical line painted on the target). When the vertical wire of the boresight is on the target, he calls "Mark," and the gun captain reports how much his vertical wire was off the target and in which direction.

(s) Move the deflection scale in the proper direction and mark again. Repeat this until both the pointer's telescope and the boresight are on together.

(t) Repeat the process with the horizontal wires, using the top of the target or other well-defined horizontal line, and changing the range scale as necessary to bring the pointer's horizontal wire on with that of the boresight.

(u) Bring the trainer's cross wires on with the pointer's in the same way, adjusting the trainer's telescope by means of the tangent screws on the telescope holder, so that all three telescopes are "on" together after setting up tight.

(v) Now, without moving the telescopes or the sight mount, slack up the range scale and move it to read zero, setting up again carefully. Slack the azimuth drum and move that to read 50. See that all cotter pins and set screws are in place.

(w) The three observers should check each other by changing places and repeating the process after everything is set up.

(x) Go over all holding-down bolts and adjusting screws and make sure they are all set up for a full due.

(y) Run the sight up and down several times and move the deflection drum 10 or 15 knots each side of 50 several times.

(z) Check up both the horizontal and vertical wires again, having each man go to each station and check as before.

(aa) If all cross wires are on:

Put in muzzle disc and see if boresight telescope cross wires have moved. If they have, you will have to center them again and re-boresight. If they are still in the center of hole in muzzle disc the gun is correctly boresighted.

Remove muzzle disc and put away boresight outfit, take lashing off breach mechanism.

Guns should be boresighted at about 2,000 yards range.

(bb) Both wires should be brought on the same object—that is, do not use one object for the horizontal wire and another for the vertical.

(cc) After guns are boresighted *be very careful to see that no one fools with the sights. Never allow any object of any kind to be placed on them. Never allow the crew to lean against or hold onto the sight for any purpose whatever.*

(dd) You will have to be very careful about this as you will find it is one of the sailorman's favorite amusements. Check your sights at every opportunity on passing objects and after firing.

223. When practicable, the bore sighting should be checked daily, and especially before and after firing.

224. The sight is operated by the sight setter, and in both elevation and azimuth from one side of the mount. Illumination of the sight scales is provided for night use, small electric lights being used for this purpose.

225. The sights are designed to give as long a radius as possible to the sight bar and the azimuth head, thereby reducing to a minimum any errors in readings due to lost motion in the sight parts. The azimuth gear is also provided with an adjustable arc for eliminating any lost motion due to inaccuracy in manufacture or wear in the azimuth pinion and arc teeth.

The sight elevation dial is graduated in yards. The sight bar graduation strip is, on the edge, graduated in yards, which are used as a check on the dial graduations, and on the outer edge in degrees and minutes, which are used as an arbitrary elevation scale.

226. The azimuth drum is, on some sights, graduated in knots, but on other sights an arbitrary scale is used. The divisions on this arbitrary scale represent divisions of one-tenth of an inch on a 100-inch radius, these divisions running from 0 to 100, the 50 division line being opposite the index line on the pointer when the sight is set at zero azimuth.

### SIGHTS, CARE AND ADJUSTMENT.

227. Care.—All working parts of the sight mechanism must be kept free from grit and rust and kept covered with a coating of good mineral lubricating oil. Oil holes are provided in the different sight parts for the proper lubricating of the sight-operating mechanism. All telescopes should be provided with a canvas cover, as nearly as possible moisture and dust proof, which can be readily removed. When the telescope is not in use this cover and the dust cap must be kept on in order to protect the lenses from moisture. The outside of telescopes should be cleaned or dried when necessary with a soft, dry cloth, which should never be used on the lenses. When telescopes are not being used, a ply of loosely folded lens paper in the rubber eyepiece is very convenient for keeping dirt off the rear eyepiece lens. Sights that are exposed to salt spray should be disassembled, cleaned in alcohol, covered with a fresh coating of oil, and reassembled. This should be done as often as it is considered by the gunnery officer that the conditions warrant such action. Emery paper



or any gritty substance must not be used for cleaning. The sights are so constructed that any lost motion in the bearings and working parts, caused either by cleaning with emery paper or by wear, will materially affect the accuracy of the sight.

**228. Lost motion.**—Sights that are constantly used for Morris tube or dotter practice should be carefully tested for lost motion in the parts. To test a sight for this, proceed as in bore sighting. If lost motion in any of the sight's parts has developed, the refitting of the sight should be done only by a skilled mechanic.

**229. The adjustment of the mount,** as well as that of the sight, should be carefully checked. If the gun and the telescope objective are not parallel, there will be a vertical error in pointing, as the gun will not be at the elevation as indicated on the scale.

**230. To test the adjustment of the sight and mount,** first adjust the trunnion bearing to insure good contact between the elevating arc and pinion, the lost motion in the other parts of the sight and mount having been previously eliminated. Now attach an accurately marked gunner's quadrant to the gun and another to the telescope, move the gun in elevation and depression, and if there is no error the angular change shown in each quadrant will be the same. (Should be done in dry dock.)

**231. Graduation dial.**—Sights are fitted with an elevation graduation dial which is used instead of the direct reading sight bar graduations, the dial admitting of a finer adjustment of the graduating scale. Lost motion in the sight elevating gear will more readily affect the readings on the dial. The lost motion in this mechanism should be tested as follows: Lay the sight on a distant mark and by means of the sight elevating mechanism elevate the sight well above and depress it back to the distant mark, then depress below the mark and back to the distant mark. The ship being stationary, the reading on the dial should be the same each time the horizontal cross wire of the telescope is accurately laid on the distant mark; if not, there is lost motion in the gearing.

The azimuth drum should be tested in a similar manner, using the vertical cross wires of the telescope instead of the horizontal wires.

**232. Azimuth mechanism.**—The lost motion in the azimuth mechanism is eliminated by the adjustable arc in the yoke teeth or by the split pinion. There are no means provided in the earlier marks for taking up the lost motion in the elevating mechanism, as the weight of the sight bar and head should always keep the teeth of the rack and pinion well in contact.

Later marks of sights have adjustable elevating arcs. This adjustment is accomplished by having an adjustable steel key which carries the center section of each tooth, and which can be set up to diminish the lost motion due to wear of the pinion by advancing the center part of each tooth sufficient to take up the play.

**233. Telescopes.**—(a) If the telescopes are not in their holders, put them in place, using care to have the side marked "UP" placed uppermost. Place upper part of sight holder on and set up on the screws. Be sure the fit of the upper plate is not bringing any undue pressure on any one particular place on telescope but makes a snug fit all around. Wipe off the lenses, using only "lense paper" or "chamois skin" and never allow your lenses to be touched with anything else. Then look through your telescope, focusing same until a clearly defined image is seen. You should see the cross wires and image with equal clearness. If you can not clear up the image by focusing and the objects appear indistinct, you have what is called parallax in your sights, and this condition is corrected as follows:

(b) Come up on locking nut on underside of telescope just abaft the holder, loosen up the distance rings that go around telescope just back of sight holder and move the eyepiece in or out until you find the place in which you can clear up the image and have a good, sharply defined field in which the cross hairs stand out sharply.

(c) When you have secured this condition, hold eyepiece carefully in place and take up on locking nut, using only such pressure as you can apply to wing wrench by use of fingers only. Bring your distance rings up tightly against the body of telescope and secure in place, using your hands only. Check up to see that you did not throw anything out of adjustment when setting up on locking nut and distance rings. Do not use any more pressure than that of your fingers in setting up on your telescopes as you may distort the tubes and ruin the sights.

(d) In case telescopes are fitted with checking eyepieces, these should always be pulled out as far as they will go when actually firing the gun so that all the light will be reflected directly back to the man at the sight. To pull out the checking eyepiece, come up on the collar nut on the underside of the check eyepiece, pull out on the eyepiece as far as it will come and set up on nut. It will be noticed that with checking eyepiece pulled out it is impossible to see through it. Pulling out the checking eyepiece does not throw the telescope out of bore sight and adjustment.

(e) All parts of the sights must be kept free from all grit and rust and a light coat of oil must be kept on all bright steel parts.

(f) In case telescopes are not mounted they must be kept in a warm, dry place. Never keep a telescope in a damp place.

(g) In wiping the lens always use lens paper and never anything else. Never use alcohol to wipe off a lens, as the lenses are made up of two or more pieces of glass cemented together and alcohol will soften the cement.

(h) When at dock have canvas hoods made and kept on your sights at all times to protect them from the weather as much as possible. When going to sea have these removed and sights covered only by a light piece of canvas, which can be thrown off in a second's time.

(i) Never take the telescopes apart nor allow anyone else to do so, as in putting them together you may bring too much pressure on a lens and distort or bend it, thereby ruining the telescope. Telescope parts are *not* interchangeable.

(j) Always keep the front caps on when telescopes are not in use.

(k) If possible, get a piece of blotting paper and place inside of cap. This will absorb any moisture that would otherwise collect on the lens. If possible, make light wooden plugs and cover same with blotting paper and insert in after end of telescope when not in use. Be careful to see that inner end of plug does not touch lens.

(l) Never allow anyone but the gun-crew to touch the sights under any circumstances and never allow any of the gun-crew to make any adjustments except by your express permission and in your presence. It is far better to make all the adjustments yourself.

(m) Gun telescopes are very delicate instruments and must be handled with great care to insure that they are at all times in adjustment and ready for use. You can not be too careful of them or watch them too closely. Always remember that if your telescopes go out of adjustment the gun is practically useless.

(n) All telescopes are fitted with cross-wire illumination for night firing. To adjust the illumination remove the projecting cap on the after outboard side and move the four adjusting screws the cap uncovers. When in proper adjustment the cross wires should stand out clearly.



(o) Remember that a gun without sights is only a piece of junk and of no value for fighting. Protect your sights at all times.

### NOTES ON AMMUNITION.

234. Marking on ammunition.—Since the correctness of reports and records depends upon it, care must be taken not to obliterate the identification marks on ammunition or to shift it to incorrectly marked containers.

### CARTRIDGE CASES.

235. Care and preservation.—To prevent the rapid deterioration of metallic cartridge cases the following rules must be observed for their care and preservation.

236. The cases at all times, whether before or after firing, should be kept free from salt moisture, oil, or grease of any kind, and from time to time, as opportunity occurs, they should be examined, especially at the neck and mouth, for signs of corrosion.

237. The larger cases when empty should not be laid on their sides, except unavoidably, but should be stood up on end. The cases should not be replaced in their boxes until examined for powder gases, and decapped and washed.

238. As soon as possible after firing, the firing primers should be backed out; the cases thoroughly cleaned and dried, and turned in with empty cases for reloading as soon as practicable after return to United States. Cartridge cases are most valuable now.

239. If the residuum is found difficult of removal, a little lye may be added to the water used in cleaning, but soapsuds will usually suffice, the soap being not used in lumps. After cleaning, the cases should be rinsed with clean water, drained, thoroughly dried inside and out, and put away in their boxes.

### PRESERVATION AND TESTS OF POWDER.

240. Handling.—Ammunition shall be handled as little as possible, since it is often the cause of deforming powder tanks and cartridge cases, to the detriment of their air-tight condition. Service ammunition shall not be used for drill purposes, as damage to primers, etc., may cause misfires and other difficulties. Powder stored for a considerable period in a nonair-tight con-

tainer is apt to deteriorate rapidly, introducing the danger of spontaneous combustion. Charges that are not in air-tight containers should be landed for repairs or replacement. When ships receive from magazine ammunition that shows rough handling, the circumstances should immediately be reported to the Bureau of Ordnance. Magazines shall make similar reports regarding ships. Too much care can not be given to keeping powder in air-tight containers. Moreover, excessive handling is apt to make dents in cartridge cases, loosen projectiles, etc. The cartridge bags for B. L. guns are made of the most suitable material obtainable, and, when issued, have ample strength. However, the sharp edges of powder grains will cut through the bags if the charges are handled too much.

**241. Unexpended ammunition.**—The unexpended portion of such ammunition as may have been issued for a specific target practice or experimental firing shall be turned in, as soon as practicable after such firing, to a naval magazine on shore; if practicable, to the magazine from which such ammunition was obtained.

**242. Exposure to sun.**—When smokeless powder is removed from magazines on shore or on board ship for transportation, target practice, or other purposes, it shall not be exposed to the direct rays of the sun or subjected to other abnormal conditions of temperature. This prohibition applies equally to powder in bulk, in tanks, cartridge cases, ammunition boxes, or other containers. Whenever it may be necessary to transport smokeless powder ammunition in boats, or to take it on shore, as for boat gun or field gun target practice, it must be effectively shaded from the rays of the sun.

**243. Whenever, in particular cases, the terms of the above paragraph have not been complied with, any ammunition which may have been exposed shall be segregated, and shall, for purposes of tests, inspections, and reports be regarded as a separate index; and if on board ship, it shall be landed at a naval magazine at the first opportunity should there be reason to believe it has deteriorated.**

**244. Temperatures above 100° F.**—If at any time smokeless powder be exposed to a temperature higher than 100° F., a special report shall be made to the Bureau of Ordnance immediately, explaining the circumstances in detail and stating the temperature and the length of time the powder was so exposed.

**245. Stowage.**—Smokeless powder shall not be stowed in any magazine wherein the temperature is habitually above 95° F., or

wherein the temperature ever reaches 100° F. If the temperature reaches 90° F., artificial means for reducing it shall be adopted.

246. Air in magazines.—If the air in any magazine be at all impure, or if the odor of ether be noticeably strong in any magazine containing smokeless powder, such magazine shall be blown out by portable fans and otherwise ventilated.

247. Empty tanks.—Empty cartridge cases, boxes, and powder tanks shall be handled and stowed with care and *shall be turned in at a naval magazine at the earliest opportunity. Cartridge cases must not be deformed by severe handling while still hot from firing, and as soon as practicable thereafter they shall be thoroughly washed with hot water and soap, carefully dried, and repacked in the boxes in which they were supplied.*

#### INSTRUCTIONS REGARDING STOWAGE.

248. Smokeless powder must always be kept in air-tight, moisture-proof containers.—This requirement is of the first importance, as exposure to the atmosphere tends to progressive deterioration and destroys all uniformity in ballistic qualities. Smokeless powder aboard ship is stowed in powder tanks (B. L. R. charges), or in cartridge cases which are sealed with a mouth cup or by the projectile. No effort must be spared to insure that all containers of smokeless powder are absolutely tight. Charges that are not in air-tight containers must be landed for repairs or replacement.

249. Smokeless powder shall never be exposed to the direct rays of the sun.

250. Smokeless powder that has been wet from whatever cause must be regarded as dangerous for stowage on board ship and must be turned in to a naval magazine without delay for shipment to Indian Head for reworking. Such powder must be clearly marked to indicate its condition. Powder which is packed (completely immersed) in distilled water for shipment is entirely safe for storage and transportation, and powders of very low stability are shipped in this way.

#### FORTNIGHTLY EXAMINATION.

251. The powder in one or more charges of each index shall be visually examined fortnightly for signs of decomposition or change in appearance. Different charges shall be selected from



time to time for this examination, and after making it particular pains shall be taken to see that the tank or cartridge cases, the contents of which are to be exposed for as short a time as possible, are restored to their former air-tight condition.

252. The inside of a tank, case, or bag containing smokeless powder, which has been given off the nitrous fumes which accompany decomposition, will probably show a reddish or orange appearance. Upon first opening such a container the characteristic acrid and pungent odors of the nitrous fumes can be readily detected by smelling. Upon this point depends the main value of this examination, and the conditions upon first opening a charge should be carefully noted by applying the nostrils to the charge immediately after opening. The odor of ether is natural and is of no consequence.

253. In general, no notice is to be taken of the color or change of color of smokeless powder, except that a very marked whitening of the grains, taken in connection with other indications, is to be considered as indicating loss of stability. The grains of decomposing powder will, in a measure, become soft, yielding to the pressure of the thumb-nail or crumbling easily.

254. Powder shall not be destroyed unless it shows unmistakable signs of advanced decomposition.—In the event of such deterioration every charge of the index on board shall be examined, and only such charges will be destroyed as contain the decomposing powder. Decomposition in the sense here used is evidenced by—

- (a) The grains being friable and easily crumbled;
  - (b) Unmistakable odor of nitrous fumes; and
  - (c) Very low violet-paper and surveillance tests.
- (d) Powder found to be in a soft, mushy condition shall be thrown overboard immediately.

255. Inspection of ammunition should consist in seeing projectile firmly seated in case and not loose and primer home.

256. Ammunition may be tested by trying in the gun, but guns should be pointed in a safe direction. Naval Instructions, article 2852 (2) requires that in testing live ammunition in the gun the firing pin shall be kept removed from the breech plug during the test.

257. Ammunition should be stowed securely in a place safe from fire or heat or moisture.—Ammunition carried at the guns should be under cover if possible. Cover it with a tarpaulin if nothing better is available. Protect from sun and rain important.

258. If they do have a misfire, better throw the charge of cartridge overboard. A hangfire of considerable duration is possible:

(a) In bag guns, if ignition end is loaded forward instead of aft or if the ignition is missing. The latter is not at all likely, but the former is and must be carefully guarded against. Such an occurrence is *extremely dangerous*, as the powder charge is liable to burst into flame *when* the plug is opened.

(b) In cartridge-case guns if wads and distance pieces get badly adrift and get down around the primer: It can be determined if wads and distance pieces are adrift by tilting the cartridge and noting if powder charge is *very loose*; such cartridges should be set aside. A hangfire is not likely with 3''/50-cartridge-case ammunition and larger, as the magazine extension primer will probably set the charge off in any event. Drill primers can be supplied for bag guns if wanted (20 per gun, but no drill primers for cartridge-case guns).

259. Ammunition boxes containing cartridges which have projectiles fitted with tracer fuzes have a *white band* painted around them. Projectiles which have *tracer fuzes* have a white band on the ogival behind the collar, indicating the burster charge.

260. In testing ammunition for fit in the guns, the cartridges must be *very gently and carefully loaded* and unloaded, the gun being pointed in a safe direction and the firing pin removed; otherwise the rotating band of the projectile will *bite in* the rifling and the extractor will then tend to pull the cartridge apart, with the result that subsequently it can not be loaded.

261. Service ammunition is not to be used for drill or target firing unless absolutely necessary or specially authorized by the department.

262. Turning in empty ammunition containers.—Every effort shall be made to return empty ammunition containers such as powder tanks, cartridge cases, and ammunition boxes to the naval ammunition depots when opportunity offers. This is particularly important at the present time as the reserves of powder, etc., is considerably in excess of the reserve of cartridge cases and containers.

