# THE ORDNANCE SERGEANT

VOL. 3 JANUARY 1942 NO. 1

Published by the Ordnance School in the interest of Ordnance Sergeants

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HIGHLIGHTS

In this First Anniversary Issue of THE ORDNANCE SERGEANT, The Ordnance School, past and present, takes the spotlight. Captain Spinrad tells us of the earlier educational methods of the Ordnance Department in an article beginning on page 1. Mrs. Nelson recalls a few memories of the last ancestor of The Ordnance School, the former Ordnance Field Service School, at Raritan Arsenal, on page 9. This article is amply illustrated with photos from the old school at Raritan. The story of the New Ordnance School begins on page 12 and before the discussion is ended each section of the School has told its own story.

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If you have ever wondered about the beginning of THE ORDNANCE SERGEANT, read, "The Birth of THE ORDNANCE SERGEANT" on page 5. But if you want to play fair, continue by reading the next article (page 7). It is a challenge to every reader and every organization in the Ordnance Department.

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Among the regular department pages you will find several articles of interest. The automotive equipment of the Ordnance Battalion (Maintenance), is described on page 81. "Reports of Change", sometimes troublesome little pieces of paper, are explained in detail on page 84. Captain Ame Vennema gives us the story of the development of pyrotechnics in an interesting article which begins on page 95.

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Your attention is invited to two new departments which appear in this issue. Both the Carpenter Shop and the Welding Shop will be represented in future issues. These, together with the old established Machine Shop page, will usually replace the former Ordnance Shop page.

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


REPRODUCTION PLANT
THE ORDNANCE SCHOOL
ABERDEEN PROVING GROUND
MARYLAND


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IN APPRECIATION

As this special issue of THE ORDNANCE SERGEANT goes to press, the Editor is thankful to many individuals for their cooperation in its preparation. Every Section of the School has expended a great deal of effort to help make this issue a true picture of The Ordnance School as it exists today. Captain Spinrad, of the Office of the Chief of Ordnance, has been most helpful, as have both the Commandant and the Assistant Commandant of The Ordnance School.

The thoughtfulness of those who have written letters of birthday greetings is appreciated.

The Editor is especially appreciative for the cover design for this special issue. It is the work, and the contribution, of Rockwell Kent, widely known and appreciated artist who is contributing widely to the publicity material required by our National Defense efforts.

There exists in The Ordnance School one section without which THE ORDNANCE SERGEANT could never appear in its present form. The Photographic Section has always, and especially in this issue, given its best to provide illustrations whenever and wherever needed. To this group of technical personnel THE ORDNANCE SERGEANT is thankful for its assistance during its first year, and in the preparation of this special issue. (See article and photos below.)

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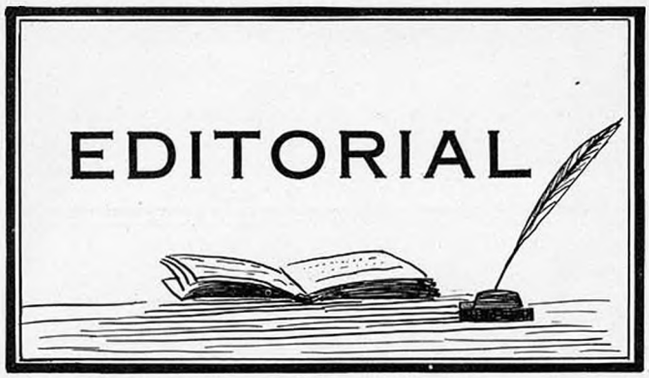
# PHOTOGRAPHIC SECTION, THE ORDNANCE SCHOOL

By: E. R. Manfrin, Tech. Sgt., Ord. Dept.

It is a long exposure from the Photographic Section, formally stationed at Raritan Arsenal with the Ordnance School to the focusing of the present Photographic Section now at Camp Rodman (Ordnance Training Center).

Formerly consisting of one camera, one tripod, two floodlights and the necessary dark corner and utensils for turning out the finished product — the print — the section is now completely equipped for all types of photographic work. Lieutenant R. L. Johnson, at present in the Fire Control Section of the Ordnance School, was the School's photographer at Raritan Arsenal, assisted by Technical Sergeant E. R. Manfrin, Lt. Johnson's new duties

(Continued on page 112)




# You And Your Resolutions--

The first plan for this Editorial, the first of a New Year, would have made it something of a resolution for the new year. But THE ORDNANCE SERGEANT has decided that it doesn't particularly like New Years' Resolutions. Possibly this resolution not to make resolutions results from the fact that such resolutions are so often mistreated. They are inspiring things while they last, but within a short time so very many of them dwindle away just as the winter snows disappear with the approach of warm weather.

Something you resolve to do doesn't mean a thing. Something you do really counts. These two statements can be viewed from a number of different angles. In the first place, do you really have the time to think of things you should or should not do during the coming year? If you use this time to think of resolutions, couldn't you have used it to better advantage in some other way? Someone who reads these lines will immediately maintain that the idea of resolutions is basically good, but what of it? Beauty is only skin deep. And ideas which are basically good, but which are not followed by real and definite accomplishment, have served no useful purpose.

On the other hand, think back over the past year. What have you done which was really worth while? Did you stop to resolve to do that thing before you started doing it? In all probability you didn't. You started with a feeble idea and eventually worked it into something really worth while. Had you stopped to plan it in the beginning you would have lacked the experience which you were to gain later. You probably couldn't have planned it adequately. The idea wasn't spontaneous, at least not in its entirety. It was something which started in a small way, and then grew and grew until it amounted to something.

Resolutions are almost always "spur of the moment" thoughts. They flare up quickly, they die out quickly. Instead of thinking of showy words (or thoughts) to express your intentions for the New Year, take a look at your activities of the past year. Don't boast about what you are determined to do in the future; criticize what you have done in the past. You know more about your motives in the past than any other person. You know what caused your failures, you know where you made mistakes, you realize where and in what way you could have done a little better or a little more.

Instead of resolving to do or not to do a lot of things during the coming year, limit yourself to only one resolution. Word it something like this:

"RESOLVED: That during the coming year I will try to profit by every mistake, large or small, which I made during the past year."

If you keep this one resolution you will have accomplished every single thing you could possibly have included in a long list of resolutions, some of which you could not have kept if you had tried, some which you would have forgotten purposely, and others which would just have slipped your mind in spite of you.

May the

NEW YEAR

bring

INITIATIVE, ABILITY AND SUCCESS

to

Each And Every One Of You!

Six months ago I had the pleasure of addressing the first units graduating from The Ordnance Training Center on the eve of their departure for assignments in the field. At that time I pointed out the great responsibility which was theirs, and my faith in their ability to maintain the high standards of the Ordnance Department. Reports reaching my office assure me that my confidence at that time in the Ordnance men was not misplaced.

Ordnance units and individuals have performed the tasks assigned them, and well. This is not only true of men in the field but also of the personnel at The Ordnance Training Center. Typical of the splendid work performed by The Training Center is the publishing of THE ORDNANCE SERGEANT. This publication is serving a most useful purpose in keeping the Ordnance Noncommissioned Officer abreast of the latest developments in Ordnance maintenance.

The present issue of THE ORDNANCE SERGEANT is a striking improvement over the first one published in January 1941. A year ago it was a 28-page mimeographed pamphlet; today it is a magazine of more than 72 pages. The entire layout is so attractive as to engage the reader's immediate attention, and to hold his attention as he peruses the material which has been carefully selected to accomplish the purpose desired.

On this, the First Anniversary of THE ORDNANCE SERGEANT, I take great pleasure in commending the staff for its efforts in making this publication such an outstanding success.

C. M. WESSON

Major General, Chief of Ordnance

**MAJOR GENERAL C. M. WESSON**
**The Chief of Ordnance**

# Greetings from General Case

With the New Year upon us, we re-dedicate ourselves to a strong American Army – a vital link in the defense of our great Country.

Through the columns of THE ORDNANCE SERGEANT I take this means of greeting the personnel of the Aberdeen Proving Ground. The year 1942 arrives at a time when the world is burdened with war and hate. Here in this Land of the Free and Home of the Brave, we stand ready to defend the principles for which our glorious forefathers gave their lives.

We at Aberdeen are playing a vital role in National Defense. Not only are we testing guns and bombs and tanks – we are training the men behind the men behind the guns.

An Army must have a trained personnel to be victorious. Poorly trained leaders and poorly trained soldiers mean disaster. That is why you in Ordnance, who play an important part in the Army, receive such excellent schooling at the Aberdeen Proving Ground. Whether you are in basic training or in the Small Arms School, or in other units of Ordnance PUT YOUR SHOULDER TO THE WHEEL! FOLLOW THROUGH! DO ALL THAT IS REQUIRED to give the American Army the finest soldiers in the world.

Incidentally, your training at Aberdeen will be valuable in later years, whether you remain in the Army or return to civilian life after the emergency.

In Ordnance COOPERATION should be our motto.

Let's all pull together for a strong Army and UNITED AMERICA!

In the words of Alexander Dumas' great characters, the Three Musketeers – "All for one – and one for all!"

R.W.C.

Rolland W. Case,
Brigadier General,
Commanding
Aberdeen Proving Ground

# EARLY HISTORY of THE ORDNANCE SCHOOL

By: William M. Spinrad,
Captain, Ordnance Department,
Office of The Chief of Ordnance,
Washington, D. C.

An early history of the Ordnance School is actually a study in development of two distinct training schools: (1) a school for officers, (2) a school for enlisted men. Following is a brief chronological summary of both schools from their first organization to their merger into The Ordnance School in 1940.

On December 16, 1901, Brig. Gen. William Crozier, Chief of Ordnance, issued instructions for Capt. B. W. Dunn to visit several technical schools to observe courses and methods of instruction with the object of using the information for establishing a course of instruction at Sandy Hook Proving Ground, N. J., in the design and construction of Ordnance.

On February 28, 1902, Captain Dunn's report was received in the Office of the Chief of Ordnance. The recommendations and suggestions contained therein were used as a basis for establishing The Ordnance School of Application at Sandy Hook.

A series of problems which had been solved in connection with the designing of guns, carriages and projectiles were prepared and young officers of the Ordnance Department on duty at the Sandy Hook Proving Ground as Assistant Proof Officers were encouraged to master the basic principles in the time not required for their other duties.

Later, courses in Electricity, Chemistry of Explosives, Differential Equations, Work on Machines and Power Appliances, were added. As many of the officers entering the Department as could be spared were assigned, with no other duty, as student officers for a period of one year in which to devote themselves to the courses.

In 1905 the Commanding Officers of the principal manufacturing arsenals prepared programs of practical work in shops, and young officers upon their entry into the Ordnance Department were encouraged to complete as much of the programs as their duties would permit. The shortage of officers prevented this method of instruction proving satisfactory and as the variety of work carried on at Watertown Arsenal offered the broadest field of instruction, all practical shop and laboratory work was concentrated at that place in 1906, thus creating the Ordnance School of Technology. The objects of this school were to give courses of "instruction in the subjects of metallurgy and metallography; metallurgical chemistry; testing materials; shop work, machine, smith and foundry; arsenal administration; general administration of the Ordnance Department except that of the field service thereof; steam power and compressed air, etc., to officers of the Ordnance Department and such other officers as may be ordered to the school for instruction; and to supervise such Ordnance work in the above subjects as may be taken by officers of the Ordnance Department at civilian educational institutions and commercial establishments."

Officers were assigned to the school for a period of one year.

The Ordnance School of Application at Sandy Hook Proving Ground and the Ordnance School of Technology at Watertown Arsenal continued in operation until the summer of 1917.

The National Defense Act of 1916 provided for the detail of 30 Lieutenants of the Line for duty with the Ordnance Department as student officers who were to pursue courses at Ordnance Schools for two years. The successful completion of the course was to be taken in lieu of an examination for detail in the Ordnance Department.

Shortly after the passage of this act the War intervened and the schools were allowed to lapse until the fall of 1919. In September, 1919, courses were started at the schools and two classes of officers were graduated in June, 1920, one class from the School of Technology, and one from the School of Application. The latter school had been reestablished at Aberdeen Proving Ground.

At this time the objects of the School of Application were to give courses of "instruction in mechanical and chemical engineering to officers of the Ordnance Department and such other officers as may be ordered to the school for instruction; to supervise such Ordnance work in the above subjects as may be taken by officers of the Ordnance Department at civilian educational institutions and commercial establishments; to give instruction in the operations of the field service of the Ordnance Department; and such military training to officers as may be found necessary."

To obtain the advantages resulting from the association of officers with other students in civilian technical institutions and the economy resulting from utilizing existing facilities, the Ordnance School of Application was transferred to Watertown Arsenal in the summer of 1921, consolidated with the Ordnance School of Technology, new courses of instruction were added, and the Ordnance School was formed. At the same time arrangements were made with the Massachusetts Institute of Technology to give the courses of instruction formerly included in the School of Application.

The courses given at the Ordnance School were designated as

Course I (at M.I.T.)

Course II (at the arsenal except for one subject which was taught at M.I.T.)

First draft of the regulations to cover the Ordnance School at Watertown Arsenal, Mass., was submitted by Major General C. C. Williams, Chief of Ordnance, to The Adjutant General on September 20, 1921.

At that time the object of the Ordnance School was "To give such courses of instruction to officers of the Ordnance Department as are necessary to prepare them for the efficient performance of their duties and to supervise post graduate work given by civilian educational institutions, Watertown Arsenal and by commercial manufacturing plants to officers of the Ordnance Department."

The Ordnance School is open to such officers of other branches of the Army as are ordered by the War Department to duty as student officers therein. The course of instruction at that time included one year of theoretical instruction, one year of practical instruction and one year of post graduate and research work. There were three National Guard and Reserve Officers' courses of 30 days duration taken in subsequent periods.

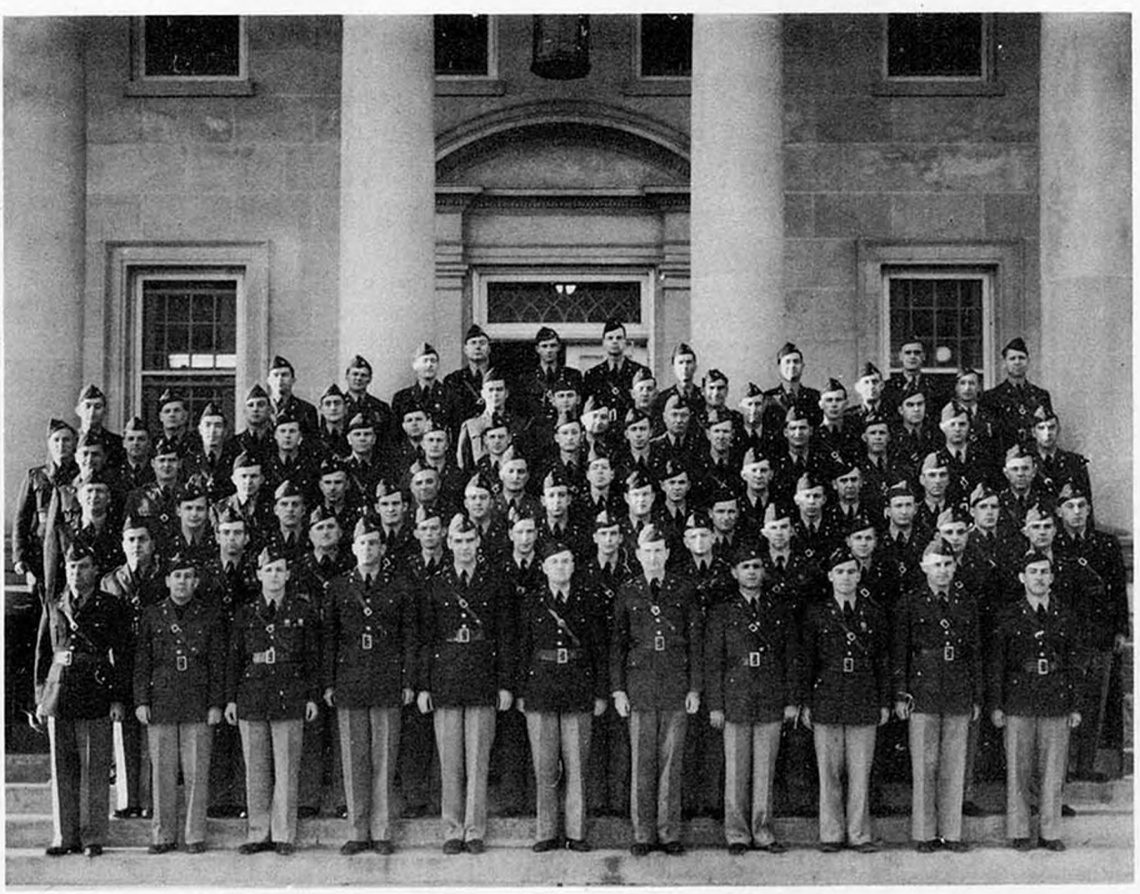
In 1932 it was decided to return to the original idea of conducting part of the training at the Proving Ground and to have less of it given at the Massachusetts Institute of Technology. Headquarters of the Ordnance School was moved to Aberdeen Proving Ground. Course I, given at M.I.T., remained under the supervision of the Commanding Officer of Watertown. Course II was to be given at the Proving Ground.

In 1940, due to the emergency, the regular 2 year course of instruction at the Ordnance School was suspended and was replaced by a 3 months course of study given wholly at Aberdeen.

This concludes a resume of that part of the Ordnance School devoted to the training of officers, and we will now cover the early history and development of that section of the School devoted to the training of enlisted men.

Prior to our entrance into the World War, very little consideration had been given to the training of Ordnance enlisted men for maintenance duties. All maintenance operations in the field were performed by personnel of the using services. Complicated repairs and modifications were handled by the Arsenals. Soon after our entrance into the War, it was evident that the field artillery would be motorized and that the Ordnance Department would necessarily furnish the motor equipment. This huge increase in motorization, plus the development of many new weapons, required the services of personnel especially trained for Ordnance maintenance duties. In September, 1917, the Secretary of War approved a request to establish three training schools at different manufacturing plants in the Middle West for the purpose of giving proper instructions to Ordnance personnel pertaining to Ordnance repair shops and field artillery organizations.

Courses of instruction at the different plants and at Rock Island Arsenal were so coordinated that the majority



COMMISSIONED STAFF AND FACULTY, THE ORDNANCE SCHOOL
(December 6, 1941)

CHRONOLOGICAL SUMMARY OF ORDNANCE INSTRUCTION

Dec. 16, 1901 -- Study of Ordnance instruction begun.

Feb. 28, 1902 -- Captain Dunn submits report and recommendations. Ordnance School of Application established soon thereafter at Sandy Hook Proving Ground, N. J.

1905 -- Programs of practical shop work established at principal manufacturing arsenals.

1906 -- Ordnance School of Technology established at Watertown Arsenal, Mass.

1916 -- Machine Gun School opened at Springfield Armory, Mass.

Summer, 1917 -- Ordnance School of Application at Sandy Hook Proving Ground, N. J., and Ordnance School of Technology at Watertown Arsenal, Mass., discontinued.

Sept. 1917 -- Ordnance Instruction Schools in manufacturing plants approved by Secretary of War.

-- Rock Island Arsenal School for officers and enlisted men opened.

Oct. 1917 -- Kenosha, Wisc. Branch opened at Nash Motors Company, for officers.

Oct. 23, 1917 -- Peoria, Ill. Branch of Ordnance Instruction Schools designated as Headquarters for Ordnance Motor Instruction Schools, for officers and enlisted men, and classes open at the Holt Manufacturing Company.

Oct. 30, 1917 -- F. W. D. Branch of Ordnance Instruction Schools opened at The Four Wheel Drive Company, Clintonville, Wisc., with instruction for officers.

Dec. 1917 -- Enlisted students enter F. W. D. Branch at Clintonville, Wisc.

Dec. 12, 1917 -- Enlisted students enter Kenosha, Wisconsin Branch.

1918 -- Ordnance Instrument Repair School opened at Frankford Arsenal, Pa.

Apr. 23, 1918 -- Machine Gun School moved from Springfield Armory, Mass.,to Camp Hancock, Ga.

June, 1918 -- Specialists School for motor instruction opened at Camp Jackson, S. C.

July, 1918 -- Motor, Artillery and Machine Gun Schools consolidated at Raritan Arsenal, N. J., and called "Ordnance Maintenance and Repair School."

Sept., 1918 -- Electric Welding School at Lincoln Electric Company, Cleveland, Ohio, opened.

Nov. 11, 1918 -- ARMISTICE DAY -- Personnel at Ordnance Schools numbered 458 officers and 5867 enlisted men. Schools discontinued shortly after World War I.

Nov. 23, 1918 -- Electric Welding School closed.

Nov. 27, 1918 -- Ordnance Instrument Repair School closed.

1919 -- Plans considered for consolidation of all Ordnance training activities at Aberdeen Proving Ground, Md.

-- Ordnance Operations, Maintenance and Repair School established at Raritan Arsenal, N. J.

Sept., 1919 -- Ordnance School of Technology reestablished at Watertown Arsenal, Mass.

-- Ordnance School of Application reestablished at Aberdeen Proving Ground, Md.

1921 -- Ordnance School of Application transferred to Watertown Arsenal, Mass., and consolidated with Ordnance School of Technology there. Consolidation known as the Ordnance School. Arrangements made with Massachusetts Institute of Technology, Cambridge, Mass., to give certain former School of Application Courses.

Sept. 1, 1921 -- Ordnance Operations, Maintenance and Repair School changed to Ordnance Specialists' School.

1931 -- Ordnance Specialists' School changed to Ordnance Field Service School.

1932 -- Headquarters of Ordnance School moved to Aberdeen Proving Ground, Md.,from Watertown Arsenal, Mass., certain courses, however, remaining at Massachusetts Institute of Technology, under the supervision of the Commanding Officer of Watertown Arsenal.

Dec. 11, 1936 -- Adjutant General approved plans for consolidation of Ordnance School and Ordnance Field Service School at Aberdeen Proving Ground, Md.

Jun. 1, 1940 -- Ordnance School and Ordnance Field Service School consolidated at Aberdeen Proving Ground, Md., known as The Ordnance School.

Jan. 1, 1941 -- Ordnance Training Center activated, consisting of The Ordnance School, Ordnance Replacement Training Center, and Ordnance Unit Training Center.

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of the students by classes were to go from one plant to another and thus receive a thorough training in automotive equipment.

On October 30, 1917, the F.W.D. Branch of the Ordnance Instruction Schools was started at The Four Wheel Drive Auto Co., at Clintonville, Wisc. The first classes were composed of officers. Instruction for enlisted men commenced in December, 1917. During the operation of the school approximately 262 officers and 500 enlisted men received instruction.

The Peoria, Ill. Branch was the headquarters of the Ordnance Motor Instruction School, and was established at the plant of the Holt Manufacturing Co., on Oct. 23, 1917. This was a school in the operation and repair of the caterpillar type of tractor. A welding course was later added to the curriculum. This school trained during its eight months existence 564 officers, and 1505 enlisted men.

The Kenosha, Wisc. school was located at the plant of the Nash Motors Co. Instruction consisted of a study of the Nash quad truck and assemblies. Later a course in welding was added. First groups trained here were officers. Enlisted men commenced studies on December 12, 1917. Personnel instructed here totaled approximately 348

officers and 1,000 enlisted men.

The Rock Island Arsenal school for both officers and enlisted men was started in September 1917. Artillery enlisted men took a course of four weeks, and equipment men from mobile ordnance repair shops were given a six weeks course on equipment repair only. Officers took a six weeks general course. 375 officers and about 2,286 enlisted men were trained in this school.

Other training schools for enlisted men included an Electric Welding School at the Lincoln Electric Co., Cleveland, Ohio. This school had a brief existence of two months from September, 1918, to November 23, 1918. A Specialists School for motor instruction in connection with the field artillery replacement depot was established at Camp Jackson, S. C., in June, 1918.

An Ordnance Instrument Repair School was started at Frankford Arsenal and by the time it closed on November 27, 1918, four officers and 132 enlisted men had been trained.

A Machine Gun School, first established at Springfield Armory in the Spring of 1916, was transferred in bulk to Camp Hancock, Ga., the location of the Ordnance Training Camp, on April 23, 1918.

In July, 1918, the motor, artillery, and machine guns schools were concentrated at Raritan Arsenal, N. J., and the establishment was designated as "The Ordnance Maintenance and Repair School." Raritan was selected as the location for this centralization as it was convenient to the port of embarkation for the overseas shipment of Ordnance companies and, also, because it was the only Ordnance establishment of sufficient size to receive and train the large number of Ordnance enlisted men required. On November 11, 1918, the school personnel consisted of 458 officers and 5867 enlisted men.

Shortly after the close of the War these various schools were discontinued, and in the early part of 1919 the "Ordnance Operations, Maintenance, and Repair School" was established at Raritan Arsenal.

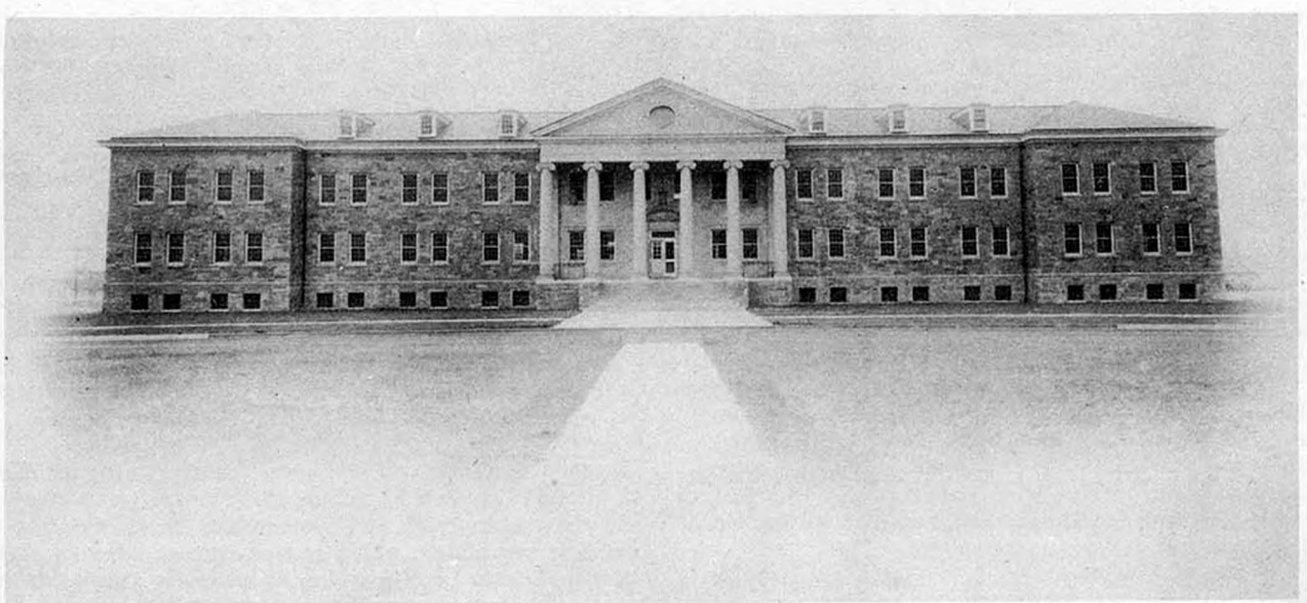
On September 1, 1921 the name of the school was changed to "The Ordnance Specialists' School", and on September 20, 1921 Major General C. C. Williams, Chief of Ordnance, submitted the first tentative regulations for the school, giving the following as its objects: "a. To train enlisted men of the Ordnance Department for specialist ratings specified in tables of organization; b. To train qualified specialists for the higher grades in the Ordnance Department. Noncommissioned Staff; a. To train such officers of the Ordnance Department as may be ordered to the school for instruction in the specialized branches of Ordnance work as maintenance and repair of Ordnance materiel; d. To train such officers and enlisted men of the Line or other Corps or Departments as may be ordered to the School for duty; e. To train officers and enlisted men of the Reserve Corps in accordance with the opportunities which may be presented from time to time."

The length of the course was approximately one year.

In 1931 the Specialists School became known as the Ordnance Field Service School. It contained an Officers' Course of 13 weeks duration, a Noncommissioned Officers' Course of 29 weeks, and an Enlisted Specialists' Course of 37 weeks duration.

As far back as 1919 plans were being considered for consolidating all training activities in one school at Aberdeen Proving Ground. On December 11, 1936, The Adjutant General approved consolidation of the Ordnance Field Service School with the Ordnance School at Aberdeen Proving Ground, to become effective when appropriations permitted the construction of essential facilities for the operation of the school and the housing of the personnel.

On June 1, 1940, The Ordnance School and The Ordnance Field Service School were consolidated into one school, designated as The Ordnance School. AR 350-1200, dated June 6, 1941, "Military Education, Ordnance School" outlined the aims and purposes of the School, but it should be remembered that due to the emergency, some of the courses have been completely suspended, while others have been condensed into a shorter more intensive training period.



# THE BIRTH
# of
# THE ORDNANCE SERGEANT

By: Lt. Col. Geo. W. Outland, Ord. Dept.,
Commandant, The Ordnance School

Prior to July, 1940, The Ordnance School conducted a Noncommissioned Officers' Course for eight months each year. The class was limited to twenty-five students a year, especially selected from approximately four hundred applicants. Upon completion of this course the graduates were placed on the eligible list for Staff Sergeants, Ordnance Department. Approximately fifteen men were appointed from the list during the year following their completion of the course.

On July 1, 1940, in order to meet the tremendous expansion in the number of men who were trained for service in the first three grades, three special courses were started. These courses were to run for three months. There were fifty students enrolled in the Depot and Supply Course, one hundred twenty-three students enrolled in the Maintenance Course, and twenty-five enrolled in the Ammunition Course.

Among the students in the Maintenance Course was Sergeant Hugh E. Martin, D.E.M.L., Command and General Staff School Detachment, Fort Leavenworth, Kansas. Upon completion of the course, Sgt. Martin was assigned to the 40th Ordnance Company (Tng), for duty on the Staff and Faculty at The Ordnance School. He was placed in charge of the Publication Section.

A few weeks thereafter, the following memorandum was submitted by Staff Sergeant Martin:

"Memorandum to Captain Billingsley:

"While I have no knowledge of the reception this proposal may meet with the School, I respectfully submit it for your consideration and, if it meets with your approval, for submission to other authority for consideration.

"The thoughts here expressed are not mine alone, but are based upon conversations and correspondence with several members of the First NCO Class of the Ordnance School (1940).

"A considerable number of these men were not Ordnance men until October 5, 1940, or even a later date. They have entered a field of endeavor which embraces so many types of duty that adequate training could not possibly be acquired in twelve weeks of instruction. They realize fully that their training must continue if they are to protect their futures or become efficient Ordnance men. This applies as well, but in a lesser degree, to men who came to the School from Ordnance units, and to men of the present and future classes.

"I feel sure that most of these men feel greatly indebted to The Ordnance School for the benefits it has given them and for the future it offers them. They feel themselves obligated to offer their best efforts to maintain the high standards of the Ordnance Department. They are well aware that any raising of those standards must be dependent upon the continuous improvement of individual Ordnance men. Self-improvement, therefore, is their obligation.

"At the same time they believe that The Ordnance School has an obligation to meet. The education which ended on October 18, 1940, will, they hope, be continued. These men, and undoubtedly all Ordnance men, look upon The Ordnance School as the brain center of Ordnance knowledge. They look to the School for news of new developments and methods, for answers to their questions, for solutions for their problems, and for reminders and hints which will keep them always on the path toward greater efficiency. The average man, however, hesitates to write to the School to seek an answer to a question or a solution to a problem which he has encountered in the field.

ARMY ORDNANCE
THE JOURNAL OF THE ARMY ORDNANCE ASSOCIATION
MILLS BUILDING-PENNSYLVANIA AVENUE AT 17TH STREET
WASHINGTON, D. C.

OFFICE OF THE EDITOR

November 6, 1941

Editor,
The Ordnance Sergeant,
The Ordnance School,
Aberdeen Proving Ground, Md.

Dear Sir:

"The Ordnance Sergeant" has done a really great piece of work during its first year. ARMY ORDNANCE, after twenty-one years of striving for armament progress, adds its birthday greetings to a valiant co-worker. Hand in hand these ordnance cousins must do a still bigger job as the Ordnance Department of the Army, under gallant leadership, continues its record-breaking achievement.

Sincerely yours,

L. A. Codd,
Lieut. Col., Ord. Res.,
Editor.

A SOLUTION

"The Ordnance Association publishes a magazine which surely is helpful to Ordnance officers. Yet, it does not meet the needs of the average Ordnance Sergeant. Attached hereto is a suggested "dummy" magazine which I believe could be very helpful to Ordnance Sergeants.

EFFORT REQUIRED

"The effort required of any individual involved in the execution of this project (except the Publication Section) would be very little, because of the division of the total effort.

"The greater portion of the suggested material is contained in eight Departments, as follows:

Small Arms
Artillery
Automotive
Fire Control
Administration
Depot and Supply
The Ordnance Shop
Ammunition

"To one man in each of these departments could be assigned the responsibility for the preparation of material; for instance, T. Sgt. Goodman, Small Arms; M. Sgt. Winslow, Automotive, etc. The effort required in each case would be small, and even that effort might be delegated to various assistants for each month. The net result required each month would be the preparation of one page (or slightly more) for each department. Any of these men could probably think of several useful topics for discussion, in addition to suggestions and other material which I believe would soon be coming in from the Field.

"Editorials and Feature Articles could be provided in a similar way. I believe I could secure suitable Editorials and Feature Articles from almost any officer on duty at the School, and from enlisted instructors qualified to prepare such material.

"Many questions can be obtained to fill the Question Page if the "experts" will accept the responsibility of providing the answers.

"News items should present no problem.

"Letters from the Field will come in, I feel sure, I can secure several merely by asking for them (1) from a Corps Area Ordnance Office (2) from an Ordnance Depot (3) from the Presidio of Monterey (4) from an artillery section in Puerto Rico.

"The Library and Humor pages can be filled easily, and would add to the publication.

SUPERVISION

"Editorial: The publication should be supervised by a commissioned officer of the School to insure that all material used would be approved by the School, the Ordnance Department, and the War Department, and to add authority and reliability to the publication. Ordnance Sergeants would feel a closer association with the School, however, if the eight Departments were conducted by enlisted instructors at the School, whom many of them know and respect.

"Technical: The elements of time and space should be controlled to a considerable extent and coordinated by the Publication Section. By the control of time a great deal of the publication could be run off in advance of publication date, to distribute the work throughout a month and prevent congestion on a few days. The entire publication should be divided into parts, and a definite "dead line" established for each part, to provide a continuous but uniform rate of work throughout the month. By coordination of space allotments a more consistent grouping of material and proper preparation of page layout should be possible.

DISTRIBUTION

"Several plans of distribution are possible:

1. To all First Three Grade men of the Ordnance Department.

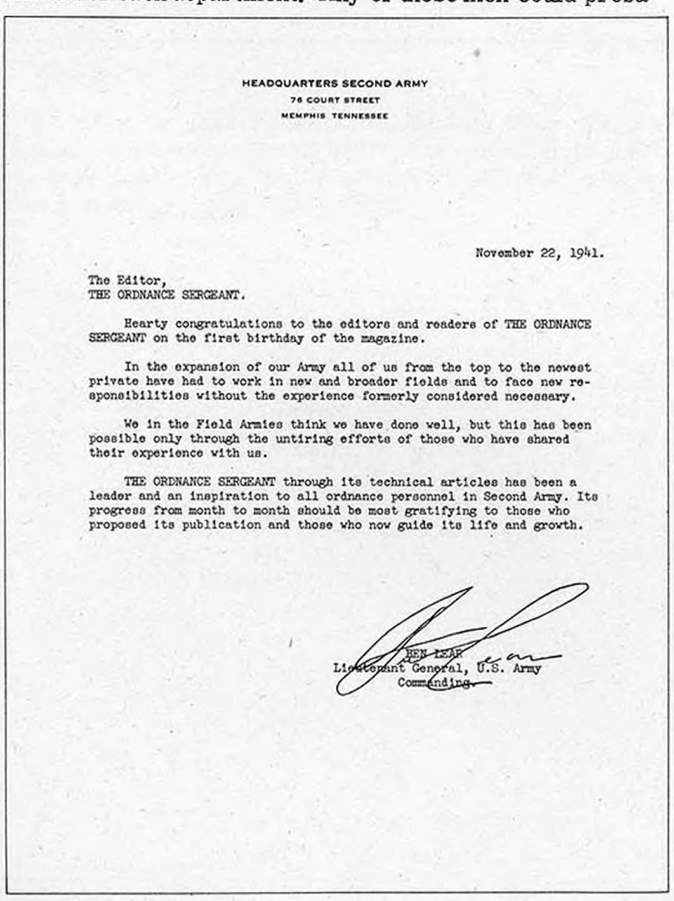
2. To all First Three Grade men of the Ordnance Department who would express a desire to receive it.

3. To all Ordnance men who would pay a small subscription fee.

4. To all Ordnance units or detachments in sufficient quality to insure adequate distribution.

CONCLUSION

"I believe such a publication would be helpful to a great many men, to the Ordnance Department, and there-



HEADQUARTERS SECOND ARMY
76 COURT STREET
MEMPHIS TENNESSEE

November 22, 1941.

The Editor,
THE ORDNANCE SERGEANT.

Hearty congratulations to the editors and readers of THE ORDNANCE SERGEANT on the first birthday of the magazine.

In the expansion of our Army all of us from the top to the newest private have had to work in new and broader fields and to face new responsibilities without the experience formerly considered necessary.

We in the Field Armies think we have done well, but this has been possible only through the untiring efforts of those who have shared their experience with us.

THE ORDNANCE SERGEANT through its technical articles has been a leader and an inspiration to all ordnance personnel in Second Army. Its progress from month to month should be most gratifying to those who proposed its publication and those who now guide its life and growth.

HEN LEAR
Lieutenant General, U.S. Army
Commanding.

fore, to the Army as a whole. In my opinion, the Publication Section can handle this work if it is properly distributed throughout each month. If the number distributed is large, one (1) additional man (unskilled) may be required for 1 or 2 days each month to assist in final assembly, stapling, punching and preparation for mailing.

Respectfully submitted,

s/s Hugh E. Martin
HUGH E. MARTIN
S. Sgt., Pub. Sec."

As a result of the above Memorandum, THE ORDNANCE SERGEANT was founded. Its growth from the small mimeographed pamphlet which first appeared last January to the imposing publication now used to portray the interesting technical and educational information so diligently prepared by noncommissioned officers of the Ordnance Department is the result of the untiring efforts of Sgt. Martin.

On this, the first Anniversary of THE ORDNANCE SERGEANT, it appears fitting that this tribute should be paid to the man whose efforts have made the publication a credit to this institution.

## "BUT -- I'M A HUSKY ONE-YEAR-OLD NOW"

Have you ever taken the time to notice that a healthy youngster is healthy and husky and hearty because of the efforts of someone other than himself. He blunders along through his early years, doing the best he can with his limited knowledge. He has a lot to learn. Some things he learns from experience. Other things he learns from other people. But he learns and learns and learns. And if all goes well he develops into a useful man — because of the help of experience and of interested persons.

THE ORDNANCE SERGEANT began its existence with as much frailty as any infant ever began its life. Even before its birth there were those who eagerly looked forward to its first appearance. Principal among these were those men who guide the destinies of the Ordnance Training Center and The Ordnance School, Brigadier General Hatcher, Lt. Col. Outland, Major Conway, Major Billingsley. The original idea was one thing, permitting that idea to become a fact was another, and the former was useless without the latter.

Among those individuals who were interested in the early development of THE ORDNANCE SERGEANT, of course, were those men who gave their time to conducting its various departments. All our readers have seen their names in every issue. They rightly felt that they were a part of THE ORDNANCE SERGEANT, and they grew as it grew.

But there were others who were also interested, and credit to them must not be neglected. Hundreds of letters have come to us from readers, and each letter indicated interest. Many letters signified more than mere interest, however. Some contained advice and suggestions. It is significant that every bit of advice received has been of a constructive nature. Articles have come from the field, and in many ways the readers have added their bit to THE ORDNANCE SERGEANT. These contributions have not simply helped to fill the pages of a magazine, they have acted as encouragement and inspiration -- and guidance.

It is the interest of the readers which has provided the experience upon which the new-born infant prospered. All those individuals who helped bring the infant to life made plans for his future. Those plans were intertwined with the very best of intentions. Though they have been changed numerous times, they cannot be looked upon as failures. Just as the needs of each new generation of men change, so did the requirements to be met by THE ORDNANCE SERGEANT change. Those requirements have been dictated by the readers, not by the men who prepare the magazine. It is incumbent upon the readers that they determine the future progress of this youngster. THE ORDNANCE SERGEANT is exactly that which its readers make it possible for it to be. It can never be anything more. We who engage in the various phases of its reproduction pledge our best efforts that it shall never be anything less.

THE EDITOR

HEADQUARTERS FOURTH ARMY
OFFICE OF THE COMMANDING GENERAL
PRESIDIO OF SAN FRANCISCO

November 27, 1941

Editor, The Ordnance Sergeant
The Ordnance School
Aberdeen Proving Ground
Aberdeen, Maryland

I have had the pleasure of examining a recent issue of THE ORDNANCE SERGEANT, and wish to commend its editors and publishers on the great variety of material covered and the general excellence of the form of presentation which has been adopted. The publication, with its valuable texts, artistic illustrations and clear reproduction of photographs, cannot help but substantially contribute to the knowledge and training of its readers in the field of ordnance.

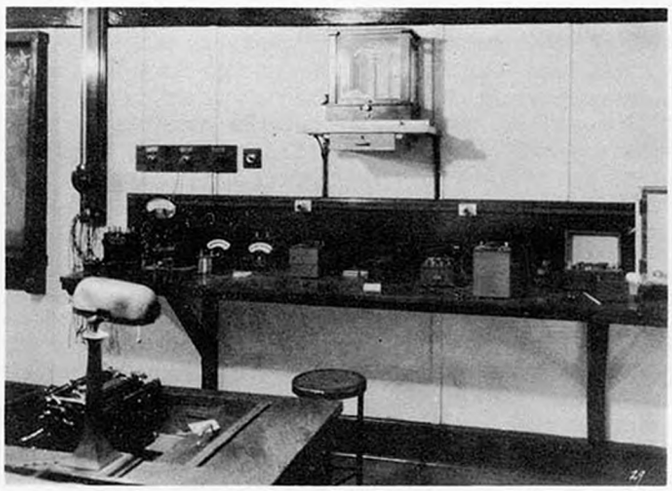
With best wishes for the future continued success of THE ORDNANCE SERGEANT, I remain,

Yours sincerely,

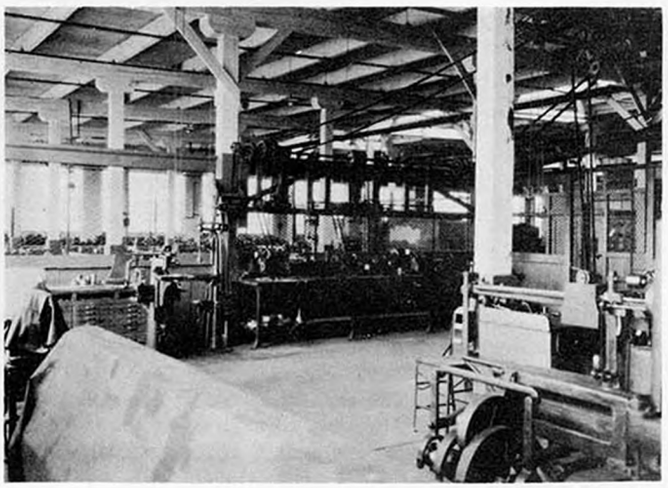
J. L. DeWitt
Lieutenant General, U. S. Army

JLD/tgb

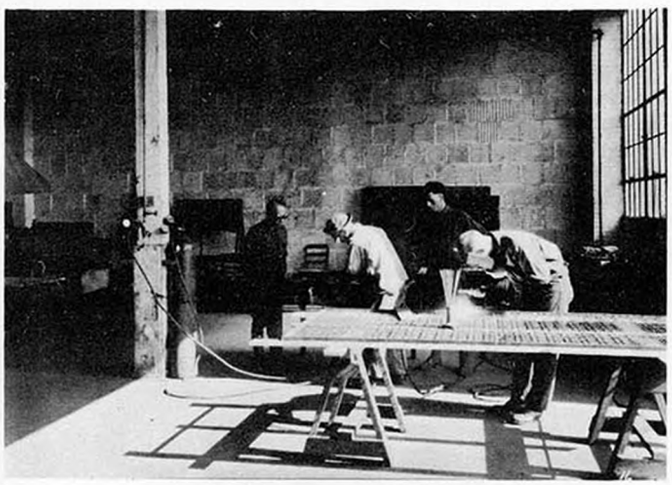
# SHOP SCENES -- RARITAN ARSENAL



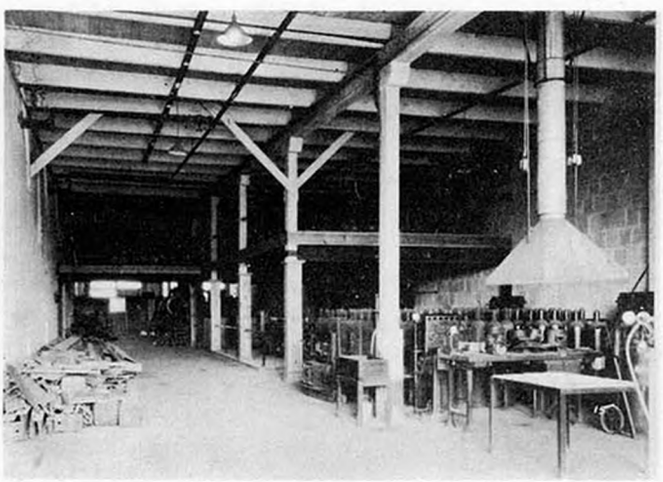
Electrical Research Laboratory



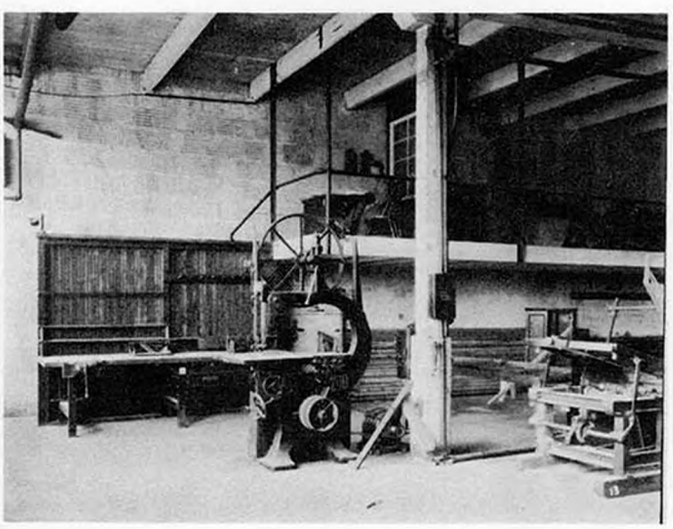
Precision tool room, Machine Shop



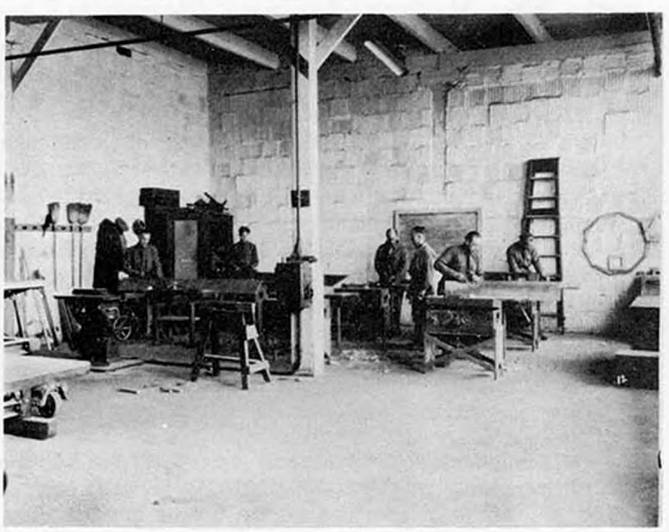
T. Sgt. R. J. Qualls and Corp. Burr N. Stevick instructing two welding students in the Welding Section



Welding Section, Blacksmith Forge Shop and Shears



Carpenter Shop



Carpenter Shop

# "AT RARITAN -- I REMEMBER"

**By: Mrs. John C. Nelson**

You have heard of Army women who have followed their husbands through successful military careers. Maybe you have known such women. Very often the success of the soldier's career has been largely due to the encouragement and inspiration and assistance of a woman. Such a woman is Mrs. Nelson, wife of Master Sergeant John C. Nelson, Senior Enlisted Instructor in the Military Section of The Ordnance School. No one knows how many Ordnance men Mrs. Nelson knows. Undoubtedly a great many Ordnance men have heard of her. When the Editor was asking questions about the School as it existed at Raritan Arsenal, an old-timer said, "Ask Mrs. Nelson. She went to Raritan on the first load of lumber." A slight misstatement, no doubt, but the Editor asked Mrs. Nelson, and here is her answer.

A school for the training of Ordnance enlisted men, under the peacetime organization following the World War, was organized at Raritan Arsenal, Metuchen, New Jersey, in July, 1919. It was known as "The Ordnance Operations, Maintenance and Repair School". Its first Commandant was Lieutenant Colonel Harry T. Herring, O.D., and its staff was made up of officers and enlisted men who had served during the war in the several branches of the wartime Ordnance school. These branches were located at Rock Island Arsenal, Ill., Camp Herring, Kenoska, Wisc., the Holt Tractor Company, Peoria, Ill. Camp Hancock, Ga., Fort Hancock, N. J., and Raritan Arsenal, N. J.

The first classes entered the School in December, 1919, and were assigned to the various trades, such as Automechanic, Armorer, Artillery Mechanic, Carpenter, Electrician, Leatherworker, Munitions Worker, Welder, Blacksmith, etc. These courses varied in length from six months to one year, and the first classes graduated in May, 1920.

The demand for enlisted specialists and replacements became so great, and the graduates of the School were so few in comparison, that it was decided after July of 1920 to send all men enlisting in the Ordnance Department to the School for training. It thus became necessary to stagger the classes, and so classes entered and graduated every month.

Lt. Col. Herring returned to civil life at the termination of the emergency, and was succeeded by Major Roland W. Case, O. D. (now Brig. Gen. Case) (and now Commanding General of Aberdeen Proving Ground, Maryland, where the new version of The Ordnance School is located: Editor).

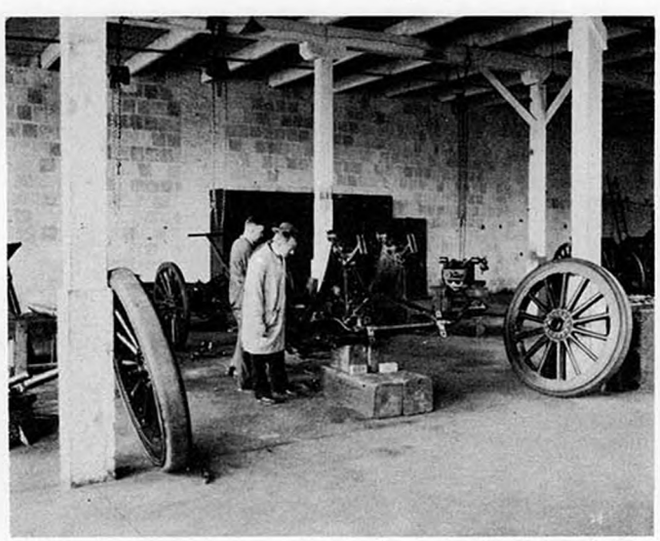
By this time the need for training of Ordnance noncommissioned officers had become apparent, and a course for them was added to the curriculum. This course extended over an entire school year, from September until June of each year.

Major Case was succeeded by Major John Q. McDonald, O. D. About this time the name of the School was changed to the "Ordnance Specialists' School".

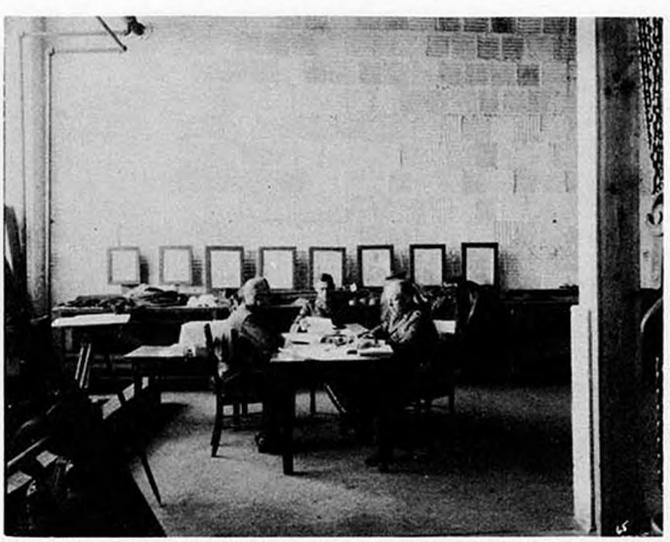
After a reorganization of the school, which occurred at this time, it was divided into three main departments: Trades, Armament, and Automotive.

The Trades Department included the Machine Shop, Blacksmith's Shop, Carpenter's Shop, Electrical Shop, Sheet Metal Shop and Welding Shop.

The Armament Department included the Artillery Section, Small Arms and Machine Gun Section, Leatherworkers Section, and Explosives Section.

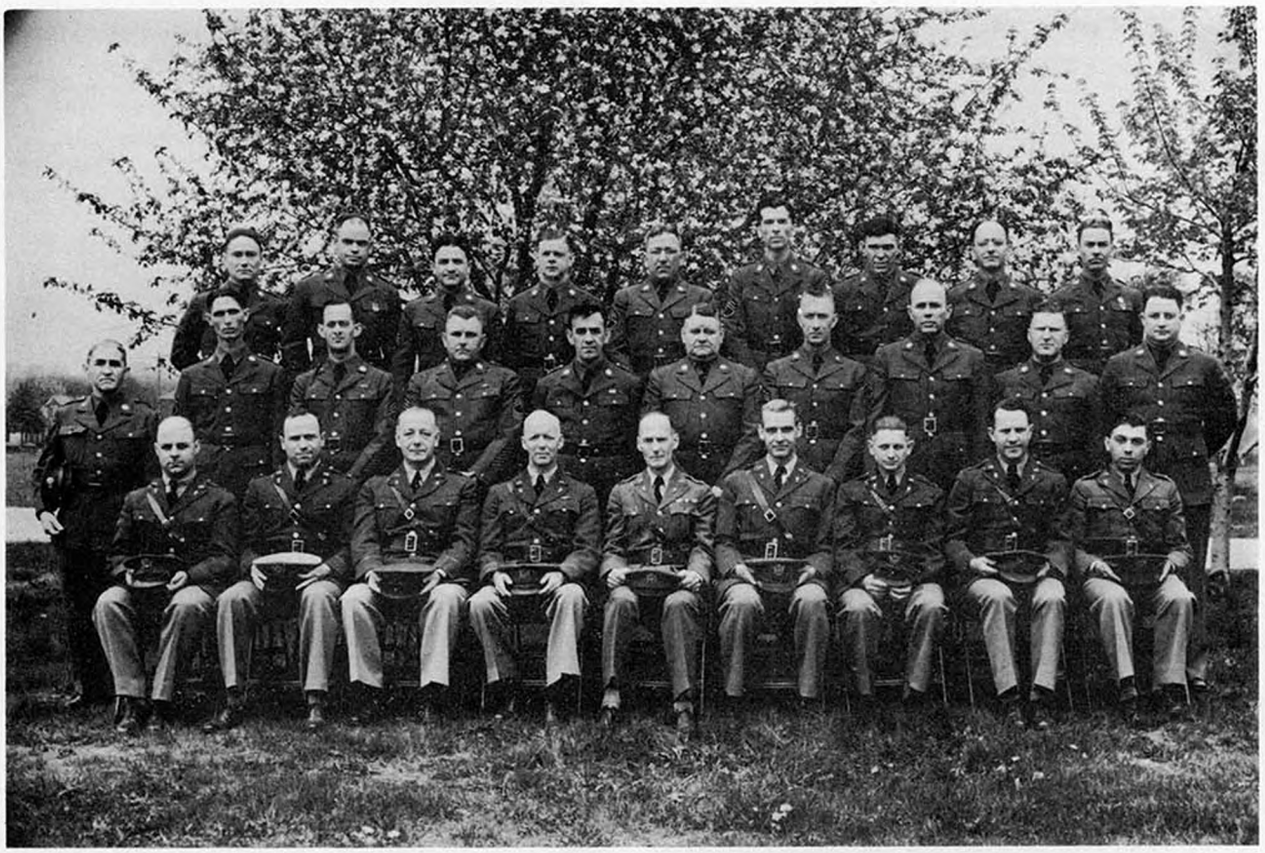


Maj. George Graham, Assistant Commandant, and Capt. Arthur B. Loose, in Artillery Section



Lt. Edward B. Smith and two student officers in rigging class room

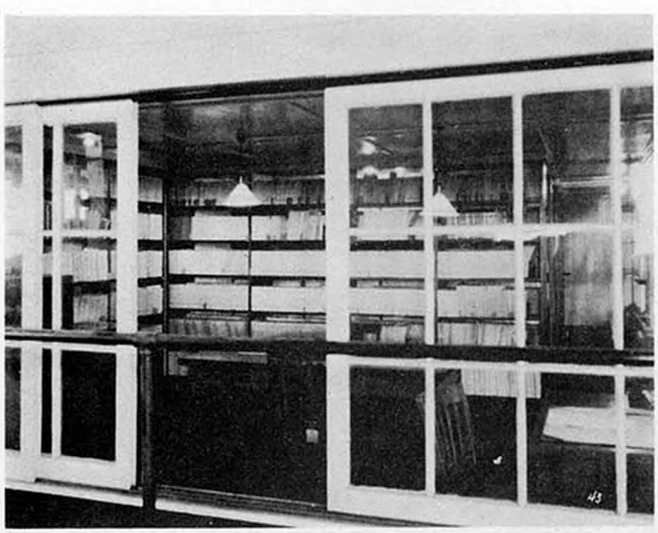
LAST PHOTOGRAPH OF STAFF AND FACULTY, ORDNANCE FIELD SERVICE SCHOOL, RARITAN ARSENAL



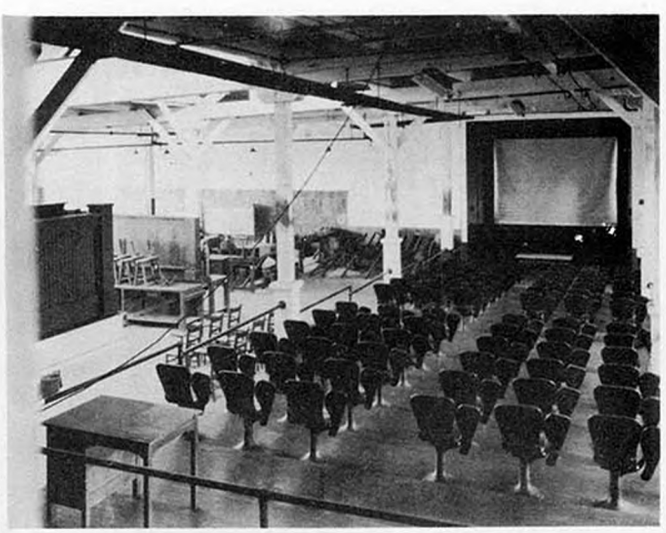
Seated (Left to right): 2nd Lt. John E. Difendorfer, 1st Lt. Elbert A. Newhouse, Capt. Victor Wickum, Lt. Col. John A. Brooks, Jr. (Asst. Comdt.), Col. K. B. Harmon (Commandant), Capt. John D. Billingsley, Captain Donald D. Alexander, 1st Lt. William A. Call, 2nd Lt. George S. Prokop.

Second Row (Left to Right): M. Sgt. Clyde Whitlatch, T. Sgt. Lee I. Dance, T. Sgt. John W. Winslow, M. Sgt. John C. Nelson, T. Sgt. L. Kaldizar, T. Sgt. John Buckley, T. Sgt. J. P. Rigg, T. Sgt. W. C. Minshaw, S. Sgt. Sam Goldsmith, S. Sgt. Tom Campbell.

Back Row (Left to Right): T. Sgt. C. B. Goodman, S. Sgt. T. H. Freeman, S. Sgt. Guy Orsino, S. Sgt. A. T. Argue, Jr., T. Sgt. U. G. Fetterman, S. Sgt. R. L. Johnson, T. Sgt. H. L. Bagley, T. Sgt. D. M. Fairweather, T. Sgt. H. E. Hampton.



Library, Ordnance Field Service School



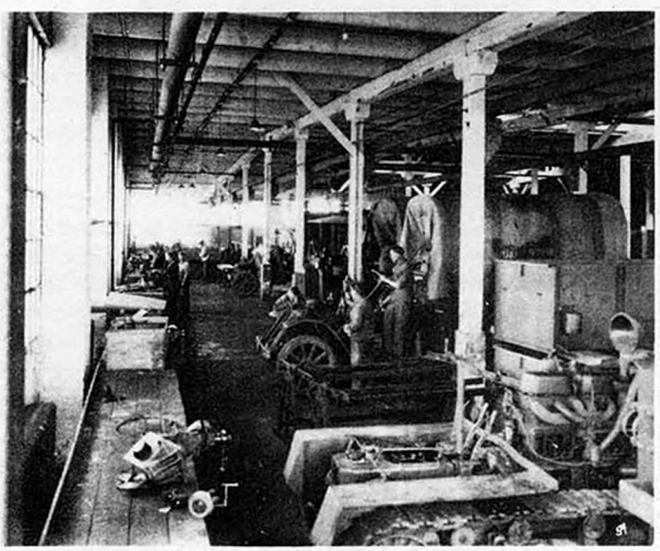
Old theater and lecture hall

The Automotive Department consisted of the Automobile Section and the Tractor Section.

In addition to the Specialists' Courses conducted by each of these Departments, classes for advanced specialists offered an opportunity to graduates of one or more of the Specialists' Courses, or men having equivalent qualifications, to qualify as Toolmaker, or for the Depot, Ammunition or Maintenance Companies.

Military instruction was given the entire student body of the school. This instruction consisted of close order drill, including manual of arms, school of the company, bayonet drill, small arms target practice, lectures and study covering customs and courtesies of the service, as well as Army and Ordnance Regulations.

Academic instruction consisted of arithmetic, algebra, grammar and spelling for the Specialists' Courses, and algebra, plain and solid geometry, elementary physics, and trigonometry for the Advanced Specialists' Courses.



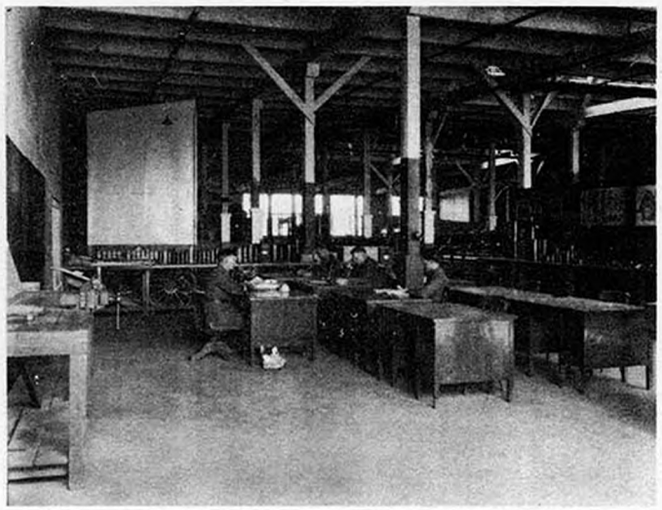
Automotive Repair Section

This school, in addition to its military usefulness, offered a most unusual opportunity for learning a trade or completing an education.

Major McDonald was succeeded by Major Adam F. Casad, and at about this time the course for noncommissioned officers was materially changed. Instead of one course for all students in the class, a division was made into separate courses — Administration, Depot and Supply, Ammunition, and Maintenance.

At this time the task of writing correspondence courses for the Ordnance Department was given the school staff, and two additional officers were added to the school staff to assist the Commandant in this work.

Colonel Casad was succeeded by Major James H. Burns (now Maj. Gen. James H. Burns) and the name of the School was again changed, this time to the "Ordnance Field Service School". By this time, too, the advisability of training groups of officers had become apparent, and an officers' course of three months' duration was added to the school curriculum. At the same time the separate



T. Sgt. Charles Farmer teaching ammunition

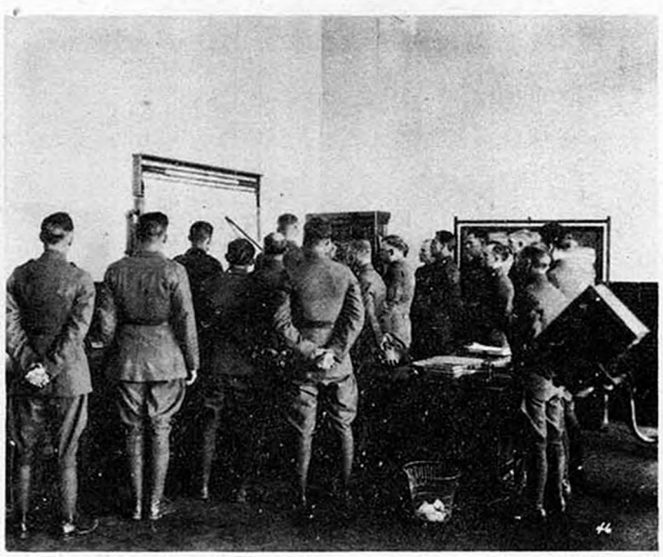
courses for noncommissioned officers were changed to the single line course.

