



THE ORDNANCE SERGEANT



VOL. 2

JULY 1941

NO. 1



INDEPENDENCE HALL

Published by the Ordnance School in the interest of Ordnance Sergeants

THE ORDNANCE SERGEANT

VOL. 2

JULY 1961

NO. 1



INDEPENDENCE HALL

Published by the Ordnance School in the interest of Ordnance Sergeants

HIGHLIGHTS

THE ORDNANCE SERGEANT delves into the mouldy archives of the past in this issue, or to be more specific, we take you for a visit to one of our oldest and most romantic posts--Key West Barracks, Florida. Old guns, old documents, an old setting for a modern post. See page 2.

One of the biggest events in recent Ordnance Department history was the Ordnance Training Center Field Day. Probably the largest group of Ordnance men ever assembled together was present. You can read about it on page 33.

Two serialized articles and in this issue, each with a chapter of unusual interest. Lt. Johnson closes "Elementary Optical Principles" (see page 25), and Lt. Ramnes brings his "History of the Development of Field Artillery Materiel" up to the present time. (See page 21.)

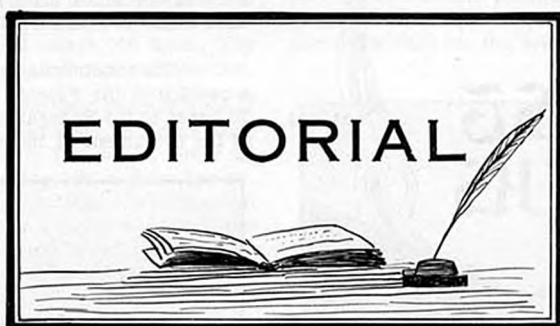
If you are interested in how powder is made for the Army on a huge scale, read the first installment of "Powder for the Army in a Hurry" on page 39.

All Ordnance Sergeants who have been interested in automotive texts should notice the list the library offers on page 63. The latest texts are listed, and you are told where they can be obtained--if you are entitled to them.

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

--IN THIS ISSUE

Editorial "INDEPENDENCE"	1
Key West Barracks, Florida	2
by Oscar Davis, Technical Sergeant, Ord. Dept.	
Documents from Old Fort Taylor	4
Armament from the Past (Picture pages)	14
Small Arms	16
R. O. T. C. Camp	20
Artillery	21
Automotive	24
Fire Control	25
"Notes in Brief"	68
Administration	29
Ordnance Training Center Field Day	33
Powder for the Army in a Hurry	39
Depot and Supply	40
The Ordnance Shop	43
The Machine Shop	46
"Machine Shop Notes"	47
Ordnance Shop, Key West Barracks, Florida	52
Ammunition	54
Ordnance Aviation Activities	58
Ordnance Training Activities	62
Library	63
Letters from the Field	65



INDEPENDENCE

July
1776

Several editorials on this page have considered various phases of Americanism. But when would there be a more fitting time to think of Americanism again than during the month of July? One hundred and sixty-five years ago this month a group of patriotic Americans assembled at Philadelphia to discuss, write, and adopt the most sacred of all American documents -- the Declaration of Independence. Then, and there, they instituted a new order of living and established a new theory of cooperative assistance among men.

Words in themselves are such limited things. They have certain definite but restricted meanings if we think of them only in the light of their completely correct and generally accepted definitions. Words such as "Independence" should mean more to us than the limited expressions found in a dictionary.

Are you independent? Of course not, and furthermore you don't want to be. When our founding fathers declared the independence of a new nation, they sought to break off the restraints of a tyrannical mother country; they hoped to sever the restrictions of old-established but dogmatic religious theories; and they planned the establishment of a government under which men might live in freedom, and liberty, and trust. They used the word "independence" because they wanted to express the complete dissociation of the future from the past.

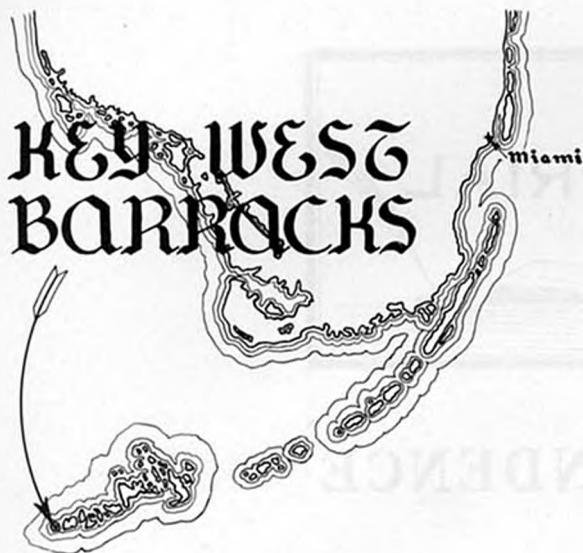
July
1941

Neither we nor our founding fathers would wish to see this nation a nation in which each individual was entirely self-sufficient; nor one in which states

or definite economic areas would act independently without regard for the rights or interests or needs of others; nor even a nation which in itself would feel that it could exist and prosper with no intercourse with the remainder of the world. At first thought we might think that such conditions would be ideal, but just a little consideration will convince us that individuals would live very lonesome and more or less miserable lives, states or economic areas would find themselves greatly restricted in many ways, and even our nation would suffer greatly if it were completely isolated from the best things of all nations.

Our founding fathers established an independence which would make possible the creation of a government under which men could live in reciprocal dependence one upon another; under which individuals and states could place implicit trust in others, knowing full well that this trust would not be betrayed; under which all, regardless of race or creed, could enjoy the rights of free speech, a free press, the privilege of a secret ballot, freedom to worship according to the dictates of his conscience, and all the other liberties which have long been the basic principles of American life, depending without hesitation upon the willingness of others to recognize and honor the same rights and privileges as the heritage of all men.

Our most pleasing conception of independence must be that manner of living in which any man can **DEPEND** upon recognition of his rights and in which he can **TRUST** his fellow citizens and his government to respect those rights. This deliberate but justifiable dependence is the **INDEPENDENCE** which we of America know and appreciate. It is the American version.



By: Oscar Davis,
Tech. Sergeant, Ord. Dept.

Key West derives its name from the Spanish "Cayo Hueso," which is translated "Bone Island." When the first Spanish explorers reached this spot they found the ground littered with the skulls and skeletons of warring Indian tribes, an indication of the bitterness with which the natives had fought for possession of this well-watered and wooded island.

The legal history of the spot began in 1815 when Don Juan de Estrada, the Spanish governor of Florida, granted it to Lieutenant Juan Pablo Salas. The latter in turn sold it to John Simonton in 1822. Key West was incorporated as a city in 1828, and its growth was continuous for many years. Salt manufacturing, the creation of an immense cigar manufacturing business by Cuban patriots seeking refuge in a free country, the extensive business of salvaging cargoes and vessels wrecked in the treacherous channels nearby, and the development of sponge fishing -- all these helped to make Key West the wealthiest community per capita in the country. Many changes occurred during succeeding decades of Key West's history. During the nationwide depression of recent years, certain enterprises there were greatly curtailed, and the city plumbed the depths of despair. But of late this city in the sea has experienced that ever-recurring miracle which only the sea and its tributaries know -- the turn of the tide.

The military history of Key West began in 1833, when the United States Government purchased the land upon which Key West Barracks now stands. At that time the post became an infantry garrison, established for the protection of white settlers against the Indians of the region. Infantry, however, has not occupied the post for many years.

Actually Key West Barracks can scarcely be regarded as a military post, for no armament exists there. Rather it serves as a headquarters and a housing station for other nearby reservations, East Martello, West Martello, and Fort Taylor, all together comprising the harbor defenses of Key West. Ordnance personnel consists of an authorized strength of seven enlisted men. This personnel, as well as

that of the coast artillery corps, is transported by truck to Fort Taylor where all drills, target practice and maintenance duties are performed.

The construction of Fort Taylor began in 1845 after a session of the Florida legislature ceded approximately 70 acres to the Federal Government. Here is located much of the armament of the harbor defenses of Key West. It

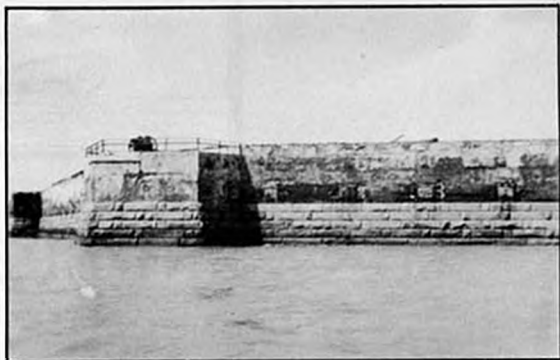


Fig. 1 - This photo shows a saluting gun, M1902 (Obs.), placed on top of the southeast corner of Fort Taylor, for firing salutes

is a coast artillery station, and a saluting station. (See figure 1). The ordnance problem is a difficult one. Ordnance materiel, especially fire control equipment, corrodes rapidly and requires cleaning and re-doping far more often than at an inland station. Instruments, without exception, require disassembly, cleaning and reassembly once each year. This is true even though practically all fire control items are stored in what is known locally as the "dry room." In this room three 100-watt carbon lamps burn at all times. Papers are packed in and around telescopes and other equipment at all times. All materiel such as guns and carriages must be cleaned and repainted every two years, because they are stored outside. Woodwork, pyramidal targets, small arms rifle ranges and other ordnance items constructed of wood require repainting each year for their preservation, disregarding their appearance. Another serious problem is the rapid deterioration of gunpowder, both in made up charges and in bulk. This condition is caused by the high salt content of the atmosphere.

Fort Taylor (see figure 2) was built as the result of surveys made by a board of officers of the corps of engineers in 1844 and 1845, the purpose of the survey being



Fig. 2 - Photo taken from Navy Yard, showing Searchlight No. 2, mounted on upper story of Old Fort Taylor

to locate suitable sites for fortifications among the Florida Keys. Numerous sites were studied, but those selected were Key West (Fort Taylor) and the Dry Tortugas (Fort Jefferson, which will be mentioned later). Of these, Key West, or Fort Taylor, was of course the most important.

To secure the island and the land defense side of Fort Taylor against attack by landing forces, outworks were necessary, and so placed that their fire would cover all parts of the island lying east and north of Fort Taylor. Four "Martello" towers were projected, with casemated seacoast batteries to be added as a defense against the covering fire of vessels assisting a land force. Two of these were constructed; the others were to have been located on Stock Island and Fleming Key.

Work on the east and west towers began in 1861. Key West's first railroad was built for the transportation of materials from the supply wharf at Fort Taylor, extending a distance of about four miles along the southern beach sand ridge to the east tower. The brick used in the towers came from New York State, and labor, both skilled and unskilled, came mostly from New York and the New England states. The work was carried on rapidly until the close of the Civil War, and was continued at a slower rate until about 1876. The two structures were identical in plan. The central towers, or citadels, and the outer galleries on the land side were nearly complete, but the casemate batteries were not completed above the floor of the second tier. No armament was ever installed. The west tower was partially demolished when the fortifications were modernized; the east tower remained as it is today (see figure 3).

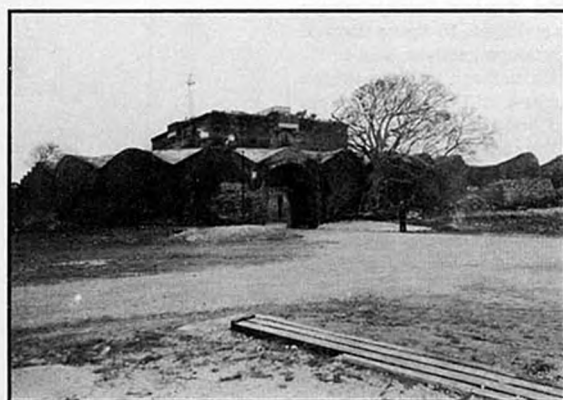


Fig. 3 - View of East Martello Tower, near waterfront. A huge seawall keeps tidewater from flooding Roosevelt Boulevard, between seawall and tower

The armament for each tower was to have consisted of 10-inch Rodman smoothbore guns in the first tier of the casemate battery, with 8-inch Columbiads on the second tier. Four Parrott guns, firing 100-pound projectiles, were to have been mounted on the central tower.

Flank defense howitzers, firing 24-pound grape and canister projectiles, were to have been mounted in the interior casemates to fire on enemy troops who might gain access to the interior of the fortifications.

The present entrance was built (see figure 4) for use during construction, and was to have been bricked up and covered by the rock and sand rampart projected to

surround the structure on the land side. The roofed brick corridor connecting the tower and the galleries (left open during construction) was to have been completed, to afford secure passage for the defenders.

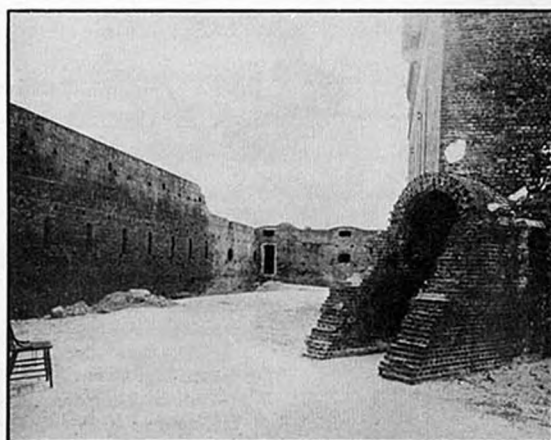


Fig. 4 - Inside lower view of East Martello Tower. No armament was ever installed or mounted here

The only access to the interior of the completed structure was to have been over the rampart and across a drawbridge entering the tower at the second floor level. Stairways were to have been built from the ground level to the upper tiers of the casemate battery. Provision was made for throwing grenades or hot pitch down on the invaders from the four apertures at the top of the tower.

Enemy forces attacking from the land side would have been exposed to musket fire from the defenders on the rampart and gunfire from the top of the central tower. Should they overcome the fire of the defenders and mount the rampart, they could only gain access to the interior of

(Continued on page 19)

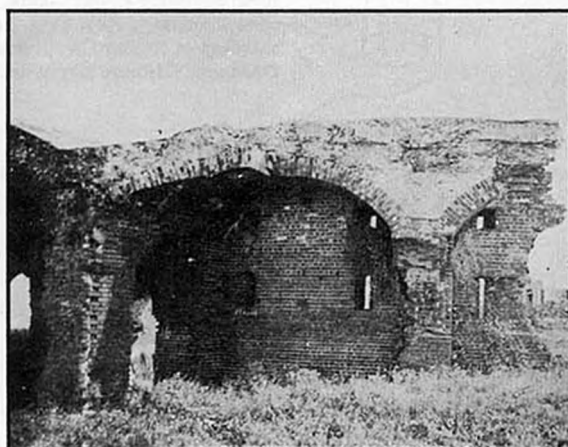
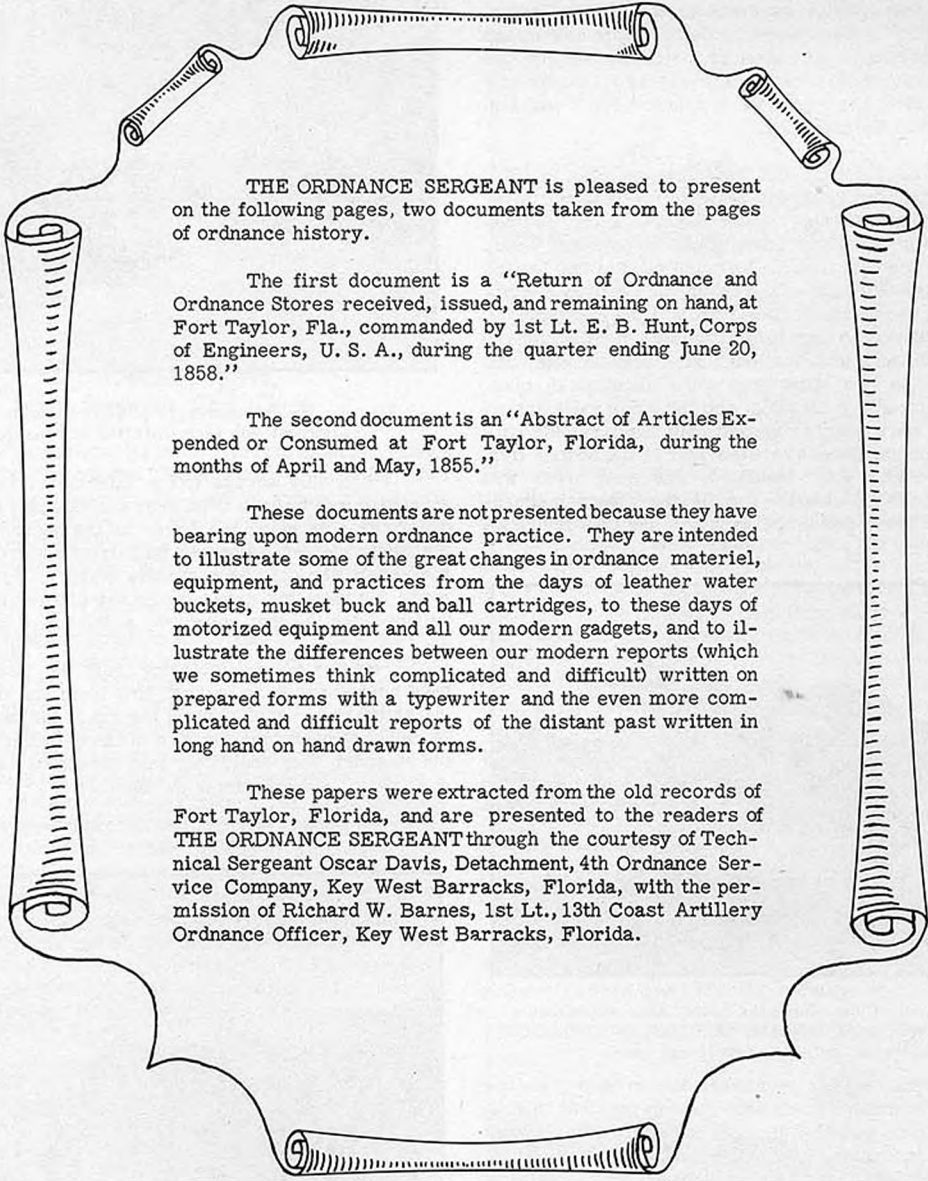


Fig. 5 - Eastern portion of West Martello Tower, the most dilapidated section. The brick are to be replaced, President Roosevelt has announced



THE ORDNANCE SERGEANT is pleased to present on the following pages, two documents taken from the pages of ordnance history.

The first document is a "Return of Ordnance and Ordnance Stores received, issued, and remaining on hand, at Fort Taylor, Fla., commanded by 1st Lt. E. B. Hunt, Corps of Engineers, U. S. A., during the quarter ending June 20, 1858."

The second document is an "Abstract of Articles Expended or Consumed at Fort Taylor, Florida, during the months of April and May, 1855."

These documents are not presented because they have bearing upon modern ordnance practice. They are intended to illustrate some of the great changes in ordnance materiel, equipment, and practices from the days of leather water buckets, musket buck and ball cartridges, to these days of motorized equipment and all our modern gadgets, and to illustrate the differences between our modern reports (which we sometimes think complicated and difficult) written on prepared forms with a typewriter and the even more complicated and difficult reports of the distant past written in long hand on hand drawn forms.

These papers were extracted from the old records of Fort Taylor, Florida, and are presented to the readers of THE ORDNANCE SERGEANT through the courtesy of Technical Sergeant Oscar Davis, Detachment, 4th Ordnance Service Company, Key West Barracks, Florida, with the permission of Richard W. Barnes, 1st Lt., 13th Coast Artillery Ordnance Officer, Key West Barracks, Florida.

FIRST
DOCUMENT

RETURN
Of Ordnance and Ordnance Stores
Received, issued, and remaining on hand,
at Fort Taylor, Fla., Commanded by Lt.
Col. C. B. Hunt, Corps of Engineers, U. S. A.
during the Quarter ending
June 30, 1858.

Retained Copy.

Part First.

Artillery, Small Arms, Ammunition,
And Other Ordnance Stores.

Date.
1858.

No. of Voucher.

Second Quarter, 1858.

Class I.—
Ordnance. Artillery Carriages.

Brass Guns. Iron Guns. Field Artillery. Casemate.

12-pdr. Howitzers.
8-inch Columbiads.
24-pdr. Howitzers, for flank defense.
12-pdr. Howitzer Carriages.
8-inch Columbiads Carriages.
8-inch dr. Chassis.
24-pdr. Howitzer Carriages.
24-pdr. dr. Chassis.

April	1	-	On hand from last Return, --	4	50	10	4	50	50	10	10
	1		Received from Capt R. W. White, Ord. Dept,								
Total to be accounted for, - - -				4	50	10	4	50	50	10	10
June	30	2	Expended at the post, per abstract,								
Total issued and expended, - - -											
Remaining on hand to be accounted for next quarter,				4	50	10	4	50	50	10	10

Class III. — Artillery

Buckets.				Budge Barrels.		Cannon Locks.		Gunners Bimblets.				Handspikes.												
Sponge, shut iron.				Columbiads, armd.		do.		24-pdr. Howitzer, do.				For 8-inch Columbiads.												
Cannon, do.				For 24-pdr. Howitzers.		" 8-inch Columbiads.		" 24-pdr. Howitzers.				" 12-pdr. do.												
Chalk line.				Muzzle-plug vacuum.		do. do. , yule.		Jugs full.				For 8-inch Columbiads.												
" 24-pdr. Howitzers.				" 10-pdr. do.		Gunners' Haversacks.				do. do.														
do. do.				do. do.		do. do.				do. do.				Mansuering.										
Sponges, Column & iron.				Roller, do. do.		Roller, 24 pdr. How. do.		Trail,																
4	50	2	8	50	10	50	10	4	8	8	2	1960	50	8	4	64	5	4	50	120	100	50	10	8
4	50	2	8	50	10	50	10	4	8	8	2	1960	50	8	4	64	5	4	50	120	100	50	10	8
4	50	2	8	50	10	50	10	4	8	8	2	1960	50	8	4	64	5	4	50	120	100	50	10	8

Equipments & Implements.