263. Shortages in ammunition allowance.—Shortages in the allowance of any ammunition should be reported on powder card (Ordnance Form 41) and projectile card (Ordnance Form 42). Any shortages reported will be ordered filled by the Bureau

of Ordnance (see art. 4477, Naval Instructions, as modified by change 7).

**264. Allowance of target ammunition.**—The allowance of target ammunition is specified in articles 536, 561, and 586.

**266. Use of Ordnance forms.**—The best way to obtain any material needed to fill allowance is by the use of the regular Ordnance forms provided for the purpose of reporting shortages and requirements (powder cards—Ordnance Form 41; projectile cards—Ordnance Form 42; equipment cards—Form 70; and requisitions—S. & A. Form 44-D; etc.). Correct returns are absolutely necessary to enable the Bureau of Ordnance to keep its records straight.

**267. Service ammunition must not be used for purposes of training or target practice.**



## CHAPTER X.

### ORDNANCE INSTRUCTIONS.

(Naval Instructions, Chapter 26.)

#### Section 1.—GENERAL INSTRUCTIONS.

278. The following are extracts from the Naval Instructions, 1913:

2801. (1) **Ordnance pamphlets.**—The methods of caring for and handling ordnance matériel set forth in the descriptive pamphlets issued by the Bureau of Ordnance shall be closely followed.

2803. (1) **Powder charges.**—Naval smokeless powder is manufactured to contain, in the finished grain, a standard percentage of "residual volatiles," which is as low as practical considerations will permit. Under normal conditions of storage the volatiles will not become appreciably reduced. Furthermore, powder is packed at the factory, and charges are made up at the magazines under normal atmospheric conditions as far as practicable to obtain a standard percentage of surface moisture. The charges for breech-loading guns are issued in air-tight tanks, and charges for cartridge-case guns are virtually sealed by the mouth cups of the projectiles. The weights of charge are established by actually firing the various indexes under standard conditions of volatiles, temperatures, etc., and it is most important for ballistic reasons that the powder undergoes no change in service thereafter. To insure this, those charged with its care shall see that the air-tightness of the containers is rigidly maintained. Powder exposed to the atmosphere will lose a portion of its residual volatiles, and on board ship will gain or lose surface moisture. While the changes may be counteractive, it is unlikely that they will exactly offset each other. Therefore the importance of keeping powder charges air-tight is to be considered on a par with that, for instance, of keeping the sights in condition.

(2) **Temperature charges.**—The "proof" of powder, besides being held under normal conditions as regards volatiles and

moisture, is conducted with the powder at that temperature which closest approximates that of ships' magazines. Variations in storage temperatures do not affect the ballistic qualities, provided the powder is brought to standard temperature before firing. Loss of stability, unless it has gone so far as to preclude retaining the powder on board ship, will not of itself affect ballistics if the other conditions are normal.

(3) **Care in handling charges.**—Ammunition shall be handled as little as possible, since it is often the cause of deforming powder tanks and cartridge cases to the detriment of their air-tight condition. Powder stored for a considerable period in a nonair-tight container is apt to deteriorate rapidly, introducing the danger of spontaneous combustion. Charges that are not in air-tight containers should be landed for repairs or replacement. When ships receive ammunition from magazines that show rough handling the circumstances should immediately be reported to the Bureau of Ordnance. Magazines shall make similar reports regarding ships. Too much care can not be given to keeping powder in air-tight containers. Moreover, excessive handling is apt to make dents in cartridge cases, loosen projectiles, etc. The cartridge bags for B. L. guns are made of the most suitable material obtainable and when issued have ample strength. However, the sharp edges of powder grains will cut through the bags if the charges are handled too much.

2804. (1) **Service ammunition not used for drill purposes.**—Service ammunition is supplied to ships for use in battle only. It is not to be used for drill at the guns, for instruction of the personnel that requires opening of charges or projectiles, for testing hoists or conveyers, or for other similar purposes except upon the express authority of the Navy Department. It shall be regarded as part of the vessel's outfit, shall be kept distinct from the ammunition issued for target practice, and shall never be expended in target practice without the authorization of the Rules for Target Practice or special instructions from the Bureau of Ordnance.

(2) **Target-practice ammunition.**—Special ammunition is put up and issued for target practice, or else certain of a ship's allowance of service ammunition, particularly designated, is set aside for that purpose. Such ammunition may, where in the discretion of the commanding officer it becomes necessary, be used for instructional purposes, for testing hoists and conveyers, or for drill at B. L. R. guns, provided it is not live ammunition. (Art. 1 2852.)

(3) The unexpended portion of such ammunition as may have been issued for a specific target practice or experimental firing shall be turned in, as soon as practicable after such firing, to a naval magazine on shore; preferably to the magazine from which it was received.

2805. (1) **Powder shall not be exposed to sun.**—When smokeless powder is removed from magazines on shore or on board ship for transportation, target practice, or other purposes it shall not be exposed to the direct rays of the sun or subjected to other abnormal conditions of temperature. This prohibition applies equally to powder in bulk, in tanks, cartridge cases, ammunition boxes, or other containers. Whenever it may be necessary to transport smokeless-powder ammunition in boats, or to take it on shore, as for boat-gun or field-gun target practice, it must be effectively shaded from the rays of the sun.

(2) Whenever, in particular cases, the terms of paragraph 1 have not been complied with, any ammunition which may have been exposed shall be segregated, and shall, for purposes of tests, inspections, and reports be regarded as a separate index; and, if on board ship, it shall be landed at a naval magazine at the first opportunity should there be reason to believe it has deteriorated.

(3) **Exposure of powder to high temperature.**—If at any time smokeless powder be exposed to a temperature higher than 100° F., a special report shall be made to the Bureau of Ordnance immediately, explaining the circumstances in detail and stating the temperature and the length of time the powder was so exposed.

(4) **Wet powder dangerous for storage.**—Smokeless powder that has been wet from whatever cause must be regarded as dangerous for storage on board ship and must be turned in to a naval magazine without delay. Such powder must be clearly marked to indicate its condition and on receipt at the magazine shall be scrapped for shipment to Indianhead for reworking. The above condition does not apply to powder which is packed (completely immersed) in distilled water for shipment, as it is entirely safe in this condition.

2806. (1) **Magazine stowage.**—As far as practicable, smokeless powder for different calibers shall be stowed in separate magazines.

(2) **Black powder stowed alone.**—Black powder (except ignition charges) shall not be stowed in the same magazine with smokeless powder, but shall be stowed in a separate magazine by itself, if practicable.



(3) **Small-arm ammunition stowed alone.**—Small-arm ammunition shall be stowed in a separate magazine by itself.

(4) **Fixed ammunition stowed alone.**—Fixed ammunition, in cases containing the primers, shall be stowed in separate magazines by itself.

(5) **Temperature of magazines.**—Smokeless powder shall not be stowed in any magazine wherein the temperature is habitually above 95° F., or wherein the temperature ever reaches 100° F. If the temperature reaches 90° F., artificial means for reducing it shall be adopted.

(6) **Ventilation of magazine.**—If the air in any magazine be at all impure or if the odor of ether be noticeably strong in any magazine containing smokeless powder, such magazine shall be blown out by portable fans and otherwise ventilated.

**2807. Care of projectiles.**—Projectiles comprising the service outfit of ammunition shall not be altered or disassembled on board ship, in any of their parts, without explicit instructions from the department. They shall be kept free from rust, and the paint or lacquer shall be renewed when necessary. The old paint shall be removed before painting in order that the dimensions may not be increased thereby. Projectiles for separate loaded 5 and 6 inch guns are issued with their rotating bands protected by rope grommets or slings. The slings and grommets shall be removed only when preparing for firing, except in those cases where stowage space necessitates their removal before stowing in the shell rooms. Since the slings are liable to jam the hoists they should be removed before sending the projectiles up. When removed, slings shall be returned to the naval magazine.

**2808. Empty cartridge cases, tanks, etc.**—Empty cartridge cases, boxes, and powder tanks shall be handled and stowed with care and shall be turned in at the naval magazines at the earliest opportunity. Cartridge cases must not be deformed by severe handling while still hot from firing, and as soon as practicable thereafter they shall be thoroughly washed with hot water and soap, carefully dried, and repacked in the boxes in which they were supplied.

**2809. (1) Primers.**—Combination (percussion and electric) primers will in the future be supplied for all main-battery ammunition and simple percussion primers for all secondary-battery ammunition. Combination primers will also be used in 3-inch ammunition until the present supply is exhausted, after which percussion primers only will be used.

(2) **Drill primers.**—With the exception of such as are designed as “drill” primers, primers in excess of an allowance of 10 per gun per year shall not be expended except in actual firing. A number of “drill” primers have been manufactured and issued for the purpose. In addition to these, the following main-battery primers are designated and authorized to be used as drill primers: Simple percussion, simple electric, and combination B. L. R. primers, with magazine sealed with a crimped ring. Other models may from time to time be designated as drill primers.

**2810. Identification marks.**—Since the correctness of reports and records depends upon it, care must be taken not to obliterate the identification marks on ammunition or to interchange it in incorrectly marked containers.

**2815. General-alarm gongs and “cease-firing” gongs** shall not be used for any other than their designated purpose.

**2817. When necessary** to make shipments of gun-sight telescopes, they shall be packed in the following manner:

(a) Not more than 20 telescopes shall be packed in one box.

(b) The packing box shall be substantially made of good material and should, when practicable, be especially made for the purpose.

(c) Each telescope, before being placed in the box, shall be wrapped in soft paper and in heavy wrapping paper.

(d) The telescopes shall be so packed that there will be about 4 inches of clear space all around each one, this space being well filled in with excelsior, fine shavings, sawdust, paper, rags, or any soft packing material available.

(e) Particular care must be observed in packing to guard against surging of the telescopes longitudinally, the packing material being suitably disposed around the sides of the box.

(f) The outside of a box containing telescopes must be suitably marked to indicate its contents and to enjoin care in handling.

**2831. Stability of powder.**—Navy smokeless powder being an ether-alcohol colloid of nitrocellulose, can not be held to possess unlimited chemical stability, and the length of its life depends very largely on the conditions under which it is stored. At temperatures approaching 100° F. the period during which it will retain stability sufficient to warrant its retention in service is relatively short, although chemical tests give an indication as to the probable life of powder.

**2833.** The following examinations and tests shall be made of smokeless powder on board ship:

(a) Periodical examinations and tests.—Daily: Visual examination of samples and test of charges for local heating. Examination of violet paper.

(b) Fortnightly: Visual examination of one or more charges of each index.

2834. (1) Daily examinations.—The daily examination shall be made as a part of the daily magazine inspection required by these instructions. With ammunition received from naval magazines, there will be supplied a sample of each index, which will be contained in a glass bottle with tight glass stopper. The different samples shall be stored in the racks provided, in the same magazines with the indexes which they represent and shall not be opened, except for the purpose of conducting the violet-paper test hereinafter provided for. The samples shall be daily examined in a good light, without removing stopper, to note whether the powder retains its normal appearance. The presence at any time of reddish or orange-colored fumes in the bottle will indicate decomposition of the powder.

(2) Since advanced decomposition of powder is often accompanied by heat several charges of each index shall be examined daily for evidence of heating by laying the bare hand on the surface.

2835. (1) Fortnightly examination.—The powder in one or more charges of each index shall be visually examined fortnightly for signs of decomposition or change in appearance. Different charges shall be selected from time to time for this examination, and after making it particular pains shall be taken to see that the tanks or cartridge cases, the contents of which are to be exposed for as short a time as possible, are restored to their former air-tight condition.

(2) Nitrous fumes.—The inside of a tank, case, or bag containing smokeless powder, which has been giving off the nitrous fumes which accompany decomposition, will probably show a reddish or orange appearance. Upon first opening such a package the characteristic acrid and pungent odors of the nitrous fumes can be readily detected by smelling. Upon this point depends the main value of this examination, and the conditions upon first opening a charge should be carefully noted by applying the nostrils to the charge immediately after opening. The odor of ether is natural and is of no consequence.

(3) Color, etc., of powder.—A small scoopful of the powder should be taken into a good light and examined as to its physical properties. Powder is of various colors, ranging from light



yellow to a dead black. Certain indexes have been dyed a bright red ("rosaniline" powders), which in the course of time may bleach but still retain a sufficient margin of stability. Any loss of color of a rosaniline powder after receipt on board, while not a cause for alarm, is an indication of loss of reserve stability and of the necessity for vigilance in making the prescribed inspections and tests. Other powders may change color, darkening from the original yellow to brown or black; this indicates a certain change but does not indicate loss of stability or change in ballistic qualities. Stabilized powders become black with only very slight decomposition, so that any darkening of the grain is no criterion of its stability as such stabilizer. In general, no notice is to be taken of the color or change of color of smokeless powder, except that a very marked whitening of the grains, taken in connection with other indications, is to be considered as indicating loss of stability. The grains of decomposing powder will, in a measure, become soft, yielding to the pressure of the thumb-nail or crumbling easily.

**2839. (1) Decomposed powder.**—*Powder shall not be destroyed unless it shows unmistakable signs of advanced decomposition.*—In the event of such deterioration every charge of the index on board shall be examined, and only such charges will be destroyed as contain the decomposing powder. Decomposition in the sense here used is evidenced by—

(a) The grains being friable and easily crumbled.

(b) Unmistakable odor of nitrous fumes.

(c) Very low litmus-paper and surveillance test.

(2) Powder found to be in a soft or mushy condition shall be thrown overboard immediately.

(3) Whenever any powder is landed or destroyed because of its unstable or decomposed condition samples of each index shall always be preserved and forwarded to the naval proving ground for examination and the Bureau of Ordnance notified at once of the shipment and the reasons therefor.

### Section 3.—SAFETY ORDERS.

**2851. Naked lights in magazines prohibited.**—No naked light shall ever be taken into a magazine or other compartment containing explosives of any kind.

**2852. Live ammunition for drill prohibited.**—Live ammunition will never be used for loading drill. The insertion of a live primer in a B. L. R. gun containing powder makes it live. With-

out the primer the charge is not live. Fixed ammunition and loaded and fuzed projectiles are live ammunition.

**2853. Plug face to be watched.**—In every cartridge-case gun, except those of the sliding wedge or eccentric plug type, the breech plug shall not be closed until the gun captain is assured that the front face of the plug is in normal condition.

**2854. Opening of breech during salvos.**—Locking devices are being developed to prevent the breech of a loaded gun from being opened during salvo firing. Prior to the installation of these devices, whenever two or more guns are fired together, effective measures shall be taken to guard against opening the breech of a loaded gun. The salvo latch shall be removed from or made temporarily inoperative on guns the breech mechanisms of which are to be operated for purposes of drill, and such salvo latches shall be replaced and made operative before firing is carried on with such guns.

**2855. Mushroom to be sponged.**—The mushroom of every breech-loading gun shall be thoroughly sponged after each shot.

**2856. Posting of safety orders.**—Copies of all safety orders and instructions pertaining to the armament of the ship shall be kept posted in convenient places easy of access to members of the crew, and all members of the crew concerned shall be thoroughly instructed in them.

**2857. (1) Precaution against unlocked plug.**—It is possible to fire a screw breech-mechanism gun by percussion when the plug is swung home but not rotated and locked. Every possible precaution shall be taken to avoid accidents from this cause. If a gun be fitted for electric firing, with contacts so arranged that the plug must be fully rotated before the firing circuit is closed, it is not possible for an accident of this kind to happen.

(2) In a bag gun, where the lock is operated automatically, the automatic functioning of the lock should not be interfered with in any way. Should any of the parts operating the breech mechanism and the lock break and the lock be then operated, the gun might be fired with the plug unlocked. Every possible precaution shall be taken to avoid accidents from these causes.

**2858. (1) Close breech as soon as loaded.**—As soon as a gun is loaded the breech shall be closed without delay.

(2) When a gun which has been fired is still warm when reloaded, and it later becomes necessary to remove the charge, the gun need not be fired but should be unloaded. When it is apparent that the service of the gun will not be resumed within a reasonable time the powder involved will be dumped in dis-

tilled water and kept in that condition until turned into a naval magazine at the first opportunity.

(3) When it becomes necessary to unload a gun which has not been warm at any time while loaded, the following will be observed. If a cartridge-case gun, the cartridge will be carefully examined, and if found in good condition it may be returned to the magazine; if not in a good condition, it should be broken down and the powder treated as stated in paragraph 2. If a bag gun, the charge should be most carefully examined. If found clear from grease and otherwise in good condition, it may be sent back to the magazine; if slightly greasy, the charge should be rebagged on board ship if spare bags are available; if such bags are not available, or if the grease has in any way gotten on the powder, the charge should be dumped into distilled water and treated as directed in paragraph 2.

2859. **Tompions.**—In preparing a battery for firing, the division officer shall assure himself that the tompon is removed from each gun and that each bore is clear.

2860. (1) **Breech kept locked when primed.**—The breech of a gun shall never be unlocked or opened while there is a live primer in the lock.

(2) **Precaution with firing lanyard.**—The firing lanyard shall never be hooked to the trigger of the lock until after the breech plug has been closed and locked and the gun primed. The lanyard shall be hooked just before cocking the lock.

(3) **Breech kept locked while lock is cocked.**—The breech of a gun shall never be unlocked or opened while the lock is cocked or while the lanyard is hooked to the trigger.

(4) **Cease firing.**—When the order "Cease firing" is given, loaded guns must be put in such condition as to render accidental discharge improbable. This necessitates for—

B. L. R. guns.....Removal of primer.

R. F. guns.....Removal of case.

If a crew leave a gun at any time, the gun shall be left in the condition of "cease firing."

2861. (1) **Firing pin housed.**—No cartridge-case gun shall be fired with a breech mechanism in which the firing pin is not completely housed.

(2) **Condition of firing pin.**—As the firing pin of every concentric screw breech mechanism is directly in rear of the primer when the plug is closed but not rotated, the utmost care shall be taken to insure that the firing pin and all parts are in good condition, as the failure of a part of the mechanism might permit the firing of the gun before the plug is rotated.



(3) **Broken firing pin.**—The danger of a broken firing-pin point or of the fusing of metal on the face of the breech plug, due to a primer blowback, shall be constantly borne in mind and guarded against.

(4) In a cartridge-case breech mechanism having the firing pin held in position by a cotter pin, similar to the 5-inch Mark V mechanism, the cotter pin shall be in place at all times, in order to prevent the firing pin from losing its housing. If the firing pin be not housed, a premature explosion is apt to occur.

**2862. Priming.**—The priming of a breech-loading gun while the breech is open is forbidden, and the breech shall be closed and locked before the primer is inserted in the firing lock, except in a breech-loading gun in which the wedge block containing the firing pin is arranged to operate automatically by the functioning of the breech mechanism, in such a manner that the firing pin can not be brought opposite the primer until the breech is closed and locked.