Major Burns was succeeded by Major Walter P. Boatwright, O. D. (now Brig. Gen. W. P. Boatwright), who in turn relinquished the assignment to Colonel Claude B. Thummel, Ord. Dept.

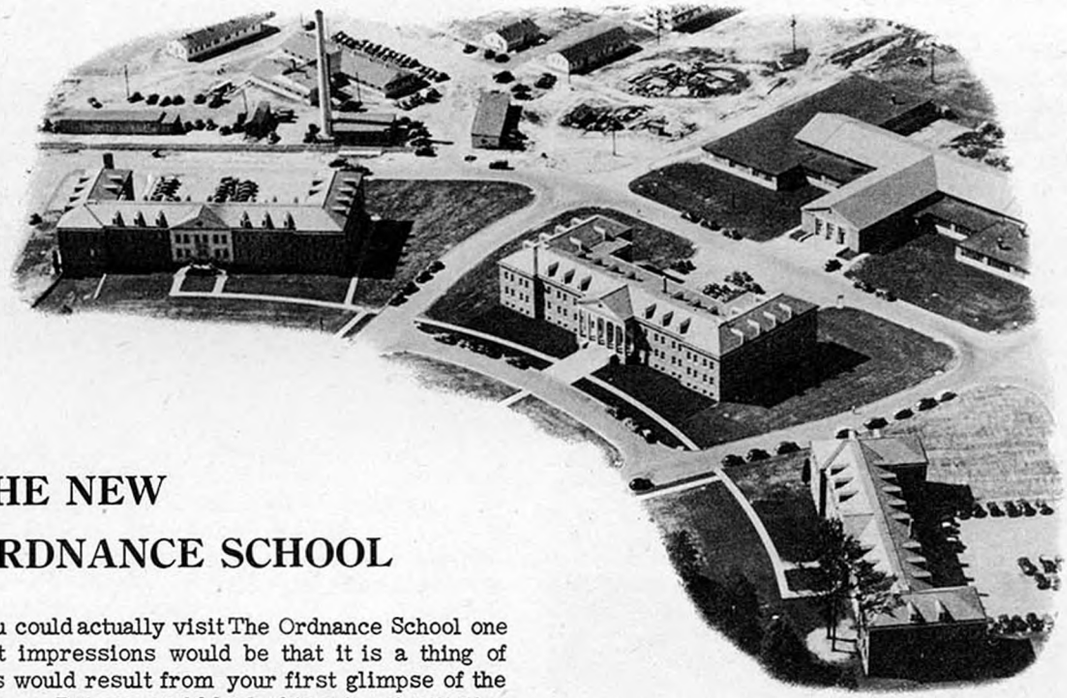
Colonel Thummel's tour of duty was short, and he was succeeded by Lt. Col. Kenneth B. Harmon, Ord. Dept.

By this time the expansion of the School was in process, and buildings for housing the institution were under construction at Aberdeen Proving Ground, Maryland. The school was moved to Aberdeen in July, 1940, merged with the Officers' School, and became "The Ordnance School", with Colonel Julian S. Hatcher as its Commandant.

When expansion in the interest of National Defense became necessary, and the Ordnance Training Center was established, Colonel Hatcher moved to the command of the Training Center. Lt. Col. George W. Outland became, and remains, the Commandant of The Ordnance School.



T. Sgt. Penland instructing a geography class



# THE NEW ORDNANCE SCHOOL

If you could actually visit The Ordnance School one of your first impressions would be that it is a thing of beauty. This would result from your first glimpse of the school buildings. But you would be looking at an institution which possesses more than atchitectural beauty; an institution of usefulness. In the picture above you see the three beautiful buildings around which the school activities revolve. These three stone buildings were the first to be constructed. They were the original "new Ordnance School". From them The Ordnance School has expanded into numerous additional buildings, but here remains the center of all school activity.

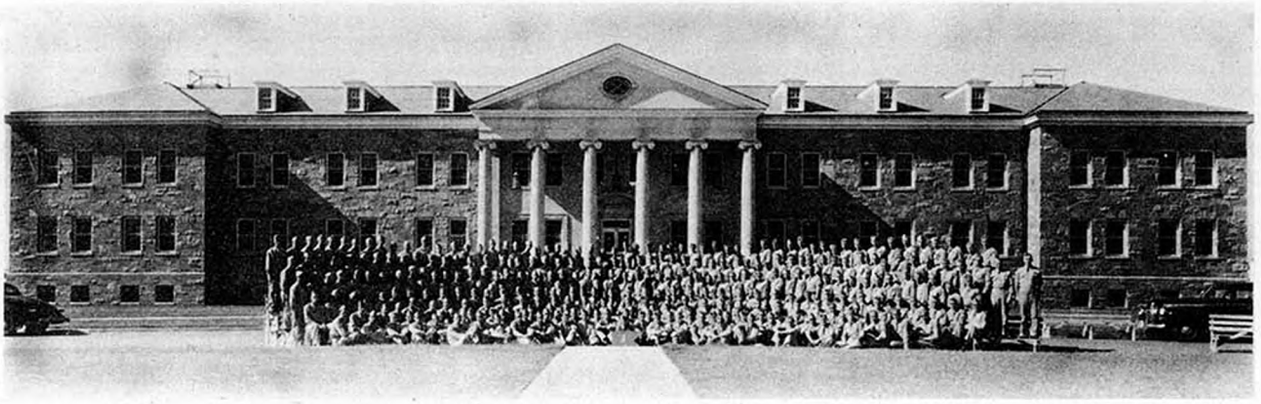
In the center is the Administration Building, housing the executive and administrative offices, the library, and the facilities for reproduction of texts and other Ordnance literature. This building is the home of THE ORDNANCE SERGEANT. On the left is the barracks of the 40th Ordnance Company (Training), the organization which came from the old Ordnance Field Service School at Raritan Arsenal, New Jersey, to establish the new Ordnance School. On the right is the building commonly known as the Auxiliary Barracks, built for the housing of enlisted students attending the school. During the rapid expansion of the school this building has housed various sections of the school at various times, being actually used as an "auxiliary" building, for whatever purpose it might be needed most urgently at the time. At the present time it houses the Fire Control Section of the School, and serves as a barracks for Officer Candidates.

Brig. Gen. J. S. Hatcher
Commanding Ordnance Training Center

For nearly twenty years, prior to 1940, the Ordnance Department trained its officers at Aberdeen Proving Ground, Maryland, and at the Massachusetts Institute of Technology in Cambridge, Massachusetts, while enlisted students were trained at The Ordnance Field Service School, at Raritan Arsenal, New Jersey. The latter school was poorly equipped with barrack and shop facilities and, due to the limitations of appropriations, little could be done to improve these conditions for many years.

About 1937 a board was appointed by the Chief of Ordnance to investigate the school situation. This board recommended, and the General Staff approved, consolidating the two schools at Aberdeen Proving Ground when new facilities could be provided.

During the summer of 1938, funds were provided to initiate the construction of The Ordnance School. The funds permitted the erection of an Administration Building, two barracks buildings, a central heating plant, and ten Noncommissioned Officers' quarters. It was known that additional buildings, including a shop, vehicle storage building,



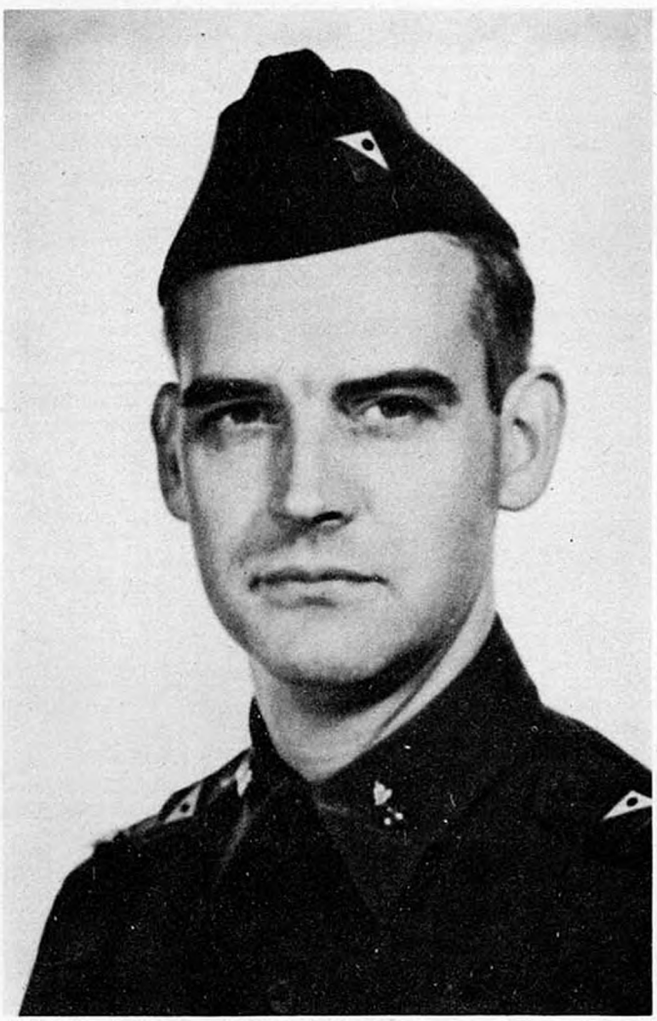
40th Ordnance Company (Training)

and additional Non-Commissioned Officers' and Officers' quarters would be required to complete the school plant.

The buildings under construction were nearing completion during the summer of 1940, when a decision was reached to move the school at once, due to the increased training program to be placed upon the school as a result of the rapidly increasing National Defense forces. It became necessary to provide additional facilities immediately for carrying on the school work.

Funds were provided for the conversion of the Museum at Aberdeen Proving Ground into a shop and several classrooms. The time allowed for this conversion was so short, and the needs of the increased school program were so urgent, that classes began amid the installation of partitions, plumbing, and lighting and heating facilities. And there were other difficulties. The 40th Ordnance Company moved from Raritan Arsenal early in July, 1940. Ten days later the first class of two hundred enlisted students reported. Neither the Administration

Lieutenant Colonel George W. Outland
Commandant



Major John D. Billingsley
Assistant Commandant

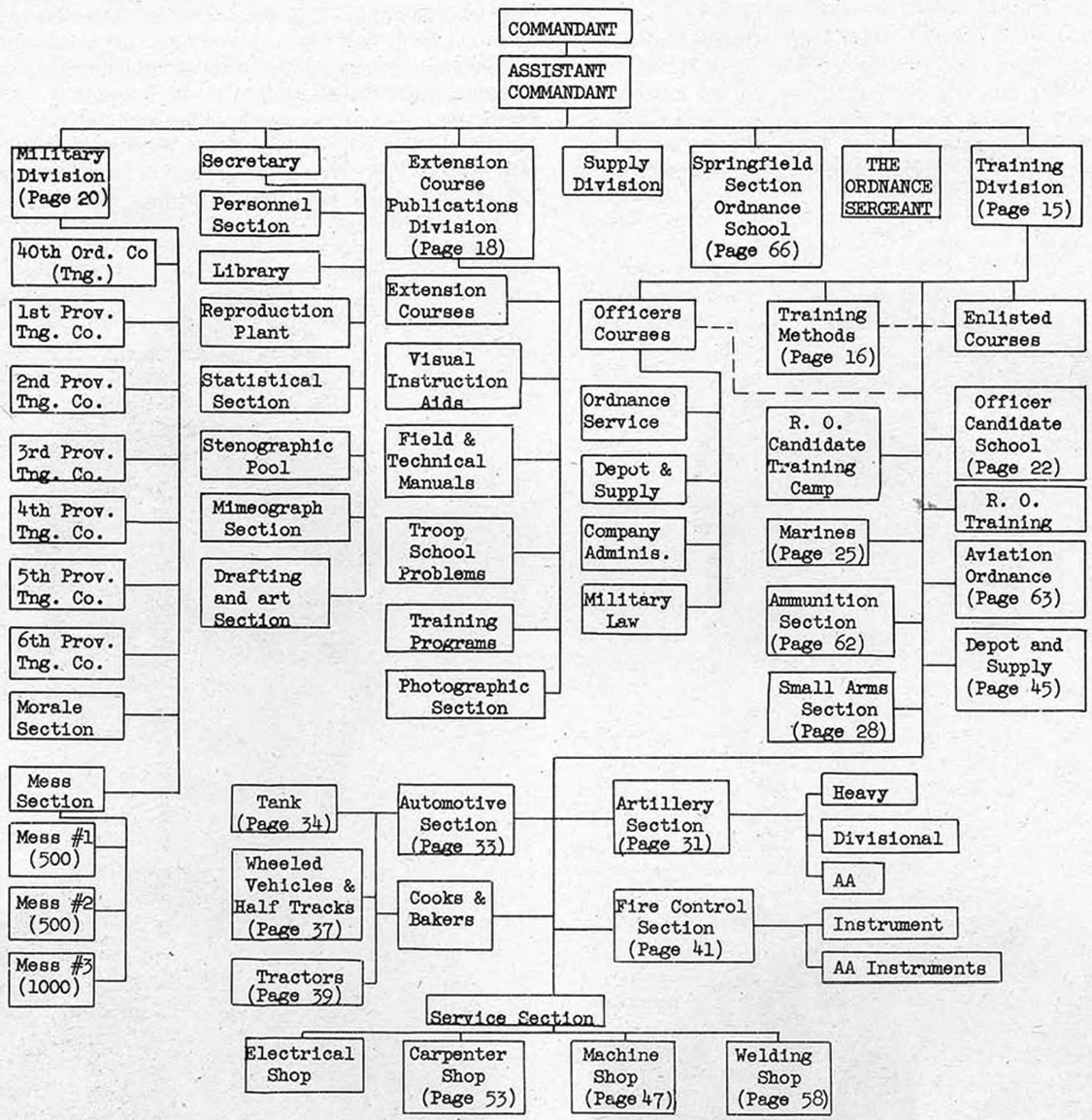
Building nor the Auxiliary Barracks were completed. Equipment for the proper housing of the students were not yet available. Among the inconveniences facing the students were cold showers, screenless windows accompanied by mosquitoes, pillowless and sheetless beds, and inadequate lighting. Lockers were not available. Traffic facilities were so overcrowded that students walked a mile to classes in the old Museum Building — two round trips per day.

But difficulties were pushed aside. Already an officers' class was undergoing instruction at the Proving Ground. The first Special Non-Commissioned Officers' class, beginning its studies near the end of July, 1940, was graduated late in October. The new Ordnance School had become a reality.

Then came the expansion of the Army, the Selective Service Act, and the accompanying rapid expansion of the School to meet even greater demands, The construction of additional buildings began; barracks, shops, classrooms, and others. It is this new Ordnance School which we plan to visit with you.

## ORGANIZATION OF THE ORDNANCE SCHOOL

(Page numbers refer to descriptive articles in this issue)



# THE SCHOOL STAFF

While it is true that in every military organization the commander controls and is responsible for all activities of the organization, there are some variations between the staff of the tactical commander and that of the commandant of an organization such as The Ordnance School.

The Commandant, of course, is the commander of the School. His chief assistant, quite naturally, then, is the Assistant Commandant. In addition to this assistant, the Commandant has need for certain other assistants, and certain of these will be considered briefly before consideration is given to the actual instructing sections of the School. In some instances it is found that the duties of these staff officers closely parallel the duties of staff officers of tactical units, although they differ in some details and they are known under a different title.

# DIRECTOR OF TRAINING

Captain S. A. Daniel reported at Aberdeen Proving Ground in August of 1940, and was assigned to duty as a member of the staff and faculty of The Ordnance School. For several months he acted as an Instructor in the Automotive Section, and upon the departure of Captain Young, the Senior Instructor of the Automotive Section, he became the head of that Section. During this period the Automotive Section was expanding rapidly, and new classes were being organized.

On January 1, 1941, Captain Daniel was named Director of enlisted specialists' courses, and on July 25th, 1941, he was made Director of Training. At this time Captain Kibler was Director of Officers' Courses and Captain Gerken Director of Enlisted Courses.

As Director of Training Captain Daniel functions as an advisor and assistant to Major Billingsley, the Assistant Commandant. He is responsible for supervising existing courses and planning new courses of instruction, both for officers and enlisted men. Constant supervision of this phase of school activities is necessary for a number of reasons. The coordination of facilities, equipment and instructor personnel is necessary in order to avoid conflict among the numerous classes. Almost constant revision of courses is necessary in order that they may be improved from time to time, as well as to provide for the adequate coverage of new materiel. Changes and additions of materiel also necessitate frequent revision of the School Table of Allowances, and supervision of this revision is the function of the Director of Training. This officer also acts as the representative of the Commandant on all matter pertaining to training, and as liaison officer. Boiled down to its basic characteristics, this job is very similar to the G-3, or Plans and Training Officer, on the staff of any commander.

Captain S. A. Daniel
Director of Training

Captain E. H. Kibler, Jr.
Director, Officers; Courses and
Officer Candidate School

# TRAINING METHODS

## By: Hubert B. Hinamon, 1st. Lt., Ord. Dept.

It has come to the attention of The Ordnance School that the commanding officers of Ordnance Companies in the field are establishing schools for the training of their units. It is felt that an outline of the training methods used here may have interest to these company commanders and with this in mind the following is offered.

Here, as at any similar school, training is divided into two main divisions: A - Theoretical and B - Practical.

The theoretical side of the picture is exactly as the word indicates, i.e. delving into the theory of the various phases of ordnance service. This is accomplished through the study of texts, army regulations, etc.

The practical end of instruction is accomplished by having the student actually perform the necessary tasks, such as assembly and disassembly of motors, tanks, scout cars, artillery pieces, small arms and fire control instruments; the setting up of a depot or company office, theoretically receiving, shipping and accounting for property, and setting up an ammunition storage depot under field conditions, issuing ammunition according to the allocation of credit.

In the selection of instructors, the company commander must select men who are, or are capable of becoming, thoroughly familiar with the subjects they are to teach. They should be able to adjust themselves to conditions, be firm and yet not severe; they must be able to hold attention through respect instead of fear, they should be men of even temper, must have a fair command of the English language; be able to ennunciate plainly and distinctly and should have some knowledge of Training methods.

In the Ordnance School the instructors are men who have a military background or who have been trained in Technical Schools and so are well grounded in the subjects they are handling.

In the initial phases of school the subjects to be taught are determined, the amount of time which is to be devoted to each subject is decided upon, and this information is furnished the various chiefs of sections. These men are directed to submit a general schedule for their various schedules. They must indicate in these schedules the material they will cover together with the number of periods to be devoted to each item and the reference material which will be studied by the student. The staff of the school reviews and consolidates these data and publishes the master schedule. Each chief of section divides each individual course by the number of instructors he has

Major P. J. Phillips
Director of Training Methods

Captain Walter W. Gerken
Director, Enlisted Courses

available. He will assign the various subjects to the instructors best suited to teach the particular subject involved. The instructor will ask himself this question - "What do I want the student to know or to be able to do after the lesson has been taught?" He will consider the desired results and decide which of the following methods of instruction will meet the requirements:

A - Lectures

B - Demonstration

C - Illustration

D - Performance

E - Discussion or Conference

F - Combination of two or more of the foregoing.

It has been found that a combination of "Lectures" and "Discussion" is the most effective method of instruction.

The lecture method alone may be used to a good advantage when it is desired to get a lot of information over to a large group of men, and their time is limited. It is essential, however, that the instructor know and stick definitely to his topic in this case. He should so arrange his lecture to allow for a few important clarifying questions.

A desirable instruction "tool" is the demonstration where the instructor actually disassembles and assembles a piece of material. This is because it gives him the opportunity to show the proper use of the proper tool with which the job is accomplished. Further, the instructor is enabled to definitely show the workings of the item.

First Lieutenant W. L. Boland
Personnel Secretary

By far the most desirable instruction "tool" is the "Performance" method in that the student actually applies the instruction given him. It further permits the instructor to check his instruction, and to make such adjustments as are necessary.

This method of instruction may be augmented by the use of illustrations for items which may not, for any reason, be disassembled or it may be used when it is impossible to demonstrate on the subject material itself.

The "discussion" or so called "Bull-session" is an excellent media for the dissemination of information since it will bring up points of interest and importance which may have been overlooked or not stressed and will also serve to pound home points which the instructor has stressed in the demonstration and/or lecture of the subject.

After the instructor has determined the "tool" which he proposes to use in his instruction, he is required to prepare a lesson plan. This plan may be written out in the following form:

Instructor's Name_____Day_____Hour_____Date_____

Course_____Unit Number_____Lesson Number_____

I Object of Lesson

II Special Devices Needed for Lesson

III Teaching Points

IV Check up Questions

V References

VI Study Assignments

The filling in of the heading and section I and II are obvious. But in entering information in the succeeding sections the instructor is required to utilize the four main steps of teaching, namely:

A - Preparing the student for the reception of the information to be given as well as preparing the instructor himself to disseminate such information.

B - Presentation - Instructor will outline the material which he proposes to teach. In this he should only indicate the high points in order that he might not omit anything important. From this outline he will be enabled to elaborate to the fullest extent of his time.

C - Application - This step is used at the school in every section since it lends itself well to both application of theory and practical work by the student. It further permits the student to apply the instruction which he has just received.

D - Testing - In this step the instructor propounds questions and/or problems by which he is enabled to determine whether or not the individual student is "getting" the

instruction or if it will be necessary for him (the instructor) to take a new procedure with certain individuals. These tests may be oral, written, or performance.

In conclusion, it may be said that we have covered the "tools" of instruction and have brought out the points without which no method is successfully presented.

The foregoing, in brief, is the training method utilized at The Ordnance School. It is hoped that it may assist any officer faced with the necessity of establishing a school in his own company.

# EXTENSION COURSE AND PUBLICATIONS DIVISION

The system of education by means of Extension Courses has been used, by the Army, for about a generation. When, under the National Defense Act of June 3, 1916, an Officer's Reserve Corps was established, it was necessary to provide some means of educating and training the members thereof for the performance of their duties. The percentage of Reserve Officers that could be ordered to active duty, for two weeks, every year was exceedingly small, and due to the short period of time allotted for this training its scope was, of necessity, quite limited.

As Reserve Officers lived in all parts of the country, in many cases there being only one or two of a particular branch in a community, it was impossible to reach all of them by means of conferences. The obvious solution was to reach them by mail, and thus the system of Army Extension Courses was created.

The mission of the Army Extension Courses is completely stated in Army Regulations 350-3000. Briefly, the primary purpose is to provide, for the Reserve Officer, a systematic course of study which will better fit him to perform the mobilization duties of his grade in the unit, of the arm or service, to which assigned, and incidentally to assist in preparing himself for promotion to the higher grades.

The preparation of Extension Courses, for those officers assigned to the Ordnance Department, has always been a function of the Ordnance School. Until about a year and a half ago, the Ordnance School was a comparatively small organization with a staff and faculty of less than a dozen officers. The number of students was also proportionately small, and the preparation and revision of Extension Courses was carried on in addition to the other duties. This was no particular burden, as most Reserve Officers had other interests which consumed their spare time with the result that the demand for courses was not excessive.

With the advent of the present emergency, the requests for courses increased to the point where the supply was insufficient to meet the demand. At the same time, the Ordnance School began a period of expansion which started with the absorption of the Ordnance Field Service School. Although the present staff and faculty consists of nearly one hundred officers and four hundred enlisted men, this process of expansion is by no means complete. Under these conditions, increased facilities for the preparation of Extension Courses were inevitable. In addition, the

Captain D. D. Alexander
Director, Extension Course Division

HEADQUARTERS THIRD ARMY
OFFICE OF THE ORDNANCE OFFICER
SMITH-YOUNG TOWER

San Antonio, Texas.
November 10, 1941.

Editor, The Ordnance Sergeant,
The Ordnance School,
Aberdeen Proving Ground, Md.

Dear Sergeant,

I wish to send greetings and congratulations to the Editor and Staff of THE ORDNANCE SERGEANT. They have just completed their first year of the publication. THE ORDNANCE SERGEANT is a very distinct contribution to the service. The magazine is read by all in the Ordnance Office, Third Army, and find it very interesting and helpful. You are doing a grand service.

I am very grateful for this opportunity to extend my personal greetings to members of the Ordnance Department. The past year has been a very busy one and I think from the Ordnance standpoint, a very successful one. We of course know that the coming year will be another busy one. We can but work hard, keep on our toes, and hope that it will be equally successful. I do not minimize or make light of the struggle which lies ahead. However, I enter the year with confidence as I am thoroughly sold on the idea that the ordnance personnel from top to bottom, are a determined, hard working, resourceful and clear thinking bunch of men that are possessed with the spirit of "let's get the job done and efficiently".

With most sincere wishes for a Happy New Year.

L. D. BOOTH,
Colonel, Ord. Dept.,
Ordnance Officer.

preparation of a considerable amount of other training literature was found necessary.

In order to meet this demand for training literature, the Extension Course and Publications Division of the Ordnance School was organized, in January 1941, with a strength of six officers and one civilian. Since that time considerable expansion has taken place. The present strength consisting of eighteen officers, five enlisted men and six civilians, exclusive of the necessary stenographers, photographers, and personnel required for reproduction.

The mission of the Extension Course and Publications Division of the Ordnance School is:

1. The preparation and revision of Extension Courses of the Ordnance School. (This Division does not distribute courses nor correct solutions.)

2. The preparation of Ordnance Field Manuals and certain Ordnance Technical Manuals pertaining to fundamentals, or general principles, as distinguished from those technical manuals dealing with specific items of equipment.

3. The preparation of Visual Aids for Training. This includes photographs and notes for Film Strip Lectures, and the scenarios for certain motion picture films relating to Ordnance.

4. The preparation and distribution of Ordnance Troop School Problems and Bulletins to be used in training Ordnance personnel.

5. The preparation of Mobilization Training Programs for Ordnance Units and personnel.

6. The preparation or editing of Ordnance School Texts.

The internal organization of the Extension Course Division is not divided, by fine lines of demarcation, into various sections in order to accomplish the mission outlined above; on the contrary, with the exception of certain civilian technicians and key officers, individuals are assigned various types of training literature to prepare or edit. Thus, all personnel acquire greater knowledge and experience, and consequently their value to the Division is enhanced. In addition, this procedure creates greater interest and prevents that stagnation, caused by the feeling of futility, which so often occurs when individuals are assigned to one type of work for a long period of time.

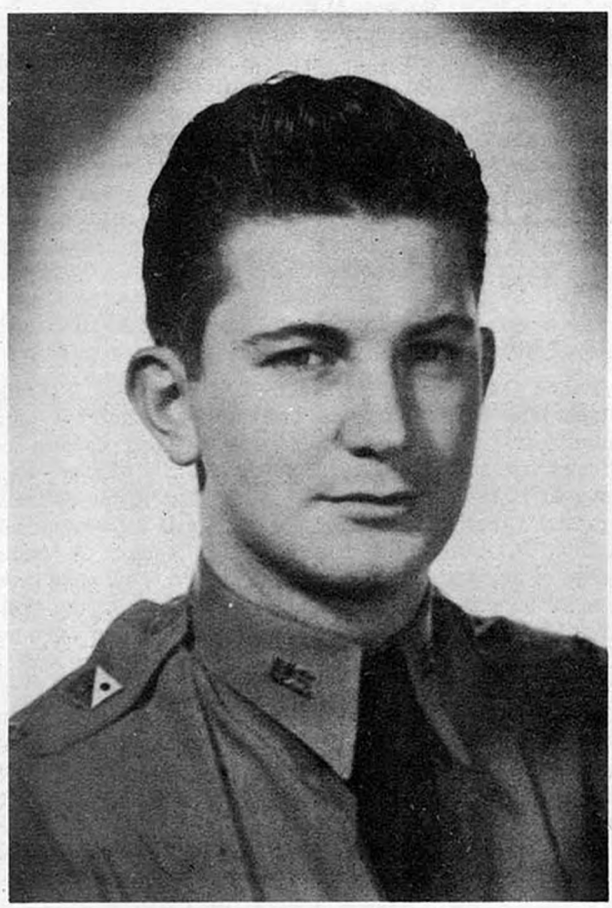
At the present time, the Extension Course Division is roughly divided into three sections which prepare training literature as follows:

1. Visual Aids, including film strip lectures and motion picture lectures.

2. Field Manuals for Ordnance officers assigned to Ordnance units or Ordnance Field Service.

3. All other training literature prepared by the Division.

Because of the nature of the work and the importance



Second Lieutenant G. Meixel
Secretary

Second Lieutenant T. F. Jones
Assistant Secretary

of having training literature which is accurately presented in a logical and concise manner, a special effort has been made to secure personnel who are not only interested in this particular type of duty, but who also have the necessary qualifications to do a good job. The degree of success, which has been attained in this effort, may be determined from a review of the publications issued.

The following publications have been completed to date and may be obtained on request through the proper channels:

ORDNANCE SCHOOL TEXTS

OS 9-3 Hispano-Suiza, 20mm Automatic Cannon, Type 404.
OS 9-5 Shotguns.
OS 9-8 Telescope, B.C., M1915, M1915A1.
OS 9-9 Telescope, Panoramic, M6.
OS 9-10 Finder, Range, 80 cm Base, M1914M1.
OS 9-11 Finder, Range, 1 meter Base, M1916.
OS 9-12 Finder, Range, 80 cm Base, M1917, M1917M1.
OS 9-14 Telescope, M5, M5A1.
OS 9-15 Glass, Field, Type EE.
OS 9-16 Telescope, Panoramic, M1.
OS 9-17 Film Strip Lecture, The U.S. Rifle, M1, Lecture No. 1.
OS 9-19 Circle, Aiming, M1.
OS 9-21 Film Strip Lecture, The U.S. Rifle, M1, Lecture No. 2.
OS 9-24 The Transportation of Ammunition, General Information.
OS 9-28 Quadrant, Gunners, M1.

(Additional late issue Ordnance School Texts are listed on page 112.)

TENTATIVE TECHNICAL MANUALS

TM 9-2602 The Instrument Repairman, General Information.

TENTATIVE FIELD MANUALS

*FM 9-5 Ordnance Service With the Field Forces.
*FM 9-6 Ammunition Supply.
*FM 9-10 The Ordnance Company, Medium Maintenance.
*FM 9-11 The Ordnance Section, Infantry Division, Triangular.

MOBILIZATION TRAINING PROGRAMS

MTP 9-1 Ordnance Enlisted Replacements at Ordnance Replacement Training Center.
MTP 9-2 Ordnance Company, Maintenance.
MTP 9-3 Ordnance Company, Ammunition.
MTP 9-4 Ordnance Company, Depot.
MTP 9-5 Ordnance Company, Aviation, Air Base.
MTP 9-6 Ordnance Company, Aviation, Bombardment.
MTP 9-7 Ordnance Company, Aviation, Pursuit.

TROOP SCHOOL PROBLEMS AND BULLETINS

Problem No. 1. The Ordnance Section, Infantry Division, Triangular.
Problem No. 2. The Ordnance Company, Medium Maintenance.
Problem No. 3. The Ordnance Company, Aviation, Air Base.
Problem No. 4. The Ordnance Company, Aviation, Bombardment.
Problem No. 5. The Ordnance Company, Aviation, Pursuit.
Bulletin No. 1. The Ordnance Company, Maintenance, Railway Artillery.
Bulletin No. 2. Ammunition Supply in The Air Force.
Bulletin No. 3. Ordnance General Supply and Ordnance Maintenance Operations in the Air Force.

*Not available for general distribution at this time.

# MILITARY SECTION

By: J. C. Nelson, M. Sgt., Ord. Dept.
and
C. F. Endsley, 1st. Sgt., Ord. Dept.

The Military Section of The Ordnance School is in general charge of the administration of the enlisted personnel of the School. Prior to Jan. 1, 1941, the section was a part of the 40th Ordnance Company (Tng.), but since that time, it has been set up as a separate office. The section has, normally, an officer director and about five enlisted men assigned to it.

In general, the Section acts as a battalion headquarters for the 40th Ord. Co. and the six provisional companies attached to the School. It directs the training of the officers assigned to the school companies, supervises the military instruction of the enlisted students of the school, trains the cadres of the provisional companies, and is the channel of communication between the provisional companies and higher authority. In addition, the director of the section represents the School on the Post Exchange council and directs the training of student officers in close order drill.

The approved organization of the Ordnance School calls for enlisted personnel to be organized into the 40th Ordnance Company, (Tng.) and 6 Provisional Training Companies. Several months before the provisional companies were organized, the training of their cadres and officers was started. Several young reserve officers were assigned to the 40th Ord. Co. for training in the duties of Company Commander under the personal supervision of Capt. T. W. Cooke and Master Sgt. J. C. Nelson. A special course of study was outlined for them and they were given as much practical experience as possible with the Company. Twelve enlisted members of the Company were selected for intensive training, six for 1st Sergeants and six for supply sergeants. The provisional companies were organized successively as the number of students in the school increased, and the room for housing them became available. Each company was started with a trained officer, 1st Sgt. and supply sgt. The rest of the cadre received its training in the company itself. The success of this training is shown by the manner in which the provisional companies have been operating since their organization.

The 40th Ordnance Company is the permanent training company of the Ordnance Department. It adminis-

Captain G. L. Bettman
Director, Military Section

Second Lieutenant P. E. Johnson
Commanding 40th Ord. Co. (Tng)

ters to the permanent enlisted personnel of the School. The permanent cadres of the provisional companies are on detached service from the 40th Ord. Co. There are 20 Master Sgts., 7 First Sgts., 34 Tech. Sgts., 107 Staff Sgts, 33 Sergeants, 30 Corporals, and 151 Privates and Privates first class in the 40th Co. They compose the instructors, assistant instructors, and general overhead of the school. The Company is authorized to have 90% of its strength composed of 3-year enlisted men. The 40th was organized in 1921 as a training company at Raritan Arsenal and remained there until July 16, 1940, when it moved to its present location at Aberdeen Proving Ground. Practically every first three grader in the Ordnance Department prior to July, 1940, has been attached to the 40th Ordnance Company at one time or another during his Army career.

The 1st Provisional Ordnance Training Company was the first of the provisional companies to be organized to take care of the expansion of the School. Originally consisting of students, it has, since July 8, 1941, been designated as the officer candidate company. The first class of officer candidates started with 50 men, the second with 100, and, according to rumor, the next class will be still larger.

The 2nd, 3rd, 4th, 5th and 6th Provisional Ordnance Training Companies are composed of students; selectees, National Guard and Regular Army. Each of these organizations has about 250 men. They are attached to a company for the length of time that their course of study lasts, and then returned to their home organizations or assigned to organizations in the field. This gives each provisional company a complete turnover every three months.

The Ordnance School has an approximate capacity at present, of 4,500 enlisted students a year, and the Military Section is geared to take care of their requirements.

# WANTED!

## INVENTIONS FOR DEFENSE!

If you have an idea or an invention that may be of value to National Defense, the Government invites you to send it to the National Inventors Council, Commerce Building, Washington, D. C., with the assurance it will receive the consideration it merits and be handled confidentially.

This Council acts as a clearing house for defense ideas and inventions, carefully considers all ideas, and passes along the more promising (with recommendations) to the arm of service most likely to find them of value. In addition to ideas of direct interest to the Army or Navy, the NIC will consider aviation inventions if they have potential value.

Recompense is outside the sphere of the NIC and is taken care of by the department receiving the idea or invention. Legislation has established the legal basis (either purchase or licensing) for Government compensation for inventions, but certain rules must be observed.

# THE OFFICER CANDIDATE SCHOOL

By: E. H. Kibler, Capt., Ord. Dept.,
Director, Officers' Courses and Officer Candidate School

Since the First Officer Candidate arrived at The Ordnance School last July two classes have been graduated and sent to Ordnance Organizations in the field. Reports received already indicate that these officers have definitely proven themselves a valuable asset to their organization and that the effort expended in their training has begun to pay excellent dividends.

The prime prerequisite in the selection of men in the Officer Candidate School is that of leadership, although high educational qualifications are necessary. Among the boards before which applicants appear there is a wide range of methods, varying in degree and intensity used in determining an applicant's qualifications for the Officer Candidate School. In many instances men are asked only elementary questions regarding their physical qualifications. In other instances, a thorough study is made of such applicants to ascertain his background, his previous environment, his hobbies, his friends, his education, his work, his experience in handling men and the many small details of his life that go to prove or disprove his ability as a leader. Questions of a technical nature or questions pertaining to current events may be asked in order to draw out the applicant for the purpose of studying his reactions, studying his ability to think clearly, concisely and coherently and to see if he is able to put his thoughts into words. The applicant may be questioned on many and varied subjects in a very short time in order to determine his adaptability to change his trend of thought.

In order to determine the capability of the Candidate there is appointed an Officer Candidate Board of three (3) Officers, operating under the supervision of the Commandant of the Ordnance School. The Officer Candidate Board is operated through the medium of the drill instructors and the academic instructors and is the custodian of all records. This board interviews each Candidate, much in the same manner as the Examining Boards interview applicants for the School. Here, however, the interview is much more intensive and much more time is devoted to studying the man. After these interviews are accomplished the Board meets frequently and conclusions are reached regarding each Candidate. Those who are questionable are observed closely and are given every opportunity to develop their deficiencies. The Board then compiles a list of those men who are not officer material and recommends to the Commandant of the School, the final authority, that these men should be relieved. After reviewing carefully each case, the Commandant then directs the relief of the Candidate or directs that he be carried for further observation.

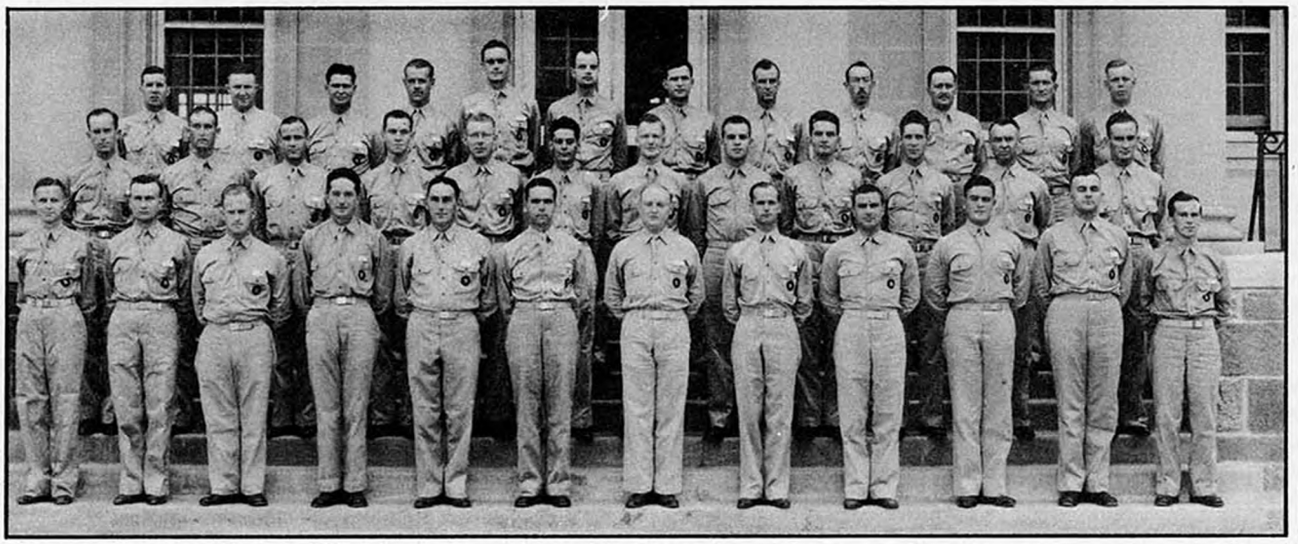
The purpose of the Officer Candidate School is to turn out 2nd Lieutenants who have the requisite leadership qualities and as much academic, practical, and theoretical knowledge as can be absorbed by them in a period of three (3) months. During these three months it is first necessary to take the Candidate and make a soldier of him. This is accomplished by impressing upon him the discipline, honesty, loyalty and all such characteristics incident to a good soldier. It is believed by the Officer Candidate Board that these men must have a sound foundation in these qualifications, before they become officer material. Although many of these men have had this training, a large proportion of them have received it without close supervision. The successful applicants report to the School from one to four days before the opening of the Course. During this time squad room assignments are made, text books are issued and all details not essential to the Course itself are eliminated. The School opens on the appointed day with a welcoming address by the Commandant. Objectives are pointed out and stressed. The Candidates are then appraised of what happens to those who do not meet the required standards. After the Commandant's address the Candidates start regular instruction.

The Officer Candidates' day is filled to the brim with activity. It begins with reveille at 6 A.M. and ends at the close of a two-hour evening study period at 10:30 P. M. During the first month the first period of morning and afternoon is devoted to drill. Once a week mass athletics are conducted for two hours. Each Saturday morning brings a rigid inspection followed by extemporaneous and formal lectures given by the Officer Candidates.

The complete course of 542 hours is divided into subjects as follows:

| | |
|---|---|
| Calisthenics | 4 hours |
| Drill | 69 |
| Mass Athletics | 22 |
| Military Subjects | 112 |
| Inspections | 12 |
| Leadership and Lectures by Candidates | 42 |
| Company Administration | 72 |
| Automotive | 32 |
| Ammunition | 30 |
| Depot & Supply | 64 |
| Small Arms | 28 |
| Artillery | 27 |
| Fire Control | 20 |
| Interviews | 4 |
| Clearance | 3 |
| Graduation | 1 |
| Total | 542 hours |

The first month of the course, although fairly easy academically, appears to be the most difficult. Candidates have to become oriented to their surroundings and routine, as well as getting into the habit of studying nightly for the next day's classes. Academically this month is allotted entirely to military subjects, such as military law, Hygiene, Map Reading, etc. Knowing that the first month is the one in which their potential qualities of leadership must be developed, the officer candidate feels the full pressure of the system. It is for this reason that the Officer Candidate Board experiences its greatest task — the problem being to determine just which men are actually lacking these qualities essential for leadership and just which men have the potential qualities but who, through bad cases of "buck fever", are unable to demonstrate their real qualities. Age, inexperience and a myriad of little factors must be taken into consideration in placing the men in the proper categories.



THE FIRST OFFICER CANDIDATE CLASS

The second and third months are devoted almost entirely to administrative and technical subjects. During this period, drill is reduced from two hours per day to forty minutes per day. This time is utilized by the instructor in observing any questionable or borderline cases, also in developing and polishing those Candidates who have successfully passed the first month.

The Candidates are notified at the opening of the Course that they are being observed at drill, at athletics, in the class room, in the mess hall and in the barracks. Any member of the Staff and Faculty of the Ordnance School is encouraged to make reports in writing on all discrepancies or on all commendatory matters at any time. A pamphlet of instruction, which is issued to each Candidate on the first day, serves as his Bible for the three months that follow. This pamphlet defines his status, his limits, his privileges, his etiquette, and it determines his actions in any incident that may confront him at any time. Delinquency reports or infractions of these instructions are submitted daily and are filed in their individual files. The purpose of this instruction is not to bury his initiative,

## GENERAL CHARACTERISTIC CARD

..... (Name) ..... Candidates Class

| SUBJECT | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PHYSICAL FITNESS** (physique, posture, physical stamina) | | | | | | | | | | | | | |
| **MILITARY BEARING AND PERSONAL APPEARANCE** (dignity of demeanor, neat and tidy in person and uniform) | | | | | | | | | | | | | |
| **ALERTNESS** (physical and mental, ability to work rapidly and think quickly) | | | | | | | | | | | | | |
| **INTELLIGENCE AND JUDGEMENT** (ability to grasp readily new ideas and instructions-to think clearly and arrive at logical conclusions) | | | | | | | | | | | | | |
| **ATTENTION TO DUTY** (industry the trait of working thoroughly, conscientiously and willingly) | | | | | | | | | | | | | |
| **DEPORTMENT** (conduct-promptness, sobriety and obedience) | | | | | | | | | | | | | |
| **LEADERSHIP** (capacity to direct, control and influence others-actual and potential qualities to be considered) | | | | | | | | | | | | | |
| **FORCE** (faculty of carrying out with energy and resolution that which is believed to be reasonable, right, or a duty) | | | | | | | | | | | | | |
| **COMMAND PRESENCE** (voice, bearing and conduct in command duties) | | | | | | | | | | | | | |
| **ADAPTABILITY** (temperamental, moral and physical qualities for military life) | | | | | | | | | | | | | |

**REMARKS:** ..... By ..... Name ..... Rank

but rather to teach him to live with his fellow men, to pay attention to details and to furnish a unit of measure to determine his ability to follow instructions. An individual file is kept on each man and into this file goes every report, good or bad. These reports build up over the course of three months to such an extent that a very good insight of the man himself may be derived from a character study of this file. Also into this file goes the "General Characteristics" card which is nothing more than a grade or rating on the Candidate in ten (10) essential leadership characteristics. A reproduction of the "General Characteristics Card" is shown on page 23.

From the first day, each drill instructor grades daily each Candidate in the above characteristics. The marks of the several instructors on any individual are then consolidated into one single entry in the individual's file. At the end of each month this method averages out any difference of opinions of the instructors. The last two weeks of the Course is considered as a transition period, in which the Candidate is allowed more leeway. During this period he is being groomed for his second change of status, from that of an Officer Candidate to that of a Commissioned Officer (The first change of status being that from an enlisted man to that of an Officer Candidate).

The freedom of the Candidate is limited to those holidays declared by the War Department and to the week-ends from Saturday noon to Sunday evening. In addition to this there is one afternoon each week from 2:40 P.M. until 4:30 P.M. devoted to recreational activities in the form of mass athletics, attention being devoted to competitive team games of those sports in season. Here again much can be learned of the participants by the Officers Candidate Board and by the instructors.

The objective of the Officers Candidate Course is to turn out 2nd Lieutenants who will be able to perform the duties of an Ordnance Officer in the field or in any of the Ordnance organizations. To this end the Staff and Faculty of The Ordnance School bends every effort to raise rather than lower the already rigid standards.

CIVILIAN AMMUNITION INSPECTORS' CLASS

# CIVILIAN AMMUNITION INSPECTION

By: L. I. Dance, M. Sgt., Ord. Dept.

During the last two years there has been a considerable increase in the quantities of ammunition stored and handled by the Field Service Division of the Ordnance Department.

It is essential that properly trained personnel be used to periodically inspect this ammunition while in storage to determine its serviceability, to see that necessary safety precautions are complied with by workmen in depot magazine area, to determine causes of unserviceability, and to make recommendations to the Commanding Officer of any necessary additional safety regulations. This is just a broad summary of the various duties of ammunition inspectors, intended to give only their general duties.

Prior to these increases in ammunition stores, a very small crew of trained civilian inspectors could and did perform these duties, but were unable to take on the vast added load. It became necessary to train additional men to assist in the performance of these duties. In July, 1941, the Ordnance School was called upon to provide parts of this training for about fifty (50) men selected from among munitions workers of various ordnance ammunition depots. These parts of the training were: Explosives and their characteristics; construction, functioning, identification, storage, transportation, and inspection of all ammunition and ammunition components in current service, as well as destruction of unserviceable ammunition.

The preparation of the course and instructing of these men was delegated to the Ammunition Section of the Ordnance School. The course was prepared and Technical Sergeant Phillip Schuyler was put in charge of the class with the privilege of using any additional instructors of the Section he deemed necessary. The course of instruction was to be of approximately five (5) weeks duration. Mr. H. F. Harris, senior ammunition inspector, was delegated by the Ordnance Office as the administrative head of the class to relieve the Ordnance School of this responsibility.

The class opened on July 28, 1941, with these sellected students, as the first known one of its kind.

These men proved to be eager to learn their job and cooperated wholeheartedly with the instructors in their work.

Of the original fifty (50) students who started, five (5) were dropped out early in the course due to insufficient educational background and not because of any misconduct. Those five (5) men were undoubtedly good men, tried and true, but their lack of education prevented them from keeping pace with the rest of the class. The class photo shown, includes Mr. Harris and all those fortunates who graduated on August 29, 1941. We wish them every success, and their work will prove the job the Ordnance School did on them.

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1846 — "Remember the Alamo!" 1898 — "Remember the Maine!"
1941 — "Remember Pearl Harbor!"

# MARINE CORPS ORDNANCE INSTRUCTION

**By: Captain Norman Hussa, U. S. M. C.**

It is a pleasure to contribute to the first anniversary issue of THE ORDNANCE SERGEANT, the official organ of The Ordnance School, Aberdeen Proving Ground, Maryland.

The attendance of marines at this school is not a recent innovation. They have received instruction here since 1934, the first class being graduated in 1935. That class comprised two officers and ten enlisted men. This number has not varied greatly through the years, until 1941. At the moment, we find seven officers and forty-six enlisted men at the School. An interesting feature concerning the Marine Detachment is the fact that eight of its members are accredited instructors, charged with imparting information to their mixed classes of soldiers and marines. Among these, we find Marine Gunner Moberly, and Platoon Sergeants Brown, Thomas and Atcheson with the artillery section, Platoon Sergeants Adamski and Bartoszek in the ammunition section, and Master Technical Sergeant Williams, Platoon Sergeant Watkins and Sergeant Ogilvie with instrument repair.

Marine officers find available to them the following courses: fire control, ammunition, artillery, automotive, and depot and supply. There are others, of course, but these concern us most. For the men there are artillery, ammunition, instruments and fire control.

In times past arsenal jobs on marine equipment were performed by the Army. However, with the recent tremendous expansion of the army its facilities may not be available, in the future, to the Marine Corps.

Hence, the inception of a Marine Corps Ordnance School with its attendant artillery and fire control repair shops. By the summer of 1942, it is hoped that those ordnance activities will be in full swing at Marine Barracks, Quantico, Virginia. A similar establishment may be set up on the West Coast.

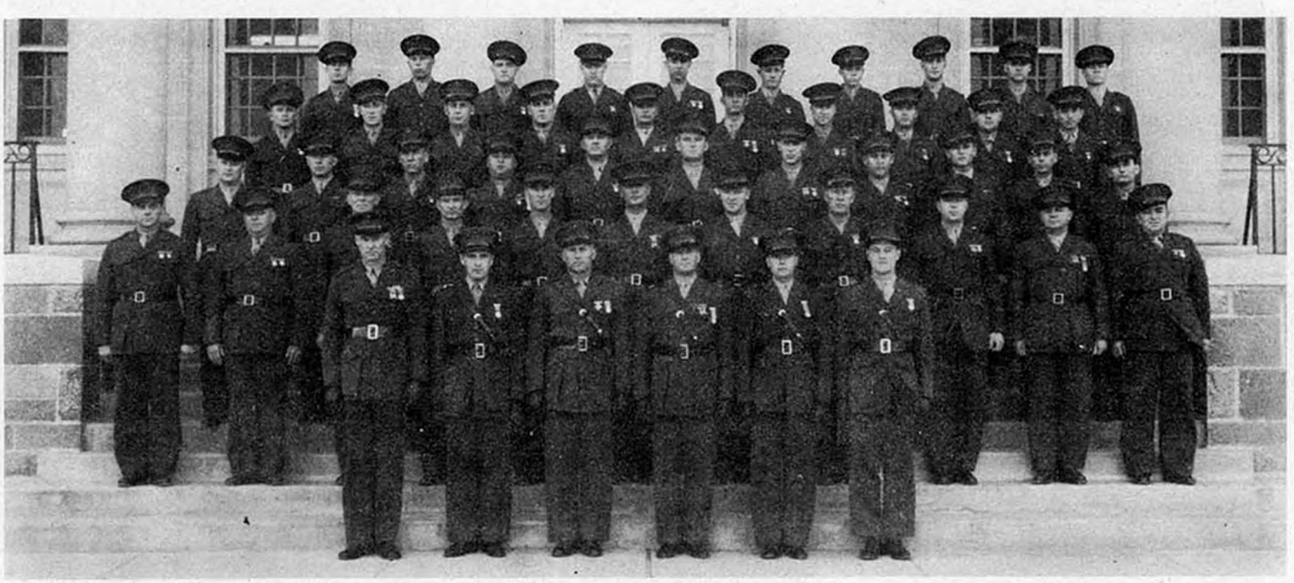
At this point, it may not be amiss to propose a vote of thanks to the authorities of the Ordnance School at Aberdeen Proving Ground for their cooperation and forbearance. Let it be understood that this post has mushroomed from an establishment of about seventeen hundred officers and men to eleven thousand in a few months. In spite of these acute growing pains, the Army, which could make excellent use of the barracks and facilities now being used by the Marines, has been kind enough to allow us to remain here under these extraordinary conditions.

It is not improbable that the Army and Marine Corps will be again brigaded together. Tradition records a Napoleonic epigram: "History is a pack of lies agreed upon". However, it is definitely no lie that the Ninth and Twenty-Third Infantry Regiments and the Fifth and Sixth Marines made history in 1918. The German General Staff will testify to that.

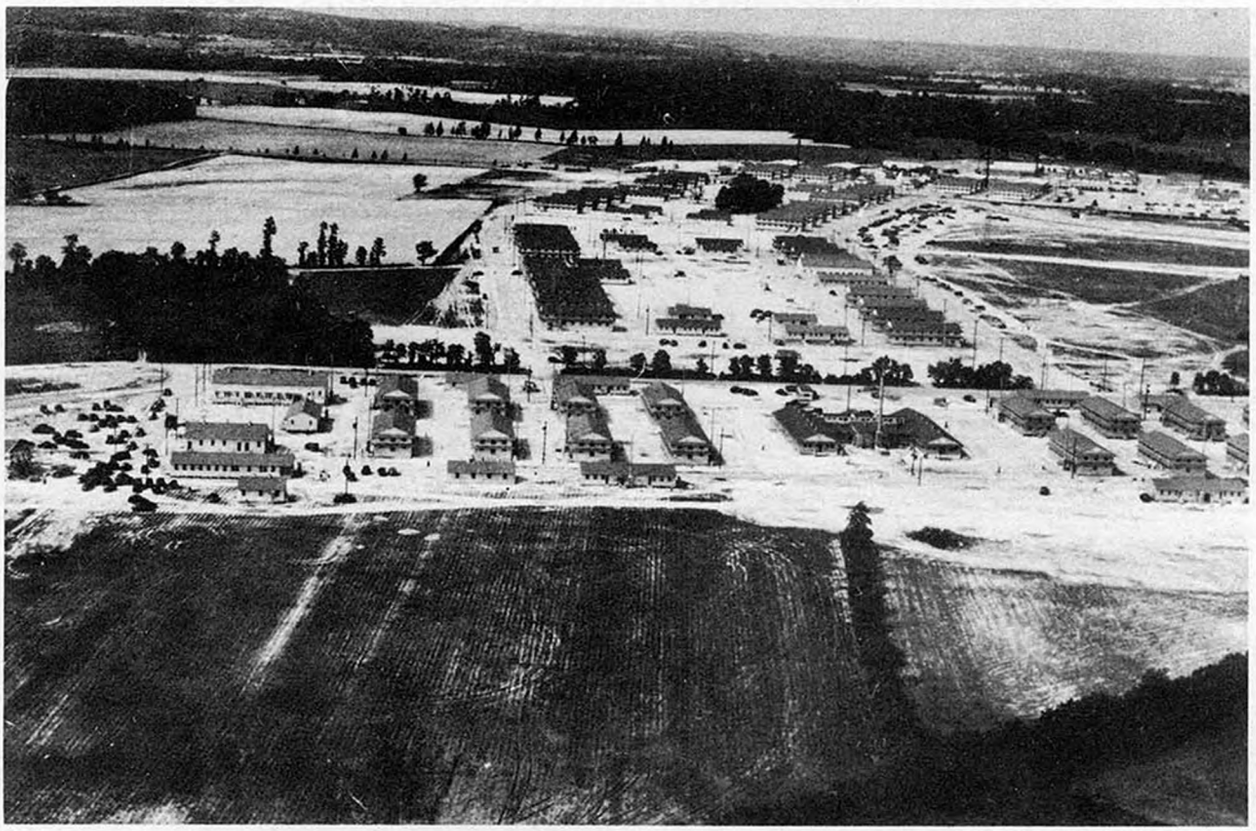
Today, as never before, there is a crying need for an efficient, energetic and far-sighted Ordnance Department — in the Army, in the Navy, in the Marine Corps. Considering the universal mechanization, the complexity of modern fire control equipment and the difficulties of the supply problem with which all branches are confronted, it is axiomatic that the force with the best Ordnance outfit should gain the upper hand.

Unimpeachable military records point an accusing finger at the A. E. F. during World War I with respect to the supply of ammunition and rations. To quote another Napoleonic epigram: "An army marches on its stomach". But an army fights with guns and ammunition. To get the ammunition to them, and the right ammunition, is the job of the Ordnance Department. Imagine, if you will, sending 155 gun ammunition to an outfit that requested 155 howitzer ammunition. Or making an erroneous manometer test on the recoil mechanism of a piece. Or placing the wrong

(Continued on page 104)



MARINE CORPS PERSONNEL, THE ORDNANCE SCHOOL



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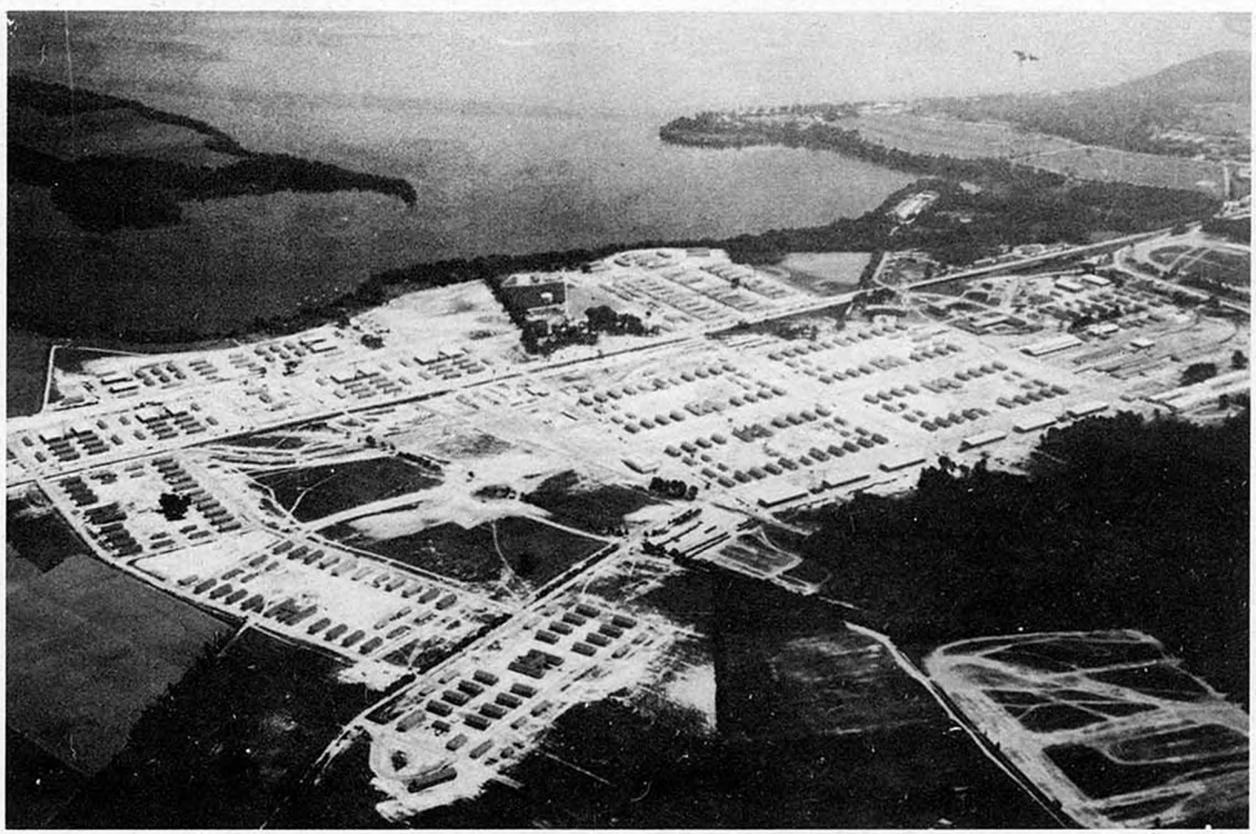

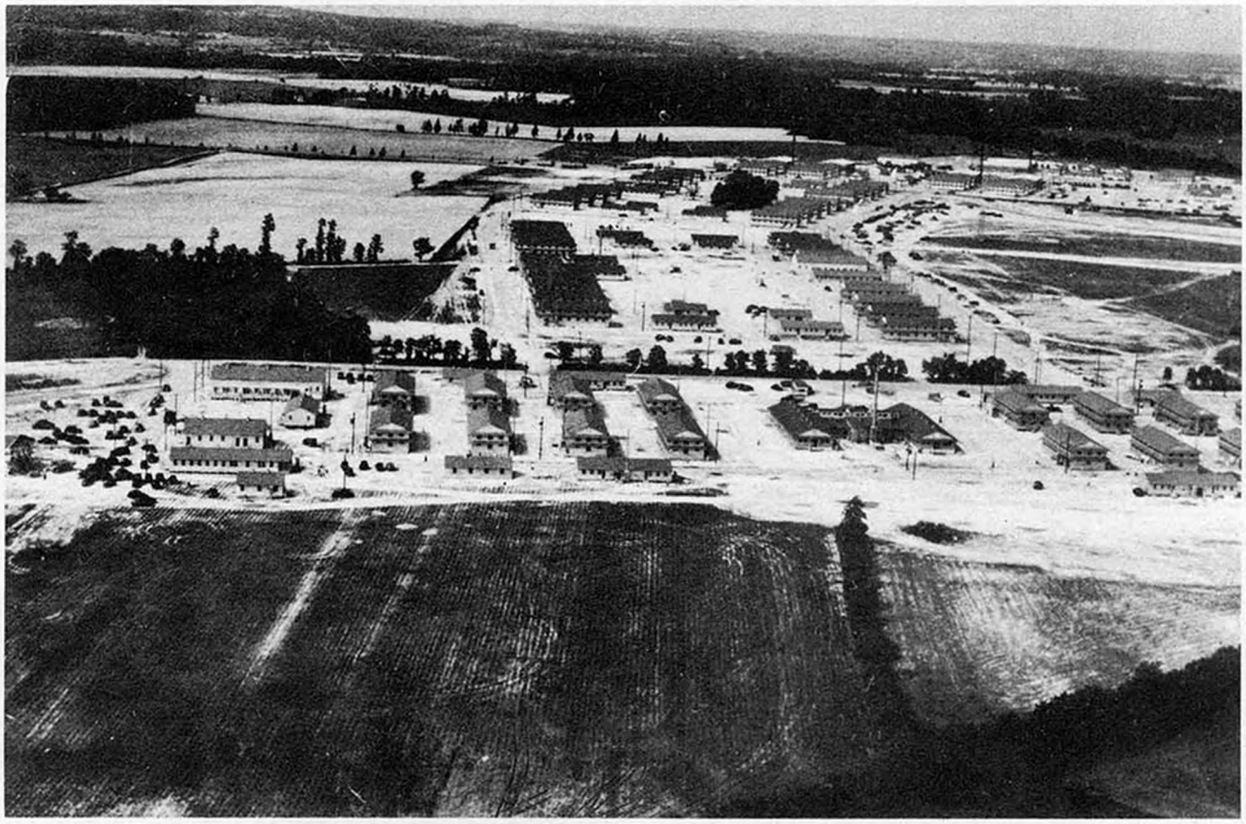

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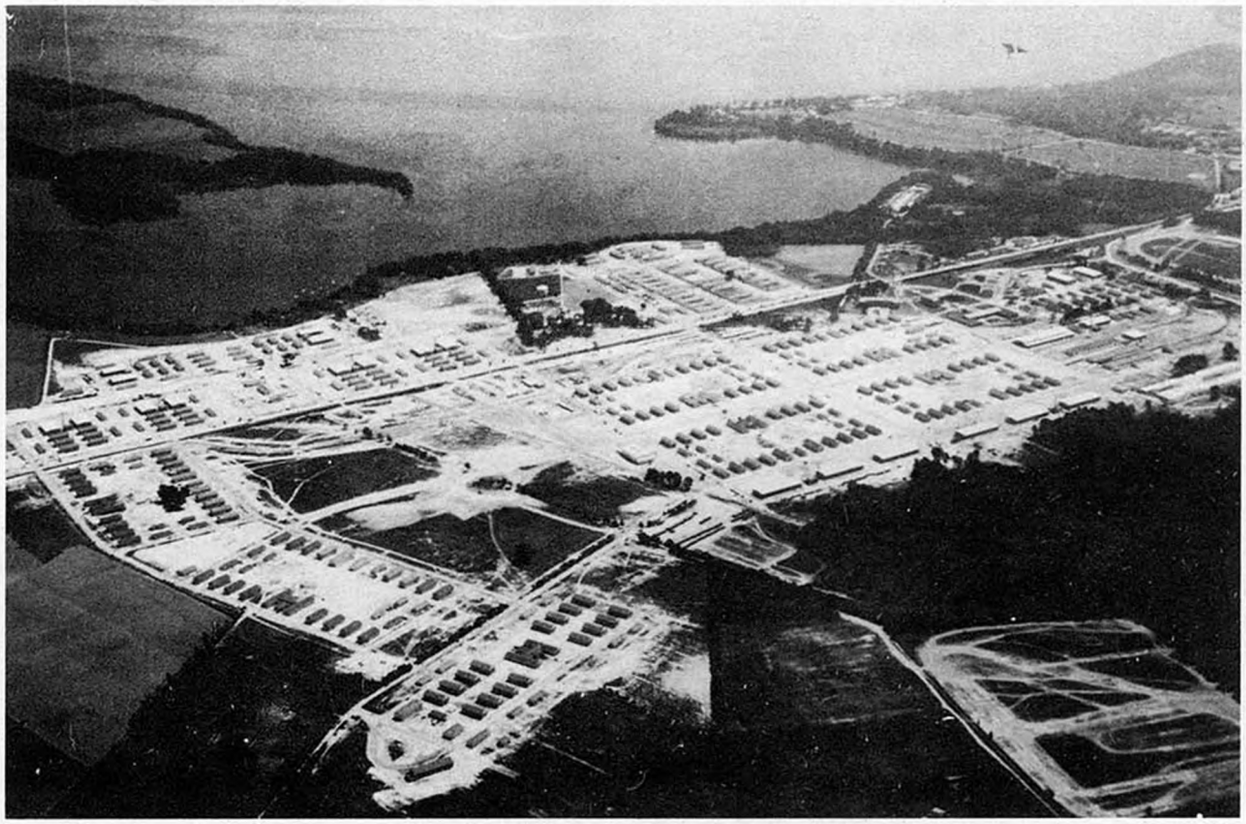


# INSTRUCTING SECTIONS
## of The Ordnance School

The readers of THE ORDNANCE SERGEANT should be more or less familiar with the sections of The Ordnance School which actually devote their time and energies to the instruction of students. Almost every phase of this instruction is included in previous issues of THE ORDNANCE SERGEANT.