Tanyards	Sock Covers.	Priming Wires.	Sponges Covers.	Sponges & Sponges Rammers Slaves.	Tampers	Worms & Slaves.	
badly and claws, 80 per. for friction primers. " do. 100.	Block. Covers. 8 in. x 6. Columbia, leather. 12 per. 7000 yds. do. 24 per. do. Bad. Priming cases. do. outer. do. inner.	Powder measure. for 8 in. x 6. Columbia. " 24 per. 7000 yds. " 12 per. do. Priming wire. Rammers and claws, 80 per. Bright, front- do. Break, for 8 in. x 6. Columbia. do. do. for 24 per. 7000 yds. do. 8 in. x 6. Columbia, 100. " 24 per. do. Chamber. " 12 per. 7000 yds. " 6 per. do. " 24 per. 7000 yds. " 12 per. do. " 6 per. do. unimicable. " 8 in. x 6. Columbia, 100. " 8 in. x 6. do. Chamber. Priming wire. Rammers and claws, 12 x 16. for 8 in. x 6. Columbia. " 24 per. 7000 yds. For Ropes. do. for 1000 yds. do. do. for 1000 yds. Priming wire. Priming wire.	do. do. for 24 per. 7000 yds. do. 8 in. x 6. Columbia, 100. " 24 per. do. Chamber. " 12 per. 7000 yds. " 6 per. do. " 24 per. 7000 yds. " 12 per. do. " 6 per. do. unimicable. " 8 in. x 6. Columbia, 100. " 8 in. x 6. do. Chamber. Priming wire. Rammers and claws, 12 x 16. for 8 in. x 6. Columbia. " 24 per. 7000 yds. For Ropes. do. for 1000 yds. do. do. for 1000 yds. Priming wire. Priming wire.	do. do. for 24 per. 7000 yds. do. 8 in. x 6. Columbia, 100. " 24 per. do. Chamber. " 12 per. 7000 yds. " 6 per. do. " 24 per. 7000 yds. " 12 per. do. " 6 per. do. unimicable. " 8 in. x 6. Columbia, 100. " 8 in. x 6. do. Chamber. Priming wire. Rammers and claws, 12 x 16. for 8 in. x 6. Columbia. " 24 per. 7000 yds. For Ropes. do. for 1000 yds. do. do. for 1000 yds. Priming wire. Priming wire.	do. do. for 24 per. 7000 yds. do. 8 in. x 6. Columbia, 100. " 24 per. do. Chamber. " 12 per. 7000 yds. " 6 per. do. " 24 per. 7000 yds. " 12 per. do. " 6 per. do. unimicable. " 8 in. x 6. Columbia, 100. " 8 in. x 6. do. Chamber. Priming wire. Rammers and claws, 12 x 16. for 8 in. x 6. Columbia. " 24 per. 7000 yds. For Ropes. do. for 1000 yds. do. do. for 1000 yds. Priming wire. Priming wire.	do. do. for 24 per. 7000 yds. do. 8 in. x 6. Columbia, 100. " 24 per. do. Chamber. " 12 per. 7000 yds. " 6 per. do. " 24 per. 7000 yds. " 12 per. do. " 6 per. do. unimicable. " 8 in. x 6. Columbia, 100. " 8 in. x 6. do. Chamber. Priming wire. Rammers and claws, 12 x 16. for 8 in. x 6. Columbia. " 24 per. 7000 yds. For Ropes. do. for 1000 yds. do. do. for 1000 yds. Priming wire. Priming wire.	do. do. for 24 per. 7000 yds. do. 8 in. x 6. Columbia, 100. " 24 per. do. Chamber. " 12 per. 7000 yds. " 6 per. do. " 24 per. 7000 yds. " 12 per. do. " 6 per. do. unimicable. " 8 in. x 6. Columbia, 100. " 8 in. x 6. do. Chamber. Priming wire. Rammers and claws, 12 x 16. for 8 in. x 6. Columbia. " 24 per. 7000 yds. For Ropes. do. for 1000 yds. do. do. for 1000 yds. Priming wire. Priming wire.

[illegible]

Part Second.
Tools and Materials.

[illegible]

I certify that the foregoing Return exhibits a correct statement of the public property in my charge during the second quarter, 1858; and that an accurate inventory of property has been made, and the return corrected accordingly.

Fort Taylor, Fla. }
 June 20, 1858. }

SECOND DOCUMENT

No. 2
 Abstract of Articles Expended
 or Consumed at Fort Taylor Florida
 during the months of April and
 May 1855

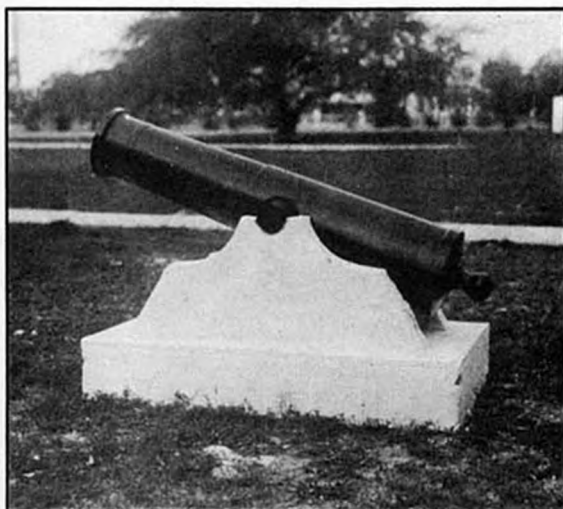
*Abstract of Materials &c. Expended or Consumed at Fort Saylor
Florida, During the Months of April and May, 1855*

<i>Expended or Consumed</i>	<i>1/2 inch Shot</i>	<i>1/2 inch Shell</i>	<i>1/2 inch Shell Plugs</i>	<i>Paper Targets</i>	<i>Artillery Tubes Primers</i>	<i>Artillery Powder Pounds</i>	<i>1/2 inch Sabots</i>	<i>1/2 inch Cartridge Bags</i>	<i>Musket Ball and Buck Cartridge</i>	<i>Corn Brooms</i>
<i>April 5th In target practice</i>	5	2	2	2	9	80	2	1	..	..
<i>10</i>	5	1	1	1	7	60	1	6	..	..
<i>11</i>	3	2	2	2	6	30	2	5	..	..
<i>14</i>	9	2	3	3	13	120	3	12	..	..
<i>20</i>	6	..	..	..	7	60	..	6	..	..
<i>May 2nd Firing Salute</i>	..	..	..	..	23	112	..	14	..	..
<i>April 14th Issued to Guard</i>	..	..	..	..	..	..	..	200	..	..
<i>Expended During Inspections</i>	..	..	..	..	..	..	..	..	..	4
<i>Total issued and Expended</i>	28	8	8	8	65	482	8	50	200	4

I Certify that the above abstract is correct and that the stores therein
referred to have been issued for the above purposes by my Orders
agreeably to the 46th 47th and 143rd Articles of the Regulations

{ Duplicates }

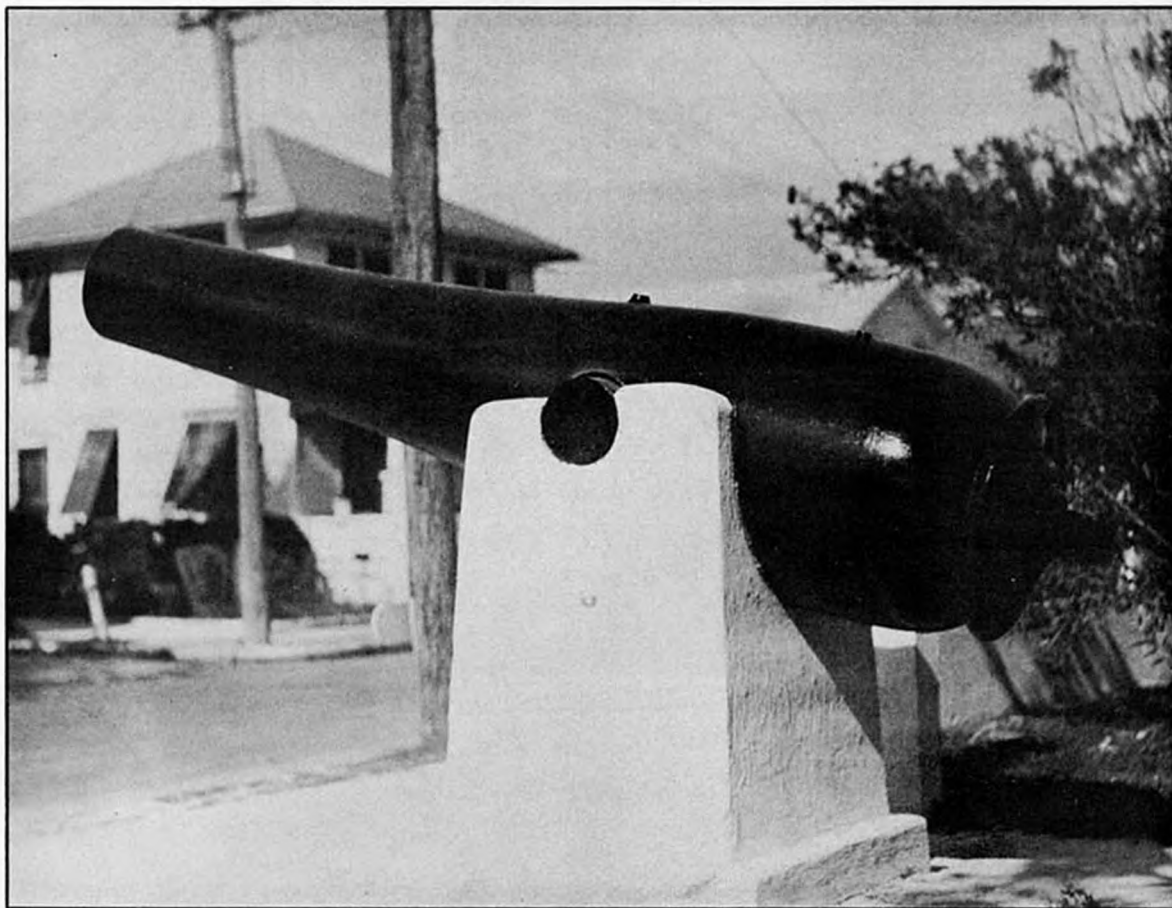
C. J. Hare
Hare

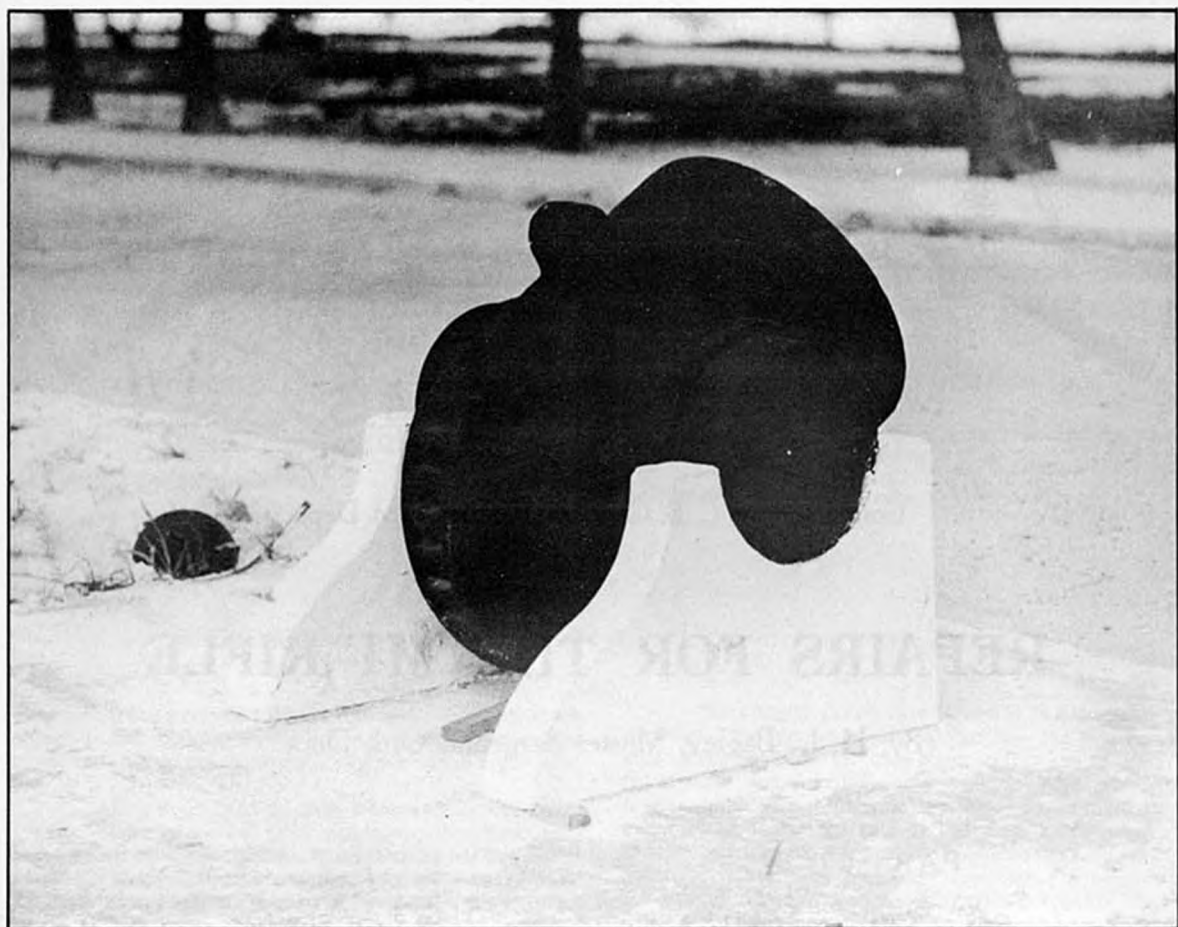


ARMAMENT
of the
PAST

The weapons shown on these pages are all located in or near Key West Barracks, Fla. It is reasonable to assume that each has seen service at that station in the past. The photos are furnished by Technical Sergeant Oscar Davis, Detachment, 4th Ordnance Service Company, who has kindly identified each weapon for us.

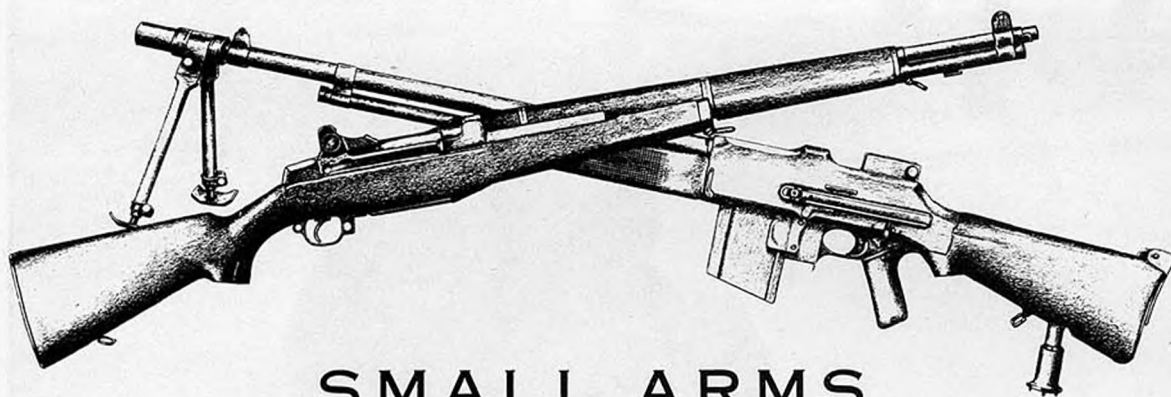
Above -- A 24-pounder flank defense howitzer with 5.82" bore, model of 1880, mounted and no doubt used at old Fort Taylor. Below -- A coast defense gun patented by John Erickson in 1872, believed to have originally been mounted on the upper story of old Fort Taylor. One of these is on each side of the main gate entrance to Key West Barracks. The picture below was taken on the steps of the armory of Battery E. 265th Coast Artillery (Harbor Defense) (Florida National Guard), where that organization held regular drills prior to their departure for a year of active duty at Fort Crockett, Galveston, Texas.





Above -- A 10-inch siege mortar (19th century) probably a model of 1834 (American Artillerist's Companion by Toussard). Lower left -- A 24-pounder Cohorn brass mortar, 5.82" bore, weight 160 pounds, model 1841 (Ordnance Manual of 1841). Lower right -- A 6-pounder gun, probably a model of 1840 (Ordnance Manual of 1841).





SMALL ARMS

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

REPAIRS FOR THE M1 RIFLE

By: H. L. Bagley, Master Sergeant, Ord. Dept.

PART 6

Trigger Group

The trigger group (see figure 1) may be considered the last and hardest group of parts to work with, but this is wrong in that the trigger group is about the easiest and simplest group of parts in the weapon.

The removal of this group from the rifle is considered difficult in some cases but this depends strictly on the method used. It will relieve considerable strain if the bolt is opened on the weapon before starting to remove the group from the receiver. This carries the hammer to the cocked position and relieves this pressure on the trigger guard when it is opened.

To open the trigger guard, grasp the rear of the trigger guard and pull straight toward the butt of the rifle, holding this pressure rotate the guard toward the muzzle of the rifle, and then move the entire group from the receiver.

After removing the group from the receiver it is advisable to close the trigger guard. The hammer is sometimes released while the guard is in the open position and will often cause personal injury.

There are other precautions to be taken on disas-

sembly of the parts from the group. Be sure the hammer is released before removing either the trigger pin or the hammer pin. Remove the trigger pin first in all cases. A great many times the hammer pin is removed first with the hammer in either the cocked or released position; in either case do not attempt to continue with the disassembly as it cannot be carried out without distortion of parts or possible breakage.

Replace the hammer pin and start over and you will save time and parts by doing so. Place the trigger finger through the trigger guard, the same as in firing, and bring the thumb up against the rear of the sear. Now by applying a slight amount of pressure to the rear with the finger, and pressure forward with the thumb, the trigger pin may be removed. Then allow the trigger to rotate to the rear until the tension is relieved. This allows you to remove the trigger hammer spring housing, hammer spring and plunger. Next remove the hammer pin to the right. The hammer is then free to be removed. You will notice the trigger guard is free, but do not try to remove it, just let it hang free. It is necessary to remove the safety first, and this can be done by grasping the top of the safety, moving it to the right and lifting straight up. Now we are ready to go back to the trigger guard. Let the guard hang straight down, move it to the rear on the housing until it is half way between the two pin openings, and then grasp the lower end of the guard and rotate it to the right of the housing for removal.

The next item is the clip ejector. It may be removed

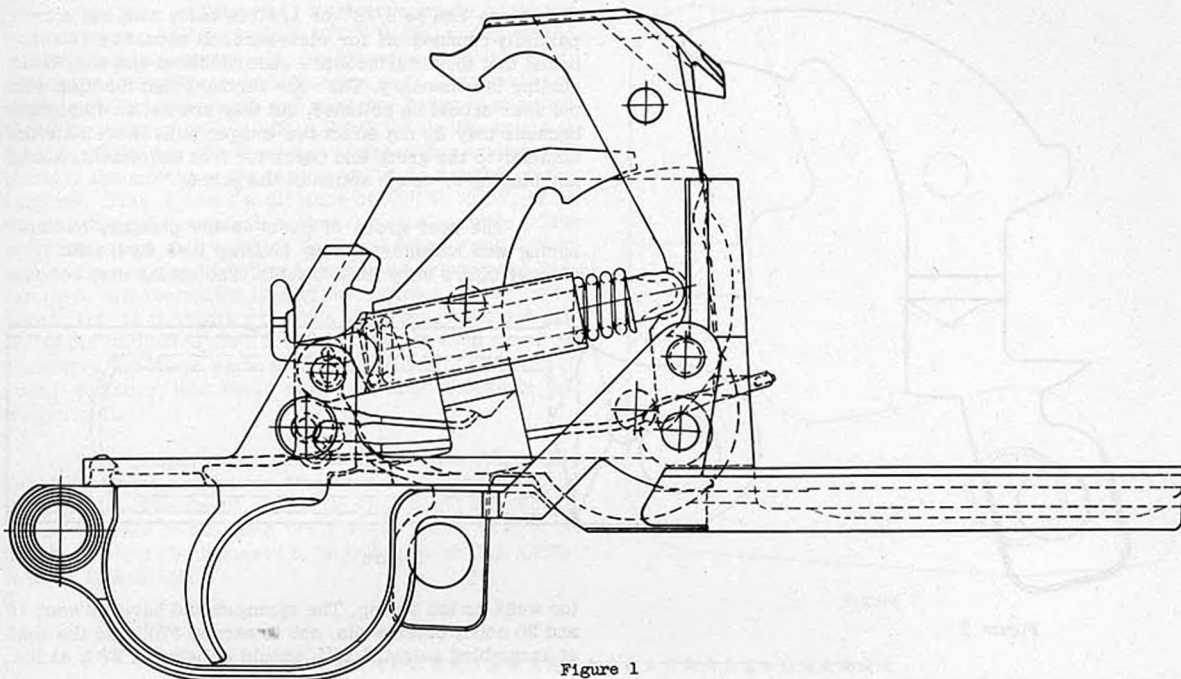


Figure 1

by inserting the nose of a round of ammunition, or any sharp object, in the opening on the left side of the housing, just below the trigger pin opening and pushing to the right side.

Let us start back through the assembly and cover the important points and the repairs or alterations necessary for proper functioning. The first piece is the trigger housing. Starting at the rear of the housing, the opening for the trigger is first looked over for burrs and clearance. Move up to the area around the trigger pin and check for rough surfaces. These points may be smoothed up with an oil stone to give a smoother trigger action.

The remainder of the housing should be checked for burrs and smoothed up with an oil stone.

The clip ejector is next to be assembled. Note its position in the housing as to clearance and free movement and force the forward end down, watching that it clears all the way to the bottom. They sometimes extend into the fillet in the bottom of the housing. In this case it is necessary to slightly round the inner corner of the clip ejector to secure clearance.

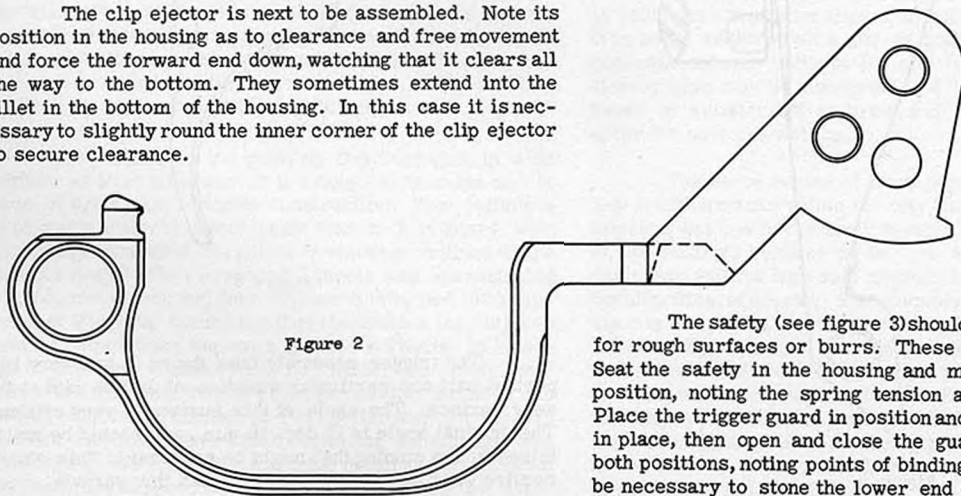


Figure 2

The trigger guard (see figure 2) is next to be assembled. The points to be watched are the two locking lugs on the right and left side because they are sometimes out of shape and wear abnormally. These studs are .205" in dia. at the time of manufacture. Any wear of these studs will tend to loosen the trigger group in the receiver and cause a loose stock. Very little can be done to correct this condition, other than temporary correction by peening of the studs a slight amount to compensate for wear. This is only a temporary correction and should not be carried out until it is necessary. The guard should fit close around the hammer pin opening but should not bind. This can be taken care of by bending these surfaces, in or out, as the case may be.