**2863. Jammed cartridge case.**—No force greater than that which can be applied by the hand alone shall be used in loading a cartridge case into a gun. Any cartridge case that does not freely and fully enter the chamber of the gun under the influence of the force of the hand alone shall be carefully extracted and put aside. It shall be properly marked to indicate its condition, and shall be turned in to store at the first convenient opportunity.

**2865. (1) Hangfires.**—The possible danger of a serious accident, due to opening the breech of a gun too soon after a hangfire, demands the constant exercise of the utmost prudence and caution whenever a misfire occurs.

(2) Whenever a gun pointer presses the firing key or pulls the lock lanyard and the gun fails to fire, a hangfire shall be regarded as probable, and, until an examination of the extracted primer discloses the fact that the primer itself failed to fire, no distinction shall be made between the case of a misfire due to a failure of the primer to ignite and a misfire due to a failure of the charge to ignite after the primer has functioned properly.

(3) In time of peace, whenever a misfire occurs in any gun, an interval of at least 30 minutes shall be allowed to elapse after the last effort to fire the gun before the breech is opened, except when, in the case of a gun using a breech-loading primer, an examination of the extracted primer shows that it did not fire. In such a case there is no danger of a hangfire, and the

foregoing rule need not apply. In case of misfire in field and landing guns on shore, an interval of 10 minutes shall be allowed to elapse after the last effort to fire the gun before the breech is opened.

(4) Nothing in this article shall be construed as discouraging possible efforts to fire the gun which do not involve opening the breech. The primer shall be removed from a breech-loading gun (using an appropriate tool in order to avoid danger of being struck by the recoil or of injury from a blowback) and a new one inserted and fired, using either electric or percussion mechanism, as seems most desirable, and these efforts shall be continued as long as there is a reasonable chance of firing the gun. A gun using cartridge cases and fixed primers shall be tried again, either by electricity or percussion or by both, whenever this can be done without opening the breech.

(5) In time of war, when the possible chance of serious danger due to a misfire may be overbalanced by the more important considerations of battle, the commanding officer may, at his discretion, decide what interval shall intervene between the occurrence of a misfire and the opening of the breech.

2866. (1) **Care enjoined.**—The attention of all officers is invited to the necessity for the continuous exercise of the utmost care and prudence in the handling of all kinds of ammunition.

(2) **Fire hose.**—Whenever the guns of a vessel are being fired, the fire hose shall be led out as at fire quarters and the fire pumps shall be kept running.

(3) **Ammunition outside of magazine.**—During firing no ammunition other than that immediately required shall be permitted to remain outside of the magazines.

(4) At gunnery exercises there may be assembled on deck no more than the necessary allowance of ammunition for the intermediate or secondary battery guns that are to fire on the next run; but no charge for a breech-loading gun shall be taken out of its tank, nor shall the top of the tank be removed until immediately before the charge is required for loading. For guns using fixed ammunition and for guns using separate powder charges put up in cartridge cases, the allowance required for the gun or guns that are to fire on the next run may be removed from the boxes.

(5) **Ammunition-supply tests.**—If an ammunition-supply test is at any time required, the ammunition used therefor will be

gunnery exercise ammunition unless the order requiring the test authorizes the use of service ammunition.

(6) Ships must exercise care in handling service projectiles for breech-loading guns (especially in hand loading large-caliber projectiles) not to strike the tracer mouth cup of the fuze, as otherwise the tracer may be ignited, with danger of igniting exposed powder charges in the vicinity.

2867. **Morris tube.**—No Morris-tube practice shall be held without an efficient bullet catcher securely attached to the muzzle of the gun or otherwise suitably secured in the line of fire of the small rifle.

2869. (1) **Sponging of guns.**—As there is an inflammable gas present in the chamber of a gun after firing, which, under certain conditions, may constitute a danger in igniting the exposed charge while the gun is being loaded for the next round, the chamber of every broadside breech-loading gun using charges that are unprotected by metal cases shall be sponged after each discharge before loading. In case of guns of this class, the combined sponge and rammer shall be used, with the bristle dampened with water. The sponge will be entered in the chamber immediately following the shell and shoved home as far as the shell, when seated, will permit, and then withdrawn. When the gun is sponged in this manner it is not possible for inflammable gases or bits of burning powder bags to remain in the powder chamber to endanger the ignition of the charge.

(2) **Gas ejectors.**—When adequate mechanical means have been fitted for the purpose of promptly clearing the chamber and bore of all gas, fragments of powder bags, etc., and when, after satisfactory trials, the same shall have been approved by the department, the foregoing precautions may be dispensed with; but in no case shall any of the precautions be omitted while using any extemporized blowing appliance or when the approved appliance is not working at the standard pressure for which it was designed.

**NOTE.**—In a bag gun, ram shell home with combination sponge and rammer before exposing powder bag in rear of gun.

(4) **Examination of bore.**—When firing any powder-bag gun, whether fitted with gas ejector or not, it shall be the duty of a member of the crew to look through the bore of the gun immediately after the opening of the breech and note when the bore is clear, announcing this condition by calling out, sharply and distinctly, "Bore clear!" In order to guard against the danger of flarebacks, the charge shall not be exposed at the breech of



the gun until after the announcement "Bore clear." Exception is made of guns mounted on broadside mounts on weather deck, using powder bags, not fitted with approved gas-expelling device; but in such the powder charge shall not be exposed close to the breech of the gun until after the shell has been rammed home with the standard combined bristle sponge and rammer wet with water and the mushroom has been wiped off with a wet sponge.

(5) **Cartridge-case guns.**—The sponging of guns using fixed ammunition, where the charge is protected by a metal case, it is not necessary, but, before stowing the empty cartridge cases below, steps shall be taken to free them from all inflammable gases. This can best be done by laying the cases on their sides and testing each one for the presence of gases by inserting a lighted taper in each case as far as the bottom, thus setting fire to any inflammable gases, or by washing the cases out with soap and water.

(6) **Strengthening cartridge bags.**—Under no circumstances shall the material of the cartridge bags or strengthening tapes be added to without authority. Should it be necessary to stiffen the charges, additional cloth or tape shall not be used, but, if necessary, the old cloth or tapes shall be retied or replaced by new material similar to the old.

(7) **Magazine flap doors.**—The magazine flap doors of only such magazines as are being used to supply charges shall be open, the flaps, in all cases, being down except during the time of actual passage of the sections of the charge through the door.

(8) **Unnecessary exposure of charges prohibited.**—There shall not be exposed (removed from the tanks) at one time in all the magazines in use more than one charge for each gun, and then only as necessary to supply the demand in the handling room; nor shall there be permitted at any time an accumulation of exposed sections for more than one charge for each ammunition hoist outside the magazines in the handling room.

(9) **Safety orders to be posted.**—A copy of this article shall be posted in every turret and in every handling room, together with the other safety orders pertaining to the turret and the handling room.

2870. **Inspection of recoil cylinders.**—Before the firing of any gun, other than for saluting, the commanding officer shall require a report that the recoil cylinders have been inspected and filled in the presence of the gunnery and division officers.

2871. **Blind shell for subcaliber.**—Only blind shell shall be used for subcaliber or ex-caliber practice.

2872. **Care in loading.**—Especial care shall be exercised to see that all sections of powder charges are entered in the chamber with the ignition (red) ends toward the breech.

2873. (1) **Removal of fuzes.**—Fuzes shall not be removed from loaded shell except under explicit instructions from the Bureau of Ordnance.

(2) **Loaded projectiles dropped in service.**—Any loaded and fuzed projectile which may be accidentally dropped in service from a height exceeding 10 feet should be set aside and turned in to a naval ammunition depot at first opportunity. Such a projectile should be clearly marked to indicate its condition and should be handled with the greatest care. On receipt at the magazine it shall be unfuzed and the fuze scraped.

2876. Conditions not covered by these safety instructions may arise which, in the opinion of the commanding officer, may render firing unsafe. Nothing in these safety instructions shall be construed as authorizing firing under such conditions or as preventing the commanding officer from issuing such additional safety orders as he may deem necessary.

#### SECTION 4.—CARE AND PRESERVATION OF ORDNANCE MATERIAL.

2881. (1) **Changes in batteries.**—Material changes or modifications in the batteries of ships or any of their attachments, or in the torpedo equipment, shall not be made without explicit authority from the Bureau of Ordnance.

(2) **Experimental changes.**—It is not the intent of these instructions to in any sense discourage criticism of ordnance material or suggestions for improvements in the same, but improved arrangements or modifications shall only be tried when the arrangements as supplied are not altered and can be restored if necessary.

(3) **Responsibility for armament.**—It is not the intent of these instructions to hamper the judgment or initiative of flag or commanding officers who, on foreign stations, must often exercise their own judgment and discretion in their efforts to keep their commands in the highest state of efficiency. Under such circumstances those officers shall assume the responsibility for their action in case of emergency, but wherever possible the authority of the Bureau of Ordnance shall be obtained before making changes or modifications. The Bureau of Ordnance has the ultimate responsibility for the efficiency of armaments of ships,

and it can meet this responsibility satisfactorily only when suggestions and recommendations for changes are referred to it for decision.

**2882. Guns to be moved daily.**—Every turret shall be revolved, and every gun moved through the extreme arcs of train and elevation, and all motors and mechanisms in connection with the guns and ammunition hoists shall be operated daily, except on Sundays and holidays, and except when coaling ship or heavy weather render it impracticable. The men regularly stationed to point and train the guns and to operate the hoists and mechanisms shall be required to do so at this time. All parts shall be lubricated at this time as may be necessary.

**2883. Cleaning breech mechanism.**—Every breech mechanism shall be cleaned daily, but no gritty substance shall be used for this purpose or allowed to get on the mechanism. The breech plug shall be frequently removed from the tray in order that the bottom threads may be reached for cleaning.

**2884. (1) Avoidance of grit, etc.**—Brick dust or other gritty substance shall never be used on any part of a gun.

**(2) Scraping prohibited.**—No parts of any gun mechanism shall ever be scraped with knives or metal scrapers or defaced or roughened in any way.

**(3) Protection against rust.**—All bare metal parts of every gun and mount shall be kept lightly oiled as a protection against rust.

**2885. (1) Washing guns.**—Every gun shall be carefully washed out with fresh water after every firing, using the bristle bore and chamber sponges, the muzzle being depressed for the purpose. If a hose be available, it will be found very efficient, and its use will save the sponges.

**(2) Drying and oiling guns.**—The bore and chamber shall be carefully dried with the sheepskin sponge, and finally thoroughly oiled by passing a sheepskin sponge well coated with oil through them several times.

**2886. Care of slope and rifling.**—Particular attention shall be given to keeping the slope and origin of rifling well oiled and free from rust.

**2887. Breech mechanism after firing.**—After firing a gun of 6-inch caliber or smaller, the breech mechanism shall be completely dismantled. Every part shall be washed with warm water, dried, and rubbed with a well-oiled rag, after which the mechanism shall be reassembled.

**2888. Protection against grit, water, etc.**—All guns and mounts shall be kept covered whenever there is a chance of get-



ting coal dust, grit, or salt water on them. They shall be inspected and reoiled once a week. In reoiling, all the old oil shall first be wiped off, as it may have become clogged with dust and grit.

**2889. Compression slope.**—If a gun is closed by a tompion, such tompion shall be withdrawn every fair day and the compression slope cleaned and reoiled.

**2890. Gas checks.**—(1) As far as possible, every gas check shall be protected from the weather and from everything which could indent or bruise the pads. The rings or disks shall be kept scrupulously clean and well oiled, and the pads shall be habitually coated with vaseline. As soon as practicable after firing the gun, the mushroom and gas check shall be removed, cleaned, and oiled.

(2) When practicable, the pads, rings, and disks shall be removed, cleaned, dried, oiled, and kept in such place as may be appointed for them, especially during bad weather.

**2891. Gas-check slopes.**—In loading especial care shall be taken not to injure the gas-check slope of the gun. If the slope be injured, the escape of gas to the rear can not be prevented, and serious damage may result.

**2892. Choke of guns.**—Care shall be taken to see that the choke of guns is not so great as to overcome the clearance between the bore and the bourrelet diameter of the shell. This clearance should never be less than the one-hundredth part of an inch.

**2893. Dispersion due to erosion.**—Every gun shall have the distance from the face of the tube to the base of the seated projectile measured frequently. This distance should be the same in all the guns of the same caliber in a battery. If, on account of erosion, shells seat at different distances in different guns of the same kind, allowance for this fact should be made in order to eliminate dispersion of fire.

**2894. Primer seat.**—In every powder-bag gun, care shall be taken to keep the primer seat thoroughly clean and smooth. If the primer seat does not permit close fitting of the primer, primer blowbacks may occur, possibly disabling the firing mechanism. Too frequent use of the taper reamer with the entailed wear of the primer seat is to be avoided.

**2895. Firing mechanism.**—Every effort shall be made to keep the firing mechanism of every cartridge-case gun in thoroughly efficient condition. A failure on the part of the firing mechanism may cause the gun to be fired prematurely.

## CHAPTER XI.

### SUBMARINES.

287. A submarine is a vessel of war designed to operate on the surface, semisubmerged, or completely submerged, and has as its principal weapon of defense the automobile torpedo. A submarine is in the "light condition" when cruising on the surface, usually with bridge and top hamper rigged; in the "awash condition" when sealed up ready for diving, conning tower showing. In the "submerged condition" when below the surface of the water with or without periscope showing. In the light and the awash condition the motive power is internal-combustion engines; when submerged, electric motors operated by storage batteries.

288. The best surface speed is about 18 knots, and the best submerged speed about 10 knots. This submerged speed can not be kept up for more than an hour, because the storage batteries will run down and it is necessary to come to the surface to recharge them. Of course, by running at a slower speed, they can run submerged longer, as much as 20 hours. They can rest on the bottom in depths of less than 200 feet and wait until dark to come to the surface to recharge their batteries.

289. The conning tower is nearly amidships and appears in two steps. The submarine generally carries two guns mounted on the superstructure deck, one forward and one aft; latest practice, one just abaft conning tower. The most vulnerable part of a submarine in the awash condition is the conning tower. A direct hit on the conning tower will not completely disable or sink the submarine, but will probably put the commanding officer out of action.

290. The German U boats are of different sizes, generally the ocean-going and the coastal type. The usual duration of a cruise for an ocean type was four weeks, but the tendency now is to reduce that time. Cases have been reported of submarines running submerged from 28 to 36 hours. The motive power of a submarine when running awash is furnished by Diesel engines using heavy oil. When running submerged storage batteries are used, and the endurance under water depends upon speed and the

capacity of the battery. When running at a high speed submerged the battery is soon exhausted. The cruising endurance at 10 knots submerged is probably about one hour, while at 5 knots the submarine may stay much longer. She must come to the surface and run her oil engines to recharge, and in order to be safe this is generally done during the night or perhaps in daytime when no shipping is in sight. A submarine must never let her battery charge run down very low, because her safety depends upon submergence and because of probable injury to the battery due to reversal of plates.

291. Torpedo tubes are carried in the bow and in the stern. The tubes are kept loaded and spare torpedoes are provided. You can assume 2,000 yards as the effective range of a torpedo with a speed of 30 knots. Torpedoes can be fired while the boat is submerged. In order to aim the torpedoes, however, observation must be taken with the periscope above water. While the torpedo is the principal method of attack, submarines carry one or two guns, usually two, and of caliber as high as 6-inch. To use her guns a submarine must show herself, which, if you can outrange her, is dangerous from her point of view.

292. The Germans also have mine-laying submarines. This type is distinct from the other type, and while it would not hesitate to attack merchant vessels it probably would not go out of its way to do so before having laid all its mines. Mines can be laid while the submarine is running submerged. Mines can be laid on the surface at 6.5 knots. Because of these mine layers, all important harbors and approaches are swept daily, while areas along the coast are swept from time to time as opportunity offers. Sweeping is usually carried on at high water by vessels of light draft, and no vessel should enter a harbor until assured by the patrol that the channel is clear. Leads should not be used in a vicinity where mines might be expected, as their contact might cause explosion.

293. Submarines are provided with two periscopes to permit the necessary vision when submerged. In the latest design these are of the housing type, electrically or hydraulically operated.

294. Communication on the surface is had by the ordinary means of signaling and a small radio outfit with a range of power from 50 to 100 miles. When submerged the submarine bell and hydrophone are available.

295. The color generally adopted by the Germans for their submarines is a light gray, similar to the color of large German



vessels. For disguise black and white checks have often been used and in some instances waves or various descriptions have been painted on the sides. The deck may be gray or black and the conning tower green. Bow waves are frequently painted on to give the impression of speed. The periscope is sometimes green or in waved lines of white and gray. Various other measures are taken to reduce their visibility.

296. The white lubricating oil gases from the exhaust of a submarine running on the surface can be sighted farther away than can a submarine's hull. The Germans pay close attention to this point, as, when seen, it is easily recognized and is a dead give-away.

297. White cap seas make it almost impossible for the ship to pick up a submarine's periscope wake.

298. The most favorable line of attack for a submarine is with the sun directly astern of her, operating in the brilliant beam of sunlight. A submarine running on the surface is easily seen against the sky line. When, however, she has a sea background she is hard to find; this should be borne in mind and met by having lookouts on deck as well as aloft.

299. Time is necessary to submerge, from one to four minutes. The German submarines are said to be considerably faster than ours in this respect except in rough weather. (About 30 seconds.)

300. Our "L" class needs 38 feet of water to cover the periscope, the German submarine using the housing periscope need 35 feet.

301. "What submarines are afraid of."—(a) Having to use such a large proportion of her battery capacity while making the approach as to make it necessary to come up, then or shortly afterwards, to recharge her batteries. This especially in water deeper than 25 fathoms, where a submarine can not rest on the bottom until dark.

(b) Having to operate in shallow water, where submarines can be rammed, less than 12 fathoms.

(c) Smoky exhaust.

(d) Machinery breakdown. It is thought that this factor is probably responsible for the many cases of capture. It is exceedingly likely to happen.

(e) Injury by gun fire; or effect of concussion of heavy shell striking close aboard.

(f) Being kept below the surface, thereby preventing a recharge of batteries.

- (g) Being caught in nets, or running into mine fields.
- (h) Changes of course by the fleet or picket boats thereby spoiling the effectiveness of her submerged dead reckoning runs, data on course and speed; and increasing her chances of being rammed, due to necessity of more frequently showing periscopes, in endeavor to make attack successful.
- (i) Direct attack by depth charges.

### METHOD OF ATTACK.

302. The attack by stealth or surprise attack is the reason for the submarine's existence, for without it the submarine degenerates into a slow-moving torpedo boat with consequent limitations.