On the following pages (most of them at least) these instructing sections tell you of their courses of instructions, their facilities, their methods, and their activities in general.

# SMALL ARMS SECTION

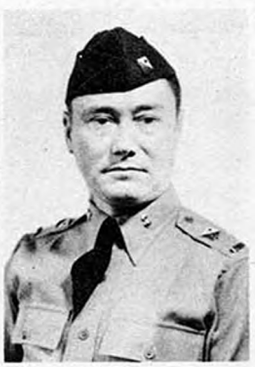
### By: A. E. Keller, M. Sgt., Ord. Dept.

This article will be very general, giving the location, personnel and outline of methods of instruction, plus the weapons on which instruction is given in the Small Arms Section, The Ordnance School.

This section in previous issues of THE ORDNANCE SERGEANT has tried to cover weapons that are in general use, but on which there is very little printed matter available. Often that which can be obtained is vague and of little help to the Post Ordnance Sergeant. The current series of articles on Shotguns, Riot Type, is a good example. Far be it from me to attempt to describe the feelings, language and actions of the usual Post Ordnance Sergeant when he is informed that there are some shotguns on the way to him for repair or other maintenance. With no good publications on hand he usually has to ship them to a higher echelon, knowing that it would probably be but a minor repair job had he a means of getting the information. Needless to say, our articles have been well received and we take this occasion to preen ourselves before the eyes of our readers.

The above photograph gives an exterior view of O. S. S. A. #1, (Ordnance School Small Arms Building No. 1 to you). Being 68' x 162', it has a total capacity of approximately two hundred students, with additional room for an office and an arms vault. Of semi-permanent construction, it is well lighted and steam heated. Classrooms with a capacity of approximately twenty students each take up the majority of the building, with various other rooms as deemed necessary, for example, a workshop. Located a short distance from the Administration Building, it is almost ideally situated for instruction, since interruptions are few.

1st Lt. R. B. Huckstep, Ord. Dept., until recently our Chief Instructor. With the school since June, 1941. Born in Iowa, he soon became acquainted with a saddle, and after a number of years in the Cavalry he attended the NCO Course, Ordnance Field Service Service School, Raritan Arsenal, N. J., in 1935. After graduating he was transferred to the Ordnance Department, and after several years, including a detail as Game Warden at Savanna Ordnance Depot, arrived at this station. His temperament, experience and adaptability made him an ideal choice. At present he is somewhere East, West, North or South of here at a place where a good small arms man was needed.



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[Two other Small Arms articles appear in this issue; Special Gages by S. Sgt. Fabrize on page 72, and a continuation of Shotguns by T. Sgt. Dyer on page 74.]

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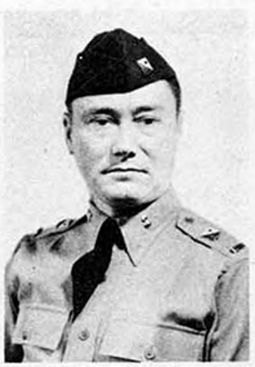

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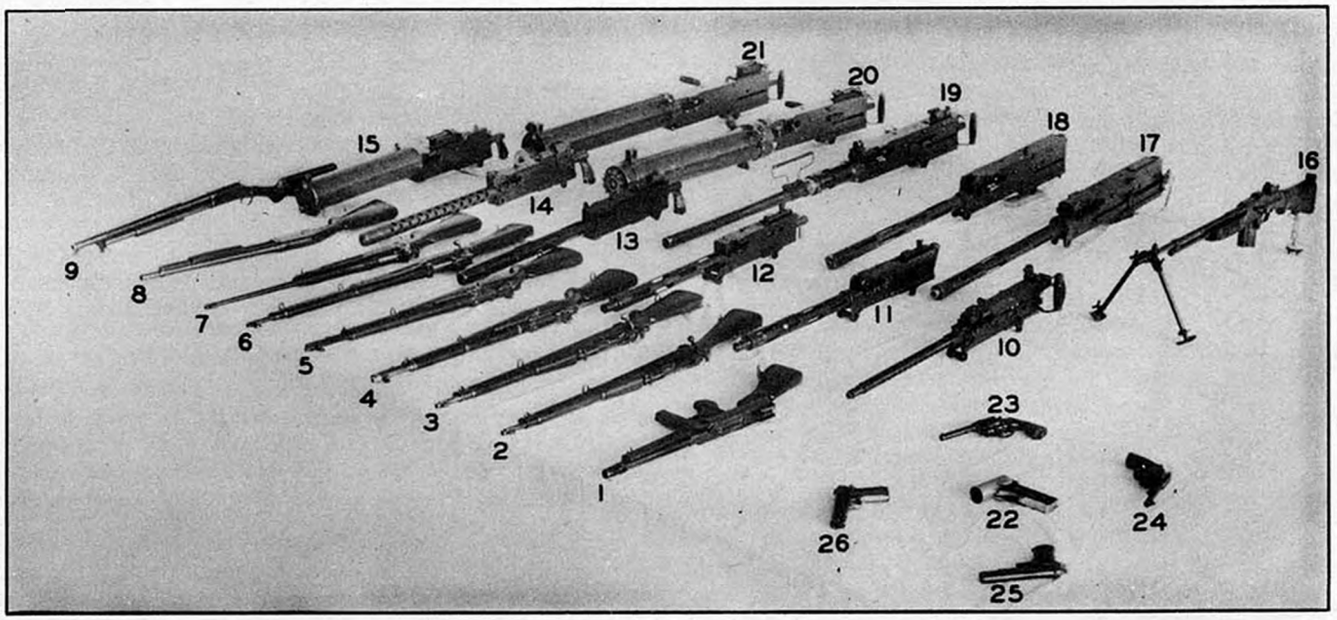



Unassigned, who will be sent (if possible) to a section of the country they prefer, to join an organization in need of men.

Fourteen states are represented, and reading from left to right they are: Front row: J. F. Patton; S. Ruip, H. Kehs; F. Kinnel and K. Sage.
Second Row: J. D. Holwagner; F. Ison; C. P. Cauthen; H. L. Lansburg; S. F. Kadlik; R. H. Gerbrick; E. C. Nilsson and B. L. Bauersacks.
Third row: J. W. Godbold; E. A. Tworek; H. S. Spinks; R. A. McKinney; F. P. Singer, C. F. Koons; J. M. Goralewski and J. M. Nesbitt.
Standing are their instructors: A. C. Fabrize and L. E. Esch.

Each student going through the course gets some necessary time in the use of tools and the identification of metals, then covers each weapon completely according to the ability of the class as a whole. Schedules are somewhat elastic to allow the groups to advance as fast as the subjects can be absorbed. At the end of the time allotted, he is capable of doing a workmanlike job on any detail with small arms, providing of course, that beginning the course he had the necessary requirements of being capable of using his hands and his head. Here and now we state that the term "Small Arms" is quite misleading, because in cases of aviation ordnance students the class are taught the Cannon, Aircraft, both 20 mm and 37 mm, in addition to all the other weapons of .22 to .50 caliber and 12-gauge.

Daily instruction is from 8:00 AM to 11:30 AM, and from 1:00 PM to 4:30 PM, Monday through Friday. As in all schools the amount of time spent in class is a very unreliable measure, as it is the additional time each student studies "on his own" that brings out the difference between John Doe and Richard Roe. John is the man who when graduated can probably do the job he is detailed on under supervision, and Richard is the man who will do an excellent job on any detail without supervision.

Above is a long distance view showing a majority of the weapons, less mounts, that we teach each specialist class. It includes all the weapons of current issue, and identification, nomenclature, disassembly & assembly, inspection, repair and overhaul are taught on all. Mounts are also covered, but in less detail. Reader, can you name all the weapons that are shown giving the correct nomenclature? Two gets you five that you cannot do it on the first or second attempt.

(Page 87 shows whether you are right or wrong.)

Regulations and texts furnished the students while they are here are only satisfactory. While not complete in the ideal sense, they are probably more so than any set the student will be able to obtain after returning to the field. Some few necessary texts are made up here, but we try to work as much as possible with the regulations as issued, due to the fact that the student will have only those to work with after he graduates.

After working with each weapon a written examination is given covering it. Exams are usually given weekly and may cover more than one weapon. As each student has a tendency to wish to keep a copy of the questions, complete new sets are written for each class. That is a sad disappointment to the occasional student who troubles himself to make the acquaintance of one or more of the men in the groups a month or more in advance of him. However, for the time allotted the average student soaks up knowledge like a sponge soaks up water, and can be rather sure of himself as an armorer.

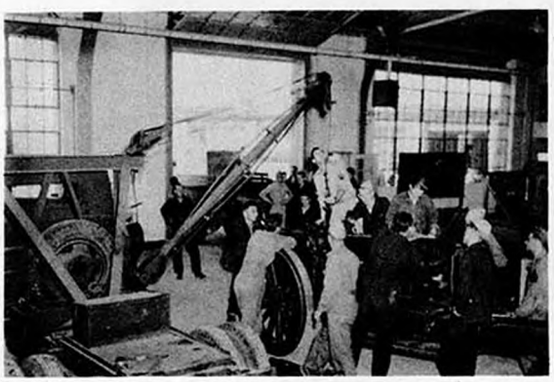
There is little, if any, information in this article, but that is quite all right as it was not (I repeat -- not) written during time usually allotted to Uncle Sammie. This is not the exception, but the usual occurrence -- much electricity that should be used to waken chickens in the early hours of the morning to induce them to lay more for defense is being used in writing both this type of article and those containing useful information. So if you have read this far -- well, better turn to Sgt. Dyer's article on shotguns which will undoubtedly be of more value to you as an "Ordnance Sergeant".

# ARTILLERY SECTION

By: C. C. Ruehle, Tech. Sgt., Ord. Dept.

The Artillery Section of the Ordnance School is sub-divided into four sections. The sections and their specific functions are comprised as follows:

A Headquarters Section with personnel consisting of a First Lieutenant as the Department Head and one Sergeant with the duties of chief clerk and stenographer, execute all the administrative and supply functions of the section with the assistance of one First Class Private storekeeper. The Artillery Specialist Sections, of which there are three, have an instructor staff of three Commissioned Officers, thirteen first three grade noncommissioned officers and two Sergeants.



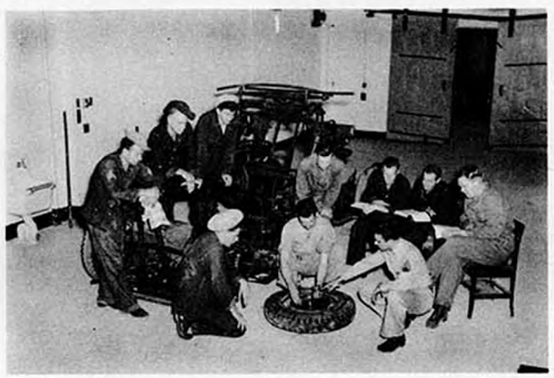
Employing the light wrecker for the disassembly of the cradle of the 155 mm howitzer, M1918.

Detailed disassembly of the 75 mm Gun and Carriage, M2A2.

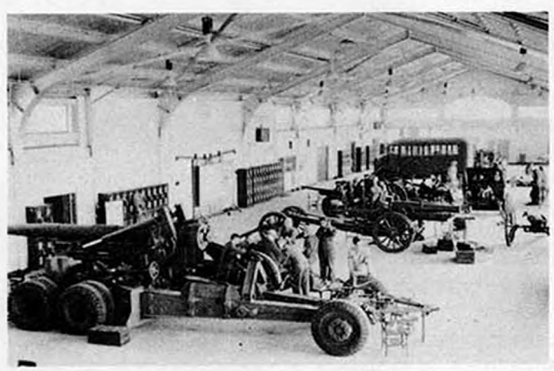
Each section is operated under the direct supervision of a Second Lieutenant who is designated as the Senior Instructor of the section. There is in each section one private who acts in the capacity of a mechanic and assistant to the instructors of the section. The sections with their various assignments of classified materiel are as follows:

| | |
|---|---|
| First Section (Heavy Artillery) | 155 MM GUN AND CARRIAGE, M1918; 155 MM GUN AND CARRIAGE, M1; 155 MM HOWITZER AND CARRIAGE, M1918A1. |
| Second Section (Division Artillery) | 37 MM GUN AND CARRIAGE, M4, 75 MM HOWITZER AND CARRIAGE M3A1; 75 MM PACK HOWITZER AND CARRIAGE, M1A1; 75 MM GUN AND CARRIAGE, M2A3, 75 MM GUN AND CARRIAGE, M2A2; 75 MM GUN AND CARRIAGE, M1897A4; 105 MM HOWITZER AND CARRIAGE, M2. |
| Third Section (Anti-Aircraft Artillery) | 37 MM A.A. GUN AND MOUNT, M3; 3" A.A. GUN AND MOUNT, M2A2; 90 MM A.A. GUN AND MOUNT, M1. |

Due to the varied number of weapons assigned to the Artillery Specialists Section for instructional purposes, the section has been divided into three separate sections as outlined above, each having assigned thereunto a certain type, caliber and number of weapons. Organization of the section in such a manner permits the instructor to thoroughly prepare himself to give comprehensive instructions, lectures and demonstrations in the limited time allotted, whereas, should each instructor be required to carry a class through the entire course covering some thirteen weapons, many of the instructors would, without question, due to the numerous complex technical features now incorporated in the modern artillery weapon, be confronted

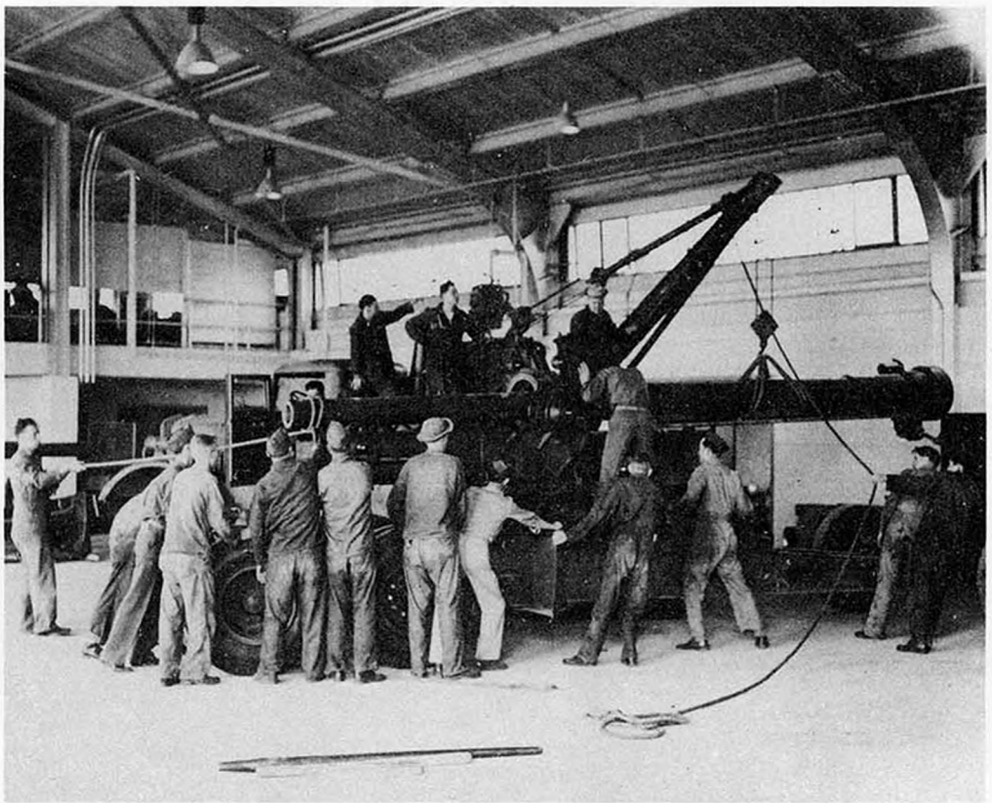


Gaging and testing the electrical brake system of the 37 mm AA gun mount, M3.

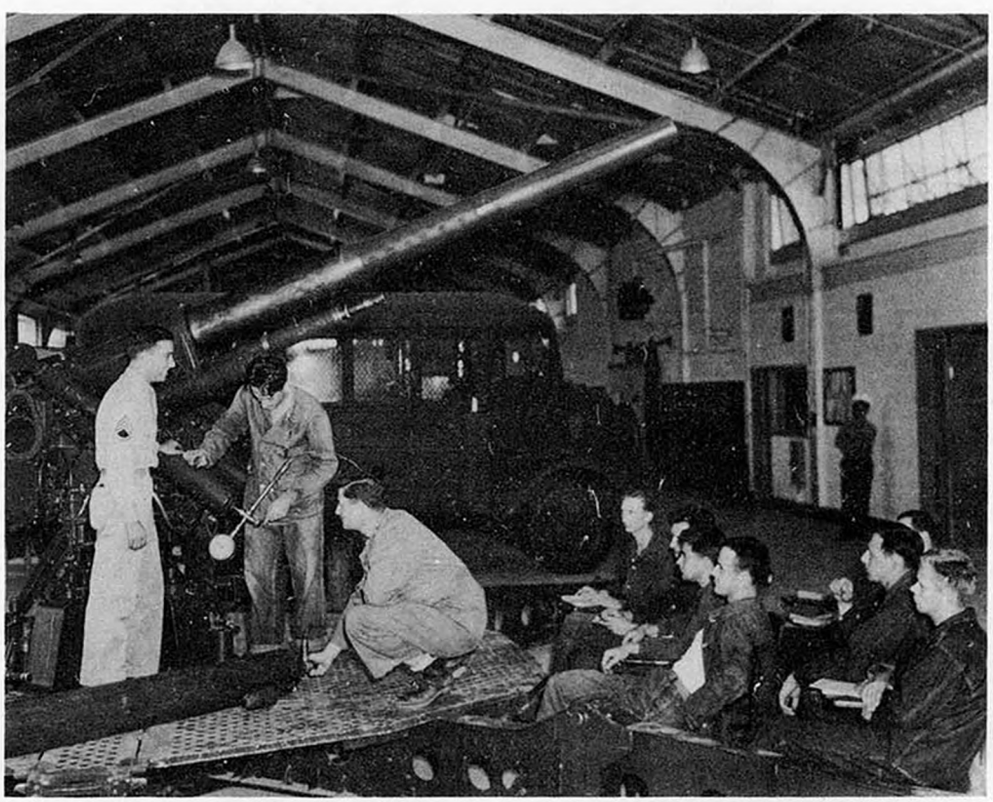


General view of the main class room of the Artillery Section with several classes in session. Five additional classrooms adjacent to the main class room are used for study rooms, lectures, and classwork with the smaller weapons.

[Another Artillery article will be found on page 78.]



Students employing the use of the M1 wrecker to remove the 155 mm Gun tube M1. Tube weighs approximately 9,640 pounds.



Students receiving instructions and a practical demonstration of the method employed to replenish the nitrogen gas and manner of adjustment of the pneumatic equilibrator of the 3 inch AA gun mount, M2A2.

Manometer test of the 75 mm Howitzer, M3A1.

Star gaging a 75 mm gun with a three point, lever type star gage instrument.

with the enormous task of constant study and preparation for class work.

The Artillery Mechanic

The Artillery Specialists Course has been designed to prepare the student, upon successful completion of the course, as an artillery Mechanic with a general knowledge of the field artillery weapons covered in the course, maintenance problems incident to inspection and repair of artillery materiel, the proper use of special repair tools and equipment required by the Ordnance Maintenance Company engaged in actual operations, also, the functions of the Artillery Section within the Ordnance Maintenance Company.

The course opens with a lecture on "Artillery in general" to acquaint the student with the various types of guns, carriages, brief characteristics of each and a summary of the theory of recoil mechanisms and the manufacture of gun barrels. A brief course in rigging follows, teaching the essential knots, splices, uses of rope, chain, cable and blocks as required to be applied by the artillery mechanic both in the shop and in the field.

The general procedure of class instruction on artillery weapons is to teach general data, characteristics, operation, disassembly, assembly, inspection and repair, sight adjustments, star gaging, special reports and instructions covering the materiel being inspected, the use of the gun book and inspection forms in addition to the proper use of technical manuals and other publications pertinent to the subject weapon. Lectures with training films, some accompanied by sound, are shown from time to time to amplify instructions and create interest among the students, especially those who may find it quite difficult to create their own interest on the subject.

In view of the relatively short time allotted for the Artillery Mechanic's Course, the graduating student is by no means a "finished" mechanic. It is hoped that the student will, on his own initiative, broaden his knowledge of the fundamentals of Ordnance Maintenance required of the Artillery Mechanic as soon as practicable upon his assignment to an Artillery Section of an Ordnance Maintenance Company.

It is not expected of the graduating student that he be thoroughly qualified to perform intensive repairs and critical adjustments without the guidance of experienced and skilled mechanics; such qualifications can only be attained by considerable practical experience, however, he should be able to disassemble, assemble, inspect, and replace worn parts; make the necessary adjustments and repairs to the fullest extent of his ability with the available equipment and facilities that may be on hand; or supervise such work with some practical experience gained while actually engaged in the maintenance problems; be able to diagnose most problems that may arise, and cope with the situation. Difficulties and problems in the field are of such magnitude that it is impossible to discuss and teach remedies for each in detail to the student attending a brief course of instruction at the Ordnance School. Therefore, only the student possessing initiative, intelligence, and good judgement can be expected to fulfill the requirements of an Artillery Mechanic.

# AUTOMOTIVE SECTION

By: K. T. O'Keefe, Capt., Ord. Dept.,

The function of the Automotive Section of the Ordnance School is to train mechanics to maintain and repair Ordnance Automotive equipment. If this mission is analyzed, the following can be pictured:

Each infantry division has one troop of scout cars. Each corps has a regiment of horse-mechanized cavalry with three troops of scout cars per regiment and one regiment of tractor drawn artillery -- 155 m/m Gun. The corps also has the special vehicles of the Corps Ordnance Battalion. Each army has the special vehicles of its maintenance and supply battalion. Each cavalry division has a reconnaissance squadron with three troops of scout cars and one of light tanks. Each motorized infantry division has hundreds of half-track and wheeled combat and special purpose vehicles. Each armored division has hundreds more, including many tanks, both light and medium. General Headquarters Reserve has tractor drawn artillery and tank battalions; and the Air Force Combat Command has hundreds of tractors, bomb service trucks and other special purpose vehicles.

To meet the many requirements necessary to maintain the above groups of vehicles enlisted students must be taught to perform unit replacement of all units pertaining to them. They also must be taught how to over-

haul all types of units, including tank transmissions, radial and in-line engines, magnetos, generators, starters, carburetors and scores of other units of diversified origin, type, model, size and purpose. In order to do this they must be taught to use many tools, both simple and complex. In addition to the above, some of the men, must be taught the use of special vehicles, for example, the M1 Wrecker; how to service, operate and maintain it.

Other types of students attending courses in the section are officers receiving refresher courses, officers specialists, officer candidates and non-commissioned officers.

To better perform its function the automotive section is organized into several sub-divisions or groups. These may be classified as a "command" group consisting of the senior instructor and necessary office force; three general instruction groups, tanks, tractors and wheeled vehicles and half-tracks, and three special groups, officer instruction, carburetion, and wrecker maintenance.

The three general groups each consist of one officer and the necessary enlisted instructors together with required equipment to instruct each type enlisted group. The officer instruction group instruct all officer personnel and officer candidates in all subjects pertaining to their course except tanks, tractors and electricity. The first two of these subjects are taught by the commissioned personnel of their respective sections and electricity by the officer instructor of the wheeled vehicle section.

The service group functions under the control of two commissioned instructors -- these officers acting in a dual capacity, one with supply and the other in the maintenance or utilities group.

The tool and stock room, operating with the personnel assigned to it, functions as a supply establishment, i.e., procurement -- through the school supply officer -- storage, issue and safe-guarding of the parts and tools used by the section, and keeps the necessary records pertaining to the above work.

The present automotive section, with its three general groups and several special ones, is a more or less complex growth from a much smaller section, which in turn had grown from the union of the automotive sections of the Ordnance Field Service School at Raritan Arsenal, New Jersey, and the former Ordnance School, Aberdeen Proving Ground, Md.

A more detailed description of the components of the section, how they were separated into their present organization, their objectives, how they perform their work, how they met the problems that confronted them, and how they are preparing to meet those of to-morrow, will be found in the following sub-divisions of this article.

# TANK GROUP

## By: R. L. Taggert, 2nd Lt., Ord. Dept.

The tank Section of the Ordnance School is at present a husky and rapidly growing sub-division of the Automotive Section of the same institution. In order to describe the objectives of the section and how they were determined; some of the problems encountered during the organization of the section and how they were met; and the training methods used to accomplish the desired objectives of the section, it will be necessary to turn back the hands of the clock to the summer of 1940.

The present Automotive Section of the Ordnance School is more or less the offspring of the similar sections of two different institutions, namely, the Ordnance Field Service School, which was located at Raritan Arsenal, New Jersey, and the Ordnance School, Aberdeen Proving Ground, Maryland. The first school trained non-commissioned officers and specialists for the Department and included as a part of general automotives courses some training on light tanks and their components. The second school gave similar training to officers.

During the months of June and July, 1940, the equipment and personnel of the Ordnance Field Service School was moved from New Jersey to Aberdeen and the present automotive section was organized under the direction of Capt. (then 1st Lt.) F. R. Young. The instructors of the section at that time consisted of Capt. Young and two instructors from Raritan, M. Sgt. (then Tech. Sgt.) J. W. Winslow and M. Sgt. (then S. Sgt.) Freeman. To that, were added three very new and more or less inexperienced staff sergeants, H. J. Martin, Herbert Hansen, and the writer. S. Sgt. Hansen had served some time with a scout car unit of the 4th Cavalry and the writer with a tank unit of the 1st Armored Regiment. Shortly after this Capt. S. A. Daniels, then 1st Lt., was assigned to the section.

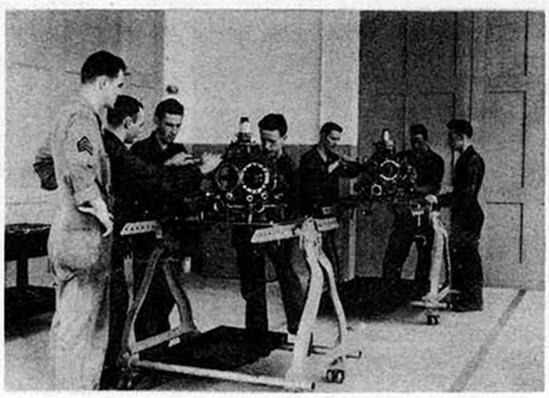
The new section was set up in the old museum building of the Proving Ground and the first class opened July 29th, 1940.

The course planned at the time was one of three months for specialists and was to include the following phases of training:

1. Power Trains and Chassis.
2. Electricity.
3. In-line Engines.
4. Radial Engines.
5. Tanks.
6. Scout Cars.
7. Tractors and Half Tracks.

Several problems soon developed; first, that too much material was being covered to attain the proper degree of training and skill necessary for students to perform their work properly; second, that training in fourth echelon maintenance or unit repair was necessary particularly with engines, electrical components and power transmission units of tanks.

It was decided that in order to meet and overcome the above, permission would be asked to divide the auto-



Tank Mechanics, basic; Engine disassembly

motive section into two sub-divisions, namely, Wheeled Vehicles and Tanks. In order to accomplish the above reorganization several additional problems had to be met. Since this article is concerned with tanks, only those problems that pertain to them will be described. Briefly they are as follows:

1. What should be taught to meet the needs of organizations maintaining tanks in the field? Should the student be taught a general tank course with third echelon maintenance as the objective, or should they be specialized? If they should be specialized, how far?

2. How should the new section be organized to meet the above?

3. What tools and equipment would be necessary to accomplish the desired training?

4. How would instructors be obtained?

5. What teaching methods should be employed?

6. What texts should be used: how could they be obtained?

It was believed that a compromise between a general course and more specialized courses would have to be made in order to train men to function in the particular units that service the Armored Force and to determine what these problems were and how they could be met. Two members of the faculty were sent to Fort Knox, Kentucky, to observe the maintenance problems and the maintenance methods employed in the field. A survey was made by them of the organization and shop practices of the 19th Ordnance Company

Tank Mechanics; general; Unit replacement, medium tank

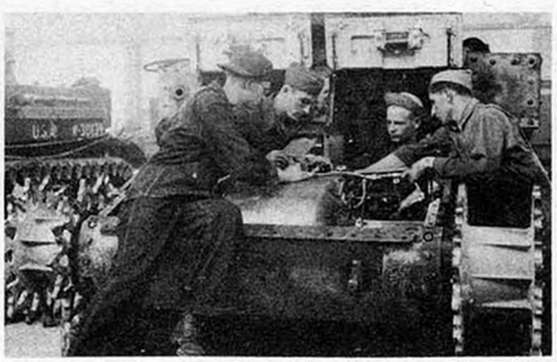
and the Regimental and representative company maintenance/ sections of the armored regiments of the 1st Armored Division. It was found that third echelon maintenance was performed by the using arms and that both third and fourth was performed by the Ordnance units.

Upon the return of these instructors from Fort Knox, and approval having been granted for the reorganization of the Automotive Section, the tank course was planned and executed. It was, and is, organized to train men to fit into the maintenance picture with GHQ, tank units and the Armored Force. The course was arranged to give all tank students two months of basic training in power transmission systems, engines, and tank electricity, and then specializing them the third month in the following manner:

40% of them to become general tank mechanics, i.e., trained to form contact groups, trouble shoot disabled vehicles, perform any unit replacement on both light and medium tanks and in addition to that perform overhaul of the transmissions of both.

Another 40% were to be specialized in radial engines and taught overhaul of the Continental, Guiberson Diesel and Wright Whirlwind engines.

The remaining 20% to become tank electricians,



Tank Mechanics, basic; Unit replacement, Transmission, light tank

that is, taught to test, adjust, repair and overhaul all units of the ignition systems and battery electrical systems of both light and medium tanks.

This is done in the following manner; after reporting to the section the student, for the first two weeks, receives basic instruction on the light tanks to include 1st, 2nd and 3rd echelon maintenance and transmission disassembly and assembly. From this he goes for a second two weeks period to basic electricity to include 3rd echelon maintenance. The second month of the course is spent working with radial engines and includes the overhaul of Continental, Guiberson and Wright engines. At the end of the second month the students are divided into three specialists groups as shown above. Course outlines and job sheets or work sheets are prepared to fit this plan.

An inventory of equipment disclosed the following units and tools available, sufficient general hand tools in stock or on order. General equipment, one light tank M2A3 from Raritan Arsenal, one hull of a light tank T-2, two transmissions, one set of transmission overhaul tools, light tank. One 5 cylinder radial diesel engine, several series 5 and series 7 Continental engines, one sectionalized series 3, two Wright J6's, a more or less complete set of

Continental overhaul tools and a few Wright tools. Of electrical units and equipment there were a few early type magnetos and generators.

Texts were confined to the Supplements 1 and 2 of SNL G-38 and the Continental Overhaul Manual for Series R670 engines.

Requisitions were submitted for light and medium tanks, tank maintenance trucks, shop equipment, electrical test equipment, all the required tools listed in Supplement 2, SNL G-38, and in addition, a complete set of overhaul tools for the Wright Whirlwind engines. Also engines, transmissions, electrical units, parts and accessories were requisitioned to carry a student load of 20 new men each two weeks.

The fates, while hiding their faces in most matters pertaining to the infant section, smiled broadly concerning instructors. In the first group of non-commissioned officers to graduate with the first three months course were the following invaluable men; Staff Sergeant, now Technical Sergeant George Seastrom, formerly a member of the 19th Ordnance Company, Fort Knox, Kentucky. Sgt. Seastrom, having served with that unit from the time that the original Mechanized Force was organized in 1930, had performed 3rd and 4th echelon maintenance on radial engines and power transmission units of Christie tanks and Combat cars M1 and M1A1 in Virginia, Kentucky, Tennessee, Kansas, Georgia, Michigan, Northern New York and Louisiana under all conditions of time and weather. Equally experienced was Staff Sergeant, now Technical Sergeant William B. Mills, formerly of the 17th Ordnance Company, at Fort Benning, Georgia. Sgt. Mills had years of experience with that organization at the Infantry School, (Tanks), and in the field, during which he had become an excellent radial engine mechanic, having worked with both the Guiberson Diesel and Wright engines and their accessories, and finally Staff Sergeant, now Technical Sergeant Floyd C. Coleman, also from the 17th Ordnance Company, at Fort Benning. Sgt. Coleman, having had considerable experience as a tank electrician and being an intelligent and apt student, fitted quickly into the picture.

It was decided that the instruction methods to be used would include the minimum amount of lectures necessary, demonstrations, and the maximum quantity of shop work.

The section was set up with the writer teaching the first two weeks basic, Sgt. Coleman, basic electricity, Sgt. Mills, Radial Engines and Sgt. Seastorm, with additional instructors who were to come later, to teach the specialists.

The men who were to be the first class were selected with great care. This was done for several reasons; first, the training program was an experiment, true, one in which all concerned had complete confidence, but an experiment nevertheless; second, it was believed that the type of work the students were to be trained to perform required men of above average intelligence and mechanical ability, i.e., perform complete overhaul work on aircraft engines with their electrical and other accessories and at the same time absorb information enough to enable them to perform general repair work on the other components of the tanks; third, time was short and equipment none too plentiful.

Twenty carefully selected students composed the first group, all of them from the Regular Army, and all of them young and with previous mechanical experience and sound basic education.

The results obtained from this group justified the confidence of the instructors and the careful selection of the students. Some of the men were graduated at the end of three months and assigned to other components of the Ordnance Training Center as instructors. The remaining men continued for another month and were then graduated to be assigned as instructors and mechanics to the Replacement Training Center and to the new maintenance companies which were organized in the Unit Training Center. Six of them were retained in the Ordnance School to augment the instructor staff of the section. Two of these were assigned as radial engine mechanics and assistant instructors, two as general tank mechanics, and one as a tank electrician.

Two other excellent instructors were obtained during this time from the second NCO class; they were Staff Sergeant I. R. Vollrath, an experienced tank mechanic from the 29th Ordnance Company, Fort Devens, Mass., and Staff Sergeant R. P. Crosslin, an excellent electrician from the 13th Armored Regiment, Fort Knox, Kentucky.

Equipment and tools now arrived in increasing quantities, among them a M2A1 medium tank, several light tanks, a tank maintenance truck, and various sets of overhaul tools.

No text or instruction material was available for the medium tank other than it's Wright Engine Manual. It was decided that the section would dismantle the tank and prepare a set of notes to be used as instruction material. Several instructors were detailed to the Proving Ground for a short time to observe the methods used in unit replacement of components and their disassembly and assembly, also, drawings of the tools required to perform the above work. This was accomplished with the excellent cooperation of Mr. Matare and other personnel of the Proving Ground.

To meet the training needs of the Ordnance Training Center, several short classes were graduated during the winter. These varied in length. These men received a course based on the longer three months' course. Many of the men that received these short courses were, or at present are, instructors and mechanics at the Replacement Training Center, and others have gone into the field with new organizations.

Capt. Young and Capt. Daniels were relieved from the Automotive Section and assigned to other duties. Capt. P. J. Phillips assumed command of the section and Capt. K. T. O'Keefe, then 1st Lt., was placed in charge of the tank section, being the first commissioned officer assigned to it.

In July, Capt. O'Keefe was detailed to Fort Knox to observe maintenance methods as practiced there and to see how the course of instruction given by the Armored Force School compared with that of the Ordnance School. It was found that the course at Knox was primarily for officers and men of the using arms and did not go beyond third echelon maintenance, in practice, while that offered by the Ordnance School included fourth echelon maintenance as far as tanks could be repaired in the field, and was

planned for training Ordnance personnel.

It was believed at this time that the section could expand and under Capt. O'Keefe's leadership this was accomplished. More equipment was received and additional equipment requisitioned.

Six instructors were detailed to attend a short course at the Wright Aeronautical Service School, Patterson, New Jersey. One attended a course at The Auto-Lite Electrical School at Toledo, Ohio, and two to the Mack Plant at New Brunswick, New Jersey, to observe the manufacture of tank transmissions. Sgts. Seastrom and Coleman were placed on detached service.

In July the tank group, along with the rest of the Automotive Section, moved from the old museum building to the new shop at School Street and Center Road.

As soon as the section was moved to it's new site the next group of three months students began their course. This class included some men from the Ordnance units of the Armored Force, men from other units in the field, and men from the Ordnance Training Center. Subsequent to this, another class has succeeded this one the first of each month.

In July, two medium tanks, M3, were received by this section, the first two to be issued for service in the field. It was decided that these tanks would be disassembled and assembled to obtain data and pictures to compile a new maintenance manual pertaining to that model. This was done. An instructor from the Armored Force School, officers and enlisted men from Ordnance units and the Tank Regiments of that force, personnel from the Publications Staff of Raritan Arsenal and members of the tank section were used to complete this task. This work was accomplished under the supervision of Capt. O'Keefe and M.Sgt. Hansen.

To date the tank section has received about 60% of it's authorized complement of vehicles and other equipment. When completed this will include twelve light tanks, both gasoline and diesel, four medium tanks and one heavy.

Due to probable expansion, steps are being taken within the section to meet a much larger student load.

The personnel of the tank group have to be versatile. They function in the capacity of both the using arm and Ordnance Department in the following manner: One, as members of the tank crew, they drive the vehicle for several reasons, to service and lubricate them and in other ways perform 1st echelon maintenance on them. In this type work they "run in" the rebuilt tanks used in class and have performed other duties from forming tank drill platoons for demonstrations to teaching classes of drivers for other components of the Ordnance Training Center. Second, they must function in the corresponding manner of the tank company and regimental sections of the using arm in that they have "live" equipment and must perform second and third echelon maintenance with it and keep the proper administrative records pertaining to it. Third, they must function as the shop personnel and unit repair section of the Ordnance unit, and in that capacity, perform overhaul of all the accessories and units of both light and medium tanks. The above duties must be performed in addition to their basic and primary duty, which is that of the instructor staff of the section.

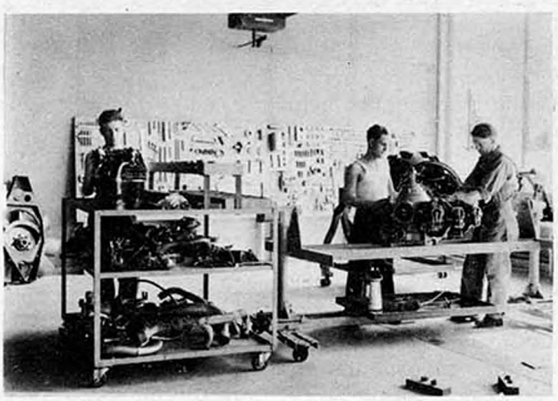
The section has succeeded in doing whatever asked of it in the past and feels satisfied that, with increased instructor personnel, it can meet any problem of the future.

# WHEELED VEHICLE GROUP

## By: H. J. Martin, 2nd Lt., Ord. Dept.

During November, 1940, the Wheeled Vehicle and Tractor Group came into existence as a sub-division of the Automotive Section of The Ordnance School. Within the group, it was divided into Chassis, Engine, Electrical and Tractor sections. Its object was to instruct Ordnance men in the repair and maintenance of wheeled vehicles and tractors used or furnished by the Ordnance Department.

At the time of its beginning as a separate division of the Automotive Section, many things were needed by the group for efficient instruction. It will be remembered that the Automotive Section itself was a product of the old Ordnance Field Service School at Raritan Arsenal and the Ordnance School here at Aberdeen Proving Ground, neither of which were exceedingly well off as far as new and modern equipment was concerned, not to speak of instruction on the scale planned for the new School. Among the needs of the group were equipment, sufficient instructors and adequate texts. Instruction equipment at the time consisted of several outmoded 1934 model 1-1/2-ton Dodge Trucks, a few chassis units such as clutches, transmissions, etc., and such cast-off test model Scout Cars and combat vehicles as could be borrowed from the Proving Ground. Two Caterpillar Tractors had survived the trip from Raritan Arsenal when the Field Service School moved to Aberdeen Proving Ground in July, 1940, as well as some half a dozen engines of various makes (including an air-cooled Franklin!). Hand tools were good but scarce, and the power tools such as valve grinders, boring bars and electrical testing equipment were mostly out of date or pretty much used. As soon as plans for expansion of the school had been announced, orders were placed for modern equipment and tools, but just at that time industry was also beginning to consume tools and equipment in the re-armament effort, so the long and painful process of waiting for new and adequate equipment was begun.



Shop Work; Advanced engine specialists, Tank Mechanics' Course

Personnel at this time included T. Sgt. T.H. Freeman, S. Sgts. W. C. Pearce, Arnold Swenson, James Mc-

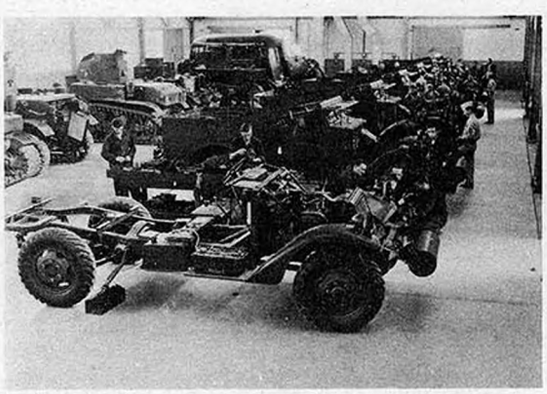
Closkey, W. E. Ransom and R. E. Pace. Of these men, T. Sgt. Freeman and S. Sgt. Ransom were the only instructors with previous experience. The others were selected from the first Non-commissioned Officers Class which graduated on October 18, 1940. Instructors were a rare commodity, due to the rather limited experience of the Ordnance Department in motor vehicle maintenance on a large scale. This same condition was general throughout the Army, for that matter, but was helped a great deal here at the School with the graduation of the second Non-commissioned Officers Class in the early part of 1941.

The early days of teaching experience for the Wheeled Vehicle Group were fraught with a great many difficulties. Chief among these, of course, was the difficulty encountered in coordinating the small amount of instruction equipment among the classes. This task was simplified immensely by the skillful and competent sectionalizing of units and fabrication of additional instructional equipment by the Maintenance Group of the Automotive Section headed by S. Sgt. James McCloskey, who has been since promoted to Technical Sergeant, as have most of the other members of the Wheeled Vehicle Group who were then staff sergeants. Other men assisting Sgt. McCloskey were Privates Cross and Stivers.

Every possible teaching aid was employed in conjunction with the actual equipment. These aids included slide film, moving pictures, diagrams, charts and demonstration equipment. Also, it was incumbent upon the head of the group, T.Sgt. Freeman, to train his instructors, most of whom were experienced men in their trade, but lacked experience as instructors. Those who have always imagined teaching to be a soft job will find that a capable instructor must know two trades instead of one — the one he teaches and the art of teaching it to others. This training of instructors was rather difficult to accomplish because of the heavy teaching load imposed upon the small group of instructors during the period from November, 1940, through January, 1941. It was done mostly by conferences whenever the opportunity presented itself, usually on Saturday mornings, and teacher training manuals issued by the School Teacher Training Staff.

Three more instructors were assigned to the Wheeled Vehicle Group when the second Non-commissioned Officers Class graduated in January, 1941. They were S.Sgts. W. E. Grimme, J. E. Veech and R. W. Buba. All of these men had that most desirable of all qualifications from the viewpoint of the Automotive Section — experience.

At this time another event took place that was occasion for great rejoicing. An M3A1 Scout Car Chassis arrived! Now instructors did not need to sketch the anatomy of a Scout Car on the blackboard so that interested students could see how the chassis components fitted together. Heretofore, the only glimpse that students had of a late model scout car was one borrowed occasionally from the Proving Ground when it was not being used for tests. This new chassis was the forerunner of a continuous procession of equipment that brought smiles to the careworn faces of instructors who were tired of trying to substitute blackboard diagrams for the real thing.



Students at work in the Wheeled Vehicle Section

In January, 1941, Lt. A. L. Hettrich was placed in charge of the Wheeled Vehicle Group, relieving T. Sgt. Freeman, who transferred to the Replacement Training Center to assist the automotive section in that organization to get started.

Two months after Lt. Hettrich took charge of the group it was decided to change the Tractor Course to one of Tractors alone, instead of combining it with Wheeled vehicles. To this end, the Tractor Group was separated from wheeled vehicles, taking with it Sgts. Swenson and Pearce.

Texts, not heretofore mentioned, were procured from Holabird Quartermaster Motor Transport School. These were only on Automotive Theory, construction and Operation. When actual details of the vehicles being taught were desired, actual details were lacking. These were later supplied in part by T.M. 9-705, a technical manual on the M3A1 Scout Car, which furnished second echelon maintenance information. Instructors in many cases had, of necessity, to write their own manuals, have them mimeographed and issued to students. Adequate repair manuals for both the wheeled and half track scout cars are now being prepared by the Field Service Division at Raritan Arsenal. Maintenance manuals for other Vehicles, such as Bomb Service Trucks, etc., are being furnished by the manufacturers and classified as technical manuals. One manual is supplied with each vehicle.

During the spring and summer of this year, the Wheeled Vehicle Group has kept pace with the rapid advance in instruction and equipment of the other groups of the Automotive Section. Instructors now are afforded a course in teacher training initiated by the Commandant, Lt. Col. Outland, and taught by Captain Phillips, formerly a professor at Oklahoma A. and M. College. Recent months have seen the total vehicles in the group rise to eight M2A1 Scout Cars and six Scout Cars, Half-track, M2, as well as several late model Hercules and Chevrolet engines. Tools, both hand and power, are steadily arriving, all of which makes an efficient job of instruction infinitely easier, and what is more important — FASTER. Approximately 85 Specialist students are being trained at this writing by the Wheeled Vehicles Group alone.

A recent consideration in the matter of courses has been to change the present Wheeled Vehicles Course, which includes an equal amount of time on each of the three phases of the course, viz Chassis, Engines and Electrical, to a more specialized one. In the new course, the first few

[See another Automotive article on page 81.]

weeks would be devoted to a general study of the three phases, and at least half the course to a detailed study of one or the other of the three phases. This is in line with the courses given in the Tank Group which have proved more satisfactory than the more general ones in which the student did not get sufficient knowledge to do efficient trouble shooting. It is anticipated that this change will be put into effect in the near future.

# TRACTOR GROUP

## By: Loren E. Lura, 2nd Lt., Ord. Dept.

In November, 1940, tractor instruction was included in the Wheeled Vehicle Group of the Automotive Section at the Ordnance School. At that time the Automotive Section had four tractors which were available for instructional purposes. They were: one (1) Heavy, M1, I.H.C. TD-18; one (1) Medium M1, Caterpillar "35"; two (2) Light, M2, Caterpillar "20". Since tractor instruction was included in the Wheeled Vehicle Group and a great number of vehicles had to be covered in a short period of time, the two (2) Caterpillar "20" tractors were the only two (2) tractors that could be worked into the course in the time available during the winter of 1940-41.

S. Sgt. W. C. Pearce just having finished the Non-Commissioned Officers' Course, and having a great deal of experience with Caterpillar tractors was placed in charge of tractor instruction. S. Sgt. A. Swenson was also made tractor instructor to help S. Sgt. Pearce.

The need for different makes of tractors on which to teach maintenance and repair was noted at this time. In February, 1941, the Automotive Section received two (2) Cletrac "20" Tractors which were added to the course.

The Caterpillar "20" and Cletrac "20C" being rather obsolete tractors, it was decided to add the more recent I.H.C. TD-18 Diesel tractor to the course. The Field Artillery having purchased a number of these vehicles as prime movers for the 155 mm gun, it was realized that tractor mechanics should become familiar with this tractor. Since no instructor in the Automotive Section was familiar with the TD-18 tractor, Mr. Thorp, a representative from I.H.C., came to the Automotive Section in March, 1941, and gave a course of instruction on the service and repair of the TD-18 tractor. No Serviceman's Guide being available, notes were taken on the disassembly, adjustment, repair, and reassembly of the tractor.

The Automotive Section now having available a total of six (6) tractors, it was decided that enough equipment was available with sufficient importance attached to the repair and maintenance of tractors that it could be separated from the Wheeled Vehicle Group and made a separate Tractor Specialists Course. This occurred during April, 1941, and a separate three (3) months Tractor Specialists Course established. This allowed the students more time to spend on tractors and they would be able to cover more completely the repair and maintenance of the different types of tractors. Lt. A. L. Hettrich and Lt. R. Fisk of the Automotive Section were both instrumental in this original organization and its separation from the Wheeled Vehicle Group.

Increased student load required more equipment for the students to work on, so one (1) Medium M1, AC "WM" tractor with Angle Dozer was acquired in April, 1941, and two (2) Light, M2, Cletrac "AG" tractors in June, 1941.

In July the Automotive Section was transferred from the old Museum Building on the Aberdeen Proving Ground to the new Automotive Building No. 1, at the Ordnance School. About a month later conditions became rather crowded in the Automotive Building so the Tractor Group was moved to a section of the Ordnance School Welding Building No. 1.

Once again increased student load in the Automotive Section as a whole and in the Tractor Group demanded more instructor personnel. In June 1941, S. Sgt. H. Chandler and Pvt. R. J. Miller were assigned to the Tractor Group. Also about this time the Tractor Group lost another experienced instructor when T. Sgt. A. Swenson was assigned to the Wheeled Vehicle Group in August, 1941.

The loss of T. Sgt. Swenson caused another shortage of instructors so Pvt. Hill and Pvt. J. F. Schurr were assigned to the Tractor Group in August, 1941, after completing the Tractor Specialists Course. Hill, however, was in this section only a short time, being discharged from the Army in September, 1941.

Lt. O. R. Stach was in charge of the Tractor Group from July until October 1941, when he was transferred to Erie Proving Ground, Ohio.

This brought the Tractor Group up to the present time with the following instructors; M. Sgt. W. C. Pearce, S. Sgt. H. Chandler, S. Sgt. R. J. Miller, and Pfc. J. F. Schurr. The writer was assigned to the Tractor Section during the first week of September, 1941, and was placed in charge of the Tractor Group when Lt. O. R. Stach was transferred.

For equipment the Tractor Group now has eleven (11) tractors for instructional purposes including; six (6) lights, three (3) mediums, and two (2) heavies. This number includes all of the different makes so that the student receives instruction on all four makes of tractors. These tractors are furnished to the Army by four (4) private manufacturers and are their production models with slight modifications required by the Army. The four (4) manufacturers are "Cletrac", "Caterpillar", "Allis-Chalmers",

Wheeled Vehicle Mechanics; In-line engine overhaul

and "International Harvetser".

The Ordnance Department issues these tractors to various branches of the Army. The tractors are used in many ways; for instance, the Field Artillery and Coast Artillery use the tractors to move heavy guns and ammunition to and into firing position. The Engineers use them for construction work and road building. Also, the Air Corps has a tractor equipped with a crane used for heavy bomb loading and unloading.

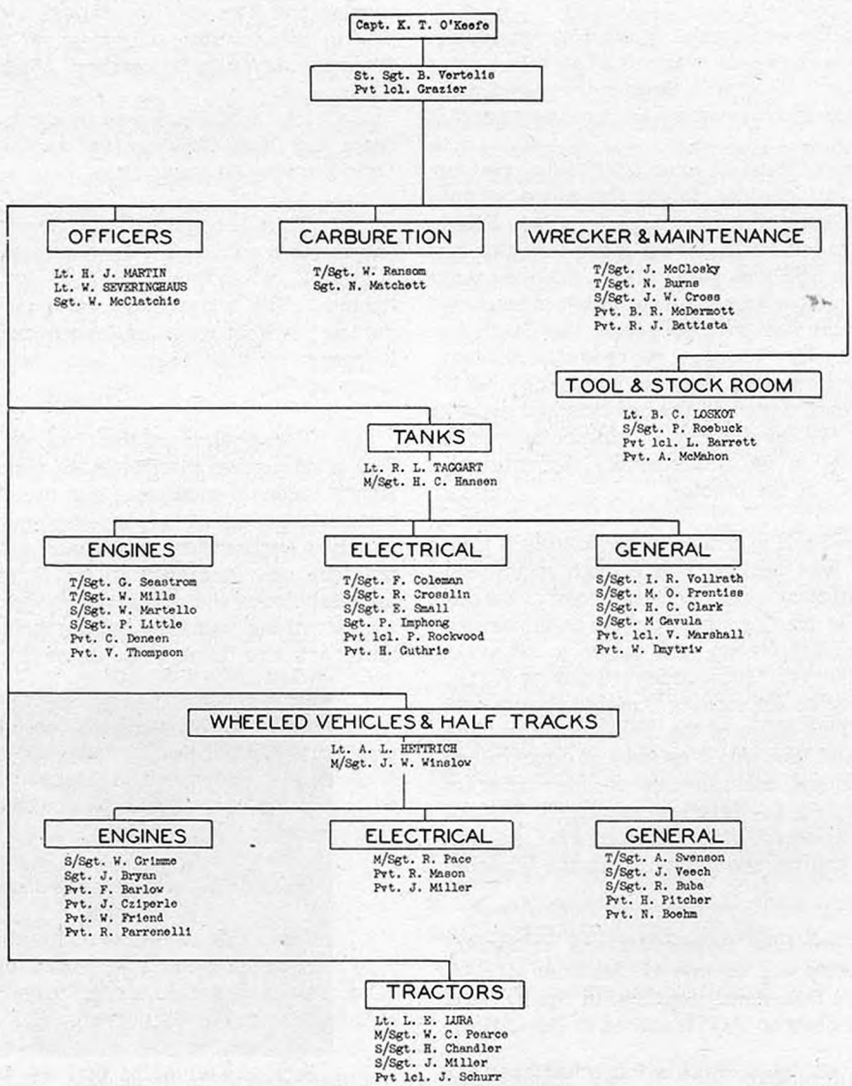
The tractors maintained and repaired by the Ordnance Department are classified as to size and weight and also according to type of fuel, for instance gasoline and Diesel. The three (3) classifications are the light which weighs 1 ton to 5 tons, medium from 5 tons to 9 tons, and heavy from 9 tons up.

The tractors maintained and repaired by the Ordnance Department are all of the track laying type, commonly called the crawler type, because of their slow speed. As yet the rubber tired tractor has not been used a great deal by the Army, however, they do have approximately one hundred (100) Allis-Chalmers, Model "B" light wheeled tractors.

The Tractor Specialists Course as now set up is divided into three (3) parts of approximately one (1) month. The first part is to acquaint the student in the proper use of tools, the proper nomenclature of parts, use of the standard parts catalogs, electricity, and the basic functioning and design of the internal combustion engine and power train of the tractor. In the second part the student will disassemble, repair, replace, and reassemble all units of the tractors. This work will be on the types of the tractors which are now in most extensive use as Ordnance Tractors of the light and medium class. The last part of the course will be devoted to study, disassembly, repair, operation, and reassembly of the heavy Diesel tractor.

This gives a general history of the Tractor Group, how it was originally organized, along with a short outline of the course and what it covers. A great many obstacles had to be overcome in the securing of experienced instructors and the necessary equipment. The Tractor Group is now well organized and is looking toward further expansion in number of instructors, students, and equipment.

ORGANIZATION AND ROSTER
AUTOMOTIVE SECTION



# FIRE CONTROL SECTION

By: R. L. Johnson, 1st Lt., Ord. Dept.

The technical training problems of an expanding army are varied and many, but never more so than those same problems which confront the schools or training centers established to provide the technical training for such a training establishment. The Fire Control Section of The Ordnance School is one of the essential, highly specialized nerve centers within this training establishment and is troubled with the same acute "growing pains".

An impressive picture of growth may be seen from the increase within the past year from two to fourteen instructors and the inauguration of a completely new course in antiaircraft fire control which has already grown into a problem child as large or larger than its foster parent. In addition, currently proposed increases will expand the section to twice its present size.

The activities and problems of the Fire Control Section are, in general, similar to those of other sections, but upon closer examination it will be found that there exist certain conditions peculiar to this section alone.

In order that these can be brought forth into a comprehensive and understandable picture it will be best to break up the functional duties of the section into four general groups. These will hold true whether we speak of the general instrument repair division of the section, or of the antiaircraft fire control division.

1 - Training facilities.

2 - Training schedules.

3 - Selection of students.

4 - Instructors and instruction.

It is well known that training facilities govern the courses to be given as well as the number of students to whom those courses may be given. A sound deduction might be therefore, that good training facilities indicate good training, or conversely. This holds true to a large degree. However, in every establishment there will be found personnel capable of working under inadequate conditions, yet producing results of the highest order. It is only natural that the section as a whole is proud of its record in this respect.

The requirements of an optical workshop are such as to make it mandatory that air conditioned, dust free rooms be available which have an unlimited field of view and are well lighted. The optical workshop of this type is ideal and exists in few places. The Fire Control Section has had no such facilities, although plans have been approved which will provide them as soon as possible and there is no doubt as to the boon.

Housing requirements are primary, but nevertheless essential. They include not only the working space, but suitable chairs, desks, work benches and individual lamps. To provide these facilities has taken untiring planning and initiative.

Other training facilities which merit especial attention are tools, to say nothing of the instruments, jigs, fixtures and special testing devices which are an integral part of any optical workshop.

The availability of funds during the present emergency has left little to be desired in the way of tools. The section has procured the finest tools available for the use of its students. These tools were made up into standard sets which could be issued to every student. At the same time sets were made of special tools which pertained to a specific instrument. These tools are now available as necessary. It can be seen easily that this is the only logical solution to the problem. Its success has proven its worth many times.

It has been only natural that difficulties arose in obtaining new instruments for the purpose of instruction. The demand for such instruments for actual field use was preeminent. However, it is pointed out that almost always instruments were available which were similar in operation to the new instruments, so little has been lost in this respect.

The next point for consideration is training schedules. The first and natural question which it was necessary to ask ourselves was. "What is to be taught and how long do we have to teach it?" The answer to this question, as can be readily seen, depended to a large extent upon the complete survey of training facilities available.

Appropriate training schedules determine in advance the degree of success which we may expect from any course. Therein is set up for the information of everyone the exact contents of a particular course, the points to be emphasized, the field to be covered. Needless to say, the importance of training schedules cannot be emphasized too strongly.

The preparation of such schedules entails a complete knowledge not only of the subject to be covered, but also of teaching methods and their application to service schools.

In addition to the points already covered in preparation of training schedules there must also be taken into consideration the number of students to whom instruction must be given and the frequency with which the course must be repeated. Both are very cogent points in any training schedule.

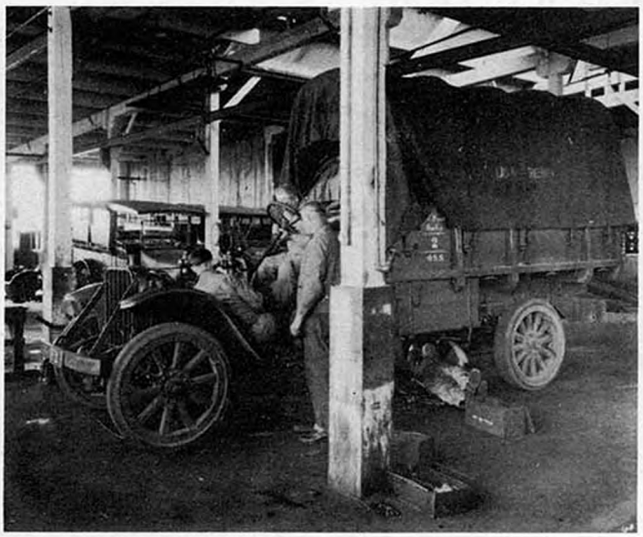
After having made adequate plans for the necessary training facilities and having prepared appropriate training schedules, it becomes necessary to consider another point, the selection of students who are adaptable to such a course of instruction.

What do we want in our student?

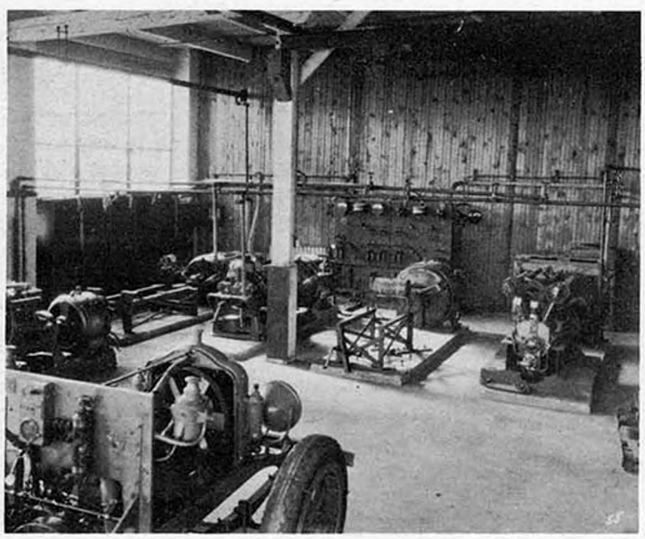
The basic requirements for all students are approximately the same, i.e., education, intelligence, personality, ambition, health, experience background, and adaptability, though not necessarily in that order.

It is at this point that we find differences arising

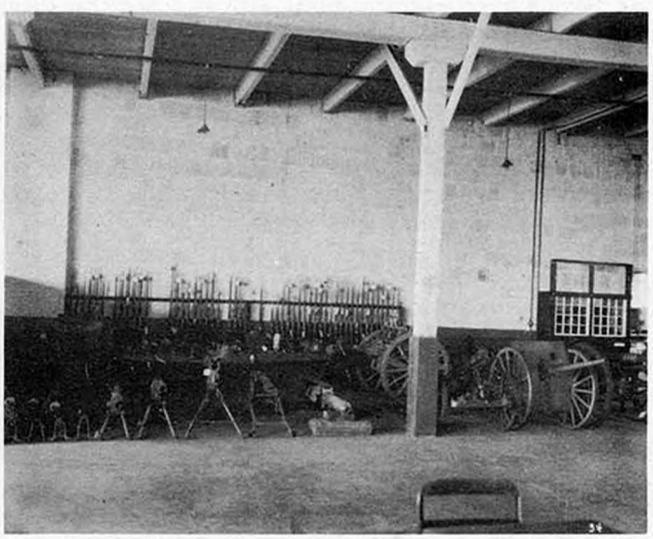
# MATERIEL of the Not-so-Distant PAST



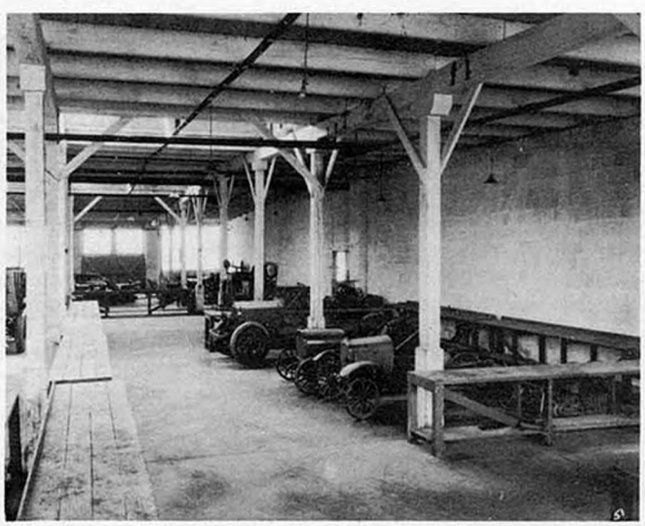
Automotive Section (Students working on White truck)



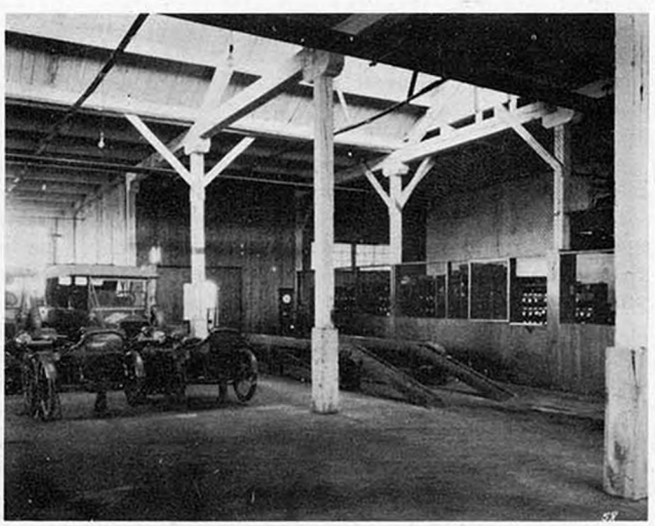
Dynamometer Laboratory, Automotive Section



Small Arms Museum



General View, Automotive Section



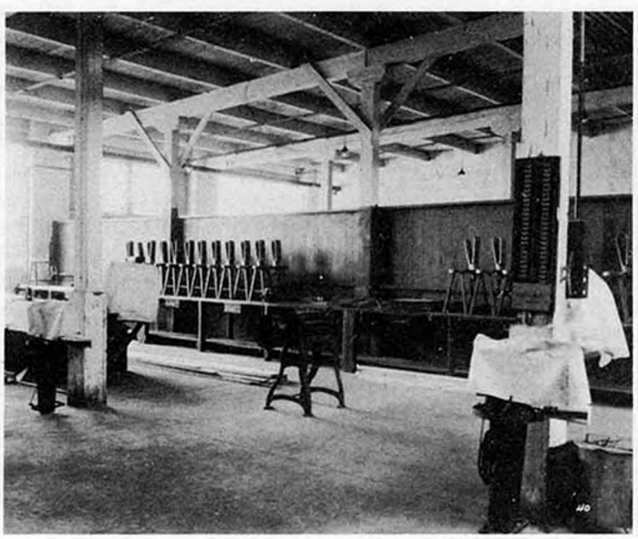
Automotive Section (Tool Room in background)

# ORDNANCE FIELD SERVICE SCHOOL

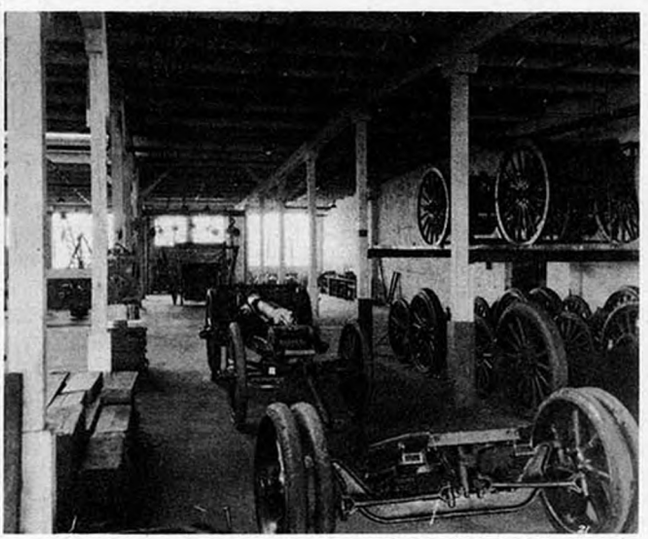
## Raritan Arsenal, N. J.

