



THE

Lt. A. Fisher
2nd Lt. Ordn. Dept.

Lt Fisher



ORDNANCE SERGEANT

VOL. 2

NOVEMBER 1941

NO. 5



Published by the Ordnance School in the interest of Ordnance Sergeants

THE ORDNANCE SERGEANT

VOL. 2

NOVEMBER 1941

NO. 5



Published by the Ordnance School in the interest of Ordnance Sergeants

HIGHLIGHTS

The importance of Aberdeen Proving Ground is the predominant theme in this issue of THE ORDNANCE SERGEANT. The reasons for the existence of the Proving Ground, and the methods used there, comprise the material contained in eight articles beginning on page 274.

Lt. Col. Outland, Commandant of The Ordnance School, continues his "Officers and Gentlemen" series with "Leadership", on page 296. It's inspiring, and it's good advice for even YOU.

Interesting observations and pictures from the maneuvers of the Fourth Army at Fort Lewis, Washington, are provided by Brig. Gen. Hatcher on page 298, and by Major Billingsley on page 299. Photos by Major Billingsley.

The cover photo portrays an M3 tank climbing a test incline at Aberdeen Proving Ground. Photo by the Photographic Section, The Ordnance School.

Two "firsts" in illustrations appear in this issue of THE ORDNANCE SERGEANT. On page 300 the members of the 55th Ammunition Company are the first colored troops to appear in this publication.

The first of the ladies to crash our pages is Miss Jeanne Hayes. She smiles at you from page 322. Probably you would notice her without this word of warning.

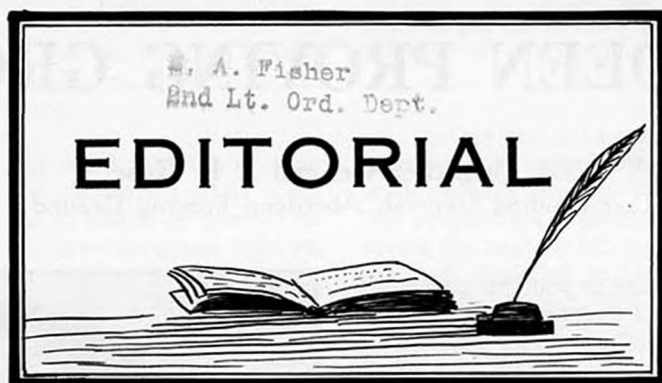
Staff Sergeant Fabriz gives us the first of a series of articles on "Special Gages" on page 302. More of these will follow, in compliance with repeated requests for such material.

Address all communications to THE ORDNANCE SERGEANT, The Ordnance School, Aberdeen Proving Ground, Maryland.

REPRODUCTION PLANT
THE ORDNANCE SCHOOL
ABERDEEN PROVING GROUND
MARYLAND

--IN THIS ISSUE

Editorial	"He Sits and Thinks"	273
ABERDEEN PROVING GROUND, MARYLAND.		274
Brig. Gen. J. B. Rose, Biographical sketch		275
Development of Ordnance Automotive Materiel		276
Automotive Testing at Aberdeen Proving Ground		279
The Job of the Ballistic Research Laboratory		283
Ballistic Studies		285
The Antiaircraft, Railway, and Seacoast Section		290
Small Arms Development and Testing		294
Officers and Gentlemen. "Leadership".		296
Fourth Army Maneuvers		
Brig. Gen. J. S. Hatcher		298
Major J. D. Billingsley		299
Special Gages		302
Small Arms		304
Artillery		306
Automotive		311
Fire Control		313
"Notes in Brief"		332
Administration		314
Depot and Supply		315
The Ordnance Shop		316
The Machine Shop		318
Annunition		319
Ordnance Aviation Activities		320
Ordnance Training Activities		321
Ordnance News Items		322
Library		324
Letters from the Field		326
A Practical Field Shower		344



Who do you suppose the fellow on the right is? He may be intended to represent a Greek deity, he might represent a worker resting, or he might be the typical American man. Who knows, or who cares?

One thing may be surmised from his pose--he is thinking, reflecting, considering, deliberating, speculating, contemplating, pondering, or maybe just dreaming. Choose your own word, the result is all the same, the man, whatever else he is doing, is making a mistake.

Modern civilization does actually demand that men think; but by no flight of imagination is a man justified to SIT AND THINK. The world we live in can use a great many thinkers, but there is no room for sitters. All through the ages of the past the men who have done the best of the thinking have been men who did great things, men who worked while they were thinking, and men who placed a greater emphasis upon real accomplishment than upon careful and deliberate planning. They started out to do something, they studied the results of each part of their work, they based their next steps upon this study, they worked and they thought at the same time, and their deeds live in history. Don't take time to sit and think.

You can have only one reason to sit and think. You must be planning your future conduct. You must be looking for the right answer to some question. Don't place too much reliance in the old adage "Be sure you're right, then go ahead", for it doesn't mean just what it says. Try to be right, but whatever you do, GO AHEAD. Thinking and planning accomplishes not a thing, action gets something done, and if you think while you act the odds are in favor of success.

Don't sit and think, trying to determine the right answer. There are no right answers, and we can be thankful that this is true. An answer which is right now is very apt to be wrong in the immediate future. Circumstances change, individuals change, and answers to our problems change. The answer which is certain to be changed by accomplishment is definitely not the right answer. The world doesn't stand still; life moves on and on continually; it is only the sitter who fails to go places. Thinking while you sit is no excuse for the sitting. The two must be practiced simultaneously if real results are to be realized.

Be sure you are right, if there is time to be sure; but whether you are right or wrong, begin your task and do your best. Think about the results as you continue your work. Don't wait for the perfect answer to come to you, or even for the best answer. Do something, notice the results, base your later activity upon your analysis of those results, keep doing something, and you may be sure that each succeeding decision will be better than the last. Your work will improve, too.

It's all right to be a thinker, but don't be a sitter.

He
Sits
and
Thinks--



ABERDEEN PROVING GROUND

By: Brigadier General J. B. Rose
Commanding General, Aberdeen Proving Ground

The Aberdeen Proving Ground is youthful compared with the permanent arsenals of the Ordnance Department, but it is now contributing in a major way to the delivery of Ordnance to troops and has assumed a testing load which will soon exceed that carried in 1918. Development work is in progress on a scale never before approached.

This Proving Ground was a reincarnation of the old Proving Ground that existed at Sandy Hook, New Jersey. The latter was clearly unsuitable for the load of a major war and under authorization of the Congress on October 6, 1917, the land here was acquired and a contract let on October 15 to begin construction. The first shot was fired on January 1, 1918.

The entire area acquired in 1917 by the Government, including the Gunpowder Neck and Carroll's Island, covers 33,088 acres of land and 34,600 acres of restricted water. During this year (1941) the land now occupied by the Ordnance Training Center, 924.4 acres, was acquired and quite recently somewhat less than 5,000 acres more have been acquired for an air field and other purposes.

The relentless march of aggression during the very recent years made evident that plans should be made for a rapid expansion of the existing plant as soon as the proper time should be determined by competent authority. The first result of these plans was construction of the present handsome buildings of the Ordnance School. These were completed just in time to provide a headquarters for the training of larger groups of regular officers, and of reserve officers, as soon as calls to duty were authorized. This School formed the nucleus for subsequent construction of the Training Center. The smooth evolution of the School into a well-planned training center for 11,000 men and 1,000 officers must be credited to a small group of officers who planned with judgment and directed the execution of plans with dispatch.

Along with plans for the Training Center the expansion of facilities for the industrial activities was also planned and during the last eighteen months much construction of buildings, roads, and special proof structures has been completed, and much is in progress to meet needs as these develop under a constantly expanding procurement program. This construction is not so concentrated as that of the Training Center and not so obvious to a casual visitor, but the total value of the expansion is not far below that of the Training Center.

As a result of this great expansion of facilities the Proving Ground has been able to meet each increment of load as it arose. This could only be done by visualizing what would be needed some year or more in advance, after making a shrewd guess as to what our war effort would involve.

As in the case of the Training Center, the Proving



Brigadier General John B. Rose
Commanding General, Aberdeen Proving Ground

Ground was fortunate in having officers and engineers of vision and ability and their sound judgment has been proven by the immediate active use of each facility as first visualized. This is a continuing problem and it is to be hoped the future can be met as successfully.

There are now employed some 2500 Civil Service people on Proving Ground duties. Soldiers are not so used, and this is quite different from 1918. Personnel then included 310 officers, 4,934 enlisted men (largely used in work now civil), 1,350 civil and 3,500, also civil, on construction work.

It is difficult to say whether the primary mission of the Proving Ground is the acceptance testing of all types of Ordnance munitions or the search for improved types which we call "research" and "development". Certainly, both duties are conducted on a scale one can only measure after close and daily contact.

Since the Proving Ground has stood prepared for immediate action it is natural that Aberdeen should receive the first production of arms and ammunition for proof. This testing of early production, while not on a huge scale, is of critical value. It is essential that the "bugs" in early pro-

duction shall be detected promptly, otherwise the flood of production might include quantities of defective products.

It is thus most important that the Proving Ground make the most careful tests of early production and report any defects at once to the producers.

To these producers it may seem that the Proving Ground is a very disagreeable and persistent critic of all they are doing. On the other hand no one is so pleased as the Proof Department when it can give the green light on production. The correction and removal of defects here is certainly a disagreeable and burdensome task.

The diversity of development projects is so great that the discussion which follows is very cursory. Many quite vital projects in relation to tanks and combat vehicles, ammunition and arms, have been successfully solved and many are in the mill. Many projects completed have already influenced production and will continue to do so. Of course, these problems are never ending for perfection is an unattainable goal.

Since the Proving Ground thus sits in judgment on acceptance of munitions for use by troops and must also contribute largely to the improvement of types, it feels that competent personnel is a sine qua non. If progress is to be made, or the true merits of a product are to be determined, anything less than the best quality of knowledge

and experience is not only useless but may be disastrously harmful. Of course, one can get blood from a turnip and one can get silk from a sow's ear, but it cannot be done in the time we now have.

One who is in command soon learns he can accomplish nothing except through the loyal and untiring effort of those who work in every rank of the organization. In this respect the present Commander is very gratified that among the reserve officers called to duty, the vast majority are well qualified to carry on the variety of specialized work assigned and they have attacked their duties in a spirit which insures success. In a like degree the smaller group of regular officers and enlisted men, and our key civilians, have responded to increased responsibilities and have well proven the value of training and experience.

It has been difficult to restrict these comments to the immediate theme of this issue of THE ORDNANCE SERGEANT, for the Ordnance Training Center is viewed with great pride by those of the other half of the establishment who have worked for and with it during adolescence. No one can read the issues of THE ORDNANCE SERGEANT without reflecting that the high standards of its editors and the serious but interesting presentation of subjects discloses very clearly the character and ability of the men of our new Army and that we may be confident that this Army will never fail the people from which it springs.

Brigadier General J. B. Rose

Upon graduation from the United States Military Academy at West Point, N. Y., in 1907, Brigadier General J. B. Rose, served for two years in the Coast Artillery Corps, being stationed first at Fort Totten, N. Y., and then at Fort Mills, Philippine Islands. He was then detailed to the Ordnance Department, and served at Sandy Hook, New Jersey, as Proof Officer and as a student in The Ordnance School. Thereafter, he completed the practical course in shop work at Watertown Arsenal, and for two years was in charge of inspection and maintenance of artillery armament of the New England Coast.

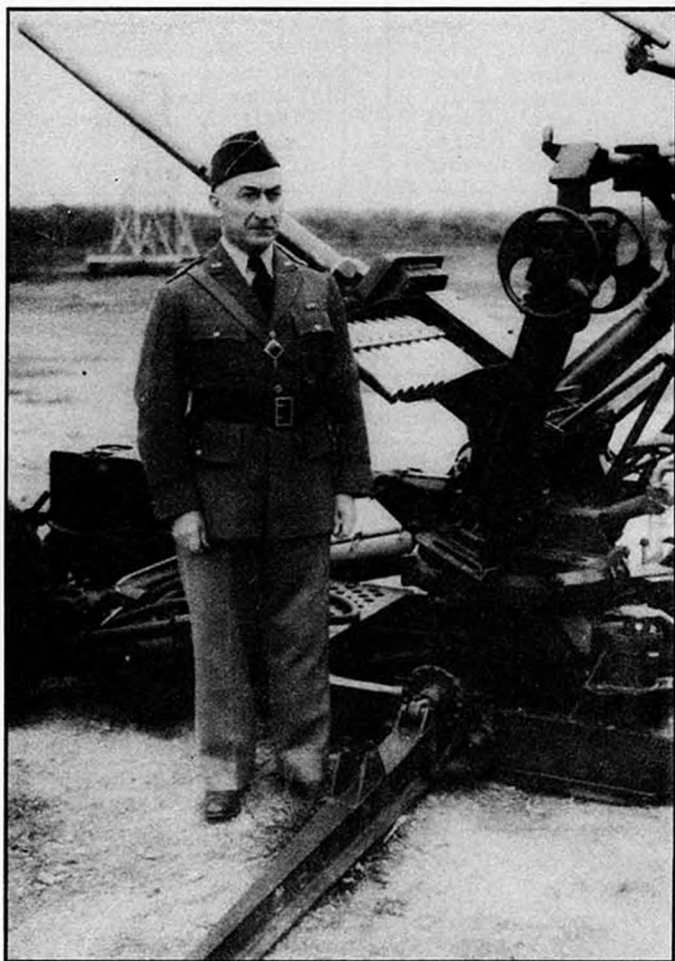
In 1914 he reported for duty in the Carriage Division of the Office of the Chief of Ordnance, being placed in immediate charge of design and maintenance of seacoast armament.

Upon the organization of the Ordnance Department for war in 1917, he was placed in charge of the Antiaircraft Section of the Engineering Division, and in 1918 of the Mobile Gun Carriage Section. During the winter of 1917-18, he was sent to the A. E. F., in order to obtain better information on Antiaircraft Artillery, and visited the French, British and American fronts for this purpose.

In 1922 he attended the Field Officers' Course at Fort Monroe, and in the following year graduated from the Command and General Staff School at Fort Leavenworth, Kansas.

In 1922 he was returned to the Office of the Chief of Ordnance, and placed in charge of the Artillery Division;

(Continued on page 278)



I. INTRODUCTION

"Development of Ordnance Automotive Equipment" should form a reasonably clear picture in the mind of the reader. Consider further that "Development" connotes research, design, and presentation of an idea in a workable scale model; "Ordnance" pertains, according to Webster, to all "material for fighting", including "arms or engines for throwing missiles of any kind"; "Automotive" applies to any equipment that moves under its own power; and there you have the scope of this article in a nutshell.

II. FUNCTIONAL ORGANIZATION

The development of an idea into a working machine and the combination of various machines into an integrated fighting vehicle is the mission of the automotive development work of the Ordnance Department. Working under the Chief of Ordnance in Washington, through the Tank and Combat Vehicle Division of the Industrial Service, the Proving Ground's Automotive Division carries on an increasingly large share of the automotive development work. The increasing activity of the Proving Ground in this field arises from the ready availability here under one head of the prerequisites for successful development work, which are, engineering and design, manufacturing and procurement, and testing facilities.

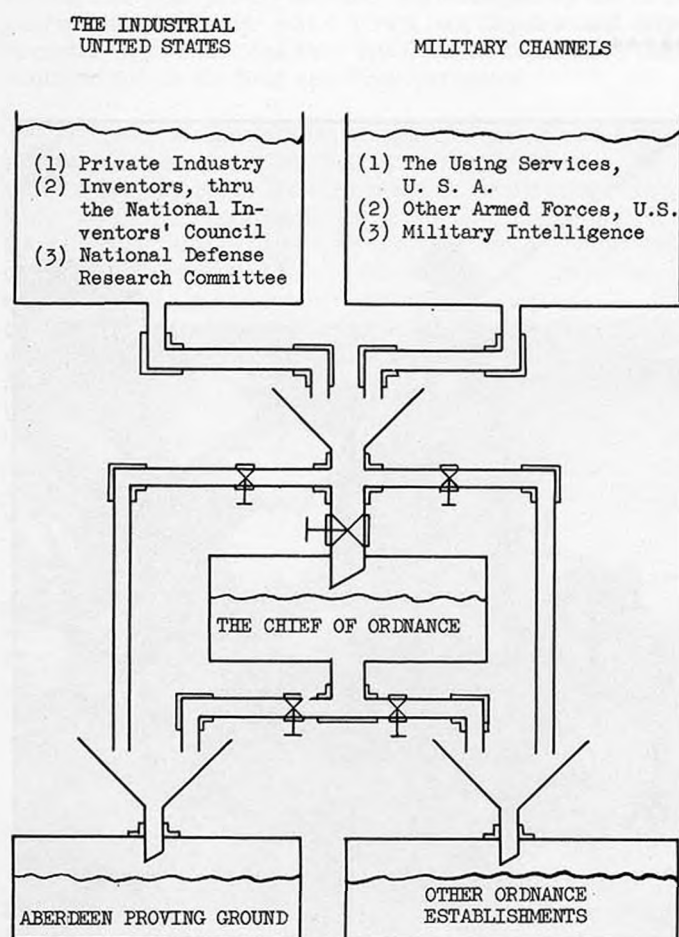


FIGURE I

SCHEMATIC DIAGRAM, SHOWING SOURCES OF OUTSIDE IDEAS AND CHANNELS OF DISTRIBUTION

DEVELOPMENT OF ORDNANCE AUTOMOTIVE MATERIEL

It is interesting to note the various sources from which an idea may start on the road to becoming a reality. A considerable amount of original thought can safely be attributed to the various Ordnance engineers and officers, which, through the media of memoranda and letters is relayed to the proper party for study. However, it is important that there be available and recognized channels for the receipt and distributions of information and help from outside sources. These sources of outside ideas are shown in Figure 1. Ideas, like water, flow by gravity to the proper point for action, the flow being controlled by the valves operated by "The Chief of Ordnance". Important reservoirs are broadly classified as "The Industrial United States" and "Military Channels".

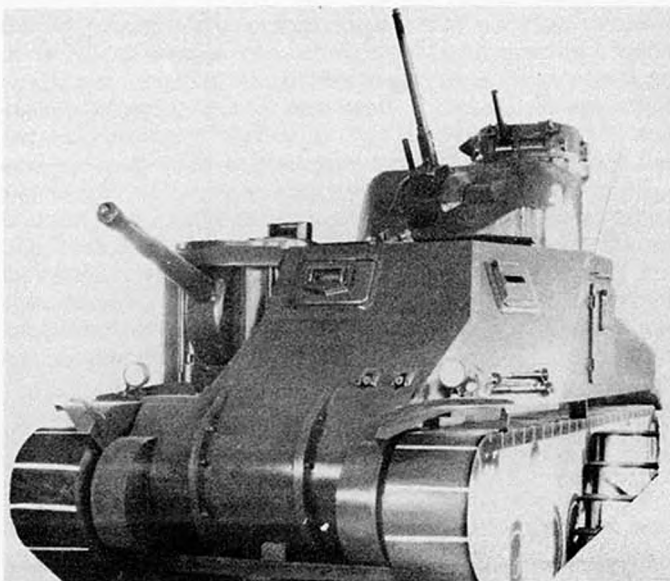
In the first group, "Private Industry" represents all the companies working under contract or otherwise for the Ordnance Department. "The National Inventors' Council" is set up to save the Ordnance Department from the onslaughts of a nation of gadgeteers and inventors, and performs a valuable filtering and classification function, separating the wheat from the chaff, and allowing proper attention to be focused on the significant contributions. "The National Defense Research Committee" is set up by the government to subsidize and coordinate fundamental research on basic technical problems. This puts the scientists and engineers of the country's industries and universities in the service of the technical branches of the Army and Navy.

The second classification, "Official Channels", lists the means whereby ideas and suggestions from the armed forces may reach the Ordnance Department. "The Using Services, U.S.A.", are the beginning and the end of the Ordnance function. They set up military characteristics for certain fighting equipment, and, through their representatives on the Ordnance Technical Committee, agree on a design which meets the requirements within the limitations imposed by practical engineering and production practices. "The Other Armed Forces" of the United States, such as the Navy and Marine Corps, naturally are important sources of information. Likewise, the functioning of "Military Intelligence", which brings to light developments in foreign armies, has considerable effect on the trend of developments here.

Given an idea that appears to be worthy of further study, from one of the above sources, this will at an early stage in its development be cleared through the Chief of Ordnance for approval. Assuming it is an automotive project for action by Aberdeen Proving Ground, a typical course of action is shown schematically in Figure II. The idea is first turned over to the "Engineering and Design Section" for the production of drawings and the construction of a wooden model in many cases. A photograph of the wooden mock-up of the Medium Tank M3 is shown as an illustration of this stage of development. In

By: L. B. Magruder, 2nd Lt., Ord. Dept.
Executive Officer, Engineering and Design Section,
Automotive Testing and Research Division
Aberdeen Proving Ground, Maryland

certain instances, mainly for components of a vehicle as opposed to an integrated vehicle design, the drawings may be prepared by an industrial source, in which case the coordination of the design with the rest of the vehicle is the function of this section.



Medium Tank, M3, (Wooden Mock-up). Three-quarter left front, guns elevated. Illustrating early stage in development of this tank.

The next step is then the manufacture or procurement of a pilot model of the equipment. This is handled through the "Facilities Section" with the cooperation of "Industry" and "Ordnance Manufacturing Facilities". The function of the "Facilities Section" with the actual mechanisms involved, is the same as the function of the Engineering and Design Section with the drawings. Each is responsible for certain details, but is primarily concerned with the coordination of the efforts of others into a complete assembly.

The final step shown on Figure II in the development procedure is the function of the "Test Section". Here various components and vehicles both of an experimental type and production models are tested. These test results, recommendations and conclusions, are forwarded through channels to The Chief of Ordnance. However, close coordination between Design, Facilities, and Testing by personal, on-the-spot, contact, speeds up the work and effectively integrates the several steps necessary in the development of an idea into a reality.

III. CLASSES OF MATERIEL

Having broadly defined the scope of Ordnance automotive equipment, and explained the conception of new ideas and their development up to the appearance of the

pilot model, it remains to show how the broad classification breaks down into smaller groups for the purposes of decentralization and specialization which are necessary for efficiency in any large organization. Two main sub-groups to automotive materiel are namely: (1) Components, and (2) Vehicles. These are shown in Figure III with a partial listing of the various subdivisions. It is apparent that even the simplest Ordnance vehicle reaches a considerable state of complication, and the need for men with a specialized knowledge of certain components, as well as a comprehensive picture of one type of vehicle is easily recognized.

IV. FACTORS OF DESIGN

To conclude this article it seems appropriate to note the basic considerations encountered in the development of a new fighting machine.

First of all there are the opposing ideals of Production and Perfection. At first thought the job of the design and development seems to stop with the presentation of as near perfect a device as can be made to satisfy a stated need. However, on consideration it is obvious that unless the device can be produced in quantity, the development has not been satisfactorily completed. It therefore is important for the development program to include careful

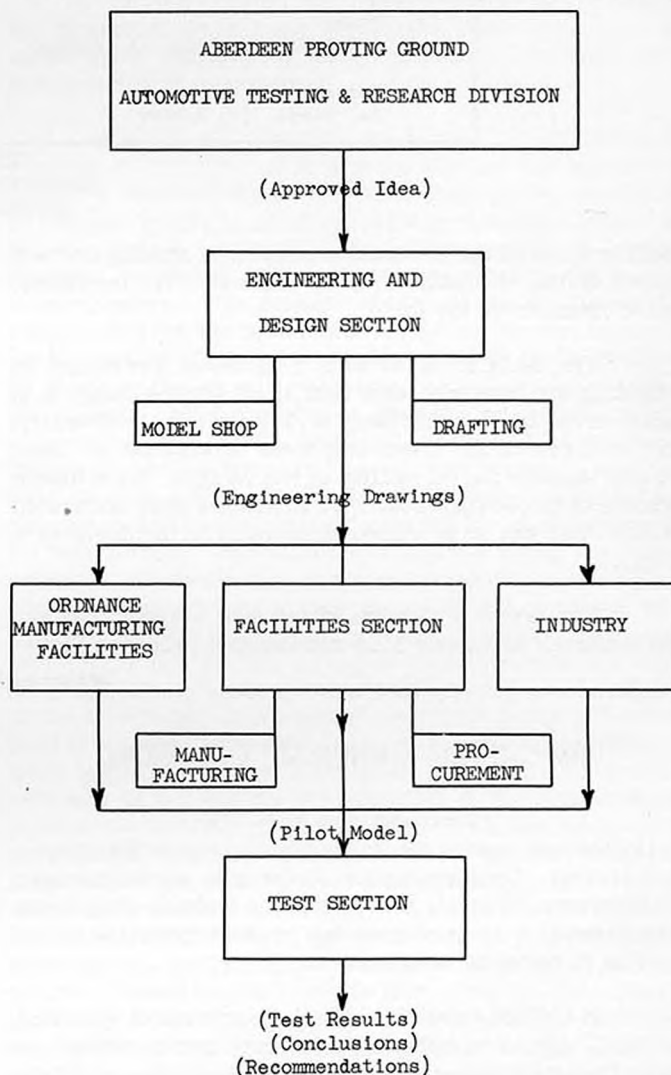


FIGURE II

SCHEMATIC DIAGRAM SHOWING DEVELOPMENT OF
AN IDEA INTO AN EXPERIMENTAL WORKING MODEL

ORDNANCE AUTOMOTIVE EQUIPMENT	
COMPONENTS	VEHICLES
(1) Accessories (a) Electrical, (b) Equipment	(1) Wheeled (a) Armored Cars, (b) Self propelled Gun Mounts (Machine Guns) (Anti-Tank) (Anti-Aircraft) (Artillery), (c) Wreckers, (d) Repair Trucks, (e) Prime Movers
(2) Armament (a) Machine Guns, (b) Cannon, (c) Fire Control	(2) Half-Tracks (a) Scout Cars, (b) Personnel Carriers, (c) Artillery Mounts
(3) Armor (a) Cast, (b) Rivited, (c) Welded	(3) Full-Track Laying (a) Tractors (Low and High Speed) (b) Light Tanks, (c) Medium Tanks (d) Heavy Tanks
(4) Engines Gasoline (Air-cooled Diesel) (Water-Cooled	
(5) Power Trains (a) Clutch, (b) Driveshaft, (c) Differential, (d) Transmission (Mechanical) (Automatic Mechanical, Electrical, Hydraulic)	
(6) Suspensions (a) Spring, (b) Hydraulic, (c) Pneumatic	
(7) Tires (a) Bullet sealing, (b) Combat	
(8) Tracks (a) Steel, (b) Rubber	

FIGURE III
CLASSIFICATION OF ORDNANCE
AUTOMOTIVE EQUIPMENT

consideration of the production problems, making correct choice of the (a) materials, (b) methods, (c) machines, and (d) men, to do the job.

The decision as to what constitutes Perfection in a fighting machine such as a tank, must also be weighed in terms of the basic quantities, (a) Fire power, (b) Mobility, and (c) Protection. Over-emphasis of any one of them rapidly lessens the versatility of the vehicle. An optimum balance of the design factors to produce a well integrated vehicle that can be produced in quantity is the designer's mission.

The trend of design, which was started long ago and continues at present at an accelerated pace, has there-

fore manifested itself in three ways (a) Simplification, (b) Specialization, and (c) Standardization. Simplification is used in a relative sense. There is no denying that modern war requires complex machinery, but there is always a simplest way to accomplish a result. Specialization of the functions of machines, or the emphasis of a particular mission for a certain type of machine, has been necessary because no one type of tank, for instance, can carry out all the possible missions that might be assigned to it. That is why the navy needs torpedo boats, destroyers, cruisers, and battleships, while the army needs "blitz buggies", scout cars, light tanks, medium, and heavy tanks. Standardization of Ordnance automotive equipment follows the industrial trend, and is the only way that technical advances are eventually put in the service of the using arms.

BRIGADIER GENERAL J. B. ROSE

(Continued from page 275)

In 1928 he was sent to the Army War College in Washington as a student. Upon graduation he became works manager at Watertown Arsenal, and installed a welding shop which introduced in a large degree the present extensive use of welding in carriage construction.

In 1930 he was ordered to the command of Picatinny Arsenal, and upon completion of duty there, served as Department Ordnance Officer in the Canal Zone. While on this latter assignment he was in command of a provisional regiment composed of various organizations at the General Depot at Corozal.

From 1935 to 1939 he served as a member of the General Staff Corps, in the G-4 Division, and in July, 1939, was placed in command of the Aberdeen Proving Ground.

A few days after this issue of THE ORDNANCE SERGEANT was taken from the editorial office to the Reproduction Department, the War Department announced that Brig. Gen. John B. Rose, commanding officer of Aberdeen Proving Ground, had been ordered to command Picatinny Arsenal at Dover, N. J.

Brig. Gen. Rolland W. Case, recently commander of Watertown Arsenal, Mass., was named to succeed General Rose.

AUTOMOTIVE TESTING AT ABERDEEN PROVING GROUND

By: Winthrop B. Reed, 2nd Lt., Ord. Dept.
Chief, Armor and Armament Section, Automotive Testing and Research Division
Aberdeen Proving Ground, Maryland

The Test Section of the Automotive Testing and Research Division of Aberdeen Proving Ground, Maryland, can be placed on an organization chart showing the flow of a project through the Automotive Testing and Research Division as the final step before the acceptance or rejection of any project. It is in this section that all development and acceptance projects of Automotive Equipment and equipment related thereto are given a test to determine whether or not various units possess the necessary serviceability for field use. The Test Section has a dual function, that of testing units and making recommendations on the results of test. Due to this advisory capacity of the Test Section, it can be seen that coordinated team work is necessary between this Section and all other Sections of the Automotive Division.

For convenience of executive control the Test Section is divided into five Sub-sections which include:

1. Armored Vehicles.
2. Engine and Power Train.
3. Laboratory.
4. Armor and Armament.
5. Special test.

The Armored Vehicle Sub-section is charged principally with the test of tanks, scout cars and half track vehicles. The test routine of this section will be described later.



Demonstration of Medium Tank, M3, for Tank Committee meeting.

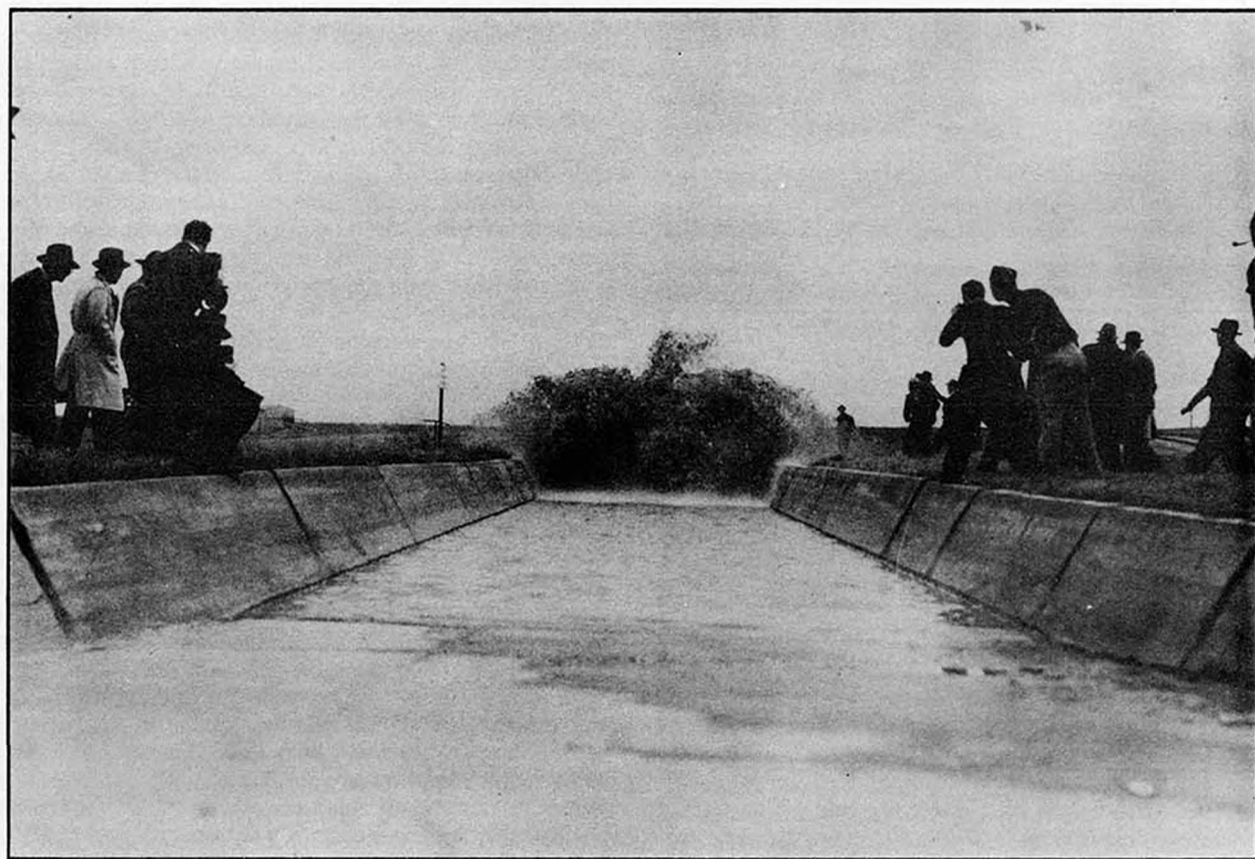
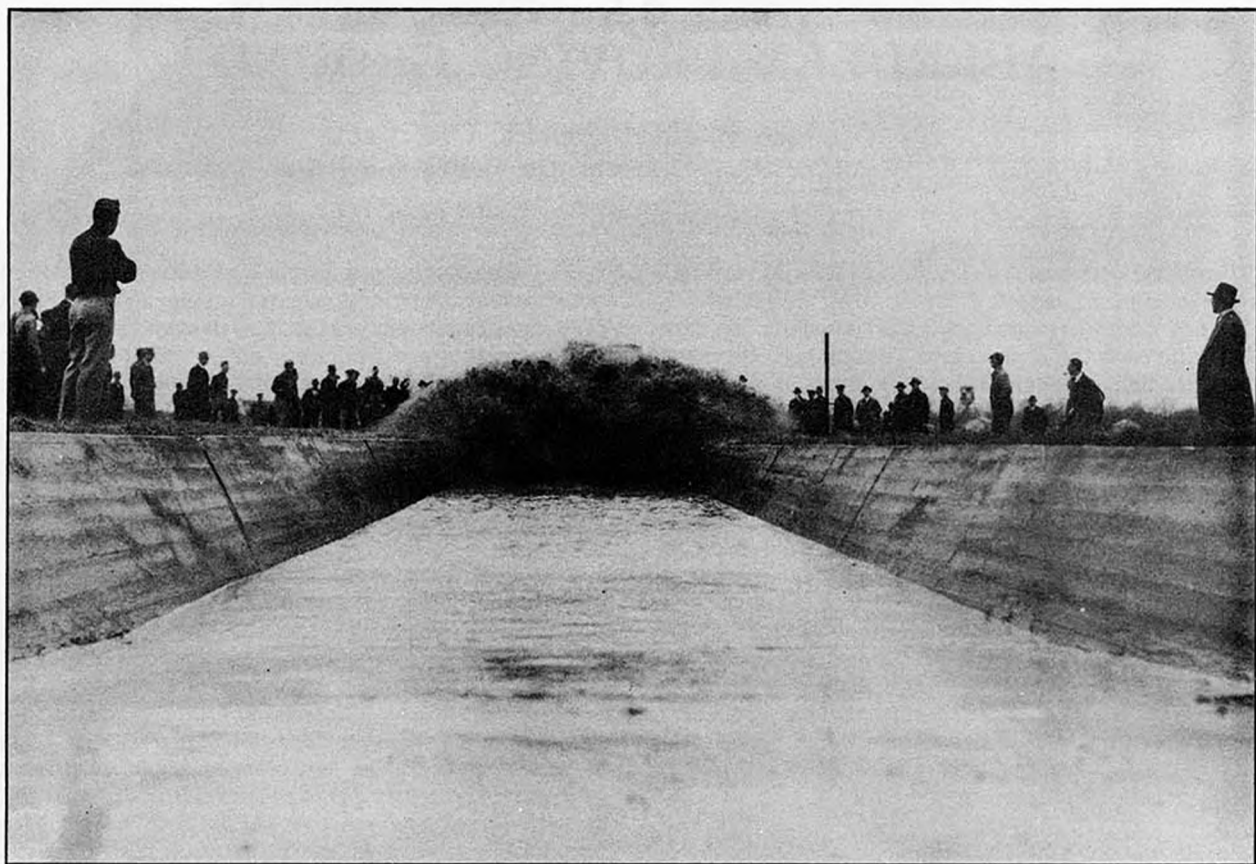
The Engine and Power Train Sub-section is charged with the test of engines, transmissions, and general laboratory work regarding engines and power trains. Operations in this Section are intimately allied with the Armored Vehicle Section project so that difficulties encountered during the test of Armored Vehicles may be observed by a Proof Officer whose special duty it is to test engines and power trains. The engine and power train Proof Officer thereby may better organize his tests of assemblies taken from vehicles to the Laboratory.

The work of the Laboratory Sub-section includes air cleaner tests, oil and oil cleaner tests, cold starting tests, field engineering tests, chemical analyses, and maintenance of instruments.

Air and oil cleaners are tested for efficiency in removal of foreign matters from air and oil against a standard cleaner; the test cleaner must prove its ability to remove specially prepared foreign materials placed in the air stream or the oil. A definite weight of foreign material is placed in the air stream prior to the test of an air cleaner. The relative ability of the air cleaner to remove this foreign material from the air stream as compared with the ability of a standard cleaner is determined by weighing the amount of foreign matter collected in the air cleaner and comparing it with the amount of foreign matter collected by the standard cleaner. The standard cleaner is called "absolute" and is considered to have an efficiency of 100%. The ratio of the weight in the test cleaner to that in the standard cleaner is the efficiency of the test cleaner. Oil cleaners are tested using the same principle. Cold starting tests are designed to determine what auxiliary equipment must be placed in Automotive vehicles, to aid starting during the winter months. There are available to this Section an engine dynamometer in a cold room and a refrigerator room large enough to contain an armored vehicle. Such a vehicle is placed in the cold room and brought down to winter temperature, cold starting equipment having been placed in position. Time and rise of temperature of the vehicle are reported as the cold starting "assistance unit" is brought into play. The time necessary to run these auxiliary units before the engine can be started is recorded for each type of cold starting unit, hence, a comparison of units is obtained. The field engineering tests include determination of drawbar pull, acceleration, fuel consumption, cooling, and resistance to traction of test vehicle. Tests are conducted in part using the field dynamometer. (See Photographs.) The determination of these characteristics of the vehicles gives an indication of the vehicle's performance both on smooth surfaced roads and across rough terrain. The Instrument Section maintains the storeroom containing testing instruments for the

(Text continued on page 282)

DEMONSTRATION OF MEDIUM TANK, M3 FOR TANK COMMITTEE MEETING



PILOT MEDIUM TANK, M3 FORDING AT HIGH SPEED



AUTOMOTIVE TESTING

(Continued from page 279)

Automotive Division. The oil section takes samples of oil from vehicles during vehicle test and checks them for viscosity, gravity, and foreign matter content at different periods. Routine chemical analyses incident to all tests are made in the chemical laboratory. A limited amount of research concerning lubricants is carried out by this section.