303. In making an attack a submarine will maneuver to gain a position about two points forward of your beam, distance six to seven hundred yards. From dead ahead to the beam is therefore the most dangerous sector. In the case of a convoy a favorite method of the submarine is to follow the first steamer and get her course and speed; then await, submerged, for those following.

304. German submarines are very gun shy and they will avoid a gun duel if you can range over them. It is not all plain sailing for the submarine; he is enemy with friend and foe; he has a difficult job and unless you make it simple for him by failing to keep lookout and to act as you have been trained and instructed, chances are against him making good his attack. His tubes are fixed and to point his torpedo it is necessary for him to point his boat and in addition he must have knowledge of or make a good guess at your course and speed.

305. White cap sea and light conditions at dawn and sunset are most favorable conditions for submarine attack.

## CHAPTER XII.

### LOOKOUTS.

316. A lookout is of first importance. What is the use of all this training, all this knowledge about submarines, all this knowledge about your gun and how to use it—if lookouts *won't see*? “Constant vigilance is the price of safety.” The slightest delay in sighting a periscope may mean the loss of the vessel.

317. The lookout should not stand watch longer than one hour, as he soon becomes tired and less efficient if he remains longer than this period. One captain engaged in special service work stated that during 18 months' active work in the danger areas, during which time many submarines or periscopes were sighted, that in no case did the lookout see the enemy first; every periscope or submarine on the surface was first sighted by an officer trained and experienced in such work.

*Provide the lookout with warm clothing.*

*Shelter him from wind and weather.*

Binoculars, while very valuable, are not absolutely necessary for an efficient lookout. The main thing is to keep alert every minute of the time.

*Teach him what a periscope looks like.*

Tell him that a submarine need not show more than a foot of periscope, and that it will be shown perhaps three times while the submarine is gaining a position for attack.

*Assign him a definite arc to search.*

Instruct him to always point with his arm at anything sighted, at the same time singing out the relative bearing and approximate distance.

*Drill him at picking up objects.*

Practice will train the eye to pick up objects that a landsman would never notice.

Paint on the deck a fore and aft line and an athwartship line and then radial lines every 15° from zero ahead to 180° astern.

Impress upon the lookout the importance of reporting instantly everything he sees, no matter of how little importance he believes it to be.

318. *No hard and fast rules can be laid down for the number of lookouts except that you can never have too many.*



319. *Station lookouts aloft as well as low down as possible.*

320. *Keep a lookout off on the horizon, but the most probable distance a periscope is likely to appear is inside 1,000 yards.*

321. *A moving periscope can be seen 6,000 yards in a smooth sea with no whitecaps.*

322. *With whitecaps it is difficult to distinguish between whitecaps and the periscope wake.*

323. *A sea gull on the water may be taken for a periscope wake.*

324. *Very often flocks of sea gulls will follow a submarine, and when flocks of these are seen the locality should be carefully searched with glasses.*

325. *Similarly, sharks will play around a stationary submarine submerged, or a floating mine, and when fins are seen in dangerous waters give them a wide berth.*

326. *Mines are sometimes fitted with dummy periscopes, so be careful not to ram one in mistake for a submarine.*

327. *Loose barrels or boxes are to be observed carefully, as they are sometimes tied loosely to a mine.*

328. *Lifeboats are frequently found floating both on top of the water and partly submerged and must always be avoided; under no circumstances should a vessel stop to pick them up.*

329. *There are instances near marked channels of periscopes being made to resemble the tall spar buoys used.*

330. *In some cases a dummy periscope has been towed astern with a long line well clear of the submarine to attract attention and gunfire while a second submarine discharges its torpedoes from the other side of the vessel.*

331. *As a periscope rises from the surface it throws up a kind of small spray, which is especially noticeable when the wind is blowing.*

332. *A kind of slick or smooth wake is almost always apparent near the location of a submarine.*

333. *Periscopes can be distinguished easily from similar objects on the surface by their steadier motion. Even in quite rough weather it remains vertical and hasn't the choppy bobbing up and down of the loose object on the surface.*

334. *If at night, the submarine will probably attack awash and when sighted will probably have already discharged her torpedo.*

335. *Submarines usually lie on the surface at night. Just before dawn a lookout should be sent aloft to scan the horizon with good glasses.*

336. In thick weather a submarine may be suddenly encountered on the surface and probably at short range.

337. The general belief is that the morning and evening during the twilight are the most dangerous times. Extra special lookouts should be stationed during these times.

338. It is important that lookouts know signals. There are cases on record of ships having run into mines owing to their inability to receive a simple warning signal.

339. Everything seen, no matter how small or unimportant it may seem, must be reported.

340. Lookouts should search through their assigned arcs by successive  $2^{\circ}$  steps, rather than by continuous sweeping. The time to cover a  $20^{\circ}$  sector by steps has been found to be about 40 seconds. Lookouts should always search in the same direction, from the forward to the after limit of his sector. When the after limit is reached he should quickly swing back to the forward limit, repeat the search from forward to aft and so on.

341. Telescopes are more fatiguing than binoculars. Watch coming on should wait on station about 5 minutes before relieving in order to accustom eyes to light conditions.

342. Lookouts must be instructed in methods of submarine attack. In the usual attack a skillful submarine commander will show the periscope at short intervals somewhat as follows: Beginning at 4,000 yards, at which range an alert lookout can see a periscope, the submarine will show about 1 foot of periscope and observe for a period of about 30 seconds. After that the periscope will be shown at intervals of about 1 minute for a period of time diminishing to about 5 seconds. At about 1,000 yards, when the torpedo is fired, the periscope will be exposed for an aiming period of about 25 seconds. This is not an absolute procedure, but is a typical example, and in the majority of cases the periscope will probably be shown more rather than less.

343. This means that between the time the submarine can be seen to the time the torpedo is fired, about 10 minutes elapse, during which there are about 10 exposures of periscope. Relaxation of lookouts must not be tolerated and constant supervision of lookouts is necessary. The entire crew should be impressed with the idea that if lookouts are alert and see that periscope in time to permit report, maneuvers, and gunfire before the torpedo is fired, then there is small chance that the attack will succeed.

344. There should be coordination between lookouts and armed guards. A member of a gun crew who has as lookout discovered something to shoot at enhances the speed with which that gun gets into action.

345. The length of a trip through the danger zone for a vessel of 10 knots speed bound for England or France is usually 3 days.

346. A real periscope is generally steady in its motion and leaves a small frothy wake.

347. Impress on the lookouts the seriousness of their duty and the necessity for reporting everything they see instantly. See that an efficient system of communication is established from all lookouts to the officer of the deck and that the officer of the deck is promptly informed of all reports.

348. From dead ahead to each beam is the most dangerous sector and the one to which the majority of the lookouts should be assigned. When seen against the skyline the silhouette of a submarine is most distinctive. Lookouts should therefore be stationed as high and as near the water line as possible, the former to discover submarines at a distance and the latter those near by.

349. The following is thought to be the least number of lookouts that should be on at one time day and night. If you have extra men, split the arcs given below and put them on watch.

One lookout from ahead to  $45^{\circ}$  starboard bow.

One lookout from ahead to  $45^{\circ}$  port bow.

One lookout from  $45^{\circ}$  starboard bow to abeam.

One outlook from  $45^{\circ}$  port bow to abeam.

One lookout from abeam to astern starboard side.

One lookout from abeam to astern port side.

One lookout in crow's nest from port to starboard beam around the bow.

350. Lookouts often make the mistake of only looking for submarines off on the horizon. The probable distance at which a periscope may appear is from 300 to 800 yards from your vessel from dead ahead to either beam. Slow-speed vessels will probably be trailed from astern, so if making less than 10 knots watch out for this particularly.

351. Remember that anything to prevent a surprise attack on your ship is a prime factor in its safety, and in this the lookout is of first importance.

352. In addition to keeping a lookout for submarines, a lookout for mines must be kept when approaching the coast. Avoid passing between any two floating mines as they may be connected.



353. The physical stress and strain of a run through the danger zone tells on the men, the most common surface sign being a puffiness under the eyes. They quickly recover. The sun glare, wind, and a certain amount of mental tension varying with different mentalities all enhance the stress, and the men become nervously alert, which is a good thing. The practice of giving them coffee at nightfall and at daylight must be carefully watched. After three days the effect is bad. If under proper control they go to sleep or lie down on the deck when not actually on watch. If not, they chatter and keep others awake.

## CHAPTER XIII.

### GENERAL SHIP INSTRUCTIONS FOR ARMED GUARD CREWS.

363. While this section concerns primarily the captain and ship's officers, the armed-guard crews should be familiar with the instructions laid down here, not only in order that they may have knowledge of the dispositions that they can expect to be made aboard ship, but also to secure closer cooperation in fighting the guns.

364. Information before sailing.—Commanding officers should visit shipping intelligence officers before leaving home ports and the reporting officer before leaving foreign ports. This is the only method of obtaining information regarding routes, dangers, escorts, and other friendly vessels.

365. Zigzag.—Efficient zigzag day and night and full speed is absolutely necessary while in the danger zone. In one week 15 British ships were torpedoed of which 12 admitted they were not zigzagging and 2 stated they were zigzagging but could not describe the pattern used. The symmetrical zigzag is of no value. The legs should never be longer than 2 or 3 miles, except for ships with excessively high speed. The times of the different legs should be widely irregular and variation of 2 miles on either side of the base course should be made. Directions as to the route must be carried out implicitly, for those directions have been carefully compiled by experienced persons, basing their conclusions on past experience and knowledge of the location of the enemy as obtained daily from the various steamers and friendly vessels.

NOTE.—On the first cruise of the *Moewe* all ships but one captured by that vessel were off the track they were ordered to take.

366. Handling ships.—Commanding officers should have at all times definite plans of action, the relative bearing and state of the sea and wind being determined factors. Every officer must be thoroughly instructed so in the event of a submarine or periscope being sighted they can act instantly and correctly

without waiting for anyone to be informed or called. If a submarine is outside of 1,000 yards, it would be best to bring him astern. If inside 1,000 yards and abaft the beam, bring him astern. If inside 1,000 yards and forward of the beam, head straight for him and also attempt ramming. If ship is shelled, steam straight into the wind or sea, as the enemy can not operate his guns in even comparatively head seas. You may expect from the captain the latest data regarding submarine areas, so-called.

**367.** Whenever anything resembling a submarine submerged is sighted it is extremely important that the course of the ship be changed instantly at least  $90^{\circ}$ . Change of course upsets all the submarine's arrangements for firing a torpedo and gives the ship time, which is very important. In cases where the lookout sights something that is not instantly seen from the bridge the same rule should hold—change course instantly at least  $90^{\circ}$  and investigate afterwards.

**368.** If a gun's crew sights a submarine periscope, fire should be opened on it at once without waiting for orders.

**369.** Firing at a submarine on the surface at long range, get first shot over to show the submarine you can outrange it. This will drive him out to longer range where his shooting will become less accurate. *Don't waste your ammunition.*

**370.** In case of a gun-fire action with a submarine in which the submarine outranges you and maintains this by superior speed remember that by turning and heading for the submarine you either bring her within range, compel her to turn and use her small stern gun, or drive her under. No rule can be laid down as to procedure, but if confronted with the above condition don't expend too much of your ammunition without trying the above plan of charging the submarine.

**371.** Every man not actually serving the guns should keep the sharpest possible lookout for other submarines.

**372. Methods of attack.**—The general belief is that the morning and evening, during the twilight, are the most dangerous times; at such times the ships must be fully darkened, extra special lookouts set, guns ready, and this condition maintained until pitch dark or broad daylight, as the case may be. It is reasonable to believe that the submarine may follow a vessel on the surface at an extremely long distance, keeping his boat below the horizon and only taking occasional looks through his periscope, running it up for the purpose and lowering it again,



until darkness, at which time he can easily speed up and overtake the vessel and attack with torpedo. Also it is possible the submarine may attack at or just before daylight when the outline of the vessel begins to become distinct and before the periscope itself can be picked up. There is also the fact that the ship is advancing into an area which through the darkness has not yet been thoroughly observed. Slow vessels may be tracked by the submarine submerged by use of the hydrophone and attacked at daylight. The escort may be expected to take station either on the bows of the convoy or well aft on the quarter; on dark nights the latter place is best, as the greatest danger lies in a submarine tracking unless vessel has speed of approximately 10 or 12 miles. In the case of faster vessels the better place would be ahead or on the bows, especially in moonlight or clear weather, for anything passed by the convoy under the latter circumstances will not later be dangerous; the usual real danger at night, when no moon is shining, is from an occasional submarine which might be on the surface charging or getting supply of air. The zigzag should be continued at night as well as by day, and immediately after dark and just before daylight an abrupt change of course of 45 or more degrees would be sometimes advisable.

**373. Confidential papers.**—Arrangement must be made for prompt disposal of all confidential papers should the ship be attacked and in danger of capture to prevent such from falling into the enemy's hands; also no entry must be made in any of the ship's papers of the fact that other merchant vessels or men-of-war have been sighted, communicated with, helped, or heard by radio or other signal.

**374. Nights.**—Ship must be absolutely dark at all times during the night regardless of moonlight or other conditions; matches and flashlights should not be exposed on deck. Lights in living quarters may be painted blue and thus rendered almost invisible at even short distances. A searchlight mirror may sometimes reflect the moon's rays even at considerable distances; these may be turned toward the sky or kept covered. A searchlight should not be turned on at night until guns are opening fire, and then its use may sometimes be questioned, as its beams furnish something for range finders to range on. The searchlights in some cases should be placed well aft in the ship and high up the mast, or even abaft the mast on a platform, as they will then tend to lead the enemy to fire astern of the vessel. Side lights have sometimes been reversed to lead the enemy to

believe the vessel heading the opposite direction. A dingy dropped astern and having lights on it and towed with a long line, or left floating in some cases, detract the enemy's attention from the vessel attempting escape. The same result might be obtained by dropping a burning life buoy or other burning substance. A lighted match has been seen through a periscope a distance of 2 miles.

**375. Communications to engine room.**—There must be dependable communication between the bridge and engine room and the men below made to feel they will be given ample time to abandon ship in the event of such being necessary. Under no circumstances should the stations below be left without orders to do so, and when the engine room is finally abandoned the engines must be stopped. One vessel sank with her engines still turning over and some of her lifeboats were swamped by the excessive speed she was still making. Also, the ship will invariably fill with water much more rapidly under way than when lying still, as such moving usually puts extra stress on the bulkheads which may under other circumstances hold longer.

**376. Small arms.**—High-powered rifles or machine guns are useful against the crew of a submarine on the surface or against hostile aircraft. There is considerable difficulty in getting wounded men down hatches of a submarine and much delay might become fatal in case it becomes necessary to submerge. British merchantmen must carry rifles. The firing squad should be told off and available at all times for this necessary part of preservation of life and material. An unarmed British submarine encountered an armed German boat and opened fire with a high-powered repeating rifle, causing the enemy to submerge after having been compelled to abandon their guns before having fired a shot.

**377. Camouflage.**—Eccentric painting is often resorted to with good effect, the idea being to deceive the enemy as to the real character of the vessel and effect surprise on him. British submarine officers state they are often unable to tell which bow of a vessel they are on. The bow may be painted to simulate the stern and the bow and stern; it is quite desirable to appear a shorter ship, going in the opposite direction. Flagstaffs should not be carried aft; a gaff can easily be rigged on the forward side of the foremast and yards and derricks trimmed as deceptively as possible, as in that few minutes the ship may be saved. Checks of lighter color and black bands on a lighter field help render objects less conspicuous.

**378.** Concealment of the battery is often very necessary, as such a condition may cause the submarine to come to the surface, thus locating him and giving the vessel opportunity to sink him or force him to submerge by gunfire. If ship appears unarmed there is a fair chance the submarine will come to the surface and halt her with gunfire in order to economize in torpedoes, the carrying capacity of the modern submarine being quite limited. In case the submarine does not come to the surface the vessel has an almost certain chance for escape.

**379. Signals.**—Signaling apparatus must be provided, together with properly instructed personnel to operate same; the Morse and semaphore should both be carried; the Morse lamp should be screened to show only through a small arc.

**NOTE.**—Ships have run into mines through their inability to receive a simple warning signal.

**380.** Under no circumstances should any other vessel be allowed too close at sea, and any attempt to do so should be considered highly suspicious.

**381.** When attacked and radioing position and course the words "true" or "magnetic" should be always added and the meridian from which time is reckoned.

**382.** Some confidential code books have been recovered from sunken vessels by German divers, and one can not be too sure as to even the most secret code messages intercepted.

**383.** Sounding machines should be carried so vessels will never have to stop or slow their speed to take soundings.

**384.** A vessel carrying a Greek flag was sighted and a signal observed at her yardarm. This signal was made out to be "Steer north 40 degrees east." Of course this vessel had been seized by the enemy and the course would lead the unsuspecting into a trap. On other occasions ships have been compelled to fly urgent distress signals or send out S O S messages, and then as help approached the submarine would use the former vessel as a screen. As many as four vessels have been collected in this way at one time before any of them were sunk.

**385. Water-tight integrity.**—Water-tightness must be aimed at in all vessels; all holes in bulkheads stopped and bulkheads strengthened where possible. Water-tight hatch covers have kept vessels floating much longer when such were well secured in place, affording crew more time to abandon the ship. The majority of attacks have been made in smooth weather or smooth seas, and thus the survivors have a better chance of rescue.



**386. Deception.**—Unarmed ships may effect an escape through the following: Firing explosive rockets making reports similar to large guns, dropping open a conspicuously large port as though a gun was concealed by it, exposing a dummy gun, dropping down a large ventilator cowl, etc. In many cases the above methods of deception have worked successfully, causing the enemy to submerge. Before attempting the above it would be advisable to be sure the submarine is observing the ship. His attention can be drawn by a sudden change of a few points in course. While attacking with gunfire, the enemy constantly keeps two men on deck with strong field glasses to constantly observe the chase at all times.

**387. Fire party.**—A fire party must be organized; the construction gang with one or two mechanics or machinists could be instructed as to their duties and should be stationed at two separate stations for general quarters. Hose must be led out and water ready for turning on at once. An efficient action call must be installed which can be heard throughout the ship and capable of operation from the bridge only. This signal should not be given for drills or for other than call to battle stations, and surprise drills should be strictly avoided; then the personnel will know that the call means business and they will obey it more readily.

**388. Area.**—The submarine seems to be assigned a comparatively small area for operation, as is indicated by attacks reported in succession, and it is possible he receives new torpedoes and fuel at sea from a boat of the *Bremen* class. There is always the desire to economize in the use of torpedoes, which accounts for the increased attacks on the surface.