## 1927

Tank and Tractor Section (6-ton Renault tanks)

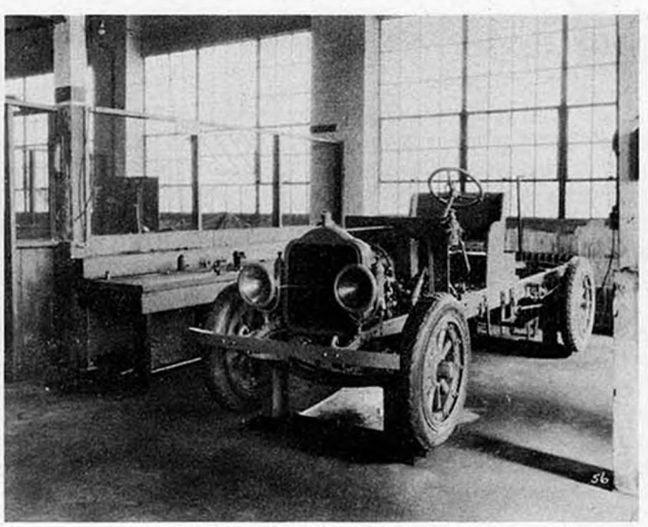


Leather and canvas workers shop



Artillery Section (4.7" Gun in foreground)

Artillery Section (3" Gun in foreground)



White Truck Chassis

between the requirements for students for the Fire Control Section and those for other sections. To the basic requirements it becomes necessary to add certain specific items. Let us consider why this is true. First, instrument repairmen must be capable of working with small, intricate, close fitting parts. Fine precision tools and expensive optical elements will be under his care throughout his career in the Army. It is obvious that he must be adaptable to a judicious practice of maintenance. His educational background must be such that he can read and correctly interpret blue prints and diagrams; prepare inspection reports in legible script; follow written directions carefully and completely. His background must be of such a nature that would indicate he is capable of working satisfactorily with optical instruments. His health must be excellent, his eye sight must be almost perfect. Experience in trades such as instrument maker, watchmaker, lens grinder, tool and die maker, machinist and similar professions tends especially to enhance the values of a man as a student for instrument repair work.

It is fairly obvious that many of the qualifications which would make a student eligible for the instrument repair course are of such a nature as to make him a key man in defense work and consequently ineligible for the draft. Even so we find many men who are considered only as an apprentice in these trades, yet they offer valuable material to the army as instrument repairmen. It is found that few persons, very few persons indeed, have civilian experience which fit them especially for instrument repair work, whereas, in the same line of selection, we find many men who have had considerable training in civilian life in trades which would fit them immediately for such positions as automobile mechanics, welders, clerks, etc. Thus we can see that the selection of suitable personnel for training as instrument repairmen is a definite problem in the setting up of a course of instruction.

The availability of training facilities, training schedules, and students themselves leaves but one item which is necessary to complete an embryo section. The selection of instructors is always a difficult and important problem, but in this instance it was of prime importance. Well trained men capable of imparting their knowledge to others are rare, but men trained in the maintenance of fire control instruments who meet this qualification are rarer still. And trained men were an absolute necessity due to the fact that no instruction texts were in existence, having never been written.

The opportunity to make a well founded selection of instructors has ever been taken into keen consideration. And in this selection the section has been fortunate, so fortunate in fact that at the present time a well rounded staff of instructors is available for instruction on all the generally used instruments.

Another problem integrally associated with instructors is the method of instruction to be used. Having no texts for use as a guide is in itself a difficulty of the highest order. A standard of practices was the only answer. Section regulations, development of instruction aids, such as charts, sectionalized instruments, display assemblies, blackboards, etc., proved a worthy goal for the initiative of the section.

The introduction of blitzkreig tactics in instruction of general instrument repair left somewhat of a bad taste with those qualified experts cognizant of the time necessary to train adequately an instrument repairman. However, the results even in the first class were of such a nature as to be gratifying.

Identification of inadequacies, both in training facilities and instruction methods was the result of constant research with a view toward improvement of the quality of instruction given by the section.

New lists of references were compiled and made available to students. Included in this was a complete catalogue of the screws in SNL F-5, in itself a tedious masterpiece of application. New subjects were soon included in the courses to be given, among which were machine shop practices, hand tools and how to use them, and a most important addition, introduction to and use of the tools and equipment to be found on the instrument repair truck. Needless to say, the addition of these items alone enhanced the course considerably.

Far more important from both the viewpoint of the student and the instructor, however, was the decision of the section head to compile and publish technical data on the maintenance of each instrument. This job is still in progress, although to date manuals have been prepared which cover the maintenance and adjustment of ten instruments. Included also is a manual on general information which the instrument repairman should know, and a manual on the principles of elementary optics.

It is unfortunate that these manuals cannot be published by the school in sufficient quantities to be available to Ordnance troops in the field, but at least there are sufficient copies that each instrument repair student has copies made available to him as necessary. The upgrading of instruction as a result of this is only natural and the results of long hours of arduous labor can be seen in this just reward.

From a purely statistical viewpoint it might prove interesting to note the number of students who have been processed by the section to date. Of approximately 119 students detailed to the general instrument repair course, 112 satisfactorily completed the course and 7 were relieved for various reasons. Of this number 4 were officers, 108 were enlisted men.

The course as given covered a period of three months and included the following subjects: principles of elementary optics, machine shop practices, general information, maintenance and adjustment of field glasses, range finder, BC telescopes, panoramic telescopes, aiming circles, sights, and quadrants. Miscellaneous instruments were included whenever time and circumstances permitted.

In covering the scope of the course let us follow a new student from the first time he reports to the section. On the first day he reports and is assigned to a seating arrangement in a group of about 20 students. Orientation will cover a portion of his first day; however, the course starts immediately with the presentation of the basic principles of elementary optics. This subject is allotted 2-1/2 days. Next comes shop practice which is allotted 5 days and this is followed by general information which is given in 2-1/2 days. During each of these subjects the student actually has in his hands the various instruction aids which are pertinent.

Upon completion of the basic preparatory subjects the group of 20 students is divided into three groups of approximately equal size and each group begins instruction on a different instrument. The standard set of tools is issued to him, as is the set of special tools for the specific instrument on which he is working.

On each instrument the student will receive instruction in the complete disassembly, assembly, testing, adjustment and inspection. This routine will be followed on each instrument until the student has covered all of the instruments on which instruction is given. During the latter portion of his course the student will be introduced to the instrument repair truck and the maintenance facilities available on it. He will perform actual maintenance on the various instruments, making use of only the equipment on the repair truck.

Finally, having satisfactorily completed the course, the student will receive his certificate of proficiency and return to the field to practice his trade, proud of his accomplishment and anxious to exhibit his new tehcnical skill.

Little has been said of the antiaircraft fire control division of the section, but certainly it is of no little importance. At the present time there are available for instruction purposes sufficient quantities of the following equipment for a class of approximately 20 students: Directors, M4 and M7, Data Transmission Systems, M4 and T17, Control Sets, M1, Height Finders, M1, Stereoscopic Testers, and Binaural Trainers.

The present course of instruction covers a period of eight weeks and includes Director, Height Finder and Data Transmission System. In this connection it might be well to note that the course which is given in the Data Transmission System is the only such course given either in the Army or out. The introduction of this course has been welcomed no end by everyone concerned.

From the date of inauguration of the course in AA fire control 118 students have been assigned, including 44 officers, 55 enlisted men and 19 civilians. Of the students assigned, 100 have graduated.

Currently proposed plans call for an increase in classes to accommodate 90 students and the addition of two new subjects. It is readily understandable that the problems arising from such a rapid and large expansion will be many. It is only hoped that they will be handled as successfully in the future as they have been in the past.

# DEPOT AND SUPPLY SECTION

**By: J. E. Dempsey, 2nd Lt., Ord. Dept.**

A casual comparison of the first issue of "THE ORDNANCE SERGEANT" with the present issue is enough to show the effort that has been given to make it a truly worth-while publication for the purpose of furnishing technical and instructive information to Ordnance personnel.

The members of the "DEPOT AND SUPPLY SECTION" of The Ordnance School take this means of congratulating the founder and editors of "THE ORDNANCE SERGEANT" on this, the first anniversary of the founding of a truly remarkable publication, and wish to assure the editors of their continued support in the furtherance of the success of this publication. The contributors to "THE ORDNANCE SERGEANT" from this Section are likewise proud of the small part they have played in furthering the success of this publication by having articles prepared by them published in this publication.

However, the growth and success of "THE ORDNANCE SERGEANT" is but a barometer indicating the growth and expansion of the activities carried on at The Ordnance Training Center, and likewise the members of The Depot and Supply Section of The Ordnance School are

INSTRUCTORS, DEPOT AND SUPPLY SECTION

SEATED: L. TO R: T/Sgt. L. Brown; S/Sgt. H. S. Smith; S/Sgt. W. Morgan; S/Sgt. L. S. Wall; S/Sgt. L. E. Reisman; Lt. J. E. Dempsey; M/Sgt. C. K. Harper; S/Sgt. M. Blaison; S/Sgt. P. A. Miller; S/Sgt. G. D. Brand; S/Sgt. J. C. Matthews.

STANDING: L. TO R.: S/Sgt. C. Wenner; S/Sgt. J. V. Smith; T/Sgt. C. L. Stuart; S/Sgt. R. E. Smith; T/Sgt. I. J. Dreher; S/Sgt. C. C. Carter; S/Sgt. J. Hannula; S/Sgt. W. S. Howard.

"DEPOT AND SUPPLY" CLASS AT "WORK" AT THE ORDNANCE SCHOOL.

proud of the small part they have played in this growth and expansion.

The Depot and Supply Section of The Ordnance School has trained a total of 764 students since the organization of The Ordnance School at Aberdeen Proving Ground in July, 1940. The first class consisted of 50 noncommissioned officers taking a three months course, the next class consisted of 80 students, and the number of students has been increased with every succeeding class till at present the Section is set up to train 300 students at one time, receiving 100 students every month for a three months' course.

With the increase in the student load, the instructor staff of the Section has been increased from one officer and five noncommissioned officers to one officer and twenty-five noncommissioned officers. Of the original instructors on duty with this Section in July, 1940, only two are still assigned to the section, Lieutenant J. E. Dempsey and Master Sergeant C. K. Harper. The rest of the instructors have been selected from the graduating classes in this section.

[Another Depot and Supply Article will be found on page 88, and an Administration article on page 84.]

# SERVICE SECTION

The Service Section is so organized that its functions are two-fold in nature. Primarily, it trains selected enlisted men of the Ordnance Department as specialists for Service Sections of Maintenance Companies. Secondarily, it constructs, modifies, repairs and maintains facilities within the Ordnance School Area.

This Section consists of the Carpenter Shop, Machine Shop, Welding Shop and Maintenance Shop, all of which have been carefully planned and equipped so as to be capable of performing a large variety of jobs. The courses of study and instructional material are further explained in the following articles prepared by each division of the Section.

Competent advice is offered to other Sections of the Ordnance School by its office personnel which includes Major C. J. Gallagher, Chief of Section, 1st Lieutenant J. P. Kottcamp, Machine Shop Officer, 1st Lieutenant W. G. Sylvester, Welding Shop Officer and 2nd Lieutenant W. A. Kuehne, Carpenter and Maintenance Shop Officer. This personnel is proud of the fact that there is scarcely a location in the Ordnance School that does not reflect some improvement either performed or otherwise administered

by the Service Section.

Approximately five hundred single decked beds have been re-designed by Major Gallagher and converted into double-decked beds. Approximately five hundred wardrobes have been constructed for the Bachelor Officers' quarters. Wall partitions, tables work benches, cabinets,

Major C. J. Gallagher
Chief, Service Section

bread racks, hat racks, black boards, bulletin boards, photographic developing tanks, gymnasium equipment, models for instruction (dummy bombs), sectionalized shells and fuzes, special as well as standard tools, special gauges, jigs, and fixtures, "in and out" mail boxes, signs, book cases, etc., have been built by this Section.

Modifications on Ordnance materiel are made frequently. Immediate electrical as well as mechanical problems are expedited as soon as reported to this Section.

In conclusion the Service Section tries to keep the following motto in mind: "To furnish service wherever, whenever, and however it might be requested by other sections of the Ordnance School."

## MACHINE SHOP

By: L. Kaldizar, M. Sgt., Ord. Dept.

On January 1st, 1941, The Ordnance School did not have an organized Machine Shop Section for training Ordnance Machinists for field duty. A small maintenance shop was in existence at that time for the purpose of job shop work and maintenance for other sections of the school which were organized and training their students. Several experienced machinists were on hand to perform this type of skilled work in the shop. As the demand for this service kept growing and increasing, it was decided to augment the section by the addition of apprentices who would receive basic machine shop training in an unofficial way and at the same time assist in the work of this maintenance section.

During the early part of March, 1941, information was received that the new shop building then in the process of erection would be ready for occupancy on or about the first week in April, 1941. Orders were given to the maintenance shop to make and prepare plans for organizing a Machine Shop Section as part of The Ordnance School; function of this section to train selected soldiers as machinists for field duty.

A scale floor plan of the wing assigned to the Machine Shop was prepared. Scale cardboard cut-outs representing the physical outline of machines, equipment and other items were plotted on the floor plan until a satisfactory shop lay-out was achieved. At the same time requests were prepared for additional tools and material estimated to be required for a peak load of 90 students for a 90 day course of instruction. Alternate plans were also made for an initial class of 30 students and an increment increase of 30 students every month, course to be of 90 days duration. Schedules were prepared dividing time alloted into units covering a major subject; units were broken down into periods; a tentative number of these periods were assigned to phases of each problem and to the entire problem as a whole.

This Machine Shop Section was to consist of the Machine Shop proper for student training; a maintenance section for job shop work for other sections of the school and the machine shop; a Tool Crib & Stock Room combined to function as the receiving, storing, and issuing point for tools, materials, and other supplies necessary to conduct all section activities; a forge room for forging, heat treating, carburizing and case-hardening metals; a class room for seating 50 students, and a section office for paper work incident to the course. The field Machine Shop Truck, M4, is located in the shop and is used as equipment in training the students in addition to the installed machines in the shop.

On April 3, 1941, actual movement of machinery and equipment from storage was started into the new shop building. With the assistance of personnel and special equipment from the Automotive Section, the handling of heavy machinery was reduced to a simple job. A heavy wrecker unloaded the load at the shop door, a small wrecker was used inside the shop to spot the machines into approximate position, a portable hoist was then used to locate the machines in the respective position as shown on the floor plan. Chalk lines previously laid out on the floor materially aided in aligning the various rows of machines installed.

On May 12, 1941, the Section was sufficiently organized to receive the initial group of 32 students for basic training as Ordnance Machinists for field duty. Scope of initial and subsequent courses consist of: Bench, Lathe, Shaper and Milling work as practical application, simple tool grinding, class room work in shop theory, shop sketching, quizzes and examinations. Demonstrations are given in the heat treatment of metals and machine and work set-

up and operations which the student does not perform due to the short duration of the course.

An advanced course of Machine Shop training was established for selected graduates of the Springfield, Mass. section of The Ordnance School where the students had received approximately 90 days basic machine shop training. The advanced course of 6 to 8 weeks duration essentially consists of Shaper, Milling and Lathe operations with practical work in the fabrication of tools, parts, assemblies, and maintenance required by the machine shop and other sections of the school.

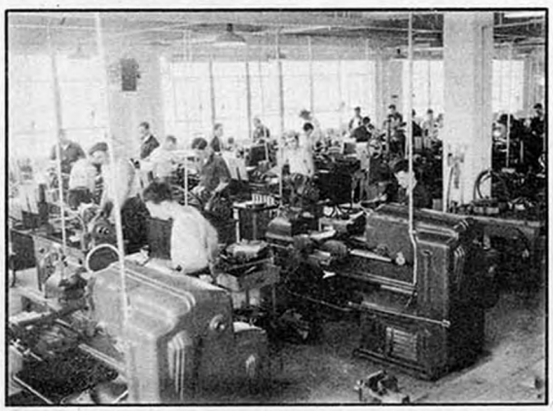
The Regular Officers' course of 70 hours in the machine shop comprises practical work on the lathe and demonstration of operations on the Shaper and Milling machine.

N.C.O. students are received and taught the rudiments of Shop Administration of Maintenance Companies in the field and are conducted through the machine shop to observe and note the fabrication of problems by the machinist students.

Graduates of the Machine Shop Course
May 12, to Dec. 30, 1941

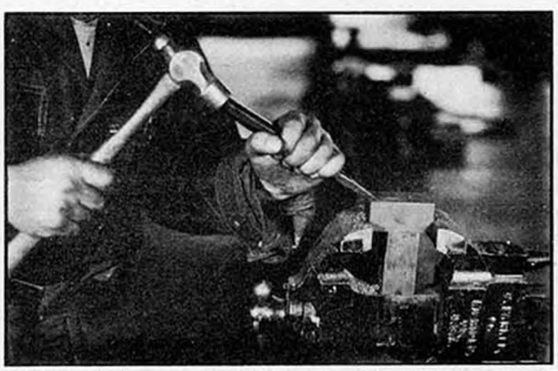
| | |
|---|---|
| Officers | 22 |
| Basic Machinists | 94 |
| Advanced Machinists | 46 |

We now take this opportunity of conducting you, our visitor, through the Machine Shop by means of a pictorial trip, the pictures depicting ordinary activity we are pursuing in the endeavor to accomplish our mission.



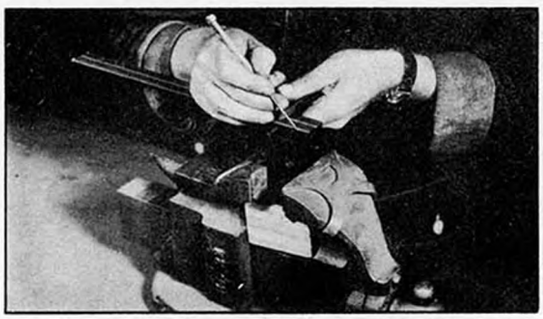
A partial view of the lathe section of the shop, lathes being operated by students of the basic and advanced groups.


One corner of the Tool Crib & Stock Room. Locater card system is used for accounting and locating tools and equipment. All issues made on Tool check or Bill of Material.

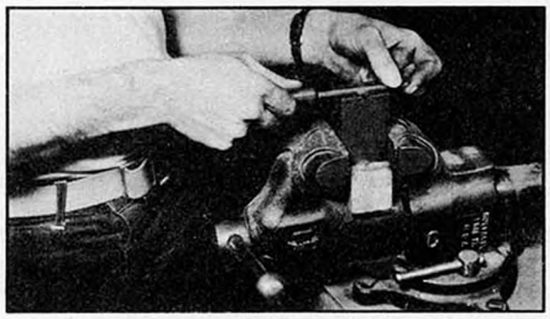


Bench Work - Chipping scale on cast iron block before filing. Use of simple hand tools in bench work considered important as an aid in developing feel and manual dexterity.

Bench Work - Draw filing cast iron block with mill file to produce a smooth level surface. A coarse or bastard cut file used in this manner removes high spots or a ridge in the center of the surface being filed, but leaves a rough finish.

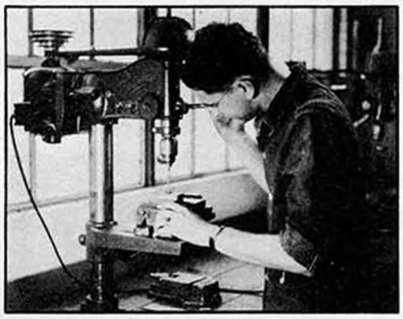


Bench Work - Simple lay-out of intersecting grooves on cast iron block prior to chipping and filing the grooves, Students work to an elementary mimeographed drawing.



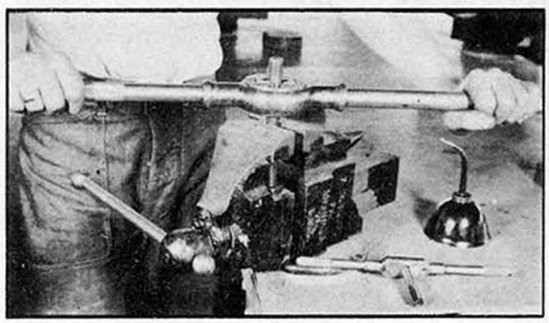
Bench Work - Filing grooves to a lay-out after chipping. Work required to be within 1/64" of nominal size, narrow pillar file with safe edges used. Note packing block used under the work held in the vise to help support it.

Bench Work - Scraping surface on cast iron block. Worn out files of different sizes and shapes ground smooth and sharp on end make excellent scrapers. Scraped surface is tested against surface plate.



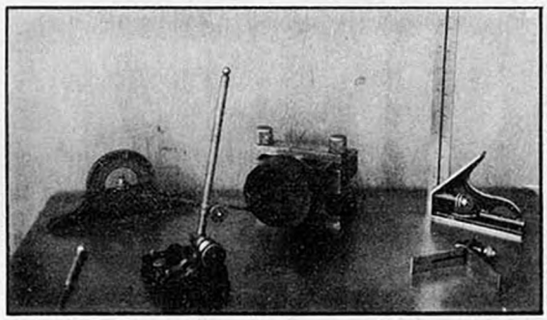
Bench Work - Drilling holes in cast iron block for hand tapping, requires student to calculate tap drill size. A simple lay-out establishes position of holes to be drilled.

Bench Work - Tapping threads in cast iron block. 4 different types of thread are tapped for screws that require a counter-sink, a counterbore, a body size drill and fitting a pipe plug to a tapped hole.

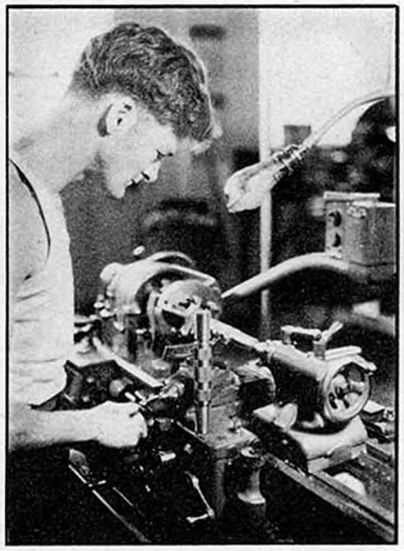


Bench Work - Cutting an external screw thread on bolt with stock & die. This stock and die with tap and tap wrench shown on bench are a ready and quick method for producing external and internal standard threads on work.

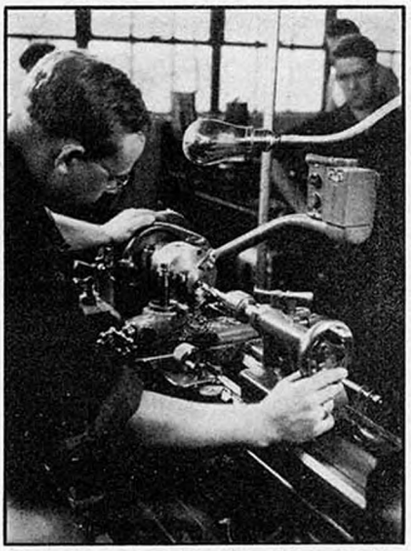
Bench Work - Off-hand sharpening of twist drill on bench grinder. The only method available for this operation if no drill grinder is available. Students drill holes in cast iron block after sharpening the drill. Note drill gage on bench near bench block.



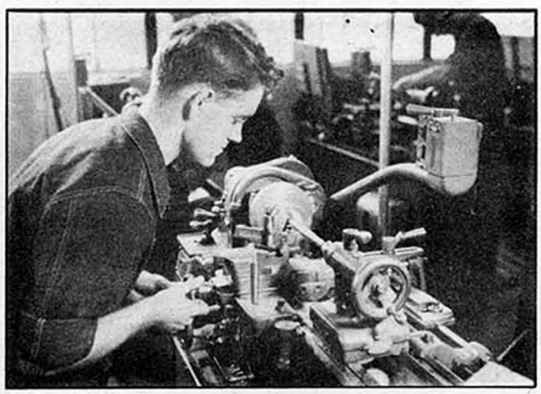
Bench Work - Progressive lay-out for keyway to secure cast iron collar on steel shaft. A snug fit is required in this assembly without cracking or rupturing the cast iron collar. A taper pin and set screw completes the problem.



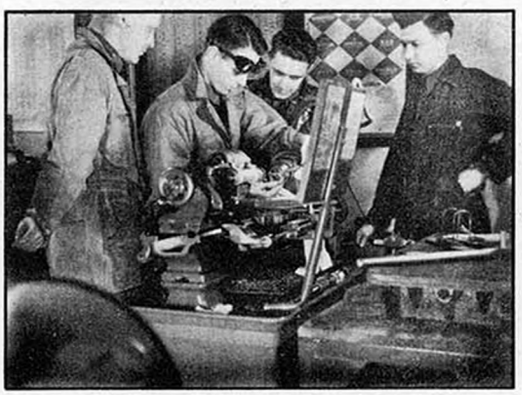
Basic Lathe Work - Producing a right and left hand threaded steel stud on centers, class 2 fit. Ordinary spring calipers and graduated rule used in finishing to size. Depth of thread calculated by use of graduated collars on carriage cross-feed screws.



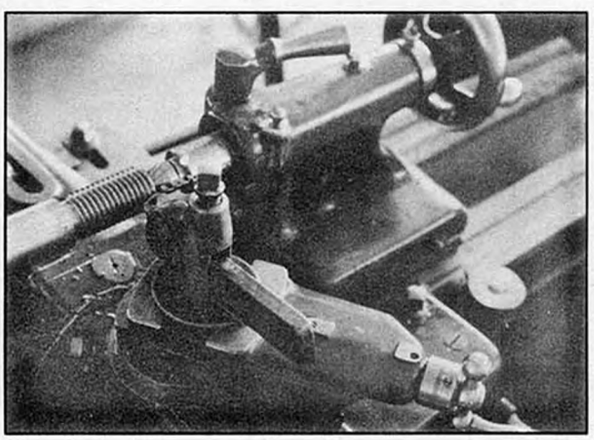
Basic Lathe Work - Drilling nut blank prior to boring and threading. Right and left hand threaded nuts are produced to fit steel stud. All threaded parts are held to limits of tolerance for class 2 fit as established by manufacturing standards.



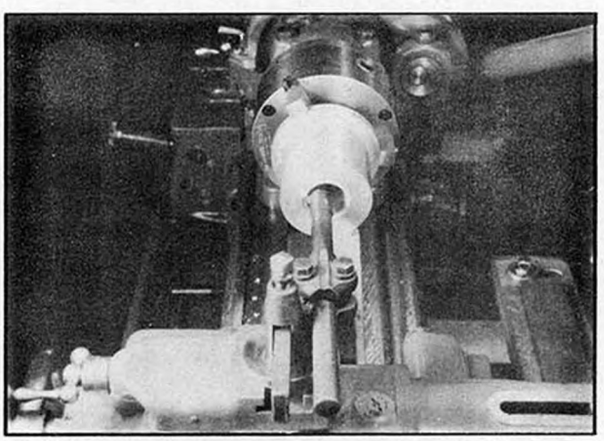
Basic Lathe Work - Making lathe centers; taper and angular turning. #2 Morse taper on body checked against taper sleeve and by dial test indicator. 60 deg. point turned, ground and checked against center gage.



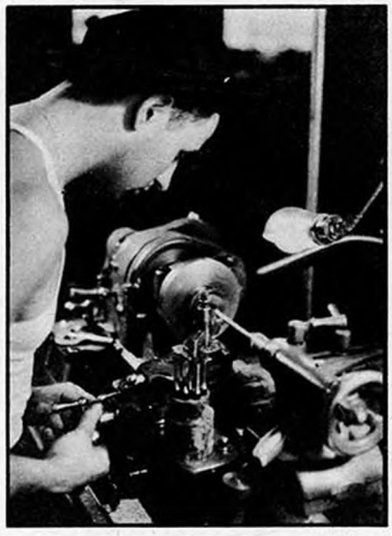
Basic Lathe Instruction - Students receiving instruction in the set-up and use of a tool post grinder in a lathe. Cylindrical, taper and angular grinding comprises the initial problem. Close tolerances are required.



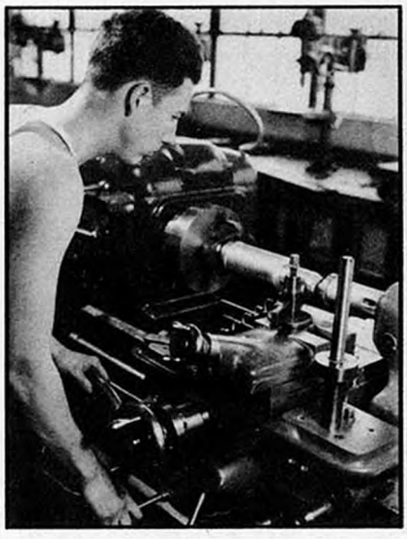
Advanced Lathe Work - Machining a flanged bushing, hole being enlarged by boring. Hole must be concentric with outside diameter and in a parallel plane with axis of work.



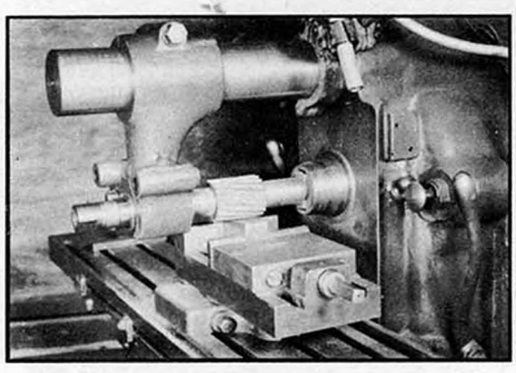
Advanced Lathe Work - A close-up of a screw thread cutting operation. Number of threads per inch cut is determined by the ratio of gearing between headstock spindle and the lead screw of the lathe.



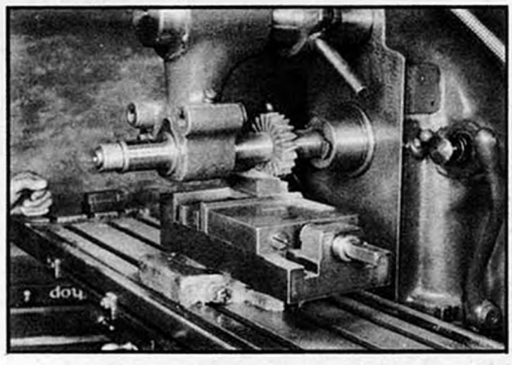
Advanced Lathe Work - Tool steel pin punch set in process of manufacture; when machining is completed the pins are hardened and tempered. More than ordinary skill is required of the student in turning out these long and slender punches.



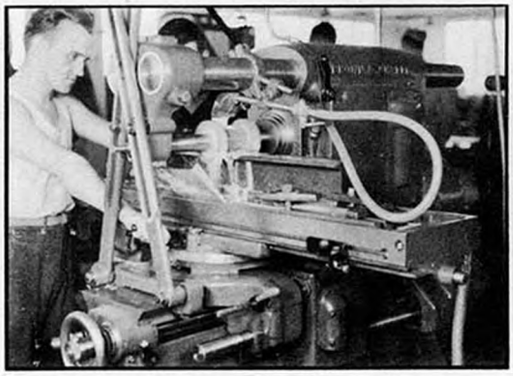
Advanced Lathe Work - Machining an oil seal driver from Chrome-Vanadium steel. Sequence: rough machine, stress relieve, finish machine, harden, temper, precision grind to .0005" tolerance from basic size.



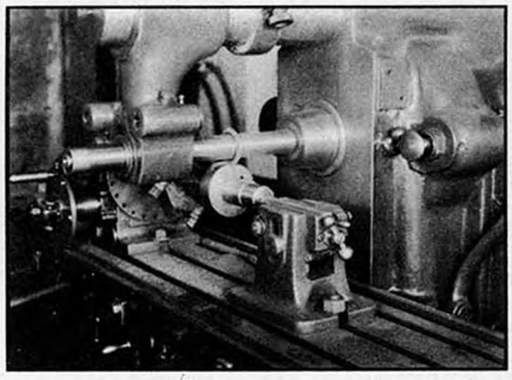
Basic Milling - Squaring cold rolled steel block by plain milling. Subsequent milling required to produce 2 small V - blocks: Form milling, slotting, angular milling, sawing and squaring ends by plain milling.



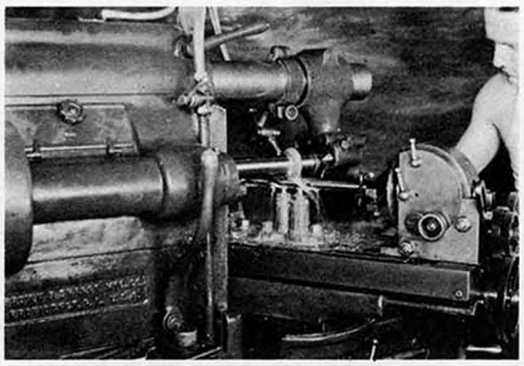
Basic Milling - Squaring cast iron block; 2nd. operation: side milling for production of 3- step strap block or tongued block to fit T - slot on table of milling machine.



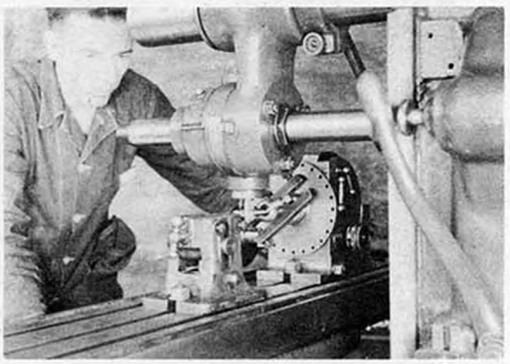
Advanced Milling - Gang milling steel rail, 3 surfaces milled to size in one cut. Other milling, shaper, sawing and bench operations will be required to produce a small bench anvil.



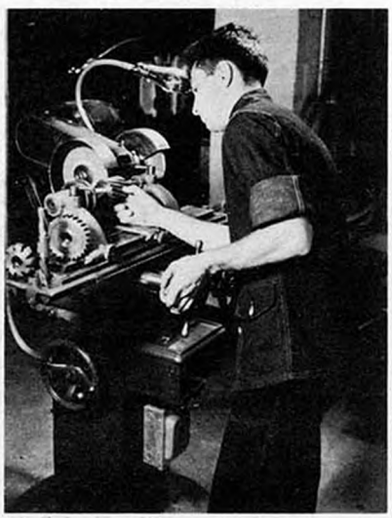
Advanced Milling - Cutting a spur gear with involute formed gear cutter. Gear blank on mandrel between index centers. This attachment spaces the circumference of the blank accurately so that all teeth on the finished gear will be alike.



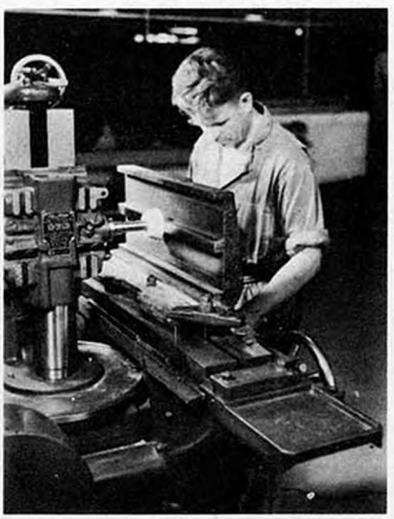
Advanced Milling - Spiral fluting a drill blank with a formed cutter. Ratio of length of flute to one turn of blank determined by the compound gearing between index head and feed screw of milling machine.



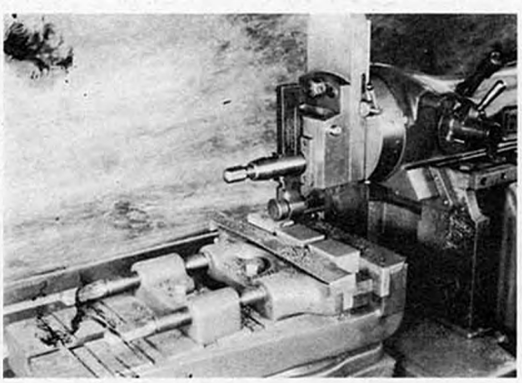
Advanced Milling - Making special slotting tool, work on index centers. Horizontal spindle of machine transformed to a vertical spindle by means of attachment. End mill used as cutting tool.



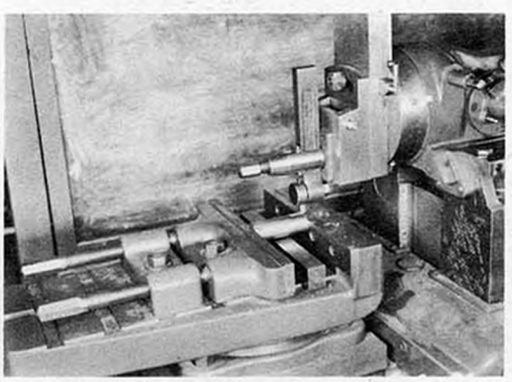
Advanced Milling- Sharpening teeth on milling cutter in a cutter grinder. An important operation, the life of the cutter and the quality of the work produced is influenced by the care and accuracy of this operation.



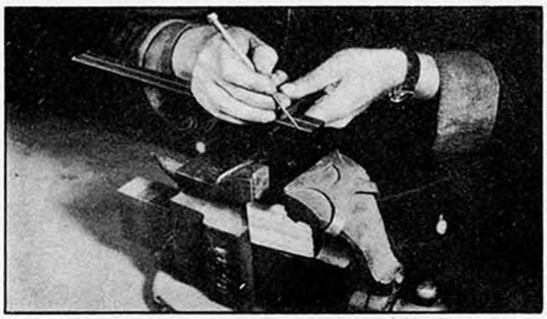
Maintenance - Regrinding flat bearing surfaces on a reconditioned part. Machine used is a Universal and Cylindrical tool and cutter grinder. Close accuracy is required in this set-up.



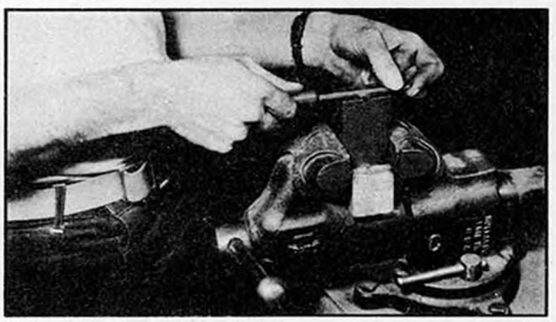
Basic Shaping - Planing flat surface on cast iron block in a 16" crank shaper. Blocks are shaped and later used as material for problem in Bench work. Same block is used again as V - block problem for basic and advanced shaper work.



Advanced Shaping - Cutting keyway in cold rolled steel shaft. A blind hole slightly larger than the width of the keyway is first drilled at inside end of keyway before shaping.

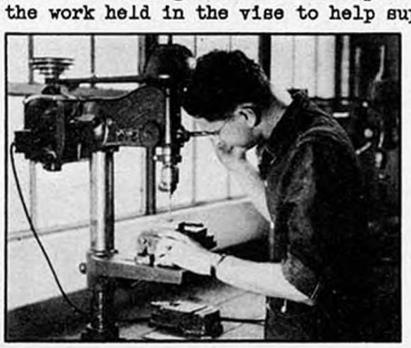


Bench Work - Simple lay-out of intersecting grooves on cast iron block prior to chipping and filing the grooves, Students work to an elementary mimeographed drawing.



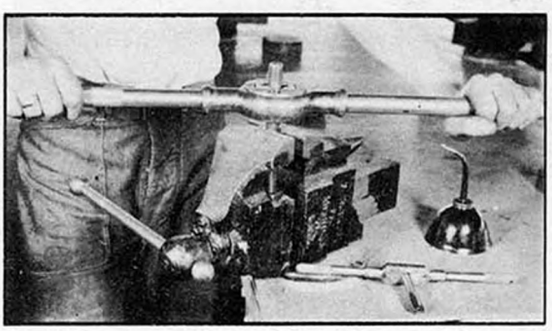
Bench Work - Filing grooves to a lay-out after chipping. Work required to be within 1/64" of nominal size, narrow pillar file with safe edges used. Note packing block used under the work held in the vise to help support it.

Bench Work - Scraping surface on cast iron block. Worn out files of different sizes and shapes ground smooth and sharp on end make excellent scrapers. Scraped surface is tested against surface plate.



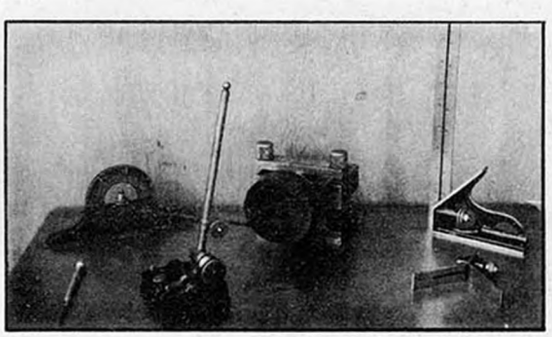
Bench Work - Drilling holes in cast iron block for hand tapping, requires student to calculate tap drill size. A simple lay-out establishes position of holes to be drilled.

Bench Work - Tapping threads in cast iron block. 4 different types of thread are tapped for screws that require a counter-sink, a counterbore, a body size drill and fitting a pipe plug to a tapped hole.



Bench Work - Cutting an external screw thread on bolt with stock & die. This stock and die with tap and tap wrench shown on bench are a ready and quick method for producing external and internal standard threads on work.

Bench Work - Off-hand sharpening of twist drill on bench grinder. The only method available for this operation if no drill grinder is available. Students drill holes in cast iron block after sharpening the drill. Note drill gage on bench near bench block.



Bench Work - Progressive lay-out for keyway to secure cast iron collar on steel shaft. A snug fit is required in this assembly without cracking or rupturing the cast iron collar. A taper pin and set screw completes the problem.


Figure 1 - Lumber rack adjoins tool room

Various types of cut-off saws are available. One type is a swing cut-off saw which is suspended from a heavy cast-iron column so that it can be swung or pulled forward over the stock to be cut. This type is what we believe to be the safest and most modern.

(c) As the lumber is now rough it must be smoothed and straightened on one side and one edge, and the edge is

Figure 2 - Cut to length on the cut-off saw

made square to the side. This is accomplished by face planing on the jointer (Fig. 3).

The jointer like other types of woodworking machines is made in a large variety of sizes, however, the main structural features are similar in all models. These

Figure 3 - Face planing on the jointer

features are the frame, two tables, the cutterhead, the fence, and the guard. The cutter is nothing more than a steel cylinder in which there are two or more knives that are fastened securely to the cylinder. The cutterhead is located underneath and between the front and rear tables. Lumber is moved against and across the cutterhead which is revolving at a high speed and in this manner is smoothed on one surface at a time.

(d) The stock is now taken to a circular saw and ripped to suitable widths (Fig. 4) for making the legs, sides, and braces. In doing this operation, the smooth side must

Figure 4 - Taken to a circular saw and ripped

slide on the table top and the smooth edge must be next to the guide. The primary reason for this is to insure a straight cut that will also be parallel to the smooth or straight edge.

The circular saw being one of the most useful and indispensable woodworking machines is manufactured in many different types from large specialized production machines to small ones of the bench type. The most popular

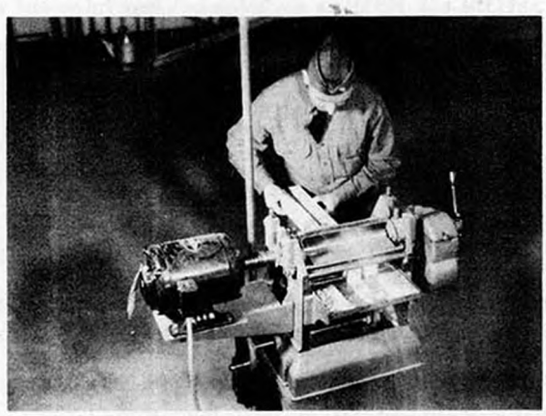
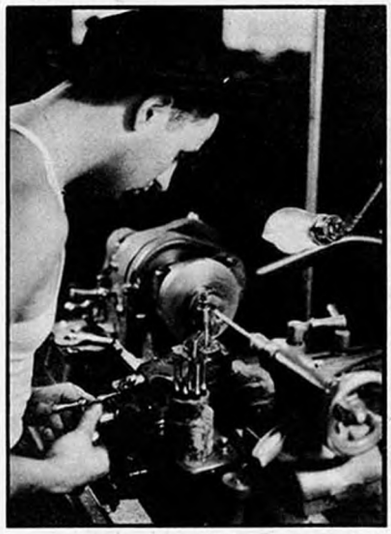
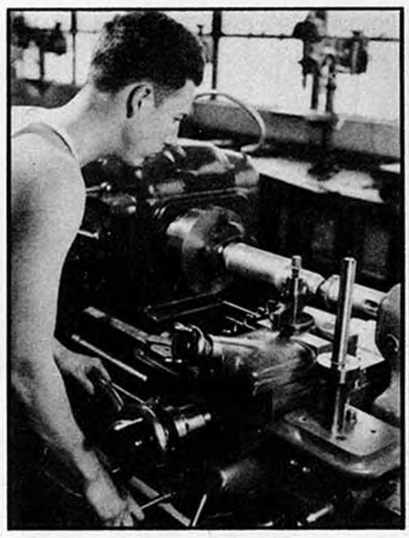


Figure 5 - Boards can be planed on four sides

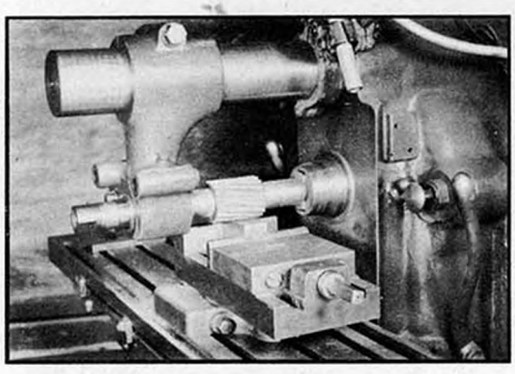
types are the universal saw and the variety saw. The main structural features are the same; namely, a cast-iron frame, an iron table, ripping fence, and one or more fences for cross cutting and mitering, one or two arbors, and saw blades. The saw arbor in its simplest form might be considered as being a shaft with a metal pulley. The shaft, which runs in two bearings, has one threaded end with a fixed collar outside one bearing. The saw blade has a hole in the center corresponding to the diameter of the shaft and is slipped over the end of the shaft and is held against the fixed collar by means of a loose collar and a nut. In order that the saw which revolves to the right will not



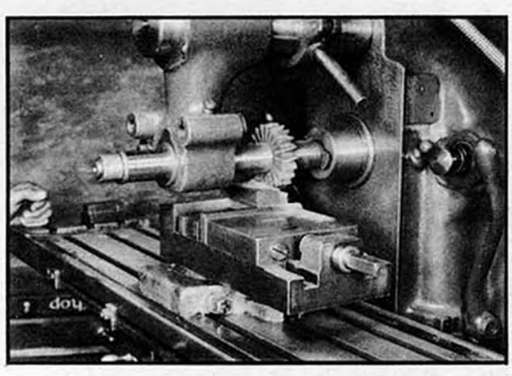
Advanced Lathe Work - Tool steel pin punch set in process of manufacture; when machining is completed the pins are hardened and tempered. More than ordinary skill is required of the student in turning out these long and slender punches.



Advanced Lathe Work - Machining an oil seal driver from Chrome-Vanadium steel. Sequence: rough machine, stress relieve, finish machine, harden, temper, precision grind to .0005" tolerance from basic size.



Basic Milling - Squaring cold rolled steel block by plain milling. Subsequent milling required to produce 2 small V - blocks: Form milling, slotting, angular milling, sawing and squaring ends by plain milling.



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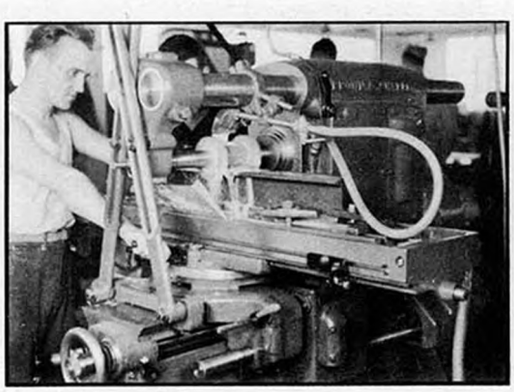

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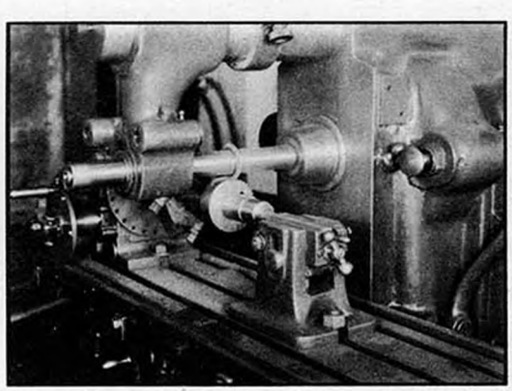
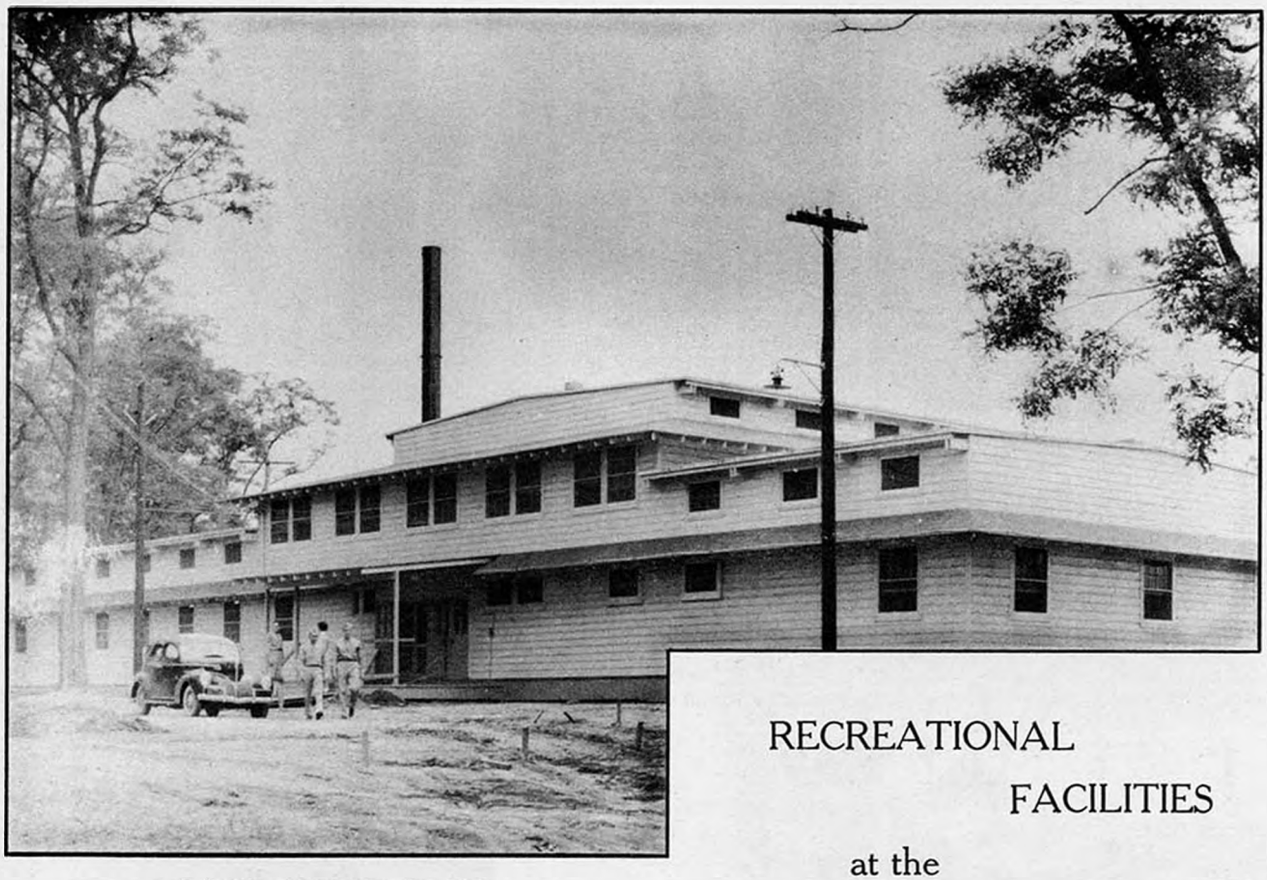


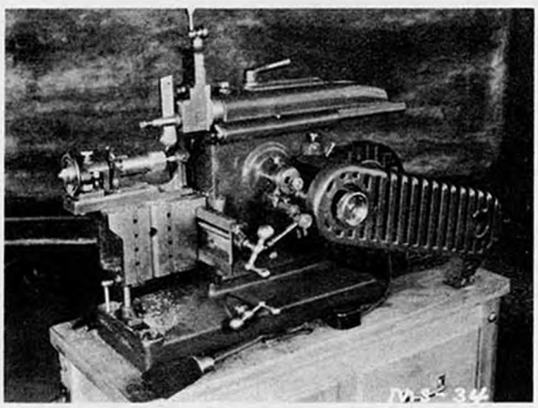
Advanced Milling - Cutting a spur gear with involute formed gear cutter. Gear blank on mandrel between index centers. This attachment spaces the circumference of the blank accurately so that all teeth on the finished gear will be alike.



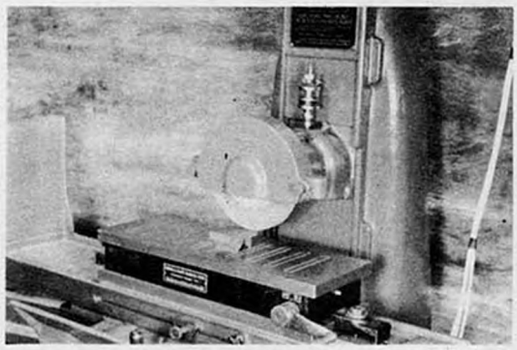
Entrance to the Service Club

# RECREATIONAL FACILITIES at the ORDNANCE TRAINING CENTER

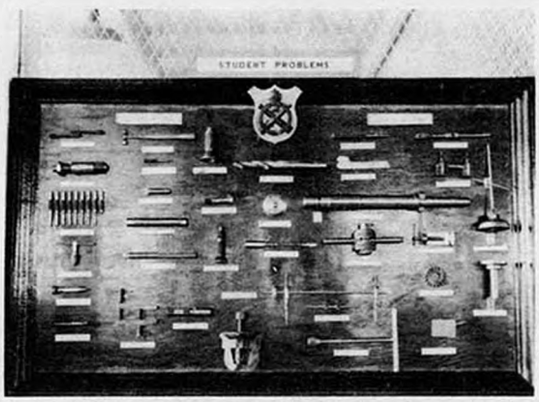
Action in the Ballroom



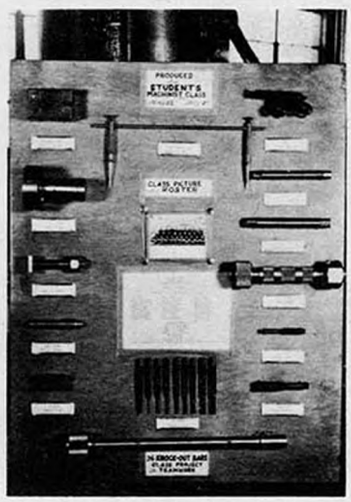
Advanced Shaping - Shaping Hexagon on end of shaft, work on index centers. Normally would be done on a milling machine, if no miller is on hand, some indexing can be produced in a shaper with this attachment.



Surface Grinding - Cast iron V - blocks produced on shaper by basic and advanced students is finish ground on this machine. Permanent magnetic platten holds work while being ground.




Display, Old Model - Before graduation each student was required to contribute towards this display as a proof of his ability and skill as an Ordnance Machinist and as an incentive for future students to equal or excell the quality of the display.




Display, New Model - End product of the initial class which opened the new machine shop. Contributions towards this display was the result of 12 weeks training, all students produced each one of the problems on the display.

# CARPENTER SHOP

## By: W. Kuehne, 2nd Lt., Ord. Dept.

The author's objective in writing this article is to impress in the minds of his readers just what is being done at The Ordnance School in order to train an unskilled man to perform the duties of an Ordnance Carpenter.

Briefly, the specialists' course in carpentry is designed to train selected enlisted men of the Ordnance Department for duty involving the fabrication of woods and related materials as applied to Ordnance maintenance activities.

The need has been felt for a practical course that covers the common operations in the field of carpentry. In the past, many analyses have been made in terms of the tools that are used. However, it is the attitude of our instructors that the analyses should be made in terms of what is actually being done or the operations performed. Tools as we consider them, are used only to accomplish what the carpenter wishes to do.

The scope of the course has been revised to meet the requirements of modern military trends. Our instructors feel it necessary to include shop mathematics, and blue print reading as preliminary subjects to the actual shop practice. However, instruction in woodworking practice involving both hand and machine tools requires the greater part of the time.

Students gain knowledge and practical experience by actually building projects in mass production. One of the typical projects is a telephone stand and the procedure for building is as follows:

(a) After a complete and accurate bill of material has been presented to the soldier in charge of the tool room, the lumber is selected from the lumber rack which adjoins the tool room (Fig. 1).

(b) The lumber must first be "cut to length" on the cut-off saw (Fig. 2). Pieces of stock are now cut into lengths for making the legs, sides, and braces and are in convenient sizes to be carried to other machines.

# WELDING SECTION

## By: W. G. Sylvester, 1st. Lt., Ord. Dept.

The extensive application of welding as a formative process in the fabrication and maintenance of ordnance materiel has initiated the need for trained welding specialists in Ordnance Maintenance Companies. There is a constantly increasing growth in the number and variety of special alloys of both ferrous and non-ferrous metals processed by selective heat treatment to fulfill specific applications in Ordnance construction. The identification of these metals and their alloys, the ascertaining of their

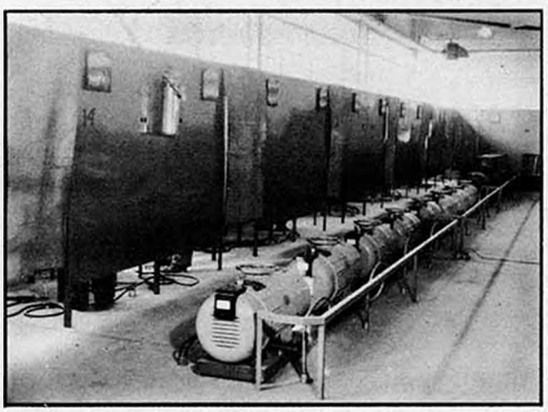


Figure 1

weldability and physical properties, and the determination of a proper welding procedure or technique are capabilities to be acquired by a skilled welder.

To expedite this problem the Welding Section of The Ordnance School was established. It has as its objective, the training of selectees to become specialists in the two major fusion welding processes, namely, oxyacetylene and electric arc welding. The scope of this training comprehends several major subdivisions which may be classified as follows:

(1) The design, application, maintenance, and safety precautions in the use of welding equipment.

(2) Survey of the properties of metals and alloys

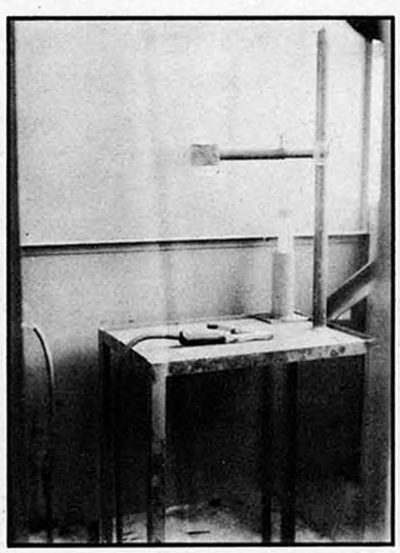


Figure 2

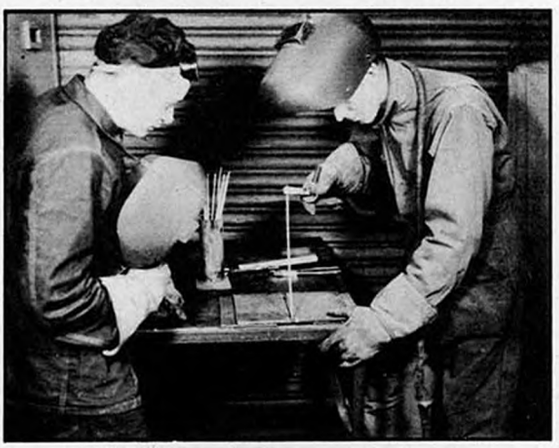


Figure 3

used in Ordnance construction, including their methods of identification, heat treatment, and any special technique required for their satisfactory fabrication or repair by welding.

(3) Outline of procedures for the fusion welding and brazing of steel and its alloys, cast iron, malleable iron, brass, bronze, copper, as well as welding of aluminum, white metal, lead and other metals.

(4) Instruction in silver soldering, aluminum soldering and soft soldering as applied to specific joint designs.

Figure 4

(5) Severing of ferrous and non-ferrous metals by melting, using the carbon arc and shielded metallic arc methods, as well as cutting of ferrous metals by oxidization, using the oxyacetylene cutting torch.

(6) The principles and applications of hard surfacing, flame hardening, surface carburizing, stress relieving and other specialized uses of the oxyacetylene torch.

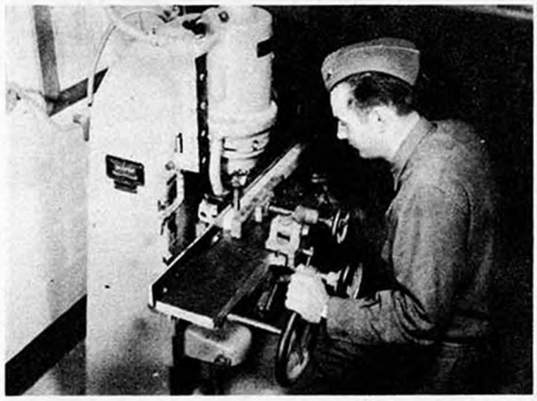


Figure 6 - "Drilling square holes"

work loose, the thread on the arbor is always a left thread. The universal saw has two arbors whereas the variety saw has only one. We use a variety circular saw that is capable of being tilted to any angle up to forty-five degrees; thereby doing a wide variety of sawing operations.

(e) By using the thickness planer, the boards can be planed on four sides (Fig. 5) and they will also be of uniform width and thickness providing that a straight surface is always kept next to the table top when planing. The top surface of the board is the one being planed each time the board passes thru the machine.