The safety (see figure 3) should be looked over next for rough surfaces or burrs. These should be stoned off. Seat the safety in the housing and move to the on and off position, noting the spring tension and points of binding. Place the trigger guard in position and put the hammer pin in place, then open and close the guard with the safety in both positions, noting points of binding of the parts. It may be necessary to stone the lower end of the safety to make

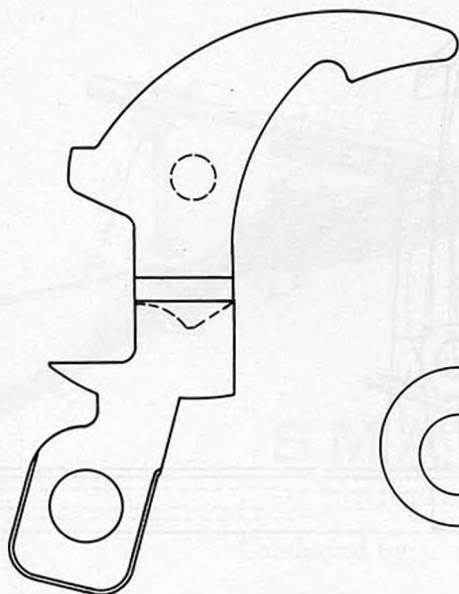


Figure 3

it pass through the opening in the trigger guard freely, or you may exchange the parts until a fit is found. Do not attempt to bend the safety, as it is very hard and will break easily.

The hammer (see figure 4) is the next item taken up. We find some very important surfaces on this piece. It should be checked over very carefully for burrs and stoned smooth. The surface that functions in connection with the trigger proper is very important. These should be level with each other as well as square with the hammer. These surfaces form a 90 degree angle to the hammer. A square polishing stone should be used to dress up these surfaces.

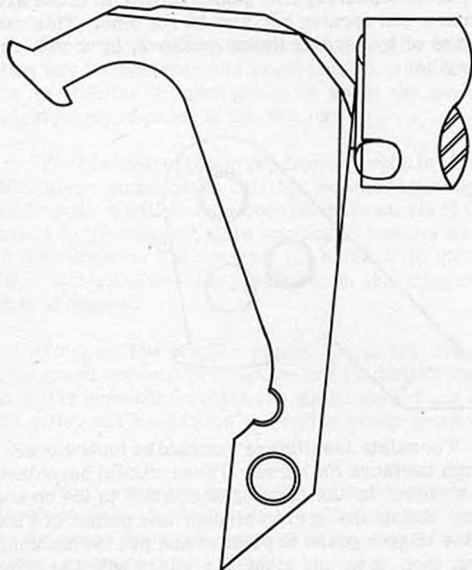


Figure 4

This stone can be $3/16''$ or $1/4''$ in size, with one corner partially rounded off for clearance. It should be remembered that these surfaces are case hardened and very little stoning is necessary. The rear surfaces that function with the sear should be polished, but they are not as important because they do not effect the trigger pull. Assemble the hammer to the group and check for free movement, noting any binding or rough action of the parts.

The next group of parts is the plunger, hammer spring and hammer spring housing (see figure 5). The plunger offers very little trouble. The spring may become

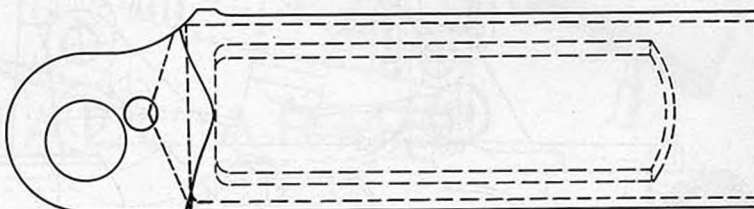


Figure 5

too weak or too strong. The spring should have between 19 and 20 coils, outside dia. not to exceed $370''$ and the load at assembled height, 1.55'', should be between 27 & 31 lbs.

The normal free length of this spring is approximately $2 1/4''$. The housing hammer spring should be checked for burrs and wear noting that the recesses which contact the sear be clean and smooth.

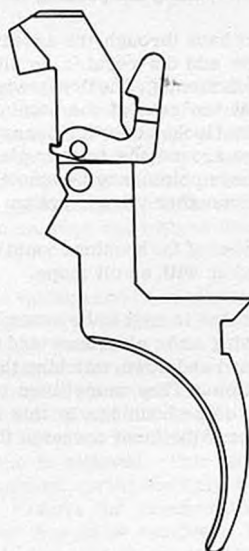


Figure 6

The trigger assembly (see figure 6) is a very important part and particular attention should be paid to the sear surface. The angle of this surface is very critical. The original angle is 12 deg. 15 min., and should be maintained in any stoning that might be necessary. This should require very little other than to polish this surface.

The sear (see figure 7) must move freely on its pin in the trigger. The sear pin is .072" in dia. and is staked in position in manufacture. It should be removed only when necessary to repair or replace some part. Assemble the parts in the trigger group and cock the hammer and then check the trigger pull (3 1/2 to 7 1/2 lbs. in the hands of troops). Note that the first movement of the trigger or slack, is the moving of the trigger off of its surface on the hammer. This is about a distance of .03" to .035", or at the time the sear comes in contact with the hammer. The movement from this point on is actual trigger pull. This pull is the combined friction between the trigger and the hammer, with the spring load of the hammer spring being added. This is through the medium of the sear as it rotates on its pin in the trigger. It can be readily seen why it is necessary for these parts to move freely and without any rough surfaces; this would affect the smoothness of the trigger pull.

This completes the articles on the U. S. Rifle, cal. .30 M-1. There are points that have been overlooked in this article. The Small Arms Section would appreciate having the men in the field bring these points to light so that they might be discussed in later copies of THE ORDNANCE SERGEANT.

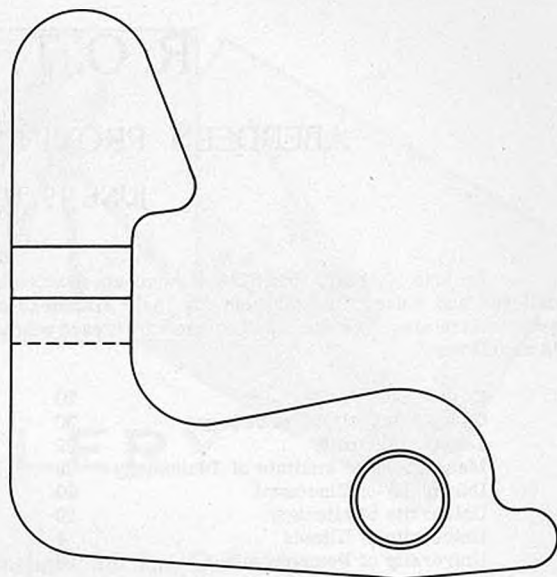


Figure 7

★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★

KEY WEST BARRACKS

(Continued from page 3)

the enclosure by dropping down from the gallery roof, and would be encountered by musketfire from the galleries and the tower, gunfire from the flank defense howitzers, and grenades and other materials thrown from the top of the tower.

Round towers of somewhat similar construction had been used at numerous places in Europe, but the Martello towers of Key West differed from those of Europe in that they were square instead of round, (see figure 5) and in that elaborate arrangements for land defense, and casemated seacoast batteries, were added. They are believed to be unique in military architecture.

Sixty miles to the west, on Dry Tortugas, is what remains of Fort Jefferson. It is hexagonal in shape and is made of brick and concrete construction. Fort Jefferson is of more interest historically than in a military way, principally because of one prisoner who was confined there until his death. When President Lincoln was assassinated in 1865, his murderer, John Wilkes Booth, fled to the interior of Virginia. During his flight he broke a leg, injured when he leaped from the stage of Ford's Theater in Washington, and was treated by a Dr. Mudd. Dr. Mudd was later tried and convicted on a charge of aiding Booth in his escape, and was confined at Fort Jefferson. During his confinement yellow fever broke out among the marines and artillerymen stationed there and the commander released him from his dungeon so that he might care for the men.

At that time he immediately ordered some of the structural pillars removed so that pure air could improve the poor ventilation of the living quarters. Possibly it is because of this change in the makeup of the fort that one corner of it has been settling for a number of years. Dr. Mudd finally contracted yellow fever himself, and died in confinement.

All the armament at Fort Jefferson was removed in 1895, and it was soon allowed to fall into ruin. At present it is being restored as a site of historical value, and the potential defense value of the site is becoming apparent. Nearby keys may be converted into landing fields, supply bases or anti-aircraft stations, and light naval craft can enter the adjacent waters.

The nerve center of these defenses of Key West is Key West barracks within the city itself. It is a station of interest, but one not entirely desirable from the viewpoint of the soldier, because of the low altitude, the extreme dampness and the high salt content of the air. It has many peculiarities, of course. For example all the fire wells of the city and of Key West barracks are filled with salt water. These wells are sunk into the ground to a depth of about fifteen feet, and the tide rises and falls within them. All drinking water on the island is cistern water. The sewer flushing system uses salt water. The Navy is contemplating the installation of an 18-inch pipe line from somewhere in the vicinity of Homestead, Fla., to Key West, a project to cost three million dollars.

R. O. T. C. CAMP

ABERDEEN PROVING GROUND, MARYLAND

JUNE 19 TO JULY 30, 1941

On June 19, 1941, 156 R.O.T.C. students from eight colleges and universities arrived for their six weeks of practical training. The number of students from each school is as follows:

Cornell University	20
Georgia School of Technology	30
Lehigh University	29
Massachusetts Institute of Technology	29
University of Cincinnati	20
University of Michigan	19
University of Illinois	4
University of Pennsylvania	5

These students are juniors and seniors. The seniors have already completed their college work, and when the six weeks training period is successfully completed they will be appointed 2nd Lieutenants in the reserve corps and after a short period will be ordered to 12 months extended active duty in the Ordnance Department. These orders are expected before completion of camp, and about 50 2nd Lieutenants will report to the Ordnance School to receive specialized training in various branches of the Ordnance Department. These young men just out of college are looking forward, with great enthusiasm, to going on active duty.

The following named officers have been assigned to duty at the R.O.T.C. Camp:

Brigadier General J.B. ROSE, Ordnance Department, Aberdeen Proving Ground, Md. - CAMP COMMANDER

Major Raymond O. Ford, Ordnance Department, Cornell University, Camp Executive Officer and Director of Training.



Back row, left to right: Maj. R. O. Ford (Cornell), Capt. W. E. Renner (Mich.), Capt. W. M. Barrows (Lehigh), Capt. A. D. Caswell (MIT), Capt. G. J. Giesler (Ga. Tech.), Capt. R. B. Alford (Ga. Tech.); front row, left to right: Lt. E. J. Raut (Cinn.), Lt. V. V. Vocelle (Ord. School).

Captain William E. Renner, Ordnance Department, University of Michigan, Assistant Executive Officer, Commander Co. "A" and Recreation Officer.

Captain William M. Barrows, Ordnance Department, Lehigh University, Commander Co. "B" and School Liaison Officer.

Captain Arthur D. Caswell, Ordnance Department, Massachusetts Institute of Technology, Commander Co. "C" and Range Officer.

Captain Garnett J. Giesler, Ordnance Department, Georgia School of Technology, Assistant Commander Co. "A" and Assistant Range Officer.

Captain Robert B. Alford, Ordnance Department, Georgia School of Technology, Assistant Commander Co. "C" and Assistant Recreation Officer.

1st Lieutenant Earle J. Raut, Ordnance Department, University of Cincinnati, Supply Officer, Transportation Officer and Assistant Commander Co. "B".

2nd Lieutenant Vernon V. Vocelle, Ordnance Department, O.T.C., Mess Officer and Assistant Supply Officer.

The camp was organized into three (3) companies with the above named officers in command. Student officers were assigned to each company thereby giving them excellent opportunity in handling the company and securing experience in order that they will be better qualified if assigned with troops when called to active duty. These student officers are detailed for one week only, in order to give each student an opportunity to command. The first few days were spent in organization, drawing equipment and receiving physical examination. Interesting lectures have been given the entire camp on Military Courtesy, Discipline, Organization of the War Department, and Organization of the Ordnance Department, the latter being especially of benefit in view of the fact that many changes have been made since the students studied the subject at their respective schools.

Among important subjects that will be taken up during the camp are Ammunition Supply, Small Arms, Depot & Supply, Artillery, Company Administration and Aviation Ordnance. These subjects are being taught by trained instructors of the Ordnance Training Center, and demonstrations are given which make for clearer understanding of the various subjects. Demonstrations and presence of Ordnance materiel have been lacking in most of the schools that the students have attended. Of special interest to the students will be firing the caliber .45, automatic pistol, since the majority of the students have not fired this particular weapon. It is expected that the largest majority will qualify

(Continued on page 57)



ARTILLERY

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

HISTORY OF THE DEVELOPMENT OF FIELD ARTILLERY MATERIEL

By: O. A. Ramnes, 2d Lt., Ord. Dept.

The following article is a continuation of the one which appeared in this space in the July issue.

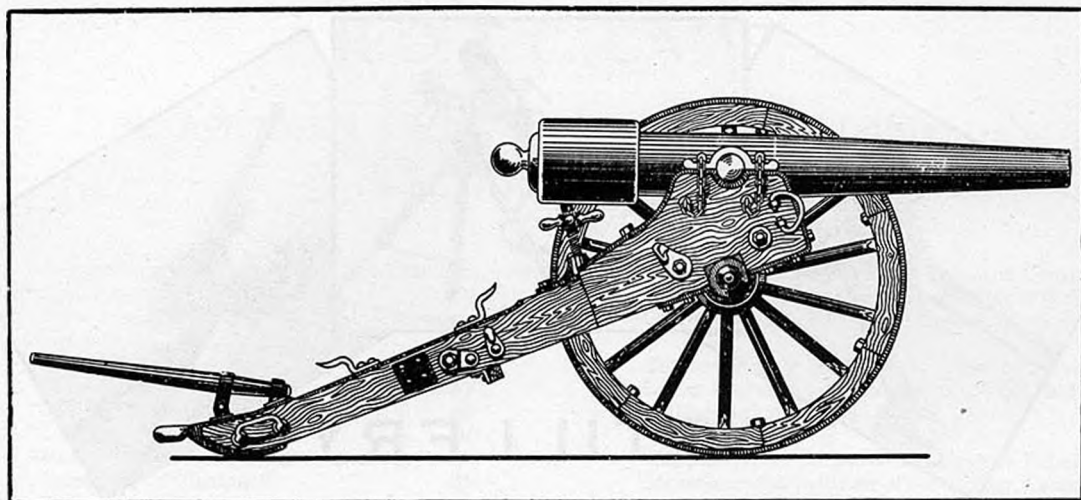
Experiments with rifling were still considered in its infancy, for the United States in 1857 adopted the 12-pounder Napoleon gun-howitzer, having a bore diameter of 4.62 inches. This weapon was a bronze smoothbore muzzle-loader, and was designed by Napoleon as a result of a demand for greater power in a field piece without additional weight. This weapon proved to be very valuable in the Civil War and remained standard in the army until as late as 1881.

By 1859, artillerymen the world over were convinced that cannon of the future would be rifled. France tried rifling their bronze cannon at this time but gave it up because the metal eroded too quickly. The United States, like most nations, had a large stock of smoothbore weapons on hand. The Ordnance Board was of the opinion that these could be converted into effective rifled cannon simply by rifling them. It was stated that the conversion would result in doubling the weight of the projectile, giving greater accuracy, effectiveness, and range, without an increase in the powder charge. Accordingly, in 1860, it was recommended that 50 per cent of the artillery weapons be rifled.² This conversion resulted in utter failure, as the guns could not withstand the increased pressures resulting from increasing the weight of the projectile.

In summarizing the late smoothbore period, which lasted a little over 200 years, we find that the smoothbore, muzzle-loading cannon reached the zenith of its development. So far as fire power and range were concerned, there was no appreciable advance over the guns of 1600,

but revolutionary improvements were made in mobility, organization, and tactical handling, enabling a more effective use of the available power. As a result, field artillery, under Gustavus Adolphus, and again under Napoleon, played a decisive role on the battlefield. This period saw gunnery and ballistics established on a scientific basis, and the organization of Field Artillery into an independent arm of the military profession. Toward the close of this period chemical and physical discoveries enabled improvements to be made on small arms which again placed field artillery at a disadvantage, and made imperative new and greater developments in cannon and ammunition.

During the years 1860 to 1897, great developments were made in small arms, resulting in a tremendous strengthening of the defense in combat. The artillery was again dethroned from its prominent place in fire power, to which it had been elevated by the great Napoleon Bonaparte. The tactics of Napoleon's time could no longer be employed. A preparation by massed artillery at close ranges became suicidal. The guns were forced to stand off at a greater distance, at which range their primitive ammunition was relatively ineffective. The defending infantry and artillery were therefore left practically intact to pour a devastating rifle and cannister fire at point-blank range into the assaulting infantry. This was the reason for the many bloody repulses in the American Civil War, such as at Fredericksburg, Gettysburg, and Cold Harbor. The records of the Civil War indicate that under the conditions prevailing, the smoothbores gave better results than the rifled pieces. The smoothbores of 6 and 12-pounder caliber fired a heavier charge of case shot than the smaller-caliber rifled guns, and in the broken, heavily wooded country where firing with direct laying had to be

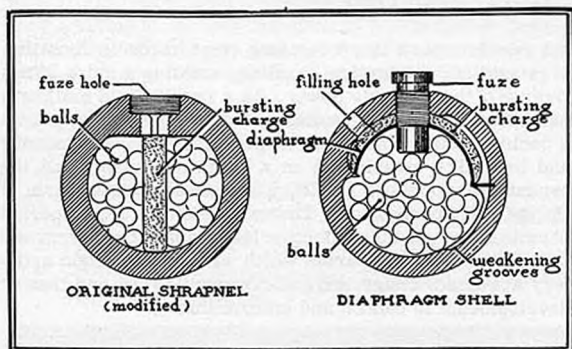


3-inch Parrott rifled gun, Civil War (1861-1865)

done at short ranges, the smoothbores were generally more effective.

A form of gas projectile called a "stink shell" was invented by a Confederate officer, but was not used because of its "inhumanity", and probably also because it was not considered valuable enough to offset its propaganda value

ity in small arms, the French were disastrously defeated. The German victory may be attributed primarily to superior Field Artillery. Although the French had actually a greater proportion of cannon per 1000 rifles than the enemy, their artillery was outpowered, outmaneuvered, and outfought. The Prussians used steel breech-loading rifled guns firing, at the rate of two rounds per minute, a percussion shell which broke into about 30 fragments. The French guns fired equally as fast, but the shell fragmentation was only half as effective as the German. The result of this war led to German military doctrines and materiel becoming the model of many nations for a number of years.



Spherical case shot (early form of shrapnel)

to the enemy. Camouflage and cover were more extensively employed than is generally believed, and even rough methods of indirect laying were used in stabilized situations.

In 1862 Professor Alfred Nobel started the manufacture of nitroglycerin explosives. By 1867 practicable time and percussion fuzes on modern principles had been introduced, and breechloading small arms using brass cartridge cases were being developed. Picric acid, which had been known to chemistry for 175 years, was at last utilized as an explosive mixture.

The Franco-Prussian War of 1870-71 found the Prussian Infantry using a rifle with an effective range of 700 yards, whereas the French had a more modern breech-loading rifle, effective at 1300 yards. France was also using a form of machine gun, but in spite of this superior-

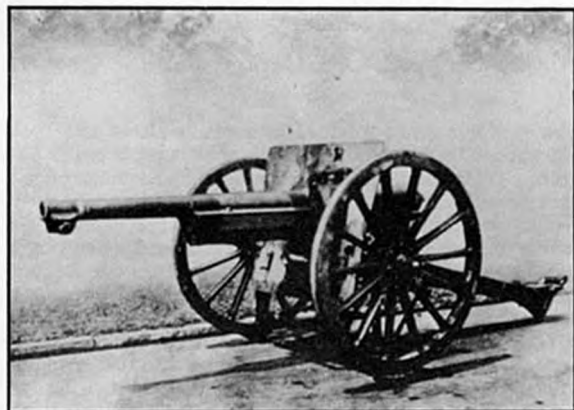
Following the Civil War, artillery development in the United States consisted of experimentation with pilot models. Many improvements were devised, such as moving the limber pintle to the rear of the axle to relieve the necks of the wheel horses of the weight of the pole; lowering the trunnions to improve traveling stability; increasing ground clearance; providing interchangeability of carriages. But the country was weary of war, appropriations were cut, and most of the projects were dropped.

In 1880, the American field artillery was still equipped with muzzle-loading smoothbores of Civil War vintage. However, there had been added a 1.65-inch steel breechloader for mountain use, and a 1.45-inch revolving steel cannon, both of Hotchkiss design. The .45-inch Gatling guns had also been adopted. Most of the heavy siege and seacoast ordnance had been converted into rifles by fitting them with wrought-iron tubes.

Smokeless powder appeared for the first time in a war between the Turks and the Russians, in 1877 and 1878. About 1880 steel began to displace cast iron for use in explosive shell. Segmented and ringed projectiles were tried and abandoned. In cannon construction, built-up steel construction, consisting of a steel tube with hoops shrunk on, was beginning to be predominant. In 1881, the rifled breechloader was at last recognized in the United States as the proper weapon for field artillery.

In summarizing the developments during the period from 1880 to 1897, the shortest but most fruitful period in the history of field artillery, we find the following outstanding developments: the replacement of smoothbore cannon by rifled pieces; the replacement of bronze, cast iron, and wrought iron by steel; the perfection of breech mechanisms; and the perfection of smokeless powder and high explosives. The muzzle-loading smoothbore finally went out of the picture after a reign of almost 700 years.

In 1897, the appearance of the famous French 75-mm gun ushered in a new era. An improved ammunition with a point-detonating fuze, fired to a maximum range of 6000 yards, was as important an innovation as the gun itself. At once all other field artillery became obsolete, and every nation set to work to redesign its materiel. The



75mm. gun, M1897 (French)

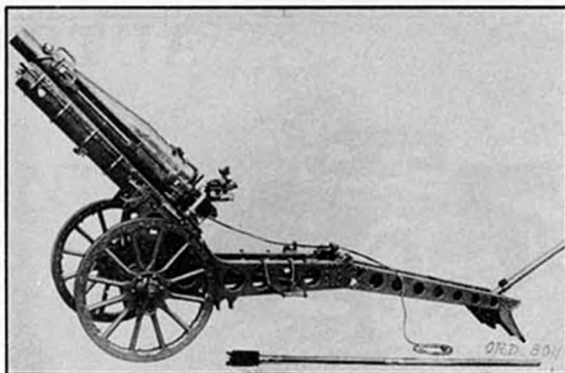
Introduction of this weapon, together with the new means of indirect firing technique, enabled the field artillery to again dominate the field of battle by fire power.