## CHAPTER XIV.

### INSTRUCTIONS FOR ARMED GUARD GUNS' CREWS.

401. If there is an officer or chief petty officer in charge of the armed guard, report to him immediately and receive your orders. If you are the senior man on board, have all other gun captains report to you. He will ordinarily assign you to your gun and instruct you in the manner in which watches are to be stood. In absence of such instructions, as would be the case should the gun captain be the senior man on board, do as follows:

Go to your gun and examine it carefully. It may differ slightly from the one at which you have been trained on board ship, but it will be essentially the same. If you find anything wrong with it, either fix it yourself or report it to proper authority. At any rate see to it that it is put in perfect working condition before date of sailing.

402. Have the hang-out for each crew in the immediate vicinity of their gun and do not allow any of them to leave it without their gun captain's express permission. Have their meals served there, and also insist that they sleep there. Give standing orders that never more than one of the gun's crew is to be absent from his station at any one time.

403. Familiarize yourself with the ship-mess arrangements, boat stowage and equipment, the boat assigned your crew in case the ship is to be abandoned, the manner in which it is got out and lowered.

404. Learn the name of the officer or chief petty officer in charge, where his room is, and where he is usually to be found. In fact, gain a complete knowledge of your gun, the ship, and the crew.

405. Rope off the space around your gun, and in port one man must be on watch and a petty officer must always be on board. There have been cases where unauthorized people have tampered with our guns. Remember this is war, and the enemy has his agents everywhere. It is particularly important while alongside docks, loading, etc., to see that lines are kept clear of gun.

406. In port keep a man on watch near the gun. This man should be armed, as there may be enemy agents on board who might attempt to disable the gun. Keep the ship's company and visitors clear of it. Have drills daily.

407. Regular watches should go on the minute you leave the dock and should be continued until you reach your destination. The exact manner in which watches should be stood can not be laid down here.

408. Divide your crew into two watches in such a manner that each watch is capable of efficiently fighting the gun independently of the other. In dangerous waters or at other times when circumstances would seem to make it advisable, the full crew must be by the gun.

409. Always see that the men are warmly clad before going on watch. Always insist on this, as the weather may change before the man comes off watch again. He must be able to take foul weather unflinchingly.

410. Hold spotting drill daily for gun captains as you have held it before leaving your ship. Remember to spot on in deflection first at long ranges. Make big changes at first, then if the target is passed, halve the correction until on. In firing, the fire must become more rapid as the range decreases.

411. Learn all about your guns and ammunition. There are included in this manual a list of points which you should know. A short study period daily will help to gain this information.

412. Provide your gun crews with rifles and machine guns if possible for use against submarine crews on deck.

413. Conceal the battery, if possible, to make the submarine come closer.

414. Drill your crews in the Morse (wigwag) signal code, and make every effort to read signals that are sent to your ship. Inability to receive signals has caused the loss of a ship. Learn to operate the signal apparatus provided.

415. See sight lighting circuit is O. K. at sunset every day.

416. Try out the gun, testing out all gear every watch, and in case the weather is bad and sprays coming over do this at least every two hours to *prevent parts from becoming stiff*. Keep the gun sights covered as much as is consistent with being *ready for instant action*. Keep sights set at the most probable range.

417. Keep tompions out. Use muzzle bags; no harm is done if, in case of emergency, you fire through them.

418. Keep the shell and powder covered at all times, but readily accesssible. Be careful it does not get wet. Keep the



gun covered as much as possible, but be careful to see that it is never covered so that it can not be gotten ready for action instantly. Assign a place for all spare parts, tools, primers, etc., see that the entire crew knows their exact location and that they are kept there at all times.

**419. Guns.**—All cartridge-case guns should be kept loaded, ammunition box opened and ready for instant service. All guns using bags of powder should be kept loaded with projectile and tanks at hand ready for use. On small steamers where seas are shipped over the forecastle, or where the weather is bad the ammunition should be kept close at hand ready for instant use.

**420.** Allow no smoking, striking of matches, or flashing of lights after dark. One ship was torpedoed while the lookout rolled a cigarette. The strictest attention to duty must be required of lookouts. Relaxation of vigilance must not be tolerated.

**421.** The gun's crew must be familiar with the duty of lookouts and while on watch must keep a bright lookout; do not depend upon somebody else to invite your attention to a periscope.

**422.** Work out plans of action for the various cases that you think might arise, and go over them repeatedly. Keep in mind that when a submarine is sighted you must act instantly. A few seconds' delay on your part due to indecision will probably be the difference between the ship's escaping and being sunk.

**423.** Make details for a fire party to handle any fires on board due to enemy fire.

**424.** Have the pointers drill at least twice a day at pointing and training, and have the loading crew go through the motions of loading. If opportunity offers, hold target practice, allowing the pointers four or five shots.

**425.** Keep enough life preservers for the entire crew at the gun. When in the danger zone, wear them if they don't interfere with your service at the gun.

**426.** Insist that the ship be darkened at night and kept so; send a man to inspect the ship each hour from sunset to sunrise. Allow no man to smoke on deck. A match under such conditions can be seen 2 miles and the glow of a lighted cigarette a half a mile.

**427.** Have some signal for general quarters that can not be mistaken for anything else and see that every member on the armed guard knows what it is. (Alarm gongs should be established in quarters of crew and armed guard commander if possible.) Insist on promptness and speed.

428. On going on watch the gun captain reports to the armed-guard commander when gun is ready. While at sea the gun must be ready at all times, and its condition as regards readiness must be reported to the guard commander at the beginning of each watch.

429. Have the men in the watch on deck, but not on lookout, keep awake and remain at the guns. During the night the gun captain should be called every time the watch is relieved, and make sure that the men coming on are wide awake before taking over the watch. Never allow a man on the watch on deck to leave for any purpose without being relieved by a man off watch.

430. German submarines can heave to submerged; therefore avoid all floating objects, as they may be (1) floating mines or (2) objects attached to a submarine lying submerged.

431. Steamers report having fired at objects which they thought were submarines, which they later found to be targets that must have been dropped by other ships. The sea is probably full of such objects, but at the same time no chances can be taken; fire upon any suspicious objects without waiting to investigate.

432. A periscope is a very difficult thing to hit, but you surely can't hit it if you *don't shoot*, and it won't give you much time to make up your mind about it. Even if you should hit it, you will probably not seriously injure the submarine, but you will probably prevent him from sinking you. Remember you are not out after submarines. You are on board to prevent submarines from getting you. If you should happen to sink one, though, don't feel badly about it.

433. If a periscope is sighted keep a hot fire on it, for, even if you aren't actually hitting, a submarine will find shells bursting near very unpleasant.

434. Should he elect to try it out with you on the surface, fire slowly and deliberately and spot carefully.

435. Remember, a poor plan quickly and sanely executed is better than an excellent plan slowly and indecisively carried out.

436. Act! Do something! Don't pussy foot. If you are torpedoed, fight your gun to the bitter end. Never tamely give up the ship, but continue to harass the submarine while sending your S. O. S. calls.

437. Should it become necessary for you to abandon the ship, first destroy all confidential publications you may have in your possession; take your assigned place in your boat, first putting

on your life preservers. Steel yourself for a severe trip, keep your head, and don't give in. You may find it to your advantage now if on the way over you have studied the chart and know your approximate position and the course and distance to the nearest land. The boat should be provided with some means of making signals or otherwise attracting the attention of a distant passing vessel. On reaching shore report immediately to the nearest United States naval officer or United States consul.

**438. Discipline.**—(a) Men on watch shall not smoke.

(b) Men shall keep themselves clean, in proper uniform, and shall bear themselves as befits a man-o'-war's man.

(c) All unauthorized persons shall be kept clear of guns and ammunition at all times.

(d) On passenger ships passengers shall be kept clear of the guns. Men shall not be allowed to mingle with the passengers.

(e) Drinking wines, beers, or liquors is strictly prohibited.

(f) Gambling or being present at gambling is prohibited.

(g) Sentries on duty will wear revolvers. (Loaded, ready for instant use.)

(h) Members of the armed guard shall keep their quarters clean and orderly.

**439.** There shall be no surrender and no abandoning ship so long as the guns can be fought. In case of casualty to members of the gun crew, the remaining men shall continue to serve the gun. The department considers that so long as a ship floats on which men of the Navy are performing duty as armed guards that they should remain thereon and take every opportunity that may present itself to destroy the submarine. To this end the department has requested that inasmuch as it is probable that before broaching the submarine will first circle with her periscope only exposed in order to assure herself that the ship has been abandoned, that all men at the guns should lie down or otherwise conceal themselves and wait until the submarine has fully emerged, and, if possible, until it is seen that its conning tower has been opened.



## CHAPTER XV.

### GENERAL INSTRUCTIONS, ARMED-GUARD CREWS.

451. The following order will be read and explained to members of armed-guard crews, and a printed copy furnished them.

COMMUNICATION IN CASE OF CAPTURE BY GERMAN FORCES.

NAVY DEPARTMENT,  
*Washington, D. C., July 5, 1917.*

1. By direction of the State Department, there has been formed in Berne, Switzerland, an organization to cooperate with the Spanish Ambassador in Berlin, representing American interest in Germany, for the relief of Americans who are now or may be in the future detained as prisoners of war in Germany. The name thereof is the "American Prisoners Central Committee," address Berne, Switzerland.

2. All officers and enlisted men of the Navy and Marine Corps and all others operating under the Navy Department are hereby directed in case of capture by German forces to communicate with the above-named committee.

JOSEPHUS DANIELS,  
*Secretary of the Navy.*

NOTE.—Arrangements have been made by the State Department with American diplomatic officers in London, Paris, Rome, Madrid, Petrograd, Lisbon, The Hague, Stockholm, Copenhagen, Christiania, and Athens by which American consuls may issue "Seamen's identification certificates" to members of the armed guard. The consuls accept the identification cards issued by the Navy Department as proof of identity. The certificates issued by the consuls must all be returned to the consul by the commander of the armed guard before the ship sails. They are to use when you go ashore.

452. The training of men and petty officers for special broad-side crews for armed-guard duty on transports and liners, should be thorough in the branches of the service that they are to perform.

453. These crews must be trained in the least possible time, and as they are in training for special duty, the courses laid

out should be the special branches necessary for defense against submarines.

454. These crews are primarily for defense only, and they should understand that their duty is the safeguarding of the transport or liner that they may be attached to.

455. Gun captains and all members of these crews must thoroughly understand the use of all ordnance material that is in use on these ships, as well as the need of continuous vigilance from the time that ship leaves port until it reaches its destination.

456. Their first duty is to protect their vessel. To do this will require their best efforts so they can at once master any situation that arises. The information and instructions which follow will, if carefully observed, greatly assist them; but nothing which follows must be allowed to conflict with orders which may be received from proper authority.

457. Secret instructions are issued by the Navy Department to the officer in charge of the armed guard. The following notes and instructions have been compiled from various sources of information from abroad and from the experience of officers who have made trips on armed merchant vessels and are issued for guidance to those in charge, gun captains and petty officers, who should consider them as confidential.

458. The crews must be made to realize that the safety of the lives on board and of the vessel itself is dependent upon them. They should at all times conduct themselves in such a manner as to reflect credit upon the service they represent as well as upon the ship that is sending them out. Petty officers will at all times maintain discipline among their crews and will cooperate with the officers of the ship in the defense of the vessel. Each gun captain will see that every member of his crew keeps himself and his clothes neat and to that end will inspect them daily at quarters and will hold frequent bag inspections. When at their gun stations they must be alert and always ready for instant service. This becomes most important when in the barred zone, when all lookouts and guns' crews must be especially vigilant.

459. The United States is at war. Constantly bear this in mind and bring yourself to realize what it means. No details of these instructions are of minor importance, none of the instructions given you on board ship are of minor importance—all are of the very greatest importance. Never before in your lives have you, and perhaps never again in your lives, will you be engaged on such serious duty. You wear the uniform of the United States Navy, you are a representative of it. The manner

in which you bear yourselves at all times and the manner in which you acquit yourselves in time of peril will reflect either credit or discredit on this service.

460. Do not forget that wherever you go you represent the United States Navy. The department and the country expects that your conduct will bring honor to the Navy and to the United States.

461. Upon the completion of your training on board ship you will ordinarily be transferred to a receiving ship for further transfer to an armed merchantman. There may be, and likely will be, either an officer or chief petty officer in charge of armed-guard crews on board. Gun captains will report to him and subject themselves to his orders, but this will in no wise relieve them of any responsibility with which they are charged in respect to their own crew. Members of gun crews will not fraternize with the merchant crew of the ship. They will, however, be respectful in their deportment to the captain and officers and will guard against unfriendly feeling arising between the armed crews and the ship's company. The merchant service has its customs and traditions, which should receive your respect and observance. Be careful to inform yourself of these customs and instruct your men in their observance. The custom of saying "Sir" when addressing an officer holds in the merchant service as in the Navy. Men, other than officers, when going on the bridge must use the port ladder. Officers' quarters, or their parts of ship, are not to be entered by men except on duty. Your attention is particularly invited to the necessity of establishing pleasant relations from the very start.

462. You are placed on board this merchant vessel to get her safely through to her destination. That is your mission.

463. Outfits of specially designed winter clothing will be issued to armed guards. This outfit includes—

- Two heavy woolen undershirts.

- Two extra-heavy woolen underdrawers.

- Two pairs heavy woolen socks.

- One blanket overshirt with hood.

- One wind-proof suit with hood (to be worn over all).

- One pair woolen mittens.

- One pair heavy arctics, to be worn over ordinary shoes.

It must be impressed upon each person to whom this clothing is issued that it is Government property and is merely loaned for use under emergency conditions.

464. The gun captain will keep a notebook, in which will be entered a complete list of the clothing of each man, and the gun



captain shall see that any deficiencies are made up at the first opportunity to draw stores. The guard should have a complete outfit of heavy clothes, boots, rain clothes, and peajackets. Woolen underwear is especially desirable to guard against exposure in open boats, and particularly necessary in case of wet clothes due to rain or boat capsizing.

465. The gun captain must realize that he is always responsible for his crew, that he is always on duty, and that he has the necessary authority to carry out his orders. He must be brought to a full realization of his responsibilities and to the fact that he must be the leader of this crew as well as its commander.

466. Attention is invited to the following order:

File 2868.

UNITED STATES ATLANTIC FLEET,  
U. S. S. "PENNSYLVANIA," FLAGSHIP,  
5 July, 1917.

From: Commander in Chief,  
To: Atlantic Fleet.

Subject: Reoutfitting of enlisted men whose effects have been lost due to the operations of the war.

1. The Secretary of the Navy has authorized the issue of new clothing to enlisted men of the Navy who have lost their effects due to the loss of merchant vessels upon which they were performing duty, through the operations of war; the total value of such issue not to exceed sixty dollars (\$60), and such issue to be charged to "Contingent, Navy," until such time as special provision is made by Congress.

2. It is desired that such reoutfitting shall be done as expeditiously as possible, and commanding officers are authorized to pass upon claims of such men as may be under their command, who have lost, or may lose, their effects due to the sinking of merchant ships upon which they may be serving, through such operations of war, and to issue to them new clothing to replace regulation clothing actually lost, such replacement not to exceed in value sixty dollars (\$60).

3. Treasury Department form, Auditor for the Navy Department, 3723, "Claim for reimbursement for property lost in a marine disaster," may be used in connection with the issue of the clothing, but it is not intended that any claims under this order shall go to the Auditor for the Navy Department, but shall be settled at once on board ship.

## CHAPTER XVI.

### LIST OF REFERENCE BOOKS.

#### SPECIAL LIST OF REFERENCE BOOKS.

##### 476. A. Seamanship.—

1. Obligations, responsibilities, and obedience.
2. Boats, types, gear, and equipment. Lifeboats at sea.
3. Tackles, life preservers, and rescue.
4. Abandon ship and fire drills.
5. Ground tackle.
6. Compass, log, and lead.
7. Sea terms and the uses.
8. Rules of the road.
9. Marlinespike seamanship.
10. Signaling.
1. Obligations, etc.:
  - (a) Bluejacket's Manual, pp. 659-665, 685, 686, 31.  
Naval Instructions, art. 2505 (2).  
Navy Regulations, art. 3401-3405.
2. Boats:
  - (a) Bluejacket's Manual, pp. 231-241.  
Deck and Boat Book, pp. 9-21.  
Fleet Regulations, art. 480.
  - (b) Bluejacket's Manual, pp. 477-480.  
Deck and Boat Book, pp. 22-29.  
Fleet Regulations, art. 479(d).
  - (c) Bluejacket's Manual, pp. 244-246, 480-485, 498.  
Deck and Boat Book, pp. 30-47.
  - (d) Bluejacket's Manual, pp. 246-259, 486-497, 499.  
Deck and Boat Book, pp. 47-60.
3. Tackles, life preservers, and rescue work:
  - (a) Bluejacket's Manual, pp. 303-318, 541-543.
  - (b) Bluejacket's Manual, pp. 217-220, 198-203.  
Deck and Boat Book, pp. 27-29.  
Fleet Regulations, art. 476-479.

4. Abandon ship and fire drills:
  - (a) Naval Instructions, art. 2505-2506.
  - (b) Ship and gun drills, pp. 39-50.
5. Ground tackle:
  - (a) Bluejacket's Manual, pp 541-543, 544-547, 303-318.
6. Compass, log, and lead line:
  - (a) Bluejacket's Manual, pp. 319-338, 551-557.
7. Sea terms:
  - (a) Bluejacket's Manual, pp. 285-300, 89-104.  
Deck and boat book, pp. 76-79.
  - (b) Bluejacket's Manual, pp. 499-502.  
Navy Regulations, art. 1100-1254.  
Fleet Regulations, art. 487.
8. Rules of the road:
  - (a) Bluejacket's Manual, pp. 502-506.  
Deck and boat book, pp. 80-83.  
Navy Regulations, chap. 41.
9. Marlinespike seamanship:
  - (a) Bluejacket's Manual, pp. 255-265, 509.
10. Signaling:
  - (a) Bluejacket's Manual, pp. 440-446.
  - (b) Deck and boat book, pp. 105, 114-118; Chap. X and  
Plates V, VI, VII, and VIII.

#### B. Ordnance and gunnery.—

1. Care and cleaning of the battery, names of parts.
2. Powder and shell stowage and marking.
3. Sights, marks, and mounts.
4. Breech mechanism, firing attachments, recoil cylinders.
5. Springfield rifle, Colt pistol instruction.
6. Machine gun, Lewis and Colt.
7. Safety precautions, misfires, and hangfires.
8. Casualties and their remedies.
9. Preparation of battery for firing.
10. Station and drill 3, 4, 5, and 6 inch guns' crews.
1. Care and cleaning of battery:
  - (a) Naval Instructions, art. 2881-2896.  
Ship and gun drills, art. 50L.  
Bluejacket's Manual, pp. 695-700.  
Ordnance pamphlet No. 560 A.
2. Powder and shell stowage and marking:
  - (a) Bluejacket's Manual, pp. 446-447-701.  
Ship and Gun Drills, art. 518, 525, 537.  
Ordnance Pamphlets.