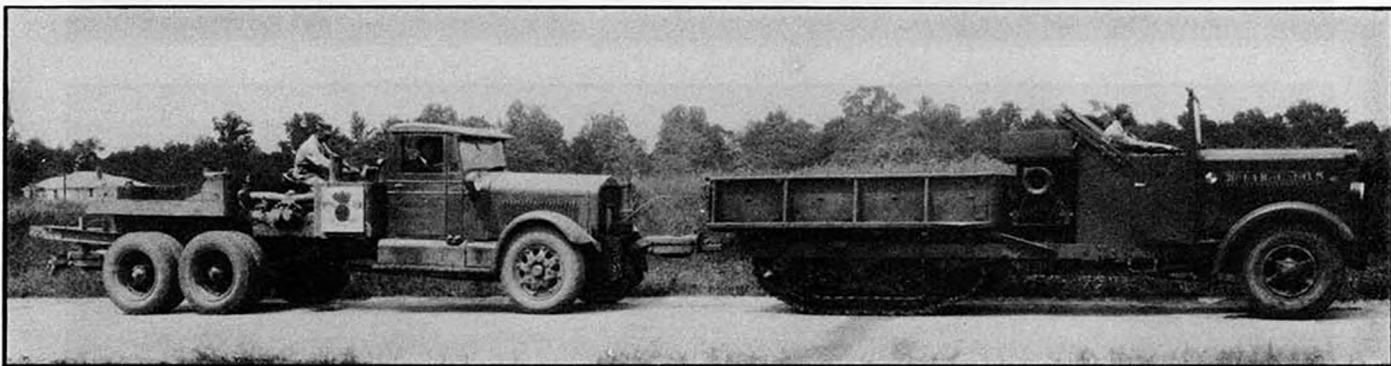
The Special Test Sub-section tests commercial vehicles, rubber products, tank carriages and self propelled mounts. Commercial vehicles include prime movers of all types, such as trucks and tractors. The rubber products section tests tracks and other rubber products incident to tank manufacture. The gun carriages section tests different gun mounts through long life tests to determine the suitability of different types of "mechanized" mounts. The self propelled mounts section gives the field test to artillery mounts placed on Automotive Vehicles.

The Armor and Armament Section tests various types of guns and gun mounts which are placed or are to be placed on Armored Vehicles. The mounts are tested both for resistance to failure during road test and also resistance to failure during firing test. The Armor Section does not of itself test armor but observes the test of armor by the Arms & Ammunition Section at Aberdeen Proving Ground, collects data from the test of armor and presents it in engineering form to the Automotive Testing and Research Division. Special tests of armored units are made by this section.

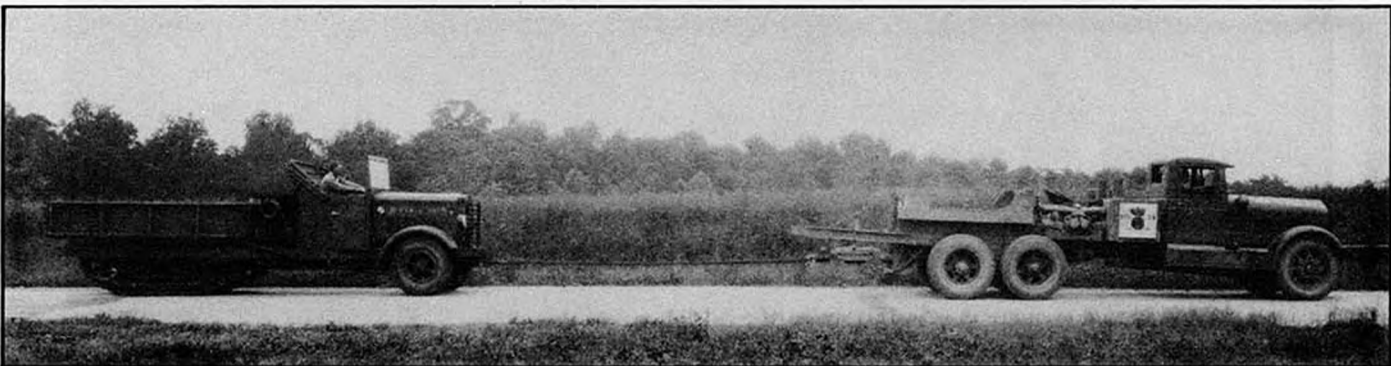
We have seen what each Sub-section of the Test Section does and in general, how it does it. Armored vehicles are the principal units for test in the Automotive Testing and Research Division; therefore, we will follow through, in an abbreviated fashion, the test of one of these vehicles after it has been received by the Test Section. First, after a general visual inspection, the vehicle is weighed and the center of gravity taken (safety in slope operation.). Riding and driving characteristics are obtained by an intensive run over the Automotive testing course. Operations on this course include cross country, mud, water, shell hole, slope sand and obstacle crossing tests. The suitability of the vehicle as a firing platform and as a protection to personnel are noted. Should a vehicle fail any part of the prescribed test, an immediate report is made to the Office of the Chief of Ordnance, and a consultation is held to determine the reasons for failure. The Chief of the Automotive Testing and Research Division in cooperation with representatives of the Test, Design, Planning, & Facilities sections proposes a new design, has the required modification made on the test vehicle and the routine test is repeated.

The combined facilities of the Test Section other than the Armored Vehicle Test Section present an opportunity to Proof Officers for determining the life of the vehicle and the components of that vehicle without testing the entire vehicle in all aspects of endurance. The various dynamometer stands under the Engine and Power Train Section are used to determine engine life, structural weaknesses, performance characteristics, continued performance characteristics, specific fuel consumption, oil consumption and other characteristics incident to continuous tank operation. The field dynamometer is used by

(Continued on page 287)



Field Dynamometer, M3. Drawbar pull test of half track truck, T3.



Field Dynamometer, M3. Resistance to traction test of half track truck, T3.

THE JOB OF THE BALLISTIC RESEARCH LABORATORY

By: O. R. Schurig, Capt., Ord. Dept.

Have you ever inquired how the answers to the following problems are obtained:

How long to make the barrel of a gun, or

How thick to make its wall, or

How to design its rifling, or

How to make an instrument to measure the change of pressure during the firing process, or

How to compute the range of a projectile fired at a given muzzle velocity, or

How to measure the range of a bomb from the point of release in an airplane to the point of impact, or

How to establish the relative merits of different types of bomb proof shelters, or

For what forces to design the trunnions of a machine gun, or

How to establish the fitness of ammunition after years of storage?

These problems and many others of a similar nature arise within the wide fields of design, development, and testing of ordnance materiel.

If you were to inquire into the basic principles which underlie the solution of these problems, and were to consult eminent scientists and engineers in industry and at universities, you would find that even they do not have much of the specialized knowledge in interior and exterior ballistics because little, if any, research in these fields is done by privately owned research establishments and by the universities. In order that our ordnance materiel shall be as effective and of as high quality as possible, the Ordnance Department pursues research work in ballistics. The agency in the Ordnance Department which is responsible for carrying on these research activities and related engineering investigations is the Ballistic Research Laboratory.

Besides carrying on this class of research and engineering work, this Laboratory computes all data for cams and for fire control directors, prepares the firing and bomb tables for the using arms and maintains a Surveillance Section for the determination of the condition of ammunition in the War Reserve and the need for replacement.

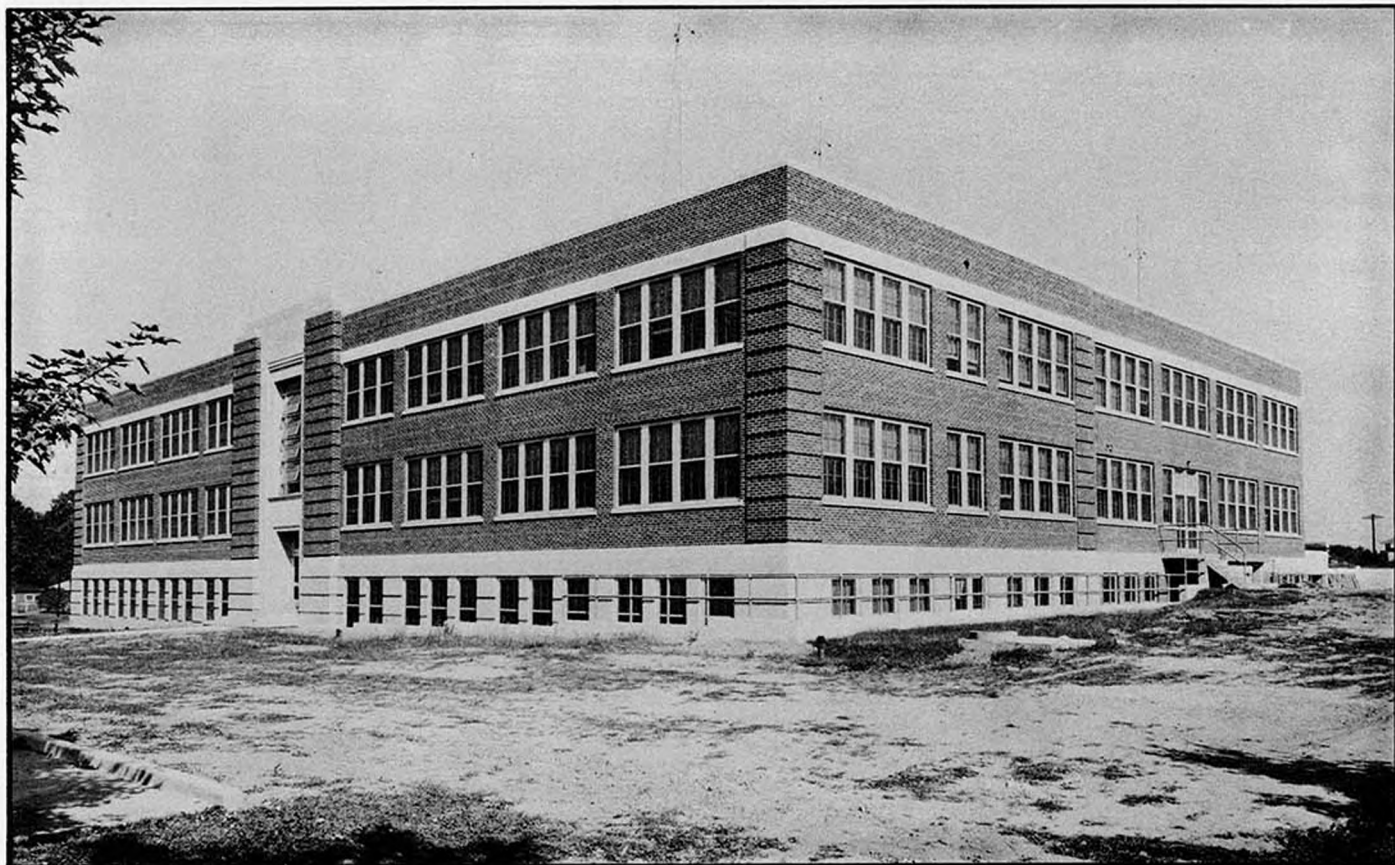


Figure 1
The Ballistics Research Laboratory, Aberdeen Proving Ground

The Laboratory operates under the direction of the Industrial Service of the Ordnance Department, except that the surveillance work is under the direction of the Field Service of the Ordnance Department.

The Laboratory has six sections covering the following classes of work:

- Interior Ballistics and Effect of Fire.
- Exterior Ballistics.
- Ballistic Measurements.
- Ordnance Engineering.
- Computations of Firing Tables and of Bombing Tables.
- Surveillance of Ammunition.

The personnel of the Ballistic Research Laboratory includes a total of 103, 8 of whom are commissioned officers, the others being civil service employees, whose activities are divided as follows:

- 39 Research and Engineering work in Ballistics.
- 5 Surveillance work, including 1 ammunition inspector.
- 28 Computations for firing and bombing tables
- 13 Clerical work.
- 4 Mechanical work.
- 6 Other service activities.

In its scientific research activities, the Ballistic Research Laboratory is aided by a non-resident Scientific Advisory Committee appointed by the Chief of Ordnance

to act as consultants for the Laboratory and to advise them in their research problems and in the formulation of new research programs. The Committee has 8 members, all of whom are eminent scientists whose work lies in the fields of the sciences on which ballistics depends, namely: mathematics, physics, physical chemistry and aerodynamics.

The Laboratory occupies a building especially designed and equipped for its own activities, Figure 1. The facilities include:

A chemical laboratory, an inside range 100 feet long, and other general-purpose laboratories for interior ballistics work;

A projectile calibrating laboratory, a projectile preparation room, an inside range 300 feet long, Figure 2, for aerodynamic studies, and spark photography equipment, all for exterior ballistics research work;

A standards laboratory with a variety of equipment for precision and electrical measurements, an oscillograph camera laboratory for making chronograph and pressure-time records, piezo-electric pressure measuring devices, an electrical development laboratory for ballistic measuring devices, electronic amplifying and control equipment, and a ballistic measurements laboratory on wheels;

A mechanical testing laboratory, a precision measurements laboratory and an indoor range equipped for gun-mechanism tests and other ordnance engineering uses,



Figure 2
300-foot range, with blast chamber, viewed from firing room; used in the study of the aerodynamics of projectiles.

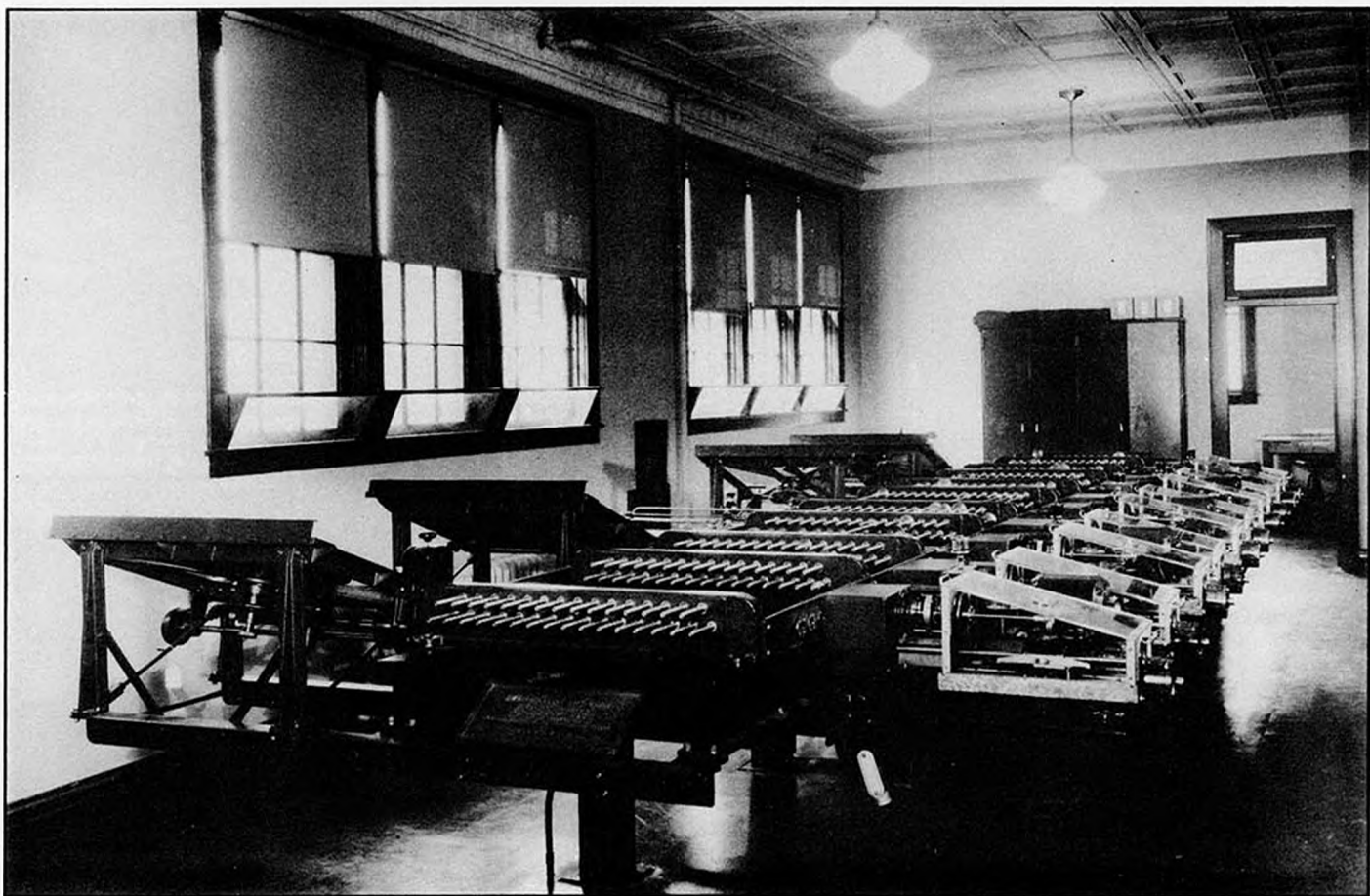


Figure 3
Bush Differential Analyzer

a machine shop, a woodworking shop; also heat-treating furnaces, photographic dark rooms, radio-transmitting and receiving equipment, and other general laboratory facilities;

A Bush differential analyzer, Figure 3, for making firing-table computations. The machine does the work of a large number of computers, who were required in the first World War to carry on the computations.

The Ballistic Research Laboratory also houses the Technical Library which serves the entire Proving Ground.

Thus it is seen that the Laboratory provides not only a staff of scientists and trained engineers but also a wide variety of laboratory facilities and special instruments for the conduct of ballistic research and ordnance engineering studies.

BALLISTIC STUDIES

By: R. H. Kent

Associate Director, Ballistic Research Laboratory

You can pull the trigger or the lanyard, the firing pin hits the percussion primer, a detonation of the primer takes place producing a pressure in it of nearly 1,000,000 pounds/sq. in. and a temperature of 5000°C or more. The hot fragments of the primer strike the grains of black powder at a velocity of a mile a second and start it burning. The black powder radiates heat to the smokeless powder which soon starts burning at a relatively slow rate. As the burning goes on, the hot gas under a high pressure accelerates the burning, the pressure rises rapidly and

the projectile moves forward rapidly until it so increases the volume back of it that the pressure begins to fall in spite of the continued burning of the powder and the projectile reaches the muzzle with a velocity of say 2800 ft/sec.

Fortunately as the projectile went up the bore a spin was imparted to it by the twisting lands. Otherwise the force of the air would make it tumble end over end. If it has enough spin the projectile will wobble only slightly and under the influence of the air forces and gravity will

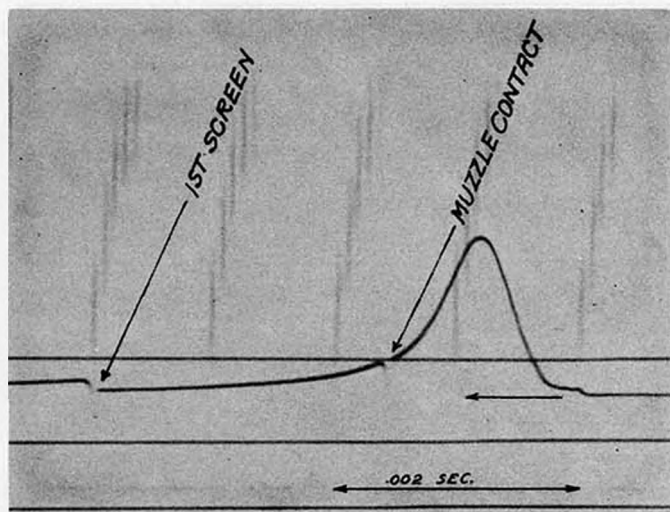


Figure 1
Pressure in the cal. .50 machine gun vs. time.

follow a curved trajectory until it bursts or hits the earth.

In the foregoing certain aspects of the motion of the projectile have been described. This is the motion which forms the subject matter of ballistics; interior ballistics referring to the motion inside the gun and exterior ballistics referring to the motion outside the gun. The aim of a complete theory of interior ballistics is to compute the pressure regime in the gun and the muzzle velocity of the projectile when the gun, powder and projectile are known, while the aim of a complete theory of exterior ballistics is to compute the trajectory of the projectile when its weight, shape, dimensions and conditions of projection are known. While neither interior nor exterior ballistics has yet fully attained these difficult goals, constant progress toward them is being made in the Ballistic Research Laboratory.

In interior ballistics, the piezo-electric gauge, * in the development of which the laboratory has played an important part, is a powerful tool. The gauge, containing quartz crystals that produce an electrostatic charge proportional to the pressure, records the pressure in the gun as dependent upon the time. From such records not only is the pressure itself inferred but also information concerning the rate of burning of the powder and the frictional resistance to the motion of the projectile.

In exterior ballistics, the great desideratum is a knowledge of the forces acting on the projectile for if these are known not only may the motion of the center of gravity be calculated but also the motion or wobble of the projectile about its center of gravity. Conversely it should be apparent that if the motion of the center of gravity and the motion about the center of gravity are known, the forces acting may be deduced.

The motion of the center of gravity is recorded by firing magnetized projectiles through coils of wire and recording the e.m.f. produced. Following the technique introduced by the English Captain Fowler, the wobble may be recorded by cardboard screens or more accurately by spark photographs.

* General Rodman was the first to invent a practical gauge for measuring the maximum pressure in a gun.

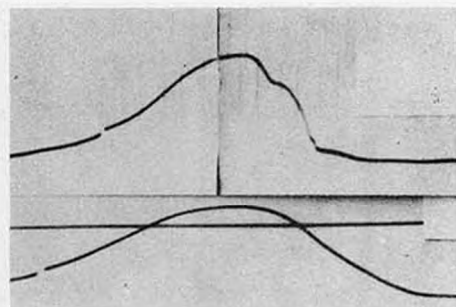


Figure 2
Pressure curves for a 155-mm gun. Upper curve shows pressure waves; the lower, absence of waves.



Figure 3
Exterior of ballistics firing range.

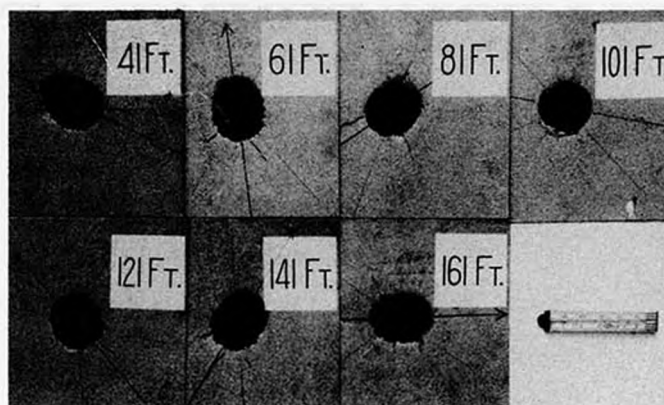


Figure 4

Cardboards showing variation of angle of yaw with range. (The angle of yaw is the angle between the axis of the shell and the trajectory.)

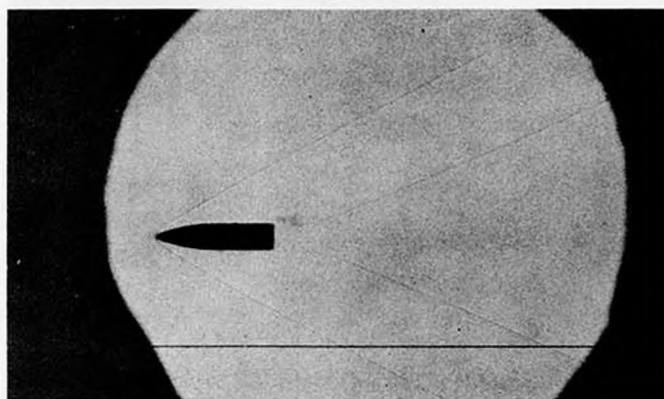


Figure 5

Spark photograph of cal. .30 bullet taken by Dr. Charters of the Ballistic Research Laboratory

Some of the types of investigations involved in interior and exterior ballistics have been mentioned. By the aid of such studies our science of ballistics progresses to provide new knowledge for the design of American shell, bombs and guns and the calculation of firing tables for the United States Army.

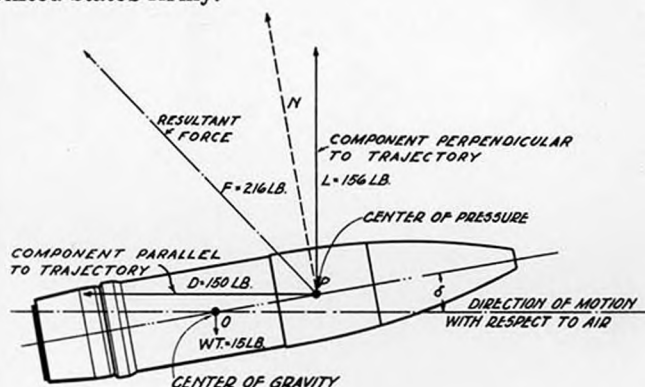


Figure 6

The forces on a 75-mm projectile at an air speed of 2500 ft/sec and angle of yaw of 10°.

If you are interested in camouflage don't miss Captain Jarrett's article "Camouflage in the Ammunition Depot" in the December issue.

AUTOMOTIVE TESTING

(Continued from page 282)

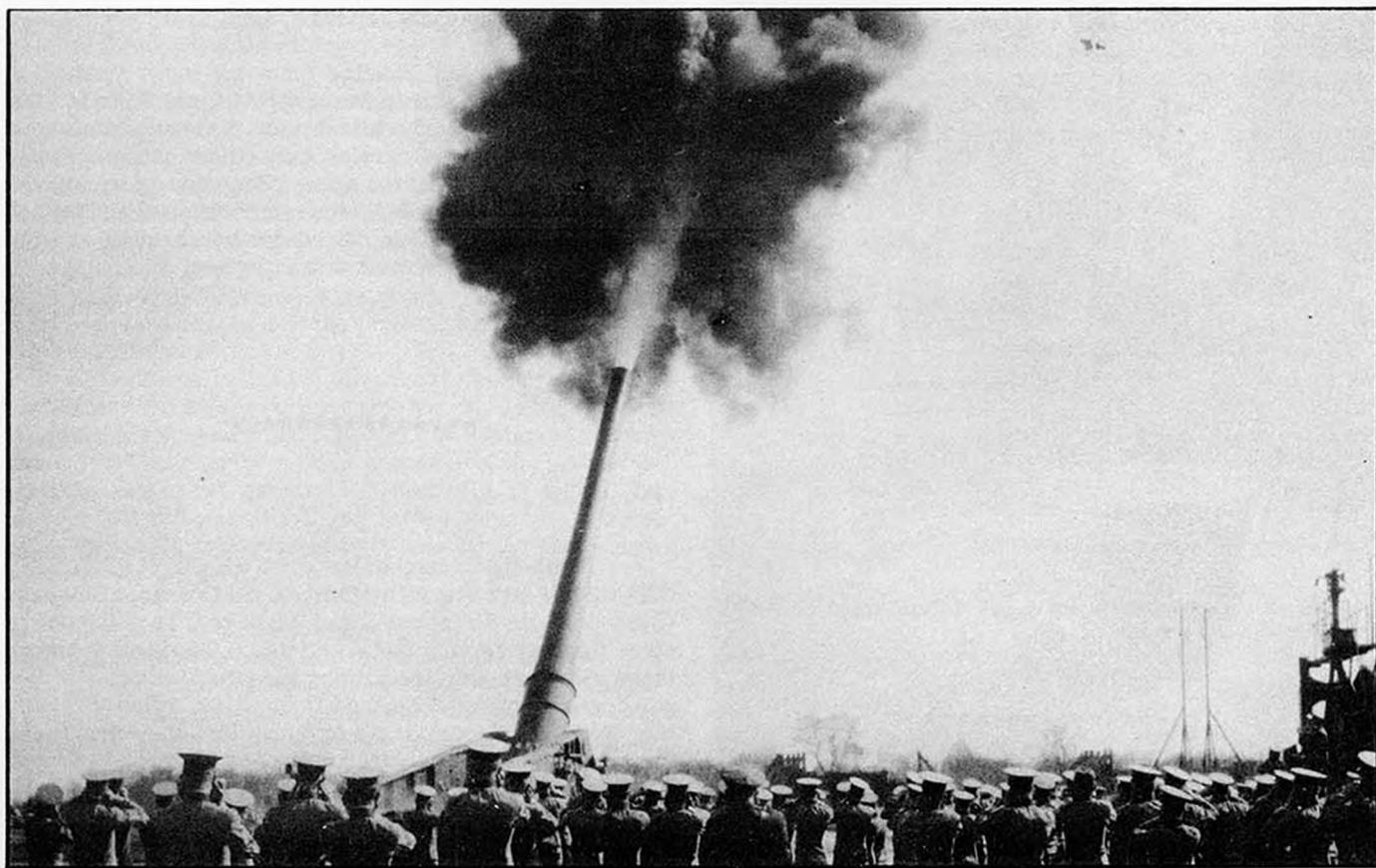
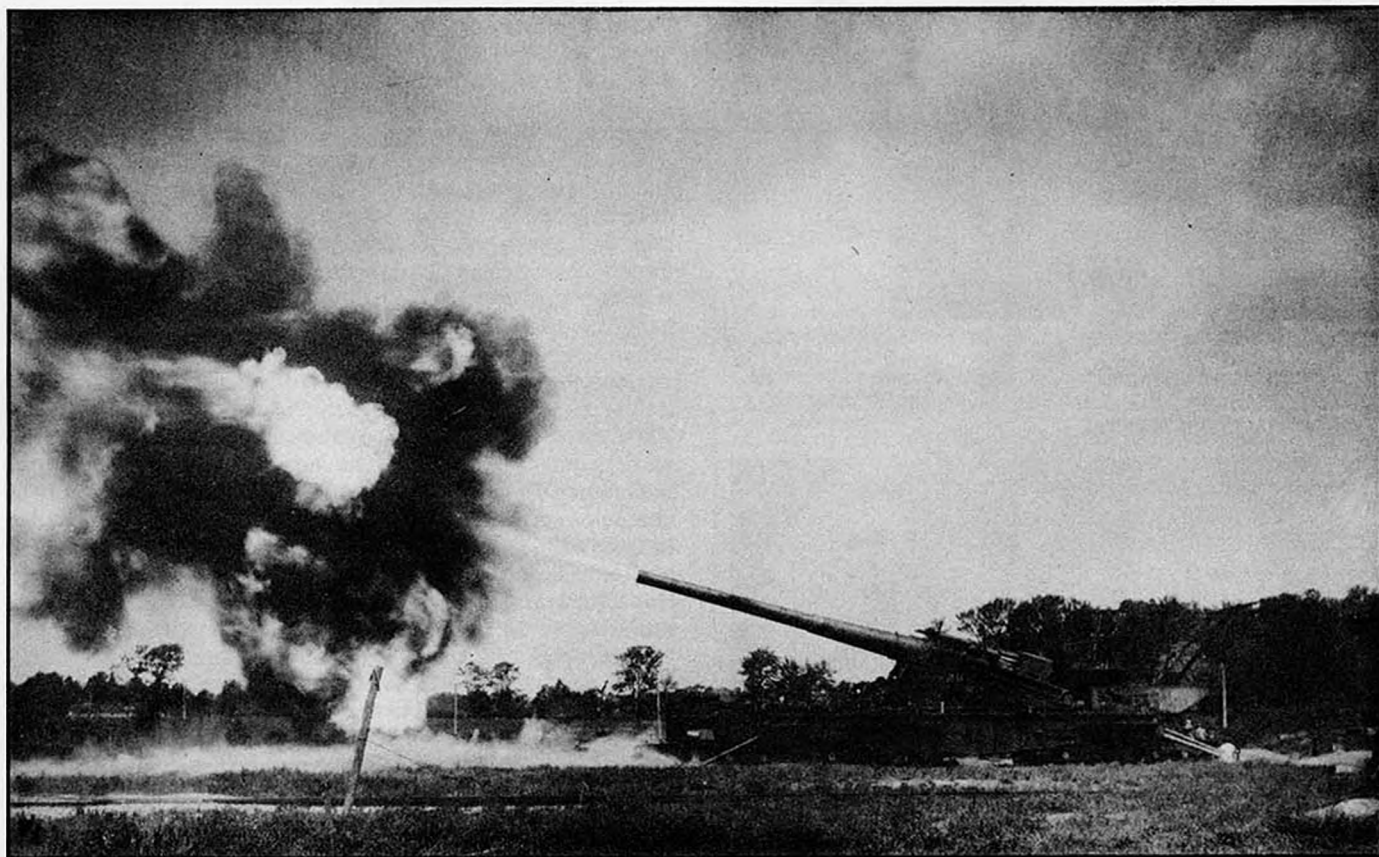
the Laboratory Section to determine power losses in a vehicle by drawing the vehicle out of gear and in various gears and noting the power necessary to drag it over a given terrain. Power consumed in a track and bogie assembly or transmission and final drive will indicate to the Proof Officer the extent of wear within that assembly and possibilities of failure. There is a track testing machine available to the rubber section to determine the life of tank and other vehicle tracks over whatever surface the Proof Officer chooses to place in the bowl of the track testing machine. Machines are available to mount bullet proof tires to test the tires for rise in temperature and hence, resistance to blow-out failure under operation at various loads and speeds and also to note the effect on the tire when pierced with caliber .30 and caliber .50 bullets. The Armor and Armament Section has the necessary stands and mounts for testing guns and gun assemblies and the resistance to penetration and shock by projectiles of the various armor plate assemblies. It has been the practice of the Ordnance Department, in recent years, to test the major types of armored vehicles to destruction by direct fire with small arms ammunition and other caliber ammunition up to 75 mm. These tests are progressive in that the projectile which would do the least damage is used first.

Reports on tests are made by telephone or teletype at the completion of any one part of the test; a letter report is written at the completion of the test along with a request for disposition of the project. After the disposition of the project has been stated by the Office of the Chief of Ordnance, a formal report is written on the project which embodies a complete story of the project from the initial presentation of authority for test to the Test Section to the final disposition of the project. This formal report represents a permanent record.

One can well imagine from the large number of parts on a vehicle, for instance the Medium Tank M3, that before completion of the test on such a vehicle, numerous operations have been carried out, parts changed, tests made and the cycle started again. Time and space are not available to examine in detail the ramification of automotive testing. It is hoped that the reader has become at least partly acquainted with the many aspects of this subject.

While the December issue of THE ORDNANCE SERGEANT will give special attention to the Ordnance Company (Depot) and the Ordnance Depot, there will be a number of other interesting and useful articles. Outstanding among these will be an article outlining the latest information regarding all types of Ordnance Companies, Aviation. Captain Foy will discuss their organization, their functions, their equipment, and their relationship to the Air Corps. Another article, by Sergeant Caverly, of Barksdale Field, will describe the construction and use of a "Spotting Charge Tamper". This item will be useful to many of you.

HEAVY ARTILLERY FIRING AT



ABERDEEN PROVING GROUND



THE ANTI-AIRCRAFT, RAILWAY, AND SEACOAST SECTION

By: John P. Traylor
Second Lieutenant, Ordnance Department

Among other missions, Aberdeen Proving Ground is charged with the responsibility of conducting the development testing and a large part of the acceptance testing of antiaircraft, railway, and seacoast ammunition and materiel. This mission is accomplished by the Antiaircraft, Railway, and Seacoast Section of the Arms and Ammunition Proof Division, at present under the direction of Capt. J. H. Weber and Lt. Col. G. G. Eddy, respectively.

Of the three types to be discussed here, antiaircraft artillery is increasing most rapidly in importance, and consequently deserves first mention. This rapid increase of importance is directly attributable to its primary mission - local defense against aviation attack.

Antiaircraft artillery mounts are designed as fixed mounts permanently emplaced, or as mobile mounts. However, mobile antiaircraft guns in use at Aberdeen Proving Ground as proof facilities are mounted on permanent concrete emplacements specially designed to accommodate the mobile mount. In order that this be done, the mounts are put in firing position and the outriggers are removed before being installed on the permanent emplacement.

Antiaircraft artillery now standardized for the Army includes 37-mm, 3-in., 90-mm, and 105-mm A. A. guns. All antiaircraft artillery now being developed or manufactured is designed with mobility as one of the most important characteristics. Other important requirements of antiaircraft gun units are: wide ranges of elevation, usually ranging from zero or below to 80 or 85 degrees; wide ranges of traverse, usually 360 degrees; high muzzle velocity; a relatively high rate of fire; speed and accuracy in bringing the gun to bear on, and tracking, the target.

The ammunition for antiaircraft artillery is usually in the form of fixed rounds to permit a high rate of fire.

Some development has been done on antiaircraft artillery to determine the possibility of its use as all-purpose artillery. Recently, direct-fire sighting equipment has been developed and approved for several types to adapt them for use against mechanized equipment.

Railway artillery comprises a part of the classification of heavy mobile artillery, and, although its earliest recorded use was during the American Civil War, little development was effected until 1914. During the World War the United States developed railway mounts for 14-in. guns, 12-in. and 16-in. howitzers, and 12-in. mortars.

Railway mounts are classified as sliding, rolling, and platform mounts, according to the type of the recoil system. Of these three classifications, the platform mount

is most important. Although there are rolling and sliding mounts available for use in case of emergency, none are in service at this time.

The platform mount is equipped with a recoil system to absorb the energy of recoil, and stays in place during firing without movement, making use of a ground platform and/or outriggers. Some permanent concrete emplacements or turntables are provided, making the railway cannon, in effect, fixed artillery.

Seacoast artillery includes fixed armament, railway artillery and motor-drawn artillery. Mobile artillery is used within and without the harbor defense to reinforce the fixed armament, to defend unfortified harbors, and to support troops engaged in seacoast defense. Seacoast artillery is classified according to caliber of weapon as primary and secondary armament. Primary armament, including 12-in., 14-in., and 16-in. guns, 16-in. howitzers, and 12-in. mortars, is employed for the attack of capital ships. Secondary armament, including 3-in., 6-in., 8-in., and 10-in. guns, 8-in. railway guns, and 155-mm guns, is employed against lightly armored or unarmored vessels, and for protection of mine fields and submarine nets and for defense against landings.

Seacoast artillery must be able to concentrate great fire power against naval targets and to shift rapidly from one target to another. Its weapons must have long range and great power; it is also characterized by the strategical mobility of its mobile armament. Seacoast artillery has some defensive limitations, its fixed armament being immobile, its mobile armament having little tactical mobility, and its lack of defense against air attack, land attack, and attack by landing parties.

The principal type of carriage in use to mount fixed seacoast armament is the barbette carriage. There being no provision in this type of mount for withdrawing the gun from firing position, and since emplacement behind a parapet limits the range of fire of the gun, the present practice



is to design the mount as inconspicuously as possible and locate it in the open.

The barbette mount consists of a heavy base ring bolted rigidly to the concrete emplacement and of a superstructure, supporting the gun, resting on this base ring and capable of moving in azimuth upon it. Electric power is usually used to elevate, traverse, and load the gun, and compressed air to actuate the breech mechanism.