In 1898, the United States found itself engaged in a war with Spain before it had an opportunity to progress far with modernization of materiel. Our mobile land armament was decidedly antiquated. Spanish equipment, what there was of it, was more up to date. Fortunately, we had an overwhelming naval supremacy which prevented the movement of Spanish reinforcements to the theatre of operations. Land engagements were few and of such nature that field artillery was little used. A number of 2.95-inch mountain guns were purchased from Britain, which broke down into 4 pack loads for transportation. These weapons are still in active service with the Pack Artillery of the Philippine Scouts.

In 1902, our Ordnance Department designed a 3-inch field piece which was adopted and remained standard until the World War.

An important change in artillery organization occurred in 1907 when the field artillery was separated from the coast artillery. In 1908 experiments commenced with pack artillery design, culminating 17 years later in the 75-mm pack howitzer, M1.

The Russo-Japanese War of 1904 and 1905, showed to all nations the value of the howitzer, resulting in all European armies turning their attention to howitzers of calibers between 105 and 120-mm. By 1910, some sort of

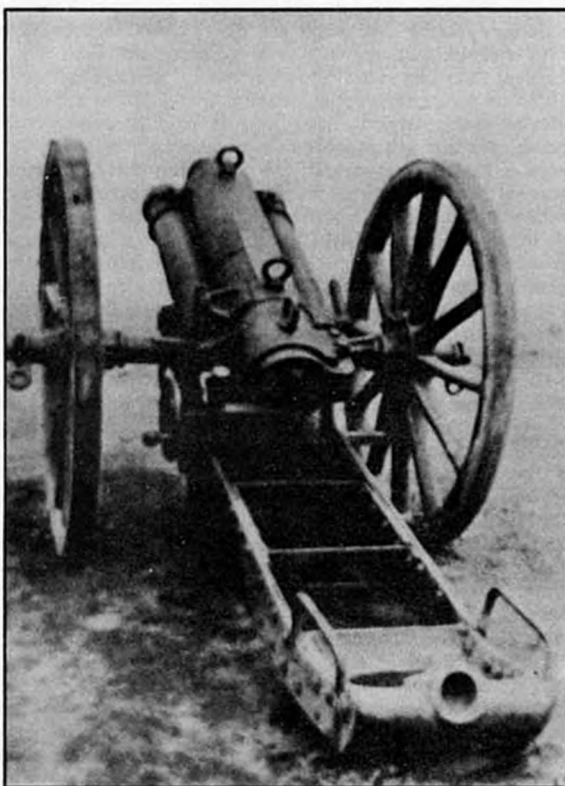


75 mm. Pack Howitzer, M1

light howitzer had been adopted in every country except France, which continued to experiment with them, but never went into quantity production, being convinced of the adequacy of their 75-mm guns.

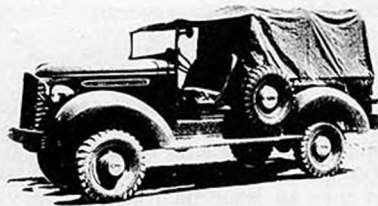
When the World War began in August, 1914, it found the British and German divisional artillery organized and armed along similar lines, although the German army contained more units. The proportion of cannon to infantry rifles was about 7 per 1000 in the German army. In the French army it was 4 per 1000, the same as in 1870. The figures show that the French were at a tremendous dis-

(Continued on page 61)



2.95" Mountain Gun

AUTOMOTIVE



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

THE STORAGE BATTERY

By: A. L. Hettrich,
2nd Lt., Ord. Dept.

Whether or not a battery is fully charged has a very definite effect on the charging rate required to charge the battery.

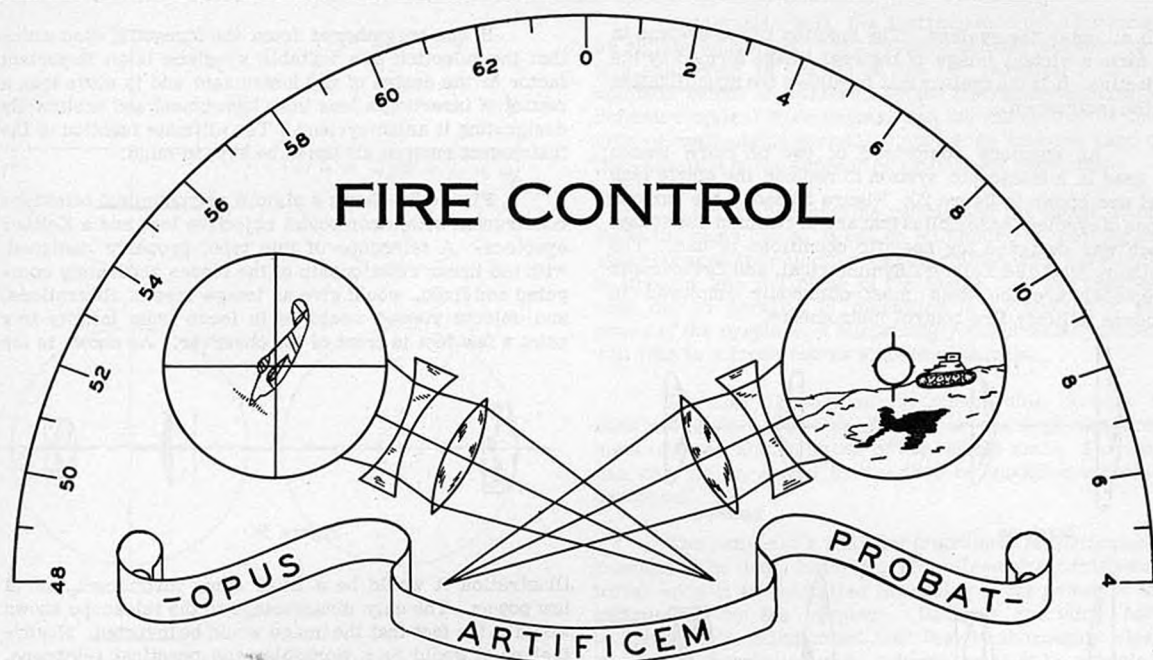
A short explanation of the action taking place within a battery during discharge and charge, and construction of a storage battery, will help to clear the need for a correct charging rate. The very name "storage battery" gives us an erroneous impression that a storage battery stores electricity. It does not. It only stores certain chemicals that are capable of generating electricity. The energy in these chemicals is converted into electrical energy by a flow of what we may say is, electrical energy between negative and positive plates immersed in an acid solution. To utilize this electrical energy however, we must have a closed circuit between the positive and negative posts of the battery. Such a circuit might be one that is completed through the starting motor, through the ignition system, through the lamp bulbs, etc. As long as a conductor is provided between the posts of the battery, the battery will generate electricity until the battery reaches a discharged condition. Without some means of conducting the electrical current between the positive and negative posts, there is no current flow.

As the battery is being discharged, the nature of the chemicals gradually change. The sulphuric acid disappears from the solution. The lead peroxide in the positive plates changes to lead sulphate. The sponge lead in the negative plates also changes into lead sulphate. Since lead sulphate and water are not capable of generating an electric current the battery is discharged or is commonly known as "dead." Charging is the reverse of discharging. Electrical current from the generator is sent through the battery in the opposite direction. That is, into the battery at the positive post, through the battery and out of the negative post. In doing so we convert electrical energy back into chemical energy which is actually stored in the form of our original chemicals to be used when we need it. The plates return to their original form. The positive plates

turn back into lead peroxide, the negative plates turn back into sponge lead and the sulphuric acid returns to our solution. (This solution is commonly known as electrolyte.) That is why the hydrometer readings rise as the battery reaches the fully charged condition. (The hydrometer is a device for measuring the specific gravity and weight, of a liquid.) As the sulphuric acid gradually enters the solution during the charging process the solution gradually becomes heavier, and the hydrometer readings rise. The opposite is true during discharge. As the sulphuric acid gradually disappears from the solution (it may be said that it unites with the plates to form lead sulphate), the weight of the solution gradually decreases and the hydrometer readings drop correspondingly.

Not only does the solution weight rise when the battery is being charged, but so does the terminal voltage (electrical pressure of the battery). This terminal voltage of the battery is the "pushing action" that the battery exerts in resisting further charge. We may say that as the battery charges, it becomes stronger and begins to assert its strength by resisting further charging. In a similar manner, a discharged battery being weak has a low terminal voltage and therefore resists charging a great deal less. Terminal voltage is measured across the battery posts during charging. It is normally 7.5 volts for a fully charged battery during charging. In a partially charged battery it is less and varies with the state of charge of the battery. The generator in charging a battery builds up enough voltage to overcome battery terminal voltage. The amount of voltage the generator builds up is dependent on the battery resistance itself and the resistance of the charging circuit. In the movable third brush type of generator, battery voltage acts to balance the generator voltage. The generator itself does not generate a high amperage rate at a low voltage and for the vehicles using a third brush generator it is generally quite satisfactory. So many electrical accessories have been added to the modern automotive vehicle that a generator that would generate a high amperage at a low voltage was necessary. This generator was designed and could develop 25 volts or more. Ordinarily generators never reach such a high voltage in a normal charging circuit. The low resistance in a normal charging circuit permits the current to flow at a normal voltage, that is, 6 to 8 volts. If the circuit should develop abnormally high resistance, however, the generator will

(Continued on page 53)



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

ELEMENTARY OPTICAL PRINCIPLES

PART 7

It has been noted that the telescope constructed in figure 20 would be useless for practical purposes. The simple lenses used do not provide a means of removing the aberrations that would be present. To correct this condition a lens system must be employed in place of each of the single lenses used. A lens system is so designed that when two dissimilar lenses are used in combination, the aberrations of one lens will be neutralized by the aberrations of the other.

The lens that is nearest the object is always called the objective lens. The purpose of any objective lens is to collect the light rays coming from the distant object, and form an image of that object. The objective lens is generally composed of two elements. These two elements comprise the lens system. The positive element is usually made of crown glass. The negative element is made of flint glass.

It is desirable to have the crown element exposed to the weather because it is of greater density, and consequently, of greater durability, than the flint element that is cemented to it. In small objective lenses the rear surface of the crown element and the front surface of the flint element are made with the same radius of curvature, so that they may be securely cemented together through the use of Canada balsam. This is a desirable procedure for military instruments, since there is then, little danger of the two elements changing their relationship. Any change in relative displacement would have an adverse influence on the accuracy of the instrument concerned.

In very large objective lenses the two elements are not cemented. As the two inner surfaces are larger, different radii of curvature can be given each element and better correction for aberrations thus secured. When it becomes necessary to construct a lens with the best possible correction three elements are used. Figure 32 shows the three types of objective lenses that have been mentioned.

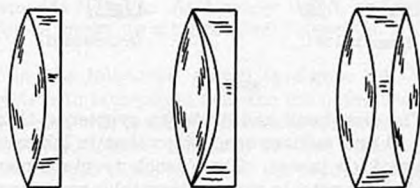


Figure 32

The single lens at the eye end of the telescope shown in figure 20 is also replaced by a lens system in a practical telescope. Again this is necessary to reduce to a minimum the aberrations that may be present. By using a lens system the field of view can be made sharper, and more clearly defined, the eye is better "accommodated" to the instrument, and the employment of different types of eyepieces allows a wider latitude of selection for instruments designed for different types of work.

The lens system that is nearest to the eye is one made up of the most important components of any telescope. It is usually composed of two or more lenses. When a lens system of this type is used, it is known as the "eyepiece". The lens that is nearest to the eye is called the "eyelens"; the lens in front of the eyelens is known as the "field" or collective lens. The eyelens is usually of the achromatic type. The function of the field lens is to bend the diverging rays of light so that they

will all enter the eyelens. The function of the eyelens is to form a virtual image of the real image formed by the objective. It is the eyelens that furnishes the magnification of the instrument.

An eyepiece comprised of two or more lenses is used in a telescopic system to replace the single lens that was shown in figure 20. Figure 33 shows the various types of eyepiece assemblies that are in common use today. Each was designed for specific conditions of use. The Kellner, Modified Kellner, Symmetrical, and Orthoscopic eyepieces are the ones most commonly employed in modern military fire control instruments.

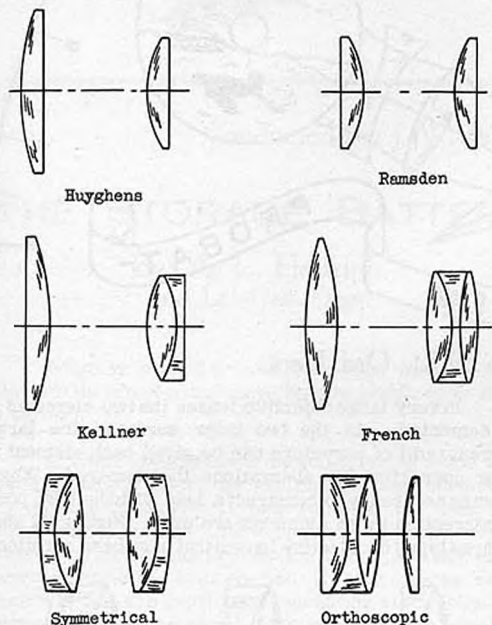


Figure 33

The Huyghens and Ramsden eyepieces illustrated in figure 33 are seldom used other than in laboratory instruments of low power. The French eyepiece may occasionally be met with in observation telescopes purchased from France during the last war.

The Kellner eyepiece is the standard eyepiece for the largest number of medium power instruments. In the modified form (indicated by the dotted line in figure 33) the field lens is a double convex lens, instead of the plano convex in the standard Kellner.

The Symmetrical eyepiece is used in those instruments where the eye is held four or five inches from the eyepiece. The use of the symmetrical eyepiece in these circumstances makes the exiting rays appear to diverge from a point about eighteen to thirty inches in front of the eyepiece. Since these instruments are usually of the fixed focus type, the average eye has been the governing factor in the design of the symmetrical eyepiece.

The orthoscopic eyepiece is used on instruments of very high power where a maximum freedom from aberrations is desired. The word orthoscopic means "freedom from distortion", indicating the exact nature of this eyepiece.

It can be gathered from the foregoing discussion that the selection of a suitable eyepiece is an important factor in the design of any instrument and is more than a matter of inserting a lens in an instrument and arbitrarily designating it as an eyelens. The ultimate function of the instrument must at all times be kept in mind.

Figure 34 shows a simple astronomical telescope constructed with a compound objective lens and a Kellner eyepiece. A telescope of this type, properly designed, with the linear relationship of the lenses accurately computed and fixed, would give an image free of aberrations, and objects viewed would be in focus from infinity to a point a few feet in front of the observer. As shown in the



Figure 34

illustration it would be a fixed focus instrument, and of low power. The only disadvantage to the telescope shown would be the fact that the image would be inverted. Nevertheless it would be a workable, and practical telescope. The inverted field of view is no handicap in astronomical work, but is however, impractical, for military purposes.

RETICLES

A telescope designed for establishing a line of sight as a surveying instrument, a fire control instrument, or telescopic sight, is provided with a reticle. This reticle is commonly a piece of plane, parallel glass, with some sort of reference lines or scales etched upon the surface. In surveying instruments, where ruggedness of construction is of minor importance the reticle may consist of two crossed spider webs, fine wire, quartz fibre, etc. Since military instruments must stand the severe shock and vibration of every conceivable field condition the construction must be of a more durable type. Reticles used in fire control instruments are, therefore, etched upon the surface of a circular piece of optical glass which can be securely positioned in the instrument.

Under limited conditions a reticle may be a lens. In this case it would have to be a plano convex lens (if of the converging type) because the etched lines of the reticle must of necessity be placed upon a flat surface.

When placed in the instrument the etched lines must lie in the focal plane of the image of the object. If these lines were etched on a convex surface they would not be equally clear, since only a portion of the scale could be in the focal plane at any one time.

Since the reticle lies in the focal plane of the object, the markings of the reticle appear to be superimposed upon the target or image. There is no relative motion between the two.

The telescope with a reticle is superior to the open sight for three main reasons.

1. The magnification enables the target to be seen much more clearly than with an open sight.

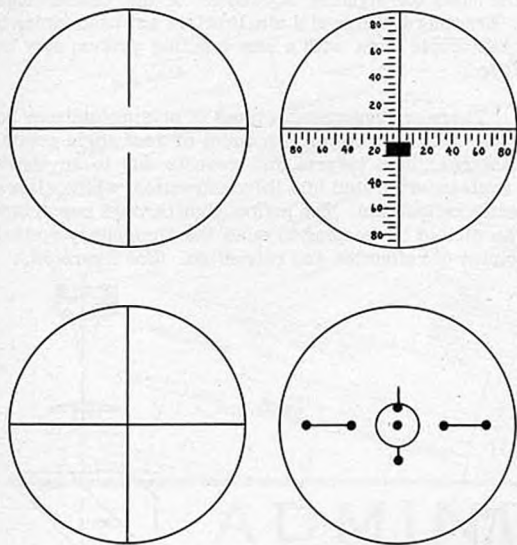


Figure 35

2. A much shorter sighting base is required.

3. Since the reticle and the target are in the same apparent plane, the eye of the observer accommodates for both simultaneously. This cannot be done with an open sight where the sighting reference mark may be three feet from the eye and the target at any range or distance.

Obviously from this it is apparent that the telescopic sight possesses a marked superiority over the open sight. Furthermore, the telescope can be designed if necessary in the nature of a periscope, to allow vision over the tops of trenches without exposing the observer to fire.

When a telescope is designed to merely establish a line of sight, the pattern of the reticle is usually simple. It may be a single horizontal or vertical line, or a cross lined pattern.

Since the apparent angular dimensions of the reticle remain constant, reticle scales represent a convenient method of measuring small angles. The angle subtended by any two points on the reticle is the angle, the tangent of which is d/f , where d is the linear distance between the two points in question and f is the equivalent length of the objective. This formula only holds true when there is no lens between the objective and the reticle, but is entirely unaffected by any changes in the optical system traversed by the light after passing through the reticle.

The various types of reticles in common use are shown in figure 35. These are reproductions of the reticles that are utilized in different military instruments.

If the adjustment of the telescope is incorrect, so that the reticle does not lie in the exact focal plane of the objective, there will be a relative motion between the reticle and the target, as the eye is moved from side to side before the eyepiece.

During this test, the instrument must of course, be rigidly supported. This relative shifting between reticle and target is said to be due to "parallax". It is a common defect encountered by the instrument section in defective optical instruments, and the correction of this type of malfunction should comprise an integral part of the education of the apprentice instrument repairman.

It arises because the reticle and the image do not lie in the same plane. It can be eliminated by altering the space between the objective and the reticle until the reticle is brought into the plane of the image. As any apparent shift due to parallax is magnified in proportion to the power of the eyepiece, a surprisingly slight maladjustment will lead to a troublesome amount of parallax.

Parallax is particularly undesirable because it does not allow a true line of sight, or accurate measurement of small angles by use of the reticle scale. Parallax can only be corrected in the shop by qualified ordnance personnel.

The reticle in a military instrument is particularly susceptible to dust, moisture, etc., since any foreign material upon it is magnified according to the power of the instrument, by the eyepiece. Reticles are very hard to clean yet it is important that they be thoroughly clean if efficient functioning of the instrument is to be expected.

ERECTING SYSTEMS

In fire control instruments it is essential that all telescopes show an erect image, since the observer must not be forced to devote a portion of his energy to the mental transposition of an inverted object. Consequently military instruments are always of the erecting type. That is, they contain an erecting system which reverts the inverted image formed by the objective, allowing a normal, erect field of view to be seen. As already noted, an instrument of this type is known as a terrestrial telescope.

If in the telescope shown in figure 34, another optical system is interposed between the objective and the eyepiece, which will revert the inverted image formed by the objective, the net result of the two inversions will be an erect image. This is one of the methods adopted in military telescopes. Either a lens or a prism system may be used as an erecting system.

A telescope in which a lens erecting system has been used to erect the image is shown in figure 36.

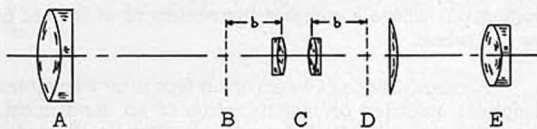


Figure 36

The objective A (see figure 36) forms an inverted image of the object at B. The lens erecting system at C is composed of two cemented achromatic lenses. It forms, at D, an image of the original image viewed at B. This final image is then viewed by the eyepiece at E. Often a plano-convex lens is inserted in the system in the neighborhood of B. This bends the outer rays proceeding from the objective in toward the axis so that they will pass

through the erecting lenses. It functions in a manner similar to that of the field lens in the eyepiece assembly. This serves to increase the field of view for a given diameter of the lenses of the erecting system. A reticle may be placed at either B or D, since both of these points are focal planes of the instrument, and the reticle would be equally distinct at either point.

It is much preferable, however, to place the reticle at B, as the objective and reticle then form a unit, and any shift of the erecting system does not disturb the line of collimation.

The objective and the eyepiece shown in figures 34 and 36 are the same in both cases and the scale of the two drawings is the same. The increase in length due to the use of the erecting system is unavoidable. When an instrument is held in the hand this is a disadvantage, as the increased length makes the instrument difficult to hold without vibration. If an attempt is made to decrease the length of a telescope of this type by use of an erecting system of very short focal length, excessive curvature of the field results, the border of the field is exceedingly blurred, and any advantage gained is nullified. For some instruments, the increased length due to the erecting system is an advantage. This is the case with all telescopes and periscopes built for periscopic purposes.

Where compactness is desirable a prism erecting system is employed. The prism erecting system, shown in figure 37, is the type employed in the field glass.

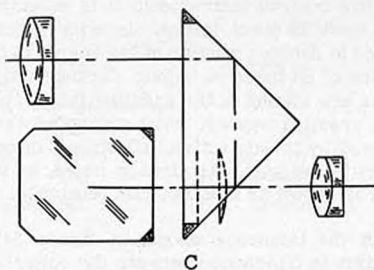


Figure 37

It will be noted that the path of light is doubled back upon itself twice (see figure 37), and it is by this means that compactness is achieved. In describing the lens erecting system, it was noted that such a system tended to increase curvature of the field. The prism erecting system tends to decrease curvature, and its use is therefore particularly advantageous where a compact instrument of wide field of view is desired.

A prism erecting system of any type in no way alters the optical qualities or magnification of an instrument. The reticle is placed at C (see figure 37) inverting telescope. If the line of collimation is to be preserved invariant, there must be no movement of the two porro prisms (see figure 37) as they are interposed between the objective and the reticle. If the telescope is to be mounted on the gun, as a telescopic sight, there is a real disadvantage, as the porro prisms are of an awkward type, and it is practically impossible to clamp them in such a position that they will not shift when the gun is fired.

Consequently, erecting systems of two prisms are

seldom used on sighting equipment of the on-carriage type. Erecting systems of a single prism are used instead; or a telescopic sight with a lens erecting system may be employed.