3. Sights and mounts:
  - (a) Bluejacket's Manual, pp. 711-712.  
Ship and Gun Drills, arts. 514-515.
4. Breech mechanism.—Firing attachments and recoil cylinders:
  - (a) Bluejacket's Manual, pp. 442, 445, 600, 611.  
Ship and Gun Drills, arts. 509-512.
5. (a) Springfield rifle:
  - (a) Bluejacket's Manual, pp. 401-419.
  - (b) Colt pistol:
    - (b) Bluejacket's Manual, pp. 420-427.
6. The automatic:
  1. Colt; 2. Lewis; 3. Benet-Mercier.  
Ordnance Pamphlets, 1915.  
Bluejacket's Manual, pp. 391.  
Ordnance and Gunnery, 1915.  
Pamphlet on Lewis Guns.
7. Safety precautions:
  - (a) Bluejacket's Manual, pp. 611-619.  
Naval Instructions, 2851-2876.  
Bluejacket's Manual, pp. 695-700.  
Naval Instructions, arts. 2881-2896.
10. Drill of gun's crew:
  - (a) Bluejacket's Manual, pp. 31, 60.  
Ship and Gun Drill, pp. 450-456.  
Standard Gun Drills.
11. Ordnance Pamphlet 560 A has been specially prepared by the Bureau of Ordnance for the instruction of armed guard crews.

## CHAPTER XVII.

### TARGETS.

486. The screens will be furnished by the Bureau of Ordnance and will be war color. They shall be numbered serially with white numbers 2 feet high, painted in the lower right-hand rectangle, and also should be tagged with weatherproof tags numbered likewise in order to avoid confusion of screens.

487. The screens will be 15 feet long and 12 feet wide.

488. The width of the screen is its vertical height when properly spread.

489. All screens shall be divided into 16 equal rectangles by three vertical lines and three horizontal lines not more than 2 inches wide.

490. Each screen shall have in its center a white bull's-eye 3 feet square.

491. When properly spread the lower edge of the screen will be parallel to and 2 feet from the working platform of the raft.

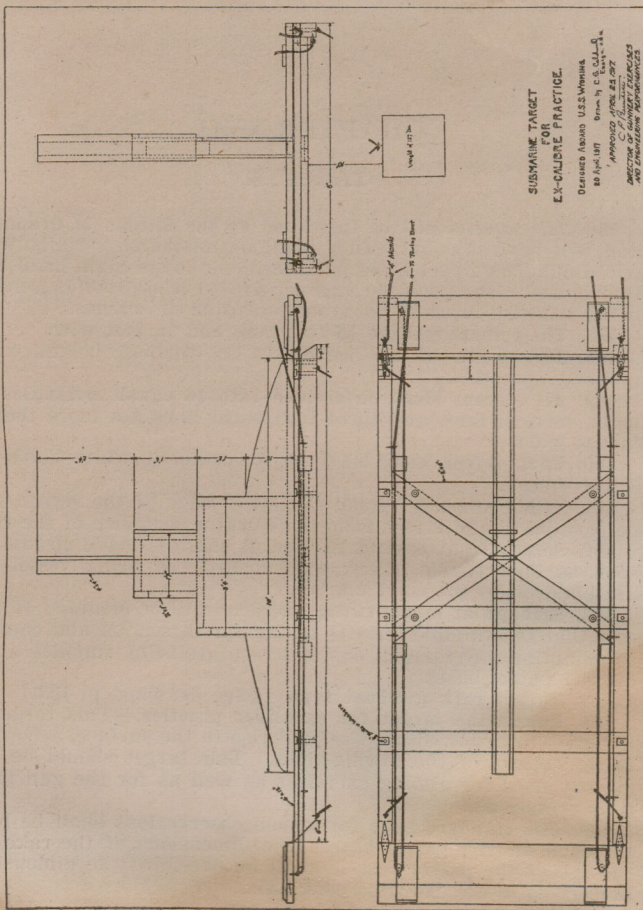
492. Screens that have been fired at shall be made up and, as soon as opportunity offers, sent aboard the firing vessel for examination by the chief umpire.

493. Triangular target rafts.—Screens will be mounted on any raft that is available. Rafts triangular in section and capable of mounting a pyramidal or flat screen are being supplied at all district patrol bases.

494. Target raft, gunboat type. (See drawing, p. 133.)

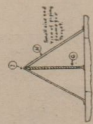
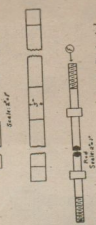
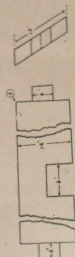
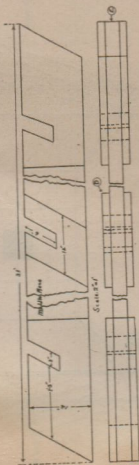
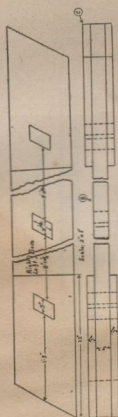
495. Submarine target for ex-caliber practice.—This target is designed to be towed, to dive, and rise to the surface, according to the control of the towing lines. This target should be frequently used for aiming exercises as well as for the gun practices prescribed.

496. One standard rake for splash observations shall be built for each district patrol base. The dimensions of the rake for the use of the patrol vessels shall be one-third the dimensions prescribed in the drawing, page 135.

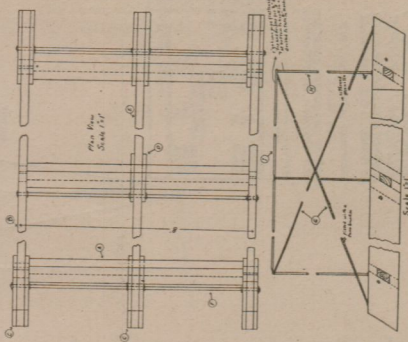




EX-CAL TKAHEET RARET  
FLORIDA TYPE



Ball of Material		
Ind.	Article	Weight in lbs. Material
A	Case One	12 5/8
B	Case Two	12 3/4
C	Ball Base	12 1/4
D	Ball	12 1/4
E	Weight	12 1/4
F	Case	12 1/4
G	Strength Rod	12 1/4
H	Base	12 1/4
I	Weight	12 1/4
J	Strength Rod	12 1/4
K	Base	12 1/4
L	Weight	12 1/4
M	Strength Rod	12 1/4
N	Base	12 1/4
O	Weight	12 1/4
P	Strength Rod	12 1/4
Q	Base	12 1/4
R	Weight	12 1/4
S	Strength Rod	12 1/4
T	Base	12 1/4
U	Weight	12 1/4
V	Strength Rod	12 1/4
W	Base	12 1/4
X	Weight	12 1/4
Y	Strength Rod	12 1/4
Z	Base	12 1/4
AA	Weight	12 1/4
AB	Strength Rod	12 1/4
AC	Base	12 1/4
AD	Weight	12 1/4
AE	Strength Rod	12 1/4
AF	Base	12 1/4
AG	Weight	12 1/4
AH	Strength Rod	12 1/4
AI	Base	12 1/4
AJ	Weight	12 1/4
AK	Strength Rod	12 1/4
AL	Base	12 1/4
AM	Weight	12 1/4
AN	Strength Rod	12 1/4
AO	Base	12 1/4
AP	Weight	12 1/4
AQ	Strength Rod	12 1/4
AR	Base	12 1/4
AS	Weight	12 1/4
AT	Strength Rod	12 1/4
AU	Base	12 1/4
AV	Weight	12 1/4
AW	Strength Rod	12 1/4
AX	Base	12 1/4
AY	Weight	12 1/4
AZ	Strength Rod	12 1/4
BA	Base	12 1/4
BB	Weight	12 1/4
BC	Strength Rod	12 1/4
BD	Base	12 1/4
BE	Weight	12 1/4
BF	Strength Rod	12 1/4
BG	Base	12 1/4
BH	Weight	12 1/4
BI	Strength Rod	12 1/4
BJ	Base	12 1/4
BK	Weight	12 1/4
BL	Strength Rod	12 1/4
BM	Base	12 1/4
BN	Weight	12 1/4
BO	Strength Rod	12 1/4
BP	Base	12 1/4
BQ	Weight	12 1/4
BR	Strength Rod	12 1/4
BS	Base	12 1/4
BT	Weight	12 1/4
BU	Strength Rod	12 1/4
BV	Base	12 1/4
BW	Weight	12 1/4
BX	Strength Rod	12 1/4
BY	Base	12 1/4
BZ	Weight	12 1/4
CA	Strength Rod	12 1/4
CB	Base	12 1/4
CC	Weight	12 1/4
CD	Strength Rod	12 1/4
CE	Base	12 1/4
CF	Weight	12 1/4
CG	Strength Rod	12 1/4
CH	Base	12 1/4
CI	Weight	12 1/4
CJ	Strength Rod	12 1/4
CK	Base	12 1/4
CL	Weight	12 1/4
CM	Strength Rod	12 1/4
CN	Base	12 1/4
CO	Weight	12 1/4
CP	Strength Rod	12 1/4
CQ	Base	12 1/4
CR	Weight	12 1/4
CS	Strength Rod	12 1/4
CT	Base	12 1/4
CU	Weight	12 1/4
CV	Strength Rod	12 1/4
CW	Base	12 1/4
CX	Weight	12 1/4
CY	Strength Rod	12 1/4
CZ	Base	12 1/4
DA	Weight	12 1/4
DB	Strength Rod	12 1/4
DC	Base	12 1/4
DD	Weight	12 1/4
DE	Strength Rod	12 1/4
DF	Base	12 1/4
DG	Weight	12 1/4
DH	Strength Rod	12 1/4
DI	Base	12 1/4
DJ	Weight	12 1/4
DK	Strength Rod	12 1/4
DL	Base	12 1/4
DM	Weight	12 1/4
DN	Strength Rod	12 1/4
DO	Base	12 1/4
DP	Weight	12 1/4
DQ	Strength Rod	12 1/4
DR	Base	12 1/4
DS	Weight	12 1/4
DT	Strength Rod	12 1/4
DU	Base	12 1/4
DV	Weight	12 1/4
DW	Strength Rod	12 1/4
DX	Base	12 1/4
DY	Weight	12 1/4
DZ	Strength Rod	12 1/4
EA	Base	12 1/4
EB	Weight	12 1/4
EC	Strength Rod	12 1/4
ED	Base	12 1/4
EE	Weight	12 1/4
EF	Strength Rod	12 1/4
EG	Base	12 1/4
EH	Weight	12 1/4
EI	Strength Rod	12 1/4
EJ	Base	12 1/4
EK	Weight	12 1/4
EL	Strength Rod	12 1/4
EM	Base	12 1/4
EN	Weight	12 1/4
EO	Strength Rod	12 1/4
EP	Base	12 1/4
EQ	Weight	12 1/4
ER	Strength Rod	12 1/4
ES	Base	12 1/4
ET	Weight	12 1/4
EU	Strength Rod	12 1/4
EV	Base	12 1/4
EW	Weight	12 1/4
EX	Strength Rod	12 1/4
EY	Base	12 1/4
EZ	Weight	12 1/4
FA	Strength Rod	12 1/4
FB	Base	12 1/4
FC	Weight	12 1/4
FD	Strength Rod	12 1/4
FE	Base	12 1/4
FF	Weight	12 1/4
FG	Strength Rod	12 1/4
FH	Base	12 1/4
FI	Weight	12 1/4
FJ	Strength Rod	12 1/4
FK	Base	12 1/4
FL	Weight	12 1/4
FM	Strength Rod	12 1/4
FN	Base	12 1/4
FO	Weight	12 1/4
FP	Strength Rod	12 1/4
FO	Base	12 1/4
FP	Weight	12 1/4
FQ	Strength Rod	12 1/4
FR	Base	12 1/4
FS	Weight	12 1/4
FT	Strength Rod	12 1/4
FU	Base	12 1/4
FV	Weight	12 1/4
FW	Strength Rod	12 1/4
FX	Base	12 1/4
FY	Weight	12 1/4
FZ	Strength Rod	12 1/4
GA	Base	12 1/4
GB	Weight	12 1/4
GC	Strength Rod	12 1/4
GD	Base	12 1/4
GE	Weight	12 1/4
GF	Strength Rod	12 1/4
GG	Base	12 1/4
GH	Weight	12 1/4
GI	Strength Rod	12 1/4
GJ	Base	12 1/4
GK	Weight	12 1/4
GL	Strength Rod	12 1/4
GM	Base	12 1/4
GN	Weight	12 1/4
GO	Strength Rod	12 1/4
GP	Base	12 1/4
GQ	Weight	12 1/4
GR	Strength Rod	12 1/4
GS	Base	12 1/4
GT	Weight	12 1/4
GU	Strength Rod	12 1/4
GV	Base	12 1/4
GW	Weight	12 1/4
GX	Strength Rod	12 1/4
GY	Base	12 1/4
GZ	Weight	12 1/4
HA	Strength Rod	12 1/4
HB	Base	12 1/4
HC	Weight	12 1/4
HD	Strength Rod	12 1/4
HE	Base	12 1/4
HF	Weight	12 1/4
HG	Strength Rod	12 1/4
HH	Base	12 1/4
HI	Weight	12 1/4
HJ	Strength Rod	12 1/4
HK	Base	12 1/4
HL	Weight	12 1/4
HM	Strength Rod	12 1/4
HN	Base	12 1/4
HO	Weight	12 1/4
HP	Strength Rod	12 1/4
HO	Base	12 1/4
HP	Weight	12 1/4
HQ	Strength Rod	12 1/4
HR	Base	12 1/4
HS	Weight	12 1/4
HT	Strength Rod	12 1/4
HU	Base	12 1/4
HV	Weight	12 1/4
HW	Strength Rod	12 1/4
HX	Base	12 1/4
HY	Weight	12 1/4
HZ	Strength Rod	12 1/4
IA	Base	12 1/4
IB	Weight	12 1/4
IC	Strength Rod	12 1/4
ID	Base	12 1/4
IE	Weight	12 1/4
IF	Strength Rod	12 1/4
IG	Base	12 1/4
IH	Weight	12 1/4
II	Strength Rod	12 1/4
IJ	Base	12 1/4
IK	Weight	12 1/4
IL	Strength Rod	12 1/4
IM	Base	12 1/4
IN	Weight	12 1/4
IO	Strength Rod	12 1/4
IP	Base	12 1/4
IQ	Weight	12 1/4
IR	Strength Rod	12 1/4
IS	Base	12 1/4
IT	Weight	12 1/4
IU	Strength Rod	12 1/4
IV	Base	12 1/4
IV	Weight	12 1/4
IW	Strength Rod	12 1/4
IX	Base	12 1/4
IY	Weight	12 1/4
IZ	Strength Rod	12 1/4
JA	Base	12 1/4
JB	Weight	12 1/4
JC	Strength Rod	12 1/4
JD	Base	12 1/4
JE	Weight	12 1/4
JF	Strength Rod	12 1/4
JG	Base	12 1/4
JH	Weight	12 1/4
JI	Strength Rod	12 1/4
JJ	Base	12 1/4
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JL	Strength Rod	12 1/4
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JN	Weight	12 1/4
JO	Strength Rod	12 1/4
JP	Base	12 1/4
JQ	Weight	12 1/4
JR	Strength Rod	12 1/4
JS	Base	12 1/4
JT	Weight	12 1/4
JU	Strength Rod	12 1/4
JV	Base	12 1/4
JW	Weight	12 1/4
JX	Strength Rod	12 1/4
JY	Base	12 1/4
JZ	Weight	12 1/4
KA	Strength Rod	12 1/4
KB	Base	12 1/4
KC	Weight	12 1/4
KD	Strength Rod	12 1/4
KE	Base	12 1/4
KE	Weight	12 1/4
KF	Strength Rod	12 1/4
KG	Base	12 1/4
KH	Weight	12 1/4
KI	Strength Rod	12 1/4
KJ	Base	12 1/4
KK	Weight	12 1/4
KL	Strength Rod	12 1/4
KL	Base	12 1/4
KM	Weight	12 1/4
KN	Strength Rod	12 1/4
KO	Base	12 1/4
KO	Weight	12 1/4
KP	Strength Rod	12 1/4
KR	Base	12 1/4
KS	Weight	12 1/4
KT	Strength Rod	12 1/4
KU	Base	12 1/4
KV	Weight	12 1/4
KW	Strength Rod	12 1/4
KX	Base	12 1/4
KY	Weight	12 1/4
KZ	Strength Rod	12 1/4
LA	Base	12 1/4
LB	Weight	12 1/4
LC	Strength Rod	12 1/4
LD	Base	12 1/4
LE	Weight	12 1/4
LE	Strength Rod	12 1/4
LF	Base	12 1/4
LG	Weight	12 1/4
LI	Strength Rod	12 1/4
LJ	Base	12 1/4
LK	Weight	12 1/4
LL	Strength Rod	12 1/4
LM	Base	12 1/4
LN	Weight	12 1/4
LO	Strength Rod	12 1/4
LP	Base	12 1/4
LQ	Weight	12 1/4
LR	Strength Rod	12 1/4
LS	Base	12 1/4
LT	Weight	12 1/4
LU	Strength Rod	12 1/4
LV	Base	12 1/4
LV	Weight	12 1/4
LW	Strength Rod	12 1/4
LX	Base	12 1/4
LY	Weight	12 1/4
LZ	Strength Rod	12 1/4
MA	Base	12 1/4
MB	Weight	12 1/4
MC	Strength Rod	12 1/4
MD	Base	12 1/4
ME	Weight	12 1/4
ME	Strength Rod	12 1/4
MF	Base	12 1/4
MG	Weight	12 1/4
MI	Strength Rod	12 1/4
MJ	Base	12 1/4
MK	Weight	12 1/4
ML	Strength Rod	12 1/4
MM	Base	12 1/4
MN	Weight	12 1/4
MO	Strength Rod	12 1/4
MP	Base	12 1/4
MQ	Weight	12 1/4
MR	Strength Rod	12 1/4
MS	Base	12 1/4
MT	Weight	12 1/4
MU	Strength Rod	12 1/4
MV	Base	12 1/4
MV	Weight	12 1/4
MW	Strength Rod	12 1/4
MX	Base	12 1/4
MY	Weight	12 1/4
MZ	Strength Rod	12 1/4
NA	Base	12 1/4
NB	Weight	12 1/4
NC	Strength Rod	12 1/4
ND	Base	12 1/4
NE	Weight	12 1/4
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NE	Weight	12 1/4
NE	Strength Rod	12 1/4
NE	Base	12 1/4
NE	Weight	12 1/4
NE	Strength Rod	12 1/4
NE	Base	12 1/4
NE		