Since modern capital ships have very heavy side armor which can withstand a considerable amount of fire, seacoast howitzers and mortars are employed to fire indirectly at high angles of elevation and attack the relatively thin deck armor.

Disappearing carriages, although still in use in many harbor defense zones, are being replaced by barbette mounts. The disappearing carriage, upon recoil, withdraws with the gun into the loading position behind a parapet and below its crest. When loaded, the gun is raised to firing position. Since naval armament is no longer limited to relatively short ranges and low angles of fire, this type of mounting gives the minimum of protection afforded by its parapet, and is itself limited to about 30 degrees elevation.

In addition to barbette and disappearing carriages, pedestal mounts for the mine and net defense guns, and turret mounts for various other guns, are employed in coast defense installations. The pedestal mount is very simple, consisting of a cradle, in which the gun recoils, which is mounted by its trunnions in bearings in the two arms of the pivot yoke. The pivot yoke is supported and revolves on roller bearings or a ball-thrust bearing at the bottom of the pedestal, which is bolted to the concrete emplacement.

Turret mounts, used to some extent during World War I, are still in use, and some development is being done on them at the present time. They do not differ in effect from naval turrets, but can be larger and heavier since there is no restriction on size and weight for land use.

Aberdeen Proving Ground, as well as any other Ordnance Proving Ground, is required to perform acceptance tests on Ordnance materiel manufactured from standardized drawings and specifications, to make performance tests on Ordnance materiel in process of experimental de-

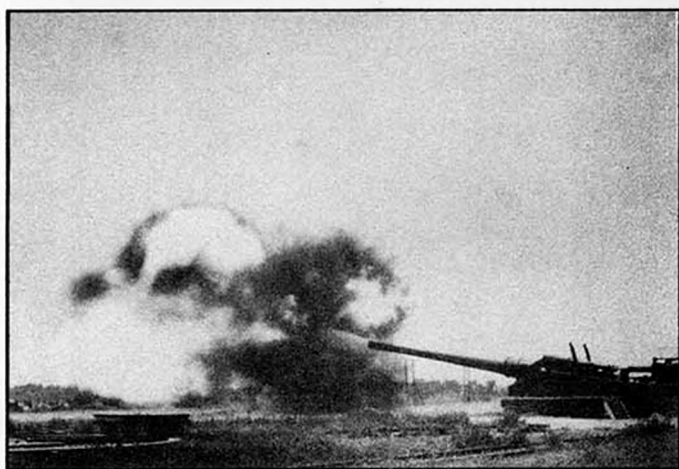
velopment, and to investigate failures of materiel and accumulate by experiment data required to advance the art of Ordnance design and manufacture. The Antiaircraft, Railway, and Seacoast Section of the Arms and Ammunition Proof Division is responsible for the completion of this mission as related to all Ordnance materiel coming under that classification, together with ammunition and ammunition components therefor.

Tests conducted at the Proving Ground are divided into classifications as (a) Acceptance, (b) Development, (c) Research, (d) Surveillance, (e) Miscellaneous. Acceptance tests are performed on given materiel to obtain results required by certain provisions of specifications, and are conducted on each unit of such materiel as guns and carriages, or on a sample from each production lot of such materiel as ammunition and ammunition components. Development tests are conducted in connection with development of Ordnance materiel and Proof Technique; some units to receive testing under this classification are "Pilot Mount" and "First of a lot of manufacture". Research tests in ballistic work are under the guidance of the Research Division of the Proving Ground, which division is responsible for the directive for the test, as well as for analysis of test results. Surveillance tests are the responsibility of the Surveillance Section, as well as are long time trends and analysis of results. Miscellaneous tests conducted at the Proving Ground include such as tests of components in War Reserve Stock for use in newly manufactured ammunition, tests of weapons and accessories, ammunition and ammunition components for American inventors and manufacturers, and tests of various assemblies or units for definite information thereon.

Ammunition acceptance tests are conducted by component and complete round. A component may be a propellant powder, a cartridge case or powder bag, primer, projectile, fuze, adapter, booster, bursting charge, filler, primer detonator, special igniter or a tracer composition, etc. Each of these components is tested for acceptance under its own specification or sample test procedure. The object of such tests is to insure that all components are correctly designed, and will give satisfactory ballistics with other components that also meet the required specifications. Complete rounds are assembled at a loading plant from ammunition components that have been accepted separately; a sample from each lot of complete rounds is tested at the Proving Ground to determine that the completed ammunition is ballistically satisfactory before the ammunition is stored or issued to the using service. Size of ballistic samples and methods of test of complete rounds vary with the caliber of the weapon for which they are assembled, however, the object of the test is the same in any case.

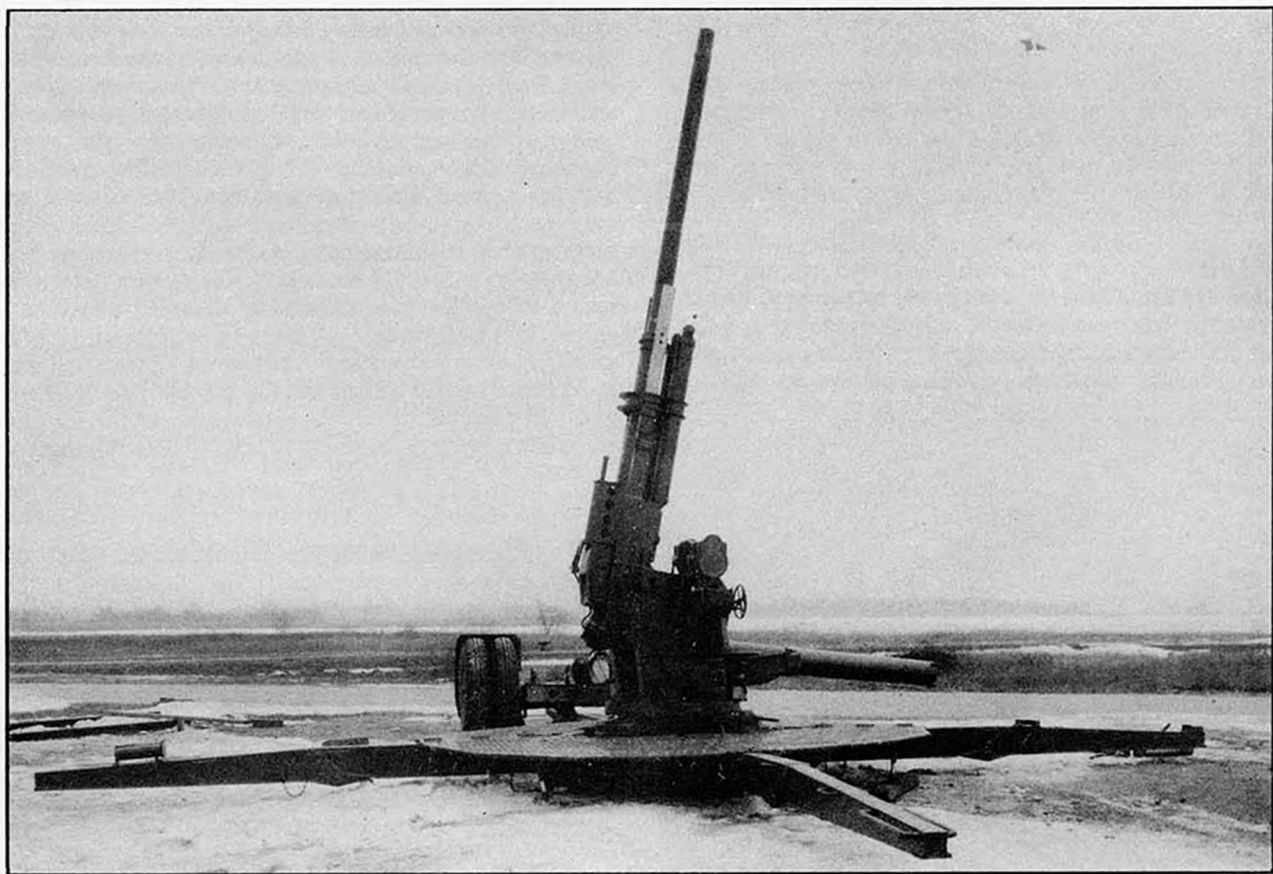
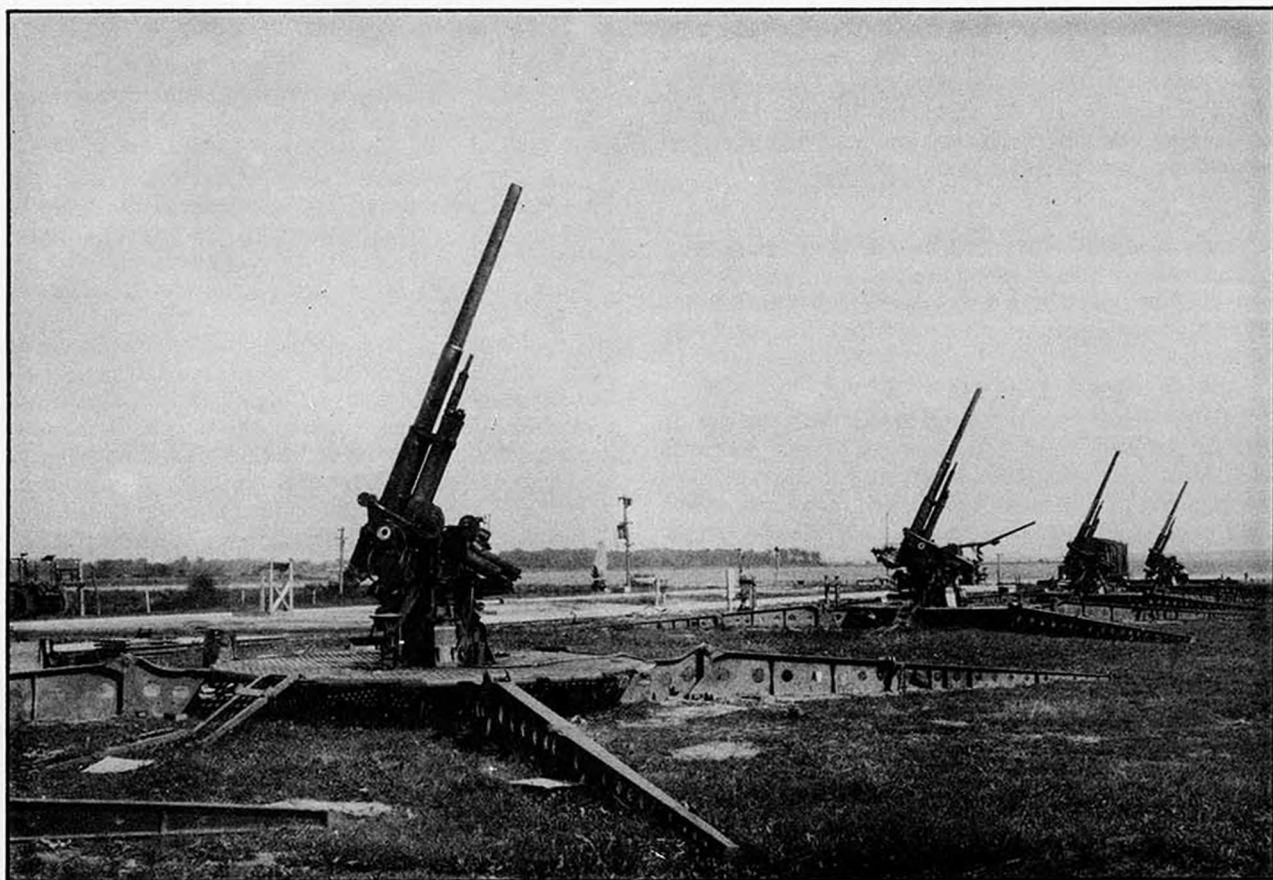
Acceptance tests are conducted on each cannon, cannon carriage, mount and firing platform, and recoil system. These tests require thorough preparation by study, an adequate plan of test, and prompt discovery and report of defects and a keen appreciation of objects of test. Considerable time may elapse before satisfactory solutions are found to correct defects; this is especially true in development testing, and personnel of the Proving Ground must so regulate testing that the least possible time is used.

(Continued on page 328)

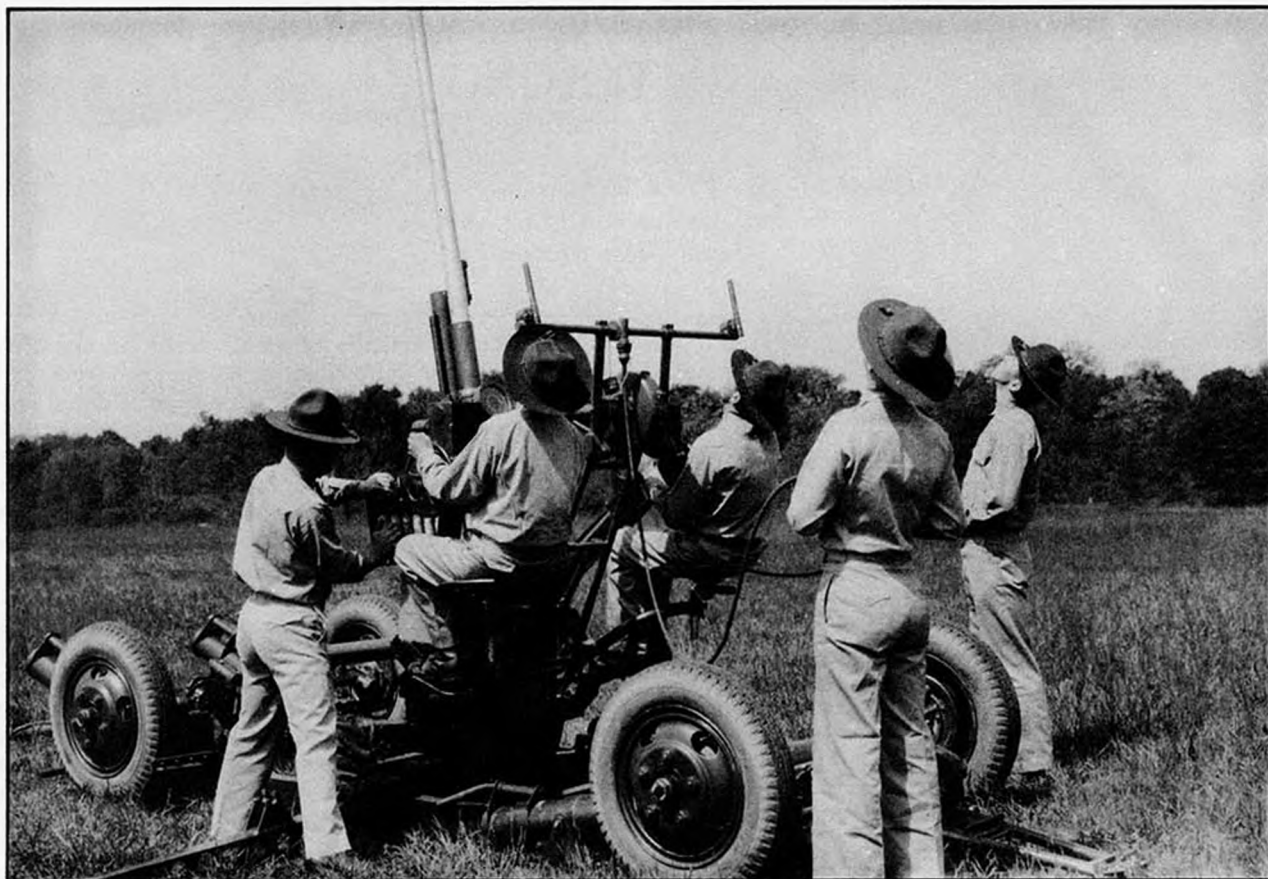


E. A. Fisher
2nd Lt. Ord. Dept.

POINTING



SKYWARD



SMALL ARMS DEVELOPMENT AND TESTING

By: G. T. Grant, 1st Lt., Ord. Dept.
Proof Officer,
Arms and Ammunition Proof Division,
Small Arms Section

Small arms proof work at Aberdeen falls into two classes: development of materiel and ammunition of smaller calibers, and check acceptance of calibers .30 and .50 ammunition of all types. In addition, all lots of tracer are fired for length of trace and other characteristics.

All small arms materiel and ammunition are proofed at the place of manufacture, with few exceptions. The restrictions as to space at Frankford Arsenal in Philadelphia make it impossible to shoot at ranges of 1000 yards and more, so this work must be done at Aberdeen.

These tests are conducted on a representative sample of the whole lot and the ammunition tested must conform to the specification in every particular or the lot fails.

The acceptance of tracer ammunition is done at night because it is easier to determine the characteristics of the trace against a dark background. The length of burning of the igniter and the total length of trace are determined by observation. Observers are stationed in bombproofs at the appropriate ranges and estimate the burning-out of the tracer mixture relative to known (marked) distances on the range.

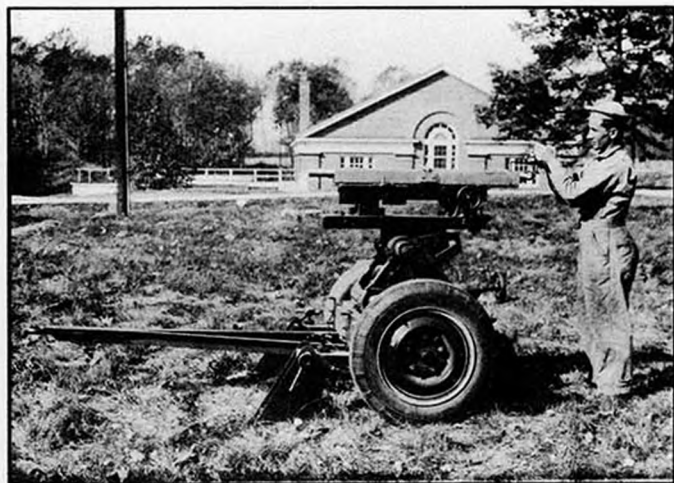
In addition, each 25th lot of ammunition, calibers .30 or .50, ball, tracer or armor-piercing, must be run through the entire acceptance test to see that the ammunition complies with the specifications. This is a check on Frankford Arsenal, whose personnel conduct the proof tests on all lots of ammunition, except as already noted in the case of tracer ammunition.

The acceptance of small arms ammunition is a routine procedure. It must be determined whether the lot concerned follows the specification as to velocity, pressure, accuracy, size of the cartridges as determined by the "Go - No Go" gages, and weight. One test consists of soaking the cartridges in water for 24 hours to determine the effect, if any, on velocity. Another test consists of immersing the ammunition in mercury to determine whether the case will crack. Mercury induces artificial aging by affecting the crystals of the brass of the cartridge case; this furnishes a convenient chemical test for evaluating the quality of the cartridge case in that particular.

Acceptance of small arms materiel is logically done at the place of manufacture. Extensive ranges are not needed and firing is usually done into a sand butt not more than 20 feet from the muzzle. Acceptance of this sort is usually for function only.

The bulk of the proof work at Aberdeen in the smaller calibers is development of materiel and ammunition. The Army must constantly look for new weapons and improve those already standard. The Ordnance Department must keep abreast of developments in foreign countries and often foreign weapons and ammunition are fired for comparison with our own.

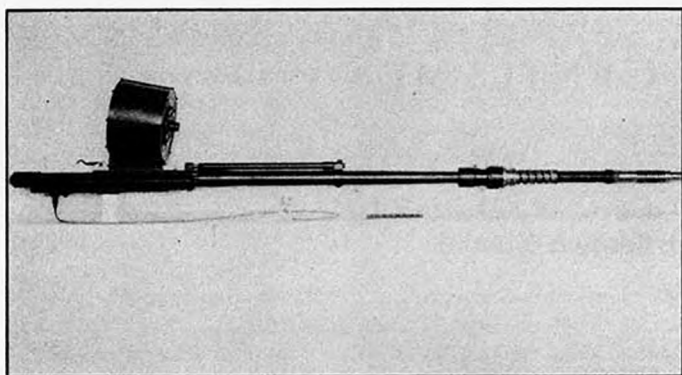
This type of work, necessarily involved and often without precedent, may require weeks and often months to find the answer sought. In this connection, the Proving Ground works directly and in close liaison with the Industrial Service, Office of the Chief of Ordnance. That office



Cal..50 Mann accuracy barrel in Vee-block mounted on firing car used in acceptance of small arms ammunition. Firing position for accuracy targets.



Same car in traveling position. Different ranges are sometimes more easily obtained by moving the gun instead of the target.



Hispano-Suiza (Birkigt) 20-mm automatic cannon, type 404, since standardized as the 20-mm Gun, M1.

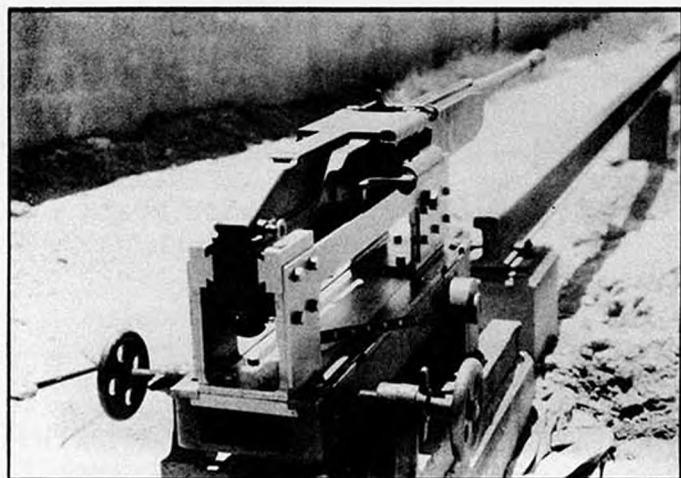
coordinates the development and writes the program to be followed in each case. The Proving Ground is charged with the actual conduct of this work and must follow the program within the physical possibilities.

Development work is definitely not routine, although technique learned on one program may be applied to another with a consequent saving of time. The report written at the end of a program and submitted to the Ordnance Office avoids speculations as much as possible and sticks to the facts as observed. This is done because, although Aberdeen may be the most important establishment concerned with the development of weapons and their ammunition, it is not the only one at the call of the Ordnance Office for this work, the others being the manufacturing arsenals and private manufacturers. The Industrial Service and the Ordnance Committee have the final say in all matters.

Not all materiel tested at Aberdeen finds its way to the using services. A case might be cited in the development of the grenade discharger.

The Infantry and other interested arms desired to find a weapon capable of discharging the standard grenade at least 200 yards. The weapon had to be light so as not to add too much to the soldier's load, and would preferably use some kind of service ammunition.

Accordingly, a set of military characteristics was



15-mm Besa Machine Gun mounted in Frankford Arsenal machine nest. Rail in background is for mounting velocity screens and yaw cards.

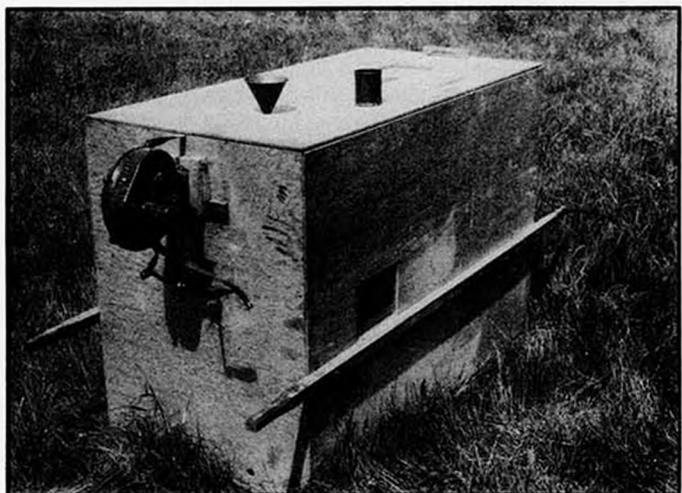
drawn up by the using arms and submitted to the Ordnance Department. One manufacturer came forward with a model of such a weapon. It held the grenade in a basket at the forward end of the discharger and the energy needed to propel the projectile was supplied by a Cal.45 blank cartridge. The expanding gases from the cartridge imparted motion to a piston on the forward end of which was the grenade, and the grenade was thus projected.

This worked very well in theory, but in actual tests at the Proving Ground, the grenades were not projected farther than a man could actually throw them.

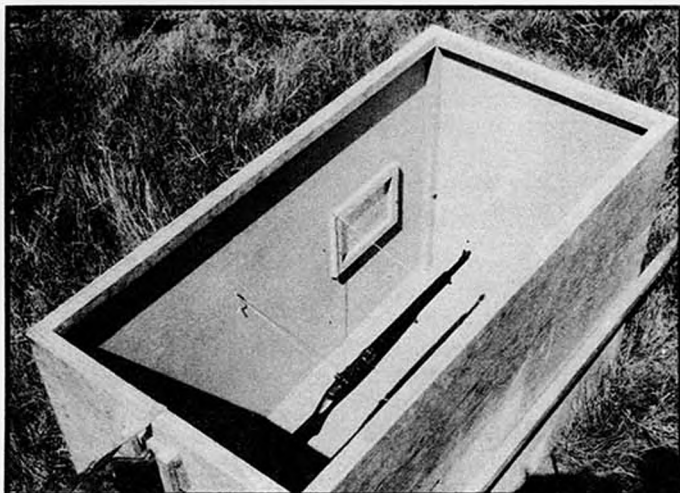
Another model was made with such changes as appeared necessary and the new grenade discharger was again submitted. It again failed to meet the military requirements as set down by the Infantry, and the development was dropped. The developments in this direction, for the time being at least, appear to be exhausted.

Many of the development programs at Aberdeen result in new or improved weapons. Tracer ammunition and the semi-automatic rifle, to name only two, saw their

(Continued on page 329)



Dust box with hand operated forge blower. This box is used for standard dust test of materiel.



Dust box with cover removed and rifle in position to be dusted.

OFFICERS AND GENTLEMEN

By: Lieutenant Colonel Geo. W. Outland,
Commandant, The Ordnance School

On October 8th the First Officer Candidate Class of The Ordnance School was graduated. Prior to graduation, on September 20th, the following lecture was delivered to the class by The Commandant of the School. It was intended to outline a plan of conduct fitting for the Commissioned Officer -- it does more; it outlines clearly a code which should be the goal of all military men.

Leadership

Today we are nearing the end of your three month training period. Only yesterday I saw many of you preening yourselves in uniforms being fitted for your new responsibilities. It will be a pleasant sight to see members of this graduating class clothed in the uniform of officers. Although it is said that fine feathers make fine birds, fine tailored uniforms, emblems of position, insignia of rank and medals do not, however, give a true measure of the officer. Fine raiment may be used to clothe a braggart, a coward, or a thief. The uniform does not necessarily reflect the personality of the man within. It is the man inside the uniform that I wish to talk about this morning.

First, let us consider for a moment the responsibilities of the position assumed by the man who first adds shoulder straps to his uniform. He is immediately raised above his former associates and by such honor he is allowed to carry higher responsibilities and to be assigned to more arduous duties. Men selected by his government to form the defense forces of the nation are entrusted to his care; their training, instruction and direction in battle are his responsibility. We are joined to our men in a comradeship of devotion to a cause and our loyalty must last until death. In time of war, there is no more honorable position to which one may be assigned by his government.

When a student of theology graduates from his prescribed course of training, and is ordained as a minister by his church, he dons the robes of his office, and assumes a new position of responsibility to his relatives, his friends, and society. His parish and his community look to him for council and advice. He immediately becomes a symbol of respect and decency. His every personal act is weighed in the light of his official position. He is no longer free to live a life independent of his responsibilities to his church. When you men raise your right hands and swear allegiance to this nation as officers in her army, you will

be assuming responsibilities to your family, your friends and fellow citizens that will restrict your personal conduct in a similar manner.

It is my purpose this morning, to point out to you some of the attributes of an officer so that you may search within your hearts and see if you are yet prepared to fill the obligations that his uniform will impose upon you. We are nearing the end of your transition period. From this day forward, your instructors will be even more alert to detect any deficiencies you may have that could, at some future date, cause discredit to be brought upon a noble profession.

All officers must possess that intelligence denoted by an alert mind and knowledge in his particular branch of the service, in order to effectively perform the duties of his office. The fact that you were selected to come here should be ample proof of your basic intelligence. Your successful completion of this course, together with your previous experience, should provide ample proof of your professional knowledge. These alone, however, are not enough. There are certain attributes of character that are just as important if you are to be a successful leader of men and exercise a proper influence upon their conduct.

If we examine the atmosphere in which war is conducted, we find four elements which have a direct bearing upon the behavior of combatants. These are: danger, physical strain, uncertainty and luck. To be successful in the midst of these, one must be prepared to face these elements with fortitude. Military writers and historians sometimes classify the necessary attributes as energy, firmness, perseverance, courage and strength of character. I want to briefly analyze each of these in turn for you.

First, let us consider energy. There is no place today among our combat forces for leaders who are not

physically and mentally young. The strength of your energy must be displayed, whether at work or at play, on the drill field, during maneuvers, in your shops, or on the tennis court. If your steps are sluggish, the chances are your mind is slow or you lack a desirable coordination between the two. The energy of an officer must enable him to carry heavy responsibilities during long periods of duty. He must share with his men, the same burdens and privations, the same restrictions and restraints if they are to respect his ability to lead them effectively.

Firmness is an attribute, without which no officer may expect to succeed as a leader of men. It is a common fault for human beings to take advantage of weak supervision and this is even more prevalent when men are banded together as a unit. I don't mean to imply that one should be haughty or overbearing. The show of an unruly temper may inspire your men with fear, but never with affection. The right of an officer to inflict punishment demands a high understanding of the responsibility such authority carries with it. Prescribe and punish when due, but never strike with vengeance. To deal out punishment quickly and often, is easy. The real art is to so guide your men by the example of your own conduct, that they will avoid doing things which displease you. Be fair and just with them and they will generally respect your authority without question. Be free with your men, but never permit them to be free with you. You will find it necessary to be severe at times. If this happens too often or becomes a habit, search within yourself for the weakness. When severity is necessary, make it refreshing. A nag soon becomes "The old woman" instead of "The old man". Let it be the just anger of a man, a thunderstorm that has been kindled. The shorter the storm, the better. It clears the atmosphere and lets the sun shine again.

It is hard for me to think of perseverance in connection with the military without thinking of the German soldier. His stubborn will to serve his purpose is one of the attributes that makes him an excellent soldier. A junior officer is leader of a group which is only a small part of a large fighting force. That group, however, plays an important part in the general plan, and the success or failure of their mission largely rests upon his shoulders. When the going gets tough and the strength in individuals dies, when the desire to continue can no longer be fed by the force of their own powers of will, the inertia of the whole group may come to depend upon the will of the leader. By his perseverance and the strength of his will alone, may he inspire his men onward. If he does not possess these qualities and his men must turn elsewhere for leadership, he has no place in modern combat.

It hardly seems necessary for me to emphasize the importance of courage, for without this attribute a soldier is wholly ineffective. I don't mean by that that one may be devoid of all fear. After all, if one is fearless, he may become reckless or careless and subject his command to unnecessary dangers. Courage is that quality of mind that enables men to meet danger and difficulties with firmness. His strength of will to face facts and act intelligently, coupled with the desire in his mind for glory and honor on the field of battle, can make an officer a fountain of inspiration for the personnel of his command.

In singling out strength of character for our discussion it would appear that I have already covered many attributes that might well be included under this term.

While this is true, there are a number of other factors that I have grouped together under this general heading for consideration. They constitute the moral vigor one has acquired through self discipline. Some authorities claim that unless a man possesses the inherent qualities of leadership, no amount of training will develop him into a leader. While this may be true, the qualities I have singled out to discuss now do not come under this heading. They may be developed in any individual who wishes to make a success in the military profession. We will call these loyalty, integrity and honesty.

Make it a constant rule to obey promptly and cheerfully, every order of your superiors. Soldierly obedience is silent obedience. Military orders require no reasons or justification. It is impractical for your superior to take time to explain his reasons or his motives. When he needs your help he will seek your assistance. By your loyalty you will acknowledge your faith in his leadership and this respect will be justly rewarded in time.

In speaking of integrity I have in mind your moral soundness and your uprightness. Do you look a man squarely in the eye, state your case clearly and concisely, and leave him with the impression that you have honestly and sincerely presented all facts in the case with impartiality? If you have knowledge of something that should be brought to your superior's attention for the good of the whole, do you hesitate to inform him for fear or personal prejudice? Do your men trust you with their problems? Can they depend upon you to treat them fairly and justly and without favoritism? A man's integrity can be judged only in the light of his personal conduct.

Honesty is something special among officers that is highly cherished. They have a code of ethics regarding honesty that may not be common among many professions. Their honesty among themselves is so fixed and sincere that they form one of the most gullible sucker lists in the country. They fall for get-rich-quick schemes because they are gullible. They accept too readily the expectation that others are guided by the same code of honesty. When they find dishonesty they are most resentful. We demand honest dealings among ourselves. We do not believe that a man can be dishonest with his fellowmen and not be dishonest with himself. If a man cheats in one phase of life, he usually cheats in others. If he cheats he cannot be trusted. A man who cannot be trusted has no place as an officer in the military service.

The officers of the army look upon their profession somewhat as a large and happy family. Their code of ethics is somewhat similar to the code that prevails in a contented household. When they find anyone desiring to join this family who is unable or unwilling to meet these standards of conduct and self discipline, they use their influence to cancel his opportunity without sympathy or regret.

When Abraham Lincoln was once asked to define democracy, he stated: "As I would not be a slave, so I would not be a master. This expresses my idea of a democracy. Whatever differs from this, to the extent of the difference is no democracy". We are today building up a democratic army in which there can be neither serfs nor masters. Each man, from private to general should serve the cause to the fullest of his capabilities. The privates of today may become the officers of tomorrow. So lead them that they will be proud to follow in your footsteps.

FOURTH ARMY MANEUVERS

War is not static. It changes constantly, always taking advantage of the latest advances in science and of the best inventions and converting them to its own deadly purposes. The World War was different from the Civil War, and this war is just as different from the World War.

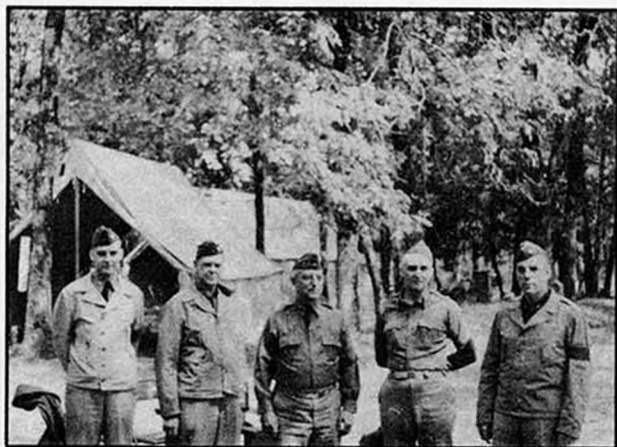
In this ever changing picture it is even difficult to keep abreast of progress, but for us here at the Ordnance Training Center, which of course includes the Ordnance School, keeping abreast is not enough. The Ordnance School is the fountainhead of Ordnance knowledge and theory; what we teach must be ultra modern. Not what happened yesterday, or what is happening today, but what will happen tomorrow. We must know what has occurred in the past, and what is occurring now, and we must evaluate it and project it into the future. In other words, our job is not merely to keep abreast of progress; it is to keep ahead of it, and to be the leaders of thought in our own chosen field of Ordnance.

We, therefore, must be constantly on the alert for new ideas; alive to new possibilities. It would be a misfortune for us to lapse into a state of indifference or, even worse, to be satisfied with what we are teaching, and to think we know it all and that there is no need to search for further ways of improving our knowledge and methods.

There is nothing that will so quickly discourage a self-satisfied attitude as getting out with the troops in the field and seeing what they need and whether we are meeting their needs. We must never lose sight of the fact that our sole reason for existence is to help the Army to win battles and our job is to find out what they want and to give it to them.

Obviously, the very best way to find out what a modern Army needs to fight a modern war is to go through an actual campaign against a real enemy. That would quickly show up the mistakes in organization and the errors in methods that always exist to a greater or lesser extent. But, just as obviously, this method is available only in wartime.

The next best way to test our ideas of how to fight



Major Billingsley, O. S., Col. Minton, IX Army Corps, Col. Kiehl, C.O., Benicia Arsenal, Col. Winningstad, Fourth Army, and General Hatcher, O. T. C.

By: Brig. Gen. Julian S. Hatcher,
Commanding General, Ordnance Training Center

a war is to conduct maneuvers in which our own troops are divided so that part of them represent the enemy, and in which all the incidents and operations of modern warfare are represented as closely as the ingenuity of our Army authorities can arrange them.

It is evident, therefore, that if we here in the Ordnance Training Center are to keep abreast of the trends of development in the business of fighting, we must take advantage of every maneuver by sending as many competent observers as we can possibly spare from their very pressing daily duties. This has for some years been the policy of the Ordnance School and is now the policy of the Ordnance Training Center.

As long as we continue this policy it is unlikely that we will ever become self-satisfied and hide-bound, or lose the alert and inquiring attitude which leads to further progress.

Those Ordnance officers who have attended several maneuvers over a period of years have noticed a distinct and encouraging trend toward more attention to Ordnance matters on the part of the troops and the staffs who direct their operations.

Several years ago little attention was being paid to Ordnance Supply and Maintenance at maneuvers by anyone except the Ordnance officers concerned, and they had scant success in rousing any interest in playing either Maintenance or Ammunition Supply. The troops had a tremendous job merely to get to the assigned positions and to get their Class 1 supplies there when needed. It was hard enough to go through all the complicated effort of fighting a battle without spending hour after hour all through the night hauling "paper" ammunition from a represented ammunition depot, so that the general attitude as far as ammunition supply was concerned was to ignore it to a greater or lesser extent. Actually, battles were often fought on these maneuvers with no provision toward supplying the enormous tonnages of ammunition that would have been required, and apparently with little realization by the various staffs of the fact that ammunition supply is a most necessary and difficult business that in many cases could not have been accomplished by the facilities available.

Fortunately, the situation has shown a marked improvement. Both the Commanders and the troops now seem to take a keen interest in ammunition, and ammunition supply is being played as realistically as possible.

One thing that has helped a lot is the provision of simulated ammunition of one kind or another. Wooden boxes, sand loaded to weight, are one favorite means of giving the men something in the shape of ammunition to handle.

(Continued on page 303)

AT FORT LEWIS, WASHINGTON

By: Major John D. Billingsley,
Assistant Commandant, The Ordnance School

The fall maneuvers of the Fourth Army were held in the vicinity of Centralia, Washington, August 15 - August 26, 1941. The Fourth Army consisted of the III Army Corps, IX Army Corps and attached units. The 40th Division and the 7th Division made up the III Army Corps, and the 41st and 3rd Division made up the IX Army Corps. The Fourth Army was designated as the Blue Forces, and the 7th Infantry Regiment simulated the Red Forces.

The general situation was developed in a C.P.X. conducted at Fort Lewis, Washington, by the IX Army Corps preceding the actual maneuvers. It was assumed that there has been an invasion of the Northwest United States by strong enemy forces, who had succeeded in effecting landings at Willapa Bay and Grays Harbor, and had taken the coastal defenses around Seattle and destroyed McCord Field.