There are innumerable types of prisms that may be used for erecting systems. An amici or roof angle prism, for instance, both inverts and reverts due to an extra roof angle incorporated into its construction, which allows two extra reflections. The path of light through any prism can be plotted by keeping in mind the elementary optical principles of reflection and refraction. (See figure 38.)

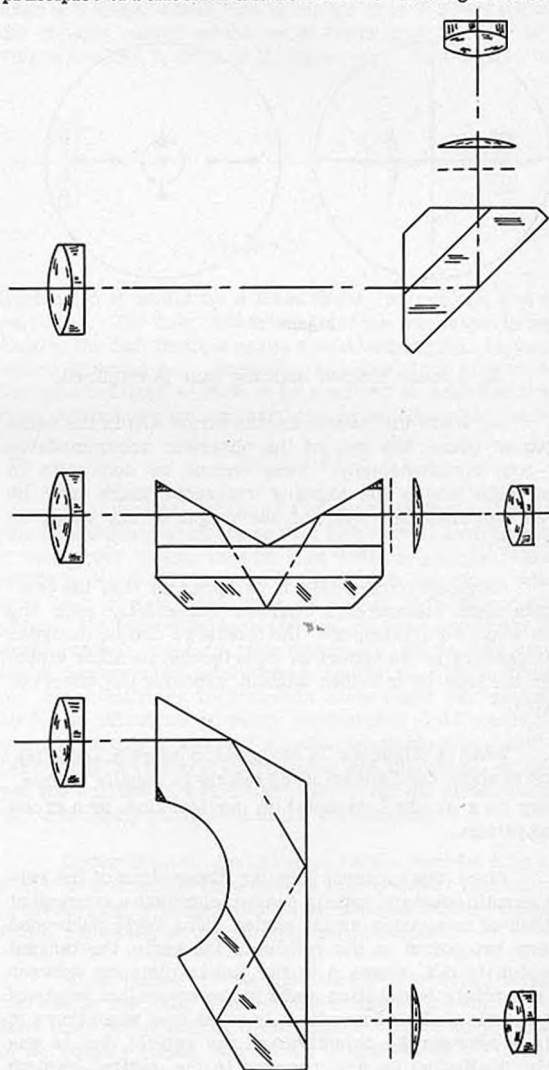
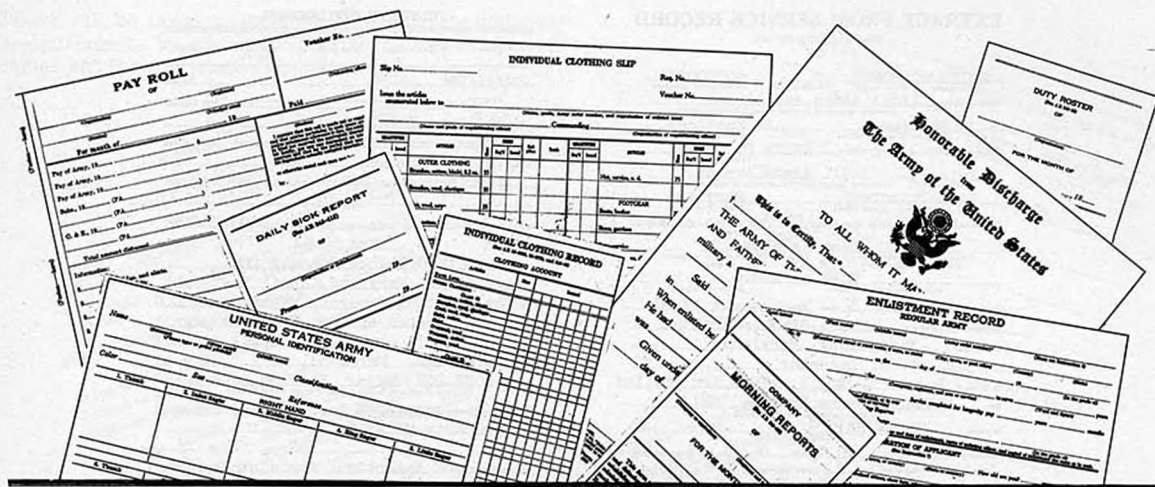


Figure 38

Summary

This concludes the series on the principles of elementary optics. Readers desiring more advanced information on any phase of optical theory are advised to consult suitable references obtainable at any library or

(Continued on page 68)



ADMINISTRATION

Conducted by: C. K. Harper, Master Sergeant, Ord. Dept.

ABSENT WITHOUT LEAVE AND DESERTION

1. When is a soldier deemed to be absent without leave (AWOL)? When is a soldier deemed to have deserted the service? What action must be taken when a soldier is absent without leave? What action must be taken when a soldier has deserted the service? These are four simple questions that do NOT have four simple answers. We shall take each of them up in turn and cover, in a logical sequence, the action to be taken and the forms to be completed in each case.

2. **ABSENT WITHOUT LEAVE (AWOL).** A soldier is deemed to be absent without leave (AWOL) whenever he absents himself from his organization or place of duty without proper authority or when he fails to report at the properly fixed time at a duly appointed place of duty.

3. **DESERTION.** A soldier is deemed to have deserted the service when he has left his organization or place of duty to avoid hazardous detail or important service. He may also be a deserter if he has gone AWOL and after a certain number of days the commanding officer, after careful investigation, rules that the soldier has no intention to return to regular duty. No time limit is placed by Army Regulations upon the length of time that a soldier may be carried as AWOL prior to changing his status to that of desertion. It is, however, customary, in the absence of any information concerning the man's status, as used to determine desertion, to carry the soldier for ten (10) days as AWOL and if he has not reported for duty within that time to drop him as a deserter.

4. **EFFECTIVE DATE OF DESERTION.** The actual effective date of a desertion is the date of the commencement of the unauthorized absence as shown on the Morning Report. Thus, when an enlisted man has been carried as AWOL for ten (10) days and action is taken to change his

status to desertion, the effective date of this desertion is the date of commencement of the AWOL and NOT the date upon which the action is taken to change his status from AWOL to desertion.

5. ACTION TO BE TAKEN AND FORMS TO BE ACCOMPLISHED IN CASE OF AWOL.

a. **Action.** An officer of the command must search for, secure, list, and properly safeguard all public property and clothing for which the absentee is responsible, including that which may have been left with the laundry or any other Government agency. (Par. 10, AR 615-290). Thus, the organization commander or an officer designated by him must take possession of all effects abandoned by the absentee. All government property issued for use of the soldier must be checked, missing items noted, and those found returned to organization storage. All clothing abandoned by the absentee must be listed, secured, and safeguarded by suitable organization storage pending return of the absentee or further disposition in case the absentee does not return to duty and is later dropped as a deserter. Uniform clothing and civilian clothing abandoned by the absentee should be listed, secured, and otherwise safeguarded separately. The reason for this segregation will be apparent under disposition discussed under desertion.

Immediate action should be taken to determine the cause or causes of the absence and collect all data relating to or bearing upon this absence for use at such time as the status of the absentee may be changed from AWOL to desertion. (Par. 6d, AR 615-300.)

b. **Forms to be accomplished.** In a case of AWOL only two (2) forms require accomplishment or entries made therein. These are the organization Morning Report and the Service Record of the soldier.

(1) **Morning Report.** In our organization morning report the organization commander must make an entry substantially as follows:

EXTRACT FROM SERVICE RECORD

(See Sec. III, AR 345-125)

OF

SMITH HOMER C 000000001
 (Last name) (First name) (Middle initial) (Army serial number)
 Home address 11011 Adams Avenue
 (Number and street or rural route; if none, no state)
 Baltimore Maryland
 (City, town, or post office) (State or country)
 Name and address of nearest relative ARLEN D. SMITH
 (Name) (Address)
 Father 11011 Adams Avenue
 (Relationship) (Number and street or rural route; if none, no state)
 Baltimore Maryland
 (City, town, or post office) (State or country)
 Person to be notified in case of emergency Same as above
 (Name)
 Same as above
 (Degree of relationship; if friend, no state)
 Same as above
 (Degree of relationship; if friend, no state)
 Age at enlistment, 21 yrs. 8 mos. Rate of pay per mo. \$ 30.00
 Accepted for service at Fort Blank, Maryland
 Enlisted at Fort Blank, Maryland on the
 5th day of December 1939
 in grade of Pvt. by ASA B. AARON, 1st Lt., Inf.
 for 150th Ordnance Company (MM)
 (Company, regiment, arm or service)
 to serve Three (3) years
 (Words and figures)
 Completed 0 years 0 months 0 days for longevity pay
 at enlistment. Has over 0 years' service.
 Grade Pvt. Specialist rating None
 Time last prior to the normal date of expiration of term of enlistment to be made good
 under 10th Article of War (here give inclusive dates of absence, number of days,
 and cause):
 Sentences by courts-martial:
 Confinement
 Forfeitures
 Detained pay
 Deduction for Class E allotment, \$ 4.08 per month.
 Deduction for Class D insurance, per month.
 PRIOR SERVICE
 None from 19 to 19
 (Co., regt., arm or service)
 Discharged as (Grade); character
 By reason of
 from 19 to 19
 (Co., regt., arm or service)
 Discharged as (Grade); character
 By reason of
 from 19 to 19
 (Co., regt., arm or service)
 Discharged as (Grade); character
 By reason of
 W. D., A. G. O. FORM NO. 25 8-5002
 January 1, 1952

CLOTHING SETTLEMENTS

Date	Due soldier	Due U.S.	Date entered on pay roll	Initials
12/31/39	4.56			HCA
Four				56 Dollars
6/30/40	10.67			67 Dollars
Ten				67 Dollars
9/15/40	14.99			99 Dollars
Fourteen				99 Dollars
				100 Dollars

2nd Ind.
 150th Ordnance Company (MM),
 Fort Blank, Maryland, April 11, 1941
 To The Adjutant General, Washington, D.C.
 This soldier deserted at Fort Blank, Md., April
 1, 1941, and left this organization April 1, 1941
 He was last paid to include March 31, 1941
 by JOHN DOE, Major, Finance Department
 (Name and grade of finance officer or agent officer, if any)
 Due United States: \$33.64 for lost and damaged
 property MR \$3.64
 Due soldier at date of desertion: for clothing not
 drawn \$14.99
 This soldier has not a Class E allotment running which has been deducted from
 his pay to include: 19 to 19
 This soldier has received a Class D deduction for Government insurance which
 has been deducted from his pay to include: 19 to 19
 His character is Poor
 Efficiency rating as soldier Satisfactory
 I have personally verified all entries in this indorsement.

WADE R. ROTH

(Name)

Capt., Ord. Dept., Pers. Off.

(Grade and organization)

REMARKS

Here will be shown such other entries not set forth elsewhere as may be required
 to make the extract complete as in the case of a soldier finally separated from
 the service.

Class "E" allotment in amount of \$4.08
 in favor of Belton Insurance Company,
 Belton, Ill., discontinued effective
 April 1, 1941. Form 30 mailed direct
 to Finance Officer, US Army, on April
 11, 1941.

Service record with inclosures transmitted to The Adjutant General
 by U.S. Mail April 11, 1941.

4 Inclosure (Individual clothing record. *Strike out words not applicable.
 2-5002

Report of Desertion, Form 44
 List of Clothing Left at Post.
 Evidence Gathered at Time of Des.

FIGURE 1

Pvt. SMITH duty to AWOL, 6:00 AM.

This entry shows the name of the soldier, the change of status from duty to absent without leave, and the time the absence began. The entire entry being on a particular line of the morning report, indicates the date in question. Should there be more than one soldier having the same surname in the organization, the initials of the soldier are added to indicate which is absent. In a case where two men of the organization have the same surname and same initials, the Army Serial Number of the absentee is added to the entry.

(2) Service Record. Two entries are required in the service record of the soldier. These entries are made by the Unit Personnel Officer (custodian of the service record). On page 7 of this form we find provided a space for entry of time a soldier is AWOL or in desertion. In the first column under "From" the personnel officer will enter the date upon which the absence of the soldier began as indicated in the morning report of the organization to which he is assigned or attached. On pages 13

and 14 we find a space for "Financial Remarks" where we also make an entry indicating the absence of the soldier, as this absence, if in excess of twenty-four (24) hours, will affect his pay even though he returns to duty before a charge of desertion is made against him. It is possible that some local form of a pay card may be used for payroll purposes, in which case, such an entry would also be made on that form for local use. (See Figure 1.)

6. ACTION TO BE TAKEN AND FORMS TO BE ACCOMPLISHED IN CASE OF DESERTION:

a. Action. All uniform clothing which was issued to the absentee for his use and abandoned by him will be turned over to the local Quartermaster for disposition. (This clothing was secured, listed, checked, and tagged with the name of the absentee immediately upon his becoming absent.) All personal clothing and effects are stored by the organization pending further disposition at a later date.

b. Forms to be accomplished. A total of from eight (8) to eleven (11) forms will require accomplishment.

These will be taken up individually to indicate their accomplishment, by whom accomplished, the number of copies and their ultimate disposition.

To be forwarded in triplicate No. _____

REPORT OF DESERTION

(See AR 615-300) 6241696

SMITH HOMER C. (Last name) (First name) (Middle initial) (Army serial number)

Private (Grade) 150th Ordnance Company (Company, regiment, and arm or service)

absented himself without proper leave on Apr. 1, 1941.

and is on this 11th day of April, 1941.

dropped as a deserter.

Witnesses as to charge of desertion:

Capt. HENRY C. ADAMS, Ord. Dept.

1st Sgt. WARD BURGESS, 150th Ord. Co.

Sgt. ALLEN T. SUMMERS, 150th Ord. Co.

The soldier is also charged with additional offenses as follows (give a summary only; if none, so state):

None.

Witnesses as to additional offenses:

None.

(Signature with grade and organization)

HENRY C. ADAMS, Capt., Ord. Dept.

Commanding 150th Ord. Co.

Place Fort Blank, Maryland.

W. D., A. G. O. Form No. 44

January 15, 1937

REPORTS AND RECORDS FORWARDED

Name	Number	These columns are for A. G. O. USE ONLY
Service Record	1	Missing papers called for
Individual Clothing Record	1	Receipt and disposition in A. G. O.
List of clothing left at post	2	To file
Evidence Gathered at Time of Des.	2	

Reason for not forwarding a required paper will be stated below:

* EXTRACT COPY OF MORNING REPORT OF—

150th Ordnance Company (MM)

(Company, troop, battery, or detachment) (Regiment or other organization)

Apr 1 - Pvt Smith duty to AWOL, 6:00AM-ECA.

RB

Apr 11 - Pvt Smith AWOL to Des. HCA

RB

150th Ord. Co. (MM) Ft. Blank, Md. Apr. 11, '41

(Complete designation of command) (Station) (Date)

I, HENRY C. ADAMS, Capt., Ord. Dept., certify

(Name, grade, and arm or service)

that I am the commanding officer of 150th Ordnance Company (MM) and official custodian of the morning reports of said command, and that the foregoing is a true and complete copy (including any signature or initials appearing thereon) of that part of the morning report of said command submitted at Fort Blank, Maryland

(Station)

for the dates indicated in said copy which relates to HOMER CARSON SMITH, 6241696, Private.

(Full name, Army serial number, grade, and organization of person referred to in extract copy)

150th Ordnance Company (MM)

(Signature)

HENRY C. ADAMS

Capt., Ord. Dept.

(Grade and arm or service)

* In case the Extract Copy of Morning Report is offered in evidence in a court martial, it must be detached from pages 1 and 2.

—open rear cover

(3)

Figure 2

(1) Morning Report. The organization commander must make an entry in the organization morning report substantially as follows:

Pvt. SMITH AWOL to des.

(2) Report of Desertion. W.D., A.G.O. Form 44. The organization commander must accomplish the report of desertion on the prescribed form in quadruplicate and furnish it to the Unit Personnel Officer for ultimate transmittal, in triplicate, to The Adjutant General, Washington, D. C. The quadruplicate copy is filed for future reference. (See Figure 2.)

(3) Individual Clothing Record. W.D., A.G.O. Form 32. The organization commander must check the original individual clothing record of the soldier to be sure it is complete and ready for forwarding. A true copy is then prepared and filed in the organization records for future reference. The original of this form is furnished the Unit Personnel Officer for ultimate transmittal to The Adjutant General along with Form 44.

(4) List of Clothing left at the Post. The organization commander prepares the list of the clothing left at the post for forwarding with Form 44. This list is ready at the time the soldier's status is changed from AWOL to desertion, as it was prepared immediately upon his becoming AWOL at the time of the inventory of effects abandoned by him. No form is provided for this list. It should be prepared on letter size paper in conformity with Army correspondence procedure as covered in AR 340-15 and forwarded to the Unit Personnel Officer in at least triplicate.

(5) Evidence gathered at Time of Desertion. The organization commander prepares a report covering the evidence gathered at time of the desertion as prescribed by paragraph 6d, AR 615-300. As no form is provided for this report it should be prepared in a manner similar to that prescribed above for the List of Clothing left at the Post. This report should likewise be furnished to the Unit Personnel Officer in at least triplicate.

(6) Service Record, W.D., A.G.O. Form 24. The Unit Personnel Officer checks the Service Record of the absentee to ascertain that it is complete in all entries and ready for forwarding. No addition or change can be made to our AWOL or desertion entry on page 7 as the soldier is as yet absent and the entry as already made, covers absence either in AWOL or desertion. The next numbered endorsement is accomplished, forwarding the Service Record to The Adjutant General, Washington, D. C. THE FINAL ENDORSEMENT IS NEVER USED FOR THIS PURPOSE.

(7) Extract of Service Record, W.D., A.G.O. Form 25. The Personnel Adjutant next fills out an extract of the service record on the form provided for this purpose and files it in his records for future reference. This form thus becomes the only remaining record of any of the entries in the service record of the soldier after the original service record is forwarded to The Adjutant General along with Form 44. (See Figure 1.)

(8) Supplemental Pay Roll, W.D. Forms 366 and 366a. The Unit Personnel Officer prepares a deserter's

supplemental pay roll on the usual form provided for pay rolls in order to show the accounts of the deserter in full at time of desertion. This pay roll is prepared in triplicate and is furnished to the local finance officer in duplicate. The triplicate copy is retained in the files of the Personnel Office. (See Figure 3.)

(9) Notification of Discontinuance of Allotment, W.D., A.G.O. Form 30. In a case where the deserter had an allotment or deduction of pay in effect at the time of desertion, the personnel officer accomplished the notification of discontinuance form in duplicate. The original of this form is forwarded direct to the Finance Office, U. S. Army, Washington, D. C., in the case of a Class "E" allotment and direct to the Director of Insurance, Veterans' Administration, Washington, D. C., in the case of a Class "D" deduction. The duplicate copy is retained in the Personnel Office files. (See Figure 4, page 38.)

(10) Report of Survey, W.D., A.G.O. Form 15. Where any articles of government equipment (as distinguished from uniform clothing) are found to be missing upon inventory of this equipment the organization com-

(Continued on page 37)

**SUPPLEMENTAL (DESERTER'S)
PAY ROLL**

OF
150th Ordnance Company (MM)
(Organization)
Fort Blank, Maryland
(Station)
For month of April, 1941.
(Month) (Year)

None
(Principal crime)
1941.
(Year)

Voucher No. _____
(Disbursing office)
Paid April 11, 1941.
(Date)

I CERTIFY that this roll is made out as required by Army Regulations, and that entries pertaining to each name are correct; that where rental and subsistence allowance is due, the soldier was not furnished ration in kind nor received the equivalent thereof in money; that neither he nor any one dependent on him has occupied quarters at the address shown. Except as otherwise stated each man was last paid to Mar. 31, 1941.
by JOHN DOE, Major, WADE R. ROTH, Captain, Ord. Dept.
PERSONNEL OFFICER
- (Witness the payment of this roll and that prior to the issuance of each man received the amount set opposite his name marked "Not paid.")

Page 2

NAME, PRESENT AND ABSENT, GRADE, AND SERIAL NUMBER	DATE OF ENLISTMENT	No. Yrs. Ser.	Spec. Rating	ALLOWANCES		DEDUCTIONS		
				Subs.	Qrs.	Gov't Ins. CL-D	Allotment CL-E	Gov't Laundry
1. PRIVATE.								
2. SMITH, HOMER C. 000000001 Last paid to include March 31, 1941 by Major JOHN DOE, Fin. Dept., Dec. 5, 1939. Fort Blank, Maryland. Deserted at Fort Blank, Maryland, on April 1, 1941. Due soldier at time of desertion: For clothing not drawn \$14.99. Due US Lost or Damaged property MR \$3.46.		0						
7. "I further certify that the employment of the persons named on the within pay roll is not prohibited by any provisions of law limiting the availability of the appropriation involved."								
8. WADE R. ROTH, Capt., Ord. Dept., Personnel Officer.								
9.								
10.								
11.								
12.								

Information: Ins. and a' \$ _____ Qrs. (P) \$ _____
Finance collect' \$ _____

Total amount disbursed \$ _____

(Station - here)

FIGURE 3



ORDNANCE FIELD DAY

By Major Lewis O. Heck, M. I. D.
Intelligence Officer

On Tuesday, June 24, 1941, the Ordnance Training Center presented an Ordnance Field Day in honor of the first thirteen maintenance companies to complete the prescribed course of study and organization in the new Unit Training Center and to become the first fruits of that institution. The Field Day consisted of an official inspection of the Ordnance Training Center in the progress of a normal day's routine. The inspection was made by Major General Charles M. Wesson, Chief of Ordnance; Brigadier General J. B. Rose, Commanding Officer, Aberdeen Proving Ground, Maryland; accompanied by Colonel J. S. Hatcher, Commanding Officer of the Ordnance Training Center and his staff. There were a number of distinguished guests in the party,



General Wesson and Colonel Hatcher

including Brigadier General James K. Crain, Chief of Ordnance Field Service; Lieutenant Colonel John B. Bellinger, Public Relations Officer; Major Wingate Reed, Chief of Military Personnel and Training Division; all from the Office of the Chief of Ordnance, and Colonel L. A. Codd, Secretary of the Army Ordnance Association.

There were in attendance also, representatives of the press and news reels: New York News, Associated Press, AP Wire Photo, United Press, Baltimore Sun, Baltimore News Post and Paramount News.



General Rose, General Wesson and Colonel Hatcher

General Wesson and his party from Washington arrived by automobile and were met at 10:00 o'clock in the morning by Colonel Hatcher at Perryman, Maryland, and escorted to Camp Rodman.

A second echelon of the official party arrived by train and were met at the railroad station by Colonel Bethel W. Simpson, Commanding Officer of the Replacement Center; Lt. Col. H. G. Stanton, Executive Officer of the Replacement Center, and Captain A. V. Dishman, Acting Executive Officer of the Ordnance Training Center.