APPROVED: 4-18-1967

CONTRACT OF GUARANTEE FOR SALE OF  
AND EXCHANGE OF PROPERTY

**TARGET RAFT**  
**GUNBOAT TYPE**  
DESIGNED AND CONSTRUCTED  
ON BOARD U. S. S. NASHVILLE

ON BOARD U. S. S. NASHVILLE

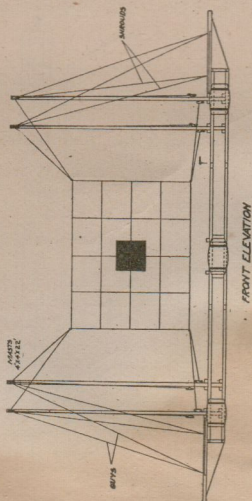
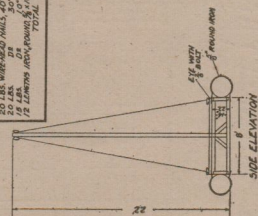
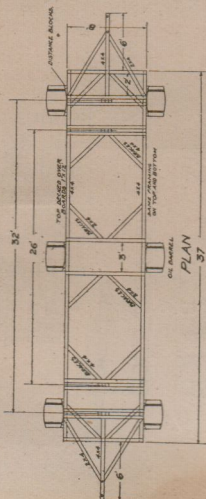
APPROVED APRIL 26, 1917

C. A. Plunkett.

**DIRECTOR OF GUNNERY EXERCISES  
AND ENGINEERING PERFORMANCES.**

**MATERIAL REQUIRED:**

		174 B.M.
MINISTS YELLOW PINE 45x22		
FRAMING DR	45x16	648 B.M.
BOARDS DR	2x4x16	88 B.M.
DECKING DR	1x12x16	296 B.M.
TOTAL	1206 B.M.	
COST		\$ 57.29
MISCELLANEOUS		
20 LBS. WIRE-HEAD NAILS, 40°		0.40
20 LBS. DR	30°	0.40
15 LBS. DR	10°	0.30
1/2 LENGTH IRON, ROUNDS 1/2x16 (48 LBS.)		9.25
TOTAL COST		67.64



## CHAPTER XVIII.

### OBSERVATIONS OF THE FALL OF SHOT.

#### RAKE OBSERVATIONS.

506. Standard rake for splash observations—Nomenclature—

- (1) Rake arm.
- (2) Sighting arm.
- (3) Parallax arm.
- (4) Parallel motion link.
- (5) Stationary sight.
- (6) Stationary sight block.
- (7) Sliding sight.
- (8) Parallel motion link connections.
- (9) Sighting arm clamp.
- (10) Sighting arm carrier bar.

*Description.*—The rake is designed for mounting in a 1-pounder cage stand, and for that purpose a large cylindrical plug of appropriate size is fitted to carry the large pivot pin passing through the "sighting arm carrier bar" (10) and through this plug, the pivot pin carrying one washer under its head, one washer between each separate piece through which it passes, and a nut with cotter pin at its upper end.

The "rake arm" (1) is shellacked, as are all other wooden parts of the instrument, and the use of the color "yellow" as a mark on the beveled edge has been abandoned, owing to its poor visibility against that background.

In order to obtain the greatest range of adjustment of the "sighting arm" (2), together with compactness of the instrument as a whole, the "carrier bar" (10) is used, the "sighting arm" (2) is thrust offset by the width of the "carrier bar" but the line of sight is brought back into proper alignment by the use of the "stationary sight block" (6) secured to the end of the "sighting arm" (2). The "parallax arm" (3) and the "sighting arm carrier bar" (10) are extended forward of the point of their pivot with the "rake arm" (1) by an appropriate amount so that the "parallel motion link" (4) can be attached on the side of the "rake arm" away from the operator, thus eliminating any congestion or interference of the several parts





of the instrument when the settings of the "stationary sight" (5) and the "sliding sight" (7) are close to the "rake arm," as will be the case during observations taken when a short towline length are being used.

The "sighting arm" (2) is graduated for towline lengths from 300 yards to 1,300 yards, and is made adjustable in its set length by means of the "sighting arm clamps" (9), the graduation representing the towline length being set in coincidence with the arrowhead pointer on the "sighting arm carrier bar" (10). If any increase over 1,300 yards in towline lengths is being anticipated it will only be necessary to increase the original length of the "sighting arm" (2) by an appropriate amount.

The reading edge of the "rake arm" (1) is beveled in order that the colored distinguishing marks will run as close as possible to the base of the pins and thus reduce to a minimum the possibility of confusing adjacent pins during the hasty observations necessary with the several shots of a large salvo.

The "parallax arm" (3) is graduated in inches from its pivot with the "rake arm" (1) so that the forward edge (edge nearest the "rake arm") of the rectangular strap piece forming the base for the sighting pin is the reading edge. By a very short and easy solution of similar triangles where approximate mean range of firing ship, towline length, and length of "rake arm" are known, the correct setting of the "sliding sight" (7) is easily determined.

For maintaining the "rake arm" (1) parallel to the line of fire, the operator at the "sliding sight" (7) must align the pin of the "sliding sight," and the right end pin on the "rake arm" with the firing ship.

**507. Personnel of one rake party.**—(1) One officer, to make observations and in charge of party (line officer of rank not below lieutenant, junior grade). (2) As many officers and reliable petty officers and assistants as may be necessary to man two rakes.

**508. Observations.**—The following data will be obtained, the duty of each member of the rake party being prescribed by the officer in charge:

For each shot or salvo fired from firing ship—

(1) Time of flash of each shot or salvo (0 second at flash of first shot or salvo).

(2) Number of shots observed in salvo.

(3) Actual amount over or short of the point of reference, in yards, of each shot. (Edge of splash toward firing ship should

be observed, not center of splash. Point of reference is the middle of target at water line.)

**509. Recording the observations.**—The officer in charge of the observation party will see that the rake or instrument used for measuring the apparent amount over or short is properly graduated, and that when taking observations the observer is at the exact distance from the center of the target raft (not the bow) corresponding to the graduations on the instrument. The above must be certified to in a report to the department forwarding the "Report of observations."



## CHAPTER XIX.

### SPOTTING PRACTICE.

#### VESSELS OF THE DISTRICT NAVAL FORCE.

521. The ammunition allowance for spotting practice is, for 1-pounder and above, 20 rounds per gun; for machine guns smaller than 1-pounder, 200 rounds per gun.

522. In order to conduct this spotting practice, the following are necessary: One observing vessel, one spotting vessel. The observing vessel may be a ship's boat detailed from the firing vessel in case no observing vessel is available.

523. The target will be a screen 15 feet long and 12 feet wide, mounted as prescribed in articles 491 and 493.

524. The ammunition for each caliber shall be fired as follows: For 1-pounder or larger caliber—

(a) Two single shots to determine correct range and deflection.

(b) Six strings of three shots each.

For machine guns smaller than 1-pounder—

(c) Twenty single shots to determine correct range and deflection.

(d) Six strings of 30 shots each.

525. The stations and duties of ships conducting spotting practice shall be as follows:

(a) Observing ship anchored 150 yards from target. The bearing of the observing ship from the target shall be the base course.

(b) The firing ship shall be under way, speed 1 knot less than maximum speed, on a line parallel to the base course and which, when continued, will bring the target 800 yards when abeam.

(c) Commence firing for single shots and for each string of shots shall be given when the target bears  $70^{\circ}$  from the base course, the firing ship making the prescribed speed and on the prescribed line.

526. Reports of the observations of the fall of shot shall be made to the firing vessel after each single shot or string of shots.

## CHAPTER XX.

### OBSERVERS, VESSELS OF THE DISTRICT NAVAL FORCE.

**536. Vessels of the district naval force.**—There shall be appointed from the observing vessel the following observers, who shall report to the commanding officer of the firing vessel. Where one vessel is unable to furnish the required number of observers, the deficiency will be supplied from another vessel.

(a) *One chief observer.*—A commissioned officer trained in spotting.

(b) *One gun observer.*—A commissioned officer or competent chief petty officer.

(c) *One target observer.*—A commissioned officer or competent chief petty officer.

**537. The chief observer shall:**

(a) Be aboard the firing vessel and station himself where he can observe the course and speed of the firing vessel and watch the handling of the firing ship, target, and tow. He shall also make a rough sketch of the target screen for long-range battle practice and submarine-target practice, indicating the hits, and forward this sketch with report of scores.

(b) Collect data and make such other observations as are necessary for the correct determination of the scores, the cause of all misses, the location of all errors of communication, and the reason for any deficiency of matériel or personnel.

(c) Make up and forward report of scores, sheets 1 and 21.

(d) Report whether or not the practice was conducted in accordance with the provisions of these orders and report any violation of the spirit or letter of these orders.

(e) Inspect the raft and screens after firing and determine the number and character of hits.

(f) Observe in flight the shells of the guns firing, and note the fall of shot in deflection.

**538. The gun observer shall:**

(a) Be aboard the firing vessel and take station and observe the operation of guns during the firing.

(b) Report any artificial methods or material.

(c) Make such observations as are necessary for computing the score and for the chief observer's report.

**539. The target observer shall:**

(a) Take station in the repair boat or towing vessel and visit the target after each run, unless the firing vessel indicates that she does not desire him to do so.

(b) Observe the number of holes in each target and the color of the paint on each hole.

(c) Plot on a target diagram the location and color of each hole.

(d) Make such other observations as are necessary for computing the score and for the chief observer's report.

(e) Observe carefully and note shots striking **near** but short of the target. Those that ricochet through shall **be reported**.

(f) Be in charge of a rake observation party to observe the fall of all shots.



## CHAPTER XXI.

### SHORT-RANGE BATTLE PRACTICE, VESSELS OF THE DISTRICT NAVAL FORCE.

551. The gun practice shall be held in an inclosed bay with favorable weather and smoke conditions.

552. The target will be moored at the apex of an isosceles triangle. The perpendicular distance from the target to the base will be 1,000 yards (800 yards for 1-pounder and machine guns). Buoys will mark the ends and center of the base. The end buoys will be placed so the angle subtended by the target and the center or other end buoy will be  $62\frac{1}{2}^{\circ}$ .

553. The speed of the firing vessel shall be approximately 5 knots.

554. The firing vessel shall steam along the base of the isosceles triangle outside of the buoys and commence firing when the first buoy is abreast the navigating bridge.

555. Condition of gun at the beginning.—At the order “commence firing” all guns will be unloaded, with the breech closed and salvo latch unlocked, except that in the case of semi-automatic guns the plug shall be open, and in the case of automatic guns the gun may be loaded and breech closed.

556. The umpire will note the time from the order to “commence firing” to the last shot fired.

557. Hits.—No shots are to be counted as hits except those which in direct flight pierce the target or completely cut or sever the bolt rope or show material evidence by paint marks or otherwise of the projectile having touched the edge of the screen in direct flight.

558. All interruptions shall count as the fault of the personnel. Once the order to “commence firing” is given, the time allowance begins; and the firing must be continued until the time allowance or ammunition allowance is exhausted unless something outside the firing vessel interferes.

559. Only one gun at a time is required to fire.

560. Sets of pointers.—Two sets of pointers shall fire at each gun.

561. The ammunition allowance is, for 1-pounder and above, 10 rounds for each set of pointers; for machine guns, 100 rounds for each set of pointers.

562. The time for each set of pointers will be taken separately and will be taken from the battery officer's or sight setter's order "commence firing" to the last shot fired by that set of pointers.

563. The target will be a screen 15 feet long and 12 feet wide, mounted as prescribed in articles 190 and 192.

564. Qualification of pointers.—Pointers will be qualified and prizes paid to crews which attain the following scores:

Type of gun.	Weight.	Stand- ard hits per gun per min- ute.	Score required for—					
			Navy "E", 100 per cent.	First prize, 90 per cent.	Sec- ond prize, 80 per cent.	Third prize, 70 per cent.	First- class gun point- er, 85 per cent.	Sec- ond- class gun point- er, 75 per cent.
3-inch, all classes. . . . .	2	6.00	6.00	5.40	4.80	4.20	5.10	4.50
6-pounder, all classes. . .	2	10.00	10.00	9.00	8.00	7.00	8.50	7.50
3-pounder, all classes. . .	1	10.00	10.00	9.00	8.00	7.00	8.50	7.50
1-pounder, all classes. . .	1	10.00	10.00	9.00	8.00	7.00	8.50	7.50

### NAVY "E."

565. Navy "E."—In order to distinguish the members of gun crews that do exceptionally good work, all members of these crews will wear a white "E" on their blue uniforms and a blue "E" on their white uniforms, as specified in the uniform regulations. Members of the crews making the requisite scores will be entitled to wear this mark of distinction. The department will supply Navy "E"s to those crews entitled to this distinction upon application of the commanding officer.

### PRIZES.

566. For a fiscal year all prizes for Navy crews will be charged to the appropriation "Gunnery exercises" for that year.

**567. Prizes.**—First, second, and third class gunnery prizes will be issued to crews which attain the requisite score and will be paid immediately upon completion of the practice. The score for any gun for the payment of prizes will be the average of the scores made by the first and second sets of pointers. See article 563.

**568.** The present value of prizes is as follows: First prize, \$20 per man; second prize, \$10 per man; third prize, \$5 per man.

**569. Men entitled to prizes.**—Every member of prize crews, including gunner's mate and electrician, whether regular or supernumerary, is entitled to a prize, unless absent through fault of his own.

**570.** A man stationed with more than one prize crew shall receive but one prize. This shall be the highest prize awarded to a crew with which he is stationed.

**571.** Gun pointers will be qualified upon the scores made at the short-range battle practice and in accordance with the table given in article 253. The commanding officer will authorize the extra pay allowed such men as are regular qualified gun pointers immediately upon the completion of the short-range battle practice.

**572.** In case of an unsettled claim no prizes or gun-pointer money will be paid until the department directs.



## CHAPTER XXII.

### LONG-RANGE BATTLE PRACTICE—VESSELS OF THE DISTRICT NAVAL FORCE.

583. All vessels of the district naval force will hold long-range battle practice after short-range battle-practice runs have been completed.

584. The practices will be held during daylight.

585. All guns that bear will fire.

586. The ammunition allowance is 10 rounds per gun of target ammunition.

587. If the target is shot down, or, in the opinion of the commanding officer, the area is reduced to less than one-half the original area, the firing may cease without penalty. Fire will be resumed, at the discretion of the commanding officer, after the target has been repaired and as nearly as possible in the same part of the run as when the interruption occurred.

588. Loading.—Guns may be loaded when desired, but range at "commence firing" at the beginning of each run will be approximately 2,000 yards.

589. Procedure of firing vessel:

(a) Selects a base course to fire at a screen mounted on an anchored raft.

(b) Gets observers on board and takes station 2,500 yards from target, the latter bearing  $80^{\circ}$  to the right of the base course.

(c) When the report that all is ready is received from the repair party, heads for the target, speed 1 knot less than the maximum speed.

(d) "Commence firing" with bow guns when target is dead ahead and bearing  $80^{\circ}$  to the right of the base course, distant 2,000 yards.

(e) "Cease firing" when ammunition of bow guns is expended.

(f) Turn with left rudder and bring the target dead astern, bearing  $100^{\circ}$  to the right of the base course, distant 600 yards, speed of firing ship 1 knot less than maximum speed.

(g) "Commence firing" stern guns when target is dead astern, bearing  $100^{\circ}$  to the right of the base course, distant 800 yards, speed of firing ship 1 knot less than maximum speed.

(h) "Cease firing" when ammunition of stern guns is expended.

590. If desired, the course of firing vessel may be changed a sufficient amount to get the maximum efficiency of ahead and astern fire.

591. The official time of firing for each leg will be as follows:

(a) First leg.—From "Commence firing" bow guns to "Cease firing" bow guns, first part of run.

(b) Second leg.—From "Commence firing" stern guns, second part of run, to "Cease firing" stern guns.

592. The official time of firing for the practice will be one-half of the sum of the official times for the first and second legs.

### OBSERVATIONS.

593. Rake observations of the fall of shot will be taken by an observation party on observing vessel in charge of the target observer.

### THE TARGET.

594. The target will be a screen 15 feet long and 12 feet wide, mounted as prescribed in articles 491 and 493.

## CHAPTER XXIII.

### BATTLE PRACTICE AT SUBMARINE TARGET, VESSELS OF THE DISTRICT NAVAL FORCE.

605. All vessels of the district naval force will hold long-range submarine battle practice after the long-range battle practice has been completed.

606. The practice will be held during daylight under the same conditions as those prescribed for long-range battle practice, Chapter XXII, except that the target shall be a submarine target of the type shown on page 131.

607. This target shall be towed 200 yards astern of another patrol boat at a speed sufficient to maintain steerageway and permit the target to dive.

608. During the approach the submarine target shall be caused to dive at least twice. After the order "Commence firing" it shall be caused to dive at least once every three minutes or as often as may be practicable.

#### OBSERVATIONS.

609. Rake observations of the fall of shot will be taken by an observation party on the towing vessel in charge of the target observer.

610. Hits.—All shots will be counted as hits which strike within a space of 50 yards over or short of the target and 20 yards right or left of the target, as determined upon the results of the rake observations and the observations of the chief observer.



## CHAPTER XXIV.

### OBSERVERS—BATTLE PRACTICES.

VESSELS IN CONVOY, INCLUDING TRANSPORT SERVICE,  
NAVAL OVER-SEAS TRANSPORTATION SERVICE, AND  
ARMED-GUARD MERCHANTMEN.

621. The following observers shall be appointed:

- (a) One chief observer from the firing vessel.
- (b) One observer in charge of the rake observations on the towing vessel. (See Ch. XVIII.)

622. The chief observer shall be aboard the firing vessel and obtain the following data:

- (a) The official time of each leg of the practice.
- (b) Observe in flight the shells of the guns firing and note the fall of shot in deflection.
- (c) Where no rake observations are taken, estimate the fall of shot in range.
- (d) Assign the hits.
- (e) Make up and forward report of scores, sheet No. 21.

## CHAPTER XXV.

### SPOTTING PRACTICE.

#### VESSELS IN CONVOY, INCLUDING TRANSPORT FORCE, NAVAL OVER-SEAS TRANSPORTATION SERVICE, AND ARMED-GUARD MERCHANTMEN.

633. Spotting practice will be held as soon after commissioning as possible, and will be the first practice conducted. Vessels that have already held a practice may conduct this practice on such trips as the commanding officer may deem advisable.