On August 14th the IX Army Corps left Fort Lewis to take up defensive positions pending the arrival of the remainder of the Fourth Army from stations in California. Units of the latter organizations began arriving on August 21st, and then the entire Fourth Army succeeded in driving the enemy to the sea. The maneuvers terminated abruptly at midnight August 26. The IX Army Corps returned to Fort Lewis, and the remainder of the Fourth Army began, on August 28, its return to California.

The movement of the Fourth Army troops was accomplished by rail and motor, approximately 50% in each manner. The entire movement of the IX Army Corps was accomplished by motor transportation.

The Army Ordnance Service consisted of the Acting Army Ordnance Officer, Lt. Colonel Olaf P. Winningstad; Headquarters Section, consisting of three Lieutenants and eight (8) enlisted men; the Provisional Army Maintenance and Supply Battalion, consisting of the 82nd Ordnance Company (HM) and the 80th Ordnance Company (Depot); and the Provisional Ammunition Battalion consisting of the 55th Ordnance Company (Am) (colored).

The III Army Corps Ordnance Service consisted of the Acting Army Corps Ordnance Officer, Lt. Wood; Headquarters Section, consisting of three (3) enlisted men; and the 3rd Provisional Maintenance Battalion, consisting of the 7th Ordnance Company (MM) and the 115th Ordnance Company (MM).

The IX Army Corps Ordnance Service consisted of the Army Corps Ordnance Officer, Lt. Col. H. W. Minton; Headquarters Section, consisting of two Lieutenants and two enlisted men; the 9th Provisional Maintenance Battalion, consisting of the 18th Ordnance Company (MM), the 116th Ordnance Company (MM) and a portion of the 3rd Ordnance Company (MM).

The 3rd Division Ordnance Service consisted of the Division Ordnance Officer, Lt. Col. R. S. Barr; and the Ordnance Section, consisting of two Lieutenants and twenty-two (22) enlisted men.

The 7th Division Ordnance Service consisted of the Division Ordnance Officer, Lt. Col. E. A. Murphy; and the Ordnance Section, consisting of two Lieutenants and twenty-four (24) enlisted men.

The 40th Division Ordnance Service consisted of the Division Ordnance Officer; and the Ordnance Section, consisting of one Lieutenant and five enlisted men (detached from the 115th Ordnance Company (MM)).

The 41st Division Ordnance Service consisted of the Acting Division Ordnance Officer, Capt. Howard; and Ordnance Section, one Lieutenant, and five enlisted men, (detached from the 116th Ordnance Company (MM)).

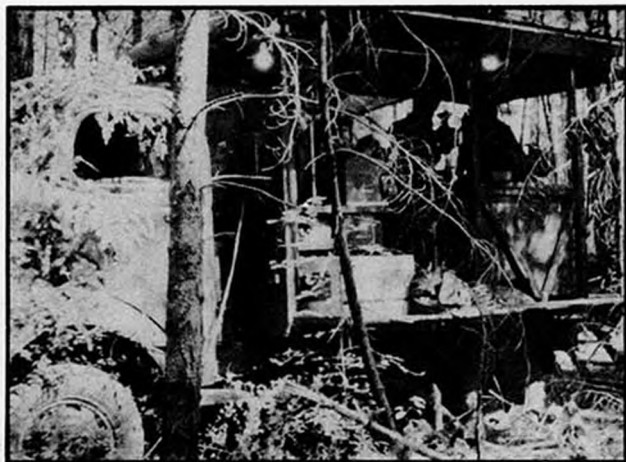
Maintenance Activities. - No system of simulating damaged or broken ordnance materiel was utilized during these maneuvers. The Ordnance Maintenance facilities were set up in the field; however, very little maintenance work was required of them.

General Supply. - The 80th Ordnance Company (Depot) established an Ordnance Depot, General Supplies, at Centralia, Washington, during the final phase of the maneuvers. A small quantity of parts, cleaning and preserving materials, etc., was stocked. No large issues were made, except the initial issue of helmets to units of the 40th Division.

Ammunition Supply. - Ammunition Supply system was played as realistically as possible throughout the maneuver. Prior to the maneuvers 86,000 solid wooden blocks, cut to dimensions to simulate ammunition boxes, were secured. Each block was stenciled indicating the type and quantity of ammunition represented. The average weight was similar to that of actual ammunition. The units of the IX Army Corps were issued their initial load of simulated ammunition prior to leaving Fort Lewis. All other units were issued their initial loads from an ammu-



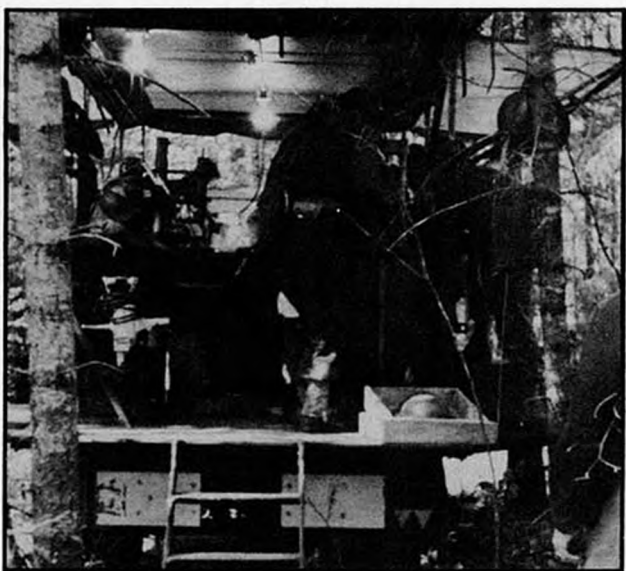
Ordnance Office, IX Army Corps



Machine Shop, 9th Provisional Maintenance Battalion



Members of the 55th Ammunition Company loading wooden ammunition



Automotive Repair Truck, 9th Provisional Maintenance Battalion

munition railhead established at Olequa, Washington. Due to the lack of organizational transportation, combat units could only transport as initial loads approximately 60% of that prescribed. However, based upon the transportation available, each unit was required to have its proper loads.

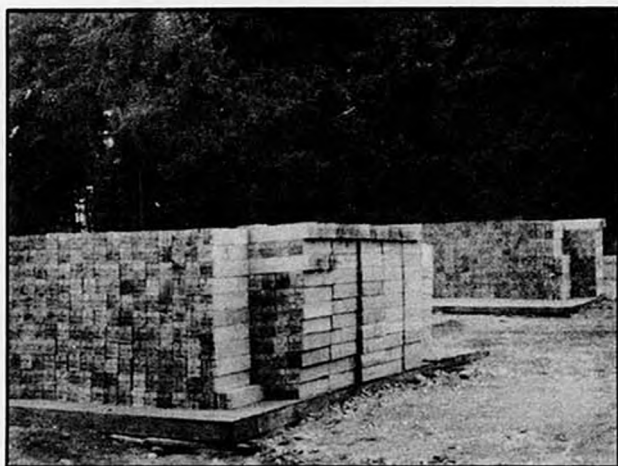
As the situation developed, the wide frontage covered by the Blue Forces necessitated the establishment of a large number of ammunition depots. The personnel of the one ammunition company participating was found to be insufficient to man so many depots; therefore, personnel from the depot companies and maintenance companies were detached to operate the majority of them. Due to the lack of handling personnel, the simulated ammunition on the ammunition trucks was not removed or reloaded at the depots. However, the trains were required to remain at the depots until sufficient time had elapsed to accomplish loading before they were permitted to proceed. Credit for drawing ammunition was given only in the event that the carrier was loaded with simulated ammunition and



Ammunition carrier entering Ammunition Depot



Members of 55th Ammunition Company, at Depot Office



Simulated Ammunition stacked in depot



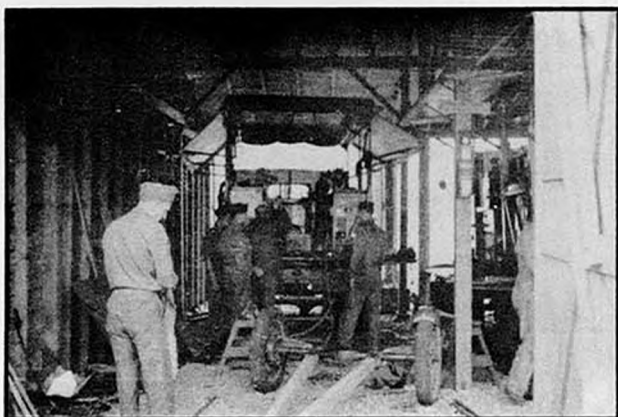
Simulated Ammunition Depot, Fort Lewis

only to the extent of the capacity of the vehicle. Although no ammunition was stocked at the depots, care was taken, in most cases, in the selection of their sites to provide for proper layout and satisfactory stockage of the depot.

A visit was made by the observers to Fort Lewis and Camp Murray, Washington, during the maneuver period. They observed with great interest the large volume of inspection and maintenance work which was being handled by the Ordnance personnel stationed at those posts. Due to lack of adequate shop facilities this personnel have had to improvise shops and rely upon the use of their mobile shop equipment to handle the work which is normally done in the post shops.

The maneuvers were quite extensive in nature, and many valuable lessons were learned by the Ordnance personnel participating. The Ordnance made every effort to serve the needs of the field forces and anticipated their every need.

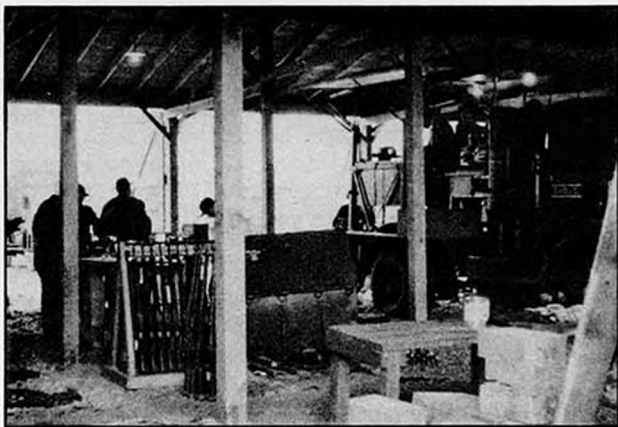
Other articles of maneuver interest will be found on pages 327 and 344.



Improvised Artillery Shop, Fort Lewis



Improvised Optical Repair Shop, Fort Lewis



Improvised Small Arms Shop, Fort Lewis

SPECIAL GAGES

By: A. C. Fabrize,
Staff Sergeant, Ord. Dept.
Small Arms Section, The Ordnance School

This article is intended for small arms men of the Ordnance Department who wish to become familiar with special gages and their use in the inspection of small arms weapons. Similar articles are being planned for early issues.

This article deals with breech bore gages used in the inspection of Cal..30 weapons. These gages are used in determining to what extent the bore is worn at the origin of the rifling; therefore, the accuracy of gages is essential. They will be sent to an arsenal to be checked at least once a year, or whenever doubt exists as to their accuracy. The establishments equipped to make accuracy tests of gages are listed in TR 1400-30A.

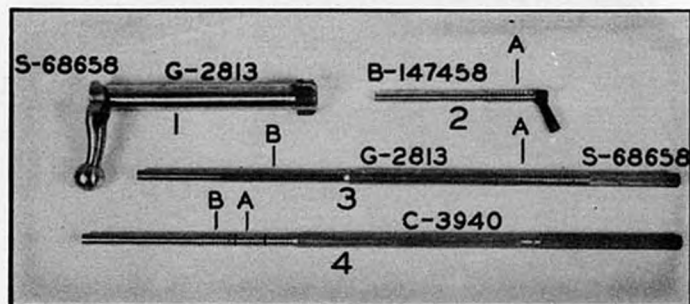


Figure 1

1. Belt, special, G2813 (Part of gage, breech bore, G2813).
 2. Gage, breech bore, B147458, M1 Rifle. (a) Index.
 3. Gage, breech bore, (old), G2813, (a) Rifle Index, (b) MG Index.
 4. Gage, breech bore, (new), C3940, (a) Rifle Index, (b) MG Index.
- (Reference to the "Old" and "New" gages are the earlier and later types used respectively.)

The piece marks or drawing numbers of each gage are included in the photograph in Figure 1. The bolt, special, G2813, and the gage, breech bore, 2813, are used in conjunction with each other, and have corresponding numbers to prevent interchanging. (The bolt, special, should not be mistaken for a bolt, field test.)

In using gages in small arms weapons, the following precautionary measures should always be taken.

1. The barrel should be cleaned thoroughly.
2. Insert the correct gage.
3. Avoid the use of excessive force.
4. Record the correct reading.

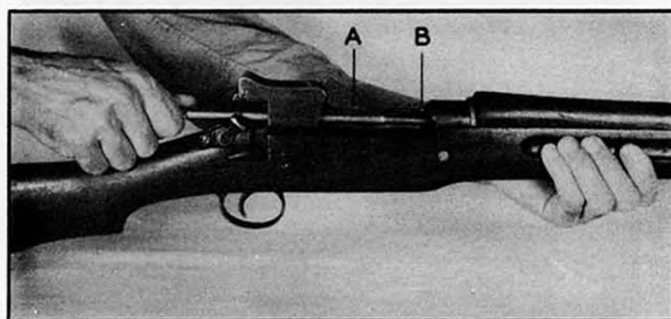


Figure 2
Rifle, U. S. Cal..30, M1903A1. (a) Gage, breech bore, (new) C3940.

As shown in Figure 2 (a), the gage is inserted into the chamber of the barrel through the receiver. The reading is taken from the rifle index mark aligned with the receiver (b). If the gage enters the bore to read .308 inch or more, the rifle is declared unserviceable, and the proper steps are taken to remove the rifle from service and return it to an arsenal. Reference: TR 1400-30A.



Figure 3
Rifle, U. S. Cal..30, M1903. (a) Gage, breech bore, (old) G2813, (b) Bolt special, G2813.

The gage shown in Figure 3 is inserted into the chamber through the opening in the bolt. The reading is taken from the rifle index aligned with the rear of the bolt (c).

Since the only difference between the rifle M1903A1 and M1903 is the type of stock, the gage used is optional. The rifle is declared unserviceable at the reading .308 inch or more. (The gage, breech bore, G2813, when declared unserviceable, will be replaced by gage, breech bore, C3940.)

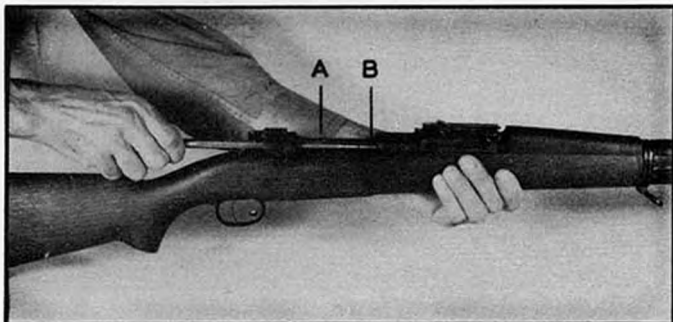


Figure 4
Rifle, U. S. Cal..30, M1917. (a) Gage, breech bore, G2813

The gage shown in Figure 4 is used in the same manner as in the rifle, M1903, eliminating the use of the bolt, special, and taking the reading from the machine gun index aligned with the receiver (b). If the gage enters the bore to read .319 inch or more, the rifle is declared unserviceable. The gage, breech bore, C3940 may be used. In this case the reading is taken from the rifle index aligned with the receiver, and .309 inch or more would cause the weapon to be declared unserviceable.

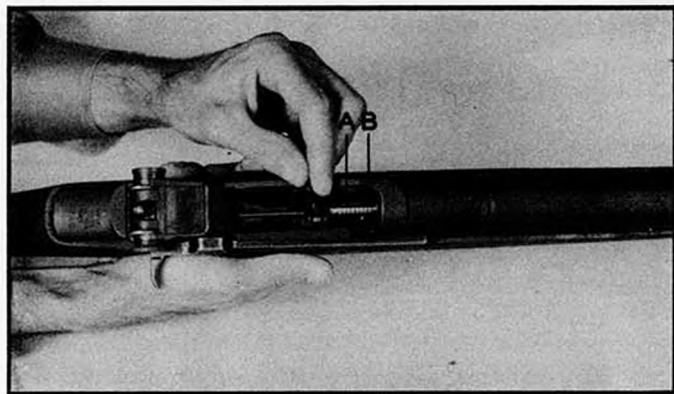


Figure 5
Rifle, U. S. Cal..30, M1. (a) Gage, breech bore, B147458.

The gage shown in Figure 5 is inserted into the bore and the reading is taken from the index aligned with the receiver (b). If the gage enters the bore to read .310 inch or more the rifle is declared unserviceable.

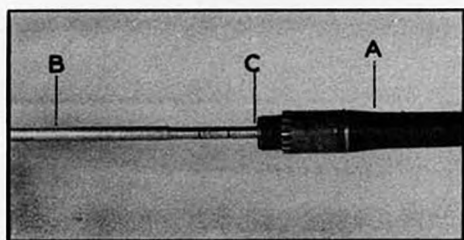


Figure 6
(a) Barrel, M. G., Cal..30. (b) Gage, breech bore, C3940.

The gage shown in Figure 6 is inserted into the bore of the barrel, and the reading is taken from the machine gun index aligned with the rear of the barrel (c). If the gage enters the bore to read .310 or more the barrel is declared unserviceable, and should be scrapped. Using the gage breech bore, "New" or "Old" is optional. Reference: TR 1400-30C.

The next article of this series will discuss head space gages and their use in Cal..30 weapons. It will appear in an early issue of THE ORDNANCE SERGEANT.

FOURTH ARMY MANEUVERS

(Continued from page 298)

Another method is by the provision of solid wooden blocks as was done by the Fourth Army in the recent maneuvers near Fort Lewis, Washington. Eighty-six thousand blocks of fir were obtained at a cost of thirty-nine thousand dollars from a large sawmill at Seattle. The blocks were of various sizes to represent ammunition boxes,

charges, and projectiles, of every kind used by the Army, including such things as anti-tank mines, and were stenciled with the name of the object represented.

Each organization which had all its organic transportation on hand was issued a full initial load of simulated ammunition, and organizations which were short some transportation were issued a proportional part of the so called ammunition.

And right there's where trouble started, for when the units were required to carry the organic load of ammunition, they immediately found that many other things they had been accustomed to take had to be left behind. Inconvenient, it's true, but it is better to have the bad news come out now than to have it spring suddenly in some emergency.

Thus it seems that the ammunition supply problem is now in for a lot of study and attention, but to date this does not seem to be true of the Ordnance Supply problem and the Maintenance problem, neither of which were played to any extent on the Fourth Army Maneuvers, though the 7th, 18th and 82nd Ordnance Companies, which had recently arrived in the area from Aberdeen Proving Ground and had not yet received all of their technical vehicles, were getting in a lot of practice in taking care of themselves in the field.

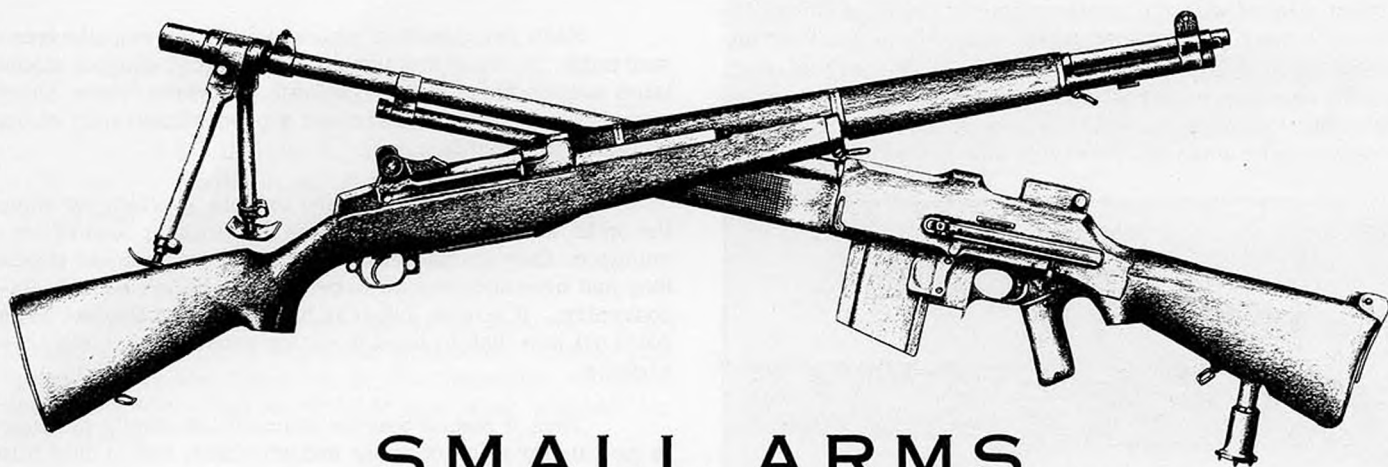
It should be understood that the degree to which Ordnance Maintenance is played on maneuvers is greatly affected by the character of the units involved. If there is little or no mechanized material present, there is less necessity for real maintenance due to actual breakdowns, and there is less interest by the troops in the maintenance function of the Ordnance Department. Consequently there is less push for a system of testing out the organization and functioning of our Maintenance Companies and Battalions. This was the case at Fort Lewis.

On the other hand, in Louisiana, both last year and this year, there were many tanks and armored cars involved, and consequently maintenance received much more attention.

From the Ordnance viewpoint, what is needed in future maneuvers is a continuance of the interest in Ammunition Supply, coupled with a realization by the higher commanders and their staffs of the importance of the maintenance function of the Ordnance Department; and the establishment of a system of insuring that maintenance will be played with sufficient energy and realism to test out our organization and equipment.

More and more questions are being forwarded to THE ORDNANCE SERGEANT -- and in a great many cases the correct answers are being furnished. In some cases questions of general interest are made the basis of an article. Other answers are sent direct to correspondents. This service is available to you upon demand. Address all correspondence to:

THE ORDNANCE SERGEANT,
The Ordnance School,
Aberdeen Proving Ground,
Maryland.



SMALL ARMS

Conducted by: C. B. Goodman, 1st Lt., Ord. Dept.

WINCHESTER SHOTGUN 12-GAUGE M1897, RIOT TYPE

By: Edward Dyer,
Tech. Sergeant, Ord. Dept.

Part II

Assembly

In assembling the gun the various groups should be assembled first and then replaced in the gun in reverse order.

ASSEMBLING THE MAGAZINE AND ACTION

SLIDE: Insert the follower into the magazine tube, from the front end, with the closed end of the follower to the rear. Feed in the magazine spring, compress it, replace the magazine plug, and secure it with the magazine plug screw. Assemble the wooden handle over the action slide sleeve, with the morticed part to the rear. Slide the action slide spring over the rear end of the magazine tube and follow with the action slide, which also assembles from the rear end of the magazine. Secure the action slide on the magazine by sliding the action slide sleeve screw cap over the front end of the magazine and screwing it onto the action slide sleeve, so that the cut out portion of the cap is in line with the cut out portion of the handle and sleeve.

ASSEMBLING THE RECEIVER. - Replace the leaf spring in its seat on the cartridge stop. Insert the cartridge stop in its seat inside the receiver, making certain that it belongs on that side by glancing at the marking on the cartridge stop. Secure the cartridge stops with the cartridge stop screw inserted through the holes located on either side of the bottom opening of the receiver.

To replace the action slide release plunger pin and spring, use needle nose pliers to grasp the spring by the long leg close to the bend, with the short leg at a 90 degree angle to the pliers. Set the pin on the end of the long leg, and insert the group in its seat on the inside of the right wall of the receiver, through the bottom of the receiver.

Insert the ejector pin in its hole on the left side of the receiver, which is the third of a row of holes, counting from the front, and located in the top part of the left side of the receiver. The ejector pin is inserted from the inside of the receiver, with the elongated head parallel with the breech bolt support rib. The ejector spring is assembled on the outside of the left side of the receiver, with the short leg inserted through the second of the three holes. It is secured by the ejector spring screw, which screws into the first hole.

No assembly of the bow guard is necessary, as the trigger pin holds both the trigger and the bow guard in the receiver. The only part that can be assembled to the bow guard is the trigger stop screw.

ASSEMBLING THE BREECH BOLT. - Insert the firing pin through the opening in the rear end of the breech bolt with the rounded out portion of the firing pin down. Replace pin through the first transverse hole from the rear end. This secures the firing pin in the breech bolt.

Insert the firing pin lock spring in its seat on the bottom of the breech bolt. Next replace the firing pin lock in the groove on the bottom of the breech bolt, with the large rounded projection to the rear and down. Press in on the lock with the thumb and screw in the firing pin lock screw in the hole located on the left side and in the center of the breechblock.

To assemble the extractor, right hand, first replace the right hand extractor spring and plunger in the opening at the front end of the right guide rib of the breech bolt. Grasp the front end of the extractor with thumb and

forefinger and push it rearward, compressing the plunger spring until the rear end of the extractor is opposite its seat in the breech bolt, then press it inward. The left hand extractor is then placed in its seat in the left guide rib, and secured with the left hand extractor pin assembled vertically through the left front part of the breech bolt.

ASSEMBLY OF THE CARRIER. - Insert the hammer from the top in the rear end of the carrier. Raise the cartridge guide as far as it will go, thus uncovering the hammer pin hole in the right side of the carrier, which is the first hole from the front, under the cartridge guide. Insert the hammer pin. Assemble the mainspring through the opening in the front end of the carrier with the claws to the rear, and engage over the stirrup on the hammer. Insert the mainspring pin through the transverse hole in the front end of the carrier. Next, screw in the mainspring strain screw in the tapped and counterbored hole on top of the front end of the carrier.

Assemble the sear between the rear bottom projections of the carrier with the shorter bent portion forward, and secure it with the sear pin. Place the leaf type spring in its seat on the bottom of the carrier, and screw in the sear spring screw.

The action slide lock spring is assembled next, in its seat on the left side of the carrier, and secured with the action slide lock spring screw. The action slide lock is assembled in the bottom groove on the left side of the carrier, with the smooth end forward.

It is held in place by the action slide lock joint pin inserted from the bottom of the carrier, and in turn secured by the action slide lock joint pin stop screw, located in the center of the left side of the carrier.

With the cartridge guide raised, insert the action slide lock release plunger in the groove on the right side of the carrier, with the long pin of the plunger in the rear-most hole.

This finishes the assembly of the various groups and the gun can now be assembled.

Insert the trigger spring in its seat in the guard bow; also the trigger. Assemble the guard bow in the receiver and secure it with the trigger pin, making sure that the pin passes through the trigger also, and that the trigger spring does not fall out.

Assemble the stock to the receiver and secure it with the butt stock bolt. Replace the butt plate and screw in the butt plate screws.

Slide the breech bolt into the receiver through the rear opening. Place the hook, action slide, into the receiver with the flat side of the hook against the left side of the receiver, and push the raised portion on the hook into its seat on the left side of the breech bolt locking lug. Secure the hook with the action slide hook screw through the breech bolt locking lug.

Cock the hammer on the carrier and insert the carrier through the bottom of the receiver, rear end first. Insert the carrier pin, with the end to which the carrier pin stop screw groove is the nearest towards the left. Secure the carrier pin with the carrier pin stop screw located on

top and rear end of the carrier. Screw in the cartridge guide stop screw in the right side of the receiver near the bottom.

To assemble the magazine and the action slide to the receiver, insert the action slide in the irregular opening in the front end of the receiver, and the magazine in the magazine opening. Screw in the magazine until the stop screw hole on the magazine coincides with the stop screw hole on the receiver. Slide the bayonet attachment over the barrel and engage the front projection on the magazine plug into the hole on the bayonet stud. Slide the bayonet attachment to the rear until the attachment screw holes line up with the threaded indentations on the bottom of the barrel. Screw in the bayonet attachment screws and this completes the assembly of the gun.

Test the assembly by working the action slide back and forth and pull the trigger.

MECHANICAL OPERATION. - In describing a cycle of operations, the starting point assumed is the ignition of the cartridge. After the hammer has fallen and ignited the primer, the camming surface on the wall of the hammer acts on the projection of the action slide lock, causing the front end of the lock to move inward out of the path of the action slide.

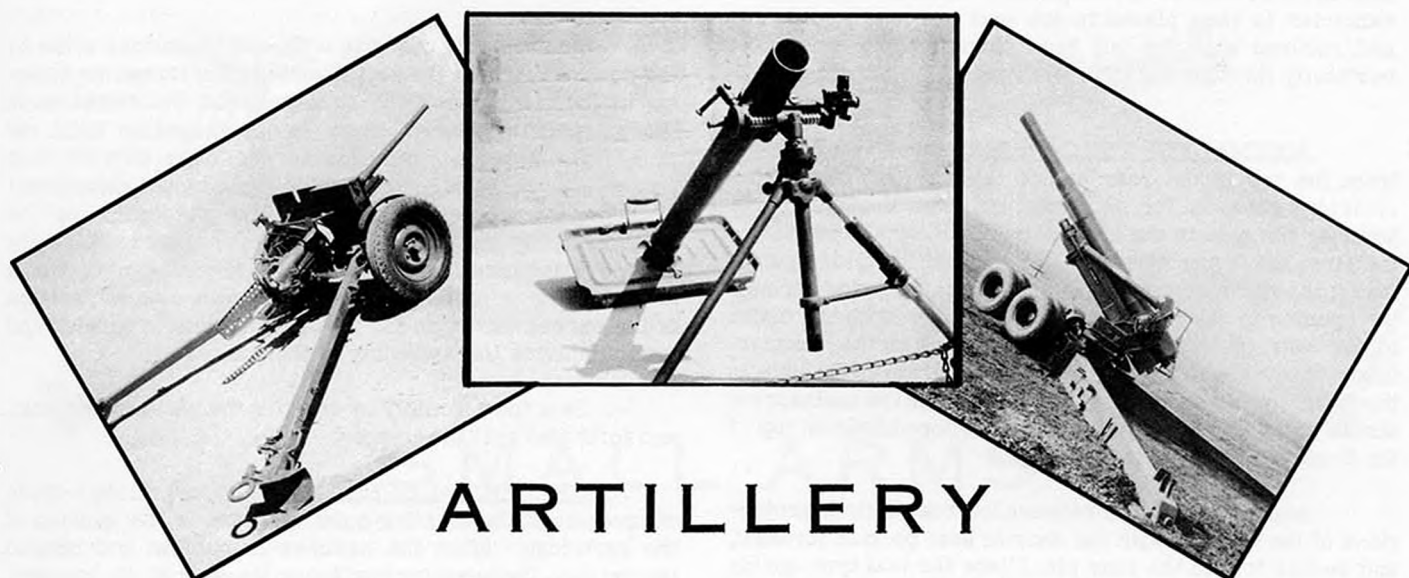
Assuming the operator wishes to feed another round into the chamber, he pulls the action slide forward slightly and then to the rear smartly. Due to mechanical linkage, the initial rearward movement of the action slide cams the carrier from behind the locking lug on the breech bolt, thus unlocking the breech bolt and leaving it free to move to the rear with the slide.

As the breech bolt starts moving to the rear, several events take place simultaneously. Extraction of the empty shell from the chamber is started; rotation of the hammer in the initial stages of cocking starts; the carrier has rotated downward sufficiently to move the cartridge stops toward the walls of the receiver (the carrier itself is now acting to prevent the next round from leaving the magazine); the cartridge guide is held from rotating with the carrier by its stop screw, which is located on the right side of the receiver near the bottom.

Continued motion of the breech bolt to the rear completes the extraction; the empty strikes the spring ejector and ejection of the empty from the weapon occurs; the rear end of the firing pin lock moves upward as the lock moves over the thumbpiece (if the spring has not already moved it down), thus causing the lock to retract the firing pin from the face of the breech bolt. The locking lug on the breech bolt contacts the cam surface of the carrier, and thus completes the rotation of the carrier downward; the next round in the magazine moves into the receiver; the cartridge stops have already moved outward, thus blocking the magazine to prevent further feeding. The rearward rotation of the hammer has caused the stirrup to pull the mainspring up, compressing it; the sear notch engages the sear nose, and the rotation of the hammer to the rear has caused the camming surface on the left wall of the hammer to mate with the projection on the slide lock, moving the rear end inward and the front end outward.

As the action slide is moved forward, carrying the breech bolt with it, the carrier is rotated upward, aligning

(Continued on page 329)



ARTILLERY

Conducted by: W. C. Minshaw, 1st Lt., Ord. Dept.

TRENCH MORTARS

By: C. C. Keith,
Tech. Sergeant, Ord. Dept.

Part II

Manufacturing briefs of 81-mm Mortar

The manufacture of 81-mm mortars and mounts does not involve the production of a large number of parts

per unit, nor is much special manufacturing equipment needed. Standard milling machines, turret and engine lathes, grinders, drill presses, and other equipment commonly found in machine shops are all that are necessary. However, these machines must be in good condition, capable of turning out accurate work, and must be equipped with precision jigs, fixtures and cutting tools in order to turn out parts within the dimensional tolerances required.

The four parts of the mortar and mount which involve the most difficult machining operations are the barrel, the base cap, the gear case and the yoke. The latter is machined from a malleable iron casting. Each operation on this part is jugged in order that the dimensional

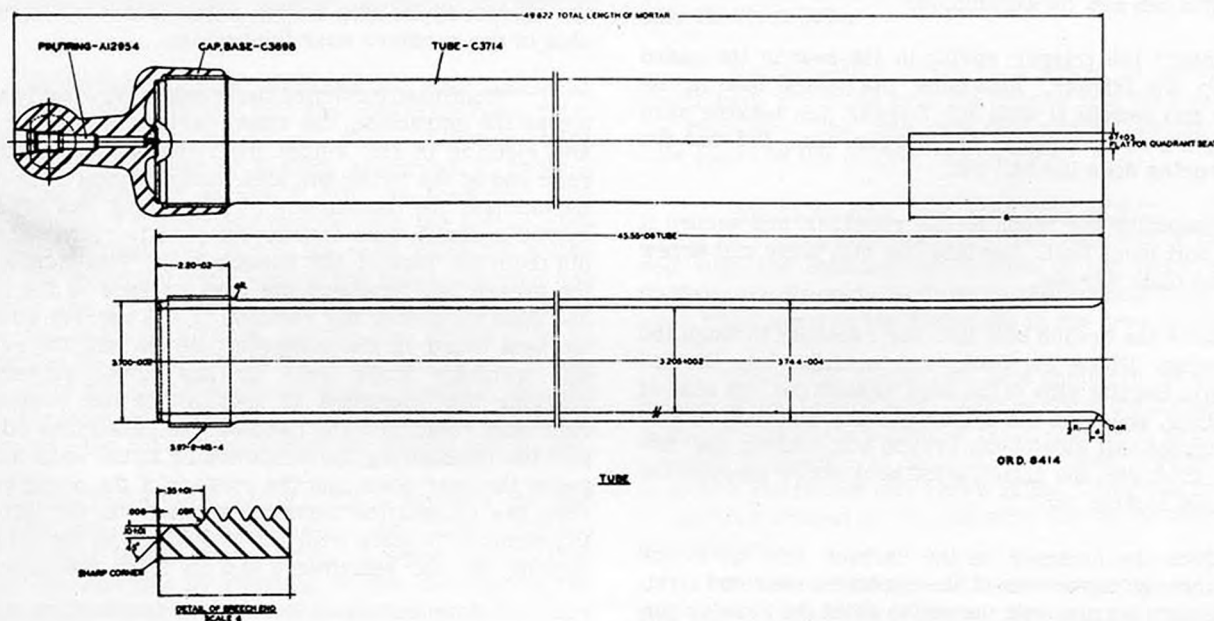


Figure 1 - 81-mm Mortar, Sectioned View

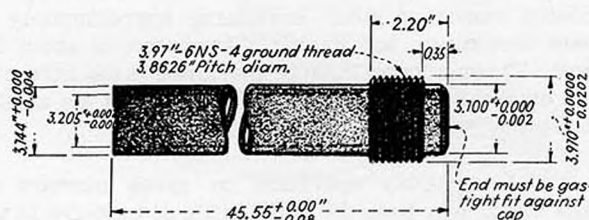


Figure 2 - Machined in engine lathes, except for the grinding of threads at the base end, the barrel tube weighs approximately 40 pounds when finished.

tolerance of 0.0007 inch for hole spacing and alignment may be met. The tapered dovetail slot (sight mount) at one end of this yoke must be located accurately with relation to the shock absorbers and traversing screw holes.

The barrel (See Figures 1 and 2) is made from a 48 inch long SAE 2330-WD seamless steel tube measuring 4-1/8 inch outside diameter and 3 inch inside diameter, as received from the mill. Hardness of the tube is about 220 Brinell.

The tube first is rough and semi-finish turned and faced in a 15-inch heavy duty engine lathe, using carbide tipped tools. The roughing cut removes approximately 3/16 inch on the diameter, while the semi-finishing cuts bring the outside diameter within 0.015 inch of the finished size.

The tube is then put on an 18-inch, 16-foot bed, heavy duty engine lathe for the boring operation. This lathe is equipped with a special cradle fixture mounted in place of the regular cross-slide of the carriage. Three boring cuts are taken. The first, or roughing cut, removes about 0.050 inch on the radius. Stellite tipped bits are used in the boring tool blade, which is of standard design. The second, or semifinish cut, also employs the Stellite tipped bits to remove an additional 0.012 inch of metal from the inside of the tube. A floating tool, made from

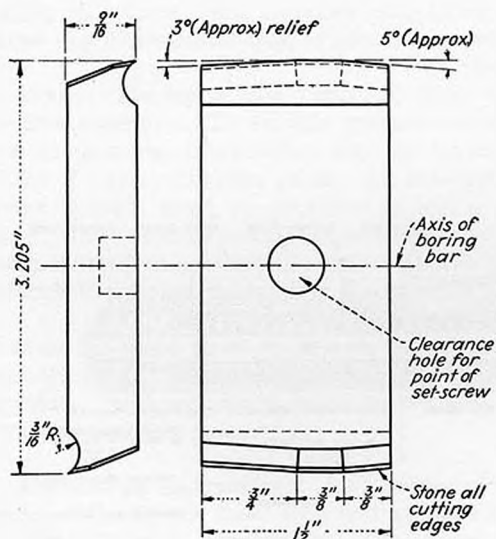


Figure 3 - A floating-reamer blade is fitted in the Davis bar for a final cut in the barrel. Cobalt steel has given best results.

Cobalt steel (See Figure 3), is used for the finish boring cut. This cut removes very little stock; the finish boring operation producing a bore measuring between 3.204 and 3.205 inch diameter. Following the boring operations the inside of the tube is mirror-polished by using the Faessler-Maupin roller head (See Figure 4), and then returned to the 14-inch lathe for finish turning the outside diameter and facing the seat at the base end.

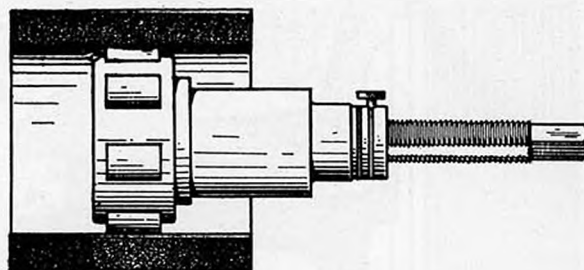


Figure 4 - Originally developed for applying bushings and brasses in railroad shops, the Faessler-Maupin roller head gives a mirror-finish when used in the 81-mm mortar.