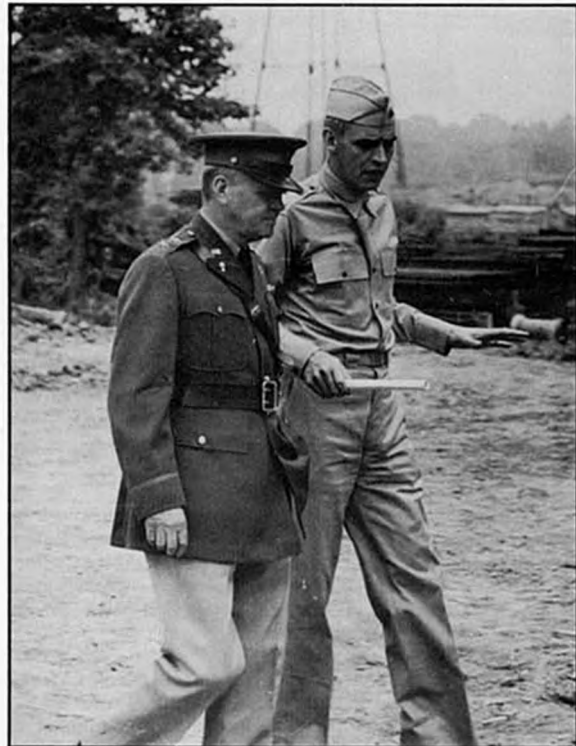
Members of the official inspection party, officers of the post, and invited guests, gathered at 10:30 A.M. at the starting point. After introductions and distribution of a printed program for the activities of the day, all were assigned to places in a long convoy of command cars with General Wesson, General Rose, and Colonel Hatcher in the first car, and the representatives of the press, writers and photographers in the cars at the end of the line. In addition to the printed program, each visitor was presented with a copy of the June issue of THE ORDNANCE SERGEANT.

The first thing on the program was a reviewing inspection of the Unit Training Center from the moving convoy, which passed down the main street of the Unit Training Center (past the drill ground). Here thirteen maintenance companies, which the next day left this station to take

their places with units in the field, stood at attention. Behind them, as a background, there stood long lines of Ordnance maintenance trucks and other paraphernalia appropriate to the function of medium, heavy and railway companies, which later in the day were to be inspected more closely.

Passing through the Unit Training Center, the convoy came next to the Station Hospital, commanded by Colonel D. L. Stewart. This is a 400-bed hospital, equipped to handle all types of medical and dental cases. From here the convoy proceeded to the Main Shop Building of the Ordnance School, of which Lieutenant Colonel George W. Outland is the Commandant.

Colonel Outland, being in California attending the army maneuvers, was represented by Major John D. Billingsley, Assistant Commandant and Executive Officer of the Ordnance School. It is the opinion of the writer that the Ordnance School, under the leadership of these two men, is one of the finest schools in the country, military or secular.



General Wesson and Major Billingsley

Here the convoy stopped and members of the official party went through the Ordnance School Shop Building where the students, commissioned and non-commissioned, and also specially qualified Selectees, were receiving technical instruction in Ordnance maintenance work. The R.O.T.C. students, now encamped at this station were attending a lecture in the theatre part of the Shop Building. Students were observed working at lathes, grinders and other machines in the Machine Shop; others in the Carpenter Shop were busy with various assignments, and still others were found

engaged in practical work on antiaircraft and fire control instruments. This Shop Building is one of the finest of its kind in the country, and has the most modern equipment.

From here the convoy proceeded to another section of the school area where are located the Assembly Building, and the Ammunition Building. In the Assembly Building the inspecting party witnessed group instruction, lectures, and demonstrations of various kinds. In the Small Arms Building they witnessed instruction in all types of weapons, from

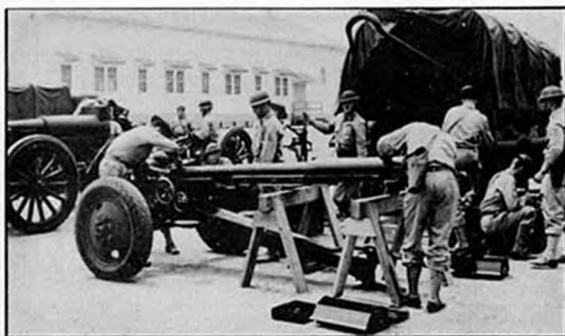
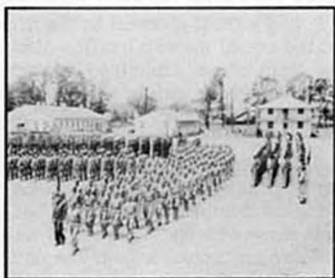
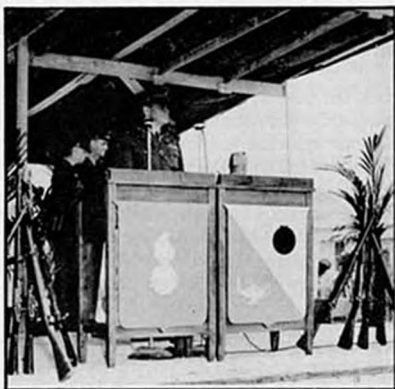


General Wesson tries the M1

pistols to the .50 caliber machine gun. Instruction of another group was in progress in the Ammunition Building. The instruction given here concerns identification, handling, storage and issue of all types of ammunition. The building itself houses a very complete museum assortment of all types of ammunition and bombs. This display is used in connection with practical instruction.

Leaving the school area, the convoy proceeded to the Ordnance Replacement Training Center, commanded by Colonel Bethel W. Simpson. The first exhibition was a gas chamber, where a group of men were being instructed in the use of the gas mask, and taught to protect themselves, and at the same time work effectively, while wearing a gas mask. Further along, the convoy passed a Tank and Automotive Repair Section, carefully hidden at the edge of the woods and camouflaged effectively behind a screen of leaves and branches. Mobile Machine Shops and Welding Trucks were to be seen as part of their equipment. A group of men, automotive students of The Ordnance School, were engaged in repairing a tank, working under open field conditions. Beyond this, light tanks were to be observed proceeding sometimes slowly and sometimes at full speed across the fields. This represented the final test given to serviced tanks before they are returned to the line of duty.

As the convoy proceeded it passed a Replacement Training Center Battalion in bivouac, with full field equipment displayed. This was a particularly fine display, emphasizing the fact that the Ordnance soldier's basic training is not overlooked, and that a selectee is first taught to be a good soldier before he is permitted to specialize as an Ordnance soldier.



Beyond this was the pistol range where a company of soldiers was engaged in practice. The ordnance soldier does not carry a rifle, and particular stress is placed on his ability in the use of the pistol.

Leaving the pistol range, the convoy turned back toward the camp and passed along the street where the great Ordnance Replacement Center instruction buildings are being constructed. There are two basic shop practice buildings and four others, devoted respectively to Munitions, Small Arms, Artillery Repair and Automotive Repair.

Turning sharply away from the camp again, the convoy proceeded through the woods to a place where an ammunition dump had been set up by the Ordnance School. Students were being given instruction in the placing of ammunition in strategic manner.

Beyond the ammunition dump and out of the woods, the convoy passed the Ordnance instruction testing ground, where all types of motor vehicles were being put through their paces by the students. It should be noted that the big Army trucks and rolling stock of various types cannot be handled efficiently without special practice and instruction.

As the convoy proceeded it came upon a tank demonstration by Ordnance School personnel, where several medium tanks were being put through their paces. The demonstration included several instances of one of these tanks running at full speed into one side and out of the other side of a wooden building which was utterly demolished without perceptibly interfering with the progress of the tank.



Utterly Demolished

By now the convoy was headed back again toward the camp, where it passed several training battalions of the Replacement Center engaged in infantry drill. Many of the men engaged in this drill demonstration were soldiers of but two weeks, and yet they gave an amazingly creditable performance. Beyond this and along the way, there was another battalion engaged in calisthenics. By this time, the convoy had returned to the Replacement Center, where it made a circumnavigation of the 6th Battalion Area of the Replacement Center, where we have in training approximately 1000 colored troops (Selectees).

Turning north into the area of the 1st battalion, the convoy stopped before the great 1,000-man mess hall, which has capacity to feed one complete training battalion at a time. Here all members of the inspecting party dismounted and took a 50 minute recess, during which they partook of

a most satisfying luncheon prepared in the kitchens of this great mess hall. After luncheon the kitchen itself was an object of inspection.

At one o'clock the convoy proceeded to the starting point in the Unit Training Center, where everyone dismounted and spent one-half hour making a close inspection of the superb, permanent shops of the Unit Training Center, where the maintenance companies which had been reviewed early in the morning were now engaged in their work. A piece by piece inspection was made also of the display of equipment of the 104th Ordnance Company MM (29th Division), which had come from Fort George G. Meade for the purpose of this demonstration.

The men who were observed at work and engaged in instruction were those who had received their basic training of thirteen weeks in the Ordnance Replacement Center and were then transferred to the Unit Training Center and organized into maintenance companies. Some among them are graduates of the Ordnance School Specialist Courses. The Unit Training Center is commanded by Lieutenant Colonel William I. Wilson, who is to be congratulated on the progress which these men have made under his command.

After leaving the Unit Training Center, the convoy proceeded again to the School Area, where a speaker's platform had been erected and proper microphone installation provided. Members of the inspecting party dismounted again, and stood at attention while General Wesson addressed more than 8,000 Ordnance soldiers who had gathered to hear him. General Wesson made a very brief but most excellent and appropriate speech. It was a great moment in his life, for he had just witnessed the actual materialization of his own "brain child" in the form of an effective Ordnance Training Center where the Army can obtain the greatest number of highly specialized, trained soldiers in the shortest possible time. As Chief of Ordnance, it was he who conceived and planned the Ordnance Training Center as a centralized command coordinating all facilities for receiving raw recruits and turning out complete Ordnance Maintenance Companies ready to serve with the Armies, as well as trained individuals as fillers and replacements for units in the field. At that moment General Wesson was addressing, on the field before him, more Ordnance soldiers than there were in the entire United States Army two years ago.

General Wesson expressed his enthusiastic approval of all that he had witnessed in the following words:

"Men of the Ordnance Department: I have long taken pride in the officers and men of our Ordnance Service trained for duty with the army in the field. Today my pride is greater than ever.

"I am thrilled by the performance which I have witnessed today, and I wish sincerely to congratulate every one who has had a part in it.

"You men will be the artisan soldiers of our victory!"

As this issue of THE ORDNANCE SERGEANT goes to press, information has been received that Colonel Julian S. Hatcher, Commanding Officer of the Ordnance Training Center, has been nominated Brigadier General by the President of the United States. THE ORDNANCE SERGEANT hopes for speedy confirmation of this nomination by the Senate, and all Ordnance Sergeants should join in this thought. But for the active interest and encouragement of Colonel Hatcher, THE ORDNANCE SERGEANT would not have become a reality. Our salute to General Hatcher.

FIGURE 6

POWDER FOR THE ARMY IN A HURRY!

by Mark S. Watson

Reprinted with permission of The (Baltimore) Sunday Sun Magazine.

When the Army Ordnance Department started production in the government's great powder works five miles from Radford, Va., late in March, the army's daily acquisition of powder, from all its sources, jumped something over one hundred per cent.

That is what this new source of 100,000 pounds a day provided at the outset. And by June even Radford's mighty output had trebled. Also by that time the army's second new plant, at Charlestown, Ind., started operation, and ultimate capacity there will considerably exceed that of Radford. And a third government financed plant, at Childersburg, Ala., was not far behind them.

All this may suggest, even to the layman, that the army is in great need of smokeless powder to fill the cartridges for rifles and machine guns and to supply the propellants for the artillery shells.

The need is admittedly great. At the end of 1918 we had very large powder production, but peace time needs for powder are small, and taxes on unproductive buildings are heavy, and so even the vast 1918 powder plant at Old Hickory, Tenn., which cost \$90,000,000, was dismantled years ago.

So were the others, and when we awoke in 1940 to the army's grave need for powder, there was a rush to order some. Only, instead of merely reopening old plants, we had to build plants all over again. Of these Radford's was the first to start production. And it started full three months ahead of construction schedule.

All this, and the efficiency with which the ordnance experts and the technicians of the Hercules Powder Company, which the government employed to build and operate the Radford plant (it employed the du Pont Company at Charlestown) has been recounted in the news columns. There is less familiarity with the job which is now being done -- the making of smokeless powder.

It is a wholly different process from the relatively simple one of making old-time black powder, achieved by mixing charcoal, saltpeter and sulphur, in almost the identical way the first Chinese experimenter employed a thousand years ago. That was a mere mechanical mixing.

Smokeless powder is mixed chemically as well as mechanically. The process has more than twenty steps, each one of them a little more perilous than the one before.

Yet despite the hazards which come from doing such things in large quantities, modern war calls for large quantities, and cannot be denied. Hence \$25,000,000 to build and equip this plant. Hence \$20,000,000 more to run it during its first year. Hence 21,000 men in the construction force, and 5,000 in the operating force. And hence enormous and unrelaxed safeguards.

Special clothing without exposed buttons. Shoes without nails, cement containing a conductor which absorbs any static electricity which may develop. Many small build-

ings instead of a few large ones, and wide dispersion of them all. Surrounding of each with earth filled walls, so that if there be an explosion in one, it will not spread to another.

What is the process by which smokeless powder is made? What are the raw materials? What does the plant look like? What are the reasons, indeed, for using smokeless powder instead of the familiar black powder?

To dispose of the last question first, we need smokeless powder partly because we do not wish the enemy to see a give-away cloud of smoke hanging above our carefully concealed forces, partly because the smokeless variety corrodes a gun barrel much less than does the other. A corroded barrel does not fire straight.

To be sure, corrosion is not eliminated altogether, for smokeless powder is not wholly smokeless -- nor is it a powder at all, but a grain, as will be seen.

What does the plant look like? It has two parts, first, the "cotton area," into which come the raw materials, and within which they get their early treatment, and, second, the "powder lines," where the process is finished step by step.

In the cotton areas the partly processed material is always in water suspension, and is not dangerous; so the buildings are fairly large and close together. As the processing proceeds, over in the "powder lines" the stuff becomes more and more dangerous, and the buildings are more and more dispersed, so that the plant looks less like an industrial factory than like a storage area.

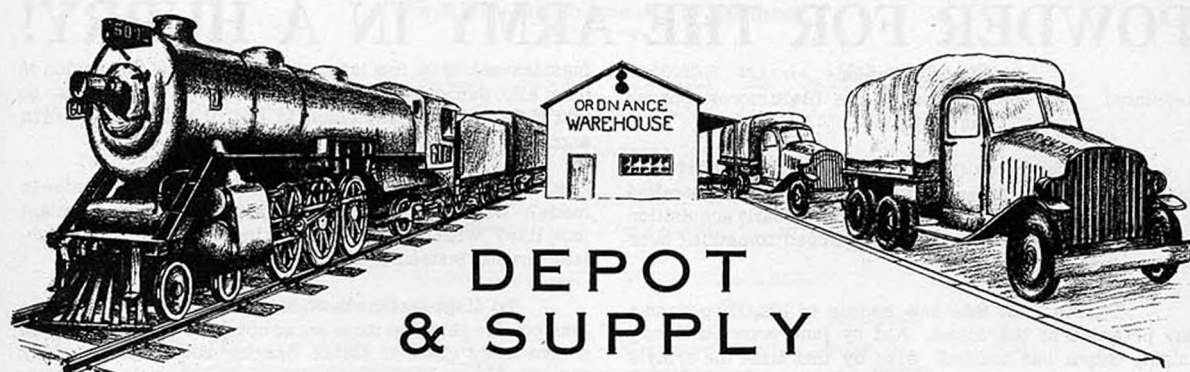
The chief raw materials are: 1, cellulose (from either cotton linters or from woodpulp, both of which are plentiful in the Radford area); 2, nitric acid (from ammonia, a chief component of which can be extracted from the air or, in this case, from nearby mountains of coal); 3, alcohol (which comes largely from molasses); 4, ether (largely from alcohol), and 5, sulphuric acid (from sulphur which is extracted from zinc and copper ores by the general chemical plant at nearby Pulaski).

Also water in huge quantities, for washing out some of the chemicals and being dried out in turn by them. Also, in the case of rifle ammunition, graphite, which makes the small grains pour smoothly and compactly and which, incidentally, provides the powder's black color -- cannon powder, it happens, is straw color.

Cotton linters (from which by other processes industry makes photographic film, rayon, cellophane, lacquer and an endless variety of plastics) are the short-staple cotton, wound tightly about the cotton seed, and in our less efficient days not used at all. They reach Radford baled, in bleached form, looking very much like surgical cotton.

The first step is to dry them by hot air blast. Then measured quantities are dumped into cooking vats, precisely timed with the right quantity of a mixture of water, sulphuric acid and nitric acid. It is the nitric which does the work, the water which provides fluidity, and the sulphuric acid which immobilizes the water.

(Continued in the August issue)



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

RECEIPT OF PROPERTY

The object of the Depot and Supply Section of THE ORDNANCE SERGEANT under this heading each month, is to endeavor to publish from the lesson material used by the classes, such lecture and reference matter which might enable Ordnance Sergeants in the field to follow along with our course at the Ordnance School as it progresses, and in this manner keep posted on such changes as might occur from time to time in the "Source of Information". It will be well to note in the previous issues of the ORDNANCE SERGEANT the sequence in which the articles have been presented.

In the foregoing articles you will note that property was requisitioned for and received. We will now take up the action of the receiving officer on the receipt of the property.

The first step in checking the receipt of property is to check the number of packages or bundles received as listed on the "Bill of Lading". The receipt of all the numbered packages as shown on the Bill of Lading indicates that the common carrier has turned over the complete shipment to us. If all the packages are not received as listed on the Bill of Lading, a prompt report will be submitted to the Quartermaster for notation on the reverse side of the Bill of Lading.

We will assume that all the packages as listed on the Bill of Lading have been received. The next step then, is to ascertain that the quantities of the articles received are as shown on the Shipping Ticket. In addition to checking the quantity of the property received, the method and completeness of the check must be sufficient to determine that the quality and condition of the property are in accordance with the information shown on the Shipping Ticket.

In checking our shipment we find what appears to be "Original Packages". Let us consider, first, what constitutes an "Original Package", and second, what latitude we are permitted in checking the articles enclosed in an "Original Package".

The term "Original Package" as used in property accounting regulations is defined as: "A package in the

original sealed container, that is, a trade package, as produced by the manufacturer; also a package which has been assembled, packed, and contents verified at a supply depot or arsenal. In either case, the package in question must contain only one kind of an article, as distinguished from a container in which miscellaneous articles are packed for convenience in shipment." The component articles comprising a standard assembled unit of equipment, such as a "Chest, Arm Repair", when shipped as a complete unit, may be considered as one article. Each package must have printed, stenciled, or otherwise permanently affixed on the outside thereof a list showing the quantity and description of the contents and designation of the manufacturer, supply depot, or arsenal, by which packed. It must have been received by the receiving officer with the seals or protective fastenings applied by the supply officer or manufacturer unbroken and with no evidence of having been tampered with.

From the foregoing it should be noted that articles packed for shipment at a post, camp, or station, even though fulfilling all the requirements of an "Original Package", that is, containing only one kind of article, seals and fastenings intact without evidence of having been tampered with, and information stenciled or printed on the outside of the package showing the amount and description of the articles in the package, cannot be classed as an "Original Package" for the reason that the regulations specifically state that the package must have been packed by the manufacturer, supplying depot or arsenal.

Original packages will not be broken until issues are to be made, or until our stock of this particular item on our warehouse shelves is about to be exhausted. Therefore, in checking the property we receive against the amount and quality shown on the Shipping Ticket, we take the amount and description of the articles packed in original packages from the stenciled or printed information shown on the outside of the package as the correct amount and description, and check these articles as "received" without opening the package to verify the amount and description of the articles contained therein.

However, when opening an "original package" the first time, to make issues therefrom, the contents of the package, as to amount, quality and condition will be verified. The verification of the contents of the original pack-

age at this time will be witnessed by a commissioned officer, either the accountable officer or by one of his commissioned representatives, and at least one other person, generally the chief storekeeper of the warehouse in which the original packages are stored. In case of deficiency or damage, persons present when the package is opened will make and file in the office of the accountable officer sworn statements in writing (certified statements in the case of officers) showing the facts disclosed by the verification, including a record of the markings on the outside of the original container sufficient to identify it and the designation of the consignor, if available. The packing slip found in the container will also be attached to the statements. These statements are used for the purpose of presenting evidence to be attached to a Report of Survey upon which the accountable officer will rely for favorable action by the appointing authority for relief from accountability and responsibility for any discrepancies discovered on a physical check of the property contained in an original package from that shown in stenciled or printed matter on the outside of the package.

Assuming that all the articles listed on the shipping ticket in the column "shipped" are received, the receiving officer will sign the acknowledgment of receipt on the copy of the shipping ticket, "Articles listed in column 'shipped' have been received". He then returns to the shipping officer this signed copy of the shipping ticket, covering this shipment. The shipping officer then uses this signed copy of the shipping ticket as a voucher to his stock record account and drops the property listed thereon from his stock record cards.

The receiving officer will use the other copy of the shipping ticket he received from the shipping officer as a voucher to his stock record account and pick the property up on his stock record cards.

Should any discrepancies occur in the amount of articles actually received and the amount shown on the Shipping Ticket, the receiving officer will modify the statement of receipt of property on the bottom of the shipping ticket, by adding the words "except as noted", and an "Over, Short and Damaged Report", WD, QMC Form No. 445, will be prepared, listing the articles short as ascertained by the actual count and the amount shown on the shipping ticket.

Two copies of the "Over, Short and Damaged Report," showing the shortages in the shipment are then forwarded to the shipping officer with the signed shipping ticket, and one copy is retained by the receiving officer. The shipping officer either approves the OS&D Report, or disapproves it, and forwards the original copy back to the receiving officer. If he disapproves the OS&D Report, he forwards affidavits to the receiving officer and certifies of the persons who prepared the shipment at his station, assuming that the shipment was as shown on the shipping ticket. These affidavits and statements are used by the receiving officer as evidence to be attached to a Report of Survey covering the shortages in the shipment.

There are certain exceptions to the foregoing where the shortage in the shipment is not greater than a certain specified value, which will be taken up in a future issue under the heading "Reports of Survey".

In the event no shipping ticket is received within

a reasonable time to cover the property we have received, we will list the property received on an "Over, Short, and Damaged Report", as "over" with explanatory remarks. The OS&D Report will be prepared in quadruplicate, one copy assigned a serial voucher number and the property picked up on the receiving officer's stock record account, one copy is sent to the Corps Area Finance Officer in the Corps Area in which the receiving officer is located, and two copies forwarded to the shipping officer.

Should property, which is shipped in accordance with War Department orders or other competent authority, be found, upon receipt at destination, to be in an unserviceable condition, a surveying officer will be appointed to make a thorough investigation of all the facts, and where the evidence clearly shows that the unserviceability of the supplies should have been evident at the time of shipment, and that the shipment of such supplies was due to the failure of the shipping officer to make proper inspection, the responsibility will be fixed. If the evidence discloses that the shipping officer made the prescribed inspection in good faith, a manifest error of judgment or difference of opinion will not alone be considered sufficient grounds for fixing responsibility for the cost of transportation upon the shipping officer.