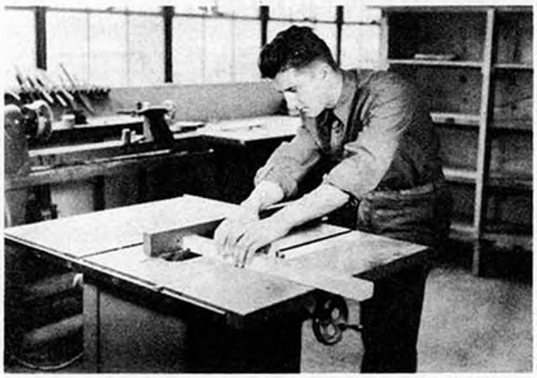


Figure 7 - Set up to cut the tenons

The action of the thickness planer is as follows: At the front side of the planer there are two feed rools, the top roll being corrugated. The board is fed in between the two rolls which pull it on its way. The board then passes under a chip breaker which prevents splintering and tearing after the knives begin to cut. After the board passes under the knives it passes under a back pressure bar that holds it down on the table. The board then moves thru two delivery rolls, the top one being equipped with a scraper. This scraper cleans the upper roll of shavings and other foreign matter which if allowed to remain would mar the planed surface.

(f) From the planer the boards are moved to a mortising machine which we might say is capable of "drilling square holes" (Fig. 6). On this machine the legs and side braces are mortised.

Mortising machines may be had in four distinct types and each of these types differs radically from the others. The most common of these is the hollow-chisel mortiser which we use because of its adaptability to most light and heavy work. This machine produces a mortise that has square sides, edges, and bottom.

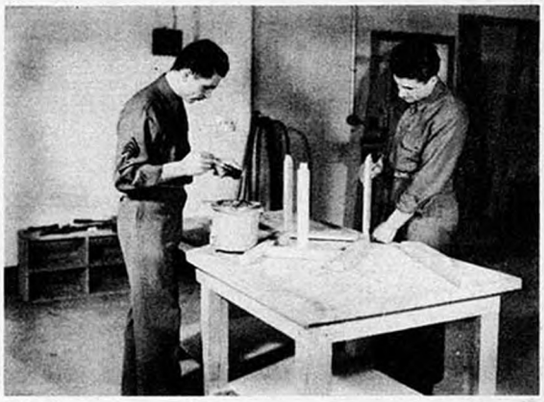


Figure 8 - Ready to be sanded and assembled

(g) After all mortising has been completed the lumber is moved to a second variety saw which is set up with a so-called dado head. This consists of two circular saws and several inside chisel-like cutters of various thicknesses placed on the arbor between the saws (Fig. 7). In other words, the machine is set up to cut the tenons which must be fitted to the mortises that have previously been made. The tenons on the side pieces are then taken back to our first circular saw to be mitred so as to meet each other at a forty-five degree angle within the mortise on the legs.

Figure 9 - Finished

(h) After the top has been made and glue blocks have been made for the underneath construction, the parts are ready to be sanded and assembled (Fig. 8). First the legs, the side pieces, and braces are assembled using glue as a means of fastening them. The top is then fastened to this assembly by gluing and screwing the blocks of wood to both the top and the side pieces.

The stand is now "finished in the white", (sanded and ready to take a finish), and is finished in any of the many ways that might be desired (Fig. 9).

[The usual Machine Shop article is on page 90. Additional Shop articles are also in this issue: The Carpenter Shop on pages 53 and 92, and The Welding Section of page 58. Carpenter Shop and Welding Shop articles appear regularly in future issues.]

tinct phase of welding and requires the development of a suitable technique for its successful accomplishment. To facilitate in this training, the student is given adequate lecture material and laboratory demonstrations to illus-

Figure 10

trate each step. The student then augments this instruction by performing appropriate practical welding exercises until the required welding skill and quality in the finished weld are developed.

In order to attain greater efficiency in the teaching process, the facilities in the welding school have been systematically arranged to fulfill the specific requirements

Figure 11

of the desired objectives. Of these, the principal sections and their functions may be grouped as follows:

(1) A classroom is available for the presentation of pertinent lecture material, examinations, and discussions

Figure 12

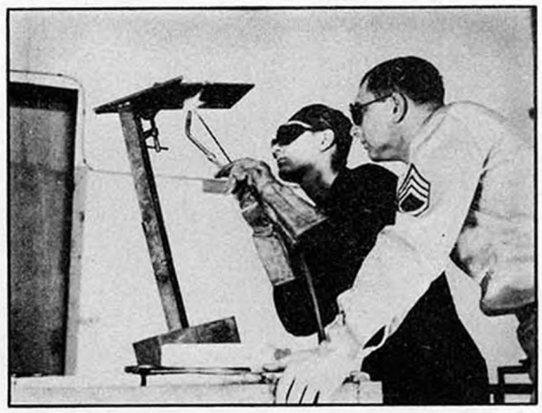


Figure 13

covering the theoretical aspects of the various welding processes and their applications.

(2) The electric arc welding section consists of 15 arc welding machines and 15 welding booths. Two students working in alternate periods are assigned to each booth and are provided with individual tool kits. This ar-

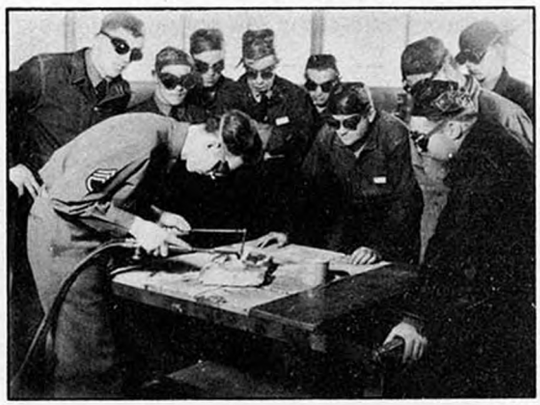


Figure 14

rangement affords optimum conditions for the development of individual skill in the operation of the welding machines as well as in arc welding practice.

(3) The oxyacetylene welding section consists of 30 oxyacetylene welding outfits and 30 welding booths with

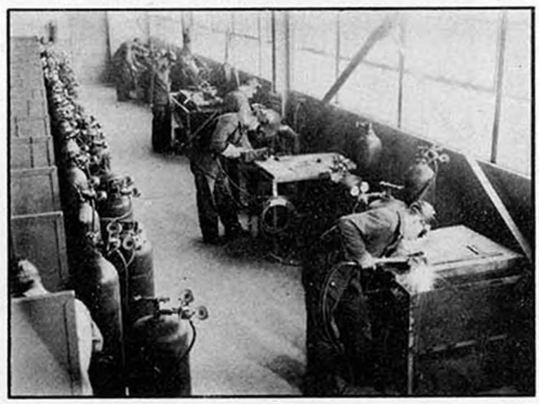
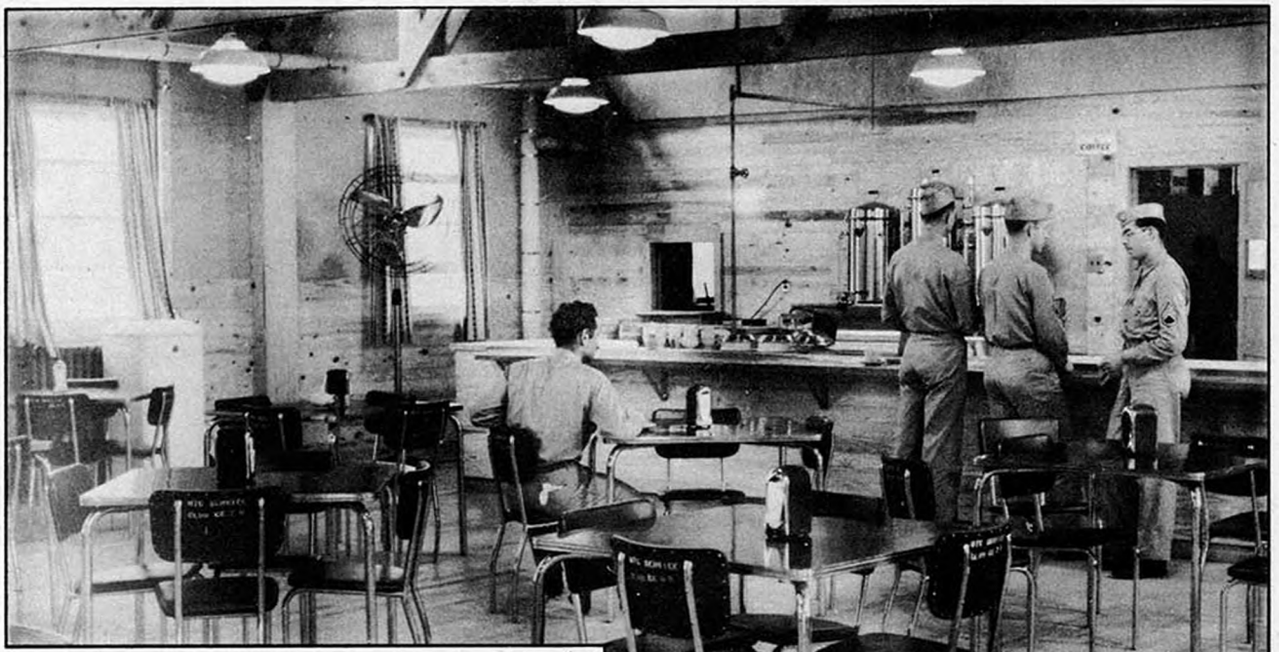
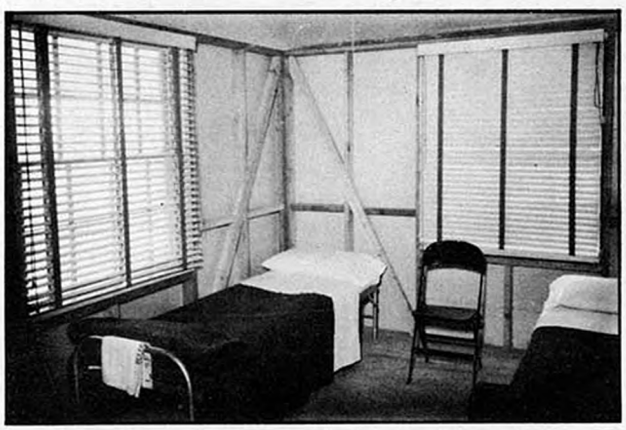


Figure 15

one student being assigned to each booth. Under this plan, each student is supplied with a complete ocyacetylene welding outfit and welder's tool kit. As in the arc weld-



Coffee Shop and Restaurant



Guest Room

Library and Reading Room

struction is used to coordinate welding theory with practice and aids materially in developing the proper welding technique for student practice.

Figs. 3 through 6 illustrate the proper relationship between the welding electrode and the joint to be arc welded. The proper procedures as demonstrated by the instructor to the student apply to flat, horizontal, vertical

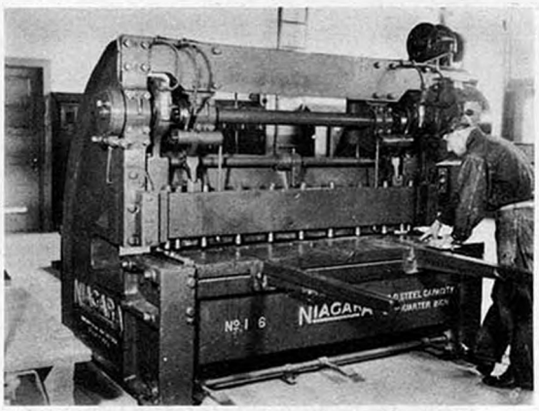


Figure 20

and overhead welding positions. Group as well as individual instruction methods are successfully employed in each welding course. Fig. 7 shows a demonstration of arc welding cast iron with the work in the flat position.

The design and arrangement of oxyacetylene booths is shown in Figs. 8 and 9. Each welding student is supplied with oxygen and acetylene cylinders and is required to adjust the regulator pressures for the particular welding operation. Under these conditions the student receives a

Figure 21

maximum amount of practical experience in the proper handling and adjustment of welding equipment and develops initiative through individual work.

The methods of instruction outlined for electric arc welding are also successfully employed in the oxyacetylene welding course. Figs. 10 through 13 show the instructor checking student welding performance in the flat, horizontal vertical and overhead welding positions. A group demonstration by the instructor of cast iron welding

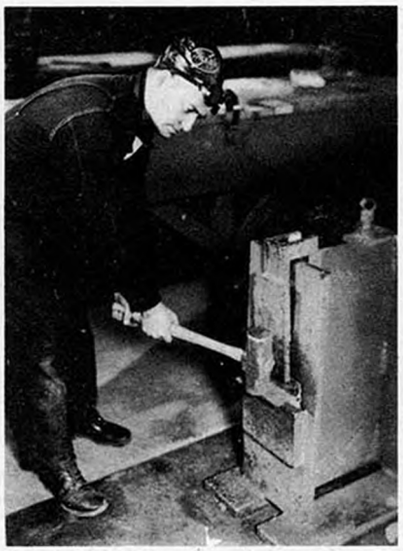


Figure 22

using the oxyacetylene welding torch and a cast iron welding flux is shown in Fig. 14.

Fig. 15 shows students preparing steel plates for welding while developing the required skill in both manual and machine guided flame cutting operations. The cutting torches in each case are attached to separate oxygen and acetylene cylinders. The practical instruction includes training in the adjustment of regulators and torches, use of proper tip sizes, cutting speeds, as well as pressures for preheating gases and cutting oxygen.

Figure 23

After the plates are square cut or bevelled with the cutting torch, any minor irregularities, adhering slag or surface oxides present are removed at work benches as shown in Fig. 16. These added precautions are reflected in easier alignment of plates at the joint as well as better weld metal quality in the finished weld.

Where the requirements for surface quality in flame cut edges are more exacting, a machine guided cutting torch shown in Fig. 17 may be used. These machines are capable of operation at varying speeds to meet the requirements of the particular plate thicknesses being cut. By properly guiding the torch, straight line or irregular

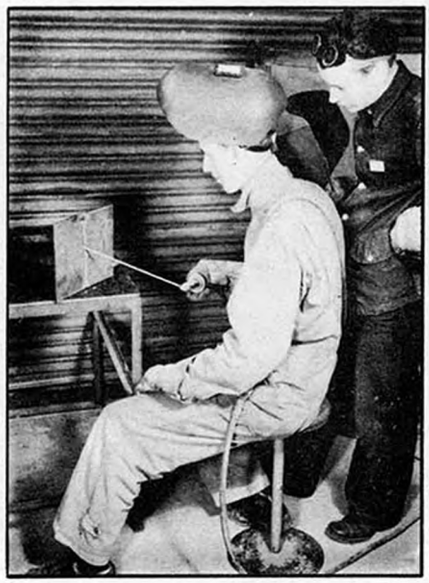


Figure 5

(7) Methods of testing welds to determine weld metal quality and welded joint efficiency.

In addition to the above, the principles and specific applications of forge welding as applied to shaping and joining steel and wrought iron sections are also covered.

Welding maintenance of Ordnance materiel in the field is accomplished by using the equipment on welding trucks which constitute a part of the mobile shop equipment assigned to medium and heavy maintenance companies. These trucks have the required facilities to permit oxyacetylene welding and cutting as well as electric arc and forge welding operations. Sufficient instruction is necessarily included in the scope of the welding course to familiarize the students with the proper operation of this welding truck equipment.

Figure 6

Students enrolled for the welding course are required to meet certain standards for educational background and mechanical aptitude. Those students who have had previous training or experience in a particular welding process, such as oxyacetylene welding, are placed in the

Figure 7

electric arc welding course and vice versa. At the end of the particular course taken covering both theory and practice in one major welding process, the students are given a short refresher course in the other major welding process. By following this schedule of instruction the students receive a proficient training in one welding method and have at least a working knowledge in the other.

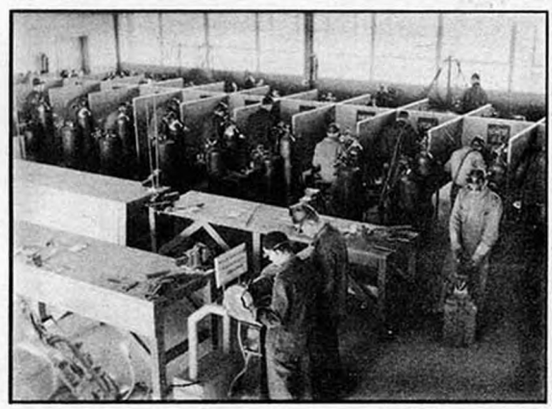


Figure 8

The available time for each course is divided into 240 instruction periods — each period is an hour and forty minutes in duration. Every effort is made to coordinate welding theory and practice with a view toward developing student initiative in solving new welding problems.

The subject matter in both the oxyacetylene and electric arc welding courses is presented in appropriate progressive steps. Each of these steps represents a dis-

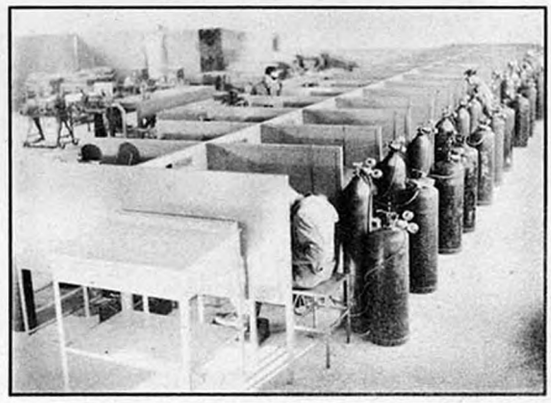


Figure 9

Figure 28

tensile and bend testing machine. In addition to some of the bend tests outlined above this machine is capable of exerting a pulling force or tension in butt welded plate specimens to determine the strength of the welded joint. The tensile strength is calculated by dividing the load, as recorded on the gauge located on the machine, by the original cross sectional area of the welded plate.

Through the expedient of these tests a constant check is made of the students proficiency in developing practical welding skill. Thus, any corrective measures required in the students' welding procedure or technique are based on the results of actual welded joint performance tests.

The transition from welding instruction in the school to welding under field conditions is affected by adequate instruction in the use of the welding truck equipment.

The major items of equipment and supplies contained in the fully equipped welding truck include complete oxyacetylene, electric arc and forge welding outfits, a power hack saw, a portable grinder and drill press, a hand shear, bench vise, and other essential tools and supplies.

Fig. 26 shows a welder preparing plate edges for welding using the work bench facilities on the welding truck. Having properly prepared the work, the welder can make the welded joint by either the oxyacetylene or electric arc welding processes. Fig. 27 shows an ocyacetylene welding operation being performed on the fire brick top welding table. When welding with the electric arc process, a hinged steel plate cover is lowered over the fire brick and the arc welding operation is performed with the equipment shown in Fig. 28.

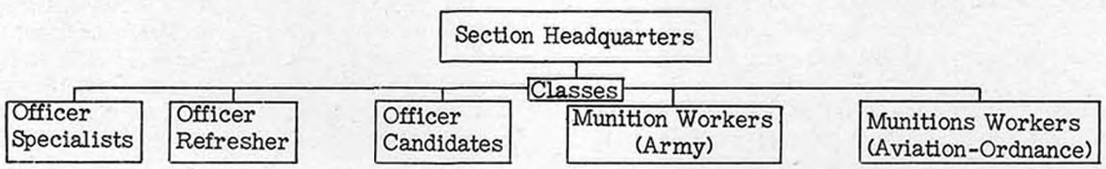
By coordinating the welding instruction given at the school with its applications in ordnance field maintenance work, the student welder is prepared to fulfill his duties in an ordnance maintenance company. He is equipped with sufficient practical experience to fabricate and repair items of ordnance equipment which are constructed from the more common ferrous and non-ferrous metals. By using the information gained through lectures, demonstrations and further outside reading, the student can repair by welding some of the special alloys used for ordnance materiel. This training includes the proper procedures to be followed considering such special precautions as preheating, use of proper filler metals and rates of cooling after welding as well as subsequent heat treatment where necessary to obtain the desired properties in the finished weld.

# AMMUNITION SECTION

By: W. W. Prichard, 1st Lt., Ord. Dept.

This section of the Ordnance School is charged with technical instruction in ammunition and conducting practical work in ammunition supply. It is an outgrowth of the merging of the ammunition sections of the Ordnance School of Aberdeen Proving Ground, Md., and the Ordnance Field Service School of Raritan Arsenal, N. J., at Aberdeen Proving Ground, Md., during the summer of 1940.

Beginning with an instructing staff of one (1) officer and three (3) first three grade enlisted men, in July, 1940, we have grown into an organization of three (3) officers and twenty-three (23) enlisted men. The section is organized to conduct Officer, Officer-Candidate, Enlisted Munition Workers (Army), and Enlisted Munitions Workers (Aviation Ordnance) classes in all phases of ammunition. Following is a chart of our present organization.




# OFFICERS' AMMUNITION INSTRUCTION

By: R. J. Russo, 2nd Lt., Ord. Dept.

The instructing staff of the Officers' Ammunition Course at The Ordnance School has been expanded from one to three officers in the past year, to meet increased officer classes. The type of instruction has been changed to meet present requirements and to keep abreast of ever changing world conditions.

Capt. G. B. Jarrett was the only officer on the School Ammunition Staff one year ago. He was joined by Lt. Ralph J. Russo in March of 1941, and a month and a half later by Lt. W. W. Prichard. Lt. Fitzwater was added to the Staff upon graduation from the Officer Candidate Course, to bring the Officers Instruction Staff to four officers. Early

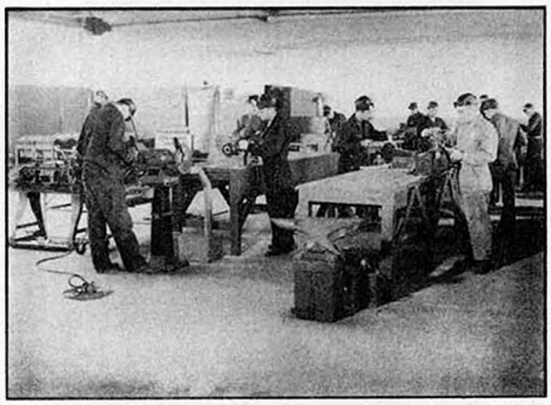


Figure 16

ing, this arrangement lends itself to more efficient training in practical welding as well as in the operation of the welding equipment.

(4) A manual and machine guided flame cutting section has been developed for cutting and beveling plate for welding as required by both the oxyacetylene and electric arc sections. Suitable tables are also available for student training in the operation and use of hand cutting torches as applied to steel and cast iron.

(5) A work bench section has been designed to provide facilities for chipping, grinding, sawing and other

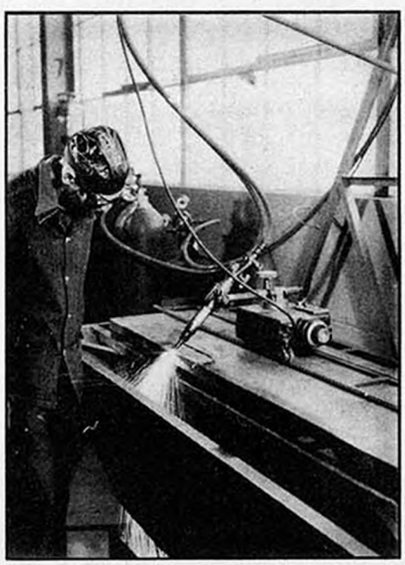


Figure 17

work required for preparing plate edges of ferrous and non-ferrous metals for welding. A power shear, metal band saw, snagging wheel, as well as portable, bench, and pedestal type grinders are also located in this section.

(6) The weld testing section is equipped with suitable testing apparatus to check the students progress in developing the necessary welding skill. These tests are used to determine the efficiency of the welded joint as well as the quality of the weld metal deposited by both the oxyacetylene and electric arc welding processes.

(7) A type M3 welding truck is available for instructional purposes. The training and welding experience gained by the student in the welding school is correlated with the use of the equipment on the welding truck. With this added training the welding student is better qualified to solve field maintenance problems as applied to welding in ordnance maintenance companies.

The arrangement of the arc welding machines and arc welding booths is shown in Fig. 1. The machines shown

Figure 18

are of the motor driven generator type. The motors are driven by 220 Volt 3 phase A.C. current supplied from a power panel through lead lined cables located in protective conduit piping beneath the floor level. The welding leads from the generator are also conducted to the booth through hollow conduit piping. This design promotes safety, neatness and greater efficiency in arc welding instruction.

Fig. 2 shows the metal top welding table design used, including a bracket for holding plate for welding in all positions as well as a container for electrodes.

In order to effectively instruct the students in the practical aspects of arc welding, the lecture material as well as outside studies are supplemented by suitable practical demonstrations in the shop. This method of in-

Figure 19

trained as units in Unit Training Centers for the Ordnance Department, the Aviation Ordnance companies were largely activated in the field at their home stations. That means that around a small nucleus of trained enlisted men and officers, there was built a functioning organization. This was necessary because of the fact that the Air Corps bases were activated and had to be functioning, and there was no time to await the training of units at some other point. The companies had to be operating their Ordnance facilities at the Air Base while the company was being formed and trained. Thus, the larger proportion of the student officers who have taken the Aviation Ordnance course at The Ordnance School have been those who have been out in the field for some months, discovered what additional knowledge they needed to perform their Ordnance functions, and then returned to School anxious to acquire it.

The knowledge which these officers with Aviation Ordnance companies must be equipped is of a more exclusive type than is necessary in other companies. In a medium maintenance company for example, the ordinary procedure is to have the company function as a unit. Thus, an officer could be trained in shop procedure to be the shop officer, and he would be the only one who would have to have a complete knowledge of that subject at the beginning. Then, when time was available, he could train the other officers in the company; and so on throughout the other specialist jobs in the company. That principle could not be carried out in an Aviation Ordnance company, because in this set-up, each platoon acts at a dispersed airdrome to service a squadron. Thus, although the enlisted specialists in the platoon need know only one subject well, it is very necessary that each and every officer know thoroughly all the subjects of armament, automotive maintenance, ammunition, and supply procedure, in order that his platoon can properly perform its mission. Unless the platoon leader can properly supervise his platoon operations the Ordnance service for the Air Force will be inadequate.

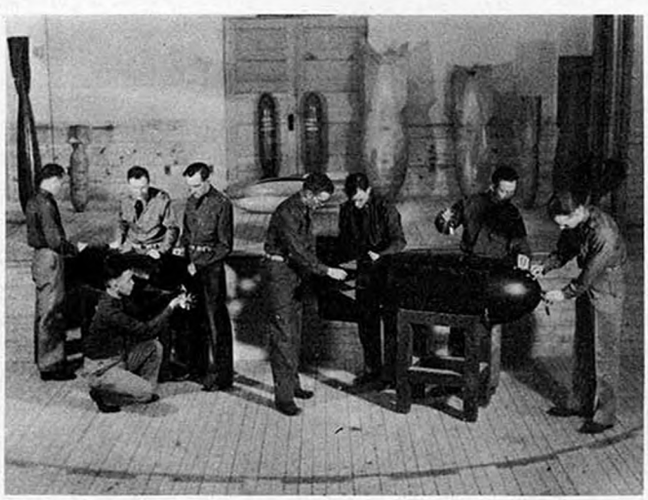
This, then, has been the problem of The Ordnance School: to attempt to hit the high spots of all the knowledge which the Aviation Ordnance Officer must have in all the fields of Ordnance service; yet confine the scope of study to those subjects which concern the Air Force primarily.

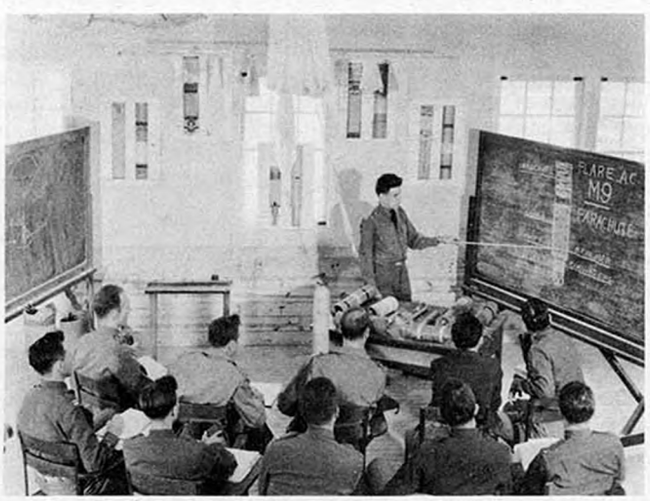
To properly follow the activities of the Aviation Ordnance Section of the Ordnance School, it is necessary to "raise it from a pup", to consider just why it was installed as a course in the Ordnance School, and how it was developed since that time. The First Aviation Ordnance course was begun on September 22, 1939, when Major H. J. Conway had a class of eleven regular officers for a three months' course at the Ordnance School, then located in the Administration Building at Aberdeen Proving Ground. This class, at the conclusion of its three months course, went to Langley Field, Va., where one platoon of the single Aviation Ordnance Company then existing was functioning — the Tenth Ordnance Service Company. Here they studied the practical aspects of Aviation Ordnance Service under the GHQ Air Force Ordnance Officer, and saw some of the airplanes and types of service which they would have to furnish. The Aberdeen phase of this course was, naturally, devoted primarily to the study of Ordnance in general; a subject which could be studied at Aberdeen in far more detail than elsewhere. The three months at Langley were spent in the study of Ordnance Service as it pertains to the Air Force, and the practical solutions of the various problems.

This first class was followed by a second which began on January 5, 1940, and was composed of fifteen regular Army officers and one Marine officer. This class, likewise, had a three months' course both at Aberdeen Proving Ground and Langley Field, Va., under the direction of the Ordnance Officer of the GHQ Air Force (now the Air Force Combat Command), Col. E. A. Lynn.

These were all of the special aviation Ordnance courses for a time, although Aviation Ordnance units continued to get some officers from the regular officers classes of the Ordnance School.

At about this time Aviation Ordnance began to grow by leaps and bounds. First, the platoons were enlarged to form an Ordnance Battalion for service with the three wings of the GHQ Air Force, then as the Air Force grew into its present four Air Forces with 54 groups, and is even yet being expanded into more groups (83 by the latest information); so did the Aviation Ordnance organization expand until there are now 98 Aviation Ordnance Companies. It was very necessary that training at the Ordnance School be provided for the Officers and men within these companies, to provide them with the training equipment nec-





shapes can be cut at any angle of bevel desired and at constant speed. Plate and pipe beveling operations using the hand cutting torch are shown in Figs. 18 and 19 respectively.

The equipment of the welding school includes a power shear which is used to produce clean cuts in ferrous and non-ferrous sheet and plate up to 1/4 inch in thickness

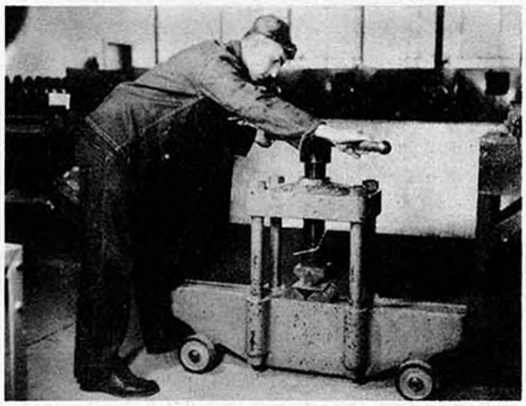


Figure 24

and 72 inches in length. This shear, shown in Fig. 20, is particularly useful for cutting brass, copper and aluminum sheet and plate as they cannot be satisfactorily cut with the oxyacetylene cutting torch. Thin steel sheets cut with the shear are free from the warping and buckling strains which are produced by localized heat when cut with a cutting torch.

In cast iron welding, the base metal material furnished is in the form of plates cast with beveled edges. In order to obtain good fusion in welding or good bond strength in brazing, the hard surface oxide present on these cast iron plates must be removed. This operation is most satisfactorily accomplished by grinding as shown in Fig. 21. Surface oxides on non-ferrous metals such as aluminum, brass, bronze and copper are removed satisfactorily by filing.

The welding performance of students in both oxyacetylene and electric arc welding is systematically checked by visual inspection and destructive tests. The primary

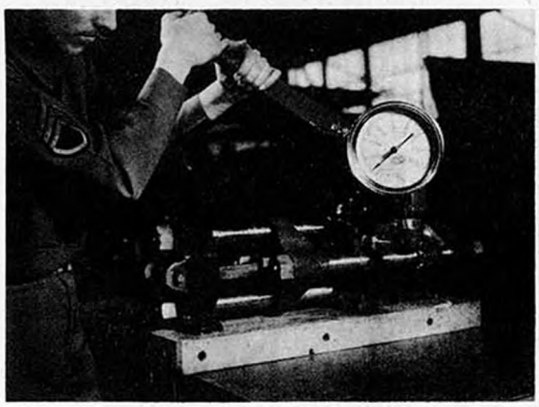


Figure 25

functions of visual inspection tests are the determination of surface quality, appearance, and uniformity of weld metal deposition, and the presence of any irregularities such as undercut, overlap, surface cracks and improper reinforcement. The destructive testing equipment is used to determine the physical properties of the weld metal. Fig. 22 is an impact testing apparatus used to determine the quality of the weld metal deposited in fillet welding as shown. With the same equipment, side break tests can be made on butt welds when notched and clamped in the proper manner. This test reveals the grain size, and the presence of porosity, oxides and slag inclusions, internal cracks, burnt metal or other defects in the weld metal. The percentage elongation or ductility of the weld metal in welded joints on steel plate may be determined by testing in the guided bend testing apparatus shown in Fig. 23. The welded specimens may be placed on a jig with either the face

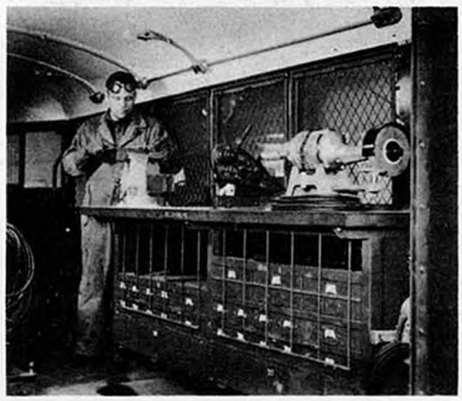


Figure 26

or root of the weld in contact with the bottom side of the plunger. The plunger is actuated by hydraulic means thus forcing the test specimen into the jig. The test is continued until the lower portion or tension side of the weld fails by cracking. Cracks 1/8 inch or greater in any dimension constitute failure. A prescribed distance across the face of the weld is measured before and after testing. The difference between these two measurements is the actual elongation or "stretch" of the surface tested. The ratio between the actual alongation and the original length when multiplied by 100 yields the percentage elongation in the weld metal.

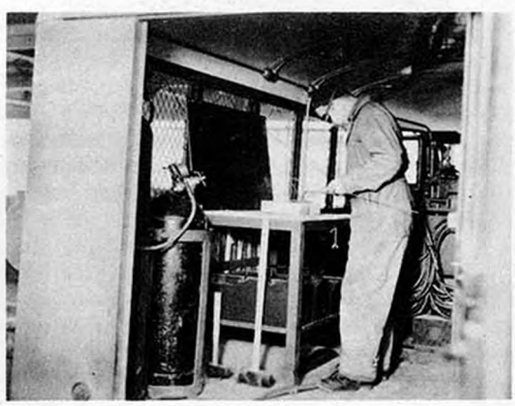
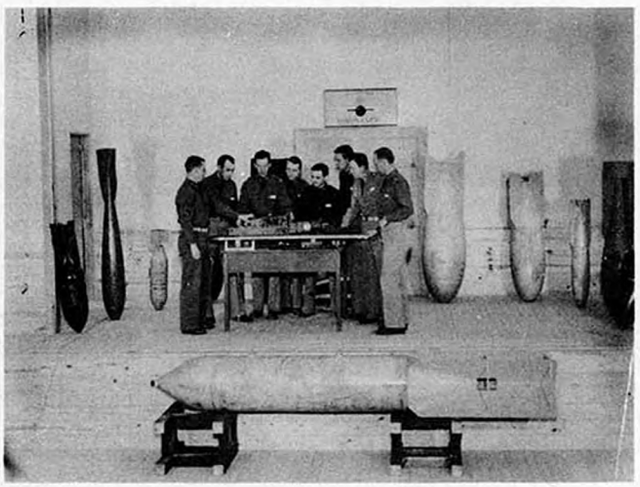


Figure 27

Fig. 24 shows a manually operated power press used to break welded or brazed joints on cast iron or steel plate. This test enables the qualitative determination of sidewall and root penetration of the weld metal into the base metal. The method of supporting the test specimen and the location of the applied force are similar in principle to those used in the guided bend test.

Fig. 25 shows a hydraulically operated portable



however, the big picture is shown the student so that he can add the details at his leisure when he returns to his base.

The present course has been a consolidation of the courses which were previously given in both Aviation Ordnance courses at Aberdeen Proving Ground and at Langley Field, Va. In addition it has attempted to incorporate all the changes which have occurred, and new techniques which the School has developed into the present course. In general, it may be stated that the mission of the Aviation Ordnance course is to better equip the individual officer to solve the problems which may confront him in his Ordnance career, by giving him the broad outline of the subject while he is here at school, and then showing him where he may find the whole story in the various publications available to him, such as Field Manuals, Army Regulations, Ordnance Publications, and other ready sources of information.

The method by which the course is presented is, in general, by the following means. An attempt is made to teach as much of the theoretical work as can be taught in the mornings, while the more practical work is taught in the afternoons. Naturally the course must be progressive, so that any student who attends must start at the beginning and all get on common ground before more advanced instruction can be given. The initial instruction, therefore, is intended to orient the student in the Ordnance Department, and then in the Air Force. Finally, the organization of the Aviation Ordnance units are covered in more detail. Similarly, the student is taught as much as can be covered in the time available regarding bombs, fuzes, pyrotechnics, and small arms ammunition, since it is these items of ammunition with which the Air Force is primarily concerned. He learns all about the bomb, what comprises its filler, how it is filled, shipped, and stored. He learns about the safety measures which must be followed in its handling, and finally how it is handled so that it arrives at the plane completely assembled, finned, fuzed, and ready to drop. He learns all about the fuze, how it is constructed, and how it functions; its safety features, and its proper handling. The students study all the components of the bombs in intimate detail, and do much homework on them, so that there can be no doubt as to how this most important tool of the Air Force, which is furnished by the Ordnance Department, operates. Also, the theory back of the bomb is presented to the student as well as its expected effect and the importance of accuracy in its handling. He also learns how the bombing tables are computed, and how they are used.

The same thoroughness is used in the study of small arms ammunition, and pyrotechnics. These are studied in as much detail as time will permit, in order that each student may have a clear conception of how they are made and how they function.

In small arms the students pay particular attention to the machine guns and aircraft cannon with which the Air Force is armed. They go into detailed assembly and disassembly, inspection, repair, and maintenance. Each student then goes on the range and sees how the various weapons function when they are fired.

A brief background of Air Force tactics and operations are given the student before the supply methods for the Air Force are taken up, so that he will understand how the two fit together. The method of ammunition supply and general supply to the Air Force is then covered in a broad way, so that the student will see the big picture of Ordnance supply to the Air Force, and can then fit in the details which may be presented at any local base.

As frequently as is applicable the students are taken to the Proving Ground to observe tests on the most recent items of Ordnance materiel, so that they can keep up-to-date on the most recent developments. Similarly, the present war developments are studied to see how they apply to the local situation.

To cover all these multitudinous subjects, it is essential that the students receive the best information which is available; therefore, all the many experts available at The Ordnance School present their specialties to the students.

The pictures on this page and throughout this article illustrate the multitude of subjects covered, and the methods by which they are presented. Emphasis is placed on the practical side insofar as facilities permit so that the student will learn by actual performance.

# SPRINGFIELD SECTION, THE ORDNANCE SCHOOL

### By: William L. Rossie, 1st Lt., Ord. Dept.

The Springfield Section of The Ordnance School, 122 Chestnut Street, Springfield, Massachusetts, was organized October 25, 1940. The function of this school is to train selected enlisted men and selected Selective Service men of the Ordnance Department in the basic principles of Ordnance Machine Shop Practice.

The Machinists' Specialists Course runs for thirteen (13) full school weeks and the course of instruction is divided into RELATED WORK and SHOP WORK. The related subjects consist of Shop Drawing, Shop Mathematics, Shop Science, Shop and Job Planning; while the Shop Work consists of the Lathe Shop, Bench Shop and Sheet Metal

in November, Capt. Jarrett was ordered to the Office of the Chief of Ordnance, and Lt. Prichard was appointed Senior Instructor. At the present time, these three officers are more than busy with three separate officer classes in session plus the direction of all enlisted instruction and the administrative work required by both students and instructors.

The officers instruction courses have changed from just Technical Training on Ammunition in general to Technical Training of Ammunition and Ammunition Supply Procedure. The time is about evenly divided between the two subjects, but a decided emphasis is placed on all graduates being as well qualified as time will permit in Ammunition Supply Procedure. Each officers' course is climaxed with a three, four or five-day field exercise usually held just before the graduating date.

Starting January 1st, 1942, all officers classes in the Ammunition Course will be of two months duration. This additional time will be welcomed by both students and instructors, as our subjects can be more clearly presented.

The Officers' Classes in session this month are; (a) Regular Army Officers' Class, (b) Special Officers Ammunition Class, and (c) Officer Candidates Ammunition Class.

# MUNITION WORKERS' CLASS

By: L. I. Dance, M. Sgt., Ord. Dept.,

We have enlisted students being trained to fill key positions in Army Ammunition Companies and Aviation Ordnance Companies, therefore it has been necessary that we provide separate classes, that the men may be more thoroughly trained in the type of ammunition work they are expected to accomplish. In the past, classes have been of three (3) months duration. Beginning this month, all enlisted classes will run for two (2) months, instead of three, with emphasis being put on ammunition service in the field.

[See another Ammunition article on page 64.]

When the students arrive on the 1st of each month, they are assigned to either an Army Ammunition Class or Aviation Ordnance Ammunition Class, depending upon their field assignments. In this way, we can emphasize those subjects pertaining to the student's future line of work.

Those men from, or expected to be assigned to, Army Ammunition Companies are given a specialists' course in: Explosives; Small Arms Ammunition; Pyrotechnics; Trench Warfare Ammunition; Artillery Ammunition; Post Storage; Field Storage; Destruction of Unserviceable Ammunition and Duds; Organization and Operation of Ammunition Companies; Army Ammunition Supply System, to include the preparation and routing of Supply Forms, and monthly small scale ammunition field exercises of several days duration. Aircraft bombs and property accountability at posts, camps and stations are covered as general subjects.

Men from Aviation Ordnance Companies are given a specialists course in: Explosives; Small Arms Ammunition; Pyrotechnics; Antiaircraft Artillery Ammunition; 20-MM and 37-MM Aircraft Ammunition; Aircraft Bombs; Magazine Storage; Open Storage; Bomb Service Equipment; Organization and Operations of Ammunition Sections of Aviation Ordnance Companies; and Preparation and Routing of Aviation Ordnance Ammunition Supply Forms. Artillery Ammunition is covered as a general subject.

Transportation of Explosives and Ammunition by Rail, Water and Motor is particularly emphasized to all ammunition classes in the Ordnance School.

# AVIATION ORDNANCE SECTION

By: John F. Foy, Capt., Ord. Dept.

There seems to be a great deal of mystery throughout the Army, and especially in the Ordnance Department, as to just what Aviation Ordnance is. This mystery is aggravated because so much has been heard about Aviation in recent months. (THE ORDNANCE SERGEANT hopes that much of this "mystery" was eliminated by "The What and Why of Aviation Ordnance" in the December issue.)

The main reason for the Aviation Ordnance course being taught in the Ordnance School is to dispel all doubts which may be present in the mind of the new reserve or regular officer who is assigned to an Air Corps or Air Force station, and to give him an outline of the knowledge which he will need as a major part of his professional equipment in his duties at his new post. There is really no mystery to Aviation Ordnance; after all, Aviation Ordnance is just Ordnance. Its name would seem to indicate that it is a specialized part of the Ordnance Department. That is a true conception, and yet it is not. If an Ordnance officer knows his ammunition, and his maintenance, and his supply, then he will be right at home in an Aviation Ordnance outfit. In the present emergency, however, there are few such experienced Ordnance officers available for duty with the various Aviation Ordnance Companies; therefore, it has become the task of the Aviation Ordnance Section of the Ordnance School to teach to the new Ordnance officer those parts of ammunition, maintenance, and supply which directly affect the Aviation Ordnance phase of Ordnance Service. We might, then, define Aviation Ordnance as being that portion of Ordnance Service which directly pertains to the armament, ammunition, and maintenance with which the Air Force operates.

It would obviously be far better to give every officer a complete picture of the entire Ordnance outline; but that is out of the question at the present time when there is such a crying need for Ordnance officers in every phase of Ordnance service. This need is especially true in the Air Force, since it has expanded faster than any other branch, with the exception of the Ordnance Department.

How has the Ordnance School met the need for trained Aviation Ordnance officers? Contrary to the manner in which many of the Ordnance Companies were formed and

amount of time in all shops, the possibility to use all available equipment and the benefit of instruction from all instructors. In this way each instructor has the opportunity to have each student in his class several times during the course.

A new class usually reports in on Wednesday. Thursday and Friday are devoted to school and company organization, administrative problems and mental and aptitude tests. The mental I.Q. for each student is determined and is used as a basis for the school room organization. The students with the highest I.Q. are assigned to Group A, the students with the next highest are assigned to Group B, and so on until the student with the lowest I.Q. will be the last man assigned to Group F. All students are assigned to their respective groups, issued necessary school texts, and provided with the first week's school schedule by Saturday morning. The following Monday morning they go direct to their first week's schedule of instruction. Saturday mornings are devoted to Military Drill, Company Inspections, etc.

The following broken down schedule indicates the activities of three groups during one typical week of instruction. This happens to be the first week for the class which began instruction on August 18, 1941. Notice that morning periods are either devoted to a variety of subjects of "related work" or to entire mornings of shop, while the afternoons of an entire week for a given group are devoted to "shop work" in the same shop.

| | Group A | Group C | Group F |
|---|---|---|---|
| MONDAY | | | |
| 8:00 - 9:00 | Scale Measurements | Cutting and Forming (Metal Shop) | Filing (Bench Shop) |
| 9:00 - 10:00 | Explanation of Lathe | " | " |
| 10:00 - 11:00 | Freehand Sketching | " | " |
| 11:00 - 12:00 | Operation Plans | " | " |
| 1:00 - 5:00 | Lathe Shop | Bench Shop | Metal Shop |
| TUESDAY | | | |
| 8:00 - 9:00 | Freehand Sketching | Scale Measurements | Layout and Center Drill |
| 9:00 - 10:00 | Operation Plans | Layout and Center Drill | Scale Measurements |
| 10:00 - 11:00 | Scale Measurements | Freehand Sketches | Operation Plans |
| 11:00 - 12:00 | Layout and Center Drill | Operation Plans | Freehand Sketches |
| 1:00 - 5:00 | Lathe Shop | Bench Shop | Metal Shop |
| WEDNESDAY | | | |
| 8:00 - 9:00 | Cutting and Forming (Metal Shop | Use of Projection Instruments | Operation Plans |
| 9:00 - 10:00 | " | Operation Plans | Use of Projection Instruments |
| 10:00 - 11:00 | " | Micrometer Measurements | Use of Micrometer |
| 11:00 - 12:00 | " | Use of Micrometer | Micrometer Measurements |
| 1:00 - 5:00 | Lathe Shop | Bench Shop | Metal Shop |
| THURSDAY | | | |
| 8:00 - 9:00 | Micrometer Measurements | Cutting and Forming (Metal Shop) | Filing (Bench Shop) |
| 9:00 - 10:00 | Use of Micrometer | " | " |
| 10:00 - 11:00 | Use of Projection Instruments | " | " |
| 11:00 - 12:00 | Operation Plans | " | " |
| 1:00 - 5:00 | Lathe Shop | Bench Shop | Metal Shop |
| FRIDAY | | | |
| 8:00 - 9:00 | Use of Projection Instruments | Micrometer Measurements | Use of Micrometer |
| 9:00 - 10:00 | Operation Plans | Use of Micrometer | Micrometer Measurements |
| 10:00 - 11:00 | Micrometer Measurements | Use of Projection Instruments | Operation Plans |
| 11:00 - 12:00 | Use of Micrometer | Operation Plans | Use of Projection Instruments |
| 1:00 - 5:00 | Lathe Shop | Bench Shop | Metal Shop |

Each related subject is treated specifically in accordance with its importance and relation to the principles of machine shop practice and in relation to what the machinist should know.

In the shops, all jobs are practical machine shop, bench shop or metal shop jobs, and these jobs are set up to be accomplished in the normal practical way as would be done in the average good shop. The jobs proceed from a relatively simple job with a few simple operations, and become more complex with an increasing number of operations, as the student advances. In this manner many basic operating principles are repeated many times, which gives the student ample opportunity to learn what he should learn to accomplish his task.

The student who learns readily and works faster is never held back with the speed of those who do not work so rapidly. As fast as an apt student finishes his scheduled work he is given work from a special schedule of jobs that is in advance of the regular schedule. On the other hand, if a student cannot keep substantially up with the regular schedule, he runs into all kinds of difficulties and generally is unable to cover satisfactorily the fundamental principles of machine shop work.

For best results, the student machinist should have an I.Q. of 100 or better, good learning ability, a keen interest and he should be able to demonstrate or explain, satisfactorily, his knowledge in this field. It is important to select a student carefully and in this respect his mechanical education and experience should be carefully weighed. If, for instance, a student actually knows the tools and instruments that a machinist must use and can use them intelligently to some extent, there is positive indication that the student can be expediently trained; while on the other hand, if he does not know anything about a machinist or his tools, the case is purely a problematical one.

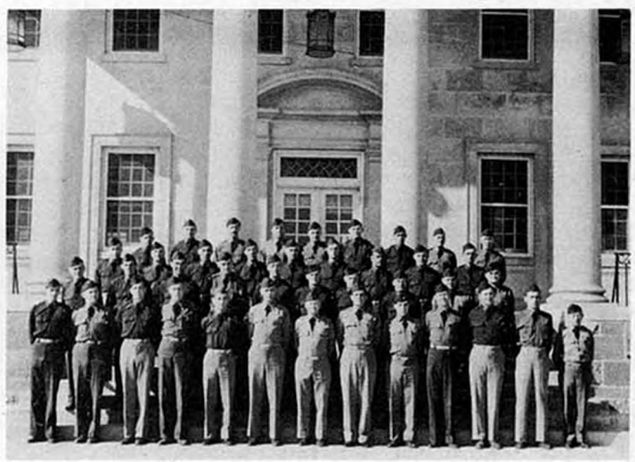
The efficiency and effectiveness of any training program is in direct proportion to the efficiency of performance of the selected trainees. Judicious selection of the student machinist cannot be over-emphasized in a

essary to provide the Air Force with standard of Ordnance Service of which the Ordnance Department has long been proud.

Accordingly, the Aviation Ordnance Section of the Ordnance School was reactivated at the new Ordnance School of the Ordnance Training Center, to which the School had moved from its old quarters in the Administration building at Aberdeen Proving Ground. Classes were begun in earnest for the officer students when the April, 1941, class started. Captain John F. Foy, who had been one of the students in the second Aviation Ordnance class, was called back from Hawaii, where he had been on duty, to head this section of the Ordnance School. Prior to his return, however, Lt. H. M. Randel, a recent graduate of The Ordnance School, Lt. (then M. Sgt.) R. R. Fitzwater, and Staff Sgt. Thomas C. Bailey had been assigned the section. Recently Sgts. Fitzwater and Bailey were relieved and Lt. Staley joined. This April class had previously received a one month general refresher course. The class was not one which had previously had any field experience, as all members of the class had been only recently called to active duty. Since that first class, the Aviation Ordnance section has continued steadily, ever attempting to give a better more thorough course which will prove immediately valuable to the outgoing officers. Obviously, the Ordnance School can not teach the graduate all the multitudinous things which he will be required to know in a one or two months' course. It has tried, however, to give the graduate the knowledge of where and how to find the answers to the questions which he might be called upon to answer.

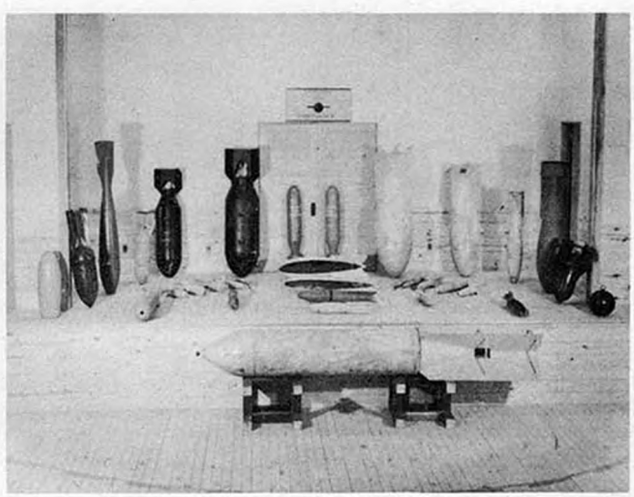
The instruction of the Aviation Ordnance Section of The Ordnance School has not been confined to the instruction of Officers. Three special classes of Aviation Ordnance Specialists were conducted under the supervision of the Aviation Ordnance Section. These classes were of two months' duration. During the first five mornings the class was given a brief course in the general organization of Aviation Ordnance, so that they would have some conception of what their job would be when they went out to duty with an Aviation Ordnance Company. They were then trained in various specialties: welding, automotive mechanics, tractor mechanics, clerks (both administrative and Depot and supply), armorers, and munition workers. Stress in all these courses was placed upon the jobs which these specialists would be called upon to do in their actual work with the Aviation Ordnance companies. About five hundred specialists were graduated from these three special Aviation Ordnance classes, to go out to field units where they were so badly needed. Since the last of these specialists' classes in July, however, all the Aviation Ordnance enlisted specialists have been trained in the regular three months' courses of the Ordnance School, where they can acquire a better picture of their specialties than in an abbreviated course.

As you can see, the major stress of the Aviation Ordnance Section has been placed on the Officer courses. There has been an Aviation Ordnance class of officers in the Ordnance School every month except June from the beginning of the course in April; and on December 1st a total of 233 officer graduates had gone out to duty at their stations.



Officer Aviation Ordnance Class of April, 1941

A month is a very short time; what does the Aviation Ordnance Course give an officer in so short a time? Obviously, the subjects which must be covered are many, and the job is large. Therefore, it requires much effort to pack all the information which the Aviation Ordnance Officer should acquire into one short month. The many details of each subject can not be presented to the student;



# SPECIAL GAGES

By: A. C. Fabrize, S. Sgt., Ord. Dept.,
Small Arms Section

This article is the third of a series dealing with special gages used in the inspection of Small Arms weapons. This article deals with an assortment of gages and their use in Cal..30 weapons.

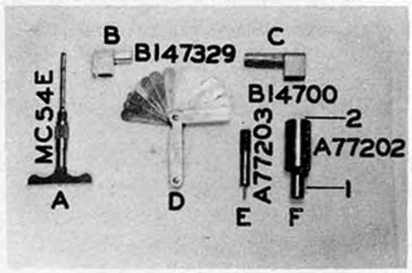



Figure 1

a. gage, micrometer, depth, 0 to 2-1/2 inch, MC54E
b. Reflector, bore, B147329
c. Reflector, bore, B147001
d. Gages, thickness
e. Gage, firing pin hole, diameter .081 inch, A77203
f. Gage, combination, gas cylinder (1), .501 inch, gas piston (2), .494 inch, A77202

Bore reflectors (b) and (c) are used to see the condition of the bore and chamber. Reflector, bore (c) B147001, is used in other Cal..30 weapons; such as the U.S. Rifle, Cal..30, M1903, B. A. R. Cal..30, M1918, etc.

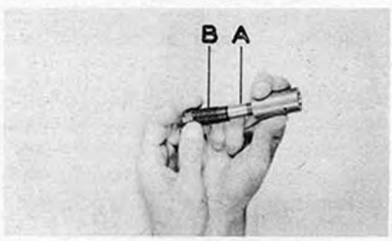



Figure 2

a. Gage, gas cylinder, .501 inch
b. Gas cylinder

If the plug end of the gage, gas cylinder (a) shown in Figure 2, .501 inch, enters the hole in the gas cylinder (b) the gas cylinder is declared unserviceable.

If the gas piston (b) shown in Figure 3 enters the gage, gas piston (a), .494 inch, the gas piston is declared unserviceable. The gage, combination, gas cylinder and gas piston, A77202, is used for the mentioned parts in the Browning Automatic Rifle, Cal..30, M1918 and M1918A1. The gage, gas cylinder, A77204, .503 inch, is being manufactured for the M1918A2, and will be available for issue in the near future. However, the gage, gas piston, may be

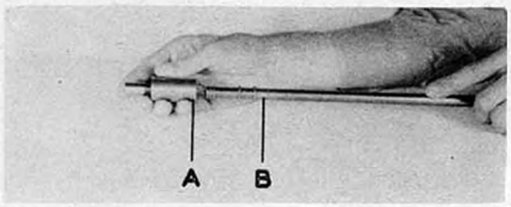



Figure 3

a. Gage, gas piston, .494 inch
b. Gas piston

used on the above mentioned model.

To determine if the face of the bolt is set back, place the depth gage (a), MC54E, shown in Figure 4, across the top of the lips and screw down the gage until it just

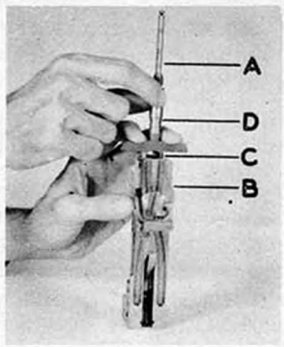



Figure 4

a. Gage, micrometer, depth, MC54E
b. Bolt, Cal. .30, machine gun
c. Dimension
d. Reading

comes in contact with the cartridge seat. The dimension (c) from the top of the lips to the face of the bolt (b) should not have a reading (d) to exceed .126 inch.

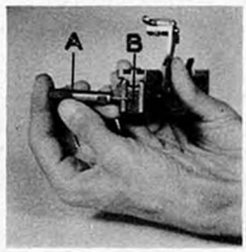



Figure 5

a. Gage, firing pin hole, diameter .081 inch, A77203
b. Firing pin hole

The gage, firing pin hole (a), A77203, .081 inch, shown in Figure 5, should not enter the firing pin hole (b). This gage is also known as a "No go" gage.

To measure the groove in the "T" slot (b), shown in Figure 6, measure the distance with a "No go" gage, .058 inch, or thickness gages (a). The groove in the "T" slot should not be .058 inch or over.

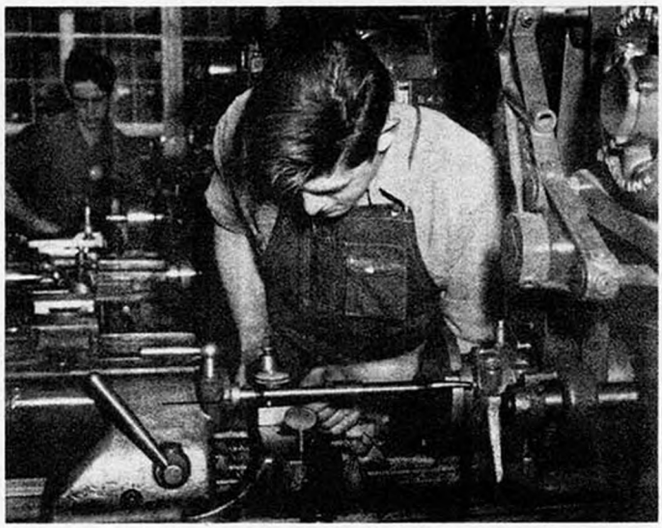
Checking for spread side plates in Aircraft Cal. .30 machine guns, the thickness gages (a) are inserted between the bolt and the side plates (b). The minimum clearance is .010 inch, and the maximum is .018 inch. This

Shop. Each student receives the same number of instruction and practice hours in each subject or shop. Bench and Sheet Metal Shops are operated eight (8) hours per day; while the Lathe Shops are operated four (4) hours per day. The forenoons are devoted to work in related subjects, Bench and Metal Shops; the afternoons are entirely devoted to Shop Practice.

The Military Staff of this section of the Ordnance School consists of the Commanding Officer, One (1) Technical Sergeant and one (1) Sergeant, all members of The Ordnance School Staff. The Civilian Staff consists of an Instructor-in-Charge, six (6) instructors, two (2) Tool Room and Stock Clerks and one (1) clerk-stenographer. All instructors are members of the Trade School Faculty and they possess the necessary educational qualifications, teacher-training hours and adequate practical shop experience, to qualify them to hold teaching certificates for Trade School teaching in the State of Massachusetts.

At present, the school is operating under the National Defense Training Act and in connection with the State Department of Vocational Education. In the State set-up this school is recognized as the Ordnance Division of the Springfield Trade School, which acts as our fiscal agent for the salaries of our Civilian Staff and all necessary educational supplies and equipment.

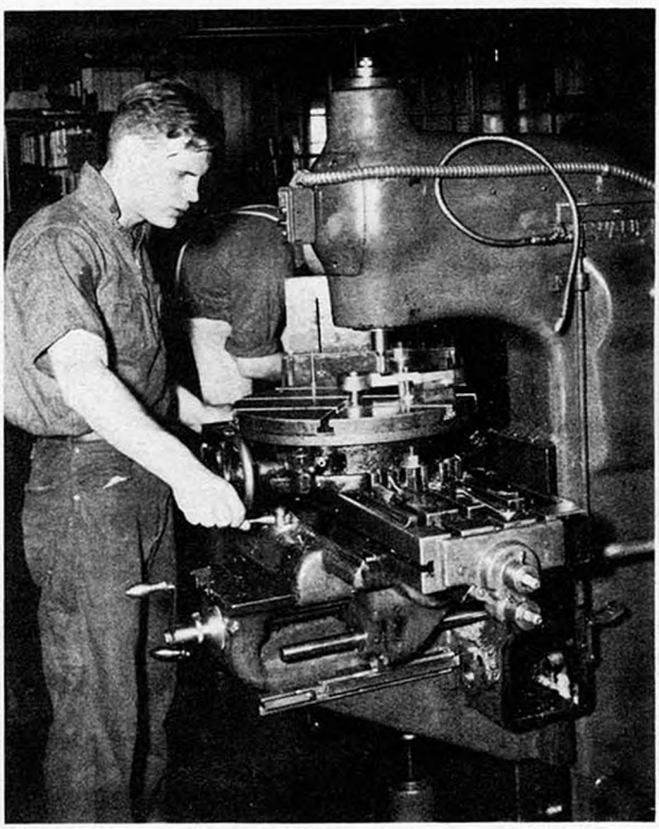
Students are attached to the Springfield Section for duty, administration and quarters and live at the Central Y.M.C.A., where they are provided with breakfast and dinner in a private Dining Room which is also used for a study hall at night. Supper may be taken at one of three local restaurants. All students are on commutation of rations and quarters status. The Headquarters of this school is also located in the Y.M.C.A. Building. The class room building is located at Oak & Union Streets; while

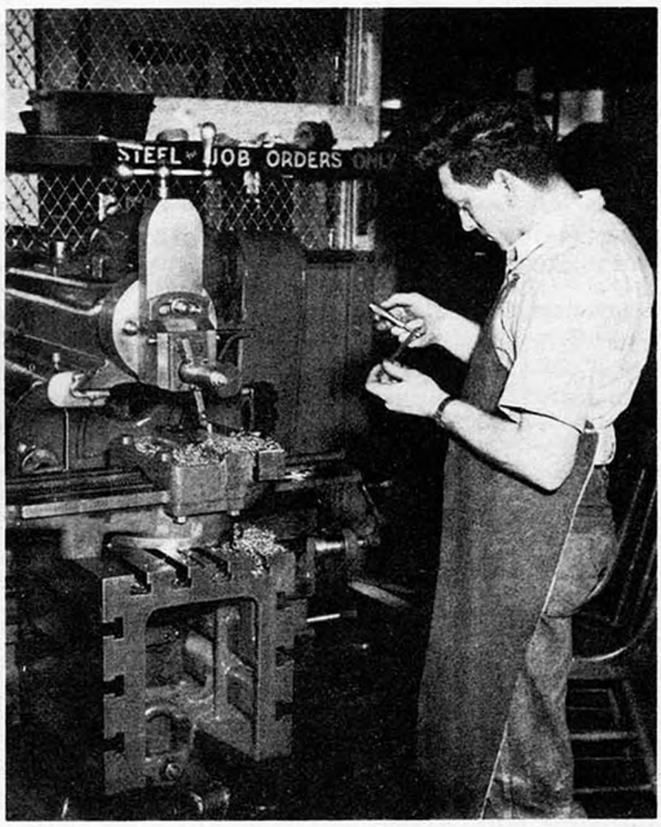


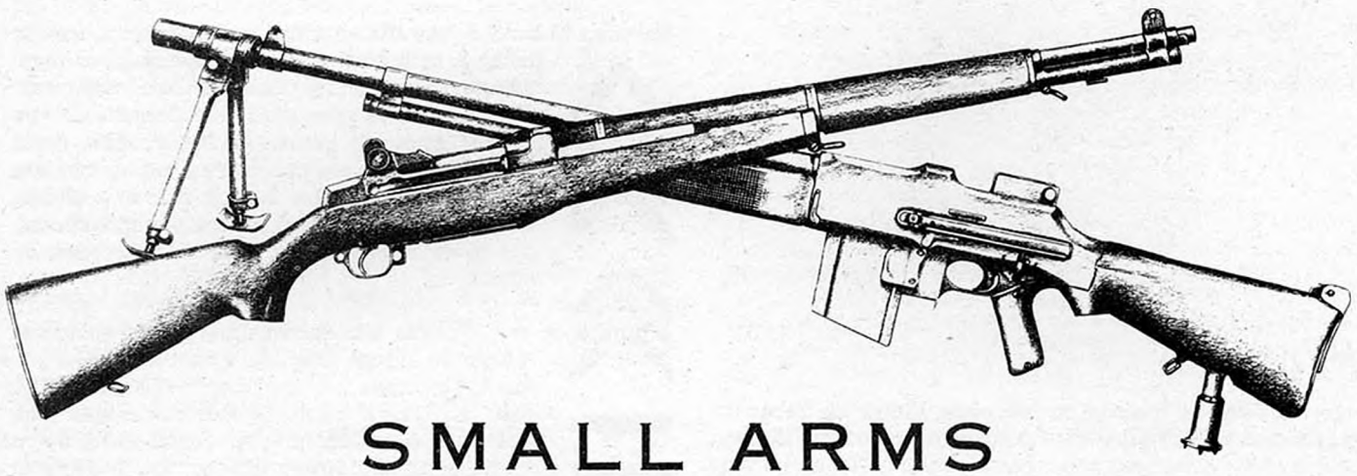
the Lathe Shops are located in the Technical High School Building.