Class 4 threads are then ground on the base end by a thread grinder. These threads must be held carefully within the allowed limits, and must be concentric with the bore of the barrel so as to assure a gas tight seal when these threads are mated to the threads of the base cap.

Finished barrels are delivered to the Ordnance Department inspector for final approval before assembly to base caps to form a complete mortar tube. The inspector examines the barrel carefully for any flaws, and uses a number of very accurate gauges to determine whether all dimensions are within permissible tolerance. A Pratt & Whitney star gauge is used to check the bore of the finished barrels.

Made from a SAE 1035-WD steel forging, the base cap (See Figures 1 and 5) is, for the most part, machined in a #1A Warner and Swasey universal hollow hexagon turret lathe. Before delivery to this machine the cavity is roughed out in a drill press using increasing sizes of standard drills, the last being a flat bottom drill which roughs the cavity to about 3-1/2 inch diameter and 2-1/8 inch deep. For tapping, the hexagon turret first is extended to the No. 2 position where a collapsible tap of 4 inch ca-

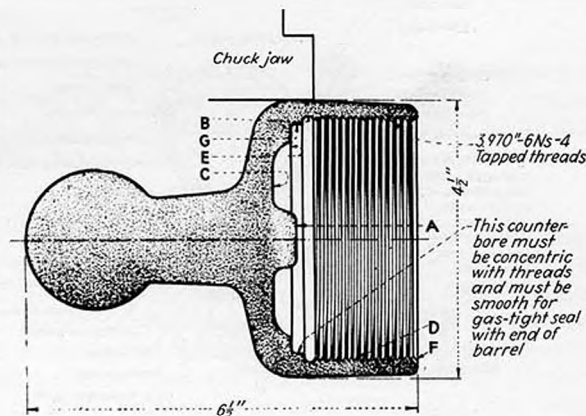


Figure 5 - Operations on the large end of the forged steel base cap are performed with special tool setup.

capacity, equipped with special chasers, is used for rough tapping the 3.97-6NS-4 thread. Four to five passes are taken with this roughing tap, expanding the chasers each time with a ratchet device incorporated in the tap body. A similar tap, held in the No. 6 position on the hexagon turret, is used for finish-tapping these threads with one or two passes. The Ordnance requirement for smooth, perfectly

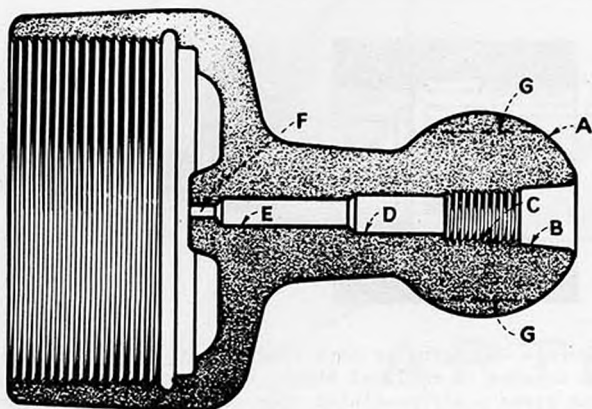


Figure 6 - Operations on the ball end of the base cap are performed in a second setup of the No. 1A Warner and Swasey turret lathe. Flats at G are milled in a following operation on a Cincinnati miller.

formed threads make necessary the extra passes of the roughing, and sometimes, the finishing tap. After the base cap has been finished on the large end a new tooling set up is made on the turret lathe and the operations on the ball end of the cap are performed. (See Figure 6.) First, the ball itself is formed with two high speed steel form tools, followed by the boring of the four-stepped firing pin hole.

The gear case is a solid steel forging, and is completely machined in a No. 5 Warner & Swasey turret lathe. Single point tools are used for most boring and chamfering operations. It has been found necessary to provide a full line of highly accurate gauges for the gear case because of the close machining tolerances.

The traversing (See Figure 7) and elevating screws (See Figure 8) for the bipod are machined from a special corrosion resisting steel containing approximately 14 percent chromium, and having a hardness of about 225 Brinell. These screws must be machined in the hard condition, otherwise the corrosion resistance of the steel is lost.

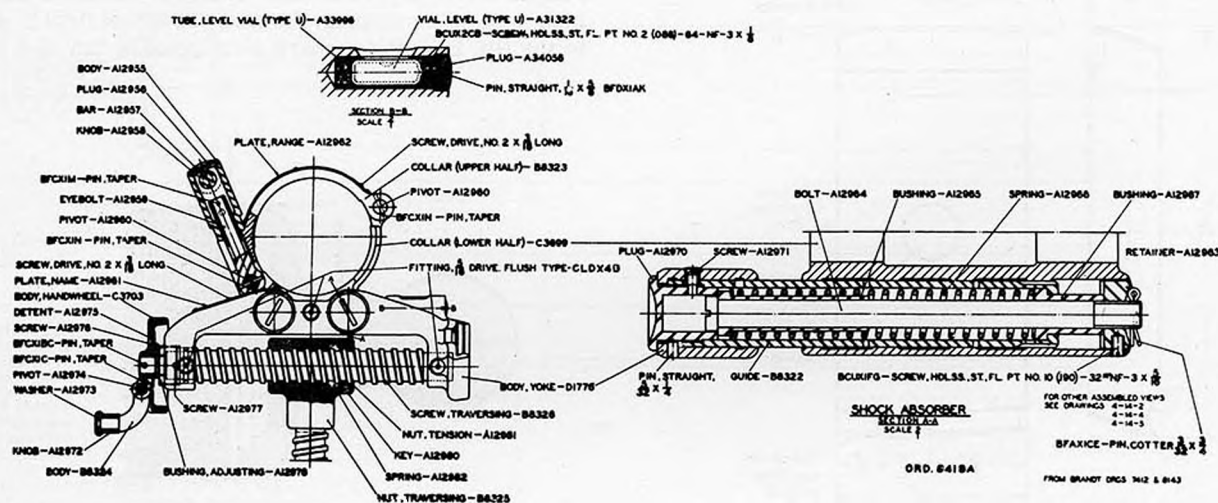
The assembly operation on these mortars and mounts which has been the most difficult to solve is that of fitting the base cap to the tube. Since there must be a gas tight seal at the base end of the barrel it has been found necessary to scrape the cap surface which mates with the end of the barrel. This involves considerable hand work, and for that reason the base cap should never be removed from the tube. If once removed there is a great possibility that the gas tight seal will be lost after reassembly.

The 60-mm mortar is manufactured along the same lines, smaller tooling set-ups being required.

Care and preservation of mortars

Maintenance of mortars is relatively simple in comparison to most Ordnance materiel; preventive maintenance being the all-important consideration. After the mortars are adjusted and proof fired at the Proving Ground they are shipped to the field in such condition that disassembly, under normal conditions, will rarely be necessary for a long time afterward.

Mortar: The importance of keeping the bore clear of powder fouling and other foreign substances cannot be over stressed. If the bore becomes fouled, or is too full, the projectile does not slide fast enough to insure percussion. After each firing period the bore should be thoroughly cleaned with a solution made by dissolving 1/2 pound of soda ash or one (1) pound of sal soda in one (1) gallon of water, using the sponge for swabbing purposes. Wipe perfectly dry, and then oil the bore with a light coating of Class A lubricating oil. In drying, and the application of oil, it will be necessary to improvise swabs of white cotton waste or other soft material.



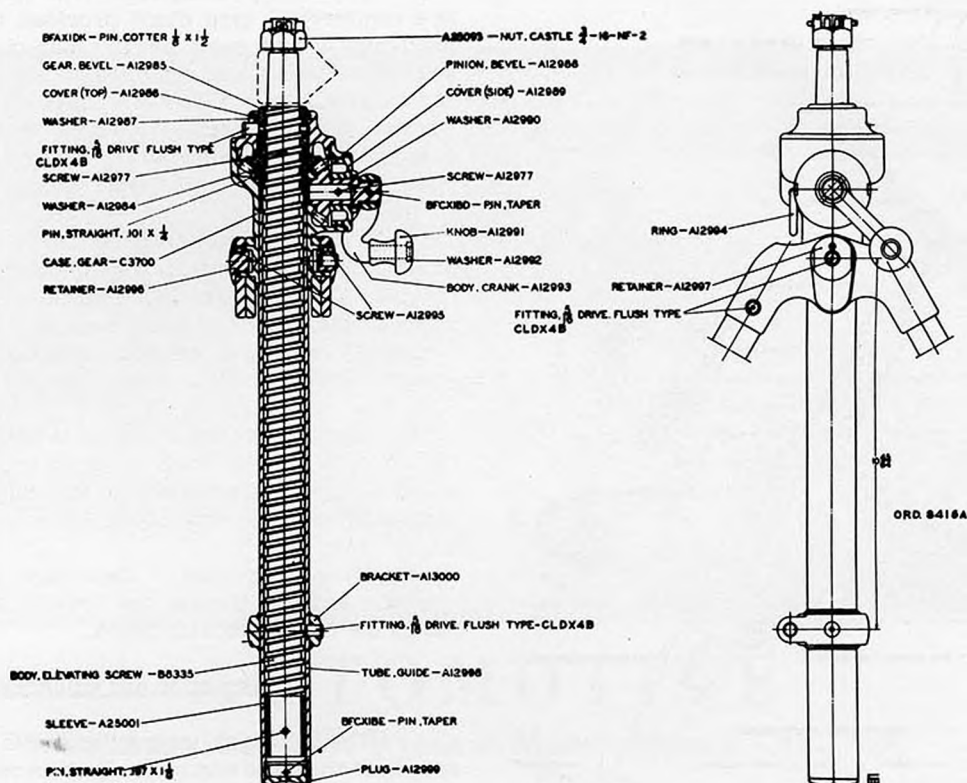


Figure 8 - 81-mm Elevating mechanism - Assembled and sectioned views.

The firing pin must be removed for the cleaning of it. The removal is made by using the large screw driver issued as an accessory, and screwing the firing pin out from the bottom of the spherical end of the base cap. The firing pin should be cleaned with the solution referred to above. The firing pin vent is thoroughly cleaned before assembling the lightly oiled firing pin to the base cap.

Should the quadrant seat on the muzzle end of the mortar show a burred condition, remove the burrs with a smooth file and coat the seat lightly with light Class A lubricating oil. Care must be taken when using a file not to remove any more metal than is absolutely necessary.

Mount: The bipod (See Figure 9) must be kept in serviceable condition. To do this proper attention must be given to cleaning, lubrication, and the repair and replacement of loose or broken parts. All bearing surfaces and screw threads must be kept free of burrs, clean and well oiled. When disassembling and assembling operations are being carried on precautions must be taken to prevent the entrance of foreign matter into the working parts.

When the bipod is to be stored, or is likely to remain unused for any appreciable amount of time, all bright and unpainted surfaces should be protected with a coat of heavy rust preventive compound.

Lubricating instructions: As a means of oiling the vital parts of the bipods flush type fittings have been provided. Light Class A lubricating oil is inserted through these fittings by means of the lubricating gun, provided as an accessory, as oiling is required. Other moving parts, such as traversing crank pivot, should likewise have class A lubricating oil applied as necessary.

Spare parts and accessories

Spare parts, general. - Parts become unserviceable through breakage or through wear from continuous usage. For this reason certain parts are provided for replacement purposes. These parts are divided into two groups, spare parts and basic spare parts. They should be kept clean and well oiled to prevent rust.

Spare parts: - These are extra parts provided with the mortars and mounts for replacement of those most likely to fail, and are for use by the using arms in making minor repairs. Sets of spare parts should be complete at all times as far as possible. The allowance for spare parts are prescribed in SNL A-33 for the 81-mm mortar and mount, and in SNL A-43 for the 60-mm mortar and mount.

Basic spare parts. - These are sets of spare parts provided for use by Ordnance maintenance companies. The list of these parts will be found in the ADDENDUMS of SNL's A-33 and A-43.

Accessories. - Accessories include tools required for assembling and disassembling, supplies for cleaning and preserving the materiel, and covers, tool rods, chests, etc., necessary for storage and protection when the mortars and mounts are not in use or when traveling. Accessories should not be used for purposes other than prescribed. There are a number of accessories listed, the names or general characteristics of which indicate their uses or application. Therefore, no detailed description is necessary. However, accessories embodying special features or having special uses are here described.

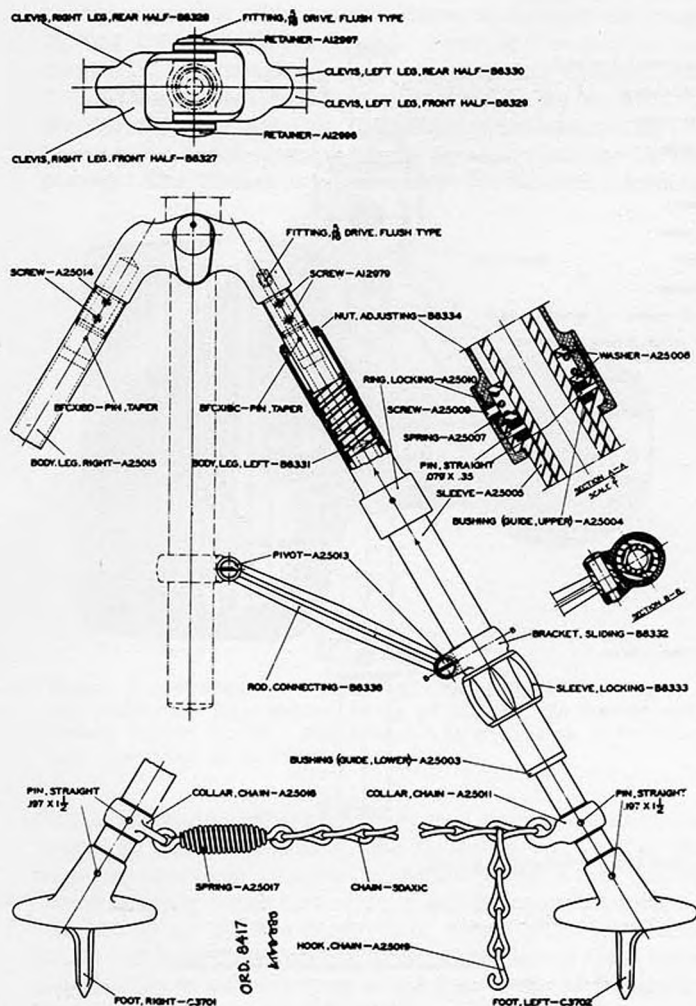
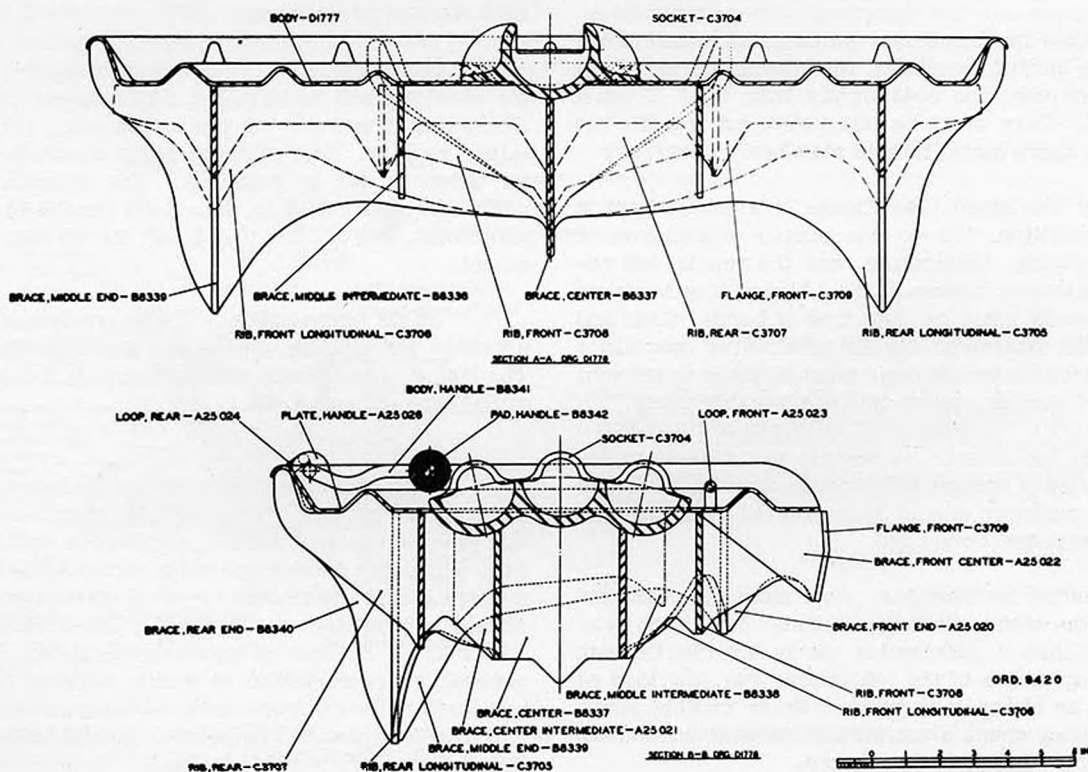


Figure 9 - (Above) 81-mm Bipod legs and cross-leveling mechanism. Sectioned views.

Figure 10 - (Below) 81-mm Base Plate - Assembled views.



Accessory chest, M3. - The steel accessory chest is a commercial type chest provided for the storage and protection of equipment, cleaning material and small stores, and miscellaneous spare parts. It is approximately 20 inches long, 9-1/2 inches wide and 4-1/4 inches deep, and carries the accessories listed in SNL A-33 except the rammer staff and ammunition carrying harness. This chest is issued only with the 81-mm mortar.

Firing pin vent cleaning tool. - This tool is made of round steel stock with the cleaning end flattened and pointed. The other end is formed into a loop handle. It is approximately 4-1/2 inches long, and is issued for both mortars. The tool is used for cleaning the firing pin hole when it becomes fouled.

Spanner wrench, 5/32" and 9/16" radii. - This wrench has a single hook spanner on either end. It is used in disassembling and assembling the top and side covers of the gear case on the 81-mm bipod.

Wrench, spanner. - This is a small single hook spanner used for turning the traversing screw adjusting nut on the 60-mm mortar bipod.

Inspection and adjustment

The following instructions with reference to inspections should be scrupulously observed by all concerned:

The mortar (tube). Note the general appearance, and condition of the bore. Examine the quadrant seat on the muzzle.

The firing pin. Remove the firing pin and examine it for fouling or foreign substance on its point.

(Continued on page 330)



AUTOMOTIVE

Conducted by: J. W. Winslow, Master Sergeant, Ord. Dept.

VOLTAGE REGULATOR CHARACTERISTICS AND DESIGN

By: R. P. Crosslin, Staff Sergeant, Ord. Dept.

We have learned that the resistance of copper wire changes with temperature. We have also learned that battery terminal voltage is higher when the battery is cold and lower when it is hot. Therefore the temperature at which the generator and battery is operated effects the charging rate and some form of temperature compensation is necessary.

As the various electrical units on cars have been improved, and engines designed with increased power, a variation in battery voltage has greater effect, and adjustment becomes more critical.

Temperature compensation in some circuit breakers is accomplished by the use of bi-metal hinges for the armature and by means of a magnetic bypass for voltage regulators. The circuit breaker bi-metal hinges are made of two strips, one of steel and the other of brass. The brass should always be on top. The circuit breaker is so designed that the voltage required to close the contact will be practically the same throughout the normal operating temperature range.

The action of the bimetal hinge is such that when the temperature of the hinge is increased, the brass part of the spring expands greater than the steel, so that the tension of the spring to hold the contacts open is reduced, and the armature will close the contacts. (See Figures 1, 2 and 3.) In this manner compensation is accomplished for changes in the magnetic pull on the armature, caused by variation in resistance of the copper wire in the mag-

netic winding, due to temperature.

Figure 4 shows a cross section view of a regulator magnet. The metal strip attached to the magnet core and the magnet yoke is made up of a combination of nickel and

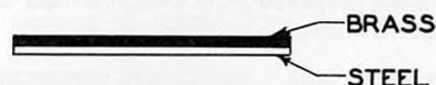


FIG. 1



FIG. 2



FIG. 3

iron and has the characteristics that it will not pass magnetic lines at high temperature and will pass magnetic lines in increasing amount as temperature is reduced.

The arrows show the direction of the magnetic lines through the magnet, around the yoke to the armature.

Under the cold condition (Fig. 4), part of the magnetic lines will be diverted from the armature, through

the metal bypass, thereby reducing the magnetic pull on the armature, requiring a higher voltage to pull the armature down, thus opening the contacts.

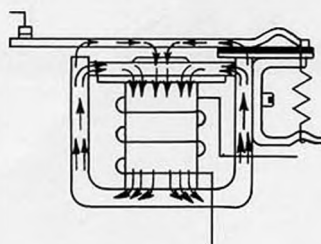


FIG. 4

Fig. 5 shows a cross section of the regulator when operating hot. In this case, more magnetic lines pass through the armature and less through the bypass, creating a stronger pull, and less voltage is required to open the contacts. By this means, the opening and closing of contacts can be regulated to meet the requirements of temperature change.

From this, it can be readily understood that temperature is an important factor in calibrating regulators. Some service manuals give calibration figures from 50 degrees in steps of 10 to 100 degrees F.

When testing electrical equipment, an accurate thermometer should be located near the unit being tested and the service manual figures used according to temperature.

Bearing in mind the temperature compensation of these regulators, it is necessary that regulators be so located on a car that they will not be overheated. On most original equipment installations, the regulator is on the opposite side of the dash from the exhaust system.

The entire electrical system on cars is sensitive to variations in voltage. Therefore, closer regulation of the battery and charging circuit voltage becomes necessary. As an illustration of effect of variation on voltage, the chart below has been prepared from technical data by the General Electric Company.

COMPARATIVE HEAD LIGHT BULB LIFE

32-32 C. P. 6-8 V.#2330 HEAD LIGHT BULB

VOLTS	C.P.	HOURS AVERAGE LIFE
4.96	14.2	3420.0
5.58	22.0	760.0
5.83	25.7	438.0
6.08	29.8	258.0
6.20	32.0	200.0
6.32	34.3	155.6
6.57	39.1	95.4
6.82	44.3	59.6
7.44	59.0	19.8

A common headlight bulb used on cars prior to 1940 was the No. 2330 double filament lamp, 6 to 8 volts, 32-32 candlepower. The design voltage for this lamp is 6.2 volts. At this voltage it produces 32 candlepower and has an average life of 200 hours. At 4.96 volts, the candlepower produced is 14.2 with an average life of 3420.0 hours. At 7.44 volts this lamp produces 59.0 candlepower, but has

only 19.8 hours average life.

From these figures it can be readily understood that voltage regulation within very close limits is desirable.

The metal used for the vibrating contacts of both the voltage regulator and current limit regulators are subject to metal transfer. It has been found by research that metal transfer is greatly reduced if contact surfaces are not made of the same metal. On some voltage regulators, one contact is made of solid metal including the rivet, the other contact is made of two pieces having a different contact metal welded to a steel rivet. For regulators designed to operate with a positive ground, the two piece contact is stationary and the one-piece contact is on the armature. Great care must be used when replacing parts of such regulators to insure the correct polarity.

On some voltage regulators the contact on the armature is mounted on a laminated spring so that there is a slight wiping action of the contacts when they are operating. Therefore, when cleaning, contacts should be

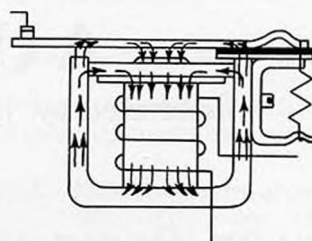


FIG. 5

honed or filed parallel with the armature, otherwise the file marks on the contacts will cause a mechanical locking, making it impossible to properly calibrate the regulator.

Regulator units are very compact in their construction and the units are so close together that there is interlocking of the magnetic fields. Therefore, the steel cover also has an effect upon the magnetic circuits.

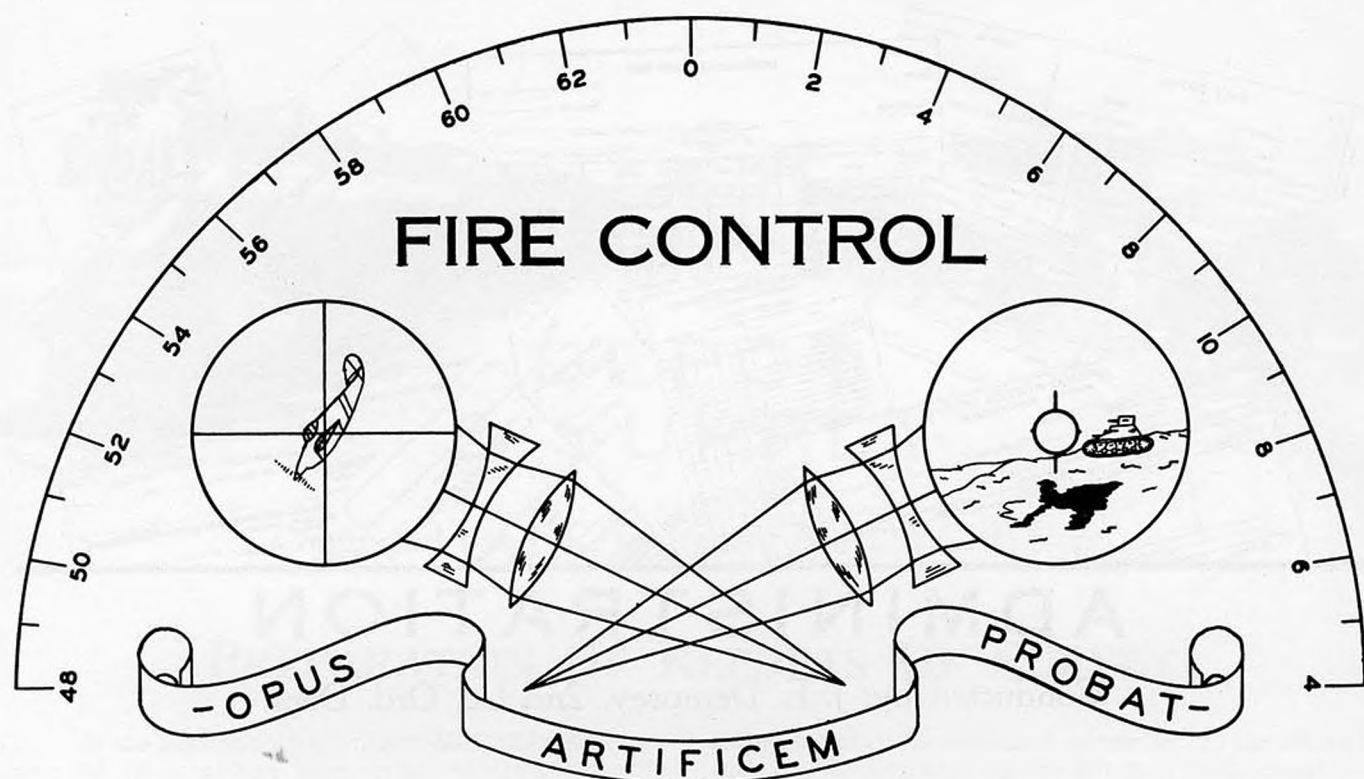
All regulators must be calibrated with the covers on.

All regulators must be calibrated in the same position in which they are mounted on the car.

Before final calibration, the temperature of the regulator must be the same as in normal operation. This is accomplished by running current through the regulator with the cover on, at the rate of 10 or 20 amperes, depending upon whether it is a 6 or 12 volt regulator, for 15 minutes. Check the calibration and adjust the regulator, removing the cover only long enough to make the adjustment.

To adjust the voltage regulator, increase the spring tension to increase the rate of output, and decrease the spring tension to decrease the rate of output. Check the setting by cycling the generator; that is, reducing the generator speed until the cut-out relay contacts open, and then bring the generator back to its rated speed. This reduces the residual magnetism in the regulator winding

(Continued on page 330)



Conducted by: R. L. Johnson, 2d Lt., Ord. Dept.

REPAIR AND ADJUSTMENT OF TELESCOPE, B. C. M1915 AND M1915A1

The following description of the adjustment of the B. C. Telescope is intended for the use of personnel of the Ordnance Department only. The using services are strictly forbidden from attempting the operations described here.

The mount and tripod must be in adjustment and mechanically correct before adjustment of the telescope is attempted. All mechanical adjustments of the telescope and mount must be correct before the optical adjustment is attempted. This sequence must be kept in mind. No detailed adjustment of the tripod will be described here as no specialized knowledge is necessary for servicing the tripod.

MOUNT. - The following description of the adjustment and repair is outlined to meet the requirements of the inspection as outlined in last month's issue of THE ORDNANCE SERGEANT.

Clean all scales and indices. Scales may be refilled with black scale filler or replaced on assembly. This will be dependent on local circumstances and policy.

Adjustment of Ball and Socket Joint. - Disassemble the lower vertical spindle assembly. Do not remove the dust cover if in serviceable condition. Clean and check all parts for burrs and wear, lubricate and reassemble. Adjust for tension by turning plug (A39338) and locking it

in place with the ring (A39336). Check the results. For a smooth movement it may be necessary to lap the surfaces between the shoes (A39339) and the ball joint of the spindle (A46540). Do not let the dust cover get wet when cleaning. Remove all traces of pumice after lapping.

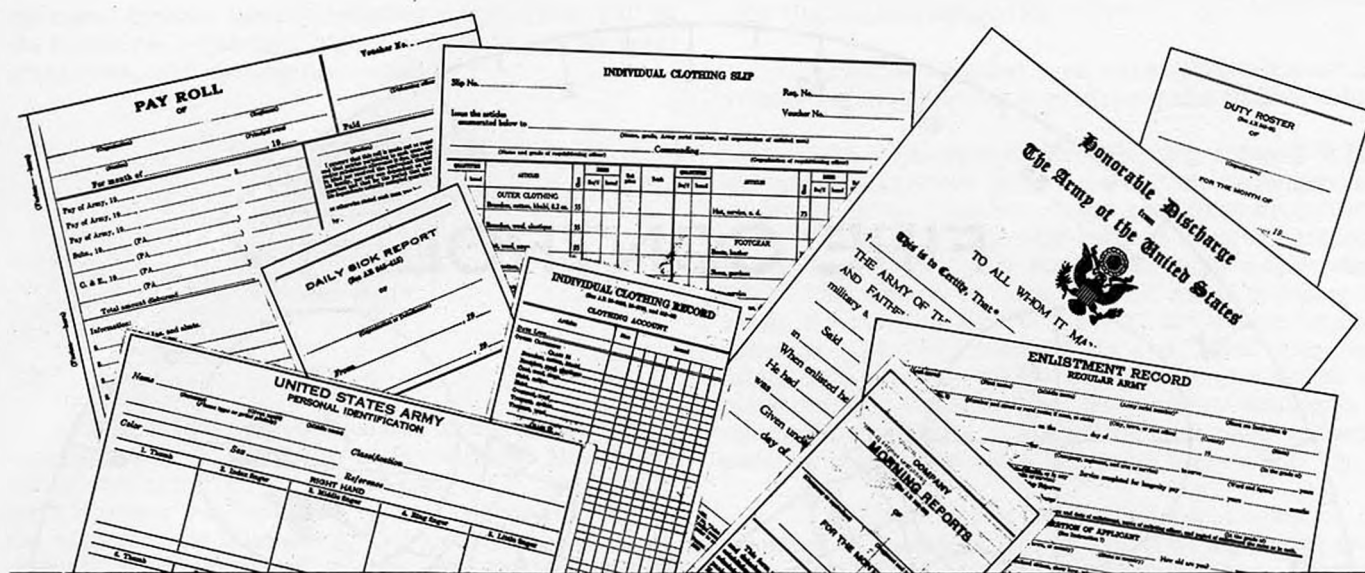
To replace Dust Cover. - Disassemble the lower vertical spindle assembly. Replace dust cover, clean all parts, lubricate and reassemble.

Adjustment of Vertical Spindle Clamp. - Place washer under shoulder of clamping screw (X59A) of tripod. Check the fit of split ring (A39333) and the fit of the shoes (A39339) to the ball joint of the lower vertical spindle. Work in with pumice and oil to a smooth fit. If worn, replace.

Adjustment or replacement of Circular Level. - Place the mount on adapter attached to round surface plate. Level the surface plate. Set the level vial in position; shim (with paper or foil) so that the level bubble indicates the level position when the mount is slowly rotated through a complete circle. Use shellac to hold the shims in place.

Adjustment for Horizontal travel in Azimuth. - Check the fit between the azimuth mechanism housing and orienting mechanism housing. If there is any play or lift tighten the retaining nut (A46546) and relocate the locking

(Continued on page 330)



ADMINISTRATION

Conducted by: J. E. Dempsey, 2nd Lt., Ord. Dept.

MORNING REPORTS

By: Carl Carter and J. C. Matthews,
Staff Sergeants, Ord. Dept.

Part II

In the preceeding issue of THE ORDNANCE SERGEANT we discussed the "Strength" and "Remarks" sections of the morning report. Now we will turn our attention to the remaining two sections of this report, namely the "Station and Record of Events" section and the "Ration Accounts" section.

First, in the "Station and Record of Events" section of the morning report are recorded all changes in the organization, with the date of such changes; all action in which the company, or any part of it, has been engaged; all battle casualties, including killed in action, wounded, gassed, missing, and captured, each stated separately giving names, places and dates; reconnaissance, marches, maneuvers, or anything else of interest relating to the discipline, efficiency, or service of the organization. In making entries as to movements, dates, places, and distances marched or otherwise traveled will be shown.

It is customary to show also the condition of the roads and weather, and a remark concerning the morale of the troops. Regulations do not require this last entry; however, in making up the annual history of the unit in which these entries are made, it is desirable to have this information.

The station or location of the company will be stated on the left side of the page immediately following the day

of the month. If there is no change during a ten day period, the name of the station will be stated only once; however, the entry must be made each ten days if there is no change of station of normal duties. (See Figure 1.)

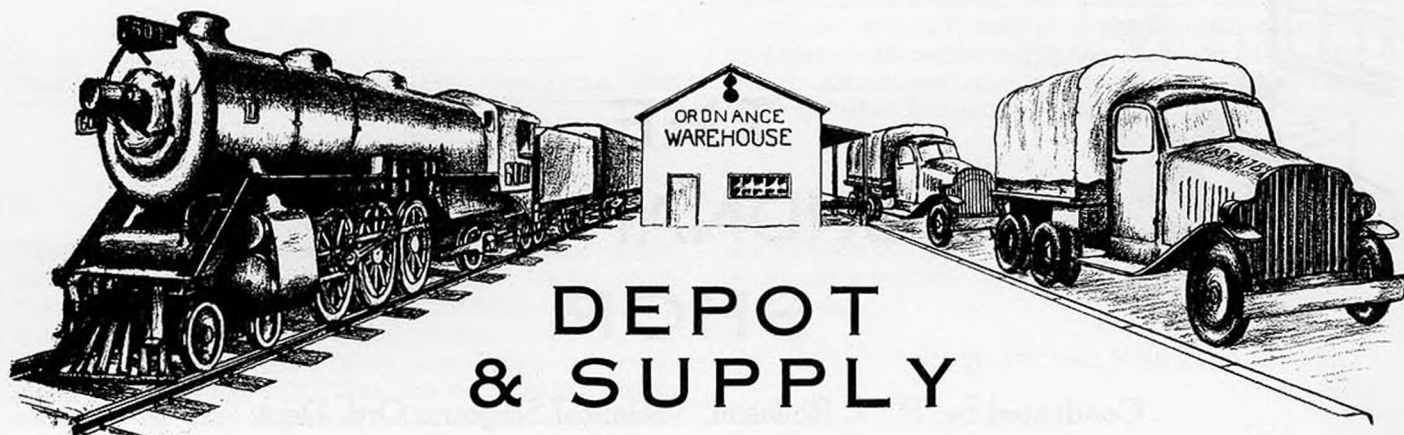
We now come to the "Ration Accounts" of the report. This section has been left until last, not because it is least in importance but because it can be more clearly understood after having acquired some knowledge of the "Remarks" and "Strength" sections of the report.

Page two of the morning report provides for the entry of the names of the men of the organization who are authorized to ration separately. (See Figure 2.) The authority to mess separately may be granted by the commanding officer of a post. After the authority has been verified, each man added to the list of men authorized to ration separately will be initialed by the organization commander. The inclusive dates during which the soldier has rationed separately will be entered in the second column at the end of the month. The total number of rations due each man whose name appears on this page is entered in the third column. At the end of the month this third column is totaled and aggregate number of rations commuted is determined. To this is added ten percent, and the result multiplied by the value of the ration for that month determines the money value of the rations commuted. When the ration account is settled at the end of the month, this money is delivered to the organization commander, who in turn passes it on to the men authorized to ration separately in proportion to the number of rations due each.

Page three provides for men messing with the organization, and is divided into four columns, "Daily Average Strength for Rations", "Number of Men Messing With Organization", "Correction For Percentage", and the "Net Number of Rations Due the Organization". (See Figure 3).

There are a few general rules which should be un-

(Continued on page 333)



Conducted by: J. E. Dempsey, 2nd Lt., Ord. Dept.

PREPARATION OF REPORTS OF SURVEY

In the July issue of THE ORDNANCE SERGEANT we discussed the procedure taken on the receipt of property shipped to the Ordnance Property Officer at a Post, Camp or Station, and stated that "Reports of Survey" were at times required when there was a shortage in the shipment, and the shipping officer returned "Disapproved" the Over, Short and Damaged Report which the receiving officer had prepared and sent to him listing the shortages in the shipment. We stated in that article that we would discuss the preparation of "Reports of Survey" in a future issue of THE ORDNANCE SERGEANT. Therefore, the subject of this article is the "preparation of Reports of Survey".

Property which has been lost, damaged or destroyed other than through fair wear and tear, must, with certain exceptions, be placed on a Report of Survey, and submitted to a Surveying Officer for investigation as to how the property was lost, destroyed or damaged. His findings and recommendations must be approved by the appointing authority, that is, the commanding officer of a post, camp, or station, or the commanding officer of a separate battalion, regiment, or similar unit when such authority has been delegated to him by the post commander, before an accountable or responsible officer can be relieved of accountability or responsibility for the property lost, damaged, or destroyed. If such approved findings and recommendations do not recommend that the person responsible for such loss, damage, or destruction be relieved of liability therefore, that person, either officer or enlisted man, will be required to pay the value of such property as shown by the current price lists, or invoice price, or the cost of repairs. Commanding Officers may allow credit on account of depreciation of the property lost, damaged or destroyed, thus reducing the amount the responsible person will have to pay the Government on account of such loss, damage or destruction. When such action is taken, the amount of depreciation will be determined by the surveying officer and incorporated in the findings and recommendations on the Report of Survey.

Any person, officer or enlisted man, who has lost, destroyed or damaged property has the right to demand that

an investigation be made by a surveying officer before he pays for the property, but the approved findings and recommendations of the surveying officer are final and conclusive.

Whenever property is short or damaged when received in a shipment from a common carrier, that is, a railroad, waterline, or express company, and the carrier's agent acknowledges responsibility for the loss or damage in writing, the articles lost or damaged will be listed on a Report of Survey and the agent's written acknowledgment will be attached thereto. The Report of Survey will be submitted to the Commanding Officer, who may approve the Survey to relieve both the shipping officer and the receiving officer of accountability and responsibility without referring the Report of Survey to a Surveying Officer for investigation.