After receipt of the property and the shipping ticket covering the shipment of the property has been received, it is imperative that the receiving officer makes receipt of the property in the shortest practicable time, and forward to the shipping officer a signed copy of the shipping ticket, listing the property received. If we will only place ourselves in the position of the shipping officer for the moment, we can readily understand the reason for returning, with the least delay, the signed copy of the shipping ticket. It is quite possible that the shipping officer may have a hundred shipments of property in a given period of time. Let us suppose that this is a month and that he did not receive signed shipping tickets back except when the receiving officer was in the mood to accomplish the shipping ticket on which he had received the property. Multiply this shipment to you by one hundred, and you can readily visualize the condition of the shipping officer's stock record account as compared with the property he has remaining on hand.

And then suppose the auditor comes to audit the shipping officer's account, and all these shipping tickets have not been received back and filed in the voucher file. In this case the vouchers are "suspended" and report is made by the auditor. Then to remove these vouchers from the "suspended list", it is necessary for the shipping officer to initiate correspondence with the Corps Area Auditor's office when you finally return a signed shipping ticket to his office. Therefore, good business practice dictates that we return signed shipping tickets to the shipping officer as soon as possible after the receipt of the property, even though it were not required by mandatory provisions of Army Regulations.

All shipments of property to a post, camp or station, will be shipped to the proper supply officer at that station; that is, ordnance property will be shipped to the ordnance property officer; engineer property to the engineer property officer; quartermaster property to the quartermaster, etc. However, at times shipments will be received by an ordnance property officer for property that is to be reissued to a regiment, battalion, or other organization at our station.

Regulations provide for the elimination of the requirement for us to pick this property up on our stock record account, and then ship it to the unit supply officer, and on receipt of a signed shipping ticket from him, to drop the property from our stock record account.

First, let us take an example of the receipt of non-expendable property shipped to us that is intended to be re-issued to an organization at our station to complete the allowances that the organization is authorized by Tables of Basic Allowances. On receipt of this property we immediately turn the property over to the regimental or other unit supply officer, and prepare a new shipping ticket listing the property as shown on the shipping ticket on which we received the property. After check of the property by the unit supply officer, he will sign one copy of this shipping ticket and return it to our office. We will then have our ordnance property officer sign the shipping ticket on which we received the property, send one copy to the shipping officer and file the other copy in our voucher file. We will also place the signed shipping ticket in our voucher file, on which the unit supply officer made the receipt to us for the property. We will then cross index the two shipping tickets; that is, the one on which we received the property and the one returned to us by the unit supply officer to show the cross references. Say, for example, that we assign voucher No. 17 to the shipping ticket on which we received the property and voucher No. 24 to the shipping ticket that the unit supply officer returned to us. Then on voucher No. 17 we would place the remark "See Voucher No. 24", and on voucher no. 24 we would place the remark "See Voucher No. 17". The property is not picked up on our stock record cards for the reason that the incoming shipment is balanced by our outgoing shipment, and in this manner all the work of posting both shipments to our stock record cards is eliminated.

In the case of expendable property received by us and intended for reissue to an organization at our station, it is not necessary to prepare a shipping ticket covering the re-shipment of this property. First, we accomplish the shipping ticket on which the property was received, and return it to the shipping officer. Then on our retained copy of the shipping ticket we would obtain receipt for the property from the unit supply officer. After this has been accomplished, we give this copy of the shipping ticket the next unused serial voucher number and file it in our voucher file. As you see, like the re-shipment of non-expendable property, the postings of the incoming shipment and the postings of the outgoing shipment to our stock record cards, in addition to the necessity for preparing a new shipping ticket, is eliminated for the re-shipment of this class of supplies.

★★★★★★★★★★★★★★★★

How many of you Ordnance Sergeants understand the procedure involved in arranging the manufacture of the materiel you maintain? What is the purpose of the Ordnance District? How does it accomplish its mission? What are educational orders? What is meant by procurement planning? These questions will be answered in the August issue of THE ORDNANCE SERGEANT in a series of articles which will help round out your general knowledge of the Ordnance Department.

COMMENDABLE FORESIGHT

During the visit of the Chief of Ordnance to the Ordnance Training Center on June 24, 1941, several realistic demonstrations were staged. During one of these, several wooden construction buildings were used to demonstrate the use of tanks for purposes of destruction.

Shortly before the demonstration was to take place, Captain Keith T. O'Keefe, Ordnance Department of the Ordnance School, decided to inspect the buildings to be destroyed. His inspection disclosed three negro laborers sleeping in the buildings, and saved them from serious injury or possible death.

In a letter of commendation written to Captain O'Keefe, Colonel J. S. Hatcher, Commanding Officer of the Ordnance Training Center, wrote:

"The above action indicates a high degree of precautionary action which is commendable in every officer, and especially those officers assigned to the Ordnance Department."

★★★★★★★★★★★★★★★★

A CORRECTION

The June issue of THE ORDNANCE SERGEANT contained an article titled "Responsibilities of Army Ordnance Ammunition Companies". One paragraph of this article was in error, and we hasten to correct it.

Page 259, paragraph 5. A part of this paragraph reads:

The ordnance personnel of the ammunition depot is so assigned as to control and supervise properly the receipt, storage, and issue of ammunition. The labor is furnished from the ordnance ammunition company. It is usually obtained through the general staff from the quartermaster service organization.

It should read:

The ordnance personnel of the ammunition depot is so assigned as to control and supervise properly the receipt, storage, and issue of ammunition. Normally, the labor is furnished by the ordnance ammunition company. When necessary, additional labor is obtained through the general staff from the quartermaster service organization.

★★★★★★★★★★★★★★★★

Questions have been asked about the preparation of the "Status of Stock Report" and THE ORDNANCE SERGEANT will offer information and advice on this form in the August issue.



THE ORDNANCE SHOP

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

THE MEDIUM MAINTENANCE COMPANY -- ITS MISSION AND ORGANIZATION

HEADQUARTERS AND SUPPLY SECTION

The Headquarters and Supply Section is organized to accomplish its two missions; i.e., military administrative control of the company and technical administrative control of its shops, in the following manner:

1. Company Commander - Captain

Duties include:

- Preparation of plan of operation for company.
- Preparation of schedule for inspection of ordnance materiel in the hands of troops.

2. Officer in charge of Headquarters and Supply Section - Second Lieutenant.

Duties include:

- Supervision of military and technical operations of the section.
- Supply officer.
- Personnel officer.
- Transportation officer.

3. First Sergeant.

Duties are those normal to first sergeants, such as military training and discipline of personnel, preparation of sick and morning reports, duty roster, etc. A private is assigned to assist him as an orderly.

4. Shop Foreman - Master Sergeant.

As shop foreman this master sergeant must supervise the keeping of all records of technical work done by the company, assign work to the various sections, and exercise general supervision and control of all sections. He should have a general knowledge of the easiest procedure for inspection and maintenance of all ordnance materiel serviced by his organization, and is responsible for the technical training of shop personnel. A private is assigned to assist him as a messenger.

5. Receiving and Shipping Clerk - Military (Staff Sergeant when company is acting alone, Sergeant when company is assigned to an Ordnance Battalion.)

In addition to the normal supply sergeant's duties of handling supply of all clothing and equipment for personnel of the organization, he keeps the records of ordnance materiel assigned to the company. As an assistant he has a private.

6. Mess Sergeant and cooks - Sergeant and 4 Privates.

Duties are those normal to mess personnel of all organizations.

7. Receiving and Shipping Clerk - Technical (1 sergeant, 1 corporal, and 3 privates).

Maintenance of stock levels of ordnance materiel, requisition, receipt and issue of stock and materiel, and maintenance of shop records are the primary duties of these men.

8. Truck Master - Sergeant.

This sergeant is responsible for the maintenance of all automotive equipment assigned to the section, and is in charge of all transportation assigned to the company. His duties include those of a dispatcher. As his assistants, he has three privates.

9. Company Clerk - Corporal.

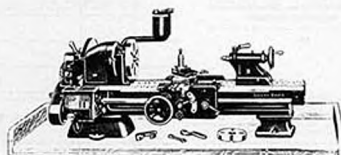
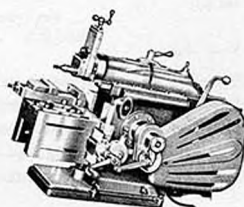
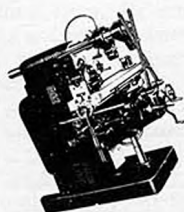
This man, while responsible for the care of all personnel records of the company, is assigned to the Unit Personnel Section of Special Troops or the battalion to perform these duties. When he is not working on personnel matters he performs administrative clerical duties for the company.

SERVICE SECTION

Essentially, the prime function of the Service Section is the accomplishment of all work the other sections of the company are not equipped to perform. A second lieutenant is in charge of the section and usually also acts as a mess officer.

The other personnel and their duties are as follows:

THE MACHINE SHOP



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

TRAINING THE ORDNANCE MACHINIST

The purpose of this article is to outline in brief, and describe the technique and methods used at the Ordnance School in training an unskilled man to perform the duties of an ordnance machinist.

The scope of the course has been revised to meet the requirements of modern military trends, i.e., a highly intensive course of instruction that will prepare the student for satisfactory field duty in the minimum of time. Equipment, hand and machine tools used in conducting the course is of the same type and nature that is found installed on the machine shop truck of a Medium Maintenance Company. In the revision and final preparation of the new course of 3 months duration, or approximately 400 hours, every effort was directed toward the elimination of non-essentials. Theory, class room instruction and examinations are limited to not over 10% of the total hours available. The production of practical problems on the various machines is emphasized, and basic fundamentals are stressed in order to lay the foundation upon which the student will build with future experience.

Students are divided into groups of 10 to 15 men under one instructor and an assistant. In the practical application of shop work, this group functions as a unit. Considerable time can be saved and better results obtained if the group instructor has a portable blackboard in close proximity to the machine for chalk talks of short duration on theory, or operations. Practical demonstration follows this preliminary talk.

All groups in the shop are instructed by the senior instructor, or his assistant, in matters pertaining to uniformity of instruction, standards of work produced, safety practice, and the operation of the shop as a unit in accordance with good military practice. Class room instruction and examinations will normally be given by the senior instructor or his assistant, forming all groups into one unit for this purpose. To promote efficiency, and obtain desired results, the senior instructor assembles his instruction personnel whenever required and outlines in

general the prime requirements of any problem, or any phase of the course.

To foster a spirit of military competition, without detriment to an individual, composite average of theory and practice of each group is posted on the shop bulletin board. Individuals are not informed as to their numerical grade unless they fail to reach grade level in their weekly examination on theory, or on failure to produce passable work. If failure is based on theory, they are immediately assembled in class, their shortcomings explained, a review held, and a short written test given in the subject or subjects they had failed. A second failure is very rare under this procedure. A tendency to fail in practical application can be quickly checked and corrected by the instructor and his assistant in covering their group. A genuine desire on the part of the instructor to instruct, and the full cooperation of the student seldom fails to produce desired results.

Class room examinations are based on the fundamentals of the trade, reading assignments and practical work performed in shop operations. Grade for shop work is determined by quality of work produced, time consumed, and spoilage of material. Each instructor maintains a detailed operations sheet for each problem in his group. As each operation is completed, the student is immediately graded, and should his work fall below grade level, he is, without delay given additional help or instruction to correct the deficiency. When the student completes a problem, the senior instructor and his assistant review the group instructors grade sheet as compared to the finished problem or operation.

The ultimate objective is to produce an ordnance machinist who is reasonably grounded in the fundamentals of bench work, metals, heat treatments of metals, blue print reading, shop sketching, and the basic operations of the drill press, bench grinder, engine lathe, universal shaper, and milling machine. This merely outlines the expected mechanical requirements of the student. Stress is pursued in encouraging the student to think for himself,

to work industriously with a minimum of supervision, and to complement the angle by being as much of an assistant to his instructor as his instructor is to him.

In brief, the ordnance machinist should be trained along the lines of a general machinist in the job shop variety, not a tool room expert, or a production man, but a good all around man, able to improvise and produce satisfactory work in a hurry on limited equipment, tools, and material found in ordnance field units.

"MACHINE SHOP NOTES"

NOMENCLATURE, USE AND MAINTENANCE OF HAND TOOLS

(Continued from the June issue)

(Note: - Photographs of the tools described are shown on pages 48 and 49.)

1. GENERAL. a. Mechanical work in connection with construction and repair of the various metal parts of ordnance materiel depends to a large extent upon the correct use of hand tools; and, in order to accomplish good workmanship, it is very essential that the hand tools be kept in good condition. The machinist should take special pride in the quality and condition of his tools at all times. It is entirely impossible to do a good piece of work with a tool of inferior quality, therefore, care must be exercised in the selection of tools. Those listed in the standard ordnance catalog are considered most suitable for ordnance work and should be used when available.

b. Hand tools should at all times be kept free from dirt, grease, rust and any foreign matter. To accomplish this, they should be carefully cleaned after use, freely oiled with a proper grade of lubricant to prevent rust and properly stored when not in use. It is sometimes difficult to clean a tool after excessive dirt or rust has been allowed to accumulate, therefore, its accumulation should be prevented. Special care in this respect should be given high grade precision tools, as their use in any other than first class condition is conducive to poor workmanship. Tools of this class should be kept in cases if possible, as their contact with other tools and their exposure to the atmosphere will eventually have detrimental results.

c. Tools with sharp cutting edges should at all times be kept sharp. If a tool becomes dull or if the cutting edge is injured in any way while in use, it should be sharpened or repaired before it is put away. Certain kinds of chisels, bearings, scrapers, reamers, etc., should not be permitted to come in contact with other tools whether in use or in storage, as this may result in injury to the cutting edges. They should be stored in separate compartments in the bin or tool chest.

2. HAND TOOLS.

a. Files. (See chapter "Files and Filing.")

b. Chisels. (See chapter "Chisels and Chipping".)

c. Punches. Center punches are used to indent the center of holes preparatory to scribing a circle or drilling a hole. The smaller sizes are commonly known as prick punches. Their sizes range from 1/16" to 1/2".

Center punches are ground to an included angle of 60 degrees for general shop work. The automatic center punch is used on light work for laying out patterns. It moves automatically and does not require the use of a hammer. The spacing punch has an extra leg similar to a divider. It is used to punch a series of holes an equal distance apart.

d. Screwdrivers. The screwdriver is a tool for turning bolts, screws, and nuts having a slot to receive the screwdriver blade. There are several styles, the most common being straight, offset and ratchet. The size of the straight screwdriver is designated by the length of the blade, the offset screwdriver by the length overall, and the ratchet screwdriver by the manufacturer's number.

e. Hammers. Hammers used by machinists weigh from 1/4 to 2 lbs. They are designated as ball peen, straight peen, and cross peen. For general use the 1 1/4 lb. hammer gives satisfactory results. The weight should be decreased for light and increased for heavy work. The handle should be tightly fitted and at right angles to the head. When using the hammer, hold the handle firmly in the hand and grasp it near the end.

f. Vises. The vise is a tool in which work can be securely held when laying out, filing, drilling, etc. The size of the vise is designated by the width of the jaw and the maximum opening.

g. Hacksaws. The hacksaw is a tool used for cutting metal. It consists of a frame, handle and blade. Most hacksaw frames are adjustable to take various length blades. The blade should be placed in the frame so that the teeth point away from the handle. For thin metal, thin wall tubing, and in some refractory steel, a blade having approximately 32 teeth per inch should be used. For solid bar stock, a blade having approximately 14 teeth per inch should be used. When using a hacksaw, have the work held securely, putting pressure on the forward stroke and relieving the pressure on the backward stroke. Take a stroke the full length of the blade, sawing it at a medium rate of speed.

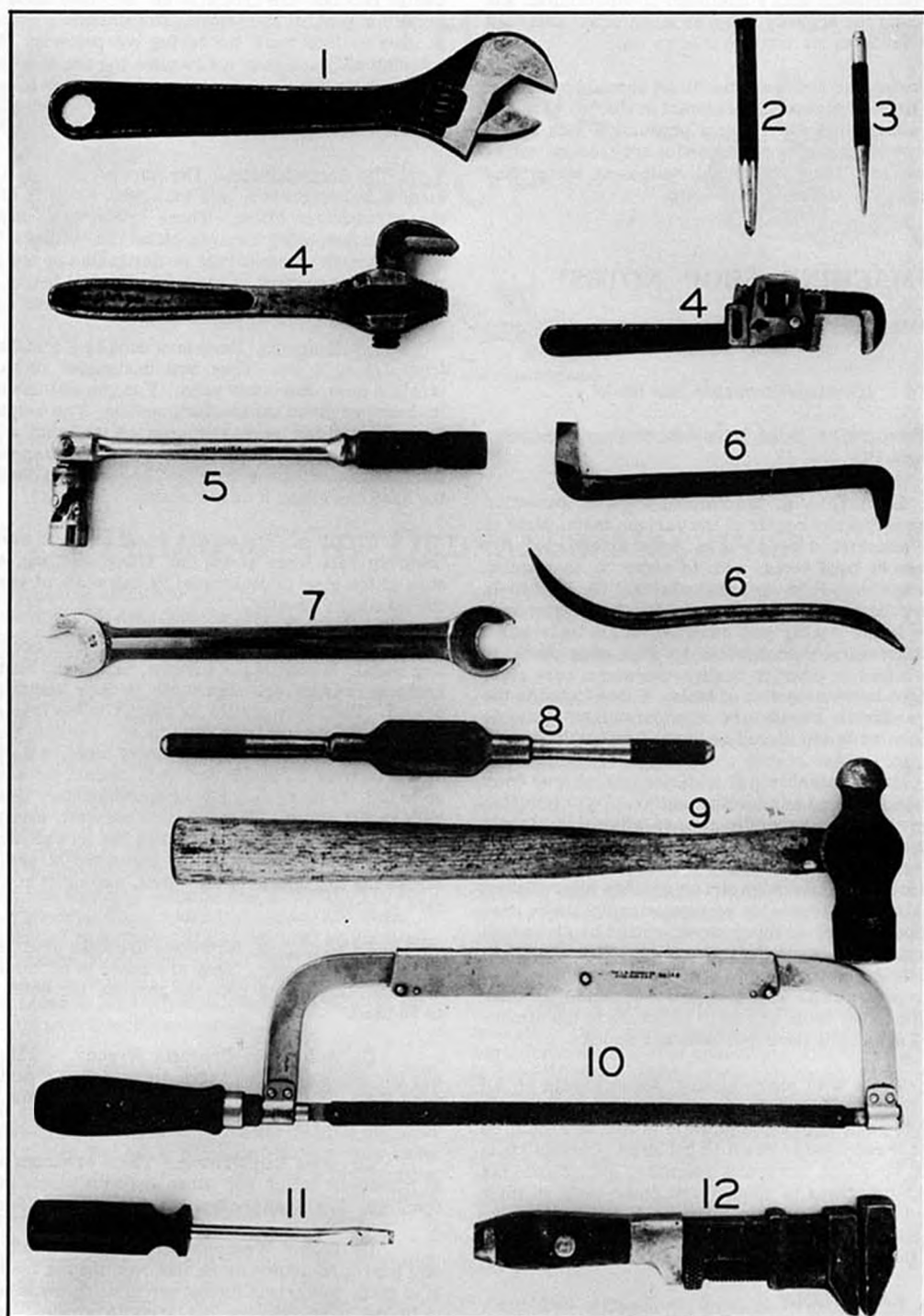
h. Wrenches. Wrenches are tools used for turning cap screws and nuts. They are made in numerous styles and sizes depending upon the purpose for which they are to be used.

(1) Adjustable Crescent Wrench. - This wrench has one adjustable jaw, making it useful as a general purpose tool. It is made in 4" to 12" sizes, the size designating the overall length.

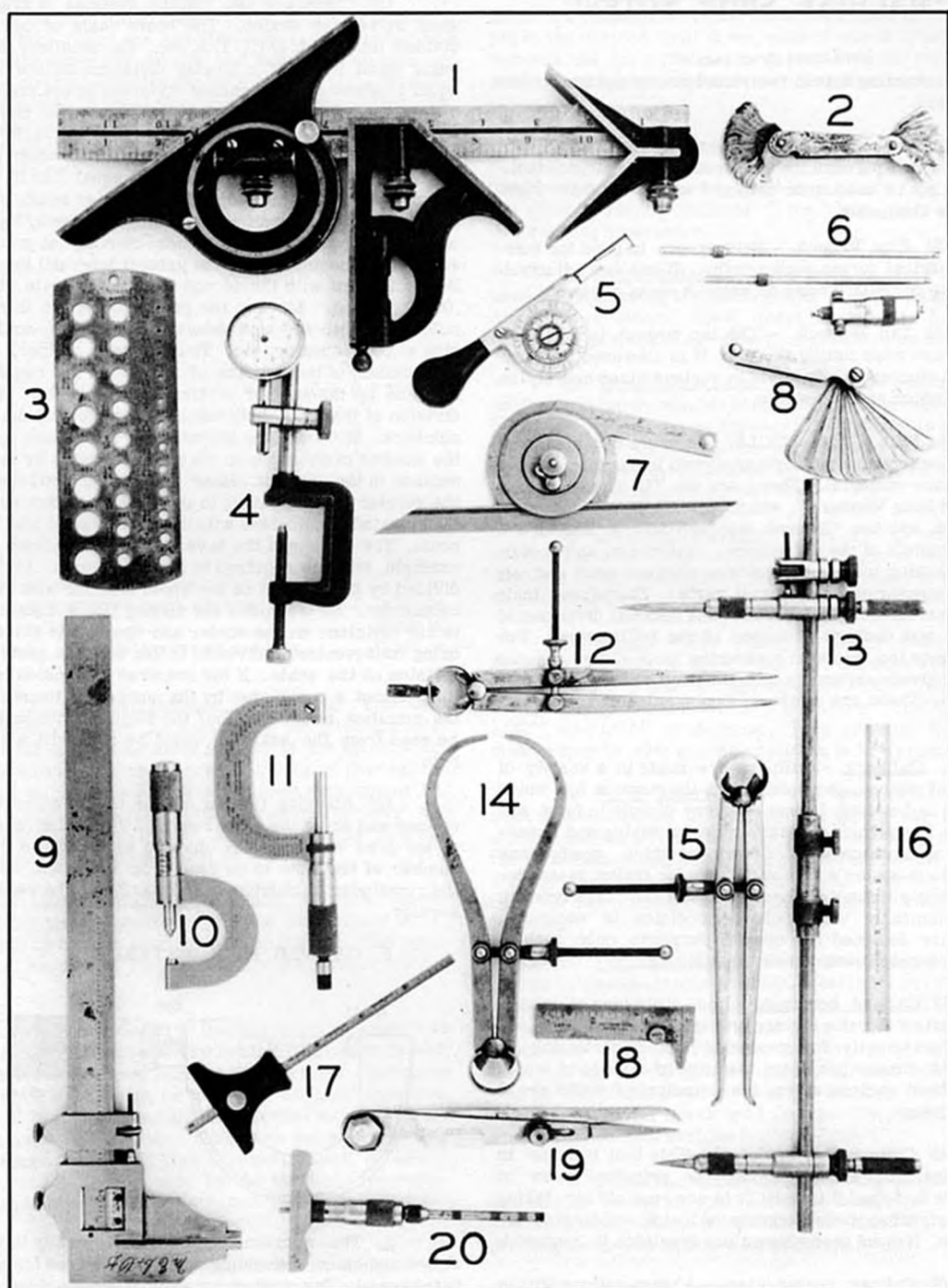
(2) Open End Wrench. - These wrenches are made in numerous forms and sizes and with single and double openings. The sizes are denoted by the size of the openings.