This school began functioning on November 4, 1940 with one Officer, one staff sergeant, fifty students and three instructors. The military staff has been increased by one (1) noncommissioned officer, the civilian staff by four (4) instructors and three (3) clerks; while the student body has been increased by approximately fifty (50) students. To date, 289 students have been sent to this school, of this number 279 have been graduated, six relieved for unsatisfactory work, two for prolonged hospitalization and two failed to acquire passing marks.

For the purpose of instruction the students are grouped into A, B, C, D, E and F groups, and the groups are rotated in a manner that gives the student the same







# SMALL ARMS

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

## WINCHESTER SHOTGUN, 12-GAUGE, M1897, RIOT TYPE

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

Part III

DETAILED DESCRIPTION OF PARTS

RECEIVER. - The receiver bears the serial number of the shotgun on its lower surface, just to the rear of the magazine opening, and the letters U. S. on its right side slightly forward of the ejection opening.

The receiver is rectangular in section, with the front end closed, except for the internally threaded openings a. Figure #1. The barrel is screwed into the upper, and the magazine tube into the lower opening. The irregularly shaped opening c. is for the action slide. On the left side of the magazine opening is impressed a small assembly mark, to which is aligned a similar mark on the magazine tube.

The right side of the receiver has a milled opening, about one by three inches, near the top, through which the empty cartridges are ejected.

Starting from front to rear, on the right side there are: the threaded and counterbored hole d, for the magazine stop screw, the vertically drilled and tapped hole e, for the right hand cartridge stop screw, the 1/4" hole f, into which projects the stud of the right hand cartridge stop, a small hole g, approximately 1/32" in diameter into which is inserted the short leg of the action slide lock release plunger pin spring, the tapped and counterbored hole h, for the cartridge guide stop screw, just below this, the trigger pin hole i, and above it, the hole j, into which is assembled the action slide lock release plunger pin, and last the hole k, for the carrier group pin.

On the left side from front to rear are: the vertically drilled hole e, for the L. H. cartridge stop screw, the 1/4" hole f, for the cartridge stop stud to project through, towards the top of the receiver there are three small holes, the first of which l, is threaded to receive the spring ejector screw, the next m, is the opening which permits assembling the bent leg of the spring ejector into the interior of the receiver, the third hole n, is for the

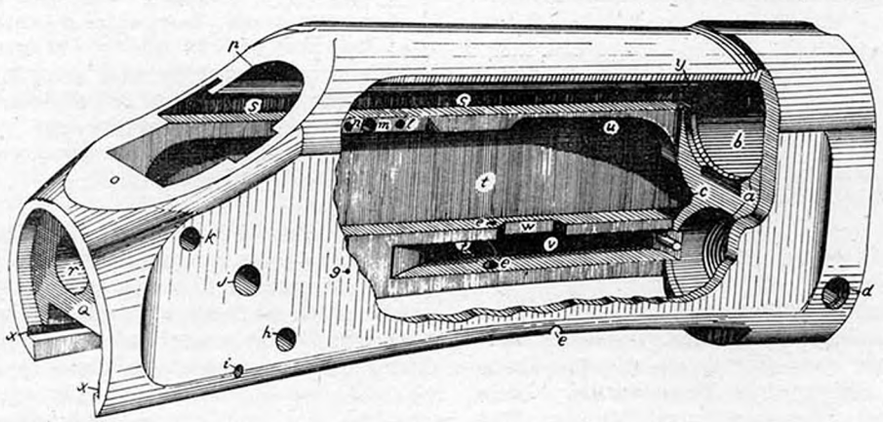
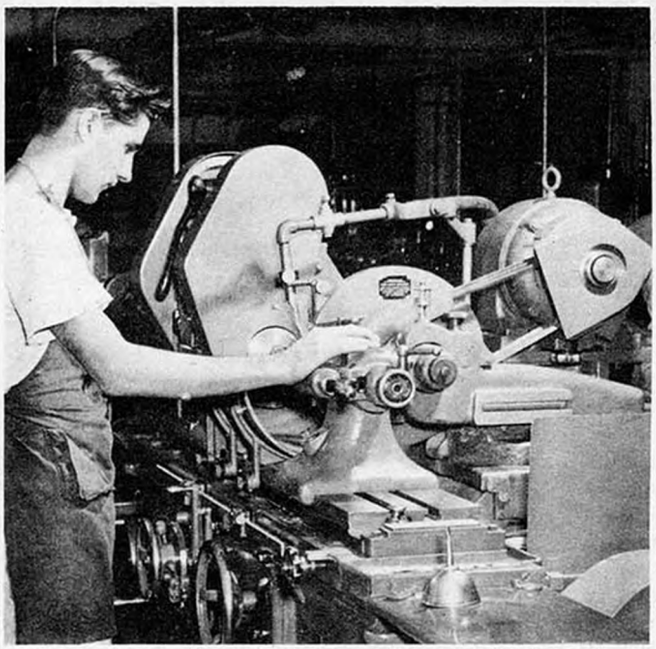


Figure #1
RECEIVER



course involving the basic and fundamental principles and practice of a machine shop course. One fundamental to be considered in selection is the indication of prior interest in machine shop work. If the prospective student does not have a fair knowledge of the general scope of the Machinists' Handbook, it may be assumed that he has never given much serious thought to becoming a machinist. One of the simplest of requirements is also one found most often neglected. Experience with several hundred students has indicated that approximately 85% are very rusty in the mechanics of common arithmetic. The machinist must be able to use arithmetic intelligently, and unless he is familiar with the decimal system it will be impossible for him to read his instruments properly. This simple yet necessary requirement should be carefully met by the young man who desires to become a machinist.

# THE SUPPLY OF AMMUNITION IN GARRISON

1. All Ordnance personnel in the field are, or should be, thoroughly familiar with the provisions of Training Circular No. 42, dated July 3, 1941. For those to whom the words "T.C. 42" does not ring a bell of memory, the following may be of assistance. T. C. 42 is the War Department Circular which outlines the policy and procedure which governs the supply of ammunition to the army in the field.

2. It has come to the attention of THE ORDNANCE SERGEANT from various sources, that several ordnance officers are applying the provisions of T. C. 42 to the supply of training ammunition to troops in garrison. This idea has met with universal approval. This item is, in fact, included in this issue of THE ORDNANCE SERGEANT at the suggestion of General J. K. Crain, the Chief of Field Service, Office of the Chief of Ordnance, in the hopes that other ordnance officers will see the merit of the plan, and institute the practice in their units or stations.

3. To quote paragraph 1 of TC 42, "The provision of adequate supplies to combat troops is an indispensable factor in the successful prosecution of any military operation. Both before and during combat, the most essential item to be supplied is ammunition. It constitutes by far the greatest mass of supplies to be moved to combat troops. The complexities of ammunition supply imposed by the numerous kinds and types of ammunition which must be supplied, and the large tonnages which must be handled constitute a difficult supply problem." It is a peculiar thing, but it is the truth, that of all the supply procedures with which troops are required to be familiar, ammunition supply procedure is the one with which they have had the least contact. In general it has been the practice in the past to follow routine garrison supply procedure in the supply of ammunition, while in garrison, and to shift abruptly to the field procedure upon entry into the field. No comments are necessary relative to the ensuing confusion.

4. It seems self evident to THE ORDNANCE SERGEANT that if the administrative procedure outlined in TC 42 are applied to ammunition supply in garrison, the resultant training of both troops and of ordnance personnel will be such as to materially reduce the confusion which usually attends the accomplishment of this important supply procedure in the field.

On the flat bottom surface of the breech bolt, Figure #3, are milled two grooves, a short one about three-quarters of an inch long and a longer one extending almost the entire length of the bottom portion of the breech bolt.

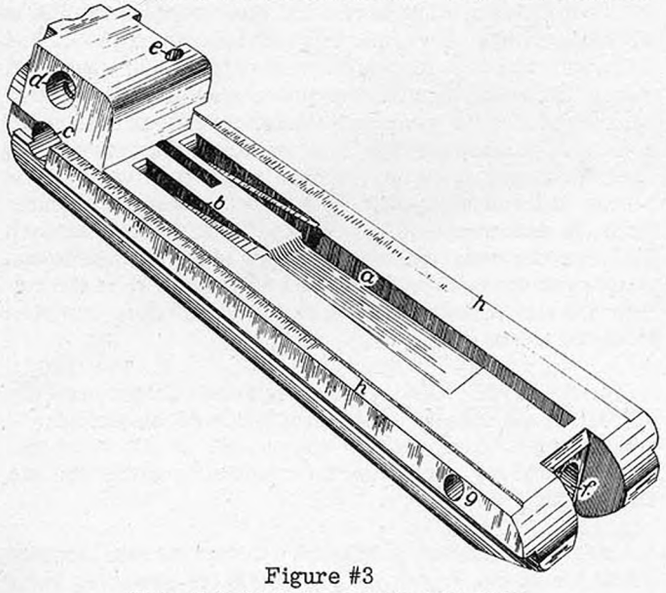



Figure #3
Breech bolt, bottom and right side

The long groove a, forms a seat for the firing pin lock, which is given spring tension by a small helical spring (about eight coils) seated at the rear end of the wider portion of this groove. The forward end of the groove a, and the groove b, mate with ears d, Figure #4, on the carrier when the breech bolt is in the locked position. The ears and mating grooves eliminate the possibility of the breech bolt canting to the right, and out the ejection opening when firing, due to the absence of a guide-way in the forward part of the right wall of the receiver.

The hole c, at the forward end of the right guide rib is for the stud of the right hand extractor, the tapped and counterbored hole d, for the action slide hook screw, the pin hole e, for the left hand etractor pin, and g, the firing pin stop pin hole. The firing pin is assembled through the large hole f. The bearing surfaces of the breech bolt are shown at h h.

CARRIER. - The carrier, Figures #4 and #5, has a number of parts assembled to it. It is irregularly profiled and has various cuts, recesses, etc., on all its surfaces. Its many duties make the part worthy of detailed study.

The top surface is a step-cut, the first step a a, and riser b, Figure #4, serving as an abutment for the locking lug on the breech bolt when the bolt is in the locked position. The second step c c, is the length of a cartridge (approximately 2-1/2" long). From the front end of surface c c, project the locating ears d, that mate with the grooves on the flat underside of the breech bolt. Between these two ears is located the tapped and counterbored hole e, for the mainspring strain screw.

The greater part of the second step c c, and most of the third step f f, are cut to form the recess g. The upper surfaces of the foreward walls of recess g, are relieved slightly to act as guides for the cartridge as it leaves the magazine during the feeding action. The bottom part of the recess g, forms a seat for the leaf type mainspring. A rectangular opening r, is provided in the

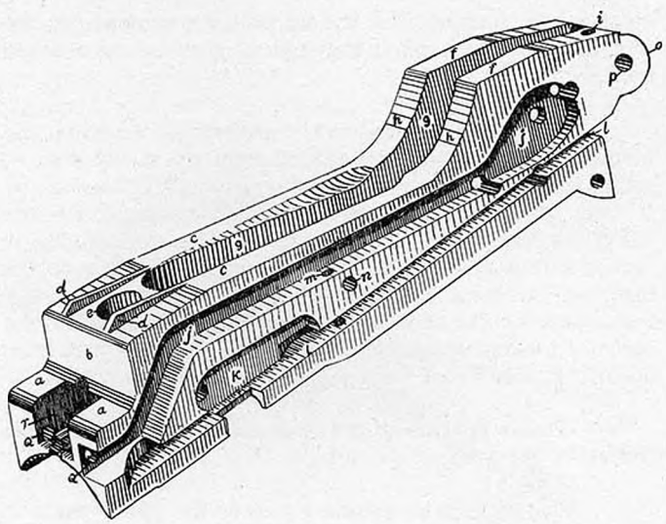



Figure #4
Carrier, top and left side view

extreme front end of the carrier which communicates with recess g. The mainspring is assembled through this opening and is anchored to a pin mounted laterally through the carrier at the point q. The rear part of the recess g, is used as a seat for the hammer. The front surface h h, of step f f, is acted on by the locking lug of the breech bolt to complete the downward rotation of the carrier when the bolt moves to the rear.

The tapped and counterbored hole i, is for the carrier pin stop screw. The left side of the carrier has the cam groove j, in which the stud on the action slide functions to operate the carrier. The groove j is for the most part about 3/16" wide, with the depth approximately the same, and has a stepped profile nearly the same as the top surface of the carrier. The recess k, is for the action slide lock spring (leaf type). A long narrow groove l, extending almost the entire length of the wall, is for the action slide lock. The action slide lock is fastened to the carrier by means of a pin mounted vertically in pin hole n.

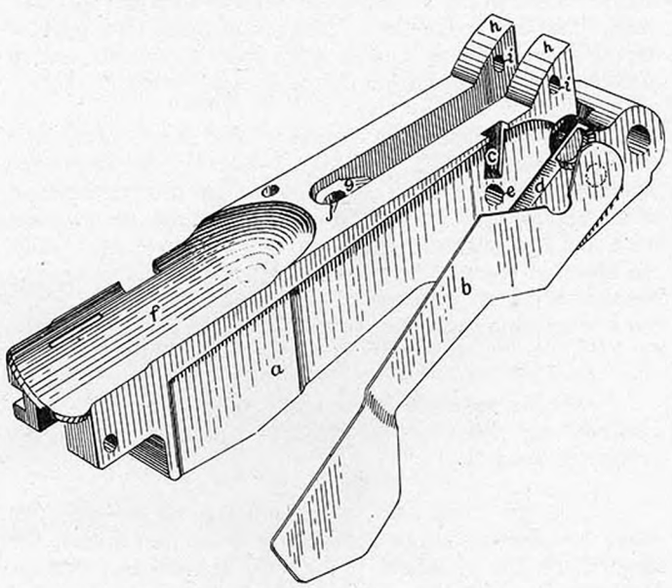



Figure #5
Carrier, bottom and right side

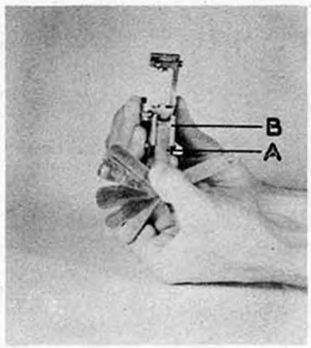



Figure 6

a. Gages, thickness
b. "T" slot

tolerance can be checked in two ways, either by thickness gages used when the gun is assembled by inserting different blades of the thickness gages between the bolt and the side plate, or by means of micrometers.

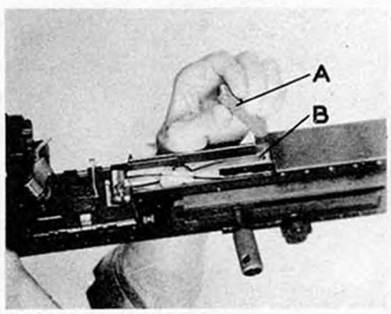



Figure 7

a. Gages, thickness
b. Recess between the bolt and side plate

In the first method, press the bolt toward the opposite side from where the measurement is to be taken and start with the .014 inch blade (if possible), and increase .001 inch at a time until the gage can no longer be inserted. The maximum clearance should not exceed .018 inch.

By the second method, remove the bolt and with outside micrometers accurately find the width of the bolt across the rear top surface; with inside calipers find the distance between the side plates in the interior of the receiver. The difference between the two measurements thus determined gives the amount of play between the bolt and the side plates.

Reference: TR 1400-30G.

# LEGEND OF OUR INSIGNIAS

During the feudal days the Lord of the Manor owned Serfs and also had Freemen on his domain. The Serfs were housed in large huts and were chattels on an equal grade with a horse, a cow or a pig. The Freeman had a little one-room hut of his own with a small plot of ground. The Serf received nothing for his efforts. The Freeman worked three days a week gratis for his liege-lord in return for his freedom, but in time of war he had to go to war for his lordship.

When war came the Serf served with no rank, but the man who owned his little hut had command of a certain number of Serfs; hence, the one chevron indicated a Private First Class, or Lance Corporal. The head man of a small settlement of two houses or more outranked the Private First Class, so two chevrons were used to indicate his superiority. The leading man of a village of perhaps ten or more houses was a Sergeant, his three chevrons denoting many houses or huts.

The man who commanded the troops of a town or village that had a barricade was indicated by a bar, which symbolized a barricade, and was known as a Lieutenant. A man who commanded a town or city around which there was a moat filled with water, symbolized by two bars, wore those two bars to indicate that he was a Captain.

The Major commanded as many troops as could be viewed from the top of a large oak tree, and therefore wore the oak leaf as his insignia.

The Colonel commanded as many troops as an eagle poised in flight could see, and so the eagle became his signal of rank.

The General commanded as many troops as could be seen by a star situated in the highest firmament of the heavens, and used the star as his indication of rank.

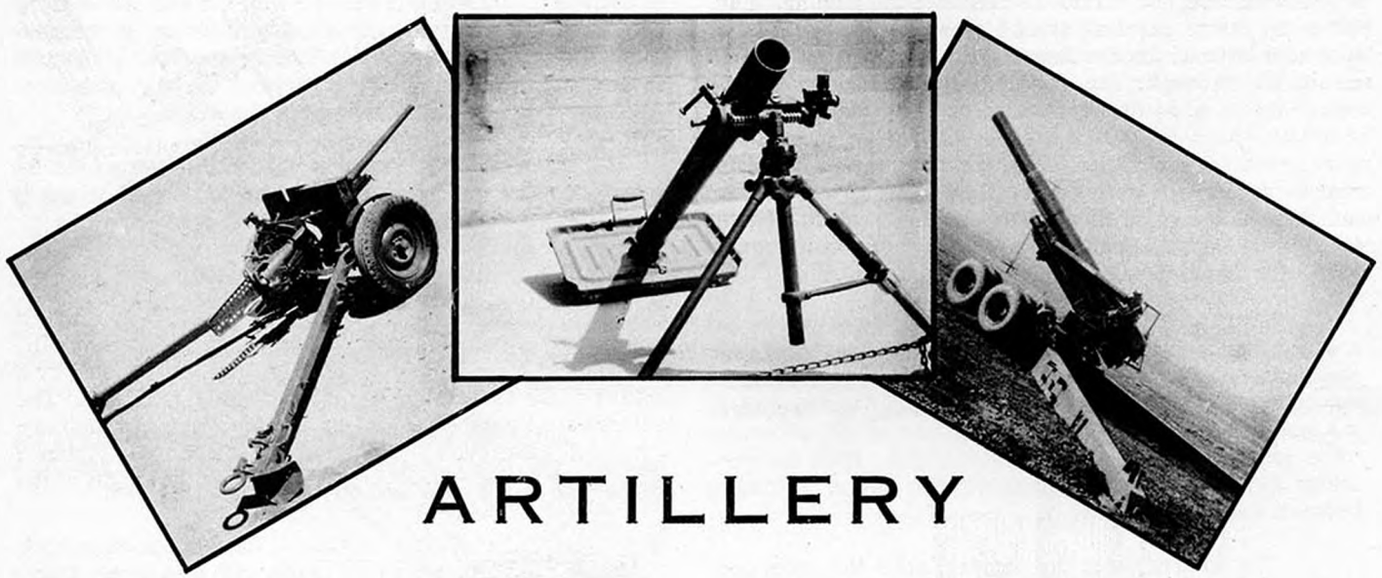
In military insignia silver outranks gold because of the fact that in the days of Marco Polo silver was brought by caravan from then far off India, and therefore was quite costly. Gold, however, was easily obtainable in northern Africa, and therefore was considerably cheaper than silver.

The author of this short article prefers to remain anonymous, but we can tell you a thing or two about him. He was a Lieutenant of the World War period, and served with the A.E.F. in France. He is a member of one of the old and honored families of the State of Maryland, and a man who has long been interested in military lore. During the World War he was thrown into contact with many men who "started from scratch and enjoyed exceptionally brilliant careers." He is familiar with many of the stories, be they fact or fiction, of their careers. From time to time we will hear from him, signing his articles as "Old A.E.F. Veteran." They will not only be informative and inspirational, but we assure you that they will be interesting as well.

During all the history of the United States Army we have had only one commissioned officer below the rank of Second Lieutenant. He was known as a Cornet of Horse, a rank which the British used for many years. The single American Cornet served under General George Washington during the American Revolution.

Sincerely,

"Old A. E. F. Veteran"



# ARTILLERY

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

## Field Rigging And Notes On Field Repair

LASHINGS

To lash a transom to an upright spar, make a clove hitch around the upright a few inches below the transom. (Fig. 42) The lashing is brought under the transom, up in front of it, horizontally behind the upright, down in front of the transom, and back behind the upright at the level of the bottom of the transom above the clove hitch. The following turns are kept outside the previous ones on one spar and inside on the other, not riding over the turns already made. Four turns or more are required. A couple of frapping turns

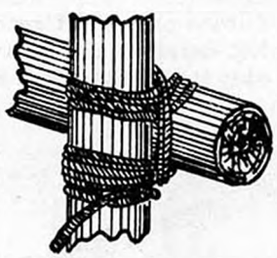


FIG. 42

are then taken between the spars, around the lashing, and is finished off, either round one of the spars, or any part of the lashing through which the rope can be passed. The final clove hitch should never be made round the spar on the side toward which the stress is to come, as it may jam, and be difficult to remove. The lashing must be well beaten with handspike or pick handle to tighten it up. This is called a square lashing.

Lashing for a Pair of Shears. (Fig. 43.) The two spars for the shears are laid alongside of each other with their butts on the ground, the points below where the lashing

FIG. 43

is to be resting on a skid. A clove hitch is made round one spar and the lashing taken loosely eight or nine times about the two spars above the hitch, without riding. A couple of frapping turns are then taken between the spars and the lashing is finished off with a clove hitch above the turns on one of the spars. The butts of the spars are then opened out and a sling passed over the fork, to which the block is hooked, or lashed, and fore and back guys are made fast with clove hitches to the bottom and top spars, respectively, just above the fork. (Fig. 44.)

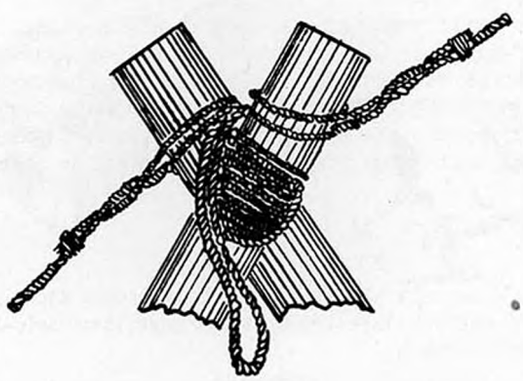


FIG. 44

ejector pin, towards the bottom of the receiver is the trigger pin hole i, and up towards the top, the carrier pin hole k.

The upper part of the receiver is rounded and formed solid except for a short distance at the rear o, which is milled at about a thirty degree angle. The opening p, thus formed allows the breech bolt assembly to pass out of the interior of the receiver when the action slide is moved to the rear. The rear part of this opening forms the seat for the carrier group. The rear face q, of the receiver is solid and slightly countersunk to house the tenon of the butt stock. In the center of the rear face is an opening r, into which the receiver shank is assembled.

The lower part of the rear end is cut away to form a seat for the trigger guard bow.

On the interior of the receiver the upper parts of the right and left walls have grooves s, that form guide-ways in which the bolt may reciprocate. The groove in the right wall has a length of about one and one-half inches starting just to the rear of the ejection opening and extending to the rear. The groove in the left wall extends the entire length of the receiver. In spite of the fact that most of the groove on the right wall is missing, there is ample supporting surface for the breech bolt.

On the left wall, just below the groove for the bolt, is another wider groove t, (approximately three-quarters of an inch in width) in which the action slide hook and the action slide operate. The forward lower end of this groove connects with the action slide opening c, in the front end of the receiver. The upper part of this groove at the forward end bears a recess u, into which the action slide hook is cammed when the breech bolt is in the locked position. The action slide lock acts on the lower surface of the action slide groove.

The lower part of the left wall has a rectangular recess v, about 3/8" x 2-1/2" that houses the left hand cartridge stop. A small cutaway portion w, in the rib, formed between the action slide hook groove and this recess, makes it possible to insert the blade of a screw-driver to release the action slide lock, should the action slide lock release plunger fail or become unserviceable.

On the right wall, there is the short guide-way previously mentioned, next just below it a short groove which is a clearance cut provided for the protruding head of the action slide hook. This groove extends to the rear for about five-eighths of an inch. On the lower half below the ejection opening is the right hand cartridge stop recess, and just to the rear of this a small slot, into which the action slide lock release plunger spring is assembled.

At the extreme lower end and on the inside of the receiver are the grooves x x, into which assembles the trigger guard bow.

On the front wall in the interior of the receiver there are the two large openings a a, and in addition the upper bore has recesses y, for the right and left extractors when the bolt is in the locked position.

The bottom side of the receiver is completely cut away, except for about three-quarters of an inch at the front end, which forms the lower wall for the magazine tube bore, and a solid wall of metal remains at the extreme rear end.

BARREL. - The barrel for the riot-type shotgun is 20" long, cylinder bore, marked with the legend 12 GA. and CYL. and with the manufacturers data on the upper left side of its outer circumferences. An alignment mark is impressed at six o'clock on its outer surface at the breech end, that should coincide with an alignment mark in the upper surface of the magazine bore in the receiver. On the bottom at the front end there are three threaded indentations, to accommodate the bayonet attachment screws. The extreme rear end of the barrel has recesses to accommodate the left and right hand extractors when the bolt is in the locked position. The barrel must not be removed from the receiver.

BREECH BOLT. - The breech bolt (Figures #2 and #3), is approximately semi-circular in cross-section. A locking lug a, from its flat lower side at the front end. The rounded top surface b, terminates on each side in a rib or flange c.

The front end of the left rib carries the left hand extractor in the recess d, Figure #2, its assembly being effected by means of a pin drifted vertically through pin hole e.

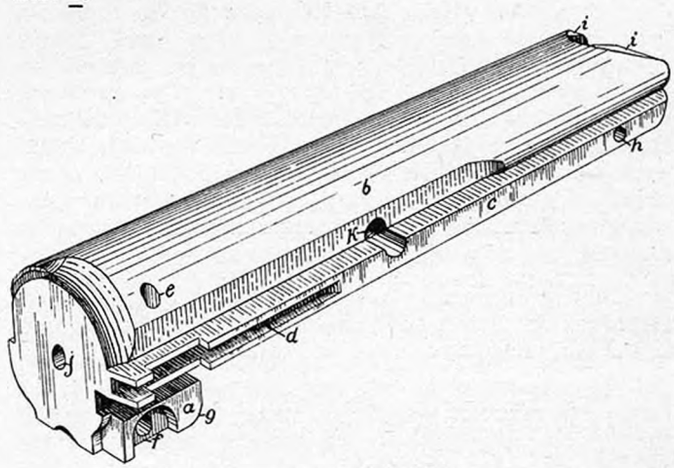



Figure #2
Breech bolt, top and left side view

The extreme front face of the breech bolt is contoured to permit proper mating of the parts when the bolt is in the closed position. The locking lug a, is drilled through for the action slide hook screw. On the right side of the lug, the hole is counterbored and tapped, while on the left side it is counterbored to form a recess f, for the small boss on the action slide hook. The rear part of the locking lug is cut at a small angle inclining towards the front, and terminating at the bottom of the lug as a well rounded camming surface g.

The extreme rear end of the breech bolt terminates in rounded ears i, that extend past the firing pin head, and act as guides for the hammer.

The breech bolt is bored axially to form a housing for the firing pin, with the striker hole visible at j. The firing pin is retained in its bore by means of a pin assembled laterally through the breech bolt in pin hole h. The tapped hole k, is for the firing pin lock screw.

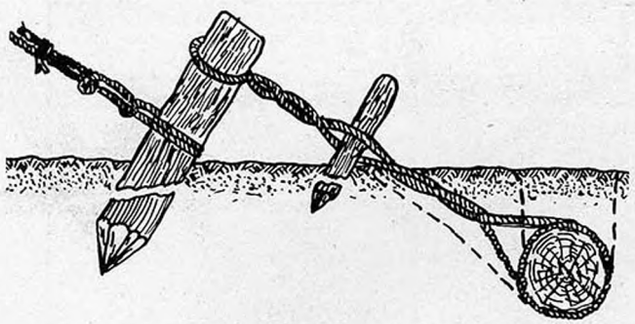


FIG. 49

pull is horizontal or below horizontal, very little earth on the anchor log is necessary. However, if the pull is inclined above the horizontal, the anchor log should be buried with well tamped earth.

BLOCKS AND TACKLES

The parts of a block are the "shell" or frame, the "sheave" or wheel upon which the rope runs, and the "pin" upon which the sheaves turn in the shell; (Fig. 50), the sides of the shell are the "checks," and the "swallow" is the space between the sheave and frame through which the rope passes. A "strap" of iron or rope is passed around the shell and forms attachments for a hook at one end, and an eye at the other. Blocks are made of wood, wood and metal, and entirely of metal. In the latter case, the strap is replaced by bolts at top and bottom, or, the strap runs through the eye of the hook and has a bolt securing the two ends at the bottom through a metal grommet. Preparation of a grommet is shown in Fig. 51. Blocks are designated by the length of the shell in inches and by number of sheaves. The largest rope a wooden block will take has a circumference equal to one-third the length of the shell. Self-lubricating blocks may be obtained and are to be preferred. Wooden blocks should be kept properly protected from weather and damage from rough handling, well filled with paint and properly lubricated. Metal blocks should be painted, oiled and kept free from rust. All blocks should be watched for cracked shells or sheaves, and worn pins.


FIG. 50

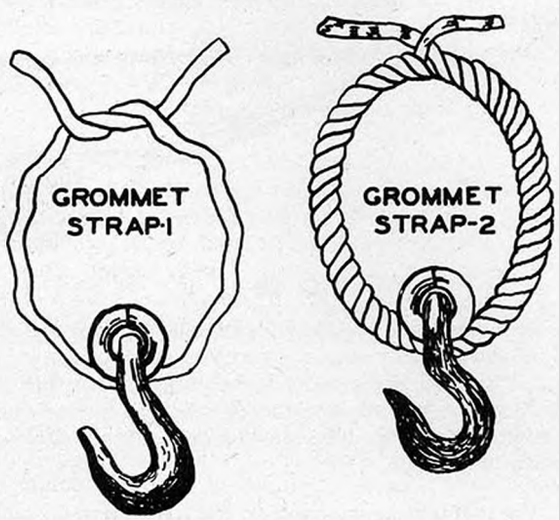



FIG. 51

Blocks with one, two, three or four sheaves are called single, double, triple or quadruple blocks. A "snatch block" (Fig. 52) is a single block with the shell and strap open at one side to admit a rope without passing the end through. A "running block" is attached to the object to be moved. A "standing block" is fixed to some permanent support. "Simple tackle" consists of one or more blocks of any

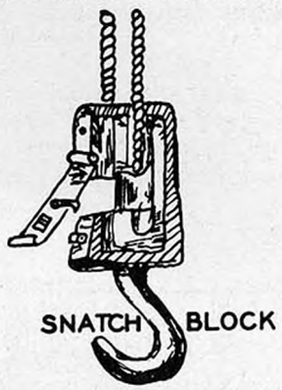



FIG. 52

number of sheaves, rove with a single rope or "fall". The end of the fall fixed in the tackle is called the "standing end"; the other is the "running end." Each part of the fall between the two blocks, or between either end and the block, is called a "return".

Note: There are many other more complicated tackles, such as the single and double Burton, etc., which are interesting, and, under certain conditions, useful. Inasmuch, (Fig. 53 and 54), however, as these riggings will not

(Continued on page 104)

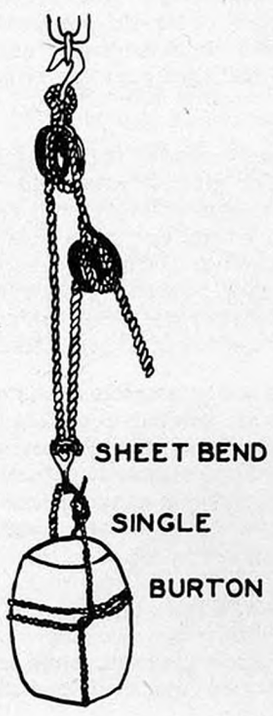



FIG. 53


FIG. 54

The upper part of the rear face of the carrier, has a semi-circular projection o, extending across the carrier. When the carrier is assembled to the receiver, projection o, mates with a concave seat in the rear end of the receiver. The carrier pin positions the carrier to the receiver walls, and is assembled through the pin hole p.

Almost the whole wall on the right side of the carrier is relieved slightly to form a seat a, Figure #5, for the sheet metal cartridge guide b, which is riveted to the carrier wall at assembly. The cartridge guide is free to rotate through a small arc.

Near the rear end of the right carrier wall is cut a shallow groove c. This groove permits contact between the cartridge guide stop screw and the cartridge guide as the carrier is rotated downward. Slightly above and to the rear is located another groove d, into which the action slide lock release plunger is assembled. With the cartridge guide b, raised the hammer pin hole e, is visible between the grooves c and d.

The underside of the carrier, near the front end, has a large depression f, that acts as a clearance to facilitate the loading of the magazine. To the rear of this is the sear spring seat g.

The forward part of the sear spring groove is rounded and the seat contains a tapped hole j for the sear spring screw. At the extreme rear end of the carrier are two projections h h, between which is mounted the sear, through the medium of a pin, inserted through sear pin holes i.

COMPONENT PARTS OF THE CARRIER.-Hammer assembly. The hammer is irregularly contoured and has, the thumb piece a, for hand cocking, and the cocking surface b, on which the bolt acts to cock the hammer automatically when the action slide is pulled to the rear. From this point the thumbpiece contour drops sharply to a flat surface c, that is the striking surface which acts on the firing pin. The lower extremity of the striking surface makes a junction with an arced portion of the hammer, which is slit to form a seat d, for the hammer stirrup. The stirrup e, is pinned in its seat in the hammer, the lower part of the seat being recessed to give the stirrup clearance during its action. See Figure #6.

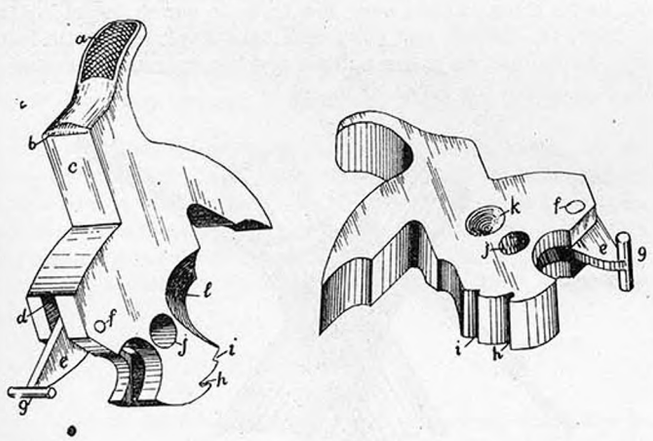



Figure #6
Hammer assembly

The Stirrup e, consists of a flat part, through which is drilled the stirrup pin hole f, with the end opposite the hole terminating in a cylindrical projection g, perpendicular to the stirrup axis. This cylindrical projection is acted on by the mainspring to give the spring tension necessary for the functioning of the hammer.

Two sear notches are cut on the bottom of the hammer. The forward notch h, is the half-cock or safety notch, the rearmost notch i, is the firing notch.

The hammer pin hole j, is located just to the rear of the recess in the stirrup seat. Above this and slightly to the rear is a conical recess k, which is a clearance cut for the short pin of the action slide lock release plunger. This recess is on the right wall of the hammer.

On the left wall, in addition to the other end of the hammer pin hole j, is a camming surface l, that acts on a projection on the rear end of the action slide lock.

ACTION SLIDE LOCK. - The action slide lock, Figure #7, is a thin tempered piece, with an average thickness of 1/16", about 1/8" wide and 4" long. It has a boss a, near its center through which is drilled the hole b, for its fastening pin.

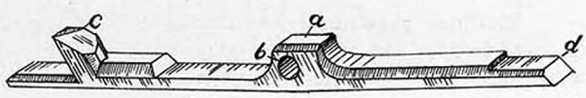



Figure #7
Action slide lock

Approximately one-half inch from its rear end is a lug c, which is manipulated by the hammer during the cocking action. The extreme rear end of the action slide lock is contacted by the long pin of the action slide lock release plunger.

ACTION SLIDE LOCK RELEASE PLUNGER. - The action slide lock release plunger Figure #8, is assembled in the right wall of the carrier. This part has a rectangular base a, which is step cut to enable the cartridge guide to pass over it when the plunger is assembled in the carrier.

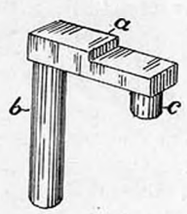
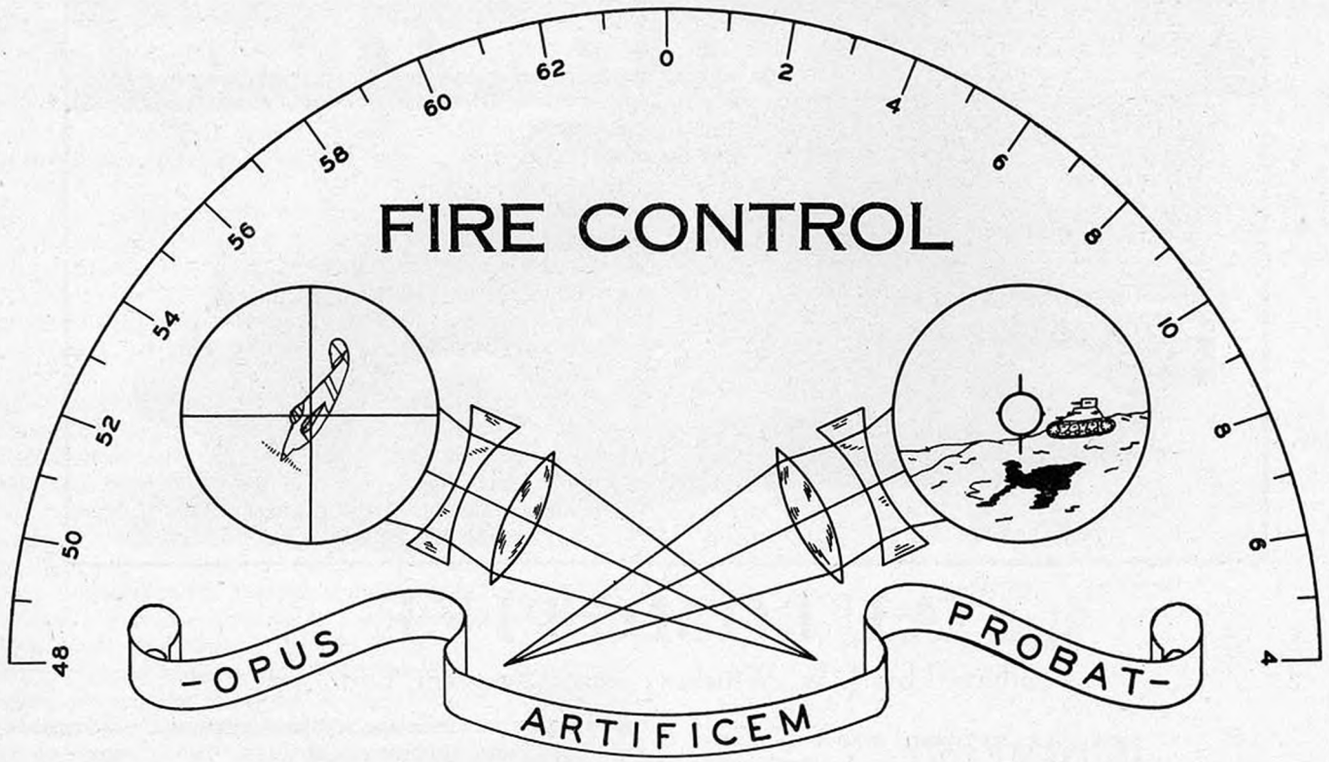



Figure #8
Action slide lock release plunger

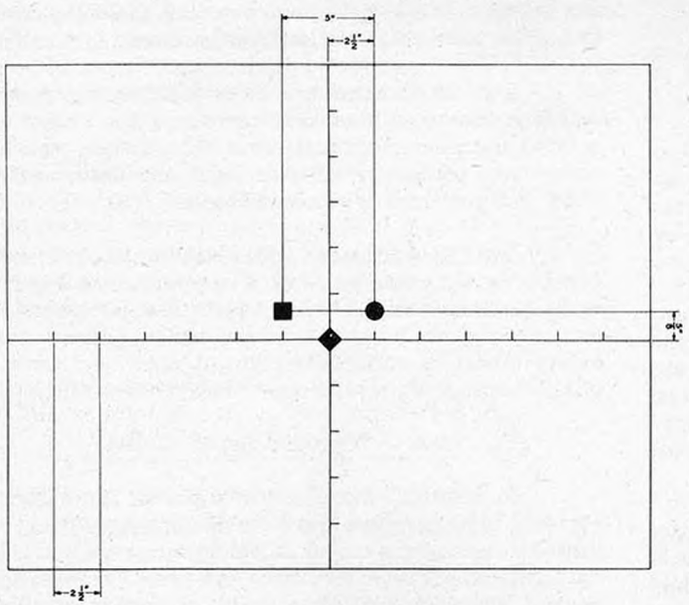
It has two integrally formed pins. The longer one b, (about 5/8") extends through the carrier and contacts the rear end of the action slide lock. The short pin c, (about 1/8") extends into the right carrier wall and acts on the right side of the hammer.

SEAR. - The sear, Figure #9, is an irregularly shaped piece about one and one-half inches long, and 3/8" wide.




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

# REPAIR AND MAINTENANCE OF FIELD GLASS, TYPE EE



TESTING TARGET.

(1) Diamond is the point to which fixture is adjusted when using the telescope adapter.

(2) Square is the point to which the left optical axis is adjusted.

(3) Circle is the point to which the right optical axis is adjusted.

b. Two and one half inches (dimension indicated above) is equivalent to 1/2 of a mil at 139 yards. Target must be erected with a plumb line to insure verticality. Five inch dimension in illustration is the value of 1 mil at 139 yards.

c. Testing target may be checkerboarded in 1 mil squares if deemed desirable. A 1 mil square at 139 yards would be 5" wide, 5" long.

ADJUSTMENTS

GENERAL. - The adjustment described in this section will be performed only by Ordnance personnel.

a. Double vision is due to the fact that the optical axis of the two telescopes are not parallel. To correct double vision the two optical axis must be made parallel to each other and to the mechanical axis of the instrument within the tolerances prescribed.

b. Two and one half inches (dimension indicated above) is equivalent to 1/2 of a mil at 139 yards. Target must be erected with a plumb line to insure verticality. Five inch dimension in illustration is the value of 1 mil at 139 yards.

c. Testing target may be checkerboarded in 1 mil squares if deemed desirable. A 1 mil square at 139 yards would be 5" wide, 5" long.

Lashing Three Spars for a Gin. — Mark on each spar the distance from the butt to the center of the lashing. Lay two of the spars parallel to each other with an interval a little greater than the diameter. Rest their tips on a skid, and lay the third spar between them with its butt in the opposite direction, so that the marks on the three spars will be in line. (Fig. 45) Make a clove hitch on one of the outer spars below the lashing, and take eight or nine loose turns around the three. Take a couple of trapping turns between each pair of spars in succession and finish with a clove hitch on the central spar above the lashing. Pass a sling over the lashing and the tripod is ready for raising.

To make clear the terms used, a "gin" is a tripod formed of three spars, or poles. The two outside ones are often called "legs", the third, or center one the "pry hole." A gin is intended for lifting weights vertically and requires no guys.

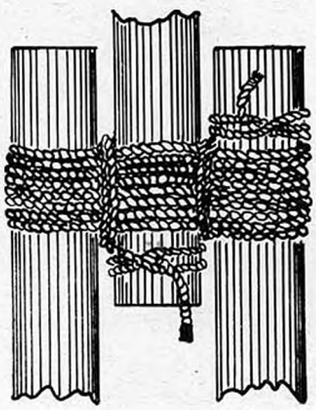


FIG. 45

"Shears" are formed of two spars, lashed as before described, and are used for lifting heavy weights vertically (where a gin cannot be constructed), or for lifting the weights and moving them a short distance, as in loading or unloading a railroad car, etc. Fore and back guys are required with shears.

Where the required spars cannot be obtained for gin or shears, a "standing derrick", or "gin pole" may be erected, consisting of a single spar of the required length, with a sling for the blocks lashed to the upper end, and three guys well secured above the sling with clove or rolling hitches, preferably the latter. The guys should spread well out from the pole — 120 degrees apart. Four guys, attached to a "masthead" knot may be used if sufficient rope is available.

Ordinarily, when spars are procurable (and, by the way, telegraph or telephone poles, from 25 to 40 feet long, according to necessity or supply, make about the best possible), you will find the gin rig most suitable for dismounting a heavy gun or howitzer in the field. In case of necessity, however, a gun may be dismantled with either shears or gin pole.

## HOLD-FASTS

If no natural objects, such as trees, etc., are in proper location to take the necessary guys, then "hold-fasts" must be provided.

To prepare such a fastening in the ground for the attachment of guys or purchases, stout pickets are driven into the ground one behind the other, in the line of pull. The head of each picket, except the last, is secured by a lashing to the foot of the picket next behind (Fig. 46). The lashings are tightened by rack sticks, the points of which are driven into the ground to hold them in position. The distance between the stakes should be several times the height of the stake above the ground.

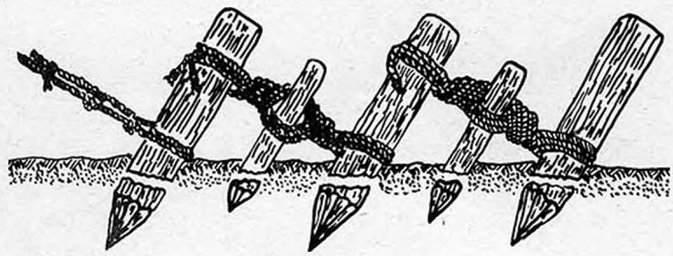


FIG. 46

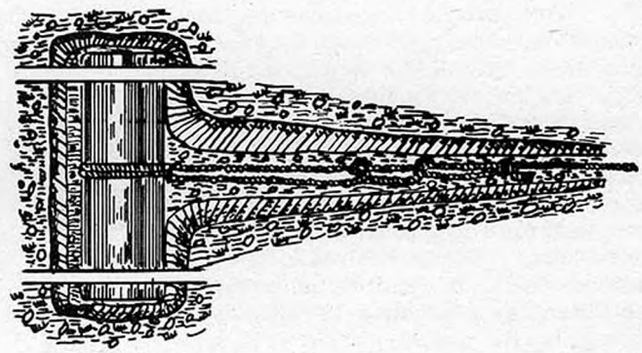


FIG. 47

Another form of hold-fast, requiring more labor, but having much greater strength, is called a "deadman," and consists of a log laid in a transverse trench, with an inclined trench intersecting it at its middle point (Fig. 47). The cable is passed down the inclined trench, taken several round turns on the log, and is fastened with two half-hitches, the end being seized to the standing part with a bit of rope

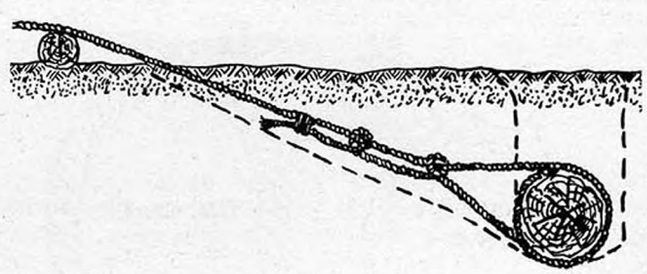
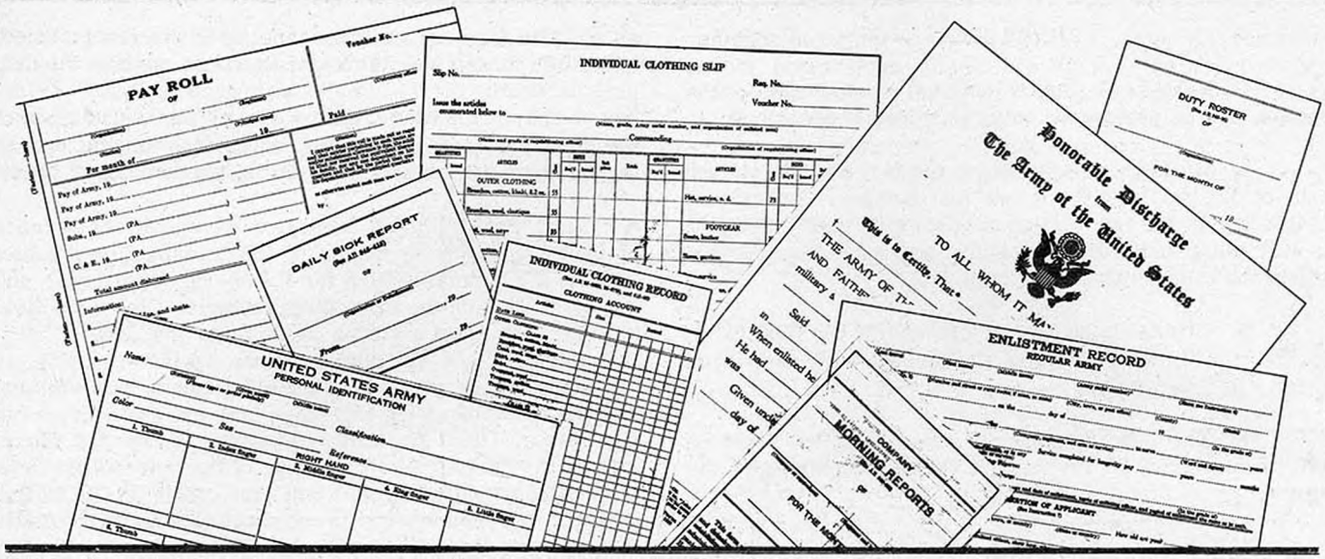


FIG. 48

yarn. If the cable is to lead horizontally or inclined downward, it should pass over a log at the outlet of the inclined trench (Fig. 48). If the cable is to lead upward, this log is not necessary, but the anchor log must be buried deeper. A combination of the "deadman" and a simple "hold-fast" is shown in Fig. 49.

In laying "deadmen", be sure that the face of the anchor log is perpendicular and solid. The inclined, intersecting trench should be no wider than is necessary. If the




# ADMINISTRATION

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

GENERAL. - Army Personnel Administration requires the use of "Reports of Change" for informing machine records units of changes in status of military personnel. Difficulty is often encountered in correctly preparing these reports in the manner and containing the information required by the machine records units and regulations.

FORM USED. - The form prescribed and furnished for reporting these changes in the status of military personnel is War Department, Adjutant General's Office Form No. 303. This form is about 7-1/4" x 3-1/4" in size and is furnished in book form containing twenty-five (25) forms in triplicate. The latest revision of this form is dated July 1, 1941, and personnel using this form should be certain that they use this latest revision.

The original copy of this form is a manila card; the duplicate copy is of white paper; and the triplicate copy is of buff paper. This form is used to report changes in status of both individuals and units (regiments, battalions, companies, etc.)

BY WHOM PREPARED. - Reports of Changes, W.D., A.G.O. Form 303, are prepared by unit personnel sections for all changes of status of individuals and units administered by the section.

In the case of a detached company or detachment, serving alone, the commander thereof will himself render the reports of changes or delegate a subordinate officer to this duty.

DATA FOR PREPARATION. - Data for the preparation of these reports is obtained by the unit personnel section from the morning reports, daily sick reports, company orders, and informal memoranda from commanders of the companies, or similar organizations, for which the section functions. Company commanders must transmit their company morning reports and daily sick reports to the unit personnel officer daily, copies of company orders whenever issued, and informal memoranda as necessary to provide the unit personnel section with the required data.

## "REPORTS OF CHANGE"

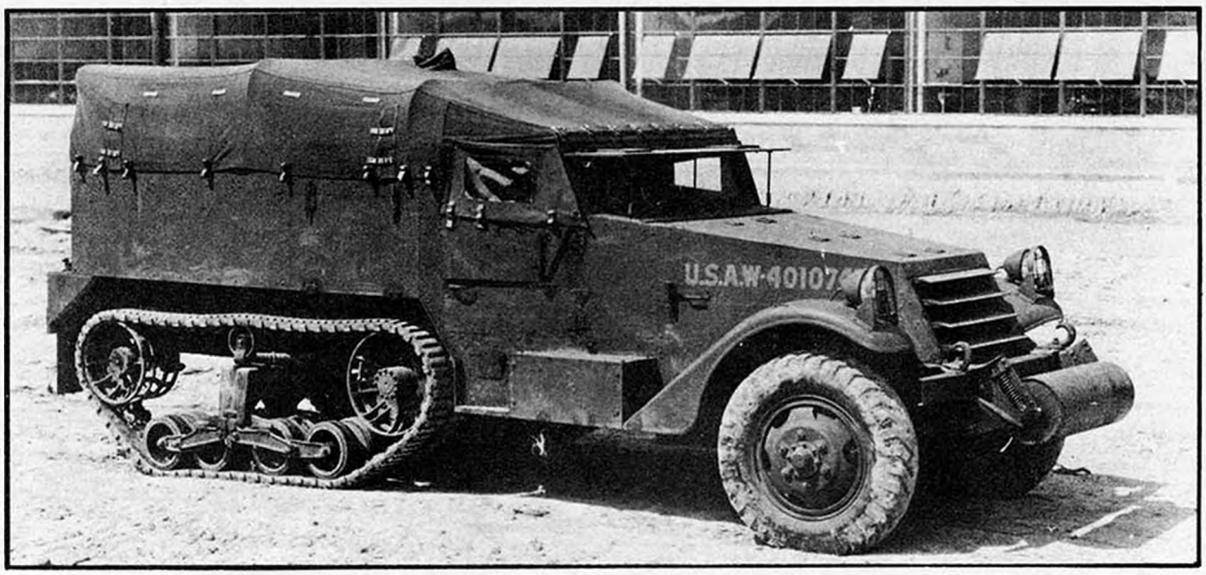
By: C. K. Harper, M. Sgt., Ord. Dept.,

During maneuvers, field operations, or other circumstances under which the company is a distance from its unit personnel section the company morning report and daily sick report may be retained in the company and all data transmitted by means of an informal memorandum, signed by the company commander, and forwarded through normal channels of communication to the unit personnel section.

WHEN PREPARED. - These reports are rendered on the day following that on which the change actually occurred. The period covered by any report is the same as the period covered by the morning report, from midnight to midnight. Thus, reports of changes for the period midnight January 2 to midnight January 3, will be rendered on January 4th.

In cases where reports of changes are rendered within the 24 hour period following the date of occurance of the change, the date to be entered in the space provided in the lower left section of the form is the date upon which the change occurred. For example, in the preparation, on January 4th, of a report of change covering a change that took place on January 3rd; the date entered in this space will be January 3rd. However, in case of reporting a change that occurred some time previously, the date to be entered is the date upon which the report of change is prepared. For example, in preparing a report of change on January 4th for a change that occurred on December 27th the date entered in the lower left space on the form will be January 4th and under "Description of Change" the remarks will include information as to the date upon which the change actually occurred, i.e., "Pvt Allen AWOL to conf Ft Hoyle Md since Dec 27th."

DISPOSITION OF COPIES. - The original copy (manila card) of reports of changes is forwarded by the unit personnel section, on the date of preparation, to division or post headquarters, where, after being checked and




# AUTOMOTIVE

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

## ORDNANCE UNIT IS TRAVELING REPAIR SHOP

**First Army Battalion Fixes Anything Right On Spot**

A vast traveling repair shop that fixes anything from binoculars to tanks right in the field of combat — that describes the 41st Ordnance battalion of the First Army, recently on maneuvers in the Carolinas under the command of Lieut. Gen. Hugh A. Drum.

The only organization of its kind in the entire First Army, this unique field unit is 100 per cent motorized and can transport, at high speed, enough machinery, parts and general equipment to repair and maintain, in an actual theater of war, almost every kind of mechanical instrument used by the army from guns and vehicles down to fine precision instruments.

Twisted axles, burned out bearings, jammed guns, battered scout cars, and the other inevitable wreckages of a great field army in action, may be seen flowing daily into the repair line of this mobile machine shop. A day or two later, they enter the "battle" again, as good as new.

### 192 Vehicles in Battalion

Of the 192 vehicles in the battalion, 86 carry permanently installed heavy machinery and spare parts bins. The remaining vehicles are jeeps, staff cars, cargo trucks and other regular types.

Five fully equipped machine shop trucks are the heart of the organization. Installed in them are light and heavy lathes, motor drills, milling machines, thread cutters, and a complete supplement of tools. These repair shops are equipped for almost any kind of work.

More specialized are five vehicles carrying machinery for repairing fine instruments. Range finders, telescopes, altimeters, watches, binoculars, anti-aircraft fire directors and manifold other precision instruments can be fixed in the field, thus avoiding the delay involved in sending them back to base repair shops.

Ten small arms trucks are fitted up to repair damaged pistols, rifles and machine guns. They carry special machinery of their own. Five other trucks are completely equipped to repair light and heavy artillery. They carry special winches and tools.

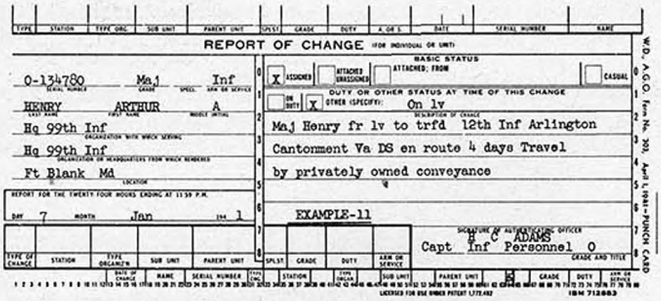
Welding equipment, both electric and oxyacetylene, is modern and complete, with five special welding trucks in the battalion devoted to this alone. These vehicles carry not only the welders, but oxygen tanks, presses, vises, safety masks, a powerful electrical plant, and strip iron of all shapes and sixes to meet emergency needs.

### Many Automotive Repair Units

In addition, there are six trucks for automotive repairs; six heavy wreckers for hauling and lifting other vehicles, up to light tanks; 20 emergency repair trucks of the light-weight type; five "tool and bench" trucks; and 20 special supply trucks, crammed with enough spare parts to repair broken down guns and machinery for a month in the field, without calling for new supplies from the depot.

Outstanding is the lubrication truck — the only one of its kind in the U. S. arms — which can oil up two tanks completely inside of seven minutes. This machine, still in its experimental stage, is driven between a double line of tanks, its oil lines out on either side, and pumps aviation-type lubricating oil through the innards of 16 tanks in less than one hour.

(Continued on page 108)


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

0-134780 Maj Inf — BASIC STATUS: X ASSIGNED — CASUAL

HENRY ARTHUR A

DUTY OR OTHER STATUS AT TIME OF THIS CHANGE: X OTHER (SPECIFY): On lv

Hq 99th Inf

Hq 99th Inf

Ft Blank Md

Maj Henry fr lv to trfd 12th Inf Arlington Cantonment Va DS en route 4 days Travel by privately owned conveyance

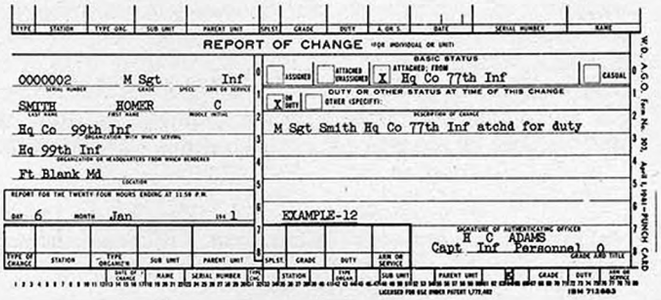
REPORT FOR THE TWENTY FOUR HOURS ENDING AT 11:59 P.M. DAY 7 MONTH Jan 194 1

EXAMPLE-11

SIGNATURE OF AUTHENTICATING OFFICER: H C ADAMS

Capt Inf Personnel O

W.D. A.G.O. Form No. 201, April 1, 1941 — PUNCH CARD


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

0000002 M Sgt Inf — BASIC STATUS: ATTACHED; FROM: X Hq Co 77th Inf — CASUAL

SMITH HOMER C

DUTY OR OTHER STATUS AT TIME OF THIS CHANGE: X DS DUTY — OTHER (SPECIFY):

Hq Co 99th Inf

Hq 99th Inf

Ft Blank Md

M Sgt Smith Hq Co 77th Inf atchd for duty

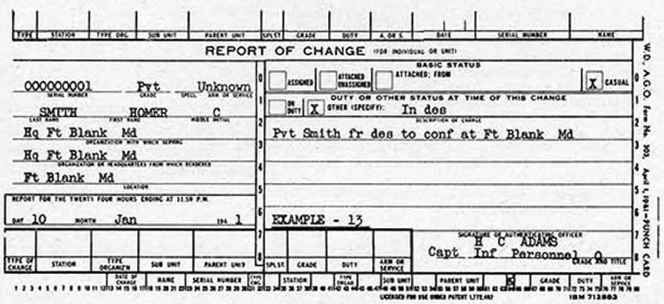
REPORT FOR THE TWENTY FOUR HOURS ENDING AT 11:59 P.M. DAY 6 MONTH Jan 194 1

EXAMPLE-12

SIGNATURE OF AUTHENTICATING OFFICER: H C ADAMS

Capt Inf Personnel O

W.D. A.G.O. Form No. 201, April 1, 1941 — PUNCH CARD


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

000000001 Pvt Unknown — BASIC STATUS: ATTACHED; FROM: X CASUAL

SMITH HOMER C

DUTY OR OTHER STATUS AT TIME OF THIS CHANGE: X DS DUTY — OTHER (SPECIFY): In dos

Hq Ft Blank Md

Hq Ft Blank Md

Ft Blank Md

Pvt Smith fr dos to conf at Ft Blank Md

REPORT FOR THE TWENTY FOUR HOURS ENDING AT 11:59 P.M. DAY 10 MONTH Jan 194 1

EXAMPLE - 13

SIGNATURE OF AUTHENTICATING OFFICER: H C ADAMS

Capt Inf Personnel O

W.D. A.G.O. Form No. 201, April 1, 1941 — PUNCH CARD

date of the change, direct to the chief of that arm or service:

| | |
|---|---|
| Air Corps | Finance Department |
| Chemical Warfare Service | Medical Department |
| Coast Artillery Corps | Ordnance Department |
| Corps of Engineers | Signal Corps |
| Quartermaster Corps | |

These copies are transmitted in an envelope bearing the notation: "Duplicate Copies - Reports of Changes" in the lower left corner.

The buff triplicate copy is retained and filed by the personnel section preparing the report. Prior to filing these copies they are checked against service records of individuals concerned and other sections records to make sure that all necessary entries have been made in these records.

DETAILS OF PREPARATION. - These reports may be prepared on a typewriter or by block printing by hand.

Commas, periods, and similar characters are not used in these reports.

The wording of remarks under the "Description of Change" should conform to that used in morning reports under AR 345-400.

Only the abbreviations authorized by AR 850-150 may be used.

Should a company commander fail to authenticate the morning report or sick report from which a report of change is prepared he will be required to do so prior to forwarding of the report of change.

Reports of change must not be stapled, pinned, or clipped together. They will be inserted between cardboard sheets slightly larger than the change cards and fastened together by means of rubber bands, by the mailing agency, and mailed in heavy manila envelopes.

An erroneous entry will not be erased. It will be deleted by drawing a thin line through the entry and making the correct entry immediately above it with date and initials of the original authenticating officer.

No individual other than the original authenticating officer is authorized to correct or alter a report of change.

USE OF ORDER IN LIEU OF REPORTS OF CHANGE. - Whenever a group of more than twenty (20) individuals is transferred on the same day from one organization to another organization, a report of change showing the number of men transferred will be prepared in lieu of individual reports of change. The paragraph number, order number, headquarters of issue, and date of order will be cited in the report of change. A copy of the order, with all inapplicable paragraphs lined out, will accompany the report of change to the machine records unit. A copy of the order will also accompany the white duplicate copy of any such report of change forwarded to the chief of any of the specified arms or services.