However, if the agent of the common carrier does not accept or acknowledge responsibility for the loss or damage of such items as are missing or damaged as a result of the shipment, and a signed statement by the agent merely admitting the existence of the loss or damage is not an acknowledgment of responsibility, then the property short or damaged will be listed on an Over, Short and Damaged Report, WD, AGO Form No. 445, and forwarded to the shipping officer for approval or disapproval.

If the shipping officer returns the Over, Short and Damaged Report "Approved", then no further action is necessary except to attach the approved copy of the Over, Short and Damaged Report to the corresponding Shipping Ticket, and both are filed in the property voucher file.

But in the event the shipping officer returns the Over, Short and Damaged Report "Disapproved", and this will be the action in the majority of cases, the receiving officer will then list the property short or damaged in the shipment on a Report of Survey, and submit it to the Commanding Officer for necessary action. If the total value of the property short or damaged in the shipment does not ex-

(Continued on page 335)



THE ORDNANCE SHOP

Conducted by: R. N. Rollason, Technical Sergeant, Ord. Dept.

ESSENTIALS OF SHOP ADMINISTRATION

(Continued from the October issue)

SECTION III

THE SHOP OFFICE

	(Paragraph)
Personnel	8
Publications to keep on file	9
Cost Accounting system	10

8. PERSONNEL. - A typical set-up of shop office personnel might be as follows:

Shop Officer
Shop Foreman
3 - Clerks
1 - Messenger

9. PUBLICATIONS TO KEEP ON FILE. - Below is a list of publications which should be kept on file by all shops. It should be noted, however, that it is not intended that all shops shall possess complete sets of publications pertaining to ALL items of materiel. Only these publications related to materiel present at the station, or materiel which may be reasonably expected to be present in the near future, are required and the obtaining of complete sets of publications is discouraged.

- (1) SNL's on all equipment serviced by the shop.
- (2) Technical Manuals.
- (3) Basic Field Manuals.
- (4) Ordnance Field Service Circulars.
- (5) Ordnance Field Service Bulletins.
- (6) Special Notes in pamphlet form published by the various arsenals prior to publication of SNL's.
- (7) Field Service Modification Work Orders.
- (8) Drawings, charts, diagrams, etc.
- (9) Commercial catalogues.
- (10) American Machinist Handbook.
- (11) AR 850-20 (Care and Handling of Gasoline).
- (12) Any additional matter pertaining to the work peculiar to the shop under consideration.
- (13) All other publications listed in "The Ordnance

Sergeant's Library" (See THE ORDNANCE SERGEANT for May, 1941.

10. COST ACCOUNTING SYSTEM. - a. A cost accounting system must be maintained in the shop, the basis of which is the Work Order. A typical example of this form is shown below.

WORK ORDER

No. _____ Date _____
For _____
Materiel _____

Work to be done _____

Work done _____ Shop Officer _____
Date _____

Inspected by _____ Section Chief _____

Cost Record

Enlisted _____
Labor - Parts _____ Total _____
Civilian _____

Tally Out

Date _____
Received from the Ordnance Shop the above materiel.

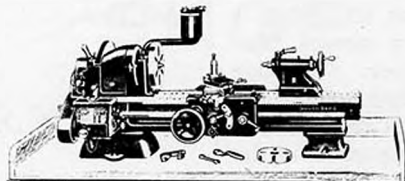
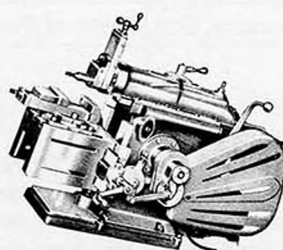
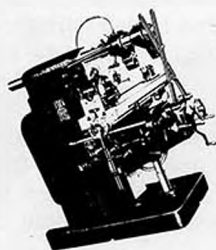
Name and Rank _____ Organization _____
.....(Perforations).....

Tally In

W. O. # _____ Date _____
Materiel _____

Section Chief

THE MACHINE SHOP



Conducted by: L. Kaldizar, Master Sergeant, Ord. Dept.

TRAINING THE ORDNANCE MACHINIST

HEAT TREATMENT OF METALS

Part II

Hardening

Hardening of steel involves heating it to a temperature slightly higher than the critical range, and then cooling it with sufficient rapidity to cause it to harden.

Successful hardening of carbon tool steel is not complicated, yet by no means is it simple enough to neglect the application of intelligent knowledge as to what happens when it is heated, and then quenched in a cooling liquid.

As a preliminary, we mention the well known fact that oxygen and steel have a marked affinity toward each other; they combine readily with each other under all conditions. Oxygen produces ferro-oxide or common rust on the surface of steel in solid form; when heated to a high temperature it oxidizes and burns out the carbon on the outer surface and leaves a soft skin or "bark"; when molten and cast into molds it may be one of the causes of blow holes often found in low grade castings.

Tools are hardened to develop their strength and wear resistance. Heating the tool slowly and uniformly, in a non-oxidizing atmosphere, to the correct heat, and then quenching in a suitable medium, will harden the steel. A suitable medium may be clear fresh water, brine solution, oil, or still air. Overheating the steel promotes grain growth in the structure of the metal and excessive oxidation of the outer surface. This growth will result in having a tool so brittle that it may crack or break in the quenching process and before a corrective treatment can be given. Surface oxidation leaves the outer surface

so deficient in carbon that the tool will have poor wearing qualities. This latter condition can be remedied on some types of tools by leaving some excess metal on the tool which is later removed by a grinding operation. Underheating will not harden the tool to the maximum which would be possible with the proper heat treatment. A burned tool is the result of overheating to the extent where the carbon has burned out of the steel, leaving a porous and brittle mass of scrap. There is no known way of salvaging a tool from this condition.

Selection of the quenching medium is governed by the type of steel used, and further modified in some cases by the shape or mass of the tool receiving heat treatment. Most of the plain carbon steels are known as shallow hardening; in cross section areas over 5/8" round they do not harden all the way through. The inside, or what is known as the core, is toughened, but is not as hard as the outer shell. For this type of steel a water or brine quench is used in order to quench and cool rapidly to get maximum hardness penetration. For deep hardening steel, such as 1.50% Manganese, oil is the best quenching medium. This steel will harden throughout, and the rate of cooling must be slower than shallow hardening steel in order to minimize the possibility of checks or cracks developing as a result of the internal strains always present in a hardening operation. Oil is a much slower heat absorbing element than water or brine, and will not "grip" a quenched tool as vigorously as water or brine. In a nutshell, the choice between the water or oil quench is determined by the hardness penetration inherent in the steel. High speed steel is a deep hardening steel; it hardens so rapidly that even oil is considered a too severe medium for hardening. When steel is highly alloyed, oil cannot be used, and it is hardened by heating and cooling in still air, or circulated air.

(Continued on page 337)



Conducted by: L. I. Dance, Master Sergeant, Ord Dept.

THE DEVELOPMENT OF ARMOR-PIERCING AMMUNITION

By: Glenn C. Funk, 1st Lt., U. S. Marine Corps

The development of armor-piercing ammunition prior to the World War of 1914-1918, was principally in connection with naval guns. There was little or no thought given to its use by ground troops because mechanization by the armed forces of the world was to come at a later date. Its main function was obviously the destruction of armor plating of opposing sea forces. At the present time, armor-piercing ammunition continues as a necessary part of our naval armament, but the introduction of tanks, planes, and other mechanized equipment employing protective armor has created a demand for armor-piercing ammunition among the ground forces. Its purpose is to provide these troops with a means of penetrating the armor plate used on scout cars, reconnaissance vehicles, and any other piece of mechanized war machinery they may encounter.

The predominating school of thought during the Civil War, in connection with the attack of armor, was to smash in the armored side of a vessel with solid shot and spread splinters from the broken projectile, plate and backing, over the back areas, rather than to penetrate the armor and burst the projectile in the rear. This theory had a short life and was finished by the introduction of rifling. It was a long time, however, before the use of the solid shot was entirely abandoned. As late as about 1895 solid shot were made for armor penetration only. There are, however, frequent revivals of variations of the "smashing effect." The latest have been the introduction of the armor-piercing bullet for use in automatic firing weapons. Its function is to pierce the armor plate with which airplanes, tanks, trucks, and other defenses are equipped, and against which the ordinary bullet is ineffective. It will be used in our armed forces in increasing quantities for all rapid-firing weapons up to and including the 37-mm cannon. There are many supporters of the theory that it is not the projectile itself, but the rivet or portion of the armor plate that will raise so much havoc on the interior of a rapidly moving tank or armored car. Therefore, the solid shot principal is employed to insure a greater shocking force without an increase in the caliber of the bore, and also to give a greater strength to small caliber projectiles which would not be possible if there were an explosive charge contained within the shell.

The development of high explosives led to the advancement of the theory that a large quantity exploded against the armored side of a vessel would cave in the armor and plating and completely destroy that part of the vessel in the general neighborhood of the impact. At one

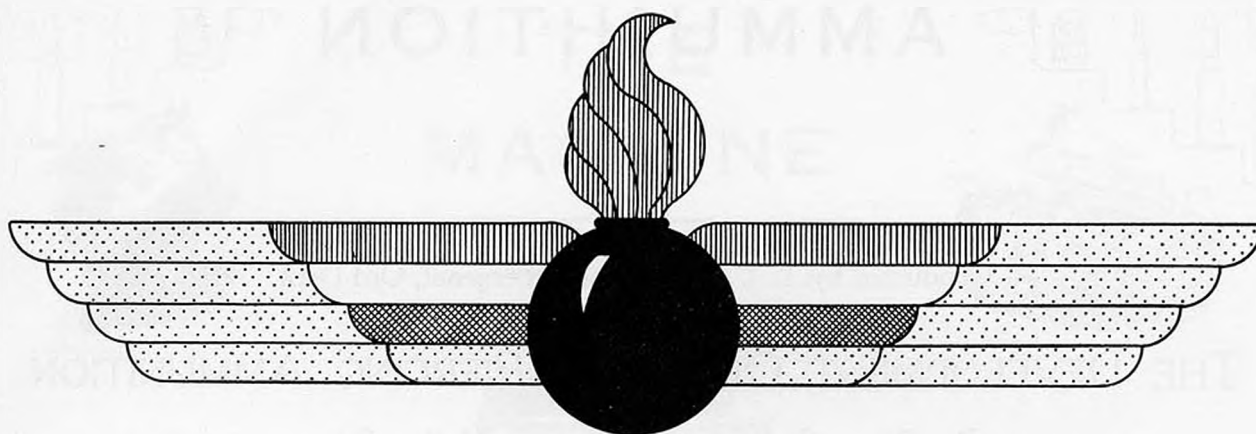
time armor-piercing projectiles were subclassified as "armor-piercing shot" and "armor-piercing shell." The first term applied to a projectile with relatively thick walls and a correspondingly small explosive charge. The term "armor-piercing shell" applied to a projectile with thinner walls and a greater explosive charge. Costly and elaborate experiments, carried out in this country during the past ten years, have conclusively shown that high-capacity, high-explosive projectiles detonating on the armored side of a vessel have no appreciable effect on the armor and negligible effect on the adjacent ship's structure. Furthermore, the engagements of the World War show beyond doubt that major-caliber bombardment or common projectiles may produce great havoc in the upper works and unarmored localities, but modern vessels are almost immune to disablement by other than armor-piercing projectiles of the finest quality. This is not true, necessarily, in the case of our land operating forces. The wheel of an armored vehicle, or the tread of a tank, remains its most vulnerable part. It goes without saying that a quantity of high explosive, detonated against the side or tread of a tank, would almost certainly disrupt its process of locomotion.

The first development in armor piercers, after the ordinary cast iron shot, was the Palliser chilled-iron projectile, which was introduced in England in 1866. This projectile was an iron casting, cast point down, the lower part of the mold being an iron chill while the upper part was sand.

The next real development was the introduction of the cap. In 1878 a comparative test was made in Europe of the effects of projectiles against the face and back of a compound plate. The same projectile which smashed on the face completely penetrated with the plate was reversed. A thin wrought-iron plate was then placed in front of the hard face and this was found to materially increase penetration. Since the introduction of forged high-carbon, nickel-chrome, and the cap, there have been no radical improvements in armor-piercing projectile manufacture, other than a gradual increase in skill in manufacture. There has been considerable experimentation on a graphite substance for the cap, but a satisfactory substitute has never been discovered. At the present time, caps are made of the same kind of steel as are the projectile bodies, except that the carbon, nickel, and chromium are not so high.

After the projectile has been manufactured, the

(Continued on page 339)



AVIATION ORDNANCE

Conducted by: T. C. Bailey, Staff Sergeant, Ord. Dept.

In order to provide readers of THE ORDNANCE SERGEANT who are interested in Aircraft Flares and Signals with the latest complete data available on that subject, and in a form which permits comparative study, the following table is presented.

AIRCRAFT FLARES AND SIGNALS

FLARES	SIZE	WEIGHT	PARA- CHUTE	BURN. TIME	CANDLE POW.	COLOR	USE	HOW RELEASED
M3	23.5x.4.5		Yes	3 Min.	300,000	White Yellow	Emergency Landing	Dropped from Plane
M8A1	25.4x4.25	17-lb.	Yes	3 Min.	400,000	White Yellow	Emergency Landing	"
M24	37x8.1	44 lb.	Yes	3-3.5 Min.	1,000,000	Yellow tint	Tactical night bombing	"
M9	13.8x2	26 oz.	Yes	1 Min.	70,000		Reconnais- sance work	Aircraft M2 Pistol
M11	7.7 x 1.56	9.5 Oz.	Yes	30 Sec.	15,000	Red Star	Signalling be- tween Aircraft or Aircraft & Ground. Dis- tress signal for grounded plane.	"
M14	Same as M11	"	No	9 Sec.	5 stars @ 1500	Red Star Cluster	"	"
M15	"	"	Yes	White 9 Sec. Total 54 sec. Dark 6 sec.		White Star Blinker	"	"
M16	"	"	Yes	Green 10 sec. Dark 6 sec. Total 54 sec.		Green Star Blinker	"	"
M25	16 x 2.5	1.7 lb.	No	1 Min.	Smoke	White Smoke	To determine drift of plane over water	Dropped from Plane
M12A1	30.3x7.3	34	Yes	Photo-flash Bomb			Aerial nite Photography	"
M23 S&M.	25.4x4.3	10.5 lb	No	.16 sec.	84,840,000		Aerial Nite Photography Cheaper than M12A1	Dropped from Plane

(Continued on page 328)

ORDNANCE TRAINING ACTIVITIES

Conducted by: G. D. Meixel, 2nd Lieut., Ord. Dept.
Secretary, The Ordnance School

FIRST OFFICER CANDIDATE CLASS GRADUATED

Wednesday, October 8th, was a proud day at the Ordnance School when members of the staff and faculty, friends and relatives, attended the graduation ceremonies for 37 officer candidates. After receiving their Certificates of Proficiency they were commissioned Second Lieutenants (Temporary) in the Army of the United States.

The principal feature of the exercise was the address by Brigadier General Earl McFarland, assistant Chief of Ordnance.

Other dignitaries attending were, Brigadier General John B. Rose, Commanding General, Aberdeen Proving Ground; Brigadier General Julian S. Hatcher, Commanding General, Ordnance Training Center; and Lt. Col. Geo. W. Outland, Commandant, The Ordnance School.

The personnel of the Ordnance School is indeed proud of the first class of Officer Candidates graduated in The Ordnance Department.

Certificates of Proficiency Presented

(The Month of September)

Officer Courses

Aviation Ordnance -----	46
General Refresher -----	39
Automotive -----	9
Artillery -----	9
Depot and Supply -----	11
Ammunition -----	8
Small Arms -----	9
Ammunition-Artillery-Small Arms -----	2
Ammunition-Artillery-Depot and Supply -----	1
Ammunition-Artillery-Automotive -----	1
Total Officers -----	135

Enlisted Specialists

NCO Depot and Supply -----	80
NCO Maintenance -----	85
NCO Ammunition -----	24
Spec. Artillery Mechanics -----	28
" Automotive Mechanics -----	37

" Carpenters -----	8
" Clerks -----	65
" Cooks -----	16
" Instrument Repair -----	21
" Machinists -----	9
" Advanced Machinists -----	30
" Munition Workers -----	28
" Small Arms -----	23
" Welders -----	17
Total Enlisted Specialists -----	471
Total Graduates (Sept.) -----	606

MEN RETURNED TO UNITS

It is the present and future policy of the Ordnance Department to return to their organizations enlisted personnel from the field who are sent to the Ordnance School as students.

SPECIAL NCO COURSE INAUGURATED

On October 1st, 1941 a new one-month noncommissioned officers course began at the school. At present the enrollment is 77. These men are graduates of enlisted specialists courses given at the School and were selected for this special non-commissioned course because of ability demonstrated in these specialist courses.

It is intended that the enrollees in this class shall be a source of material for future non-commissioned officers of the first three grades.

Following is a schedule of the first seven days instruction:

First Day:

8:00 to 10:30 A.M. - Military Customs, Courtesy & Discipline.
10:30 to 11:30 A.M. - Company Administration & Mess Management.
1:00 to 4:30 P.M. - Hygiene, Sanitation & First Aid.

Second Day:

8:00 to 10:30 A.M. - Leadership
10:30 to 11:30 A.M. - Company Administration & Mess Management
1:00 to 4:30 P.M. - Artillery

Third Day:

8:00 to 9:00 A.M. - Leadership
9:00 to 11:30 A.M. - Company Administration & Mess Management
1:00 to 4:30 P.M. - Artillery

(Continued on page 337)

ORDNANCE NEWS ITEMS

Prepared by: W. L. Boland, 1st Lt., Ord. Dept.
Assistant Secretary, The Ordnance School

NEWS ITEM

The fact that members of the fair sex are interested in THE ORDNANCE SERGEANT may not be "news" but it is nice to be reminded now and then.

Not long ago the Rochester Democrat and Chronicle, of Rochester, New York, published a page of pictures related to Ordnance activities within the Rochester Ordnance District. Among the pictures was one of Miss Jeanne Hayes of the Mail and Record Department of the District Office, reading a copy of THE ORDNANCE SERGEANT.

Through the kind cooperation of Lt. Col. Roy L. Bowlin, Commanding Officer of the Rochester Ordnance District, Capt. Louis G. Kelly, Public Relations Officer of the Rochester Ordnance District, and Mr. Jack Irving, photographer on the staff of the Rochester Democrat and Chronicle, THE ORDNANCE SERGEANT has been able to obtain and reproduce a copy of this picture. (See the most attractive photograph on this page.)

Miss Hayes, of course, also cooperated, and has given us permission to quote her as saying that "I find it a most interesting magazine and one which gives me valuable information in my work in the Ordnance Department." Thanks, Miss Hayes, for the quote, for the photo, and for your interest.



Photo by Jack Irving, Rochester Democrat and Chronicle

PRESENTATION OF REGIMENTAL COLORS TO ORDNANCE UNIT TRAINING CENTER

The Ordnance Unit Training Center was activated in February, 1941, to organize and train Ordnance Maintenance Companies for the field. This was accomplished by activating thirteen companies at a time and setting them up as a regiment. This regiment had National Colors in its possession but no regimental colors. When the Harford County Democratic Women's Club found that the Unit Training Center had no regimental colors they immediately took

steps to remedy this situation. At their own expense and on their own time they made a regimental flag.

On September 26, 1941, the beautiful flag was formally presented to the Unit Training Center at a regimental review. The reviewing party was made up of Mrs. Tydings, wife of Senator Tydings, Mrs. Rose, wife of Brig. Gen. Rose, Mrs. Cronin, president of the Harford County Dem-



Left to right; front row: Mrs. Frank P. Snodgrass, Miss Mary Ristean, Miss Lillian Forewood, Mrs. Millard E. Tydings, Mrs. J. B. Rose, Mrs. J. W. Cronin; back row: Mrs. Gardner Umbarger, Mrs. John P. Beckman, Mrs. Hubert Snodgrass. Captain Del Campo receiving the presentation.

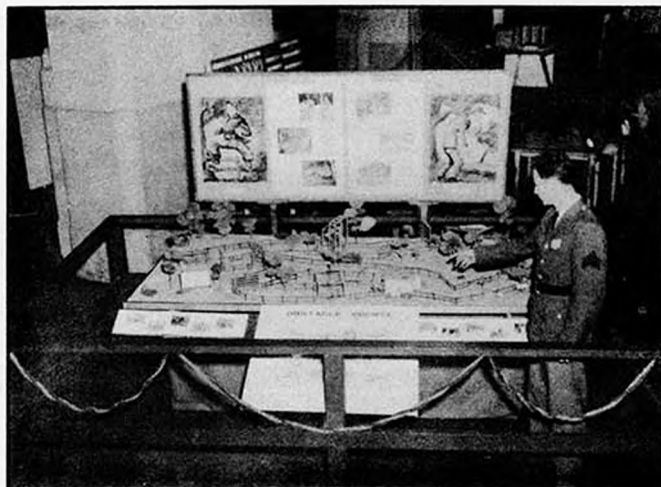
ocratic Womans Club, Capt. Del Campo, commanding Unit Training Center, and his staff. The colors were presented to Capt. Del Campo by Mrs. Cronin. Immediately following the presentation and review refreshments were served to the ladies of the club and the officers of the Unit Training Center by mess personnel of the 39th and 45th Ordnance Companies.

ORDNANCE PLAYS BROADWAY

By: Edward F. Cullen, Lt. Ord. Dept.

The Ordnance Replacement Training Center played an engagement on Broadway from September 20th to October 14th and scored a "smash hit" with their exhibit erected as a part of the Civilian and National Defense Exposition at Grand Central Palace in New York City.

Planned, set up and conducted by personnel of the



Model of the O.R.T.C. obstacle course.

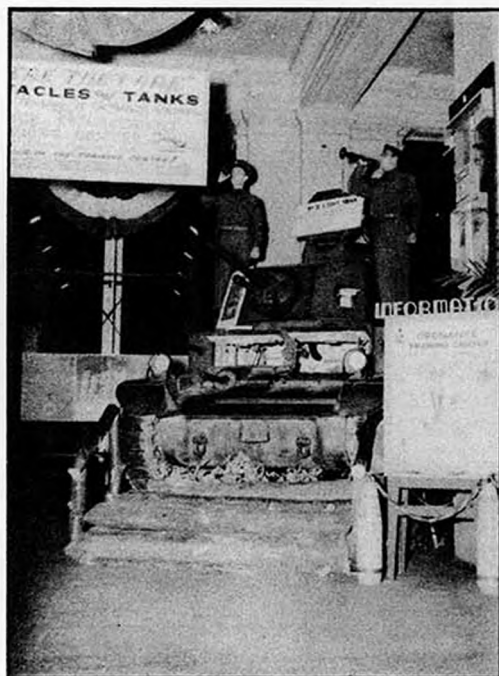


Officers and trainees of the O.R.T.C. assembled on the light tank.

office of the Director of Military Training, the show was played by a cast of thirty trainees in roles made familiar by experience in the Replacement Training Center. They lectured and conducted demonstrations on everything from tanks to obstacle courses - not to soldiers this time, but to the great American public. And the public loved it.

The first thing to be seen by visitors at the show was a huge sign over the main stairway bearing the message: "Here They Are! Tanks and Obstacles used at the Ordnance Replacement Training Center." Behind it was the M3 light tank bristling with its full complement of

(Continued on page 341)



M3 Light Tank at entrance to the show.



LIBRARY

Conducted by: J. M. Kelleher, Staff Sergeant, Ord. Dept.

The following has been prepared to aid Ordnance personnel in finding reference publications. These lists are proposed and may change from time to time.

I. A list of reference publications:

a. FM 21-6 contains a list of publications for training. (Note: The Ordnance Department Technical Manuals listed therein composed the complete list at the time of publication of FM 21-6. A more detailed list follows.

b. Training Circulars are published to promulgate new doctrine for test; to issue minor changes in Field Manuals and Technical Manuals, or other training literature; and to disseminate War Department training policies from time to time.

c. OFSC 177, revised May 15, 1941, and change 1, shows the official method for the distribution of Ordnance Department publications.

d. OPSL, dated March 15, 1941, indexes a numerical list of the various SNL's.

e. Field Manuals

1. A list of the 23-series, which gives information to the using troops for the use of ordnance materiel common to two or more arms is as follows:

- FM 23-5 Rifle, Cal..30 Semiautomatic, M1
- FM 23-10 Rifle, Cal..30, M1903
- FM 23-15 Browning Automatic Rifle, Cal..30, M1918A2 with Bipod
- FM 23-20 Browning Automatic Rifle, Cal..30, M1918A2 without Bipod
- FM 23-25 Bayonet, M1905
- FM 23-30 Hand Grenades
- FM 23-35 Automatic Pistol, Caliber .45, M1911 and M1911A1
- FM 23-36 Revolver, Colt, Caliber .45, M1917, and revolver Smith and Wesson, Caliber .45, M1917. (Note: Not yet released for publication.)
- FM 23-40 Thompson Submachine Gun, Caliber .45, M1928A1
- FM 23-45 Browning Machine Gun, Caliber .30, HB, M1919A4, Ground

- FM 23-50 Browning Machine Gun, Caliber .30, HB, M1919A4 (mounted in Combat Vehicles)
- FM 23-55 Browning Machine Gun, Caliber .30, M1917
- FM 23-60 Browning Machine Gun, Caliber .50, HB, M2, Ground
- FM 23-65 Browning Machine Gun, Caliber .50, HB, M2, (mounted in Combat Vehicles)
- FM 23-70 37-mm Antitank Gun, M3
- FM 23-75 37-mm Gun, M1916
- FM 23-80 37-mm Gun, Tank M5 (Not yet released for publication)
- FM 23-81 37-mm Gun, Tank, M6 (Not yet released for publication)
- FM 23-85 60-mm mortar, M2
- FM 23-90 81-mm mortar, M1

II. Ordnance Department Technical Manuals.

a. Technical Manuals of the 9- series are divided into the following groups:

1. -200 to -999 are for the using troops. These contain specific information necessary for the soldier to use and maintain the weapon, motor vehicle, etc., in proper condition and to perform such minor repairs or replacements permitted the using troops. These may be considered as an operators' manual.

2. -1000 to -1999 series are for the use of Ordnance maintenance personnel only. This series gives in greater detail a description of the operation of a weapon, motor vehicle, etc., and describes completely the methods of inspection and repair. These may be considered as a maintenance manual.

3. -2000 to -2999 series is for schools and specialists and are in the nature of guidebooks for specialists and instructors and as self-instruction pamphlets for the student in specialists duty. These may be considered as text books.

b. The following is a list of Technical Manuals which have been either prepared, published, or contemplated:

1. Underlined T.M.'s either have been distributed or will be distributed shortly. All others will be released for publication within the next year.

2. Following many T.M.'s is the number of the Training Regulation which it supercedes.

Group A

TM 9-204
(TR 1300-30G) Browning Mach. Gun, Cal..30 M1918M1, M1919, aircraft

TM 9-205
(TR 1300-30J) Browning Machine Gun, cal..30, M2, aircraft, fixed and flexible

TM 9-220
(TR 1300-50B) Browning Machine Gun, cal..50 M1921, aircraft

TM 9-225 Browning Machine Gun, cal..50 M2, aircraft, fixed and flexible

TM 9-226 Browning machine gun, cal..50 M2 water-cooled and mounts

TM 9-227 20-mm aircraft gun materiel, M1 & M2

TM 9-229 20-mm antitank gun materiel, - T3

TM 9-235 37-mm antiaircraft gun materiel M1A2

TM 9-240 37-mm aircraft gun materiel, M4
For 37-mm antitank gun materiel
see FM 23-70

TM 9-252 40-mm A.A. gun materiel

Group B

TM 9-280 U. S. Rifle, cal..22, M1922, M1922M1 and M2

TM 9-290 Pyrotechnic Pistol, M2

Group C

TM 9-303 37-mm antitank gun materiel, M1

TM 9-305
(TR 320-95) 75-mm gun materiel, M1897 and modifications

TM 9-307 75-mm gun materiel, M2 and M3, (tank)

TM 9-308 75-mm aircraft gun materiel

TM 9-310
(TR 1305-75B) 75-mm gun materiel, M1916 and modifications

TM 9-315 75-mm Materiel, M1917 and modifications

TM 9-320
(TR 1305-75E) 75-mm howitzer materiel

TM 9-325 105-mm howitzer materiel, M2

TM 9-330
(TR 1305-155A) 155-mm howitzer materiel, M1917, M1918, and mods.

TM 9-331 155-mm howitzer materiel, M2

Group D

TM 9-335 8-inch howitzer materiel, M1

TM 9-336 8-inch gun materiel, T2

TM 9-340
(TR 1305-240A) 240-mm howitzer materiel, M1917, M1918

TM 9-341 240-mm howitzer materiel, M1

TM 9-345
(TR 1305-155C) 155-mm gun materiel, M1917, M1918, and modifications

TM 9-350 155-mm gun materiel, M1

TM 9-355 4.5 inch gun materiel, M1

TM 9-360 3-inch AA gun materiel, mobile

TM 9-361 3-inch AA gun materiel, T4

TM 9-365 3-inch AA gun materiel

TM 9-370 90-mm, AA gun materiel

TM 9-375
(TR 1410-105A) 105-mm AA gun materiel

TM 9-380 4.7-inch AA gun materiel

Group E

TM 9-420 Minor caliber Seacoast Materiel

TM 9-440 Medium caliber Seacoast Materiel

TM 9-460 Major caliber seacoast Materiel

TM 9-480 Railway Artillery Materiel

Group G

TM 9-705 Cars, scout, M3, M3A1, 4.2 mortar motor carriage, M2

TM 9-710 Car, half track, M2; carrier, personnel, half-track, M3; 81-mm mortar carrier, M4

TM 9-725 Tanks, light

TM 9-750 Tank, medium, M2, M2A1, and M3

TM 9-755 Tank, heavy

TM 9-761 Truck, bomb service, M1 (Ford)

TM 9-762 Truck, bomb service, M1 (Diamond T)

TM 9-763 Truck, bomb service, M1 (Yellow Truck & Coach)

TM 9-764 Trailer, tractor, crane, T26

TM 9-772 Tractor, light, M2 (IHC T6)

TM 9-773 Tractor, heavy, M1 (Caterpillar D-7)

TM 9-774 Tractor, medium, M1 (IHC T9 and TD9)

TM 9-775 Tractor, heavy, M1 (Allis-Chalmers HD10-W)

TM 9-776 Truck, wrecking, heavy, M1

TM 9-777 Tractor, heavy, M1 (IHC TD18)

TM 9-778 Tractor, Medium, M1 (IHC T6)

TM 9-779 Tractor, medium, M1 (Allis-Chalmers WM)

TM 9-780 Tractor, medium, M1 (Caterpillar R4)

TM 9-781 Tractor, light, M2 (Cletrac A.G.)

TM 9-782 Tractor, light, wheeled Ind. Type (A.C.B.)

TM 9-783 Tractor, light, M2 (Caterpillar R2)

TM 9-784 Tractor, crane, 1-Ton, M1 (IHC T6)

TM 9-785 Tractor, crane, 1-ton, M1 (A. C.)

TM 9-786 Tractor, medium, M1, (Cletrac BG)

TM 9-787 Tractor, medium, T-10

TM 9-789 Truck, emergency, repair, (Fargo)

TM 9-790 Truck, emergency repair, M1 (Ford)

TM 9-791 Maintenance Trucks, including:
artillery repair, automotive repair, instrument repair, machine shop, small arms repair, spare parts, tank maintenance, tool and bench, welding.

Groups K.L.M.N.

TM 9-850
(TR 1395-A) Cleaning, preserving, lubricating and welding Materials and similar items issued by the Ordnance Department.

TM 9-855 Targets, target materials and range construction.

TM 9-860
(TR 1340-B) Construction of small bore target ranges.

TM 9-865 Method of loading railway artillery for shipment by rail.

TM 9-870 Method of loading railway artillery for shipment by water.

(Continued on page 346)

"LETTERS FROM THE FIELD"

Although many complimentary letters are received by THE ORDNANCE SERGEANT, it has become a policy to refrain from publishing most of them, even though each one is appreciated, and is an added incentive to every member of the publication staff.

Effective with the October issue a new distribution policy was adopted for THE ORDNANCE SERGEANT. This new policy prohibits the distribution of the magazine to individuals except under very unusual circumstances. It is hoped that all individuals effected will accept this change in the manner indicated in the following letter. It is reprinted because of the attitude it expresses.

447th ORDNANCE COMPANY AVIATION (B)
MACDILL FIELD, FLORIDA

October 3, 1941

THE ORDNANCE SERGEANT
Ordnance Training Center
Aberdeen Proving Grounds, Maryland

Dear Sir:

Have received today your letter notifying me of the curtailment of my issue of THE ORDNANCE SERGEANT.

As I have been in the past a faithful and avid reader of this very colorful and educational magazine, it was with the deepest regret I received this news. However, as you stated in your letter, due to the ever-expanding national army program, I realize it would be quite impossible to make available individual copies for all personnel who desire same.

I furthermore take this opportunity to extend my appreciation for the copies it has been my pleasure to have received in the past. The data I obtained thru reading this magazine has proved never-endingly invaluable to me, and without a doubt furthered by changes for attaining the rank which I now hold; that of 1st Sergeant. Not only was the data superb, but also the many editorials, from which I derived innumerable hours of enjoyment.

If there is a possibility of this organization receiving any further issues of THE ORDNANCE SERGEANT, your efforts expended toward this culmination, will be greatly appreciated. Thanking you for all past favors, I remain,

Yours very truly,

HENRY J. GREZIK
1st Sgt., 44th Ord. Co. Avn (B)

For the information of Sgt. Grezik, and of all who are interested, distribution of THE ORDNANCE SERGEANT is made upon the basis of one (1) copy per each twenty

(20) officers and enlisted men. On this basis the following number of copies will be forwarded to each organization:

Medium Maintenance Company	7
Heavy Maintenance Company	11
Ammunition Company	9
Depot Company	9
Railway Artillery Maintenance Co.	5
Proving Ground Company	10
Armored Company	8
Bombardment Company	9
Pursuit Company	4
Air Base Company	3
Headquarters, Armored Battalion	4
Headquarters, Ammunition Battalion	1
Headquarters, Maintenance and Supply Battalion	1
Each Detachment of an Ordnance Service Company	2

Distribution will also be made to all Ordnance offices which are not a part of one of the above named organizations.

HEADQUARTERS FIRST AIR FORCE
Office of the Ordnance Officer
Mitchel Field, N. Y.

September 22, 1941

The Editor
THE ORDNANCE SERGEANT
The Ordnance School
Aberdeen Proving Ground, Maryland

My dear Editor:

I always read THE ORDNANCE SERGEANT with the greatest of interest. The subjects are well chosen and written in such fashion as to whet my appetite for each succeeding issue.

Now it wouldn't be fair to poke my head into the festivities without contributing my little bit - so here goes: In the August issue, I found one article that especially interested me - Status of Stocks Report. A careful perusal indicates that columns 3, 4, 5, and 6 are being discarded since there is no explanation of these. May a poor benighted observer ask "why"? True enough, with regard to ammunition, columns 3, 5 and 6 can go by the boards. Estimates of Requirements (Column 3) suffer various interpretations in sundry hands and, consequently, are of little value. Column 4, however, is valuable in computing the total ammunition supply available at a base. For example: Since it may be necessary to shift ammunition from the hands of troops at one base to another base and to issue expenditure authorizations in case of urgency, it is important to know the total ammunition (hands of troops and storage) at a base.

Some more comments - I believe that a more detailed explanation of the column "Receipt and Issues"

(Continued on page 340)

FIELD HEADQUARTERS SECOND ARMY
Office of the Ordnance Officer
A.P.O. 402
Camp Robinson, Arkansas

MEMORANDUM:

August 29, 1941

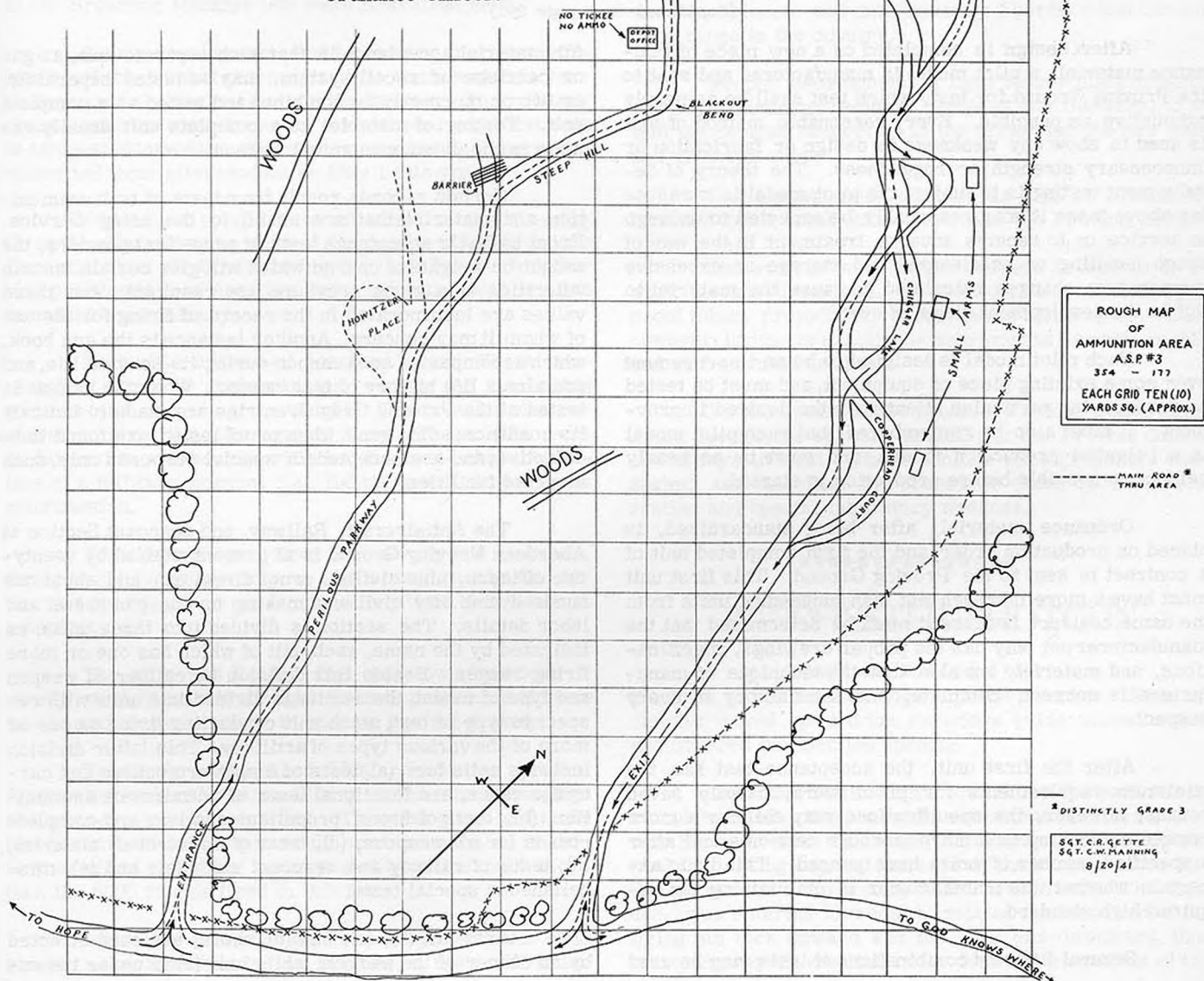
To : THE ORDNANCE SERGEANT

The enclosed is a map of an Ammunition Supply Point established in the Arkansas maneuver area by the 53rd Ordnance Co. (Am) for the supply of ammunition to Second Army troops.