634. The ammunition allowance for spotting practice for a new ship will be the five rounds per gun allowed as a test of the gun mounts. For ships that have previously fired, the ammunition allowance will be the five rounds per gun for that trip.

635. The target will be a screen mounted on some form of improvised towing raft; if practicable, a screen showing a clearly defined point of aim shall be used. The target will be towed by a ship at a speed of from 5 to 10 knots. In case it is impracticable to tow a target, or if a ship is acting singly, a target will be improvised. It must be remembered that when the target is not towed no rake observation can be obtained, and for that reason the value of the practice is greatly lessened.

636. The practice shall be conducted as follows:

(a) The towing ship shall tow the target on the base course at the speed designated. The length of tow line shall be 400 yards.

(b) The firing ship shall take position approximately 2,000 yards from the target with the target on the beam, and maintain this position throughout the practice.

(c) Each gun firing singly shall fire a string of five shots.

(d) The chief observer shall designate the initial sight bar range and deflection to be used at each gun. This shall be unknown to the group control officer.

(e) The ship's group control officer will correct the fall of each shot, and this correction will be placed upon the sights.

(f) The ship's group control officer shall endeavor to make hits.

(g) The chief observer will be detailed from the firing ship, and will be an officer who is not one of the spotters.

(h) A recorder will be detailed by the firing ship to keep a record of ranges and deflections actually set on the sights for each shot. Each spotter will also have a recorder to record the corrections given by him.

(i) All officers not actually needed for ship control will spot, keeping a record of their spots.

(j) Reports of the observations of the fall of shot shall be made by signal to the firing vessel after each string of five shots.

(k) A report will be submitted, showing the average error in range and deflection of the spots of each officer who spots on the practice.



## CHAPTER XXVI.

### BATTLE PRACTICE.

#### VESSELS IN CONVOY, INCLUDING TRANSPORT SERVICE, NAVAL OVER-SEAS TRANSPORTATION SERVICE, AND ARMED-GUARD MERCHANTMEN.

645. In order to prepare vessels when not in convoy for an action with a submarine on the surface, it is highly desirable that the ranges prescribed hereafter be increased to the maximum consistent with the visibility of the target. If a target, visible at long range, is available the practice should be conducted at the maximum range of the guns. The necessary modifications of the practice prescribed are authorized.

646. Where guns are so mounted that the maximum angle of elevation can not be utilized, through improper mounting or graduation of sight scales, the matter should be promptly remedied, or, if beyond the capacity of the ship, reported to the department for action.

647. All vessels in convoy, including transport service, naval over-seas transportation service, and armed-guard merchantmen, will hold one battle practice per trip.

648. The practice will be held during daylight.

649. All guns that bear will fire.

650. The ammunition allowance will be five rounds per gun of target ammunition per trip.

651. The guns may be loaded when desired.

652. The range at "Commence firing" will be approximately 2,000 yards.

653. All firing must take place while the towed target bears not more than 110 nor less than 70° to the right or left of the base course.

654. The practice shall be conducted as follows:

(a) The towing ship shall tow the target on the base course at a speed of from 5 to 10 knots. The length of the tow line shall be 400 yards.

(b) The senior officer present selects the base course and informs the towing and firing vessels.

(c) The firing vessel takes station 2,500 yards from the target, the latter bearing approximately 80° to the right or left of the base course.

(d) When report that all is ready is received from the towing vessel, heads for the target, speed 1 knot less than the maximum speed.

(e) Commence firing with bow guns when the target is dead ahead, distant 2,000 yards and bearing not more than  $110^{\circ}$  nor less than  $70^{\circ}$  to the right or left of the base course.

(f) Cease firing when the ammunition of the bow guns is expended.

(g) Turn with left or right rudder and bring the target dead astern, distant 1,000 yards, speed of firing ship 1 knot less than the maximum speed.

(h) Commence firing stern guns as soon as the target bears, speed of firing ship 1 knot less than maximum speed.

(i) Cease firing when ammunition of stern guns is expended. If desired, the course of firing vessel may be changed a sufficient amount to get the maximum efficiency of ahead and astern fire.

**655. The official time of firing for each leg will be as follows:**

(a) *First leg.*—From "Commence firing" bow guns to "Cease firing" bow guns, first part of gun.

(b) *Second leg.*—From "Commence firing" stern guns, second part of run, to "Cease firing" stern guns.

**656. The official time of firing for the practice will be one-half the sum of the official times for the first and second legs.**

#### OBSERVATIONS.

**657. Rake observations of the fall of shot will be taken by an observation party on the towing vessel.**

#### THE TARGET.

**658. The target will be some form of submarine target such as the type shown on page 131. In case it is impracticable to have a submarine target towed by another vessel, some form of improvised target shall be used. It must be remembered that when the target is not towed no rake observations can be obtained, and for that reason the value of the practice is greatly lessened.**

**659. Rehearsal runs will be made before firing to familiarize the officers and men with the procedure. These should be conducted while maintaining speed in convoy in case no time is available to conduct them on a regular target.**

**660. Hits.**—All shots shall be counted as hits which strike within a space of 50 yards over or short of the target and 20 yards right or left of the target, as determined by the rake observations on the towing vessel and observations of the chief observer on the firing vessel.

## CHAPTER XXVII.

### REPORTS—FORMS.

671. If all reports of a vessel's practice have not been forwarded within 10 days after the completion of the forms of practice for which they are required, a report will be submitted by the force commander to the department stating the reasons for the delay and the probable date when the reports will be forwarded.

672. Reports by all officers shall include a list of changes or recommendations on any subject which, in their opinion, should immediately be brought to the department's attention.

673. Reports of gunnery exercises will be forwarded to the department through the regular official channels.

674. Commanders in chief, force, flotilla, and division commanders will take the necessary steps to insure reports reaching the department in proper form and on time.

675. In each ship comment, criticisms, and recommendations on the same subject will be coordinated and condensed, and such remarks will be signed by the commanding officer or by the officers agreeing thereto.

676. All reports, except those for which special forms are provided by the department, will be made on thin typewriting paper, letter size (8 by 10½ inches), and they will be typewritten. A sufficient margin will be left at the side of each sheet. Paper fasteners will be employed at the side of the sheets, so that reports may be easily read, and the pages will be numbered at the bottom. The binding perforations on these sheets will correspond to those on the forms furnished by the department.

677. Reports will not be folded.

678. Reports for each form of practice will consist of three parts. Part I will be submitted immediately after the completion of any form of practice. When different forms of practices have followed one another closely, Parts II and III will be so drawn up as to cover all the practices that have been completed during the period.

679. One copy only of Parts I, II, and III are required by the department from vessels of the district naval forces. The only



report required is Part I, but officers will submit such comment under Parts II and III as desired.

### PART I.—REPORT OF SCORES.

680. The tabular report of the result of a form of practice will be submitted on the sheets provided.

681. This report will be prepared by the chief umpire, who will sign the report and deliver it, with his own report attached thereto, to the commanding officer of the firing vessel. The commanding officer will check the report, the checking to include every portion of the report of scores and every casualty that stops the firing. If it is satisfactory, the report will then be transmitted to the department; otherwise it will be returned to the chief umpire, with a statement of errors. The chief umpire will in such cases alter the scores if incorrect or make such further statements as he deems necessary and forward the report, with the protests, recommenadtions, and report of the chief umpire, to the department. The chief umpire will notify the commanding officer of his final action.

682. The names of all the board of umpires for a form of practice will appear on the report of scores; others than that of the chief umpire will be typewritten.

### PART II.—GENERAL REPORT (ONE COPY).

(Remarks in letter form.)

#### ALL CLASSES OF SHIPS FOR EACH FORM OF PRACTICE.

683. It is important that reports from all officers be arranged as follows:

- (1) Methods of preparation for the practice.
- (2) Remarks on practice and on methods of conducting it.
- (3) Remarks on any subject pertaining to the efficiency of the ship or fleet.
- (4) Conclusions drawn from results of the practice.
- (5) Suggestions for future practices.

Reports under each of the above subjects shall be submitted on separate sheets.

(New sheet.)

SHORT-RANGE BATTLE PRACTICE.

- (4) Conclusions drawn from results of the practice.

*Ohio*, Lieut. H. I. Smith, gunnery officer.

It is suggested that at the next battle practice all ships be required to -----  
-----

(Signed) H. I. SMITH.

(New sheet.)

LONG-RANGE BATTLE PRACTICE.

- (5) Suggestions for future practices.

*Ohio*, Lieut. H. I. Smith, gunnery officer, and Ensign A. B. Green, assistant fire-control officer.

The following information concerning:-----  
-----  
-----

(Signed) H. I. SMITH.  
A. B. GREEN.

PART III.—REPORT ON MATERIAL (ONE COPY).

684. Remarks will be submitted on the forms provided.  
(Sheets 43 and 44.)

- (1) Voice tubes.
- (2) Telephones.
- (3) Bells and buzzers.
- (4) Visuals.
- (5) Fire-control circuits.
- (6) Range finders (location and handling).
- (7) Tracking schemes and instruments.
- (8) Periscopes.

- (9) Directorscopes and director installation.
- (10) Spotting glasses.
- (11) Fire-control methods and instruments.
- (12) Central, subcentral, subs, plotting room.
- (13) General condition of guns.
- (14) Parallelism of guns.
- (15) Breech mechanisms.
- (16) Recoil systems.
- (17) Gas ejectors.
- (18) Firing mechanisms and circuits.
- (19) Sights and their connections.
- (20) Training and elevating gear.
- (21) General condition of mounts.
- (22) Ammunition hoists.
- (23) Loading arrangements (gun and handling room).
- (24) Turret roller paths and pivots.
- (25) Ventilation of turrets.
- (26) Lighting of turrets and magazines.
- (27) Powder and powder tanks.
- (28) Fixed ammunition.
- (29) Primers (include all misfires and hangfires; in reporting defective primers the mark, place, and year of manufacture must be reported).
- (30) Projectiles.
- (31) Tracers.
- (32) Torpedoes.
- (33) Torpedo tubes.
- (34) Air plant.
- (35) Torpedo directors.
- (36) Searchlights and searchlight control.
- (37) Radio.
- (38) Training devices (drill gun, dummy ammunition, dot-ters, check sights, etc.).
- (39) Triangulation camera method of plotting fall of shot.
- (40) Target gear, rafts, and screens.
- (41) Other items.

**685.** No two subjects will be discussed on the same sheet.

*The subject*, preceded by its proper number, will precede the comment.

**686.** The report will be arranged and bound in order of subjects, comment by the various officers on the same subject being bound together.



687. Where defects and deficiencies are reported remarks will be specific and so framed as to enable the department to understand the details.

688. Drawing and piece numbers will be carefully noted.

689. Where remarks are not submitted it will be assumed that items are satisfactory in all respects. A sheet for a subject will not be submitted unless there is comment to be made thereon.

# GUNNERY INSTRUCTIONS AND EXERCISES.

GUNNERY, 1918-19

SHEET NO. 1. DISTRICT NAVAL FORCE,  
(ONE COPY REQUIRED FOR THE DEPARTMENT)

FROM: CHIEF OBSERVER

TO: SECRETARY OF THE NAVY

(DIRECTOR OF GUNNERY EXERCISES AND ENGINEERING PERFORMANCES)

SUBJECT: PART 1-REPORT OF SCORES, VESSELS OF THE DISTRICT NAVAL FORCE

U. S. S.

## SUMMARIES

## SHORT RANGE BATTLE PRACTICE

COMPLETED \_\_\_\_\_  
(Date)

[illegible]

LONG RANGE BATTLE PRACTICE, TARGET 12 BY 15 FEET. COMPLETED

LONG RANGE BATTLE PRACTICE, SUBMARINE TARGET. COMPLETED

										(Date)

## SHORT RANGE BATTLE PRACTICE

### SCORES OF BROADSIDE GUNS

[illegible]

Statement of weather conditions and state of sea at—

### Short range battle practice

Long range battle practice, 12 by 15 target

Long range battle practice, submarine target

Submitted

(Date.)

Checked and forwarded

(Date.)

U. S. Navy,  
Chief Umpire.

U. S. Navy,  
Commanding.

## LIST OF OFFICERS

NAME	RANK	BATTLE STATION

## INSTRUCTIONS

1. This sheet will be submitted upon the completion of each form of practice. Where the different practices follow each other closely, one report will be made to cover all the practices.
2. The shots (hits) per gun per minute for each caliber of guns are found by taking the sum of each of these independently for the several sets of pointers of a caliber and dividing by the number of sets of pointers.
3. Table of standard hits per gun per minute and qualifying scores.

TYPE OF GUN	WEIGHT	STAND- ARD HITS PER GUN PER MINUTE	SCORE REQUIRED FOR—					
			Navy, "E" 100 per cent	First prize, 90 per cent	Second prize, 80 per cent	Third prize, 70 per cent	First-class gun pointer, 85 per cent	Second-class gun pointer, 75 per cent
3-inch, all classes.....	2	6.00	6.00	5.40	4.80	4.20	5.10	4.50
6-pounder, all classes.....	2	10.00	10.00	9.00	8.00	7.00	8.50	7.50
3-pounder, all classes.....	1	10.00	10.00	9.00	8.00	7.00	8.50	7.50
1-pounder, all classes.....	1	10.00	10.00	9.00	8.00	7.00	8.50	7.50



GUNNERY, 1915-19.  
SHEET No. 21.  
[The Copy Required for the Department.]

FROM OFFICER IN CHARGE OF RAKE OBSERVATION PARTY.  
TO: SECRETARY OF THE NAVY.  
(Director of Gunnery Exercises and Engineering Performances)

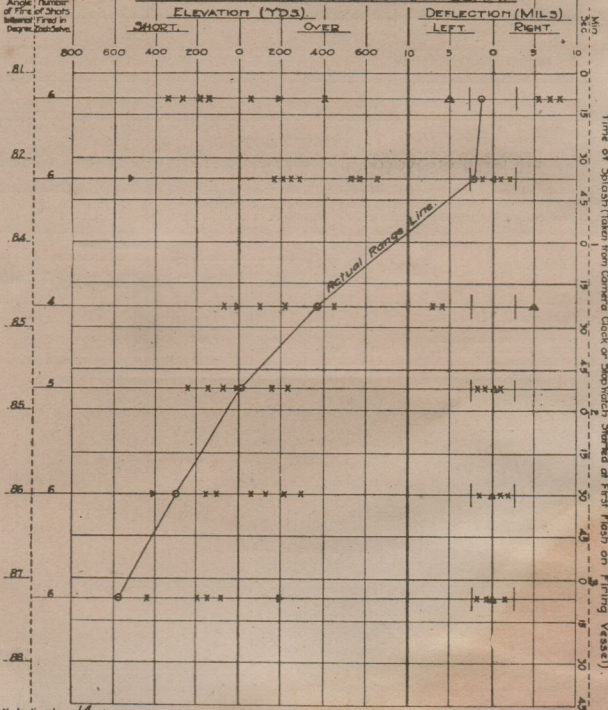
# SUBJECT: PART I—REPORT OF RAKE OBSERVATIONS.

..... Battle ..... PRACTICE, U. S. S. WASP .....

Hold Off At Sea ..... May 5, 1918 ..... Towing Vessel CADREX  
Number and Caliber of Guns Firing 6: 14 Inch and ..... Inch Firing Vessel on Port Side of Towing Vessel  
ACTUAL RANGE 3000 2000 1000 600 400 200 100 50 25 12.5 6.25 3.125 1.5625 0.78125 0.390625  
Scale: 1:1000 Yds.

Angle / Number  
of Fire of Shots  
Indicated / First in  
Degree / Zero / Sixes.

## FALL OF SHOT AND ACTUAL RANGE DIAGRAM.



x Indicates 14 Inch.  
o Indicates ..... Inch.  
Δ Indicates Spots. @ Indicates Actual Range.

Submitted, H. M. Jones, Lieut., U.S. Navy.  
Chief Observer.

## INSTRUCTIONS FOR FILLING OUT SHEET 21, GUNNERY, 1918-19.

(1) The fall of shot both for range and deflection are plotted on the diagram at the time of splash, which time is taken from the camera clock or a stop watch started at the first flash on the firing vessel.

(2) The actual ranges are plotted on this same time for the salvo or shot to which they were applied, and will be plotted from the sight bar ranges on the guns at the time of firing.

(3) The actual range is obtained from the sight-bar range as follows:

"B" is range table for initial velocity of powder and type of shell used.

"C" is range table for initial velocity of powder and type of shell for which sight bar (or sight scales) are graduated.

To obtain actual range from sight-bar range, enter Table "C" with sight-bar range, pick out corresponding angle of departure. At this angle of departure enter Table "B" and pick out corresponding range. If sight bars (or sight scales) are graduated for the velocity of powder and type of shell actually used, sight-bar range and actual range then are the same.

(4) It will be noted that the fall of shot for deflection are plotted on a mil scale. A mil is  $1/1000$  of the range at the time of firing. One division on the arbitrary deflection scale is equal to 1 mil. The limits of the target in deflection must be indicated by a black line.

(5) The spots both for range and deflection for each salvo are indicated by small triangles.

(6) Shots falling outside the limits on the elevation and deflection diagram should be indicated by remarks opposite the time line.

(7) The number of shots fired in each salvo is entered opposite the time line.

(8) The angle of fire entered to the nearest degree is the horizontal sextant angle between the target and the firing vessel and is taken from a station near the camera on the side of the towing vessel toward the firing ship. This angle is required only when camera observations are taken.

(9) When several ships are firing at the same target during the same interval of time, entries will be made in different colors, such as black for first ship, red second, blue third, green fourth. In this case it is necessary to have one sextant-angle observer for each ship.

## GUNNERY INSTRUCTIONS AND EXERCISES.

GUNNERY, 1918-19.

SHEET No. 42.

(TWO COPIES REQUIRED FOR THE DEPARTMENT)

TO: SECRETARY OF THE NAVY.

(DIRECTOR OF GUNNERY EXERCISES AND ENGINEERING PERFORMANCES)

SUBJECT: PART II - GENERAL REPORT.

.....Practice Completed.....191.....

Subject: .....

U.S.S. ....  
(Rank) (Name) (Station)

(Signed) .....





GUNNERY, 1918-19.

SHEET 44. (FOUR COPIES REQUIRED FOR THE DEPARTMENT.)

## REPORT ON MATERIAL.

This sheet will be used by officers for making out their reports on the several subjects. Specific designation of items by mark, modification, or other official designation, together with the drawing and piece number, is required in all cases. Names of officers signing reports preceded by their rank to be typewritten at place indicated by asterisk.

4-2129

SUBJECT NO. .... ITEM .....

U. S. S. ....