When no changes occur at a given station and no reports of change can be submitted a report of that fact must be made to the machine records unit servicing that station.

INDIVIDUAL CHANGES TO BE REPORTED. - The submission of a report of change is required or not required as indicated for each of the following changes in status or duty of individuals:

| TYPE OF CHANGE | X-REQUIRED FOR: OFFS | ARMY NURSE & CONT SURG | WO | EM |
|---|---|---|---|---|
| 1. Personnel regularly assigned or attached under Tables of Organization. | | | | |
| a. Present for duty. | | | | |
| (1) Assignment to or relief from primary duty. EXAMPLE - 1 | x | | | |
| (2) Assignment to or relief from additional duty. | x | | | |
| (3) Promotion or demotion. EXAMPLE - 2 | x | x | x | x |
| (4) Specialist rating established or changed. EXAMPLE - 3 | | | | x |
| (5) Return from absence. | x | x | x | x |
| b. Present not for duty. | | | | |
| (1) DS for benefit of officer alone. | x | | x | |
| (2) In arrest or confinement on post and return therefrom. | x | x | x | |

ADJUSTMENTS

GENERAL. - The adjustment described in this section will be performed only by Ordnance personnel.

a. Double vision is due to the fact that the optical axis of the two telescopes are not parallel. To correct double vision the two optical axis must be made parallel to each other and to the mechanical axis of the instrument within the tolerances prescribed.

b. Double vision may be detected in the field glass by the two methods outlined previously in this section under Field Inspection.

c. The following special tools, jigs, and fixtures will be necessary to accomplish the adjustment to be described.

(1) Surface plate and special testing fixture. (49454)

(2) Surface gage and special fixture. (49455)

(3) Collimating telescope. (C49108)

(4) Telescope adapter. (B121110)

(5) Testing target of proper dimensions. See illustration.

(6) Plumb line (for erecting testing target).

(7) Small jewelers screwdriver.

(8) Common three inch screwdriver.

ADJUSTMENT FOR DOUBLE VISION. - a. The object of the adjustment.

(1) When the interpupillary distance is set at 64 millimeters to have the optical axis of both telescopes parallel within 0.5 mils both vertically and horizontally, to one another and to the mechanical axis of the hinge joint.

(2) When the interpupillary distance is either 58 millimeters or 70 millimeters to have the optical axis of both telescopes parallel to each other in the horizontal plane within 1.4 mils; and in the vertical plane within 2.9 mils.

b. Locate the special target at a distance of 139 yards and approximately level with the testing fixture. Target may be leveled, and the vertical line on the testing target rendered accurately perpendicularly by use of the plumb line. Mount the collimating telescope in the telescope adapter and the telescope adapter in the clamping device on the testing fixture. Adjust the adjusting fixture by means of the leveling screws so as to bring the intersection of the cross lines of the collimating telescope reticle into coincidence with the point on the testing target which is indicated by the diamond. Remove the collimating telescope from the adjusting fixture and mount the collimating telescope in the telescope holder on the surface gage. Allow sufficient clearance between the end of the collimating telescope and the eyepieces of the field glasses when the field glasses are clamped into the adjusting fixture to allow free movement of the focusing nuts. With the surface gage pins against the edge of the adjusting fixture and the right hand pin against the stop pin indicated by the 1.2" dimension in drawing F/A C-49109, adjust the collimating telescope until the cross lines of the reticle coincide with the cross lines on the testing target which are clearly indicated in the drawing of same.

c. Set the field glasses to a interpupillary distance of 64 millimeters by means of the interpupillary scale. This is the normal setting for the average individual, and the zero to which the adjustment is made. Clamp the field glasses in a level position relative to the leveled surface plate. Place the surface plate against the stop pin for the right eyepiece of the field glasses, and sighting through the collimating telescope into the eyepiece, focus the eyepiece until the image appears sharp and clear. Adjust the porro prism by means of the special headless cone point adjusting screws until the circle on the testing target is in coincidence with the cross lines with the collimating telescope reticle as indicated in the drawing. Repeat this operation with the left telescope until a similar condition is obtained on the corresponding left section of the target, the square.

d. Any apparent tilt in the field of view can be similarly corrected by adjusting the headless cone point adjusting screws until the tilt is eliminated.

e. On completion of the adjustment the heads of the special cone point adjusting and tilting screws should be covered with red plugging cement of a shade to match the body finish, until the recess in which they are seated is filled flush with the body. Care should be exercised in this phase of the adjustment and a neat job should be done.

f. If the reticle is not horizontal with the horizontal line on the testing target within 1/2 mil it should be corrected by shifting the reticle in the cell until the required degree of levelness is obtained.

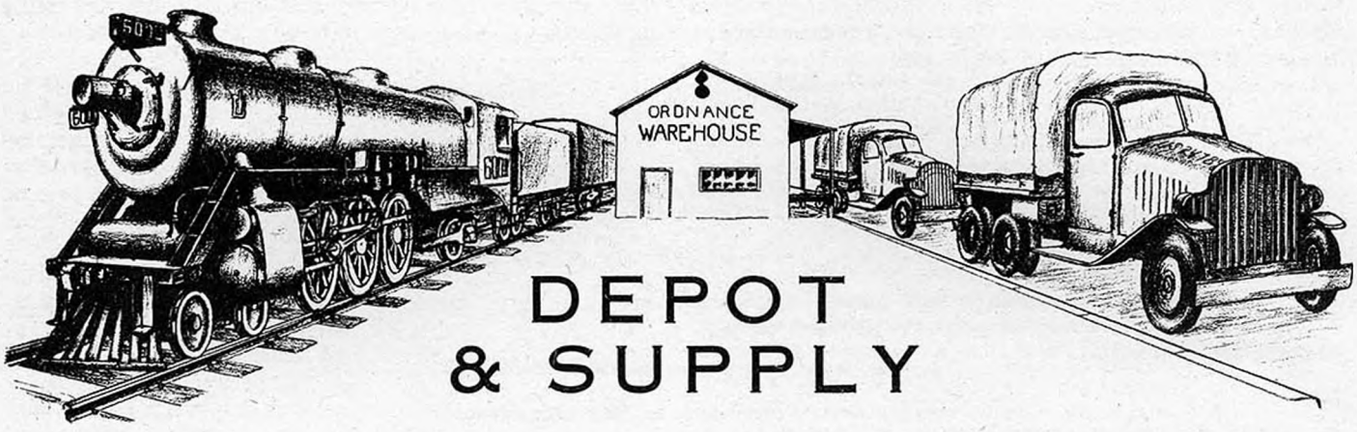
DETECTING PARALLAX AND IMPROPER DIOPTER MOVEMENT. - a. Much trouble has been encountered in teaching the meaning of parallax and how to correct for it, while at the same time maintaining correct diopter movement. It has been deemed advisable to insert a special section on it giving the probable causes and remedies in as great a detail as is possible in the space provided.

b. The two main methods of detecting parallax in the field glass were explained under "Inspection" in THE ORDNANCE SERGEANT for December, 1941.

c. The method of detecting improper diopter movement is outlined in the following paragraphs.

d. The elimination of parallax and the obtaining of proper diopter movement is a source of great trouble to the average instrument repairman. At some stage of his career he has heard that it can be corrected by the machining of various parts. This is correct to a certain degree; and looked at from another point of view can prove highly misleading. There are other and more preferable methods of eliminating parallax and obtaining the required diopter movement which should always be tried before machining is resorted to. Machining should always be as a last resort. The more preferable methods are outlined below.

(Continued on page 109)




# DEPOT & SUPPLY

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

## DISPOSITION OF UNSERVICEABLE PROPERTY

**By: Amos L. Prouty, T. Sgt., Ord. Dept.**

The November issue of THE ORDNANCE SERGEANT published an article entitled "Preparation of Reports of Survey." While that article was concerned primarily with the intricacies of the Report of Survey and the situations requiring its use rather than the disposition of the property involved, the Report of Survey is often a necessary instrument in the action to be taken to dispose of unserviceable property. This article will deal with the procedure necessary in the disposition of unserviceable property and the preparation of the Inventory and Inspection Report.

Army Regulations 35-6640 divides unserviceable property into two classes with reference to its disposition:

(1) Class I. - Property which is unserviceable as a result of fair wear and tear in the public service.

(2) Class II. - Property which is unserviceable as a result of means other than fair wear and tear.

Unserviceable property in Class II requires action through a Report of Survey whether to fix the responsibility for the unserviceable condition or to relieve all concerned of that responsibility. The Report of Survey may or may not become an instrument for the actual disposition of the property.

When the value of property on a Report of Survey does not exceed five hundred dollars ($500) and, in the opinion of the responsible officer all concerned should be relieved from responsibility, the responsible officer will include in his statement of date and circumstances a recommendation for the disposition of the property. Thus, if the commanding officer approves the Report of Survey, without action by a surveying officer, the property will be disposed of as recommended and the Report of Survey, with the disposal of the property properly receipted for thereon (if turned in to salvage) or witnessed (if destroyed) will become a credit voucher to the accountable officer's stock record account for the property so disposed of; subject, of course, to review by higher authority. If disposition is controlled by Corps Area or higher headquarters, then disposition will not be made until Report of Survey has been approved by that headquarters.

If the value of the property on a Report of Survey exceeds $500.00 (except at depots and arsenals) the surveying officer will make recommendation for the disposition of the property. The principles governing the disposition of the property are set forth in Army Regulation 35-6640 and in Circular No. 202, War Department, 1941.

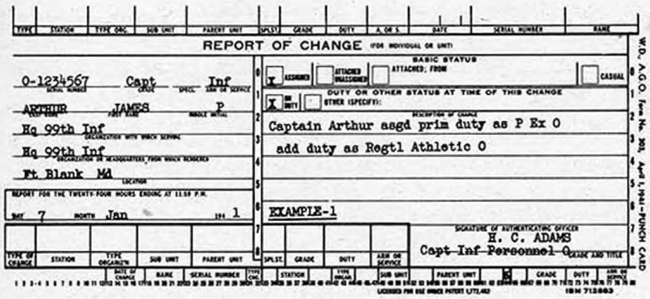
However, depending on the nature of the property involved, the Report of Survey may direct that the property be submitted to a General or Special Inspector who will determine the proper disposition of the property. In this event the Report of Survey will not become a voucher for the property but will be attached to the Inventory and Inspection Report upon which the property is listed and, with certain exceptions to be pointed out later, the Inventory and Inspection report will become the voucher to the accountable officer's stock record account.

Property in Class I does not require action by a Report of Survey prior to being submitted to an inspector for disposition. Such property will be listed on WD, IGD, Form No. 1 (Inventory and Inspection Report), acted upon by an inspector and, with certain exceptions, disposed of as indicated by him. The completed Inventory and Inspection Report will become the credit voucher to the accountable officer's stock record account except when the property is shipped instead of being disposed of locally in which case the receipted shipping ticket becomes the property voucher. However, the submission of property for the action of an inspector is not as simple as might be indicated by what has been said so far.

Before property may be listed on the Inventory and Inspection Report a check must be made to determine if any of the articles are listed as "Supervised." This information may be found in War Department circulars, letters published by The Adjutant General, and, for Ordnance property, in Ordnance Field Service Bulletin 1-5. OFSB 1-5 defines supervised articles of Ordnance as being sup-

reviewed, all reports for the day are gathered together and transmitted, in bulk and by the most rapid means available, within twenty-four (24) hours after date of the change, to the machine records unit servicing the station. The records are accompanied by a statement showing the total number of reports being transmitted, whether or not all reports from all unit personnel sections are included, and if not, the reason the missing reports are not included.

The white duplicate copy of a report of change pertaining to personnel or units of the following arms and services is transmitted, within forty-eight hours of the


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

0-12345678 Capt Inf

ARTHUR JAMES P

Hq 99th Inf

Hq 99th Inf

Ft Blank Md

Captain Arthur asgd prim duty as P Ex O

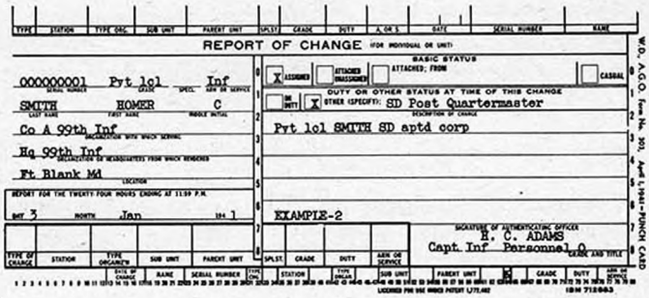
add duty as Regtl Athletic O

REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 7 MONTH Jan 194 1

EXAMPLE-1

H. C. ADAMS

Capt Inf Personnel O


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

000000001 Pvt 1cl Inf

SMITH HOMER C

Co A 99th Inf

Hq 99th Inf

Ft Blank Md

DUTY OR OTHER STATUS AT TIME OF THIS CHANGE: SD Post Quartermaster

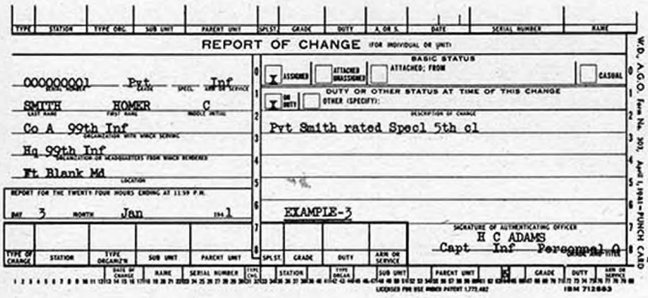
Pvt 1cl SMITH SD aptd corp

REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 3 MONTH Jan 194 1

EXAMPLE-2

H. C. ADAMS

Capt Inf Personnel O


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

000000001 Pvt Inf

SMITH HOMER C

Co A 99th Inf

Hq 99th Inf

Ft Blank Md

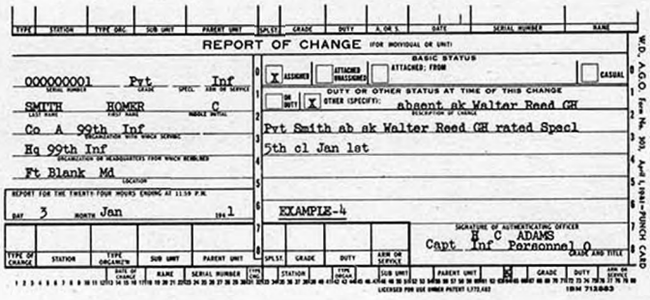
Pvt Smith rated Specl 5th cl

REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 3 MONTH Jan 194 1

EXAMPLE-3

H C ADAMS

Capt Inf Personnel O


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

000000001 Pvt Inf

SMITH HOMER C

Co A 99th Inf

Hq 99th Inf

Ft Blank Md

DUTY OR OTHER STATUS AT TIME OF THIS CHANGE: absent sk Walter Reed GH

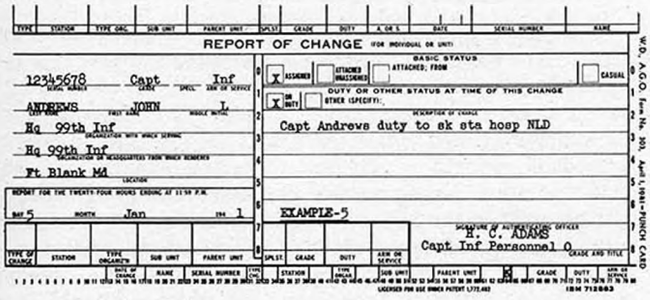
Pvt Smith ab sk Walter Reed GH rated Specl 5th cl Jan 1st

REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 3 MONTH Jan 194 1

EXAMPLE-4

H C ADAMS

Capt Inf Personnel O


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

12345678 Capt Inf

ANDREWS JOHN L

Hq 99th Inf

Hq 99th Inf

Ft Blank Md

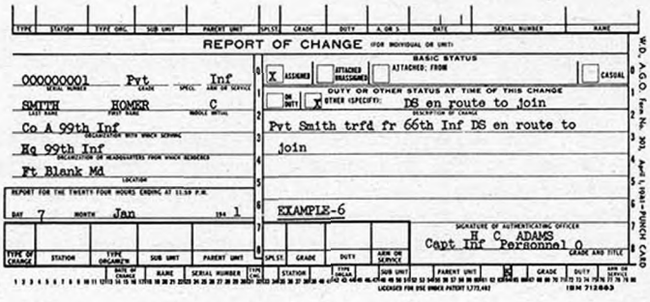
Capt Andrews duty to sk sta hosp NLD

REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 5 MONTH Jan 194 1

EXAMPLE-5

H. C. ADAMS

Capt Inf Personnel O


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

000000001 Pvt Inf

SMITH HOMER C

Co A 99th Inf

Hq 99th Inf

Ft Blank Md

DUTY OR OTHER STATUS AT TIME OF THIS CHANGE: DS en route to join

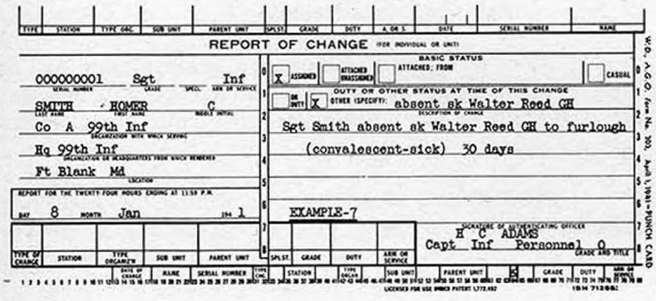
Pvt Smith trfd fr 66th Inf DS en route to join

REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 7 MONTH Jan 194 1

EXAMPLE-6

H C ADAMS

Capt Inf Personnel O


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

000000001 Sgt Inf

SMITH HOMER C

Co A 99th Inf

Hq 99th Inf

Ft Blank Md

DUTY OR OTHER STATUS AT TIME OF THIS CHANGE: absent sk Walter Reed GH

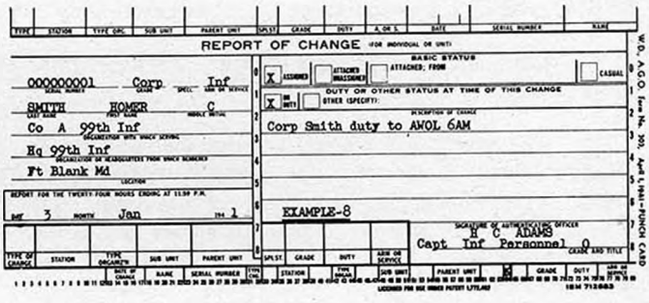
Sgt Smith absent sk Walter Reed GH to furlough (convalescent-sick) 30 days

REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 8 MONTH Jan 194 1

EXAMPLE-7

H C ADAMS

Capt Inf Personnel O


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

000000001 Corp Inf

SMITH HOMER C

Co A 99th Inf

Hq 99th Inf

Ft Blank Md

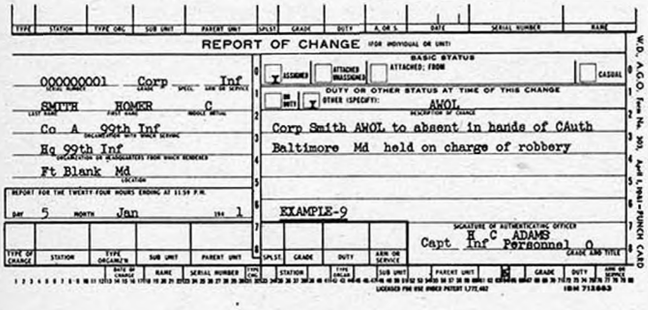
Corp Smith duty to AWOL 6AM

REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 3 MONTH Jan 194 1

EXAMPLE-8

H C ADAMS

Capt Inf Personnel O


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

000000001 Corp Inf

SMITH HOMER C

Co A 99th Inf

Hq 99th Inf

Ft Blank Md

DUTY OR OTHER STATUS AT TIME OF THIS CHANGE: AWOL

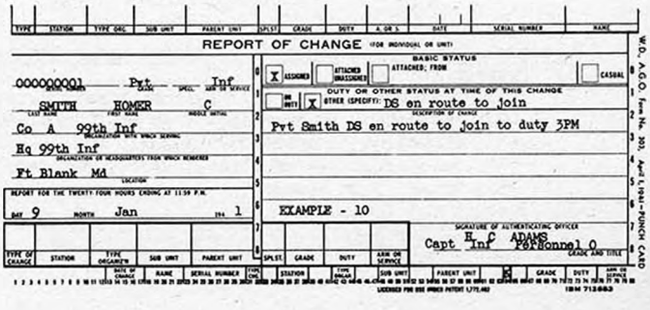
Corp Smith AWOL to absent in hands of CAuth Baltimore Md held on charge of robbery

REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 5 MONTH Jan 194 1

EXAMPLE-9

H C ADAMS

Capt Inf Personnel O


REPORT OF CHANGE (FOR INDIVIDUAL OR UNIT)

000000001 Pvt Inf

SMITH HOMER C

Co A 99th Inf

Hq 99th Inf

Ft Blank Md

DUTY OR OTHER STATUS AT TIME OF THIS CHANGE: DS en route to join

Pvt Smith DS en route to join to duty 3PM

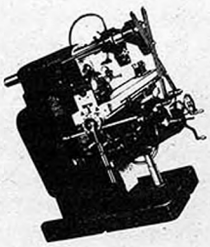
REPORT FOR THE TWENTY-FOUR HOURS ENDING AT 11:59 P.M. DAY 9 MONTH Jan 194 1

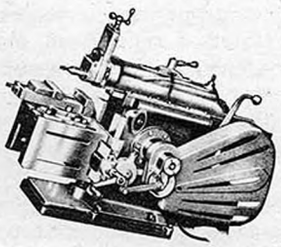
EXAMPLE - 10

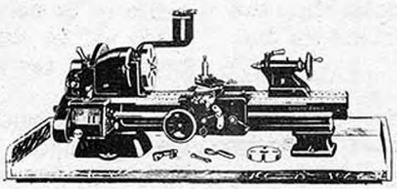
H C ADAMS

Capt Inf Personnel O

# THE MACHINE SHOP







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

## TRAINING THE ORDNANCE MACHINIST

## HEAT TREATMENT OF METALS

### Part IV

#### Carburizing and Case-Hardening

This process has been known and used from the time of the ancients. The Spaniard and his Toledo blade, the heathen Saracen with his curved scimitar are historical proofs that ancient and medieval armorers knew and practiced the secret of transforming ordinary soft iron into strong metal, metal that would hold a keen cutting edge and still be sufficiently ductile to bend and deflect without breaking. The secret of this method of heat treatment was guarded carefully, each armorer had his own secret formula and it was perpetuated by handing the secret process from father to son, thereby preventing this process from becoming common knowledge. Modern commercial trade secrets are an example of this practice.

#### Carburizing

Obtaining a surface penetration of carbon on iron, low carbon steel or low carbon alloy steel. There are many instances from the viewpoint of economy and actual requirements where a part, and in some cases a tool, can be fabricated from a cheap and easily worked steel; carburized so as to give a high carbon case or shell on the outer surface to resist wear and abrasion, but still retaining the tough and ductile core of the base metal. The ordinary cold rolled steel, (SAE - 1020) is an excellent type of low carbon steel that adapts itself readily for carburizing.

Carburization is accomplished by heating the iron or steel in intimate contact with an element rich in carbon and nitrogen, and able to transmit these elements to the metal being carburized. The three most common methods are: pack, immersion, and the nitriding process.

Pack carburizing. - A metal box or container made of cast iron or plate steel is filled with a carbonaceous material, the part to be carburized is placed in the center of the box, surrounded by the carbonizing filler which should be packed in firmly, a tight or clayed-in cover fitted to the box, and the pack heated in a furnace or a forge to the desired temperature and for a definite period of time. (See plotted graph chart at top of next page.) Some of the common carburizing materials used in this method are: hardwood charcoal, burnt bone, charred leather, and coke. Commercial and other mixtures are available, one of which is listed by compounds on the next page.

Immersion carburizing, or cyaniding. - A suitable cyanide salt is melted, the part to be carburized is preheated to the approximate temperature of the molten salt bath, the part is then immersed and soaked in the liquid bath until the proper depth of case is presumed to have been acquired. Common chemical salts are: potassium cyanide, sodium cyanide, potassium ferro-cyanide, and other like chemical mixtures sold under various trade names for this purpose. Most of these mixtures contain a percentage of cyanide salts mixed with other elements.

Nitriding process. — Surface hardening of alloy steel by heating the steel in a furnace which has an atmosphere charged with nitrogen (ammonia gas) at approximately 950 deg. F. The steel is then cooled slowly. This is a modern method used in surface hardening many small parts, the comparatively low temperature used produces work with a minimum of distortion or warpage, permitting finished parts to be processed without subsequent machining or grinding.

#### Case - hardening

As previously stated, carburizing serves the pur-

| | | X - REQUIRED FOR: OFFS | ARMY NURSE & CONT SURG | WO | EM |
|---|---|---|---|---|---|
| (3) | Sick on post NLD or LD not yet determined. EXAMPLE - 5 | x | x | x | |
| c. | Absent from organization or post. | | | | |
| (1) | Assigned to but not yet joined. EXAMPLE - 6 | x | x | x | x |
| (2) | DS with another organization, post, or station. | x | x | x | x |
| (3) | Departure on leave. EXAMPLE - 7 | x | x | x | |
| (4) | Absent without leave. EXAMPLE - 8 | x | x | x | x |
| (5) | Sick-absent from post. EXAMPLE - 4 | x | x | x | x |
| (6) | In arrest or confinement - State whether military post or civil authorities and if latter nature of offense and final disposition of case. EXAMPLE - 9 | x | x | x | x |
| (7) | Wounded in action - state place, nature of wound and whether serious or slight. | x | x | x | x |
| (8) | Missing in action - state place and circumstances. | x | x | x | x |
| (9) | Captured - state place and circumstances. | x | x | x | x |
| d. | Gains to organization. | | | | |
| (1) | Arrival at organization upon transfer from another organization or station etc. EXAMPLE - 10 | x | x | x | x |
| (2) | Gain by enlistment, reenlistment, restoration to duty after sentence by general court-martial, from desertion, etc. | x | x | x | x |
| e. | Losses to organization. | | | | |
| (1) | Transfer to another organization or foreign service. EXAMPLE - 11 | x | x | x | x |
| (2) | Dropped from rolls of Army | x | x | x | |
| (3) | Killed in action - state place and circumstances. | x | x | x | x |
| (4) | Losses from other causes - discharge, desertion, death, relief from active duty of Res Offs, and Res. Army Nurses, etc. | x | x | x | x |
| 2. | Attached personnel and casuals. | | | | |
| a. | Change in primary duty. | x | | | |
| b. | Change in additional duty. | x | | | |
| c. | Arrival and attachment to organization or station other than the one to which regularly assigned. EXAMPLE - 12 | x | x | x | x |
| d. | Relief from DS and return to organization or station to which assigned or departure to another organization or station. | x | x | x | x |
| e. | Relief from DS but remaining at station as a casual. | x | x | x | x |
| f. | Arrival and departure of casuals. EXAMPLE - 13 | x | x | x | x |
| g. | Detached service. Report departure and return of attached personnel who are further detached to another organization. | x | x | x | x |
| h. | Arrest or confinement on post and return therefrom. | x | x | x | |
| i. | Sick on post NLD or LD not yet determined. | x | x | x | |
| j. | Attached not yet joined. | x | x | x | x |
| k. | Absent with leave. | x | x | x | |
| l. | Absent without leave. | x | x | x | x |
| m. | Sick absent from post. | x | x | x | x |
| n. | In arrest or confinement - absent from post. | x | x | x | x |
| o. | Wounded in action. | x | x | x | x |
| p. | Missing in action. | x | x | x | x |
| q. | Capture (if known). | x | x | x | x |
| r. | Killed in action. | x | x | x | x |

# WERE YOU HONEST ABOUT IT?

After you have tried to name the weapons (using correct nomenclature) illustrated on page 30, compare the results you get with this list.

1. Gun, submachine, Cal. .45, Thompson, M1928A1
2. Rifle, U.S. Cal..30, M1903
3. Rifle, U.S. Cal..30, M1903A1.
4. Rifle, U.S. Cal..30, M1 (Old Type)
5. Rifle, U.S. Cal..30, M1 (New Type)
6. Rifle, U.S. Cal..30, M1917
7. Rifle, U.S. Cal..22, M2
8. Shotgun, 12-Ga., Remington, M1910
9. Shotgun, 12-Ga., Winchester, M1897
10. Gun, machine, Cal..30, Browning, M2 Aircraft, Flexible
11. Gun,machine, Cal..30, Browning, aircraft, M1919,fixed
12. Gun, machine, Cal..30, Browning, aircraft, M1918M1, fixed
13. Gun, machine, Cal..30, Browning, M1919A4, flexible. (Without latest Modifications)
14. Gun, machine, Cal..30, Browning, M1919A4, flexible. (With latest Modifications)
15. Gun, machine, Cal..30, Browning, M1917A1
16. Rifle, automatic, Cal..30, Browning, M1918A2
17. Gun, machine, Cal..50, Browning, M2, aircraft, fixed.
18. Gun,machine, Cal..50, Browning, M1921, aircraft,fixed
19. Gun, machine, Cal..50, Browning, M2, Heavy Barrel, flexible
20. Gun, machine, Cal..50, Browning, M2, watercooled, flexible.
21. Gun, machine, Cal..50, Browning, M1921A1, watercooled
22. Pistol, pyrotechnic, M2
23. Revolver, Colt, Cal..45, M1917
24. Revolver, Smith & Wesson, Cal..45, M1917
25. Pistol, automatic, Cal..45, M1911
26. Pistol, automatic, Cal..45, M1911A1

# THE CARPENTER SHOP

Conducted by: W. Kuehne, 2nd Lt., Ord. Dept.

Before beginning a series of articles relative to the training of an Ordnance Carpenter, it is thought advisable to outline the course of instruction being followed at The Ordnance School. This schedule will not only give a comprehensive view of the entire course, but will aid in coordinating other articles which are to follow. The course of study might be outlined as follows:

| SUBJECT | REFERENCES |
|---|---|
| 1. LECTURES AND DEMONSTRATIONS: | |
| A. Hand tools and their uses:<br>Hammer, saw, plane, chisel, brace and bit, rasp, file square, dividers, scale level, vise, clamps, screwdriver, wrenches, nail-set, hatchet, mitre box, marking gauge, putty knife, sliding "T" bevel, try square. | Principals of Woodworking — Hjorth, Chapt. 1, Pg. 1-26<br>Audels Carpenters and Builders Guide - #1.<br>Chapt. 6, Pg. 95-178<br>Chapt. 16, Pg. 237-312 |
| B. Care of Tools:<br>(1) Proper storage in chests or cabinets.<br>(2) Maintenance of tools<br>(a) Saws:<br>1. Jointing<br>2. Setting<br>3. Filing<br>(b) Edged tools — chisels and planes.<br>1. Grinding<br>2. Oil Stoning<br>3. Adjusting plane blades<br>4. Installing new handless-chisels. | Principals of Woodworking — Hjorth, Chapt, 3, Pg. 54-69<br>Audels Carpenters and Builders Guide #1.<br>Chapt. 12, Pg. 179-188<br>Chapt. 21, Pg. 313-328 |
| C. Bench Operations:<br>(1) Laying out work<br>(a) Selection of materials<br>(b) Measuring and marking-rule, square, dividers, marking gauge.<br>(2) Forming operations: saw, plane, chisel, brace and bit.<br>(a) Use of saws.<br>1. Corrections in sawing<br>2. Cross-cut sawing<br>3. Rip sawing<br>4. Radius sawing<br>(b) Use of plane<br>1. Flat surfaces — Jack and smoothing planes with grain and block plane across grain.<br>2. Round surfaces — Jack and smoothing planes with grain and block plane across grain.<br>(c) Use of chisels<br>1. Hand chiseling-firmer chisels<br>2. Mallet chiseling-framing chisels<br>3. Grooving chiseling-framing chisels<br>(d) Use of brace and bits<br>1. Augar bits<br>2. Expansion bits<br>3. Countersink bit<br>4. Screwdriver bit<br>(3) Fastening operations<br>(a) Nailing<br>(b) Screwing<br>(c) Gluing | Principals of Woodworking — Hjorth, Chapt. 4, Pg. 70-78<br>Chapt. 5, Pg. 79-84<br>Chapt. 6, Pg. 85-89<br>Chapt. 7, Pg. 90-93<br>Chapt. 8, Pg. 94-102<br>Chapt. 9, Pg. 103-106<br>Chapt. 11, Pg. 119-129<br>Audels Carpenters and Builders Guide #1<br>Chapt. 6, Pg. 95-178<br>Chapt. 16, Pg. 237-312<br>Chapt. 24, Pg. 377-414 |

plies and equipment stored and issued by the Ordnance Department, in which disposition of the articles, when placed on Inventory and Inspection Reports, is governed by policies announced by the Chief of Ordnance and approved by The Secretary of War. Authority must be obtained from corps area or department commanders before articles listed as supervised, except ammunition, may be placed on Inventory and Inspection Reports for action by an inspector. Unserviceable ammunition will be disposed of as indicated in Section II, Circular No. 80, War Department, 1939.

Separate Inventory and Inspection Reports will be made for supervised and nonsupervised articles since the action on the Inventory and Inspection Report and the disposition are different.

The preparation of the Inventory and Inspection Report is governed by instructions contained in Army Regulation 20-35, most of which are reproduced on the reverse side of the Inventory and Inspection Report and need not be mentioned here. It may well be pointed out here that instructions governing column "1" on the Inventory and Inspection Report requires a statement to the effect that all the articles listed thereon became unserviceable through fair wear and tear and to state the circumstances regarding any articles listed thereon that did not become unserviceable through fair wear and tear. In the event that any property in Class II is listed on the Inventory and Inspection Report a copy of the Report of Survey should be attached.

After the supervised and nonsupervised articles have been segregated and separate Inventory and Inspection Reports properly prepared in duplicate the articles should be laid out in the same order that they are listed on the Inventory and Inspection Report in order to facilitate the inspector's work.

At this point it may be well to consider the inspector. Army Regulation 20-35 as changed by Section III, Circular No. 109, War Department, 1941, points out that the inspection of property for condemnation will be done by Inspectors General except that, at posts, camps and stations, when immediate action by an inspector is required and no Inspector General is available, experienced officers, (field officers if practicable) will be designated by army, GHQ Air Force, and corps area commanders, and the chief of the Armored Force to inspect property for condemnation.

The chiefs of supply arms and services and their commissioned assistants on duty at headquarters of corps area, army, army corps, division, GHQ Air Force, and the Armored Force may be designated by appropriate commanders enumerated above to inspect property for condemnation pertaining to their arm or service for which they have no accountability or direct responsibility when the property is of such a technical nature as to require inspection by an expert.

The Inspector will examine each article submitted to him that is listed on the Inventory and Inspection Report and, if he is satisfied that the article is unserviceable and that its condition is due to fair wear and tear, will indicate the proper disposition of that article on the face of the Inventory and Inspection Report. Articles which, in the opinion of the inspector, are not unserviceable; articles which, in the opinion of the inspector, are not unserviceable due to fair wear and tear (unless accompanied by Report of Survey); and articles which were listed on the Inventory and Inspection Report but were not presented to the inspector will be designated to be continued in service.

The actual disposition that the inspector should make of any particular article is beyond the scope and interest of this article. However, the guiding principles are contained in AR 20-35, Circular No. 202, War Department, 1941, announced policies of the chief of arm or service concerned as well as special instructions from other sources. Inspectors will be held responsible for their action in disposing of property and the disposition indicated by the Inspector for articles not listed as supervised will be carried out without further review or approval with two exceptions as shown below:

1. When the Inventory and Inspection Report carries machinery or tools that may be required for donation under the act of February 28, 1936, both copies of the report will be forwarded through channels to the corps area commander in the same manner as for supervised articles as explained below.

2. In case the inspector recommends that all or part of the property listed be turned in to a depot or arsenal, both copies of the report will be forwarded to the corps area commander, through channels, for final action and distribution.

In cases not included in the two exceptions described above for nonsupervised articles the property will be disposed of locally in the manner indicated by the Inspector. All property disposed of will be properly receipted for or the destruction thereof witnessed on the reverse side of the Inventory and Inspection Report. After the disposal has been completed the Inspector will turn the completed original copy of the Inventory and Inspection Report over to the accountable officer as a credit voucher to his stock record account for the articles thus disposed of. The duplicate copy will be forwarded by the inspector to the corps area commander for his information and for the auditor's file.

In the case of supervised articles the inspector's recommendation is not final. Upon completion of the inspection, the inspector will forward both copies of the Inventory and Inspection Report to the corps area commander who will note his action thereon and forward both copies to the Chief of Ordnance who will indorse his approval or other action on both copies and transmit them to the Chief of Finance for final action and distribution under the authority of the Secretary of War. When the accountable officer receives back a copy of the Inventory Report thus approved he will make the indicated disposition of the property.

Where the announced policies of the chief of supply arm or service waive prior review and delegate such authority to corps area commanders the corps area commander may approve the report in the same manner as would the chief of arm or service and the Chief of Finance.

In either case, the inspector's recommendation being approved or other action indicated by proper authority, the corps area commander will send one copy of the report to the accountable officer concerned and retain the other copy for the auditor's file.

(Continued on page 94)

7. PACKING AND CRATING

A. Crate Construction
B. Packing boxes
D. Bracing
E. Blocking
F. Marking

8. PRACTICAL CARPENTRY

A. Construction problems
B. Repair problems
C. Entire class builds production jobs

9. CONSTRUCTION. A miniature frame house is built and used in this part of the course to assist in teaching the students fundamental structural details. While they are not being trained primarily for this type of work, the knowledge gained will be of material benefit to them in planning and carrying out any involved construction or repair job.

A. Framing:
(1) Walls, floors, and partitions
(a) Sills and joist
(b) Corner posts, studding and bracing
(c) Framing for doors and windows
(d) Cross bridging and partition trussing
(e) Flooring, rough and finished
(2) Roofs:
(a) Rafters and ridges
(b) Hip and valley construction
(c) Furring
(d) Roof trusses
(e) Struts and collar beams

B. Scaffolding and staging:
(1) Forming and bracing
(2) Safety precautions

C. Hoisting apparatus:
(1) Rigging
(2) Slings

D. Exterior finishing
(1) Siding:
(a) Insulating materials
(b) Sheathing
(c) Cornices
(d) Siding and water tables
(e) Weathering stripping
(f) Trim

E. Interior finishing
(1) Lathing
(2) Floors
(3) Trim
(4) Stairways
(5) Doors and windows
(6) Cabinets

Audels Carpenters and Builders Guide #3
Chapt. 47-55

## DISPOSITION OF UNSERVICEABLE PROPERTY

(Continued from page 89)

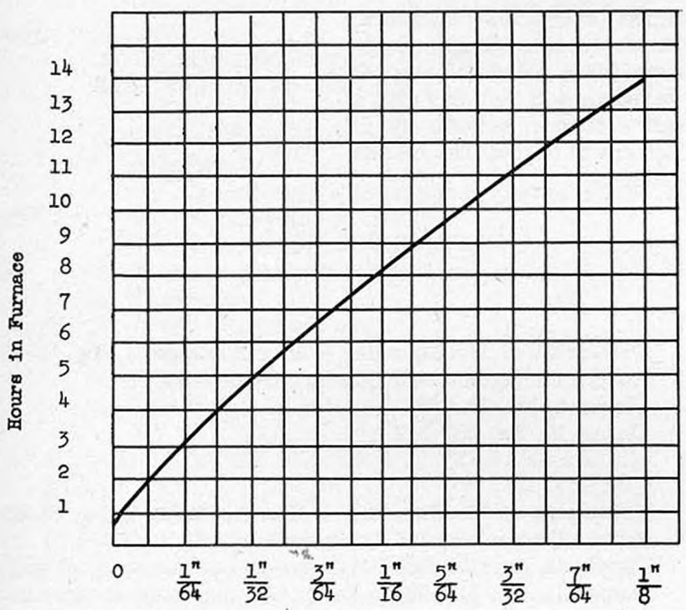
Upon receipt back of a copy of the approved Inventory and Inspection report the accountable officer will make the indicated disposition of the property. In case the disposition involves shipment of the property instead of local salvage or destruction, the receipted shipping ticket becomes the credit voucher to the stock record account, the Inventory and Inspection Report being attached to and filed with the shipping ticket.

It has not been the intent of this article to present a complete work on the subject but rather to draw a general picture of the procedure necessary to dispose of unserviceable property. When confronted with the problem of how to dispose of unserviceable property, the solution can only be found by consideration of all the factors involved and then searching pertinent regulations.

CASE - HARDENING CHART
Pack Method

Compute time when temperature is maximum

Temperature 1600 - 1750 deg. F.




Depth of Case

| Parts | Component |
|---|---|
| 13 | Hardwood Charcoal |
| 3 | Barium Carbonate |
| 1 | Precipitated Chalk |
| 2 | Soda Ash |
| | Compute mixture by weight |

Pack - Hardening Mixture

| | |
|---|---|
| Copper sulphate | 4 oz |
| Water | 8 oz |
| Sulphuric acid | 1 oz |

Copper sulphate solution

pose of increasing the carbon contents on the outer surface of a suitable metal. The outer shell or case is then refined by quench hardening the part, and is often followed by a tempering operation. It is to be noted that this is the same heat treatment as would be employed in heat treating a tool or part made of a good grade of tool steel. This entire process is included in the term Case - hardening.

Depth of case is regulated by the time the part is subjected to the process, it may range from a superficial depth of .002" up to .125", or even deeper. In the cyanide process a case depth of approximately .010 to .015" can be expected after the first 60 minutes, after that the rate of penetration slows up considerably until a point is reached where it becomes almost prohibitive to continue if consideration of the time element is a factor. The immersed steel or iron refuses to readily react with the bath, and the process almost becomes static. A case depth of .040" is considered heavy when utilizing the molten bath method.

## Precautions in Cyaniding

Cyanide, or cyanide base salts are deadly poisons. Remember this.

Wear rubber gloves when handling cyanide in lump or powdered form. Wash gloves in limed water or plain water after use. Cyanide is soluble in water.

Keep receptacle or pot containing cyanide covered to prevent absorption of moisture from the atmosphere by these salts.

When melting cyanide that has been previously melted and solidified, apply heat very slowly in order to drive off any moisture that may have been absorbed and retained by the cyanide. If heated too rapidly the cyanide will melt in the bottom of the pot, but the top will still have a solid crust which may still contain moisture. When this crust is finally weakened and drops into the molten mass, a violent reaction in the form of an explosion will result, scattering the red hot cyanide over a large area. Melting point of potassium cyanide is 1500 - 1550 deg. F., sodium cyanide 1150 - 1200 deg. F.

Fumes and gas (hydrocyanic acid) liberated by the melting cyanide are poisonous, a ventilated hood should be used over the pot.

Overheating will hasten the decomposition of the cyanide, it should not be heated much beyond the melting point. When additional solid cyanide is to be added to the pot to fortify the bath or to replace drag-out, wait until the contents of the pot have cooled down from a liquid to a solid.

## Notes on Case - hardening

Boxes and pots for case-hardening are made of nickel-chrome cast iron, plain cast iron, or fabricated of sheet steel by welding. Frequent heating and cooling of these receptacles causes warping and distortion, and if a forge is used there is always the possibility of burning out the bottom. Pots and boxes made of cast metal are able to resist these conditions and will last for a long time.

Parts to be case-hardened should be free of grease, oil, or any foreign matter. Clean parts with kerosene or any approved cleaning solvent.

Always preheat part to be processed to the same temperature as the liquid carburizer; it saves time, results are better and there is no danger of a violent reaction as a result of introducing cold and possibly moist metal into the molten bath.

(Continued on page 111)

and England. Especially in the latter two countries there was a remarkable growth of pyrotechny during the fifteenth century. With the introduction of gunpowder, while directly limiting the military uses, it greatly increased the scenic effects obtainable, and people came to thoroughly enjoy the huge displays. In the nineteenth century, the first companies were formed in England for the manufacture of fireworks, and the continued success of these companies exists today.

We have not touched, so far, on the development of the rocket. This is indeed a unique projectile, complete in itself, as it does not need a cannon to launch its flight. The Hindu troops were the first to use it against the British troops at the time of the mutiny. These were purely offensive weapons, chiefly incendiary agents, since the rockets had a metal point which held them in contact with anything it could stick in, and the flames issuing from ports in the side ignited the substance.

In the latter part of the eighteenth century there was great activity in the use of rockets as instruments of war. The British used them against the Americans in the Revolutionary War, and they were frequently employed in Europe. The gradual decline in these uses was followed by their increased use in signaling devices.

Prior to the World War, the Germans developed a number of pyrotechnic devices, such as the searchlight shell for night firing, which was held aloft by means of a parachute, illuminating hand grenades, tracer bombs for airplanes, and signal cartridges.

At the time of our entry into the War there were few requirements for pyrotechnics and such devices as we needed were procured from commercial firms. The Ordnance Department was assigned the problem of procuring devices similar to those of our Allies, and actual manufacturing was started when orders were received to the effect that we were to simply adopt the French system. This resulted in considerable delay, due mainly to the numerous special types used by the French. It was found later that the system was unsatisfactory since the various articles were neither rugged enough, nor sufficiently water proof. The great variety of pyrotechnic items in use in our Army in June, 1918, as a result of these orders, may be seen from the following list:

Signal rockets - 16 types
Very Star Cartridge (ground troop) 25 mm - 16 types
Very Pistol - 25 mm Mark IV
V-B Cartridge (fired from rifle grenade dischgr) - 16 types
V-B Rifle Discharger
Signal Cartridge - 35 mm (Aviation) - 6 types
Signal Pistol, 35 mm, Aviation - Mark I
Airplane flare, Mark I
Wing Tip flare, Mark I
Position light (ground) 3 types
Signal light, 10 gauge - 3 types, US design
Very Pistol, Mark III - U. S. design
Smoke Torch, Mark I

It can be seen that the development of pyrotechnic material prior to the War was made on an empirical basis. The war led to scientific research and we may properly consider some of the phenomena which were investigated.

Since pyrotechnics are physical mixtures of chemical elements and compounds, we find that with any single item there are four considerations to examine: (1) physical characteristics, (2) chemical characteristics, (3) stability, and (4) visibility.

The physical characteristics of a pyrotechnic composition which are of major interest in determining its suitability for use are:

a. Candlepower per unit of burning surface
b. Burning rate
c. Color of flame
d. Sensitivity to ignition
e. Sensitivity to impact and detonation
f. Density of pressed composition
g. Candlepower efficiency (cp seconds per gram)

The chemical characteristics of a pyrotechnic composition may be classified as to the ingredients necessary to make such a composition effective, and are:

a. Fuels such as magnesium, aluminum, sulphur, asphalt, and certain resinates to furnish material for burning.

b. Oxidizing agents such as perchlorates of potassium and ammonium, chlorates, nitrates or chromates to furnish additional oxygen so as to insure combustion.

c. Color intensifiers such as chlorides of barium, strontium, or copper, resinates or nitrates, in order to influence the spectral distribution of the flame.

d. Retardents such as asphalt, parafin, or sulphur, in order to prolong the burning time.

e. Binding agents such as asphalt, parafin, or sulphur, in order to make the mixture sufficiently coherent to remain in compact form.

f. Waterproofing agents such as asphalt, parafin, or sulphur, in order to make the mixture storable under adverse conditions.

We note from the above list of materials that a single chemical may serve to effect more than one characteristic which is highly desirable since it would be extremely impractical to have to use a different ingredient in order to obtain each characteristic.

The stability of the pyrotechnic composition presents a problem which is greater than that of propellant charges for the reason that the greater number of necessary ingredients, while normally stable alone, may not be so in a mixture with certain others. For this reason it is highly desirable to utilize ingredients which are non-hygroscopic, non-volatile, non-oxidizing at ordinary temperatures, and non-reactive with other compounds in the presence of moisture, so that the pyrotechnics may have suitable stability when subjected to ordinary storage conditions.

The visibility of a pyrotechnic composition is determined by considerations of candlepower, color, and weather. Very little quantitative data is at hand concerning visibility, but it has been determined that the colors may be arranged in the following order as to minimum candlepower required: red, amber, white, and green.

In view of the above listed facts, there was a spe-

(4) Finishing operations
(a) Use of rasp, file, sandpaper

D. Joints — butt, lap, mortise and tenon
(1) Butt Joints-Plain, glued and blocked, rabbetted dado or housed, dado and rabbet or gained, mitre, mitre with spline dovetail, dowelled.
(2) Lap Joints—Cross lap, middle lap, brace or angle lap, splice
(3) Mortise and tenon—Slip, through blind
(4) Cleated Joints—Side, end

Principals of Woodworking — Hjorth, Chapt. 5, Pg. 79-84
Chapt. 6, Pg. 85-89
Chapt. 7, Pg. 90-93
Chapt. 8, Pg. 94-102
Chapt. 9, Pg. 103-106
Audels Carpenters and Builders
Guide #1
Chapt. 24, Pg. 377-414

E. Materials and their uses:
(1) Woods:
(a) Classification, uses, and characteristics
(b) Commercial dimensions
(c) Board measure
(2) Masonite and other fiber composition.
(3) Plywoods
(4) Glues — cold and hot
(5) Nails and brads
(6) Screws
(7) Putty

Principals of Woodworking
Chapt. 11, Pg. 119-120
Chapt. 17, Pg. 223-249

Audels Carpenters and Builders
Guide #1
Chapt. 1, Pg. 1-22
Chapt. 2, Pg. 23-58
Chapt. 3, Pg. 59-74
Chapt. 4, Pg. 75-84

2. SHOP ARITHMETIC FOR CARPENTERS AND BUILDERS.

Arithmetic for carpenters — Dale

3. PLANNING: This unit introduces the technique of planning in construction. Its practical application is developed throughout the remainder of the course.

A. Drawings
(1) Application
(2) Reading of blueprints

B. Specifications
(1) Purpose
(2) Inspection problems

C. Estimating
(1) Materials
(2) Labor

Blue Print Reading — E. M. Wyatt
Audels Carpenters and Builders
Guide #2
Chapt. 30, Pg. 651-696
Chapt. 33, Pg. 769-812
Principals of Woodworking — Hjorth, Chapt. 18, Pg. 250-254

4. PRACTICAL BENCH WORK

A. Simple box
B. Broom holder
C. Shelf and bracket
D. Step ladder
E. Book rack or magazine rack

Principals of Woodworking — Hjorth, Chapt. 10, Pg. 107-118

5. MACHINE FINISHING

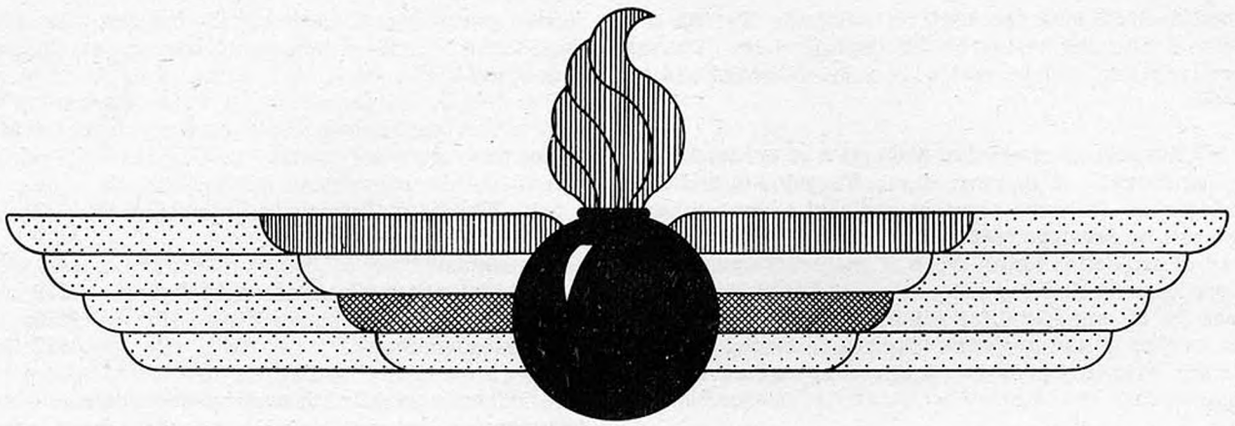
A. Use of planer
B. Use of power saw
C. Use of power sander
D. Use of band saw
E. Use of jointer
F. Use of power drills
G. Use of mortising machine
H. Use of tool grinder
I. Use of electric hand tools
J. Use of wood turning lathe

Principals of Woodworking — Hjorth, Chapt. 13, Pg. 140-165

6. CABINET WORK:

A. Tool chest, oak
B. Student is allowed to select or plan his own projects for the remainder of this unit.

Principals of Woodworking — Hjorth, Chapt. 18, Pg. 254-303
Audels Carpenters and Builders
Guide #1
Chapt. 24, Pg. 377-414 Chapt. 25, Pg. 415-430



# AVIATION ORDNANCE

Conducted by: Glenn H. Staley, 2nd Lieut., Ord. Dept.

## BOMB HANDLING

The title probably suggests to most a process or procedure of bomb drill and delivery. However, a detailed consideration of the subject should cover all phases of the picture from the arsenal or depot to the plane itself. With this in mind, we can trace the journey of the bomb from the arsenal or bomb loading plant to the Air Force Depot (if exigency demands that an intermediate depot be inserted between Zone of Interior and Air Base) to the Air Base and its dispersed airdromes. It is believed that the most expeditious manner of effecting delivery (if available facilities permit) is to deliver directly to the distributing points at the dispersed airdromes from the depot. This will depend, of course, upon whether or not the decentralized system of dispersed airdromes is being employed and upon the situation and facilities peculiar to the particular air base.

At the arsenal, the bombs are properly marked and packed ready for shipment to the depot. Fuzes, primers and detonators are not ordinarily shipped with the bomb since the Interstate Commerce Commission Regulations, having utilized the expert services of the Bureau of Explosives, term such practice as most hazardous. Exceptions to this may be found in the case of fragmentation bombs and some chemical bombs which are shipped, packed in wooden boxes with the fuzes and primer detonators inserted in the same box.

The bombs, if shipped by rail from the arsenal, are loaded into the cars as prescribed by AR 30-995. Diagrams and actual photographs showing best methods for loading and bracing shipments of explosives may be found in Bureau of Explosives Pamphlet No. 6. The primary consideration in the loading of bombs is that they are to be handled with extreme care and protected against undue shock during transit. Safety precautions can never be emphasized too strongly especially to comparitively untrained personnel. In this regard, highly trained personnel should, if possible, be employed under the constant supervision of competent officers. Men working with bombs as well as with any other explosive are prone to become careless. The old adage that "familiarity breeds contempt" can certainly be applied to this subject. First experiences in the handling of bombs are usually evidenced by a very cautious almost reverent treatment. Successive handling, assuming that no accidents have occurred, is apt to develop a certain dangerous laxity in the men. Consciousness of the ever-present hazard associated with the handling of any explosive should be drilled into the individual with complete thoroughness. Such obviously dangerous practices as rolling or tumbling bombs the length of a car while loading it should never be countenanced.

Each bomb placed in the box-car should be inspected to see that the projecting lugs are protected and that the fuze holes are closed with suitable plugs. The car itself should be carefully inspected and placed in a condition suitable to the hauling of its dangerous type of cargo. Debris of all kinds and quantities must be cleaned out and protruding metal parts such as nail or boltheads must be covered with wood to eliminate possible hazard. It is deemed wise to state here that such cars are for the purpose of transportation and not for storage. The Safety Manual prescribes that explosives shall be stored only in those buildings that are intended and used solely for the storage of explosives. Box-cars do not fall within this category and should not be left standing loaded after arrival at destination for a period in excess of 48 hours at the most.

If motor convoy is used to transport bombs, all regulations covering movement by convoy will be adhered to strictly. The route will be carefully planned to avoid as many cities and towns as possible and the local ordinances of those through which it will be necessary to travel will be ascertained and complied with. The drivers should be well trained in convoy procedure. Of course, while the truck is being loaded or unloaded, the engine should not be running. Bombs should be securely strapped or tied in place in order to prevent rough treatment on the road. If the convoy arrives at its destination too late to be unloaded at once, it should be parked sufficiently far away from all inhabited buildings to comply with the Quantity Distance Tables and no personnel, except the necessary guard, should be allowed to sleep or loiter near the trucks.

Since many Air Bases are comparitively new establishments, there is sometimes very little storage

(Continued on page 111)


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

# DEVELOPMENT OF PYROTECHNICS

By: Ame Vennema, Capt., Ord. Dept.

We may properly define pyrotechny as the art of aerial fire according to Mr. Harry B. Faber, who has been the outstanding authority on pyrotechnics in this country since the World War. We can observe that this definition limits the subject to products visible in the air, but is broad enough to cover a wide range of activities. We all know that ages ago there were fire worshippers, and perhaps the earliest origin of the art of pyrotechnics was due to religious observances. Many varieties of substances possess a tendency, under certain conditions, to combine with oxygen and in so doing yield products which are both hot and luminous to an intense degree. Ordinarily burning is dependent upon oxygen from the air, but there are certain solids which already contain sufficient oxygen in combination with other elements from which oxygen can be released so quickly as to result in combustion of extraordinary energy. Priests were among the discoverers of some of these substances, but the development of this knowledge was carried much farther by innumerable magicians who began to flourish almost at the dawn of history and have continued, with varying fortunes, even till today.

In the very earliest times of which there exists any historical record, religion and magic became well nigh inextricably mixed, as was the case in Babylonia, Chaldea, and Egypt. Priests commonly practiced the various arts of sorcery and served in addition as soothsayers. Later on magicians formed a class by themselves, apart from religious ministrations. But both before and after this separation, they were actively concerned with fire in all its various aspects. Many of these men were ambitious students and actually had considerable learning, and in seeking to increase their knowledge they laid the foundations for a true science. So as the magician evolved out of the priest, so the alchemist evolved out of the magician.

The greatest legendary name in alchemy is Hermes Trismegistus. He lived during the earliest Egyptian culture and was responsible for the Hermetic philosophy. There are numerous others; the first true one with a definite record was Gebir, an Arab, Albertus Magnus, a Dominican friar of Germany living during the thirteenth century, and Sir Roger Bacon, the Englishman who lived in the same period. Procelsus was the latest of the great alchemists and lived during the early sixteenth century.

These were the men who worked on the early art of pyrotechny, and now we might briefly examine the countries wherein the development took place. It has been generally believed that the Chinese were the inventors, but it must be remembered that the primitive culture radiating from Egypt penetrated eastward, and many later Chinese developments clearly had their source in Egypt. The development then flowed into India by way of Egypt to Bengal, Calcutta, and Benares.

It is to be noted that these nations were not noted for their progressiveness, due perhaps to oriental apathy, and so it was in the Roman reigns of Augustus, Corinus, and Diocletian that new energy and ideas for development were found. This period ended with the overthrow of the empire, and there followed a period of inactivity lasting for approximately five hundred years.

The sole development during this period of any consequence took place in Greece and was naturally called Greek fire. It was invented by an alchemist named Gallinicus and was used successfully in destroying 30,000 men of a hostile fleet. From the time of this discovery in the seventh century other workers produced many varieties that were equally effective in both solid and liquid forms. In land warfare, it was poured on besiegers, or it was loaded in jars and thrown at the enemy. It is interesting to note that a similar idea was employed in the recent Spanish civil war when gasoline contained in bottles was thrown at tanks and proved to be very effective.

For a period of years the Greeks jealously guarded their secret, and it was of inestimable value to them in the successive wars in which they were engaged. The main substances in the composition were sulphur, resin, camphor, and other combustible elements, which were melted along with niter. Woolen cords were frequently soaked in the solution and were rolled into balls for use as a highly effective incendiary agents.

By the beginning of the tenth century, the Greek fire was used by other countries. In 901, the Sarcens used it in an attack on the wooden defenses of the city with liquid fires blown from pipes mounted on the decks of their fleet. Fire was also used against the French at the seige of Damietta in 1249, and the Crusaders encountered it in their battles with the Saracens. It continued to be an effective weapon until the fourteenth century when it was met and overcome by the use of gunpowder, since it was more or less useless against the far flung projectile.

The returning Crusaders, however, rekindled an interest in pyrotechnics in Europe, and something of the old Roman spirit revived in Italy in the religious displays, and gradually greater interest evolved in Germany, France,

There is an old saying to the effect that "Quantity does not mean quality" and no doubt many old time Ordnance Sergeants will shake their heads over these increased numbers and the shortened courses that make them possible. These men should be reminded that the same high standards are still demanded by the Commandant and Assistant Commandant as they have always been, that the same thought and painstaking care goes into the planning and expansion of each course, that for the most part the same instructors head the various instruction departments. It is true that the graduates of today cannot be given the well rounded instruction that was possible in the leisurely days of a few years ago, therefore it is up to the older men to give these recent graduates the benefit of their knowledge and experience in that spirit of cooperation which is a tradition of The Ordnance Department.

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Your attention is invited to the fact that a great portion of the feature material contained in this issue is related closely to Ordnance Training Activities. See the table of contents preceding page 1, or the organization chart of The Ordnance School on page 14, to locate the phase of Ordnance Training Activities in which you are particularly interested.

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# ORDNANCE NEWS ITEMS

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

## 1000th LIGHT TANK

An eventful day in the history of Berwick, which is nestled among the hills of northern Pennsylvania, was November 28, 1939, when a vanguard of the Ordnance Department arrived from the Rock Island Tank Arsenal and, with the cooperation of the Philadelphia Ordnance District, started the wheels moving for the production of Light Tanks.

On May 9, 1940, Army Inspectors of Ordnance witnessed the reward of their months of ceaseless effort when the first M2A4 Light Tank rolled forth to be delivered to the United States Government.

cial board of officers appointed following the War for the purpose of outlining a program for the future development of pyrotechnics. Their major recommendations are as follows:

"The present method of projection of pyrotechnics, including rockets, 25 mm and 25 mm Very Pistol and V-B Cartridges be declared obsolete and that in their stead, there shall be developed for use of the ground troops, one method of projection for all types of projected signals; and one type of projected signals of the hand grenade type to replace the 35 mm Pistol for Air Service use; and that the present types of non-projected signals, including position lights and wing tip flares be continued in service without change.

"In general, all types of pyrotechnics fall within the class of "firewords" and not "ordnance", and in making recommendation for specifications covering all the types specified, the Board is influenced by this consideration and can not lay too much stress upon the importance of recommending the development of pyrotechnics along the lines of other ordnance material.

"That a projector for the firing of signals by ground troops be developed which shall be extremely durable and simple of construction. That it shall not exceed the weight of the service rifle, that it shall be capable of propelling the signal to the maximum of height attainable within the weight allowance of the device, which height shall not be less than 600 feet; that the projector shall be constructed to receive the signal cartridge in the form of fixed ammunition.

"The signal shall have a self-contained propelling charge with a delay action fuze to permit the functioning of the signal at the height of its trajectory. The effect produced by all the signals shall be equal in quality and efficiency to the effect produced by the corresponding types in the rockets now in service. The signal cartridge shall not exceed one pound in weight, and shall be absolutely waterproof.

"That the Airplane flare shall be developed in two types, one having a candlepower of 300,000 to 400,000 and a time of burning of seven to eight minutes; the other having a candlepower of 700,000 to 800,000 and a time of burning of three to four minutes; and that an effort shall be made to include in both types a time fuze to permit the functioning of the flare at any prearranged distance below the airplane."

With the exception of the grenade type signal for aircraft and the low priority assigned to other devices, the development work on pyrotechnics has continued substantially on the lines outlined in the above listed recommendations.

We may briefly examine some of the pyrotechnics and equipment now standard for issue in our Army.

The projector for firing of ground signals is the Ground Signal Projector M3. It has a bore diameter of 1.656". To operate, the signal is dropped into the muzzle and it comes to rest on a spring actuated ball about 4" above the firing pin. The signal is fired by striking the projector base on the ground. The resulting jar drives the signal against the firing pin projecting from the breech, thus firing the primer. It is contemplated to provide a more effective ground signal by developing one for operation from the 60 mm mortar, which would then have a diameter of about 2-1/2".

The signals which can be fired from the M3 projector are:

| | |
|---|---|
| White Star Parachute Ground Signal, | M17 |
| Green Star " " " | M19 |
| Amber Star " " " | M21 |
| White Star Cluster Ground Signal, | M18 |
| Green Star " " " | M20 |
| Amber Star " " " | M22 |

These are all of the same construction, an aluminum body about 9" long, containing the primer, propelling charge, delay train fuze element, expelling pellet, illuminant, and a parachute if indicated. These latter are ignited after 5-1/2 seconds delay at a height of approximately 600 feet, and burn for 20-30 seconds. The star signals give an effect of a cluster of falling stars, each one burning 5-1/2 seconds.

The projector for firing parachute flares and signals from aircraft is the Projector, Pyrotechnic, Aircraft, M2 (Pistol). It is of the self cocking type, using signals with detachable barrels, and permits the pilot to load, fire and extract the empty case with the use of only one hand.

The following signals may be used with this pistol:

Aircraft Parachute Flare M9 used to satisfy the requirement for a small parachute flare for reconnaissance work. It has an overall length of 13.8", and burns for one minute with a cp of 70,000.

Red Star Aircraft Parachute Signal M11, used for signalling between aircraft or aircraft and the ground. It is about 7.7" long and produces stars that burn for 30 seconds.

Red Star Aircraft Cluster Signal, M14, used as above, but contains five stars. They fall in the form of a cluster, each one burns for about 9 seconds with a cp of 1500.