The map is an example of the work done by Ammunition personnel in the field and the interest that the men have in the job is reflected in the map itself.

The map was drawn by Sgt. C. W. Gette and Sgt. C. R. Manning of the 53rd Ord. Co. It is being submitted to THE ORDNANCE SERGEANT with the hope that it may be reproduced in your monthly publication and with the thought in mind that a sense of humor can find expression even in a very serious job. It is certainly indicative of good morale.

FRANCIS A. ENGLEHART
Colonel, Ord. Dept.,
Ordnance Officer.



AIRCRAFT FLARES AND SIGNALS

(Continued from page 320)

FLARES	SIZE	WEIGHT	PARA- CHUTE	BURN. TIME	CANDLE POW.	COLOR	USE	HOW RELEASED
M17	9 x 1.6	8.8 lb.	Yes	GROUND SIGNALS 20 to 30 sec. 20,000		White	Signaling be- tween troops or troops & aircraft	M1 Ground Projector
M19	"	"	"	"	"	Green	"	"
M21	"	"	"	"	"	Amber	"	"
M18	"	"	No	@ 5.5 sec Total 28 sec.		WhiteStar Cluster 5 Stars	"	"
M20	"	"	"	"		Green Star Cluster	"	"
M22	"	"	"	"		Amber Star Cluster	"	"

THE ANTI-AIRCRAFT, RAILWAY AND SEACOAST SECTION

(Continued from page 291)

After design is completed on a new piece of Ordnance materiel, a pilot model is manufactured and sent to the Proving Ground for test, which test shall be as nearly exhaustive as possible. Every reasonable method of test is used to show any weakness in design or fabrication or unnecessary strength or ruggedness. The theory of development testing is to subject the pilot model to stresses far above those it may reasonably be expected to undergo in service or to receive adverse treatment in the way of rough handling or accelerated bad storage or excessive temperature changes calculated to cause the materiel to fail in the development stage, if ever.

Each pilot model is designed to be an improvement over some existing piece of equipment, and must be tested as such, paying particular attention to the desired improvement. It must also be remembered that each pilot model is a potential production model, and must be as nearly perfect as possible before production is started.

Ordnance materiel, after being standardized, is placed on production order, and the first completed unit of a contract is sent to the Proving Ground. This first unit must have a more thorough test than succeeding units from the same contract because it must be determined that the manufacturer not only has the proper drawings, specifications, and materiel, but also that the technique of manufacture is correct, complete, and satisfactory in every respect.

After the first unit, the acceptance test has the minimum requirements for proof work, usually seven rounds; however, the specifications may call for a more complete check up or a more thorough test on a unit after a specified number of units have passed. This is to ascertain whether the manufacturer is maintaining the required high standard.

Several different combinations of tests may be used

for materiel acceptance in that each separate unit, as gun or carriage or recoil system, may be tested separately, or two or more may be combined and tested as a complete unit. Testing of materiel as a complete unit usually results in the most economical method.

Certain records result from tests of both ammunition and materiel that are useful to the using Service. From ballistic acceptance tests of propellant powders, the weight or weights of charge which will give certain muzzle velocities at a given pressure are resultant, and these values are incorporated in the record of firing for the use of whom it may concern. Another instance is the gun book, which accompanies each cannon during its service life, and contains a life history of that cannon. When the cannon is tested at the Proving Ground, entries are made to indicate its condition; some guns, when proof tested, are found to be defective, and are accepted for special purposes only, such as proof facilities.

The Antiaircraft, Railway, and Seacoast Section at Aberdeen Proving Ground is at present staffed by twenty-one officers, nine civilian proof directors, and about one hundred and fifty civilians making up the gun crews and labor details. The section is divided into three units, as indicated by the name, each unit of which has one or more firing ranges. Beside this division by caliber of weapon and type of mount, the section is divided into units with respect to type of test, each unit conducting firing on one or more of the various types of artillery. This latter division includes units for: (a), tests of empty projectiles and cartridge cases, and functional tests of antiaircraft ammunition; (b), tests of fuzes, propellant powder, and complete rounds for all weapons; (c), tests of antiaircraft materiel; (d), tests of railway and seacoast materiel; and (e), miscellaneous special tests.

Units (a), (b), (c), and (d), above, are each directed by an officer of the section, while unit (e) is under the ex-

executive direction of the officer in charge of the section.

The policy at the Proving Ground at present is that ammunition and ammunition components received for ballistic acceptance tests must be tested within forty-eight hours of the time received; if, for some reason this is not possible, the office of the Chief of Ordnance must be notified of the cause for the delay. These tests are usually completed, however, within the forty-eight hour time limit, and the results of test reported to the Chief of Ordnance by memorandum report sent to Washington, D. C.

As soon as possible after completion of the test, data and records are collected, calculations, if necessary, are completed, and the report of firing is sent to the Chief of Ordnance, stating finished results of the test and recommendations relative to correspondence of the ammunition or materiel tested to the specifications therefor.

SMALL ARMS DEVELOPMENT

(Continued from page 295)

baptism of fire at Aberdeen. Most of the improvements in the Browning Machine Gun were first fired here.

A new development that is sure to increase efficiency of the combat troops was that conducted this year on the new Cal.30 semi-automatic carbine. The military characteristics were drawn up several years ago and sent to interested inventors and known arms manufacturers who submitted their pilot models on May 1 this year.

Eight guns in all were submitted to the Proving Ground. The weapons were in the hands of the Ordnance Department at all times during the test, but the inventor was privileged to witness the firing and make such repairs as might be necessary.

Each rifle underwent identical tests. These consisted of complete photographing, naming and numbering of parts and recording the weight. The inventor was required to strip the rifle against time. These tests were to determine whether the rifle had the basic characteristics of a military weapon; i.e., lightness and simplicity in construction.

Next, the rifle was fired for velocity and accuracy, firing being for group only as sights may be adjusted for the various ranges as necessary at any time before actual manufacture.

The rifle was fired at high and low elevations or nearly straight up and straight down to determine if there was enough reserve power to operate against gravity.

There were then fired 5000 rounds for general functioning and endurance. Every malfunction, breakage and replacement was recorded. This test gives an excellent picture of how the gun would act in service, as the effective life of a carbine would probably not be much more than the 5000 rounds fired in this test.

After this test, the gun was subjected to a sand blast in an enclosed box for two minutes, at the end of which

time attempt was made to fire. This simulates some conditions met in actual service.

In addition to the above tests, observation was made as to muzzle or breech flash, recoil, handiness and ease of hand operation.

Fortunately, the eight rifles represented most of the proved types of action; gas, blowback and recoil. Four of the models were eliminated on the basis of the Proving Ground tests. The remaining four, mechanically proved, were turned over to the Infantry for service test. At this point, the Proving Ground's responsibility ends.

Foreign weapons tested at the Proving Ground recently to develop their characteristics as compared to American weapons of nearly equal caliber include the 13.2-mm Browning Machine Gun, Fabrique Nationale manufacture (Belgian); the 7.92-mm and 15-mm Besa Machine Guns (English); the Cal..303 Bren Gun (English); the Boys Cal. .55 Anti-tank rifle (English); and the 7-mm Madsen Light Machine Gun (Danish).

This by no means covers all the work done by the Small Arms section of the Proving Ground. One large crew is engaged in the development and acceptance of light armor plate and armor-piercing projectiles. For this purpose, indoor ranges have been constructed for reasons of safety and convenience, and until recently Aberdeen had the only such range in the country.

Proper development of light armor plate attempts to strike a balance between hardness and ductility, to attain the desired properties in the armor for the new tanks and armored cars.

For convenience, calibers as high as 37-mm are included in the Small Arms Section at the Proving Ground.

The work in these larger calibers is similar to the work already described. In addition, it is necessary to proof tubes, projectiles, cases, fuzes and powder. This, however, is done in exactly the same manner as with mobile and anti-aircraft artillery.

To aid in any of the proof work done by the Small Arms Section, the various facilities of the Proving Ground are always at hand. These include photographing, stargaging, and velocities and pressures taken by the various routine and special laboratory methods.

WINCHESTER SHOTGUN

(Continued from page 305)

the front end of the cartridge with the chamber. When the carrier moved upward the cartridge guide moved with it and covered the ejection opening.

Continued motion of the breech bolt forward finally completes the feeding phase; the extractors cam themselves over the rear of the cartridge; the carrier is forced up behind the locking lug, and the ears on the carrier move into the recesses on the bottom of the breech bolt. The right ear, upon entering its recess, rotates the front end of the firing pin lock upward and the rear end downward, thus removing any obstruction to the forward movement of the

firing pin. During the last part of the forward movement of the breech bolt, as the stud end of the action slide nears the front end of its cam groove, it moves past the lock. The action slide lock moves outward and blocks any rearward movement of the action slide. The gun is now ready to be fired again.

Rearward pressure on the trigger raises the rear end of the sear, causing disengagement between the sear nose on the front end and the sear notch on the hammer. The mainspring exerts its force on the stirrup, causing the hammer to rotate forward and strike the firing pin. The firing pin moves forward; the striker emerges from the firing pin hole and strikes the primer; and thus the cartridge is ignited, completing the cycle of operation.

This series of articles on the Winchester shotgun will continue in the December issue of THE ORDNANCE SERGEANT.

TRENCH MORTARS

(Continued from page 310)

The Bipod.	Note the general appearance. Note whether the oil fittings are encircled by a red ring, and that all moving parts are properly lubricated.
Elevating Mechanism	Elevate and depress the mortar. Note whether the mechanism operates without binding or undue backlash.
Traversing mechanism.	Traverse the mortar. Note smoothness of operation without binding or undue backlash.
Cross level.	Examine the level and see that it is in proper condition.
Cross leveling mechanism.	Operate the mechanism. Note whether it functions properly to cross level the traversing mechanism.
Base plate.	Note its general appearance, and condition of the sockets. (See Figure 10.)
Sight and its mounting.	Note whether the ruggedness of the sight or the rigidity of mounting have been impaired.
Star Gauging.	Star gauging is made after every 500 rounds. The estimated life of the tube is 20,000 rounds, but will probably last longer if properly cared for. The allowable tolerance is plus .002 inch.

For further information pertaining to description, characteristics, sighting equipment description, and functioning consult FM 23-85 for the 60-mm mortar, and FM 23-90 for the 81-mm mortar.

For information on nomenclature, parts and accessories, consult SNL A-43 for the 60-mm mortar and SNL A-33 for the 81-mm mortar.

At the present time there is no publication in existence dealing solely with repair and maintenance of the mortars. However, no difficulty should be experienced in disassembly, replacing of worn or broken parts, and assembly if the diagrams as listed in the Standard Nomenclature Lists are first studied.

VOLTAGE REGULATOR

(Continued from page 312)

cores which would otherwise produce an error in the setting.

If the manufacturer's specifications give a high and low limit for adjusting a regulator, the adjustment should be made one-half way between the two limits. This would allow for error in meters, error in reading the meters, and temperature variation, and still be within limits.

The Automotive Section of The Ordnance School asks for information regarding the Half-track Scout Car. What difficulties, if any, are you having with it, what are its good points, what suggestions have you to offer regarding its use and operation? Remember that Ordnance troops in the field have an opportunity to obtain first hand information regarding latest developments in Ordnance materiel, or at least regarding their use in the field. Send in any information which relates to the Halftrack Scout Car in any way. Address:

THE ORDNANCE SERGEANT,
The Ordnance School,
Aberdeen Proving Ground, Md.

B. C. TELESCOPE

(Continued from page 313)

screw (BCUX3ND). Check the fit of the telescope to the mount and check the alignment of the upper vertical spindle. Replace defective parts. Inspect for results (see THE ORDNANCE SERGEANT for October.)

Adjustment of Movements. - Clean all parts and remove all burrs and scratches with a smooth file or stone. Lubricate and reassemble. Work parts in with pumice and oil for smooth fit; remove all traces of pumice; dry parts; lubricate and reassemble. Check results.

Setting Azimuth Scale and Micrometer. - Using an eye loupe for accurate setting align the azimuth scale index with the zero on the scale. Loosen the screw (A38983A) and rotate the azimuth micrometer so that the zero is opposite the index. Tighten the screw when this has been accomplished.

Adjustment for backlash and lost motion in azimuth.

- With a smoothly operating mechanism this adjustment consists of adjusting the ball cap (A46546) of bearing to eliminate thrust, and adjustment of plug (A46548) for proper tension of spring (A37047) to hold the worm gear in mesh with the wheel. The cap is locked in place with a set screw (BCUX3NB). This set screw should not be set down too tightly. If there is a smoothly operating mechanism and the backlash and lost motion cannot be brought within tolerances it may be found necessary to replace parts, usually the worm gear.

Focusing movement. - Disassemble, clean, remove burrs, and lubricate with lanolin upon reassembly.

TELESCOPE. - All mechanical adjustments must be correct, free, and smooth before the optical adjustment should be attempted.

Setting the Diopter Scale. - Remove eyeguard and sleeve (A34011). Removal of the sleeve will expose the three set screws holding the diopter scale. Obtain clear definition of the reticle with the collimating telescope (using the sky for a background). Loosen the screws, set the diopter scale at zero, and relocate lock screws. Check the mechanical movement. There should be at least a plus and minus movement of four diopters. Next obtain definition of a distant object (using the collimating telescope). Check the diopter reading. It should be within 1/4 diopter of the zero graduation. If it is not the objective lens will have to be relocated.

Adjustment of hinge movement. - If the telescopes fit too loosely on the eccentric bushing the telescope bearings should be peened in so that they have enough tension to support their own weight.

For Smooth movement between the two telescopes. - Check all parts for burrs, remove burrs with pumice and oil (or smooth file) and lubricate. To adjust tension tighten nut (A46321).

To adjust position of angle of site housing assembly. - Adjust for tension with nut (A46502) and lock with screw (BCGX4CB). If still loose replace the spring washer (A37045).

Adjustment of elevating mechanism. - Disassemble, clean, and check all parts for burrs. File or stone burrs. Lubricate and reassemble. To adjust for lost motion release clamping screw for plug (A46520) that holds the eccentric bushing (C56992). Rotate bushing by moving both telescopes together from side to side. Tighten the screw at point where movement operates smoothly. To eliminate worm end thrust remove the interpupillary scale; adjust for thrust with plug; (A46568); lock with ring (A46569).

To Collimate the telescope. - The tools and fixtures listed below will be necessary for this procedure:

Tools: Pedestal (5A), with round surface plate (6B).
1 adapter, for telescope
1 target, special, for telescope
Screwdriver, jewelers, assorted sizes.
Extra reticle, in cell, for collimating left telescope.

Procedure: Set the target up plumb and approximately the same height as the objective window of the

telescope. The distance between the adjusting bench and the target should be at least 300 yards. Set the telescope on the surface plate using the telescope adapter. Set the interpupillary scale at 64 mm with telescope in vertical position. Obtain sharp definition of the right telescope.

Align the center of the reticle on the upper right cross of the target by moving the surface plate in azimuth and operating the elevating handwheel. Rotate the right tube to the horizontal position. Again this should be done with the interpupillary scale at 64 mm. The center of the reticle should scribe an arc from the upper right cross to the lower right cross. Adjust prisms (erecting system) so that the arc formed by the center of the reticle will travel from the upper right cross to the lower right cross.

Insert (temporarily only) the special reticle in the left telescope. With the right telescope aligned on upper right cross the prisms in the left telescope must be adjusted to align the optical axis of the left telescope on upper left cross, and should scribe an arc from upper left cross to lower left cross, when the telescope is rotated from the vertical to the horizontal position. Tolerance - 1/2 mil.

Remove the special reticle. Stake the heads of all adjusting screws with a drop of shellac, after checking to see that all double vision has been eliminated. Replace covers. Fill all adjusting screw holes and wrench holes with plastelina. Touch up with paint to match the finish of the instrument.

To erect the reticle. - Remove the reticle cell. Rotate the reticle in the cell so that it can be erected for both positions of the telescope.

To correct for Plumb travel. - The alignment of the elevating wheel and the bushing (A46497) is not correct. Remove covers (A46571). Clamp the wheel in vise between blocks of wood or brass to protect the sides of the elevating housing. Insert tool (machined to same dimensions as upper vertical spindle). Strike the tool so as to force the bushing over to correct alignment. Check the results carefully.

To remove backlash and lost motion in angle of site mechanism. - Disassemble, clean, and file or stone all burrs. If movement is not smooth work in parts with pumice and oil. Adjust for lost motion by taking up on cap (A46507) and lock cap with set screw (BCUX3MC). If this does not eliminate backlash and lost motion it will be necessary to replace parts, usually the worm gear or worm wheel.

To establish the level line. - Set the angle of site scale at 3, the micrometer at 0, and make sure the bubble is level. Set telescope on round surface plate using telescope adapter. Set collimating telescope in V block on surface plate.

Level the surface plate. - Observe the testing target through the collimating telescope. The horizontal line of the reticle in the telescope should intersect a horizontal line of the testing target on the same level, and the same distance above the point intersected by the reticle of the collimating telescope as the collimating telescope is from the objective window of the telescope. When this is obtained the angle of site scale must read three, the micrometer 0, and the bubble must be level.

To reset angle of site level vial. - Requirements are as listed in previous paragraph. Insert level vial and shim with paper to level position. Fill in with plaster of paris and allow to set. Clean all parts, lubricate, reassemble and check results carefully.

Adjust for proper elevating movement. - This defect is caused by collimating the instrument on a testing target that is not set approximately on the same level as the adjusting stand or bench. Re-collimate correctly.

ACCESSORIES. - Instrument light. - Replace burned out bulbs, and batteries that are unserviceable. Replace complete assembly if switch is unserviceable. The replacement of the remaining accessories is obvious and requires no special comment.

NOTE. - It should be noted that the above instructions will be used as a guide and that under no conditions will an instrument ever be unnecessarily disassembled in order to perform adjustments that are not called for. Repair, adjustment and disassembly should be confined to the limits demanded by the results of a complete inspection of the instrument as outlined in the last month's issue of THE ORDNANCE SERGEANT. Next month the inspection of the GLASS, field, type EE, will be discussed in this same space.

"NOTES IN BRIEF"

Telescope, M5 & M5A1. - The following procedure may prove helpful when attempts are made to eliminate parallax from these two instruments. Assemble the front tube assembly to the rear tube assembly (assuming the instrument has been disassembled first) and draw up to its original position. With a collimating telescope observe the reticle through the eye and field lens assembly and the erector assemblies. If the definition of the reticle is not sharp and clear remove the front tube assembly from the rear tube assembly and move the front erector cell assembly to the front or rear several turns. Reassemble the front tube assembly to the rear tube assembly and observe the reticle again with the collimating telescope. If the definition of the reticle is not sharp and clear repeat the above procedure until it is.

Place the objective cell assembly in place. Put telescope in fixture and observe a target at least 100 yards distant. Adjust objective cell assembly in reticle cell assembly until definition of target is sharp and clear. Check results with collimating telescope. Parallax should now be eliminated. Finish by securing objective assembly, and reassembling rest of instrument.

Special Note. - Did you ever stop to consider that these various notes in brief would form an invaluable scrapbook or file for the use of the instrument section. Clip them, start a file, and add notes and suggestions of your own. You will be surprised at how fast it will grow and at how often it will be consulted. Be sure to index it. Use the Ordnance Catalog (F group) system of indexing.

Telescope, Panoramic, M6. - If the optical axis of this telescope is not within tolerances adjustment may be accomplished as follows: Elevate (or depress) the ninety degree (reflecting) prism until it is in the correct position.

If the elevation index has not moved more than its width the elevating knob locking screw can be loosened and the micrometer re-zeroed. If it is off more than its width it is usually due to faulty reassembly. Correct reassembly will remedy the condition.

QUERY. - Has your section had its monthly talk on safety precautions? Don't forget it. A fifteen minute talk may prevent death or serious injury. This should be made a monthly feature. Saturday morning is an ideal time, duties permitting.

Circle, Aiming, M1. - If the magnetic needle should be improperly balanced in this instrument it can be corrected by weighting the high end with the proper amount of shellac. It will require but a very small amount of shellac to obtain proper balance.

QUERY. - How about those fixtures, tools, etc. not in regular use. How are they stored? Are they lightly coated with oil? Inspected regularly? This is the Section Leader's responsibility, and that of his assistants. Don't get a reputation for carelessness!

Telescope, Panoramic, M1. - A hint on the inspection of this instrument. The tolerances, or allowable errors in adjustment, must not exceed the limits listed below. (These tolerances do not necessarily infer that the instrument repairman should not attempt to reduce them to lower limits if time and conditions permit.)

Parallax None.
Backlash in azimuth 1-1/2 mils (max.)
Backlash in elevation 1-1/2 mils (max.)
Incorrect horizontal travel 1 mil (max.)
Incorrect vertical travel 1 mil (max.)

QUERY. - Is every member of your section (including yourself) familiar with the contents of the OFSB 4 series (maintenance)? Especially OFSB's 4-1 & 4-8 which are essential to your work as an instrument man. How about OFSB 6-F-1 (Lubrication of fire control instruments). If you haven't read them - get these publications - and read them immediately!

GLASS, FIELD, TYPE EE. - Did you know that the replacement of a broken objective lens with a focal length longer than the original will move the focal plane in a plus direction and increase the diopter reading on the minus side and cause parallax?

Did you know that the use of a new objective lens with a focal length shorter than the original will move the focal plane in a minus direction and increase the diopter reading on the plus side - and cause parallax?

Did you know that when changing objective lenses only the focal plane of the objective is moved in relation to the reticle? The changing objective lenses will not affect a change of diopter scale reading as far as the reticle is concerned?

Did you know that nineteen out of twenty cases of parallax in this instrument are caused by careless disassembly and assembly? That mixing of similar parts, unscrubbed, unmarked, to be reassembled wrong, is the main cause of parallax?

Have you thought about these things? Thinking

saves time and the waste of valuable energy. Figure out mentally the cause of a defect, then suggest a remedy, rather than working in a haphazard, hit or miss, trial and error manner. The men who work under your command appreciate efficiency on your part and abhor hesitancy and wasted effort. To increase the efficiency of your section first increase your own. Knowing the little details helps a lot. The ability to reason can be improved with practice. Constantly strive to improve your technical knowledge and constantly strive to pass on to others what you know yourself.

SEALING NOTE. - Threaded parts are most effectively sealed by use of Royco 6A. Be sure not to over apply this grease. Adjusting screw heads should be concealed and further sealed by application of plugging cement of correct hue or plastelina. Spot painting to match instrument finish should be the finishing touch.

QUERY. - Have you read the preface to SNL H-1? There is a lot of valuable data on screws and screw threads therein. Check it!

MORNING REPORTS

(Continued from page 314)

derstood and remembered prior to computing the number of rations due the organization.

1. A soldier sick in hospital is attached to the hospital for rations. Regardless of the hour the soldier enters the hospital, the hospital is entitled to the ration for the entire day, likewise the organization is entitled to the ration for the entire day the soldier is turned to duty from the hospital, regardless of the hour. A soldier sick in quarters is rationed with the organization.

2. A soldier in confinement may mess with the organization, or at a guard house mess, depending on local conditions.

3. In case of furlough, the day of departure is considered as a day of absence, and the soldier is entitled to the ration for that day; the day of return is a day of duty and the organization is entitled to the ration for that day.

4. Unless otherwise stated in the "Remarks", a change of status as regarding rations is assumed to have occurred after breakfast and before dinner.

5. A fraction of one third of a ration is disregarded, while the fraction of two thirds is counted as one.

Now to determine the figure to enter in the "Daily Average Strength for Rations" column. We add together the number of men messing with the organization as of midnight preceeding the day for which the report is prepared. Using this figure as a basis for each of the three meals, we add or subtract from each meal the number of

rations indicated by the remarks for that day. These three meals totaled and divided by three will give the figure to be entered in the first column, "Daily Average Strength for Rations", and this figure is then entered in this column. The figure for the second column, "No. of Men Messing With Organization", is determined by subtracting the number of men messing separately from the "Daily Average Strength for Rations", and this figure is then entered in the second column. On this figure, in the second column, is based the plus or minus percentage correction which is entered in the third column. This is determined as follows:

1. For organizations averaging 25 men per day or less, add ten percent.

2. For organizations averaging 26 to 75 men per day, add five percent.

3. For organizations averaging 76 to 150 men per day, make no change.

4. For organizations averaging more than 150 men per day, deduct five percent.

5. For enlisted men while serving and messing on Army Mine Planters, add fifty percent.

Having figured the plus or minus percentage correction as shown above, the "Net Number of Rations due Organization" figure is obtained by adding or subtracting the percentage for correction from the "Number of Men Messing with Organization" figure, and this figure is then entered in the fourth column. In figuring the plus or minus

Day of month	STATION AND RECORD OF EVENTS
1-10	Fort Blank, Md. Usual garrison duties.
11	Baltimore, Md. Left Fort Blank, Md., 2.00 PM, enroute to Baltimore, Md., on practise march, arrived at Baltimore, Md. 6.00 PM, distance marched 16 miles. Roads - good, Weather - fair, Morale - excellent.
12	Fort Blank, Md. Left Baltimore, Md., 9.00 AM enroute to Fort Blank, Md. Arrived Fort Blank, Md., 2.00 PM, distance marched 16 miles. Roads - good, Weather - cloudy, Morale - excellent.
13-20	Fort Blank, Md. Usual garrison duties.
21-31	Fort Blank, Md. Usual garrison duties.

FIGURE 1.

percentage correction, any number of one-half or more is counted as one, and any number less than one-half is dropped. At the end of the month, this fourth column is totaled and the result is entered as "Total Rations Due Organization".

EXAMPLE: We will surmise that as of midnight

November 2-3 we had a ration strength of 64 men, with 4 of these men on separate rations. The remarks for the day of November 3rd are as follows:

"Pvt DoLittle duty to hosp; Pvt Kessler duty to conf 2:00 PM; Sgts Miller and Blaison duty to fur 7 days; 3 EM atchd for rations 3:00 PM.

RATION ACCOUNT

VALUE OF ONE RATION DURING MONTH, \$.4297

MEN AUTHORIZED TO MESS SEPARATELY

NAME AND GRADE	PERIOD	NO. OF RATIONS
Clapp, Sgt.	1 -31	31
Klaus, Sgt.	1 -31	31
Donovan, Sgt.	7 -20	14
Jones, R. Sgt.	7 -31	25
Cunningham, Corp.	11-31	21
Thompson, Corp.	11-31	21
Brown, Corp.	18-31	14
Potter, Corp.	18-31	14
Water, Corp.	18-31	14
Grant, Sgt.	16-31	16
<i>Verified J.R.P.</i>		
Number of rations commuted.....		201
Ten per cent addition.....		20
Total.....		221

Total commutation due men messing separately. \$ 94.96

FIGURE 2.

MEN MESSING WITH ORGANIZATION

DATE	Daily Average Strength for Rations	No. Men Messing with Organization	+ or - Correction for Percentage	Net No. Rations Due Organization
1	66	64	+ 3	67
2	66	64	+ 3	67
3	70	68	+ 3	71
4	72	70	+ 4	74
5	75	73	+ 4	79
6	77	75	+ 4	79
7	80	76		76
8	80	76		76
9	76	72	+ 4	76
10	76	72	+ 4	76
11	77	71	+ 4	75
12	77	71	+ 4	75
13	77	71	+ 4	75
14	77	71	+ 4	75
15	76	70	+ 4	74
16	78	71	+ 4	75
17	80	73	+ 4	77
18	86	76		76
19	86	76		76
20	88	78		78
21	88	79		79
22	86	77		77
23	81	72	+ 4	76
24	78	69	+ 3	72
25	75	66	+ 3	69
26	75	66	+ 3	69
27	77	68	+ 3	71
28	76	67	+ 3	70
29	76	67	+ 3	70
30	63	54	+ 3	57
31	61	52	+ 3	55

TOTAL RATIONS DUE ORGANIZATION: 2260.

FIGURE 3.

FIGURE 4.

WAR DEPARTMENT
Q. M. C. Form No. 460 (Old 72)
Revised May 11, 1926

Quartermaster's No. _____

Ration Return of 150th Ordnance Company

At Fort Blank, Maryland, **from** July 1,, 1941, **to** July 31,, 1941

Net number of rations due (including rations for men messing separately), all additions and deductions for percentage computed
2481

Corrections for percentages (Pars. 11 AR 30-2210, and 44 a and b AR 345-400): Additions No. 85 Deductions No. _____

	GARRISON	FILIPINO	TRAVEL	FIELD
Rations Required:	No. 2260	No.	No.	No.

I Certify that this Ration Return is correct.

John R. Platerance
JOHN R. PLATERANCE
Capt., Ord. Dept.
Commanding 150th Ordnance Company

Approved By order of Colonel Smith
Roger Bacon
ROGER BACON
Capt., Ord. Dept., Adjutant.

(For preparation of this form see Par. 10 AR 30-2210). U. S. GOVERNMENT PRINTING OFFICE 3-0081

(NOTE) We shall assume that men in confinement mess in the prison mess and NOT with the company).

Breakfast Dinner Supper

64	64	64	- Ration strength as of midnight November 2-3.
- 1	- 1	- 1	- DoLittle to hosp., hosp. receives ration.
		- 1	- Kessler to conf., Co loses ration for 1 meal.
- 2	- 2	- 2	- Miller and Blaison to fur. Co loses 2 rations for the entire day.
		+ 3	- 3 EM atchd for rations. Co gains 3 rations for 1 meal.
61	61	63	

61 plus 61 plus 63 equals 185 which, divided by 3 meals, equals 61-2/3 rations and, since 2/3 is counted as a unit, we have 62 rations for November 3rd. This figure is entered in the "Daily Average Strength for Rations" column. 62 minus 4 men messing separately equals 58, which is entered in the "Number of Men Messing With Organization" column. Since we have less than 75 men we must add our percentage correction of 5 percent, which is 2.9. Since .9 is over one-half it is counted as a unit, making a total percentage correction of plus 3, which is entered in the "Correction for Percentage" column. This correction, added to 58 (the number of men messing with organization), equals 61, the figure to be entered in the "Net Number of Rations Due the Organization" column.

At the end of the month, in order to obtain credit for the rations drawn and consumed during the month, and to get the money value of the rations commuted for the men messing separately, the company commander prepares a "Ration Return" (QMC Form No. 72) (See Figure 4), signs and forwards it to the next higher administrative headquarters for approval. After approval it is forwarded to the Quartermaster, and becomes a voucher to his accounts to cover the rations issued to the organization.

Another type of ration is issued to the troops and is known as "Field Ration". It is computed upon various food items and its value determined in money. This value must be two cents per ration less than the value of the garrison ration. It is then issued to the troops based upon daily strength returns of units at the post which are submitted to post headquarters. The field rations are issued to either the Division Quartermaster or Unit Supply Officers for reissue to organizations. In order to promote

operation of this system of issuing the field rations it is based upon a monthly menu system prescribed for all posts within a Corps Area.

At the end of the month the Finance Officer pays to each organization a sum determined by multiplying the number of field rations issued that organization during the month by two cents (the difference between the field and garrison ration). This is the only ration saving the organization may receive for their company fund under present operating conditions in post, camp, or station.

NOTE: For more information regarding the actual use of the Field Ration, see "The New Field Ration" which appeared on page 215 of THE ORDNANCE SERGEANT for October.

REPORTS OF SURVEY

(Continued from page 315)

ceed \$10.00, the commanding officer may, in his discretion, approve the Report of Survey to relieve both the shipping officer and the receiving officer of accountability and responsibility for the property listed on the Report of Survey. On the receipt of the triplicate copy of such approved Report of Survey, the receiving officer will file it with the corresponding copy of the shipping ticket in his voucher file, and enter on the shipping ticket which he returns to the shipping officer the following certificate: "I certify that the articles designated by # above were not received by me (were received in a damaged condition), that the value of the articles short (damaged) is \$_____, and in accordance with the provisions of paragraph 4c, AR 35-6640, have not been taken up on the stock record account."

If the value of the property short or damaged received as a result of a shipment by a common carrier, and the shipping officer disapproves the Over, Short and Damaged Report, exceeds \$10.00, but is under \$20.00, the receiving officer will list the property short or damaged on a Report of Survey, but before forwarding it to the commanding officer for necessary action, he will attach to the Report of Survey one of the following certificates, whichever is applicable as a result of the establishment of the facts in connection with the loss or damage of the property as determined by an investigation made by the receiving officer. First, when the receiving officer has determined that the common carrier is at fault and responsible for the loss or damage to the shipment, he will attach the following certi-

ificate to the Report of Survey: "I certify that the loss (damage) of the property listed on attached report occurred while the property was in the hands of (here name the common carrier), a common carrier, and that it weighed _____ pounds. Notation of the loss (damage) has been made on the bill of lading". Second, if as a result of the investigation made by the receiving officer when property is lost or damaged in shipment while in the hands of a common carrier, and he determines that the common carrier is not at fault, he will attach to the Report of Survey the following certificate: "I certify that the circumstances attending the loss (damage) of the property listed on attached report do not indicate that a common carrier is liable therefor."

If the value of the property short or damaged shipped by a common carrier exceeds \$20.00, or in any case where the commanding officer is of the opinion that all concerned should not be relieved of responsibility, he will appoint a surveying officer to investigate the loss or damage, and submit his findings and recommendations on the back of the survey form in the space provided therefor.

In connection with the placing of the findings and recommendations on the survey form it is well to note that the "RECOMMENDATIONS" follow immediately under the last line of the "FINDINGS" without any blank space; that is, "FINDINGS", if typewritten, will be written "single-spaced" on the form and the "RECOMMENDATIONS" will be single-spaced, commencing immediately below the last line of the "FINDINGS", and the typing of the name, rank and organization of the surveying officer will be made on the right side of the form and approximately four spaces below the last line of the "RECOMMENDATIONS".

Any property found to be lost, destroyed or damaged will be placed on a Report of Survey immediately after such discovery, and in any event within 30 days of such discovery. If the property is not listed on a Report of Survey and forwarded to the appointing authority within 30 days, a certificate must be attached to the Report of Survey signed by the officer responsible for the preparation of such report, stating why the Report of Survey was not prepared and forwarded within the 30-day period.

A Report of Survey, WD, AGO Form No. 15, will ordinarily be prepared in triplicate, one original and 2 carbon copies (if prepared on a typewriter). To the original will be attached original or true copies of all evidence, affidavits, certificates, Over, Short and Damaged Reports, bills of lading, etc., on which the responsible or accountable officer relies to be relieved of liability for the loss, damage, or destruction of the property. In this connection it is well to note that the Act of Congress which defines the procedure by which an officer may be relieved of accountability and responsibility for loss, damage or destruction to Government property in his possession requires that an officer will not be relieved of liability for such loss, damage, or destruction unless part of the evidence is in the form of an affidavit. The testimony of enlisted men is always prepared in affidavit form, and the testimony of officer may be in either "Certificate" or "Affidavit" form. When the testimony is all furnished by officers, care should be taken to have at least one officer's testimony submitted in affidavit form, and the affidavit on the front page of the Report of Survey should not be modified to make it a "Certificate" when the testimony under "Date and Circumstances" is furnished by an officer.

Separate Reports of Survey will be prepared for

property lost, damaged, or destroyed which pertains to the different supply arms and services; that is, Quartermaster property will not be listed on a Report of Survey on which is listed Ordnance property, or vice versa. While not required by regulation, it is well to list controlled items of Ordnance property on a separate report of survey for the reason that the Chief of Ordnance reviews Reports of Survey covering these items.

Likewise separate Reports of Survey should be prepared for property lost, damaged or destroyed under different conditions; for example, Ordnance property destroyed or damaged as a result of a fire in a warehouse should not be listed on the same Report of Survey covering property which has been lost by theft as a result of breaking and entering in another warehouse.

For the benefit of company supply sergeants, it is well to note here that Reports of Survey are required when a member of an organization deserts and a check of the Government clothing he abandons at desertion discloses a shortage from the amount charged against him on his Individual Clothing Record. In this case it is advisable to list equipment and clothing charged to the soldier for which there is no accountability separately from the equipment that is carried on the stock record account of some accountable officer, even though the items of equipment pertain to the same supply arm or service.

The money totals on each sheet at the bottom of the column headed "value" will be initialed by the officer responsible for the preparation of Report of Survey. Likewise any erasures or interlineations, or other alterations made in the written matter of the Report, must be initialed by the same officer.

When a Report of Survey covers damaged or unserviceable property, the total value of which does not exceed \$50.00, the officer responsible for the preparation of the Report of Survey will include a statement under "Date and Circumstances" of recommendation for the disposition of the damaged or unserviceable property. At depots and arsenals the \$50.00 limitation is waived.

The evidence submitted as exhibits to the Report of Survey must have written in the lower left corner the data necessary to identify the exhibit, and that it pertains to a particular Report of Survey. For example, the first exhibit to be attached to a Report of Survey that was dated September 25, 1941, having a total money value of \$45.56, would have written in the lower left corner of the page the following: "Exhibit "A", R/S, September 25/41, \$45.56", Exhibit "B" would have written in the same relative place: "Exhibit "B", R/S, September 25/41, \$45.56, and the rest of the exhibits would be identified in like manner.

Care should be exercised so that the evidence submitted in the form of certificates or affidavits is clear and concise, and as brief as is possible to give all the essential evidence. Likewise, the wording of the certificates or affidavits should be such that there would be no question as to its creditability, and that each item listed on the Report of Survey is covered in at least one exhibit submitted as evidence to support the contention of its loss, destruction or damage.

Questions, letters, articles are welcome!

NEW N. C. O. COURSE

(Continued from page 321)

Fourth Day:

8:00 to 11:30 A.M. - Company Administration & Mess Management
1:00 to 4:30 P.M. - Artillery

Fifth Day:

8:00 to 11:30 A.M. - Company Administration & Mess Management.
1:00 to 4:30 P.M. - Small Arms

Sixth Day:

8:00 to 9:30 A.M. - Company Administration & Mess Management.
9:30 to 11:30 A.M. - Aviation Ordnance.
1:00 to 4:30 P.M. - Small Arms

Seventh Day:

8:00 to 11:30 A.M. - Depot & Supply Inc. Org. War. Dept., Army & Ord. Dept.
1:00 to 4:30 P.M. - Small Arms

Other subjects covered in the course include: Ammunition and Camouflage, Fire Control Instruments, Maps and Photo Reading, Military Law, Shop Management and Practice, Instructional Methods, Ordnance Service, and Automotive and Convoy Operations.

HEAT TREATMENT OF METALS

(Continued from page 318)

Quenching Mediums

I. Clear fresh water. - Although water is a good medium for quenching water hardening tool steel, it is not the best. As previously mentioned, water is used where the steel is shallow hardening, or is slow to harden. When quenching in fresh water, the hot steel has a tendency to repel the water, preventing the complete wetting of the tool, slowing up the hardening process, and producing soft spots on the surface of the tool due to uneven cooling. This action is caused by atmospheric gases decomposing and forming bubbles of gas and steam on the surface of the red hot steel, thereby preventing the rapid cooling which is necessary for hardening. Agitating the water, or moving the object being quenched, partially remedies this condition, though the principal objections in using the fresh water quench still remain - soft spots and lack of uniformity. Advantages of the water quench are apparent under field conditions, when it may be the only medium readily available.

II. 10% Brine solution. - Dissolving 10 pounds of rock salt in 90 pounds of ordinary fresh water will produce a 10% solution of brine. Approximately the same solution can be made by using 3/4 pound of rock salt to 1 gallon of water. Ordinary rock salt, as used in ice cream freezers, makes the best solution. Any brine solution of between 5% and 10% will give satisfactory results. The purpose of adding salt to the water is to prevent the water from absorbing atmospheric gases; this in turn allows the solution to wet the immersed hot steel all over; the brine

solution "stays" with the steel and cools it off rapidly and uniformly, overcoming the deficiencies found in the fresh water quench. The salt in the water may be likened to a catalytic agent; the salt itself has no effect in the hardening process, but it does have an effect on the water by forcing it to do the heat extracting job without being repelled from the hot steel.

In connection with the use of the brine solution it might be mentioned that it is not a cure-all, nor a shot in the arm to cover poor work. A tool must be properly designed, made of a type of tool steel best suited to do the work expected, must be given the right heat treatment, and quenched so as to reduce warpage to the minimum. Neglect of the above mentioned fundamentals will cause a tool to crack or break just as quick in the brine quench as in any other. Disadvantage of brine quench: Rock salt is not readily available in the field, and is not an article of issue. If improperly or carelessly compounded it will defeat its own purpose, due to the fact that a saturated solution (26%) of brine will not cool the water hardening steel fast enough to harden it.

III. Oil. - Some tool steels, especially when highly alloyed, are medium to deep hardening, and when in small cross sectional area they harden so rapidly in water or brine that the internal strains set up during the hardening exceeds the strength of the steel. This results in surface cracks, fractures, or, in extreme cases, a complete rupture of the steel. With this kind of tool steel, oil is used as a quench to retard and slow up the rate of heat extraction. There are no secrets, trade or otherwise, in the selection of the oil as a quenching medium if it meets the following general requirements:

a. Have a high flash and fire point - an oil which will not ignite and burn when hot steel is plunged into it.

b. Have sufficient cooling capacity - when using a suitable oil this is determined by the volume of oil in the tank or container.

c. Have chemical stability - the wrong kind of oil will break down in the presence of high temperatures and form a coating of carbon on the steel which will prevent the tool from hardening as expected.

Fish oil, cotton-seed oil, raw linseed oil, lard oil, and the quenching oil issued by the Ordnance Department, are excellent quenching mediums.

IV. Air. - Allowing the heated steel to cool and harden in still or circulated air. Highly alloyed carbon and high speed steel is sometimes hardened in this manner. It should be noted that ordinary high speed steel is hardened in oil; highly alloyed high speed steel in air.

Part III of this discussion will appear in the December issue of THE ORDNANCE SERGEANT.

Tentative forecasts for future issues:

December - Depot Companies and Depots

January - Anniversary Ordnance School issue

February - Industrial issue

March - University R.O.T.C. issue

April - Arsenal

May - Storage and shipping issue

June - Mechanical historical issue.

SHOP ADMINISTRATION

(Continued from page 317)

- (a) To improve function.
- (b) To obtain economical maintenance.
- (c) To provide for safety.
- (d) To remove obsolete parts.
- (e) To replace superceded components.

14. APPLICATION OF MODIFICATIONS. - Modifications will be applied to all non-modified materiel in the shop and to all other materiel as it may be required. Materiel in storage will usually be modified only at general overhauls.

15. NUMBERING OF F. S. M. W. O.s. -Field Service Modification Work Orders are numbered by SNL group and serial number. An index to these orders is issued periodically, and the latest issue should always be kept in the shop office.

16. A report of progress on Field Service Modification Work Orders must be rendered annually, and at such other times as may be required. The annual report should be made as of the 31st of December, and must be made up in the following manner:

(5) The number of sets of parts on hand can be obtained from the Expenditure Record in the Clerical and Supply Section of the Shop Office. If a long time is required to get parts, the Expenditure Record should be checked by a physical inventory.

(6) Line (4) minus line (5).

(7) From the Requisition File (unfilled).

(8) From the Requisition File (filled).

(9) List the organizations of using troops who have any of the materiel. Sufficient space should be given to each organization to provide for all the entries required in column (14). Include the Ordnance Maintenance Company if it has any in its replacement stock.

(10) Give the total number of items in each organization.

(11) Give the number of such items which are already modified.

(12) Column (11) minus column (12).

(13) Enter in the spaces provided, the date and

STATUS OF F.S.M.W.O.

- (1) Pertains to _____
- (2) Instructions received _____
- (3) Drawings received _____
- (4) Total items to be modified _____
- (5) Total sets parts on hand _____
- (6) No. of additional sets required _____
- (7) Requisition No. _____
- Date _____

- F.S.M.W.O. No. _____
- (8) Sets of additional Parts received _____
- Date _____
- (9) Remarks _____

(10)	(11)	(12)	(13)	(14)				(15)
Org.	Total on Hand	No. of Mod. Items on hand	No. Items to be Modified	Number Modified				Date Modification Completed
				Date	No.	Date	No.	

The following instructions should be followed in preparing this report.

Enter the Field Service Modification Work Order Number in the space designated.

(1) Give the name and model number of the weapon or materiel affected. Use correct nomenclature.

(2) Date the F.S.M.W.O. was received in the shop office.

(3) Date of receipt of all drawings and any other necessary information.

(4) Total number of items to be modified by the shop; equals the sum total of column (13).

This article concludes a series of articles on the theories associated with the operation of an Ordnance Shop. The most pressing need of THE ORDNANCE SERGEANT at this time is information regarding the actual and practical operation of Ordnance shops in the field. Unusual jobs certainly have been handled successfully in your shop; you must have some tool devised locally which has proven useful; your shop personnel surely has discovered some method to save time or effort or expense -- tell us NOW; don't wait!

number of items as modifications are completed. The sum total in these columns, when the job is finished, should equal column (13).

(14) Give the final date of completion for each organization. The date of completion for the last organization may be entered in line (9) under remarks if desired.

SECTION V

INSPECTIONS AND OVERHAULS

	(Paragraph)
Annual inspection	17
Inspection schedule	18
Inspection forms	19

17. ANNUAL INSPECTION. - The Ordnance Shop is required to make an annual inspection and overhaul of all Ordnance materiel within its jurisdiction. Information concerning them may be obtained from the 1400 series of Technical Regulations and from OFSB's.

18. INSPECTION SCHEDULE. - In planning inspection schedules it should be kept in mind that the shop must not interfere with the training programs of the organizations they are to inspect. The organization commander concerned should be consulted.

19. INSPECTION FORMS. - Convenient forms for recording the results of inspections may be found in FM 9-10, in The Ordnance Field Manual, and in the August issue of THE ORDNANCE SERGEANT.

ARMOR-PIERCING AMMUNITION

(Continued from page 319)

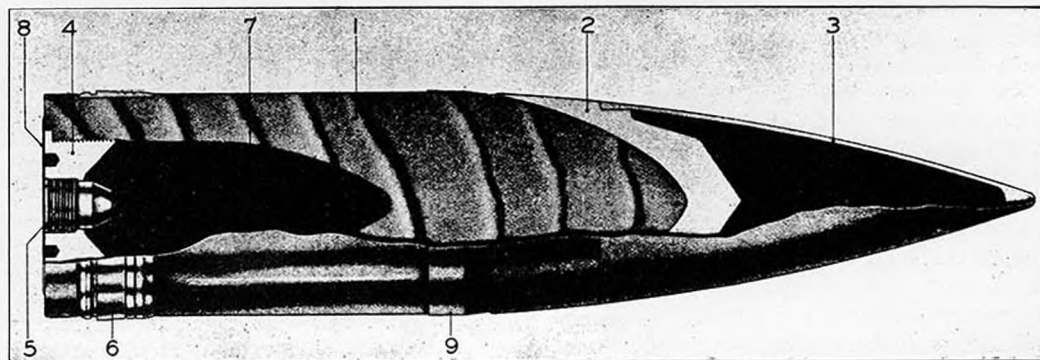
hardening process is accomplished by a complete quench in agitated cold water. The heating for this treatment is generally accomplished in a bath of molten lead, such procedure being conducive to accurate control of both temperature and position of application of heat. The base is then heated to a lower temperature than was used for quenching and upon withdrawal from the bath or furnace is suspended nose down and immersed up to the bourrelet in agitated cold water. This procedure draws or tempers the rear portion while preserving the hardness in the head. The result is an exceedingly hard head to the rear of which the

hardness gradually decreases with increase in toughness. The hard head is to effect the smashing of the plate's face while the tough rear is to support the head and stand the breaking strain of angle impact. There is a tremendous side-strain in impact with a hardened surface from an angle. Unless specially constructed to withstand this strain, the shell will be defeated before piercing the armor.

Caps are prepared in much the same manner as the projectile itself. They are secured to the projectile by several methods. The one most commonly used consists of peening the skirt of the cap into notches cut into the ogive of the projectile. Another method is that of "crimping". Probably the most popular method consists of soldering the cap to the ogive with a special low melting point solder. Such a solder is required to prevent the heat necessary for soldering from drawing the temper of the ogive. Caps should be held securely in place, and it is quite probable that their efficiency on oblique impact is materially affected by the security of the bond. Notches cut in the ogive would certainly be no source of strength. Therefore, the use of solder and "crimping" are looked upon with favor by many Ordnance engineers.

The windshield is made of either cast iron or forged steel and has no special strength other than that necessary to prevent destruction during handling and setback. A recent practice has been to use substances lighter in weight, such as aluminum. Windshields are generally screwed on the cap, and frequently the thread is cut on a tapered surface. After screwing home, they are "set" by a center punch at the joint. There should be a careful inspection made of the windshield and cap before using the projectile. It occasionally happens that caps become loosened by rough handling. A loose cap is a source of grave danger. If the cap should come off after being loaded in the gun, the projectile might ride over the cap. This would, in effect, increase the diameter of the projectile, and the gun might be disrupted by the pressure that would build up behind the projectile as a result of the increase of resistance. If the windshield becomes loosened, it can probably be tightened at the gun position.

In our larger caliber projectiles, a bursting charge is used. Explosive D is generally regarded as the most satisfactory explosive charge for armor-piercing projectiles because of its ability to withstand severe shocks and stresses before detonating. In the design of the projectile, the bulk of the metal is in front of the cavity, which is smaller than the same cavity provided for the bursting



- | | | |
|------------------------|-------------------|-----------------------------------|
| 1. Steel shell. | 4. Base plug. | 7. Bursting charge (explosive D). |
| 2. Armor-piercing cap. | 5. Fuze. | 8. Base cover. |
| 3. Windshield. | 6. Rotating band. | 9. Bourrelet. |

FIGURE 1. Major caliber armor piercing projectile.

charge in the high explosive shell. The weight of the bursting charge is approximately 2% of the total weight of the shell. Detonation is accomplished by a delayed action base fuze, screwed into the base plug, which causes explosion after penetration.

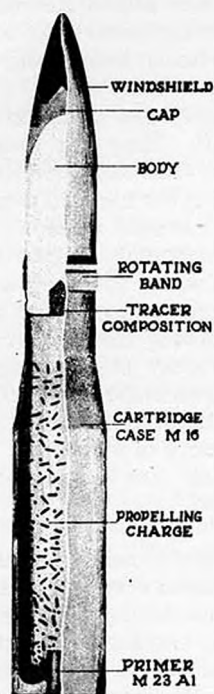


FIGURE 2. 37 mm armor piercing shot (complete round).

Studies of the penetration of an armor-piercing projectile are interesting. A projectile may penetrate or "defeat" a plate but break up in the process, to such an extent as to prevent it from bursting effectively. In considering penetration from the projectile standpoint, the standard of performance must be effective bursting condition after penetration. Effective bursting condition is generally taken

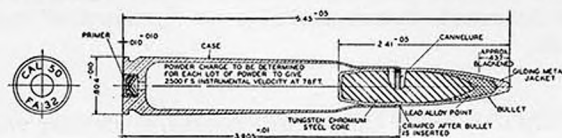


FIGURE 3. Cartridge, armor piercing, caliber .50, M1.

as complete integrity of the cavity. Thus the projectile may lose its nose, or even a large portion of the head down to about the bourrelet, but is considered to be effective if the cavity is not exposed by cracks or fractures.

Various theories have been advanced as to the reason for the increase in penetration secured by the application of the cap. The simplest, and perhaps the most reasonable, is that the cap acts to break down the initial strength of the plate, allowing the nose to reach an already strained surface, and then provides powerful circumferential support to the point and nose as they begin to penetrate the hard face, maintaining the support until they are well into the plate. This theory is supported by the fact that an uncapped projectile will penetrate a non-face-hardened plate with the same velocity as will a capped projectile; in fact, with somewhat less velocity, as experiment has shown, the slight decrease being ascribed to the adding of the thickness of the cap to that of the plate. The cap also has the effect of increasing the biting angle. This is due to the greater bluntness of the front end of the cap,

which alleviates much of the angular strain on the projectile.

The shape of the ogive of the projectile has undergone many experiments to increase its efficiency. The introduction of the windshield has obviated the necessity of having a long nose to reduce air resistance on projectiles. If the projectile has too sharp a point, the nose will probably be broken off on impact, while if too blunt, the projectile will have poor penetrative qualities. Present practice is to fix the radius of the ogive of armor-piercing projectiles at approximately two calibers.

There has been little reference in this report to small arms ammunition, other than the establishment of principals which apply to all armor-piercing ammunition. Small arms ammunition does not contain an explosive charge, but in the case of the cal.30 and cal.50 ammunition, the bullet has a hardened chrome tungsten steel core with the nose surrounded by a lead antimony filler, and enclosed in a gilding metal jacket. The lead filler acts as a lubricant for the hardened core, and also increases the biting angle. The present 37-mm projectile is an example of the principals used in our larger armor-piercing projectiles. The shell is capped, and the projectile has a false ogive or windshield which is destroyed upon impact. The projectile does not contain a bursting charge.

★★★★★★★★★★★★

"LETTERS FROM THE FIELD"

(Continued from page 326)

should be given because, in my experience with these reports, I have found that these columns give the most trouble. Incidentally (while I remember it), the article still refers to "Ammunition Supply Credits" whereas they are called "Ammunition Supply & Expenditure Authorizations."

I believe further that the report should include ammunition components as well as complete rounds. This is especially true with demolition bombs, practice bombs and links. Frequently a component of a bomb, such as a fuze or a fin, is damaged and, therefore, discarded. This leaves an incomplete bomb which would not ordinarily be listed in the report, giving an erroneous picture of the supply of available ammunition. It is essential to know how many rounds of ammunition, less links, are available, what type of ammunition and also how many links, so that provisions for the issue of components to provide complete rounds can be intelligently computed.

One more critical offering - In rendering a report for General Supplies, I believe that Column 15 should be modified to show "Demand" or "Request". In fact, it would be my suggestion to have two (2) forms - one for "Ammunition" and one for "General Supplies". In the latter instances, I would include columns 3, 4, 5 and 6. In the case of "General Supplies" the requirements are quite definite and permit very little diverse interpretations, thus giving merit to Column 3 and, consequently, to Columns 4, 5 and 6.

Finally, instructions in this article do not provide for the submission of a special Status of Stocks Reports. I think the rendition of a special Status of Stocks Report in cases of emergency or to cover unusual and unexpected conditions is essential.

Looking forward to all your future publications,
I am

A loyal reader,

John A. Dolan,
M/Sgt., Ord. Dept.,
First Air Force.

NOTE: It appears that THE ORDNANCE SERGEANT has been able to arouse considerable interest in the Status of Stocks Report. Various articles, letters, and comments have already appeared in several issues, and readers may expect that in a future issue a resume of opinion will be presented in a more consolidated form.

BROADWAY

(Continued from page 323)

guns and immediately next to it was a model of the Obstacle Course at the Training Center.

Behind the model, to the delight of every child in New York City, was duplicated in actual size the Rope Climb, the Over and Under, and the Pipe Crawl with a large sign inviting the public to try their strength. And try it they did with no serious casualties.

Regular lectures were given on both the tank and the obstacle course with the public constantly demanding more information.

Nearby was the Gas Chamber, a model training gas chamber through which the public was conducted on



A "long, hard pull" on the rope climb gives visitors an idea of the exercise he would get on the O.R.T.C. obstacle course.

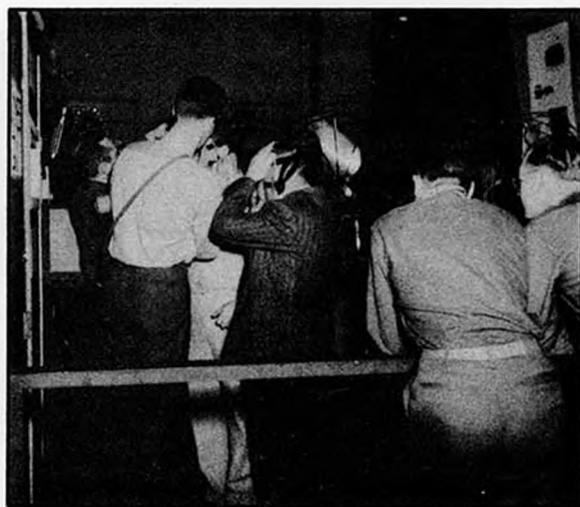


The gas chamber demonstration drew huge crowds.

periodic tours after instruction in the proper use of the gas mask. Inasmuch as the Defense Exposition itself was sponsored by Mayor LaGuardia's Civilian Defense Committee, the Mayor himself paid a call, praised the work of the Ordnance Department in this aid to civilian defense instruction, and promptly entered the chamber wearing one of the Army's training masks.

Then, to the small armstable crowded men, women, and children, when they heard that the famous Garand rifle was not only on display there, but was also being assembled and disassembled by an Ordnance soldier. Great was their amazement to see the soldier wearing a blindfold and doing the entire job in record time. Those who witnessed this demonstration absolutely refused to believe that these men were not veterans with the weapon. It was only with great difficulty that they could be convinced that these soldiers only a few months ago were civilians like themselves, with no knowledge of the rifle.

All who attended the Garand demonstration were given an official pass and score card to the Army Rifle Range which the Training Center had erected on the third



Gas masks are fitted to civilians before they enter the gas chamber.



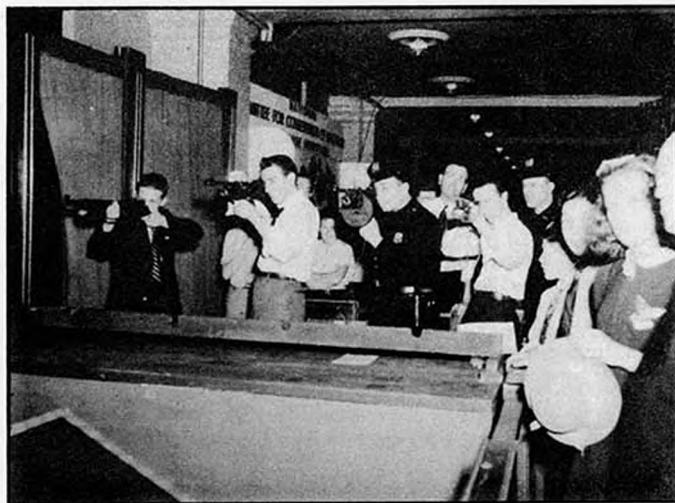
View of the gas chamber and the huge sign "Arms for America" which graced the O.R.T.C. exhibit.

floor. Here the public could shoot the Garand Rifle and Thompson Sub-Machine Gun on a photo-electric range at 35 feet and here, also, they responded like children with a new toy.

Artillery was represented on the first floor behind the Gas Chamber where a crew of trainees put on a demonstration of the assembly and disassembly of the 75 mm field howitzer - again in record time.

From this demonstration the crowd wandered farther down the floor where Ordnance soldiers were at work in a machine shop truck. Here again, not only men but also the women insisted on having detailed information and instruction in what part such equipment played in the work of the Ordnance Department. And they were told in every instance by men who, four months ago, probably did not themselves know the meaning of the word "Ordnance".

Press releases on the Ordnance Exhibit varied from practically daily releases in all New York papers to full-page feature spreads in the New York Daily Mirror. Pathe, Universal, and Fox-Movietone filmed the famed



Rifle Range: Even the city policemen enjoy practicing on the M1 rifle, and Thompson sub-machine gun on this photo-electric range.

New York Roxyettes, girls known throughout the entertainment world for their athletic ability, going over the Aberdeen Obstacles with Ordnance soldiers. The March of Time will soon release shots of the exhibit in its film "Defense in America". And here again trainees from the Replacement Training Center will appear on screens throughout the nation.

Broadcasts were made by the Ordnance Exhibit personnel on four New York stations and, climaxing the radio publicity, was a coast-to-coast broadcast on the Mutual network, Oct. 14, from the studios of station WOR in New York and entitled "Behind the Guns."

Appearing on this program with Brig. General Julian S. Hatcher, commanding General of the Ordnance Training Center, and Col. Bethel W. Simpson, commanding the Replacement Training Center, were Luise Rainer, motion picture star of "The Great Ziegfeld" and "The Good Earth"; Dinah Shore, from the Eddie Cantor show; Miss Lucille Manners, nationally known radio soprano, and Count Basie and his famous colored orchestra.



M-1 rifle demonstration.



M1 rifle assembly.

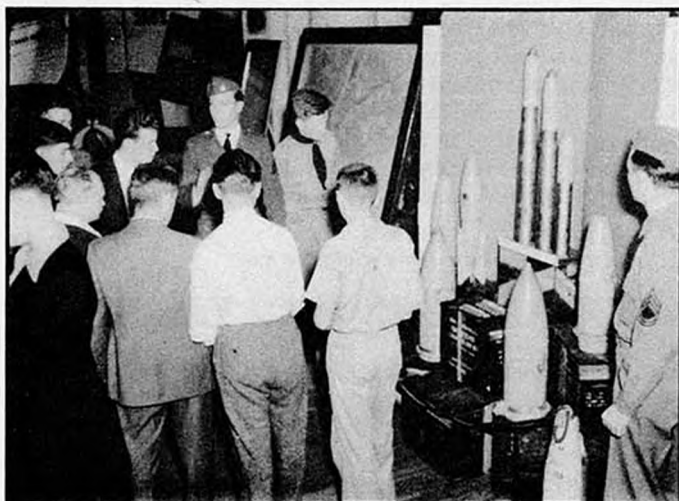


O.R.T.C. buglers blow "Assembly" at the Lexington Avenue entrance.

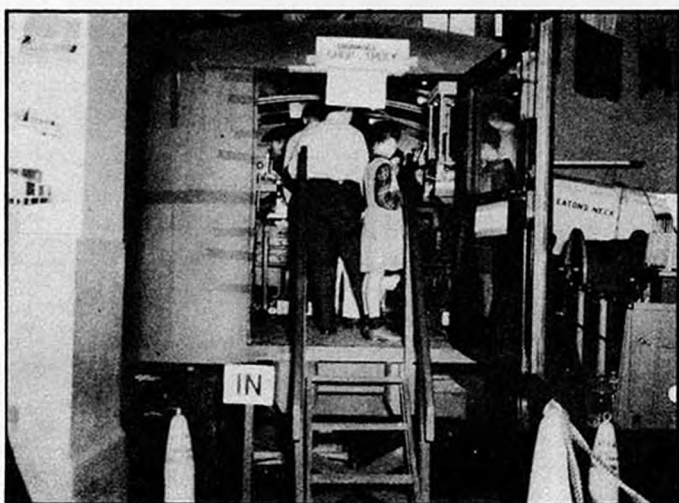
Trainees featured on the show were Cpl. Bennet, Pvts. Roberts, Lewis, Linton, and Robert Rainer, brother of Luise Rainer who is in training at Aberdeen. The entire show was written and produced by soldiers from the Replacement Center including Pvts. Garrahan and Ballard.

Among the famous who visited the Ordnance Exhibit and signed the Guest Log Book provided at the entrance were such names as Governor Herbert Lehman, Mayor Fiorella LaGuardia, Luise Rainer, Dinah Shore, Count Basie, Lucille Manners, Jessie Matthews, Kitty Carlisle, Ethel Barrymore Colt, Patricia Ellis, and a host of naval and military dignitaries.

To evaluate the results of the exhibit as far as the Ordnance Department is concerned, it is needless to say that this rare opportunity for the Replacement Center lecturers to meet the American public in a great metropolitan center gave them an experience which will prove invaluable in their lecture work at the Replacement Center. But, perhaps, the most outstanding result was the public demonstration of what a highly organized and most carefully planned training program can do with the average



"Ordnance handles ammunition, too," the lecturer explains.



Spectators file through the machine shop truck.



Demonstration of 75mm field howitzer disassembly.



Demonstration of 75mm field howitzer disassembly.

American youth in an emergency. And it can be said without the least exaggeration, that after the New York show, there is no longer any doubt in the minds of civilians who visited the show that the Ordnance Department is able, willing, and ready to do its job with the civilian soldier, whether in peace or in war. As far as New York City is concerned, the Ordnance department stands at the alert - trained, qualified, and with a morale second to none.

ORDNANCE U. T. C. DISBANDS

The Ordnance Unit Training Center was activated on January 1, 1941, with a strength of four officers and one enlisted man under the command of Lt. Col. H. U. Wagner. On February 1, 1941, the Unit Training Center staff and Headquarters personnel were increased to thirteen officers and twenty-five enlisted men and on February 10, 1941, the first thirteen companies (10 medium maintenance, 2 heavy maintenance, and 1 railway artillery maintenance) were activated with skeleton cadres. The period from February 10, 1941, to May 8, 1941, was spent in preparing training schedules, making assignments of officers and additional cadre, moving to permanent quarters, and collecting necessary supplies, instructional material and tools. Finally, on May 8, 1941, everything was in readiness and the companies were brought to full strength of officers and enlisted men.

Col. W. I. Wilson succeeded Col. Wagner to command on June 1, 1941, when Col. Wagner was called to the Office of the Chief of Ordnance.

After only six weeks of training the first thirteen companies departed for their home stations on June 26, 1941. These units and their stations are as follows:

- 5th Ord. Co. (MM) - Camp Edwards, Mass.
- 7th Ord. Co. (MM) - Camp Haan, Calif.
- 8th Ord. Co. (MM) - Ft. Bragg, N. C.
- 13th Ord. Co. (MM) - Camp Hulen, Texas
- 14th Ord. Co. (MM) - Camp Livingston, La.
- 16th Ord. Co. (MM) - Camp Stewart, Ga.
- 18th Ord. Co. (MM) - Camp Haan, Calif.
- 21st Ord. Co. (MM) - Camp Stewart, Ga.
- 25th Ord. Co. (MM) - Camp Hulen, Texas
- 26th Ord. Co. (MM) - Ft. Bliss, Texas
- 81st Ord. Co. (HM) - Ft. Bliss, Texas
- 82nd Ord. Co. (HM) - Ft. Ord, Calif.
- 95th Ord. Co. (RyM) - HD of Sandy Hook, N. J.

In the meantime the cadres of the next thirteen companies were assembled and the companies were officially activated on June 16, 1941. Immediately after the first companies left, the new group of thirteen was brought to full strength and technical and military training began. At the same time four Maintenance Battalion Headquarters Detachments were activated and the Unit Training Center was set up as a regiment with three companies in each battalion. These battalion headquarters detachments departed for their home stations on July 30, 1941, after four weeks of training, as follows:

- 1st Bn. Hqs. and Hqs. Det. - Ft. Bragg, N.C.
- 4th Bn. Hqs. and Hqs. Det. - Camp Blanding, Fla.
- 6th Bn. Hqs. and Hqs. Det. - Providence, R. I.
- 8th Bn. Hqs. and Hqs. Det. - Brownwood, Texas

On September 26, 1941, Col. Wilson was ordered to

Alaska, and Capt. A. R. DelCampo, who had been serving as Executive Officer since the original activation of the Unit Training Center, assumed command.

After fourteen weeks of intensive training the second group of companies departed for home stations with a full complement of equipment and personnel on October 7th and 8th. The designation and destination of the companies of this group are as follows:

- 32nd Ord. Co. (MM) - Ft. Bragg, N. C.
- 35th Ord. Co. (MM) - Ft. Jackson, S. C.
- 36th Ord. Co. (MM) - Camp Forrest, Tenn.
- 37th Ord. Co. (MM) - Ft. Benning, Ga.
- 38th Ord. Co. (MM) - These three companies are still at Aberdeen Proving Ground, Md. awaiting quarters at Camp Davis, N. C.
- 46th Ord. Co. (MM) - Ft. Custer, Mich.
- 47th Ord. Co. (MM) - Ft. Ethan Allen, Vt.
- 48th Ord. Co. (MM) - Ft. Frances E. Warren, Wyo.
- 83rd Ord. Co. (HM) - Ft. Lewis, Wash.
- 85th Ord. Co. (HM) - Camp Bowie, Texas
- 96th Ord. Co. (RyM) - Ft. Monroe, Va.

The last of the necessary number of Ordnance Maintenance Companies required under the present expansion program were on their way and the purpose of the Unit Training Center had been fulfilled. Some 180 officers (all reserve) and 3500 enlisted men (85% - 90% selectees) were trained and sent to the field to carry their load of the maintenance of equipment in the hands of the field forces. And so, after a very short but very busy life, the Ordnance Unit Training Center was officially disbanded on October 8, 1941.

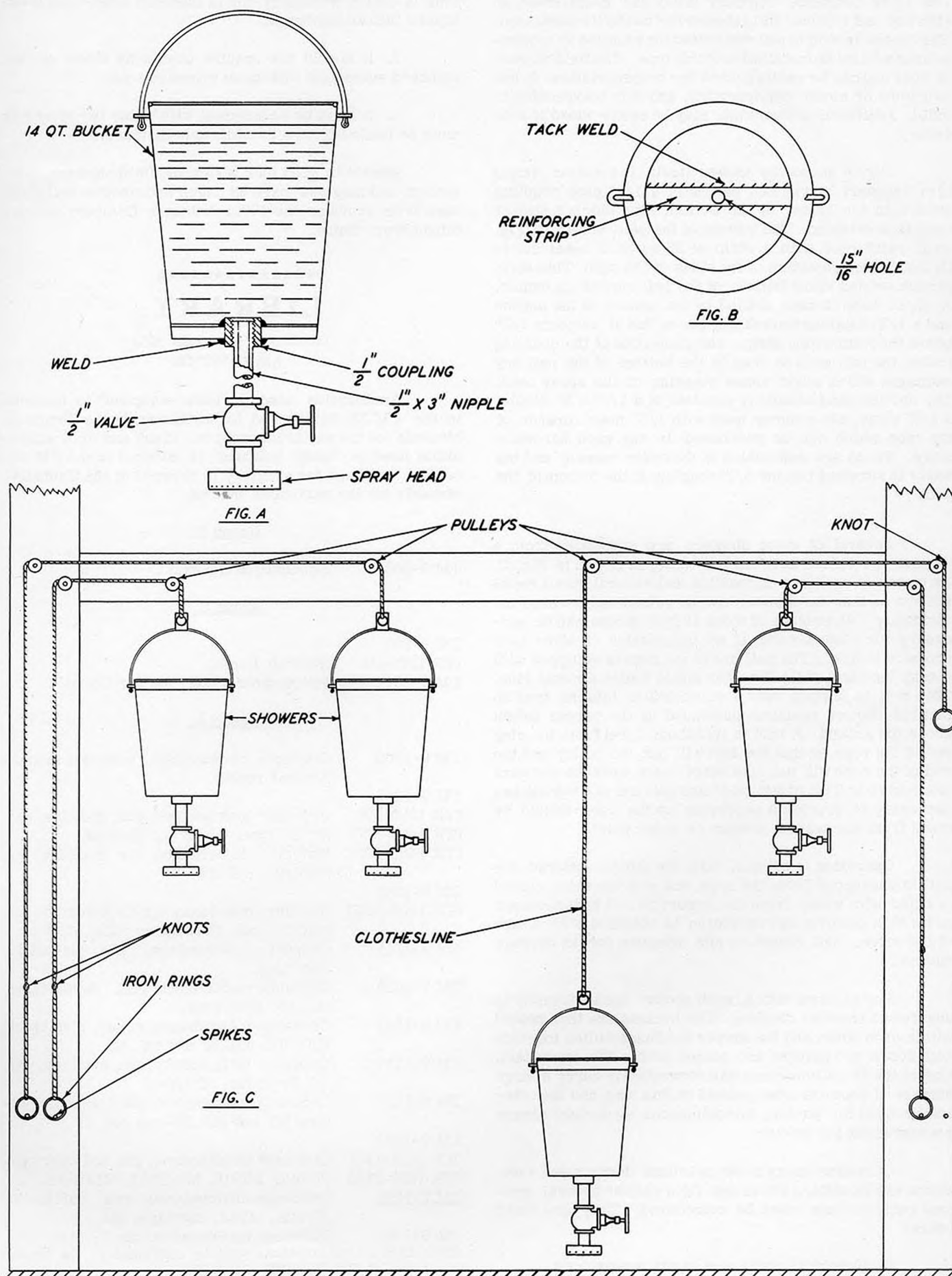
A PRACTICAL FIELD SHOWER

By: Charles R. Holman,
1st Lt., 107 Ord. Co.

Maneuvers present a number of problems which are not encountered when the units are settled in their training camps. The problems are varied, and their prompt solution depends largely on the ingenuity and previous maneuver experience of the personnel. It has been said that cleanliness is next to godliness, and nowhere is this more true than in the outdoor bivouacs of field maneuvers. It is inevitable that the men become dirty during the performance of their daily duties, and if adequate facilities for cleanliness are not available, the possibility of an epidemic of disease is self evident.

Many ordnance men by now have had the experience of riding in convoy down an unimproved country road beneath the hot southern sun. Each one perspires freely, and clouds of fine dust rise from beneath the wheels to settle in layers and stick on wet hands, faces, and clothes. After long hours, the column finally arrives at the bivouac area where shelter tents must be set up and the camp readied for the night. When at last the duties are over, the question in each mind is, "How can I best clean up and refresh myself?" What would be better than a relaxing shower bath?

Some units may be fortunate enough to be camped near streams or other bodies of water, but in most cases



the unit itself must take care of its own washing facilities. The 107th Ordnance Company (MM) has constructed an efficient and compact field shower for use by its personnel. The design is simple and well suited for adoption by organizations without an installation of this type. The field shower is light and can be easily packed for transportation. It has no pumps or power requirements, and it is inexpensive to build. Additional shower units may be easily added if necessary.

Fig. A shows the shower itself. It consists simply of a 14 quart galvanized pail with a 1/2" pipe coupling welded in the center of the bottom into which a shower head is assembled. The bottom of the pail, shown in Fig. B, is reinforced with a strip of 2" by 3/16" steel cut to fit inside the projection of the sides of the pail. This strip is tack welded to the bottom of the pail across its center. A 15/16 hole is then drilled in the center of the bottom and a 1/2" coupling welded therein so that it projects 1/2" below the reinforcing strip. The projection of the coupling inside the pail acts to trap in the bottom of the pail any sediment which might cause plugging of the spray head. The shower head assembly consists of a 1/2" x 3" nipple, a 1/2" valve, and a spray head with 1/2" male threads of the type which can be purchased in any good hardware store. These are assembled in the order named, and the whole is screwed into the 1/2" coupling in the bottom of the pail.

Several of these showers are suspended from a wooden crosspiece between two trees, as shown in Fig. C, by means of ordinary clothesline and several small metal pulleys so that the showers can be raised and lowered individually. An average of about 12 feet of rope will be necessary for each shower if an installation of about four showers is used. The pail end of the rope is equipped with a snap fastener, while the other end is tied to a metal ring. This ring is slipped over a spike driven into the tree so that the shower remains suspended at the proper height above the ground. A knot is tied about 3 feet from the ring end of the rope so that the knot will jam the pulley and the end of the rope will not rise out of reach when the showers are lowered. Two 55 gallon drums with one end cut out are necessary to provide a reservoir for the water hauled by truck from the nearest stream or water point.

Operation is simple. With the shower lowered, the pail is unsnapped from the rope, and with the valve closed is filled with water from the reservoir. It is then raised to its high position and operation is obtained with a turn of the valve. One bucket is just adequate for an average shower.

For transportation, each shower head assembly is unscrewed from its coupling. The buckets are then nested within each other, and the shower head assemblies together with ropes and pulleys are placed within the top bucket. One of the 55 gallon drums will conveniently carry a large number of showers when packed in this way, and the other can be used for packing miscellaneous equipment always present about the bivouac.

Of course many other practical designs and variations are possible, but in any field shower several general requirements must be considered. They are listed below:

1. It must be cheap and easily constructed.

2. It must be light and compact for transportation. This is doubly necessary, for in the army every pound and square inch is important.

3. It should not require pumps as these are not standard equipment with most organizations.

4. It must be economical with water for often this must be hauled from a considerable distance.

Here's to good luck with your field showers, sergeants, and may you have as much satisfaction and pleasure from yours as the 107th Ordnance Company has obtained from theirs.

LIBRARY

(Continued from page 325)

AMMUNITION

Ammunition used in "basic weapons" is included in the FM 23- series and for artillery, in the Technical Manuals for the particular weapon. Blank and drill ammunition used in "basic weapons" is covered in the FM 23-series; that used for artillery is covered in the Technical Manuals for the particular weapon.

Group P

TM 9-900 Ammunition General

Group S

TM 9-980
(TR 1370-G) Aircraft Bombs
TM 9-981 Pyrotechnics, etc., for Air Corps

Group A

TM 9-1100 Ordnance maintenance, materiel inspection and repair.

TM 9-1205
(TR 1320-39) Ordnance maintenance, gun, machine, cal. .30 all types, fixed and flexible.
(TR 1400-30C) (includes information for machine gun trainers, cal..22)

TM 9-1210
(TR 1400-30E) Ordnance maintenance, rifle, automatic and machine cal..30 machine rifle, M1922.

TM 9-1211 Ordnance maintenance, rifle, automatic, Browning.

TM 9-1215 Ordnance maintenance gun, submachine, cal..45, Thompson.

TM 9-1224 Ordnance maintenance, mount, gun, truck, M.G. T8, cal..30 and cal..50

TM 9-1225 Ordnance maintenance, gun, machine, cal. .50 Browning, all types.

TM 9-1227 Ordnance maintenance, gun automatic, 20-mm, M1 and M2, 20-mm AA, T1.

TM 9-1230
(TR 1410-120) Ordnance maintenance, gun and carriage, 37-mm, M1916, M1916A1, M1916A2.

TM 9-1235 Ordnance maintenance, gun, automatic, 37-mm, M1A2, carriage, M3.

TM 9-1240 Ordnance maintenance, gun 37-mm, M4
(This list of publications will be continued in the December issue of THE ORDNANCE SERGEANT.)