White Star Blinker, Aircraft, Parachute, Signal, M15, used as above. It is designed to give four intervals of white light with a period of darkness between each light, accomplished by incorporating an increment of "dark fire" composition between each increment of light. The signal gives the effect of a blinker light, each white light burns about 9 seconds.

Green Star Blinker, Aircraft, Parachute, Signal, M16, used as above. It is the same as the white blinker, except that each green light burns for about 10 seconds.

There has been developed the Aircraft Parachute Flare M8A1, for use in emergency landings of aircraft. It is about 25" long and 4-1/2" in diameter. It burns for 3 minutes with a cp of 400,000.

There is also the Aircraft Parachute Flare M24 for tactical training in night bombing. It is larger and burns for 3-3-1/2 minutes with a nominal cp of 1,000,000.

**KEEP THEM ARMED!**

officially opened the doors of the new chapels. Following the dedication, General and Mrs. Case, Colonel and Mrs. Simpson, Commanding Officer of the Ordnance Replacement Training Center, and Colonel Allen were conducted on an inspection tour of the interiors of the Main and Central Chapels by Chaplain Schulz, who acted as Master of Ceremonies.

## BAUXITE

One of the hindrances to a greatly increased production of aluminum in this country is the fact that most of the raw material, bauxite, has to be imported from Central and South America. (The protection of bauxite mines was the reason for our recent occupation of Dutch Guiana: Editor). There are not very extensive deposits of bauxite of suitable purity in Arkansas, but there are very much larger deposits of low grade bauxite there. A new process of washing this bauxite has just been developed which will treble the useful ore bodies of bauxite in that state, bringing into use ore that had previously been considered of no commercial value. The proposed plants in Arkansas will use this process. The Office of Production Management has also recommended to the War Department that extraction of alumina from alunite be started on a small scale at Marysvale, Utah. Alumina has never been produced from alunite or clays on a commercial scale, although pilot plant operations handling about 2,000 pounds of ore a day have been conducted.

Col. A. H. Pugh in "Bulletin",
Cincinnatti Ordnance District.

## MISSOURI ORDNANCE WORKS

As an object lesson in the results of national unpreparedness, a cardboard city, representing a typical American community, was destroyed by explosives at ground-breaking ceremonies held Sunday, November 9, 1941, at the Missouri Ordnance Works, near Louisiana, Missouri.

The pageant was originated and arranged by the united civic interests of Louisiana and several surrounding towns and cities which have joined together in a patriotic demonstration of support for the national defense program. The cardboard village was erected and painted by National Youth Administration Workers.

The celebration marked the formal beginning of work on the large plant for the manufacture of anhydrous ammonia, which is to be built at Louisiana for the Ordnance Department of the Army by the Construction Division, Office of the Quartermaster General.

Camp Hulen "SEARCHLIGHT"

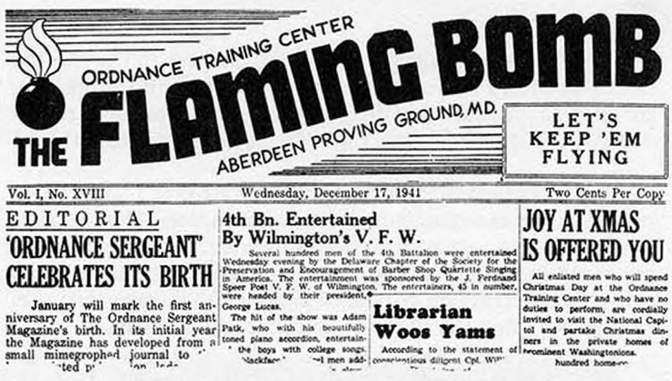
## MOLYBDENUM

The Office of Production Management announces that considerable demand has arisen for literature instructing metallurgists, heat-treaters and users as to a method for treating molybdenum high speed steel to bring forth its highest efficiency.

Many statements are made that molybdenum high speed steel is as efficient as tungsten high-speed steel, provided the former is properly treated to avoid decarburization and to bring out its best qualities. Because of the shortage of tungsten and instructions prohibiting the use of high speed tungsten steel, when avoidable, it seems desirable to circulate the pertinent information. Committees of experts on the various phases of this important matter have been appointed, and when their final reports and recommendations have been passed upon, they will be printed and circulated among those interested.

NOTE: While it is unlikely that the above mentioned reports and recommendations will be reproduced in THE ORDNANCE SERGEANT, you will be given an introduction to molybdenum and its uses in the February issue.

"Bulletin," Cincinnatti
Ordnance District



ORDNANCE TRAINING CENTER
THE FLAMING BOMB
ABERDEEN PROVING GROUND, MD.
LET'S KEEP 'EM FLYING

Vol. I, No. XVIII — Wednesday, December 17, 1941 — Two Cents Per Copy

EDITORIAL

'ORDNANCE SERGEANT' CELEBRATES ITS BIRTH

January will mark the first anniversary of The Ordnance Sergeant Magazine's birth. In its initial year the Magazine has developed from a small mimeographed journal to [illegible]

4th Bn. Entertained By Wilmington's V. F. W.

Several hundred men of the 4th Battalion were entertained Wednesday evening by the Delaware Chapter of the Society for the Preservation and Encouragement of Barber Shop Quartette Singing in America. The entertainment was sponsored by the J. Ferdinand Speer Post V. F. W. of Wilmington. The entertainers, 45 in number, were headed by their president, George Lucas.

The hit of the show was Adam Pack, who with his beautifully toned piano accordion, entertained the boys with college songs. [illegible] men added [illegible]

Librarian Woos Yams

According to the statement of conscientious diligent Cpl. Wil[illegible]

JOY AT XMAS IS OFFERED YOU

All enlisted men who will spend Christmas Day at the Ordnance Training Center and who have no duties to perform, are cordially invited to visit the National Capitol and partake Christmas dinners in the private homes of prominent Washingtonians. [illegible] hundred home[illegible]

THE ORDNANCE SERGEANT has frequently mentioned the Ordnance Replacement Training Center band as being the only Ordnance band in American military history,

ADDRESS ALL REPLIES TO "THE ORDNANCE TRAINING CENTER"
WAR DEPARTMENT
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ABERDEEN PROVING GROUND, MARYLAND
OFFICE OF THE TRAINING CENTER COMMANDER

December 12, 1941

Editor, The Ordnance Sergeant
The Ordnance School
Aberdeen Proving Ground, Md.

The entire Editorial Staff of The Flaming Bomb wishes to extend their congratulations to the Staff of THE ORDNANCE SERGEANT on the first anniversary of this excellent publication.

THE ORDNANCE SERGEANT has accomplished a remarkable task in publishing invaluable information for both officers and enlisted men who comprise the United States Army's Ordnance Department.

Until the origin of your magazine a year ago, it was impossible for Ordnance personnel to gain the wealth of material information that now constitutes THE ORDNANCE SERGEANT.

The birth of THE ORDNANCE SERGEANT has also been the birth of a new era in Ordnance work. May your magazine continue the fine precedent established since the first issue of the magazine last January.

Again we say -- Well done; Good Luck!

Sincerely yours,

James M. Chemi

Corporal James M. Chemi,
Editor, the Flaming Bomb.
Ordnance Training Center

# ORDNANCE TRAINING ACTIVITIES

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

## FIGURES DON'T LIE!

By: T. F. Jones, 2nd Lt., Ord. Dept.
Assistant Secretary, The Ordnance School

When the first edition of THE ORDNANCE SERGEANT was published a year ago The Ordnance School was in the first phases of an expansion program that is still going on. In order to fully appreciate this let us review a few figures taken from the School Records of 1940-1941.

In the Fiscal Year 1940, (July 1, 1939 - June 30, 1940) the Ordnance School conducted five officer courses as follows:

| COURSE | GRADUATES |
|---|---|
| Regular Officers' | 21 |
| Aviation Ordnance | 27 |
| Ordnance Service | 13 |
| Staff and Logistics | 18 |
| Officer's Course | 10 |
| | 89 |

During that same period 26 Noncommissioned Officers were trained in a seven month course and the following nine Specialists' courses were conducted:

| COURSE | GRADUATES |
|---|---|
| Armorer | 18 |
| Artillery | 12 |
| Automotive | 14 |
| Carpenters | 5 |
| Clerks | 23 |
| Instrument Repair | 8 |
| Machinists | 18 |
| Munitions workers | 6 |
| Welders | 17 |
| | 121 |

Total students graduated for fiscal year, 1940, Officers and Enlisted: 236.

Keeping that figure 236 in mind let us go on to the fiscal year 1941, (July 1, 1940 - June 30, 1941). During that time the Ordnance School conducted 10 officer's courses, graduating 961 Officers and during that same period 620 Noncommissioned Officers were trained in three three months courses. The following enlisted specialist's courses were conducted.

| COURSE | GRADUATES |
|---|---|
| Ammunition | 265 |
| Artillery | 157 |
| Automotive | 187 |
| Carpenters | 21 |
| Fire Control | 72 |
| Small Arms | 191 |
| Welders | 16 |
| Mess Sergeants | 6 |
| Cooks | 180 |
| Clerks | 408 |
| Machinists | 145 |
| Springfield Machinists | 196 |
| Instrument Repair | 22 |
| | 1,866 |

Total students graduated for fiscal year, 1941, Officer, Enlisted — 3,447 — almost a 1500% increase over 1940.

On July 1st of this year, as the 1942 fiscal year got under way, the School began to operate close to its maximum capacity. New three months Specialists courses are now started the first of each month, the graduates of the previous course moving out to make room for the newcomers. Since that date the Ordnance School has conducted the following eight Officer's Courses.

| COURSE | GRADUATES |
|---|---|
| Ammunition | 72 |
| Artillery | 59 |
| Automotive | 65 |
| Aviation Ordnance | 154 |
| Depot and Supply | 63 |
| AA Fire Control | 27 |
| General Refresher | 138 |
| Mess Management | 8 |
| Small Arms | 50 |
| Officer Candidates | 37 |
| | 673 |

During the same period 324 Noncommissioned Officers have been graduated and the following twelve Enlisted Specialists Courses have been conducted.

| COURSE | GRADUATES |
|---|---|
| Ammunition | 227 |
| Artillery | 167 |
| Automotive | 239 |
| Carpenters | 76 |
| Cooks | 248 |
| Clerks | 397 |
| Electricians | 118 |
| Fire Control | 24 |
| Instrument Repair | 90 |
| Machinists | 160 |
| Small Arms | 242 |
| Welders | 90 |
| | 2,078 |

This gives a total of 3,075 officers and enlisted men graduated during the first six months of the fiscal year 1942, only 372 less in a six month period than the entire number graduated the year before.

40th Ordnance Company (Training), stationed at The Ordnance School:

Master Sergeant George W. Akers, Depot and Supply Section.

Technical Sergeant Floyd E. Colman, Automotive Section.

Technical Sergeant George L. Seastrom, Automotive Section.

Technical Sergeant Eugene F. Boesch, Small Arms Section.

## MARINE ORDNANCE INSTRUCTION

(Continued from page 25)

terminals on the quadrant switch of a director. In case one, you would get a good cussing, for obvious reasons. Case two, the gun might go boom the wrong way. Case three, you might get a few steel splinters in your backside before you could immobilize your aerial adversary. Multiply these conditions a thousandfold, and the necessity for a competent ordnance outfit is quite clear.

A great personality of this generation said recently, "Give us the tools and we'll do the job". The Army has been kind enough to have given us a start in the instruction of the nucleus of our Marine Corps Ordnance School staff. A building is being erected at Quantico. The equipment has been requisitioned. Next summer, the authorities of this distinguished establishment at Aberdeen will say to the Marines, "Go ye and do likewise". Amen.

## SHOTGUNS

(Continued from page 77)

The sear pin is assembled through the hole a. The front end of the sear b, commonly called the sear nose, acts in the sear notch on the hammer. The rear end c, is formed in somewhat of an arc, and acts on the upper surface of the trigger.

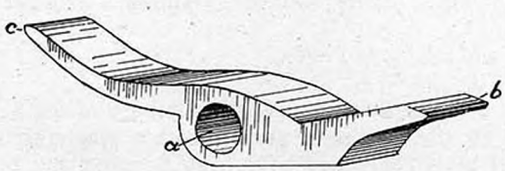



Figure #9
Sear

MAINSPRING. - The mainspring Figure #10, is a heavy leaf type spring approximately 3-1/2" long. Its forward end has a shallow seat a, for the anchoring pin and the opposite end terminates in claws b, which engage over the cylindrical projections on the stirrup.

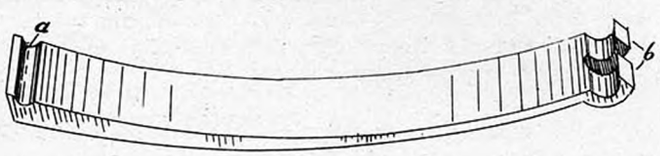



Figure #10
Mainspring

SEAR SPRING. - The sear spring Figure #11, is also a leaf type spring 1-3/8" long and 5/16" wide. It has a counterbored hole a, through which it is fastened in its seat in the carrier.

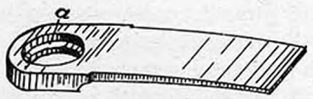



Figure #11
Sear spring

ACTION SLIDE LOCK SPRING. - This is a leaf type spring about 1-1/8" long. One end has a drilled hole for its assembling screw to pass through. The other end has a short leg, which engages behind the action slide lock to furnish the spring tension necessary to its functioning.

Did all of you Small Arms men notice the error in "Special Gages" in the October issue of THE ORDNANCE SERGEANT? We hope so. Staff Sergeant Fabrize is hereby exonerated from all blame, for in the handling of photos used to illustrate this article Figures 2 and 4 were switched. Mark this change in any copy you see. Or, if you prefer, change the captions which accompany these two illustrations.

## FIELD RIGGING

(Continued from page 80)

be necessary under conditions you will ordinarily meet in the field, they will not be introduced here, as they would confuse the things you are trying to learn.

To "reeve" a block is to thread it up with the rope or fall. To "overhaul" is to separate the blocks. To "round in" is to bring them closer together. When the blocks are in contact the fall is said to be "chock a block".

A "whip" is a single fixed block and fall; it gives no increase of power. A whip on a whip doubles its power.

A "luff tackle" (Fig. 55) consists of a single and double block; inverted it is called a "watch", or tail tackle.

A "gun tackle" (Fig. 56) consists of two single blocks, the standing end of the fall attached to the fixed block.

The following formula will be of much help in deciding the kind of tackle to rig in order to handle a given job, or how to rig what you have, if you are limited to any certain combination of blocks:

Assuming that: W = weight to be raised.
F = force applied to fall.
P = number of ropes pulling on the movable block;

This gem of production was driven overland to Aberdeen Proving Ground for further testing there. After this, production of the M2A4 accelerated very rapidly and the contract, which called for slightly over 300 Light Tanks, was completed by the middle of December.

On with production! In January, 1941, the Light Tanks ordered on a second contract had undergone production, and were known as the Light Tank, M3.

The American Car and Foundry Company is its own taskmaster, and a goal was set for the production of five (5) tanks per day. By April, 1941, this goal was reached, and in the ensuing months even higher delivery records were achieved until finally ten (10) tanks per day were being delivered to the Government. This record has been broken over and over again — the actual figures can no longer be printed.

Saturday, August 2, 1941, stands out in the history of the patriotic town of Berwick as a most important day, for it was on this day that ceremonies attendant to the completion of the 1000th Light Tank, M3, took place.

A parade was headed by the 1000th Light Tank, painted an immaculate white for the occasion. Seated upon the tank turret was pretty little Barbarann Stromer, twelve-year-old daughter of an Ordnance inspector. The sight of this grim instrument of destruction and this charming girl brought to mind the fable of Beauty and the Beast.

Thus we have a story of dates, dates which tell a story of accomplishment, and accomplishment which tells a story of America's will to win.

"TIME PHEWS"
(PHILADELPHIA ORDNANCE DISTRICT)

## CHAPELS FOR O. T. C.

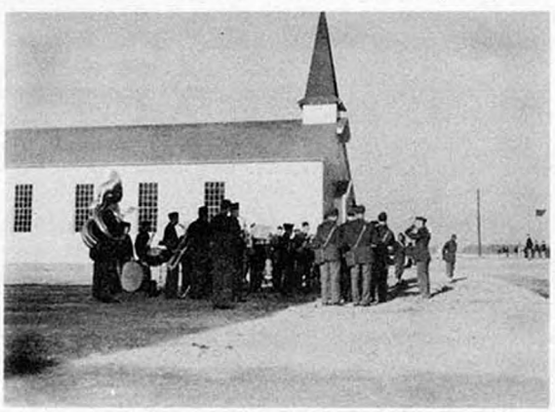
Chapels for the Ordnance Training Center became a reality with a ceremony on November 22, 1940. The presentation and acceptance of the four new chapels took place at the Main Chapel, located at Aberdeen Road and Frankford Street, west of the ORTC Headquarters Building.

Brigadier General Rolland W. Case, Commanding General of Aberdeen Proving Ground, accepted the chapels from Major Gregory, of the Constructing Quartermaster's Office, who made the presentation address.

General Case, in his acceptance address, said, "There is only one American way of life. It is the way of freedom, equality, and tolerance.

"We dedicate these buildings not for a single religious body or denomination, but for all faiths. We set aside these chapels not for a favored few, but for all who seek to give expression to their religious convictions, be they Protestant, Catholic or Jew."

The ORTC Band, only Ordnance band in the history of the United States Army, opened the dedication program with General Case's official visit to the chapels.



Lt. Col. John J. Allen, chaplain, who personally represented the Chief of Chaplains, was the guest speaker and gave his blessing to the new chapels.

Mrs. Case, wife of General Case, cut a ribbon which

trucks, or other materiel that may have succumbed to the difficulties of terrain, or been damaged by gun fire. The first instance is usually accomplished under such conditions that more or less permanent rigging may be used; for instance, the gin lashing may be made with chain, so that it is not affected by weather, and the gin left standing. Also, chain blocks are usually available for tackle, which simplifies the matter. In the second case, permanent standing and running rigging is usually provided at ports and rail heads, so that the principal problem to be solved is whether or not the available tackle is heavy enough, and is rigged properly to handle the particular load under consideration.

It is the third condition that will fully develop the knowledge and ingenuity of the rigger; cases one and two may very often approach case three, and it is imperative that the ability to take such tackle as may be available and with it improvise sufficient rigging to meet the emergency, be brought out. It is not possible to give instructions that will specifically cover every case which may present itself; but by intelligent application of the principles set forth in these notes, it will be possible to meet any field condition quickly and successfully. Two necessities the rigger should keep in mind. First: look over the work that is to be done, make up your mind exactly what you are going to do, fit the tackle and rigging to the job, and then do it. If you start the work without laying it out, you are very apt to land in the middle of it, everything standing, and no way to let go. Second: size up the object you are proposing to handle, locate its center of gravity as nearly as possible, mentally run the lines of the slings necessary, and see that they will balance the object and handle it without interference and without putting strain on parts that may be damaged. In picking up a field piece, pick three points of attachment to the carriage--usually by running each end of a sling through the wheel spokes from the inside and dropping the bight over the hub close to the wheel, making the third attachment on the trail at some point near the spade which balances the piece--and make sure that the slings put no strain on recoil, elevating or traversing mechanisms, and sight brackets. Many times guns are badly damaged by poor judgment in using tackle.

In the formulae and rules which follow, all except the most simple equations have been eliminated, and it is believed that any condition that may arise will be susceptible of solution by application of one or more of them.

Shears and Gins.

In general, the "rake" or inclination of the shears should not exceed 20 degrees, or 4/11 of their height. In this position the pull on the guy will not exceed one half the weight. An allowance of 7 or 8 degrees in the rake should be made for the stretch of the guys.

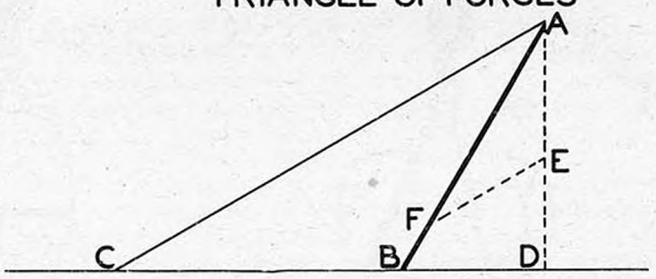
This same rough rule should also be applied to a spar used as a "standing derrick."

To ascertain the pull on the guys and thrust on the spars of shears and "standing derrick" construct on paper or on the ground a diagram as follows:

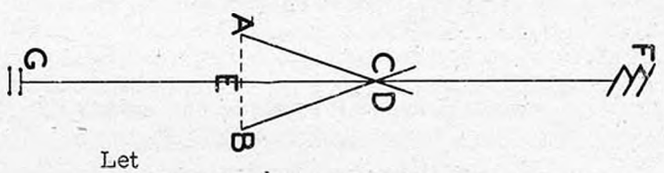
Let
AD represent a vertical line;
AB the inclination of the shears or spar when supporting the weight;
AC the inclination of the guys.

With a scale of equal parts (as large as can be conveniently used) lay off on the line AD, from A, a distance equal to the number of units of weight; through the point E thus found, draw EF parallel to AC until its cuts AB at F. Then the distance EF measured by the same scale will represent the pull on the guy and AF the thrust on the spar. If there are two spars, the thrust on each one will be one half this, or rather a little more than one-half, depending on the angle which they make with each other. It must be remembered that the thrust on the shears or standing derrick is not only that due to the weight lifted, but in addition to this the amount of pull on the end of the fall required to support this weight.

TRIANGLE OF FORCES




PLAN POSITION OF SHEERS AND HOLDFASTS




Let
AD, BC represent legs of the shears;
F, front guy hold-fast;
G, rear guy hold-fast;
E, center of line AB at right angles to FG;
AC = BD;
The splay AB = 1/3 CE;
EF and EG, at least 2 EC.

Approximate Size and Length of Spars Required for Shears

| Weight to be raised | Mean diameter | Length |
|---|---|---|
| 3 to 5 tons | 11 to 13 inches | 30 to 40 feet |
| 5 to 12 " | 13 to 16 " | 40 to 50 " |
| 12 to 25 " | 16 to 20 " | 50 to 60 " |

For a standing derrick a spar of approximately 1/3 greater mean diameter than indicated above should be used.

When definite information is at hand with regard to the strength of the rope in question, it should of course be utilized; in the absence of such information the following rules are convenient and safe:

B=Breaking strain (lbs. or tons).
L=Safe load.
C=Circumference (inches).
D=Diameter (inches).

Rule 1. Strength of Manila or Hemp.

$$B = \frac{C^2}{2.5} \text{ tons} = C^2 \times 900 \text{ lbs.}$$

but for some reason has neglected to notice another "only" Ordnance institution. Several months ago the Ordnance Training Center began publication of a weekly newspaper. The first issue consisted of six mimeographed pages, published under the title A-TEN-SHUN. Before long, though, this publication began to grow and to improve. It has continued to grow and to improve to meet the needs of the Ordnance Training Center, and a part of that growth was seen when the mimeographed issues were supplanted by an eight-page printed newspaper titled THE FLAMING BOMB. It claims the distinction of being the only tabloid newspaper published in the Ordnance Department. Plans for its enlargement are now under consideration, as its editorial staff strives to satisfy every need of the personnel which it serves with news.

# BRITISH HAIL HELP OF UNITED STATES TANK MEN

## Ordnance School Personnel Included In Staff

Cairo, Egypt, December 17, 1941

**Wireless to THE NEW YORK TIMES**
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Although actual American participation in the war is only a few days old, aid "short of war" previously given by the United States Army to Great Britain in the Middle East made possible the victory at Tobruk — the heaviest blow yet felt by the German Army outside Russia.

It is well known that British armored forces equipped with United States-built tanks drove the Germans out of Eastern Cyrenacia. But there is another story, just as important, about United States military aid.

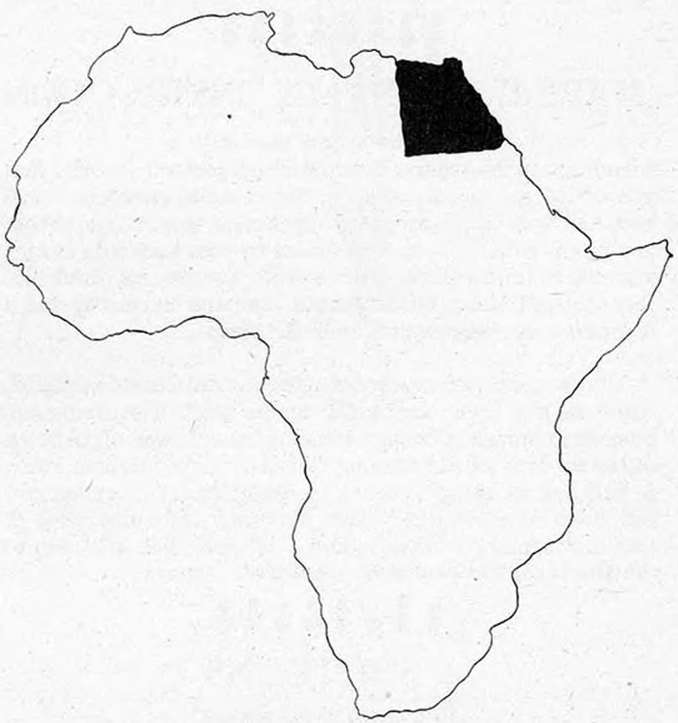
British crews drove the tanks into Rezegh, but American tank men taught them how to handle their United States-built machines. British repair men naturally did most of the work of assembling the new tanks and repairing the damaged ones — but American Army officers directed the job before the battle. When the offensive began, United States Armored Force experts volunteered and went into the heart of the fighting to see that every recoverable United States-built tank got back into action, that every new United States-built tank was rushed forward into the fray fully equipped with United States-built radios and other necessary accessories. It was because of American assistance and guidance that the British have been able to replace 70 per cent of their tank losses since the offensive began.

Many of those United States Army men were under fire for weeks. Although a few in number, the Americans did a vital job well and helped to put teeth into the drive.

Responsible for the organization and coordination of this aid to Britain is Colonel E. W. Piburn of Lamount, Okla. A veteran tank man from Fort Benning, Colonel Piburn has directed his highly competent staff so well that compliments have come from several high-ranking British officers now in the field.

One of the key officers under Colonel Piburn's command is Major Joseph M. Colby, designer of the United States' new medium tank and a collaborator on the aero-type engine that drives the United States' M-3's. He is in charge of ordnance work — assembling and repairing the United States-built tanks and teaching British officers and men how to do the job.

Another is Major William W. Cornog of Lavonna, Ga., in charge of the American tank school, which had been developed to such a point that a single day suffices to teach a British tank man how to run an American machine.



Men under Major Colby and Major Cornog who volunteered and went to the front with the British include Captain William H. G. Fuller, Captain Alvin Mente, Lieutenant J. L. Smothers, Lieutenant Ernest Ramme, Lieutenant Garrett Fonda and Sergeants Sherman Clay, Leroy Pound, Kindle Walston, William Giddings, Gerald Boyd, R. C. Powell, H. J. Cawvey, Stone Lunsford, C. B. Lewis and Delmore Parks.

Some of those men were members of the first tank school "faculty", but more arrived with a second contingent. Most of the first group have been transferred, either to Palestine with the British Ninth Army or to India. Some remain in Egypt, however, carrying on the ordnance school. These include Sergeants George Akers, George Seastrom, Floyd Coleman and Eugene Boesch.

The tank school has been turned over entirely to British officers who themselves are "graduates" of this institution, which carries on most of its instruction in the open desert. The intention is to turn the ordnance school over to the British in the same way. Once British instructors take over, the Americans will be free to go elsewhere — wherever they are needed most.

Your attention is invited to the fact that four of the men mentioned in the above article are members of the

weight . In the ordinary tackle the number of ropes pulling upon the movable block is the "power".

Note: Learn to tie the following knots, as they are in everyday use: Bowline, Bowline on Bight, Timber Hitch, Single Becket, Fisherman's Bend, Catspaw, Rolling Hitch, Half Hitches.

7. Q. Why is a bowline a good knot to use?
A. Bowline knot will neither draw up, get loose, jam when wet or under strain.

8. Q. What kind of knot would you tie in end of rope to use with hook on chain, pintle or block?
A. Catspaw. Gives double bearing surface and will not cut rope.

9. Q. In cutting off new piece of rope for use what would you do to preserve the rope?
A. Secure the end of rope with twine to prevent fraying of ends — known as "whipping".

10. Q. In what two operations would you most need block and tackle or chain falls or hoist?
A. In removing or replacing recoil mechanism and in lifting gun body.

11. Q. How much weight would you lift with the common type of chain falls marked "one ton cap", and have a reasonable factor of safety?

A. 2,500 pounds.

12. Q. What is a gin and what is it used for?
A. A gin is a tripod consisting of three spars, or poles, with their tips lashed together with chain or rope; it is used for lifting heavy weights vertically. The two outer spars of the gin are called "legs," the center one the "pry pole."

13. Q. How would you secure top of poles in constructing a gin?
A. By marking on each spar the distance from the butt to the center of the lashing, laying the two legs parallel with butts extending in the same direction and tips resting on a skid, placing the pry pole between them with butt in the opposite direction, so that the marks on the three spars will be in line; make a clove hitch on one of the outer spars (if rope is to be used) and take eight or nine loose turns around the three spars, with a couple of frapping turns about the lashing between each leg and the pry pole and finish with a clove hitch on the pry pole above the lashing.

14. Q. Describe the shears.
A. Shears are formed of two spars with their tips lashed together and butts spread apart, and are used for lifting heavy weights vertically (when a gin cannot be constructed) or for lifting the weights and moving them laterally a short distance.

15. Q. What type of jack is most used?
A. The screw-jack is the most common type.

16. Q. What is one important part of the gun to remove and protect in case of extensive field repairs?
A. The sights.

17. Q. If you were instructed to go out for a disabled gun or howitzer, what equipment would you take along?

A. Shovels, sledge, plenty of long three and four inch rope, some shorter pieces, long plank, blocking, pinch bar, blocks and tackle, material for gin and stakes, jacks, rollers.

18. Q. What would you do if one or both sides of trail had been bent, binding the trail clips on top carriage of 6-inch howitzer, making it impossible to traverse?
A. Not practical to make this repair in field--send to base shops.

19. Q. Name the different methods that you would use in the field to remove gun from carriage.
A. (a) A spider carriage of another gun could be used in the same manner if available.
(b) Use gin built up of any material that may be at hand, make hitch on gun body, when tension is on roll carriage away from gun.
(c) Dig down under one wheel, have hole wide enough that it will take the entire diameter of wheel when in horizontal position, insert pole of limber through spokes of wheel on opposite side, lash the inner end of pole to center of carriage, turn gun and carriage over on side, using this limber pole to steady the piece as it turns over. When gun is in the inverted position tamp dirt under gun body (as in tamping under railroad tie). Before attempting to roll carriage away level soil for the wheels to facilitate movement in guides.

20. Q. What wheel could be used in emergency on guns or howitzers?
A. If spare wheels have been used, take wheel from unloaded caisson or caisson limber.

21. Q. In case of broken axle or axle arm, how could gun or howitzer be transported to rear for repairs?
A. By lashing long timber along trail and under axle in manner so as to use as a skid.

# AUTOMOTIVE

(Continued from page 81)

## Fitted With Blackout Curtains

Every workshop truck has been fitted up with blackout curtains, and can perform its duties day or night, hidden in the woods. Right now, the men of this organization are working in three shifts, eight hours each. They recently received thousands of rifles, which they repaired, cleaned, packed and issued again at the rate of one every 10 seconds. If the "battle" situation in the maneuvers requires that they move, they are ready to resume repair operations two minutes after they arrive at a new location. Their machinery is all electrically run, the power generated by neat little one-cylinder gas engines, or the motors of their own trucks.

Commanded by ordnance expert Maj. James E. Hicks — who has had seven books published on the subject — the 41st Ordnance battalion, is under the top authority of Col. Lucien B. Moody of the First Army ordnance department. The outfit has probably more specialists and technical sergeants among its total of 850 officers and men than almost any other organization in the First army. Most of the men are selectees who were mechanics before their


FIG. 55

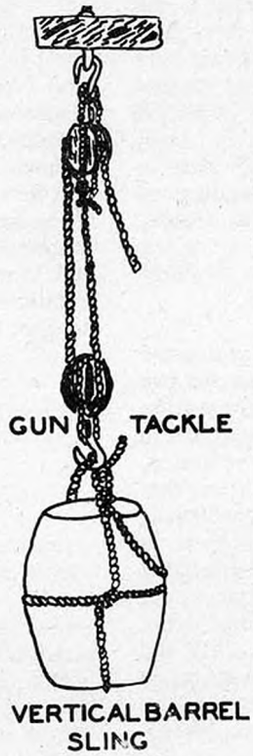



FIG. 56

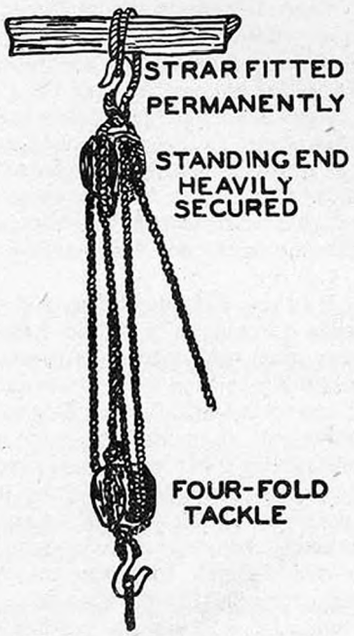



FIG. 57

Then:

$\frac{W}{F}$ equals P, or F x P equals W, or $\frac{W}{P}$ equals F.

In estimating "F", it is safe to assume the value of a man as one hundred pounds; under favorable circumstances, one or two, or perhaps even three, men may have a value of one hundred and fifty pounds each. If the footing or line of pull is not good, however, or if the tackle is more than three-fold, it is safer to put the value at the lower figure.

This formula may be fixed by remembering that the fundamental principle of the theoretical power of any tackle is as follows: If a weight (W) equal to (X) pounds is suspended from one end of a perfectly flexible and inextensible cord passing over any number of frictionless pulleys, a pull equal to (X) pounds will have to be erected at the other end of the cord to support this weight, and every intermediate portion of the cord will have a pull upon it equal to (X) pounds, which is exerted in the direction of the cord.

Tackle is designated by the number of sheaves employed (including both blocks): as, two-fold, three-fold, four-fold, etc. (See Fig. 57.)

For the handling of heavy weights in comparatively short lifts, such as dismantling a gun, it is better to use, when available, a triplex block. This is a device used to lift heavy weights with the application of a small amount of force. It consists of a train of gears operated by a large wheel, over which passes a light endless chain; force is applied to this chain. The gears operate a small sprocket, over which runs a heavy chain. The heavy chain raises the weight. A hook is attached to one side of the case for hanging the block.

In the rigging of tackle, and its application to the handling of heavy weights, only care, forethought and a slight knowledge of applied mechanics are necessary. This course is intended simply to lay the groundwork.

## LEVERS

The three orders of levers, of the first, second and third class, are dependent entirely on the position of the fulcrum, or prop. The fundamental equation of these classes of levers, under the supposition that the lever is straight and that the weight (W) and the force (F) act at right angles to it, is as follows: The lever arm (L) (or distance from fulcrum to point of application of force), is equal to the weight (W) times the counter-lever arm (C1) (distance from fulcrum to weight); or F x L = W x C1. The gaining power of any of the three classes of simple lever is equal to $\frac{L}{C1}$.

Simple levers of the first class have the fulcrum between the weight and the applied force; of the second class, the weight is between the fulcrum and the force: of the third class, the force is applied between the fulcrum and the weight. Remembering the definition of (L) and (C1), it is a simple matter to calculate the mechanical advantage of any one of the three classes.

The three classes of revolving lever are, in principle, exactly as set forth above; the lengths of the lever and counter-lever arms, are, in this case, the respective radii of the two circles. This variety of levers is exemplified in the windlass, the capstan, and the crab; the principle of the revolving lever is also made use of in a duplex or triplex block.

## FIELD USE OF RIGGING

Ordinarily, but three problems are to be met in the field, requiring the use of rigging. First, the mounting and dismounting of heavy pieces; second, the loading and unloading of materiel; and third, the handling of disabled guns,

(II) Try a new objective cell with a difference of length in the desired direction.

(III) Try a different adapter.

(b) Methods of shifting the reticle to coincide with the focal plane of the objective by the interchange of parts:

(I) Change the reticle cell for one of different size.

(II) Change the eyepiece sleeve.

(III) Change the eyepiece washer.

(IV) The eyelens cell may be screwed in or out slightly to give a longitudonal displacement of image.

(V) Interchange eyepiece assemblies.

(c) Methods of interchanging or replacing optical elements to obtain either of the results outlined in (a) or (b) above: Optical components would not ordinarily be changed unless replacement was the only alternative due to breakage, or for other reasons affecting the final condition of the field glasses.

(I) Effect of replacing the objective lens. - (A) The use of a new 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.

(B) 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.

(C) In changing objective lenses only the focal plane of the objective is moved in relation to the reticle. Changing the objective lens will not affect a change of the diopter scale reading on the reticle.

(D) Only the methods outlined in (B) above will change the diopter reading of the reticle.

(II) Effect of changing porro prisms. - (A) If a prism is replaced by one that is larger than the original the focal plane of the objective will be moved in a minus direction.

(B) If a prism is replaced by one that is smaller than the original the focal plane of the objective will be moved in a plus direction.

(d) Methods of moving the image in relation to the eyepiece by machine work on metal components: (I) After all the forementioned procedures have been tried and exhausted, the machining of metal parts may be considered. Machine work should always be done on the cheapest part in so far as practical, if satisfactory results can be obtained by so doing.

(II) Objective cell may be shortened in length to move the focal plane of the objective lens in a plus direction.

(III) The shoulder on the inside of the objective cell may be machined to move the focal plane of the objective in a minus direction.

(IV) The objective cell adapter may be machined to move the focal plane of the objective in a plus direction. (Machining should be done on the inside shoulder).

(V) Use of a thicker objective cell adapter will move the focal plane of the objective in a minus direction.

(VI) The shoulder on the reticle cell may be reduced when it is desirable to move the reticle in a plus direction to coincide with the focal plane of the objective without changing the diopter reading of the field of view.

(VII) The shoulder on the eyepiece sleeve may be machined to move the reticle in a minus direction without changing the diopter reading of the field of view.

e. The factor that determines the practicality of any of the methods outlined above is: Will this method give the proper diopter movement and be within the allowable tolerances after parallax is eliminated? Any method used, on completion, must satisfy all the requirements outlined previously in the article. A careful consideration of this section should enable every repairman to eliminate parallax in the proper manner.

SETTING THE DIOPTER SCALE. - a. Occasionally the situation may be encountered where no parallax exists; definition is sharp and clear; on the diopter scale there is the proper plus and minus five diopters movement; but — at this point the diopter scale will not read zero. An adjustment is required to allow the index to register zero when definition is sharp and clear, and there is plus or minus five diopters movement from this point.

b. If the diopter movement is correct, and only the reading of the scale is in error it can be adjusted by loosening the diopter scale lock screws and moving the scale independently of the focusing nut until the zero registers opposite the index. This will in no way change or interfere with the diopter movement or affect the optical characteristics of the instrument. The only thing that has been done is the shifting of the scale relative to the index. After the adjustment described has been completed be sure and tighten the screws that lock the diopter scales in place.

SETTING THE INTERPUPILLARY DISTANCE SCALE. - a. Requirement: When the interpupillary distance scale reads 64 millimeters in relation to the index, the center points of the two eyepieces must be exactly 64 millimeters apart.

b. When inspection indicates that this condition does not exist, or when occasion demands the replacement of the interpupillary distance scale or any part which might affect this requirement the scale must be adjusted to satisfy the requirements as outlined above.

c. A metric rule will be required for this adjustment. Remove the eyeguards from both eyepieces. No further disassembly of the instrument will be required. Measure from the outside of one eyepiece to the inside of the other. This is preferable, and much more accurate, than attempting an approximate from the center of the eyepieces and the same result is achieved. Adjust the two telescopes on the mechanical axis until the rule shows that they are exactly 64 millimeters apart. The interpupillary scale is then set so that the 64 millimeter line corresponds with the index line and can be locked in place with the lock screw.

$$L = \frac{C^2}{15} \text{ tons} = C^2 \times 150 \text{ lbs.}$$

(Note: for new rope, to be used only occasionally, at low speeds, we may assume $L = \frac{C^2}{10}$ tons.)

Rule 2. Strength of Wire.

$$B = C^2 \times 2.5 \text{ tons} = C^2 \times 5{,}600 \text{ lbs.}$$

$$L = \frac{C^2}{2.5} \text{ tons} = C^2 \times 900 \text{ lbs.}$$

(Note: Observe that the working load for wire rope is the same as the breaking strain for manila.)

Rule 3. Strength of Blocks.

It may be assumed that the safe load for a well-made block is in excess of any hemp or manila rope that it will reeve; this is not always true of the hook, however, which is almost always the weakest part, and often gives way under strains for which the block is amply strong. The strength of the hook is therefore the measure of the strength of the block. As the difficulty comes through the tendency of the hook to open out, it should be guarded against, in heavy work, by "mousing" the hook with an iron link. For very heavy work shackles are to be preferred, as may be noted:

(a) Hooks.

D = Diameter at bight of hook.
$L = 2/3\ D^2$ tons.

(b) Shakles.

D = Diameter at sides.
$L = 3\ D^2$ tons.

Rule 4. To Find the Size of Manila Rope to Lift a Given Load (in Tons).

$$C \text{ (inches)} = \sqrt{15 \times L} \text{ (tons).}$$

Rule 5. To Find the Size of Wire Rope to Lift a Given Load (in tons).

$$C \text{ (inches)} = \sqrt{2.5 \times L} \text{ (tons).}$$

Rule 6. To Find the Size of Rope When Rove as Tackle to Lift a Given Weight.

Add to the weight one-tenth of its value for every sheave to be used in hoisting. This gives the total resistance, including friction. Divide this by the number of parts at the movable block, for the maximum tension on the fall. Reeve the fall of a size to stand this tension as a safe working load.

Rule 7. To Find the Weight Which a Given Purchase Will Lift With Safety.

Find the safe working load for the rope to be used; multiply this by the number of parts at the movable block, which gives the total resistance, including friction. Multiply the total resistance by 10 and divide by 10 + the number of sheaves used; the result is the weight that may be lifted.

Rule 8. To Find the Strength of a Spar to Resist Compression (Gin, Shears or Derrick).

T = Safe thrust in tons.
R = Radius of spar in inches.
L = Length of spar in feet.

$$T = \frac{4R^4}{L^2}$$

Note: The multiplier 4 in this formula is safe for all ordinary kinds of wood; for very strong woods like oak, mahogany, etc., it could be increased 50 to 60 per cent, without danger.

NOTES

Rules 4 and 5 give larger factors of safety than are necessary for the stronger types of manila and wire, but they are convenient--and safe.

Remember, a well-made splice weakens manila or wire from 5 to 10 per cent. A sharp nip may weaken manila or wire from 25 to 50 per cent. Manila deteriorates rapidly if stored away wet, or if exposed, either wet or dry, to continued high temperature. The strength of two ropes of different sizes is proportional to the squares of the circumferences. As a working rule, wire rope is six times as strong as manila of the same size. In cases where a load is applied suddenly, with a blow or a jerk, its effect is doubled, and this should be allowed for in calculating the size of rope required. The stiffer the rope, the greater the loss from friction. Observe that, in hoisting, the maximum tension comes on the hauling part; in lowering, it comes on the standing part. If one tackle is attached to the hauling part of another, the power of the combination is the product of the powers of the tackles composing it.

RIGGING FOR FIELD USE

1. Q. Describe a block.
A. The usual type of block consists of four parts, the shell or outside, the sheave or wheel on which the rope runs, the pin or axle on which the sheave turns, and the strap, usually of iron.

2. Q. What is tackle?
A. A tackle is a purchase formed by reeving a rope through two or more blocks for the purpose of hoisting or pulling.

3. Q. How is the size of blocks expressed?
A. By the length of shell in inches.

4. Q. How is tackle designated?
A. By the number of sheaves employed; as two-fold (two single blocks), three-fold (double and single).

5. Q. What is meant by the "bight" of a hook?
A. The bight of a hook is the middle of the bend of hook part.

6. Q. How would you estimate the power of tackle?
A. The number obtained by dividing the weight raised by the force applied on the fall necessary to balance the

moisture and to provide proper ventilation; the interior of any magazine must be kept free of any paint, oil, waste rags or other inflammable materials; at least a 50 ft. space should be cleared of all leaves, weeds and tall grass around the magazine; fire fighting equipment such as water barrels filled with water, burlap sacks, etc. should be maintained ready for use at all times. Should it become necessary to repair some portion of the magazine, a competent person will decide if it is necessary to remove the bombs. In no case will any welding, soldering or melting of asphalt be done in the magazine unless it is emptied and cleaned thoroughly. After the repairs are made, the magazine should be carefully swept and all tools removed.

Bombs should be segregated in storage in piles by lot number. Piles should be neat and stable with ample aisle space between for ready inspection and inventory. Piles should be raised off the floor to protect them from moisture and should not be piled to the height of the eaves. Demolition bombs should be piled so that the fuze cavities can be readily inspected and visible signs of exudation can be readily detected. Bombs with fin assemblies attached should be carefully piled so that the fin assemblies are not damaged or bent. Chemical bombs should not be stored. with other classes of materials principally because of the danger and difficulty encountered in fighting a fire involving chemicals. All chemical bombs should be so stored as to facilitate and expedite the removal of leaky units. Gas masks and protective clothing should be provided and maintained in good condition for workers and fire fighters, and all bombs should be frequently inspected for signs of rust, corrosion and leaks.

Bomb storage units for typical field airdromes should be chosen with regard to the nature of the ground, taking into consideration that it should be level with natural drainage available as well as facilities for adequate concealment. Barricades, either natural or artificially constructed should be taken advantage of for the purpose of reducing safety distances. As in storage in the more permanent type magazine, due regard must be given to the proper separation of stacks and the employment of dunnage. The fact that field conditions exist should not result in a relaxing of vigilance in the matter of observing all safety precautions in bomb handling.

BIBLIOGRAPHY: Paper written by Lt. J. W. Billings, Jr., 442nd Ord. Co., Av. (Bomb).
Ordnance Safety Manual
OS 9-18

# PHOTOGRAPHIC SECTION

(Continued from back of Contents page)

in the Fire Control Section left Sgt. Manfrin in sole charge of the Schools' photo section at Raritan until its installation at Camp Rodman.

Having secured one corner in the basement of the Administration Building of the Ordnance School, the Photo Section then started to prepare itself for the task ahead.

The first important duties of the Section were to photograph the construction of the Ordnance Training Center. With the first spadeful of earth Sgt. Manfrin and one enlisted man made their plans to photograph a running construction of the job.

Week after week the Section, then under direction of Lt. K. R. Christy, photographed, from the air as well as on the ground, the rapid rise of the Ordnance Training Center.

From a field of corn to a field of buildings is the story that the pictures tell. The darkroom men, Mr. Concordia and Mr. Noble, were kept busy printing and developing the exposed pictures.

Suddenly a new train of thought entered into the schools' routine — visual education by means of film strips. Under Capt. A. D. Brittingham, Jr., head of the Visual Aids Section, work began on the M1 rifle. As the duties of construction photographs were numerous and the two enlisted men were in the field the majority of time, Capt. Brittingham began, with the aid of Lt. A. S. Grant, to photograph the necessary details to complete their lecture and film strip. The work of processing and finishing was done by the Photo Section.

Lt. Christy was then transferred to one of the training companies and Capt. Brittingham was given, in addition to his other duties, control of the Photographic Section.

The Visual Aid Section is part of the Extension Course Division of The Ordnance School, and the Photographic Section is busy turning out work for both the Visual Aid Section and the Extension Course Division. Capt. Brittingham, with the able assistance of Lt. Grant, then proceeded to prepare the film strip on the cal..50 Machine gun, then the 37 mm gun. Next the 105 Howitzer took its turn before the camera and pictures were flying fast and furious. This meant a continual round of development, printing and enlarging. It takes time and personnel to accomplish this task and the problem was so pressing that additional help became necessary. Mr. Concordia, and Mr. Noble, who were the first to start, were augmented in their efforts by the able assistance of Mr. Gambella, Mr. Kupferman and Mr. Schimenti, all of whom had been in the photographic field for a long period. The darkrooms that had been previously built were revamped by the Service Section of the Ordnance School, and additional equipment was procured by the Property Section. Though we still had the one corner, our equipment and establishment grew to meet the tremendous task that was expected of it. In addition to film strips and lectures, identification pictures and pictures for the Public Relations section were supplied upon demand. The Morale Officer asked for his share of pictures for various newspapers and also to meet the editorial demands of the "Flaming Bomb", the Ordnance Training Center newspaper. T. Sgt. Martin, Editor of THE ORDNANCE SERGEANT, had his requests in for pictures to add to the variety of material and interest of THE ORDNANCE SERGEANT, thus bringing to Ordnance men in the field graphic illustrations of the articles written by numerous individuals. The majority of pictures reproduced in THE ORDNANCE SERGEANT are the work of the Photographic Section. Filing of negatives and prints resulted in the necessity for an additional clerk and Mr. Titter was given the position. Prints of each negative made in the Photographic Section are on file there.

In addition to ground photographs, excellent aerial pictures of the camp were taken by Capt. Brittingham, Lt. Grant and Sgt. Manfrin, who have been up in various type planes, from attack ships to bombers, to obtain the

induction. They like their jobs, they are enthusiastic about their commanding officer, and they work like trojans at their up-to-date machines.

Besides repairing all kinds of material for special First army troops — which is their main job — the 41st also repairs equipment that cannot be taken care of by individual division ordnance companies. This includes tanks, special vehicles, certain kinds of artillery and any other material taking more than four hours to repair. Most of their machine-shop vehicles are less than one year old; none of them more than three.

From the DEMOCRAT
(Waterbury, Conn.)

# FIELD GLASS, TYPE EE

(Continued from page 83)

CAUSE OF PARALLAX. - Parallax is due to the fact that the etched side of the reticle is not lying in the focal plane of the objective.

REQUIREMENTS. - a. When the diopter scale reads zero and is opposite the index on the sleeve: (1) The field of view must be sharp and clear.

(2) The reticle must be sharp and clear.

(3) The tolerance between the difference in sharp definition of the field of view and the reticle must not exceed 1/2 diopter.

(4) When the three conditions in (1), (2), and (3) above have been satisfied the diopter scale and the focusing nut must have an allowable movement of plus and minus five diopters from zero.

(5) When the diopter scale reads zero on each eyepiece the difference in length of the two eyepieces must not exceed two diopters.

(6) The difference in length of the two objective cells and adapter must not exceed 1/32 of an inch.

(7) In checking all the above requirements, especially definition of the field of view, and definition of the reticle, observations must be made by use of the collimating telescope.

METHOD OF ELIMINATING PARALLAX. - a. Parallax may be eliminated in one of several ways: (1) The reticle may be moved to coincide with the focal plane of the objective.

(2) The focal plane of the objective may be so shifted as to coincide with the reticle.

(3) A combination of (1) and (2) may be used.

b. There are many ways of accomplishing each of the methods discussed in the above paragraph. A comprehensive knowledge of all of these ways will simplify the work of the repairman. Few variations of the methods to be discussed will ever be encountered, and practically all conditions and stages of parallax can be remedied and eliminated by one or more of the means discussed below. In the event of the rare exception to the rule that might arise, the contents of this section should enable the instrument man to figure out the probable causes and enable him to determine and apply the remedy.

c. In adopting any of the methods outlined below the determining factor is that when the job is accomplished all the requirements outlined previously in this article must be satisfied. Consequently, the repairman must consider all alternatives carefully, allowing his final decision to be governed by the requirements expected, and avoiding hasty conclusions of any sort.

d. Preliminary. - (1) To make these adjustments it is first necessary to determine how much and in what direction the correction is to be applied. To determine this place the instrument in the fixture in a horizontal position with both of the eyepieces level in relation to each other. Put the collimating telescope in the surface gage holder and place it in front of the left eyepiece. Then obtain sharp and clear definition of an object at least 100 to 200 yards away, by use of the collimating telescope.

(2) Note the reading of the diopter scale when this has been done. Assume that it is minus five. Next focus the eyepiece until the reticle is sharp and clear as seen through the collimating telescope. Note the reading of the diopter scale when this has been done. Assume that the reading is minus three. This difference in the two readings would indicate the difference of sharp definition of the reticle in relation to sharp definition of the field of view of two diopters. It follows that this is the amount of parallax present. The tolerance permitted for the difference in readings is 1/2 diopter. There is present (in this hypothetical instance) undesirable parallax to the amount of two diopters which must be eliminated.

(3) To eliminate it the focal plane of the objective must be shifted two diopters to coincide with the focal plane of the objective.

(4) To determine which of the above methods to follow first determine which of the methods will, when accomplished, afford the required movement of plus or minus five diopters from the zero point of clear and sharp definition. This is all important.

(5) The object of the adjustment, and the factors which affect the decision of the repairman have been outlined in detail previously in the article.

e. Details. - (1) When it has been decided which is the most logical method to be followed reference to the points below should be made by the repairman keeping in mind that one or more of the pertinent ones can be followed, and that the sequence in which they are applied as probable remedies should be determined by the time available and his skill in accomplishing them.

(2) The following is a list of things which may be considered for the elimination of parallax and the correction of diopter movement under the headings indicated:

(a) Methods of moving the focal plane of the objective to coincide with the reticle by the interchange of parts:

(I) Interchange the objective lens cells from left to-right (or vice versa) if they show an obvious difference in length.

# TWO BACK PAGE EDITORIALS

Back page Editorials are something new for THE ORDNANCE SERGEANT, and something which will not be continued. Preparation of the material contained in this Anniversary Issue began last August, and much of this material was ready for reproduction before a certain event took place at Pearl Harbor. In other words, almost all of this issue was prepared in time of peace -- it reaches our readers in time of war.

In reading literature issued by the Bausch & Lomb Optical Company, two thoughts have come to the mind of the Editor, two thoughts which he wants to pass on to readers of THE ORDNANCE SERGEANT. Hence, these two back page Editorials.

## ALLOYS

"America is a country of alloys, not only of steel, nickel and tungsten, but of people. In America, of all places in the world, we have united and intimately fused the brain, brawn, and skill of all nations. We are more than a "melting pot". We combine the intelligence of Michael Pupin, a Serb, with the thrift and energy of Carnegie, a Scot; we blow on the spark of genius in a Steinmetz, born a German, or a Tesla, born in Austria. We welcome an Agassiz, from Switzerland, or an Augustus Saint-Gaudens, from France. John Stephenson, an Irishman; Ericsson, a Swede; Noguchi, a Nipponese, and Michelson, a German, gave us, respectively, our first street railway car, our first armored battleship, an approach to the cure of various infectious diseases, and a method of exact measurement of the speed of light. The list is endless; the achievements varied and rich. Thus, we have in America a composite civilization alloyed from all nations to give us the temper, the toughness, and the malleability to serve the strains and stresses of our day."

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This same subject has been mentioned in an earlier Editorial in THE ORDNANCE SERGEANT. Bear in mind that in your own organization you know men who are of foreign extraction; many trace their ancestry to some of the nations with which we are now at war. How about your own ancestry? And how about your loyalty to the United States of America? Other men can be just as free from blame for their ancestry, and at the same time just as loyal as you, just as patriotic, just as willing to do their bit.

THE ORDNANCE SERGEANT does not suggest that you trust every individual. There are men who are not loyal, men who should be taken out of circulation. But don't inflict embarrassment or punishment on any man because of his ancestry alone. Insist upon some other reason before you join in persecution. Engage in no mass persecution of men because of the land of their birth or of the birth of their parents.

Remember the young Japanese who started from New York soon after war was declared, intending to enlist in our Army in California. By the time he reached Florida he had been arrested eighteen times on suspicion. In disgust he enlisted in the Army in Florida. He is an American, in spite of his ancestry. No one blames the arresting officers, no one should blame the young man for being a Japanese -- the blame belongs to fateful circumstances.

Keep your eyes and ears open, report all suspicious individuals or circumstances to the proper authorities. Take matters in your own hands only in extreme emergency. And in living with your associates remember that, if you are an average American, you TOO are one of the alloys which make America all that it is.

## BOTTLENECKS

"The word "bottleneck" has become as familiar as a tune on a hurdy gurdy. Sooner or later it comes around in every discussion of National Defense. Nobody bothers to give a definition for it, nor does the dictionary. We hear that the machine tool industry is a bottleneck; that the airplane engine is a bottleneck; that armor plate is a bottleneck, and that the optical industry is a bottleneck.

"The truth is that the elements of time and volume can make a temporary bottleneck out of any industry, despite a flow of raw materials and labor reserves. Our whole defense program is a bottleneck in the sense that we are trying to force through a volume of military equipment out of all proportion to the time element. Unpredictable repercussions and adjustments are bound to follow the introduction of billions of dollars for defense into our industrial machinery."

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We might make our own definition of a bottle neck by assuming it to be anything which tends to slow down or hinder a plan or program of activity. Don't confuse a bottleneck with a cork. One permits a somewhat restricted flow, the other stops all flow. It is evident, too, that there may be large bottlenecks and small bottlenecks. The bottlenecks we hear so much about, probably, are considered large bottlenecks. Bottlenecks may exist on smaller and smaller scales from a large one which hampers a large industry or a major part of our defense effort down to a very small bottleneck which might be represented by the failure of one lone individual who simply fails or neglects to do his utmost toward defense. This individual may fail purposely; he may postpone his best efforts; or he may fail to realize at all that his puny bit could add to the grand total – the result is exactly the same, for he fails to accomplish anything.

A great many men in the service, now that we are actually in the war on a shooting basis, are inclined to think that they are wasting their time while they drill or study. They would rather shoot a Jap. 'Tain't so. Their time is not wasted. There may come a day when each little individual effort will count a great deal. An individual's maximum effort would be a certain unknown quantity right now, diligent application to training duties now will increase that maximum effort of the same individual to a still unknown but certainly greater quantity at some future date. The maximum effort of each individual NOW should be to increase his individual efficiency so that his best will be even better THEN.

Don't let yourself become a bottleneck!

Recheck measurement after locking to verify result. Be sure that the scales are legible, and can be read plainly.

d. 64 millimeters is equivalent to 2.51 inches. This information is inserted for conversion convenience in the event no metric rule is available to the instrument repairman.

DEFECTIVE PARTS. - a. Defective parts should be replaced from stock. Replacement of defective optical elements must be carefully checked inasmuch as replacement of even one optical element may change the optical characteristics of the telescope and render readjustment necessary. Replacement of optical elements indiscriminately is one of the primary causes of parallax, malajustment, etc.

b. After working with the field glass for a while the instrument repairman will uncover many minor points, and acquire confidence in his own ability through practical experience that no amount of theoretical instruction can duplicate. He should remember, however, that replacement of optical elements cannot be considered lightly. Replacement of optical elements such as objective lens or prisms is bound to affect a minor change of the focal point of the objective, and changing the focal point of the objective will cause both parallax and the consequent improper diopter movement.

c. Replacement of metal components is easily accomplished since the components are all standardized and available as replacements. Keep in mind, however, that the replacement of such components such as the objective cell, objective adapters, reticle cells, etc., may also cause parallax and affect the final adjustment of the instrument. The greatest of care and consideration must therefore be given to the replacement of any type part.

# CARBURIZING AND CASE HARDENING

(Continued from page 91)

A common practice is to attach a stiff wire to the part to be carburized, in this way the part can be easily found and withdrawn from the bath without fishing around with a pair of clumsy blacksmith tongs. When small pieces are handled this is a good method as it prevents loss in the bath.

Tepid water that has been treated with lime is a good quench medium, the lime tends to neutralize the cyanide which adheres to the part being quenched. With good technique the part should come out of the bath clean and smooth. A good precaution is to wash the part after quenching under running water and scrub with a stiff brush. Dry and oil to prevent rust.

Keep quenching vat far enough removed from the molten bath to prevent any water or oil splatter from coming into contact with the cyanide.

Pack-hardening is often used as an indirect heating medium for tools or parts made of tool steel. The object of this is to prevent oxidation during the heating process which would leave a mottled and decarburized surface after quenching. Tools with thin cutting edges, such as taps, reamers, or milling cutters might flake away or burn if heated directly; when heated in a packed and tightly closed box such would not be the case. The few seconds required to remove the red hot tool from the box into the quench would not cause any appreciable oxidation.

Cast iron chips are sometimes used to pack the box, however if the job is overheated there is danger of sintering the chips which would then weld themselves upon the tool being heated.

When case-hardening by the pack method and it is desired to leave a certain portion of the work soft, a water solution of copper sulphate carefully applied to coat the spot or part will prevent this coated part from absorbing carbon from the mixture. This is necessary in case a hole has to be drilled or tapped after case-hardening. A deep hole can be blocked off by filling with water glass or fire clay before case-hardening.

CASE - HARDENING HEAT TREATMENTS

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| Carburize<br>Quench | Carburize<br>Quench<br>Draw | Carburize<br>Quench<br>Re-heat<br>Quench<br>Draw | Carburize<br>Quench<br>Re-heat<br>Quench<br>Re-heat<br>Quench<br>Draw | Carburize<br>Cool in box<br>Re-heat<br>Quench<br>Draw | Carburize<br>Cool in box<br>Re-heat<br>Quench<br>Re-heat<br>Quench<br>Draw |

# BOMB HANDLING

(Continued from page 98)

facility available requiring the exercise of both ingenuity and common sense in providing for adequate bomb storage. Fundamental rules to remember are: sufficient dunnage should be used to assure protection against contact with

pictures needed, both for publicity purposes and for training purposes, as is evidenced by certain pictures dealing with concealment of troops and trucks while on bivouac; camouflage of ammunition dumps and other needs as requested by unit commanders.

The primary function of the Photographic section is the production of Visual Aids to Training. The major part of the work is on Film Strip and Technical Manual illustrations. We "shoot" everything from pistols to howitzers and jeeps to tanks. All requests for photographs other than those originating in the Extension Course Division must be authorized by the Commandant.

We are now completely equipped and manned, and are turning out work the quality of which we are proud to claim is comparable to the products of most technical photographic laboratories.

# WAR

**The following thoughts are extracted from "The New International Encyclopedia" (1908).**

All definitions of war, in the sense of international law, may be said to agree in one fundamental essential, that war is a public and state act as distinguished from the acts of private individuals.

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If war, then, be the act of a nation, whatever is done in the persecution of it, must either expressly or implicitly be under the national authority, whatever private benefits result from it must be from a national grant.

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War is an existing fact and not a legislative decree. Congress alone may have power to 'declare' it beforehand, and thus cause or commence it. But it may be initiated by other nations, or by traitors, and then it exists, whether there is a declaration of it or not. It may be prosecuted without a declaration; or Congress may, as in the case of the Mexican War, declare its previous existence. In either case, it is the fact that makes 'enemies', and not any legislative act.

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Publicists have divided wars into formal and informal; perfect and imperfect; offensive and defensive; national and civil; but these classifications are practically worthless. War is a fact, its existence proved as a fact, and it is nothing more than the contention on land or sea, under the sea, or in the air, of armed bodies acting under orders from and commissioned by a sovereign.

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It is likewise immaterial whether the war begin formally with a declaration, or informally by an act of hostility. It is necessary, however, to fix the exact date of the outbreak; for the effect of war when once existing is wide-reaching as regards both belligerents and neutrals.

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As with kinds, so with causes of war. Publicists have amused themselves with divisions into permissible and non-permissible, just and unjust wars, and have classified the various causes as just and unjust. But this however interesting in itself, is not helpful. A sovereign nation has no superior, and therefore admits of no judge as to the justice or iniquity of the war into which it plunges.

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War is not an end in itself; it is a means to an end, namely peace. The "Instructions for the Government of Armies of the United States in the Field", prepared by Dr. Lieber in 1863 and reissued in 1898, say in articles 29 and 30: "Peace is their (nations') normal condition; war is the exception. The ultimate object of all modern war is a renewed state of peace. The more vigorously wars are pursued, the better it is for humanity. Sharp wars are brief. Ever since the formation and coexistence of modern nations, and ever since wars have become great national wars, war has come to be acknowledged not to be its own end, but the means to obtain great ends of state, or to consist in defense against wrong; and no conventional restriction of the modes adopted to injure the enemy is any longer admitted; but the law of war imposes many limitations and restrictions on principles of justice, faith, and honor."

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War may terminate in three ways: by treaty; by cessation of hostilities; by conquest. The treaty is the most usual method and is the best; for the parties to the war can, do and should thus settle by a careful and formal document the various issues that caused the war, and provide for peaceful and harmonious relations in the future.

THE ORDNANCE SERGEANT for February will contain a number of unusually interesting articles: "The Facts about Chemical Agents," "A Layman Looks at Light," "From Time-candle to Tank Clock", "The Army Moves on Its Tires", "The Eyes of Defense", and others of general interest to all our readers.

# ORDNANCE SCHOOL TEXTS

The following list of late issue Ordnance School Texts should be added to those listed on page 20.

OS 9-18 Ammunition — General
OS 9-20 Artillery Ammunition
OS 9-25 The Ordnance Company, Medium Maintenance.
OS 9-26 Ammunition Supply in the Air Force.
OS 9-27 Aviation Ordnance — Organization.
OS 9-29 Company Officer's Manual.
OS 9-31 Automotive Electricity for In-line Engines.
OS 9-32 Organization and Functions of the Ordnance Department.
OS 9-33 Ammunition Supply.
OS 9-34 The Ordnance Company, Ammunition.
OS 9-35 The Ordnance Company, Depot.