(3) Socket Wrench. - The socket wrench consists of a barrel structure which fits over the nut from the top. It is made in various forms, some being made up in sets to fit the most common nut sizes, having extension bars and handles which are removable and interchangeable with the various size sockets and others are made up as individual wrenches with integral shank and handle. The size of the socket wrench is denoted by the size of the opening across the flats. These wrenches are used principally for turning nuts and bolts.

(Text continues on page 50)



- | | |
|---------------------------------|---------------------------|
| 1- Adjustable "Crescent" wrench | 7- Open-end wrench |
| 2- Center punch | 8- Tap wrench |
| 3- Prick punch | 9- Ballpeen hammer |
| 4- Pipe wrenches | 10- Hacksaw |
| 5- Socket wrench | 11- Screwdriver, straight |
| 6- Offset screwdrivers | 12- Monkey wrench |



- | | | |
|------------------------|----------------------------|----------------------------|
| 1- Combination set | 8- Thickness gage | 15- Inside calipers |
| 2- Screw pitch gage | 9- Vernier caliper | 16- Flexible scale |
| 3- Drill gage | 10- Screw pitch micrometer | 17- Depth gage |
| 4- Dial test indicator | 11- Outside micrometer | 18- Pocket slide calipers |
| 5- Speed indicator | 12- Dividers | 19- Hermaphrodite calipers |
| 6- Inside micrometer | 13- Beam trammels | 20- Depth micrometer |
| 7- Bevel protractor | 14- Outside calipers | |

"MACHINE SHOP NOTES"

(Continued from page 47)

cipally for turning nuts in restricted places and for speeding up work.

(4) **Monkey Wrench.** - This wrench has one adjustable jaw which permits its use as a general purposed tool. It should not be used when open end wrenches of the right sizes are obtainable.

(5) **Pipe Wrench.** - This wrench is used for turning cylindrical forms such as pipe. It has one adjustable jaw which permits its use on various sizes of pipe.

(6) **Tap Wrench.** - The tap wrench is used for turning taps when cutting threads. It is also used for turning hand reamers. It is made in various sizes and styles, most of which are adjustable.

3. **MEASURING TOOLS.** There are two standards for the measurement of length employed in the manufacture of ordnance materiel. These are the "U. S. and British Standard Long Measure", which consists of the inch, foot, and yard, and the "French Standard Metric Measure", which consists of the millimeter, centimeter, and meter. The measuring tools of the machine shop are used entirely for the measurement of small parts. Therefore, their graduation consists of fractional and decimal divisions of the inch and decimal divisions of the millimeter. For convenience the principal measuring tools will be grouped into four groups depending upon the purpose for which they are used. These are calipers, gages, rules and protractors.

a. **Calipers.** - Calipers are made in a variety of styles and shapes, depending upon the purpose for which they are to be used. Some are very simple in form and are used in conjunction with a rule for taking and transferring measurements. Others combine graduations similar to those on a rule with jaws for taking measurements, thus eliminating the use of the rule. This type is used principally where close precision is essential. Others are designed for special purposes only, such as measuring gear teeth, screw threads, etc.

(1) **Caliper, hermaphrodite.** - This type of caliper combines one leg of a divider and one leg of a caliper. It is used principally for centering and ascertaining or laying out dimensions from the edge of a piece of work. It is made in various sizes, the principal of which are 6 and 8 inches.

(2) **Caliper, spring joint.** - This tool is made in two styles, inside and outside, the principal sizes of which are 4, 6, and 8 inches. It is used mainly for taking and transferring measurements of inside and outside dimensions. It is not used where close precision is required.

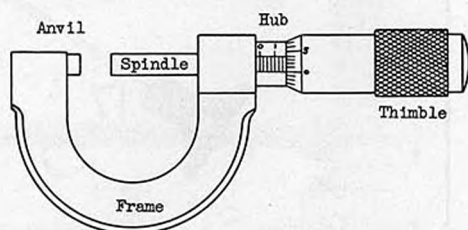
(3) **Caliper, pocket slide.** - A beam caliper with a graduated slide and with jaws at right angles to the beam for taking either inside or outside measurements.

(4) **Caliper, vernier.** (a) A beam caliper with jaws at right angles to the beam for taking either inside or outside measurements. The caliper is fitted with a vernier scale which permits measurement to within 0.001 inch.

(b) There are two leading systems of graduation used on vernier scales. The beam scale of one type is divided into 1/50, 1/10, 1/2, etc., the smallest division being equal to 0.020". Twenty divisions on the vernier equal nineteen of the smallest divisions on the scale. The difference between a division on the vernier and one on the scale is, therefore, for this instrument, $1/20 \times 1/50$ or $.05 \times .02$ and equals .001 inch. On the other type of caliper the smallest scale divisions equal .025 of 1/40", and the twenty-five divisions on the vernier equal twenty-four on the scale, the difference being equal to $1/25 \times 1/40$ of $.04 \times .025$ of .001 inch. Then starting at zero with either instrument, moving the vernier jaw until its second line coincides with the second line on the scale will give .001" opening. Moving the jaw to bring its third line coincident with the next forward line on the scale will give a .002" opening, etc. Thus, to set a caliper, divide the number of thousandths of an inch in the required dimension by the number of thousandths in the smallest division of the scale, both values being expressed as whole numbers. Move sliding jaw until its zero mark points off the number of divisions on the scale indicated by the whole number in the quotient. Move jaw further until the line of the vernier corresponding to the number of thousandths in the remainder coincides with the next forward line on the scale. The opening of the jaws will be as required. For example, let it be required to set a caliper to .137". .137 divided by 20 equals 6 as the whole number with 17 as the remainder. So we move the sliding jaw a distance equal to six divisions on the scale, and then move it further to bring its seventeenth division in line with the next forward division on the scale. If the required dimension is divisible without a remainder by the number of thousandths in the smallest scale division, the required dimension may be read from the scale as would be done with a common rule.

(c) Applying the same rule to the other vernier caliper and using the same required dimension for opening of the jaws we have .137 divided by 25 equals 5 for the number of fortieths to be read from the scale, and 12 as the remainder or number of thousandths to be read by the vernier.

5. CALIPER, MICROMETER.

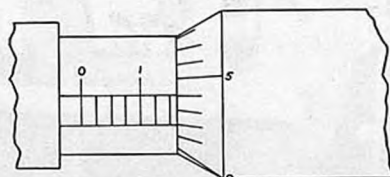


a. The micrometer caliper is made in various styles and sizes, depending upon the purpose for which it is to be used. The most common types are outside, inside, thread and depth. This tool is used where close precision is required, being capable of taking measurements to within .001", and where a vernier type is used to .0001".

b. The reading of all micrometers involves the same principle; therefore, if one is able to read a micrometer on an outside diameter, one can read any type designed.

c. The spindle, attached to the thimble, has forty threads to the inch which screw into a similarly threaded nut in the hub. Since one complete turn of the thimble and spindle will move the spindle one fortieth of an inch or .025", the circumference of the beveled edge of the thimble is graduated into 25 equal divisions, each representing .001 of an inch. As the thimble is revolved a revolution, it uncovers one graduation on the hub which is equal to .025". To facilitate reading, every fourth hub graduation is numbered.

d. The reading on the micrometer at any setting gives the distance between the anvil and the spindle and is calculated in the following manner:



	Value
Numbered graduations exposed (1).....	0.100 in.
Additional unnumbered grad. exposed (2).....	0.050 in.
Thimble reading (4).....	0.004 in.
Micrometer reading.....	0.154 in.

(1) Caliper, micrometer, thread. - (a) This style of micrometer is used for measuring the pitch diameter of screw threads. The anvil and end of the spindle are ground to an included angle corresponding to the angle of the thread to be measured. Each thread micrometer has a range of about 5 pitches; that is, one micrometer will measure threads from 8 to 13, another from 14 to 20 and so on. The spindle has a travel of 1".

(b) Caliper, micrometer, inside. - This micrometer is for taking inside measurements and has a travel of 1/2 inch. Rods of various lengths make up the set. The graduation and reading is the same as for the outside micrometer.

(2) Gages. - Gages in general are tools made with certain set dimensions and are for the purpose of readily checking sizes, etc., of parts and materials. Measurements in all cases may be taken by calipers and rule, however, it is much easier and a great deal more accurate to use a gage if possible. There are gages for nearly every class of work and kind of measurement, a number of which will never be used by the average mechanic. Therefore, only those most commonly used will be mentioned.

(a) Cylinder gage. - This is a tool designed especially for the testing of the trueness of engine cylinder bores. It incorporates a sensitive dial indicator which will readily indicate variations in dimensions of the cylinder bore to within 0.001".

(b) Depth gage. - This tool is made in two styles, one having a micrometer adjustment which will take measurements to within 1/64". It is used for measuring the depth of holes, keyways, shoulders, etc.

(c) Twist drill gage. - The twist drill gage consists of a rectangular metal plate with holes corresponding to the various drill sizes, each of which is marked to indicate the size. Separate gages are used for letter, number, and fractional size drills. (See table on drill sizes.)

(d) Thickness gage. - This gage consists of a holder with hardened steel blades of various thicknesses. These blades vary in thickness from 0.001" to 0.025", the thickness being stamped on the blade. It is used for determining clearances.

(e) Sheet metal and wire gage. - This gage is used for measuring the thickness of sheet metals and the diameter of wires. Sheet metal thicknesses and wire diameters are, with few exceptions, denoted by numbers.

(f) Screw pitch gage. - This gage consists of a holder containing a number of blades with teeth corresponding to the various screw threads. Each blade is stamped with a number indicating the particular thread pitch to which it is adapted. It is used for measuring or checking the screw threads on bolts and nuts.

(g) Drill grinding gage. - The drill grinding gage is used for measuring the angle and length of the cutting edge of a drill. The blade of the gage is ground to an angle of 59 degrees and is graduated into 1/64 inch divisions.

(3) Rules. - The rules commonly used by the machinist consist of the 6" and 12" flexible steel rule and the 3", 6", and 12" spring steel rule. These rules are usually graduated into 1", 1/2", 1/4", 1/8", 1/16", 1/32", and 1/64" graduations. They are used for taking measurements where close precision is not essential.

(4) Bevel protractor. - The bevel protractor is used principally for measuring and laying out work to various angles. There are two types, one being a part of the combination set, capable of adjustment to one degree, and the other is known as the universal type, incorporating a vernier whereby adjustment to within 5 minutes may be made.

(5) Combination Set. - The combination set consists of four independent tools, namely, steel rule, square head, center head, and bevel or protractor head. The scale contains a groove which fits into the other tools that make up the set. The square head is used to lay off right angle lines and for checking the accuracy of machined or filed edges. The center head is used for locating the center of round stock. The bevel head is used for laying out or measuring work of various angles.

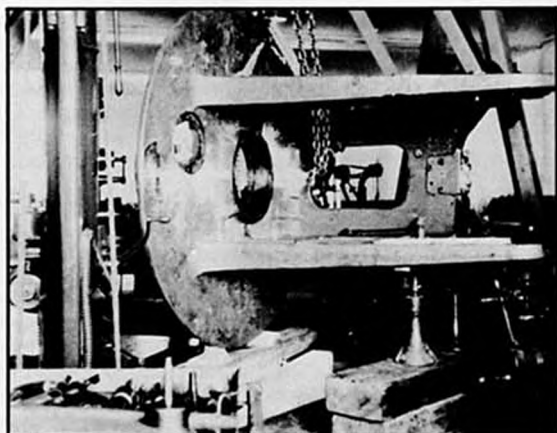
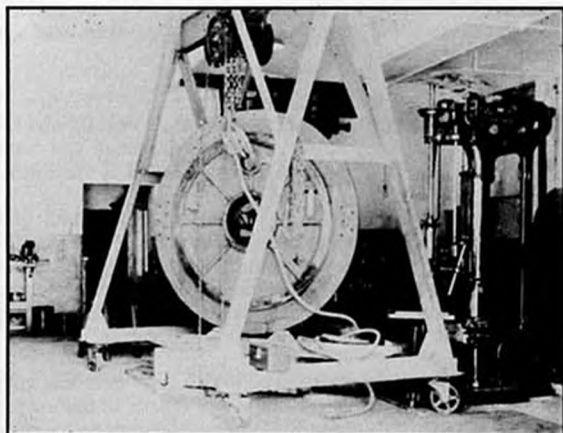
(6) Dividers, spring joint. - Spring joint dividers are similar to spring joint calipers except that the legs are ground to a sharp point. They are used for scribing circles, arcs, and marking off spacings.

(7) Trammel, points and bars. - Trammel points are similar to the divider points, except they are movable along a bar. This tool is used for scribing large circles and checking between two or more points.

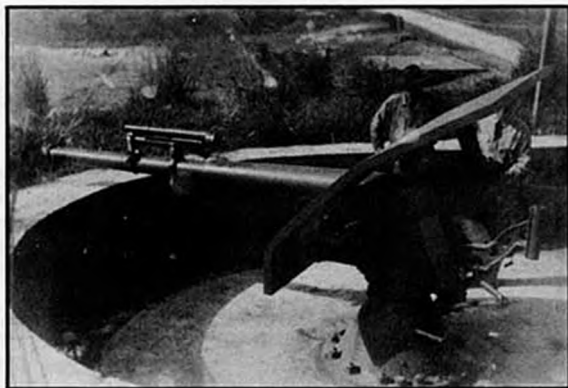
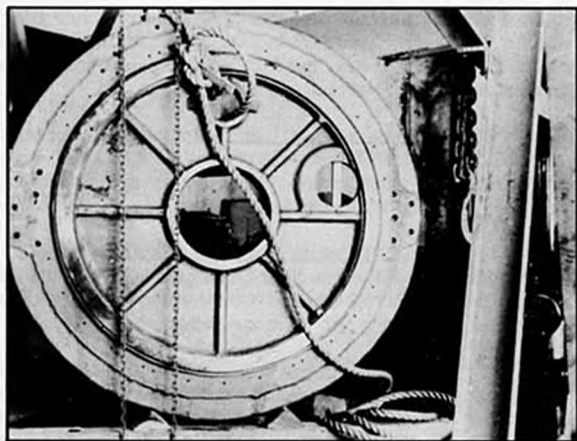
(8) Indicator, speed. - The speed indicator is a small hand tool which is used for determining the R.P.M. of rotating shafts. The spindle or point is placed on or in the spindle of a drill press, grinder, or other machine tool

ORDNANCE SHOP ACTIVITIES

KEY WEST BARRACKS, FLORIDA



The photos above and at the lower left show methods and rig-ups employed in the Ordnance Machine Shop at Fort Taylor, Florida, for cutting the trunnion caps off 3-inch A. A. Mount, M1917, with a shaper. These mounts are to be M1917M11 when modified. The photo at the lower right shows a special bracket which has been fabricated in the same shop, as well as at other seacoast defense stations in the 4th Corps Area. The gun is 37-mm., M1916, normally used for subcaliber on 155-mm. guns, M1918. This is not a standard bracket, and it is not known whether the Chief of Ordnance has approved its application for this purpose. However, it has been found to be far superior to the subcaliber gun using cal. .30 ammunition, the principal reason for this being that the gun pointer, observation detail, and others, cannot locate the splash of the cal. .30 subcaliber cartridge when it strikes the water, even though the distance be as little as 1200 yards. Photos submitted by Tech. Sgt. Oscar Davis, Det. 4th Ord. Serv. Co., Key West Barracks, Fla.



and a reading of the R.P.M. can be obtained.

(9) Indicator, dial test. - The dial test indicator consists of a base, vertical column, various shaped rods and an indicator head having a dial graduated into 0.001". It is used for checking the accuracy of surfaces and setting up work to be machined.

SIMPLE LAYOUT

To "layout" is to scribe an accurate pattern on a piece of metal of the part to be machined. This normally should be done on a ground surface and is accomplished in much the same manner as mechanical drawing, using a scribe to mark the lines instead of a pen or pencil.

It is sometimes difficult to see a line scribed in steel unless the steel has first been colored. Coloring may be accomplished by heating the piece until it turns a dark blue, or by use of a layout dye. Another method of insuring the visibility of the pattern is to go lightly over the lines with a prick punch.

Extreme care should be taken to position all lines and marks accurately. It must be remembered that after laying out, the piece is to be machined according to the pattern scribed upon it. An inaccurate layout will result in a scrapped part.

(Continued in the August issue.)

THE STORAGE BATTERY

(Continued from page 24)

of its own accord, develop abnormally high voltage to breakthrough this resistance. If there is a poor connection, a loose contact, or a high resistance ammeter in the circuit the generator will build up enough voltage to overcome such resistance. Any added resistance added to battery resistance would raise the generator voltage to the point where it may be harmful to our charging circuit, our lights, etc. It is evident that some means to control this voltage is required. This control must be just enough above battery counter voltage to allow for a high charging rate when the battery is in the discharged state, and not so high as to actually overcharge the battery with a high rate when the battery becomes fully charged.

When a battery is "dead" it can stand, and should have, a high charging rate. As the battery gradually approaches the fully charged state this high charging rate should be tapered off to prevent overcharging of the battery. An excessive charging rate at this time would cause excessive gassing and it would overheat the battery. Overheating the battery buckles the plates. The active material separates from the grids in the plates and falls to the bottom of each cell in the battery. The separators between the plates become charred and the plates, in buckling, squeeze through the separators in spots and short circuit the cell. Overheating by overcharging greatly shortens the life of a battery.

Just how a voltage regulator does regulate the voltage will be a part of the next article. However, if we wish to know why the charging rate is directly controlled by regulation of the generator voltage we may more easily understand the situation if an assumed analogy is used. If the generator is assumed to act like a liquid pump with a pressure valve on it (the pressure valve being analogous to the voltage regulator), the battery assumed to be similar to a tank with a solution that will freeze, and the charging

circuit similar to a pipe that carries a liquid which will freeze the solution in the tank, we have our similarity partially complete. Now if we assume that the pipe in the tank will contract (decrease in diameter), when the solution in the tank freezes, we will have it complete.

When the solution in the tank is not frozen the pump can pump the maximum fluid allowable by the pressure valve through the pipe. As the solution freezes, the pipe in the tank contracts and in doing so restricts the flow of the liquid. As the pressure valve does not allow the pump to increase the pressure to overcome this restriction to the flow, the amount of liquid that flows through the pipe actually varies with amount of the restriction in that pipe. This analogy, although not particularly true of the action of liquids in pipes, is particularly true of our charging circuit. The battery when "dead" allows the maximum amount of current to flow through it because the battery terminal voltage is comparatively low and restricts the flow of current very little. As the battery builds up in charge, its terminal voltage increases, and its resistance to current flow increases. Since the voltage regulator holds the generator at a constant voltage, the current rate itself drops off because of this resistance. The current rate, or amperage as it is generally called, drops off to less than 5 amperes normally, at which time the battery is actually "floating on the line". The battery is just absorbing enough current to keep it from discharging and to keep the charging circuit balanced.

The necessity of keeping the voltage regulator in adjustment is evident. The voltage regulator is the valve that keeps our generator from "running wild" yet it must allow the generator to meet our current requirements.

The next issue will cover some quick checks on the operation of the voltage regulator.

An additional short automotive article, titled "The Effect of Suppressor Resistors on Automobile Operation", will be found on page 57.



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

THE ORGANIZATION, TRAINING, AND EMPLOYMENT OF AN AMMUNITION COMPANY

By: Ralph G. LaBroad,
Master Sergeant, Ord. Dept.

GENERAL: The ordnance ammunition company is organized as prescribed by T/O 9-17, dated November 1, 1940. Figure 1 shows a suggested organization for this company. FM 9-20 covers the duties and principles governing the use of an ammunition company and battalion. It is the purpose of this article, and the one succeeding this, to refresh the memories of noncommissioned officers concerned with ammunition supply, and to stress the importance of a thorough knowledge of some of the many problems that constantly arise in the supply of ammunition.

ORGANIZATION: Contrary to popular belief, it takes a good deal more than just men with training as munition workers to properly organize an ammunition company. A glance at figure 1 of this article will prove this point. Clerks, vehicle operators, mechanics, cooks, carpenters, and painters are some of the specialists in this organization. This organization must be trained to operate in many ways. Some methods of employment are:

- (1) As part of an ammunition battalion.
- (2) Company operating an ammunition depot.
- (3) Furnishing part of the company to assist in operating a division distributing point.
- (4) Operating more than one ammunition depot.
- (5) Operation of railheads (ammunition).

There are, no doubt, several other ways in which this organization might be utilized, but this will give you an idea of the flexibility required in training.

Since the original organization of an ammunition company, many necessary changes have taken place to keep the ammunition supply geared to the increased tempo of consumption. The experience gained from the mistakes of others, facts proven by the method of trial and error, actual performance in the field under war conditions and the individual initiative displayed by all concerned with this problem, have been the basis of the present T/O 9-17.

Foresight, together with the injection of reality and variety into the problems of training, will help considerably in welding this organization into an effective supply unit.

TRAINING: It is almost impossible to spread out an organization chart and plot the duties of individuals or sections without a definite situation requiring the use of an ammunition company. The company commander must know the problem facing his company before he can outline an effective plan for the employment of the platoons and sections under his control. Company training should be so planned that it will be possible to use this organization in the manner needed, with the assurance that efficient results will be obtained.

The members of the organization must be trained to perform their duties under war conditions, otherwise a false picture may result that might be detrimental to morale when an actual field problem is presented. Problems that involve long hours of work in darkness, as well as daylight, should be stressed in the training schedule. It will, in all probability, be extremely difficult to replace trained men once the organization starts operating, therefore, an organization should have replacements trained within the organization. This could be accomplished by the understudy method common in most organizations today.

OPERATION OF THE AMMUNITION COMPANY

GENERAL: The company commander of an ordnance ammunition company, engaged in operating one ammunition depot is also a depot commander. If the company is split into two or more parts to operate more than one depot, his primary function is to coordinate the operations being carried out by the personnel of his company and to supervise the company administration. Broad responsibility must necessarily be placed upon the non-commissioned officers of the company so that they may act in the absence of superiors. This is especially true of the 1st Sgt., chief clerks and superintendents of storage.

The operation of the company, especially as it pertains to organizational details, must be flexible and capable of adjusting itself to quick reorganization to furnish overhead and labor for the number of depots or railheads that the company may be called upon to operate.

The following is a general summary of responsibilities of the various sections within the company:

COMPANY HEADQUARTERS:

The company headquarters is responsible for:

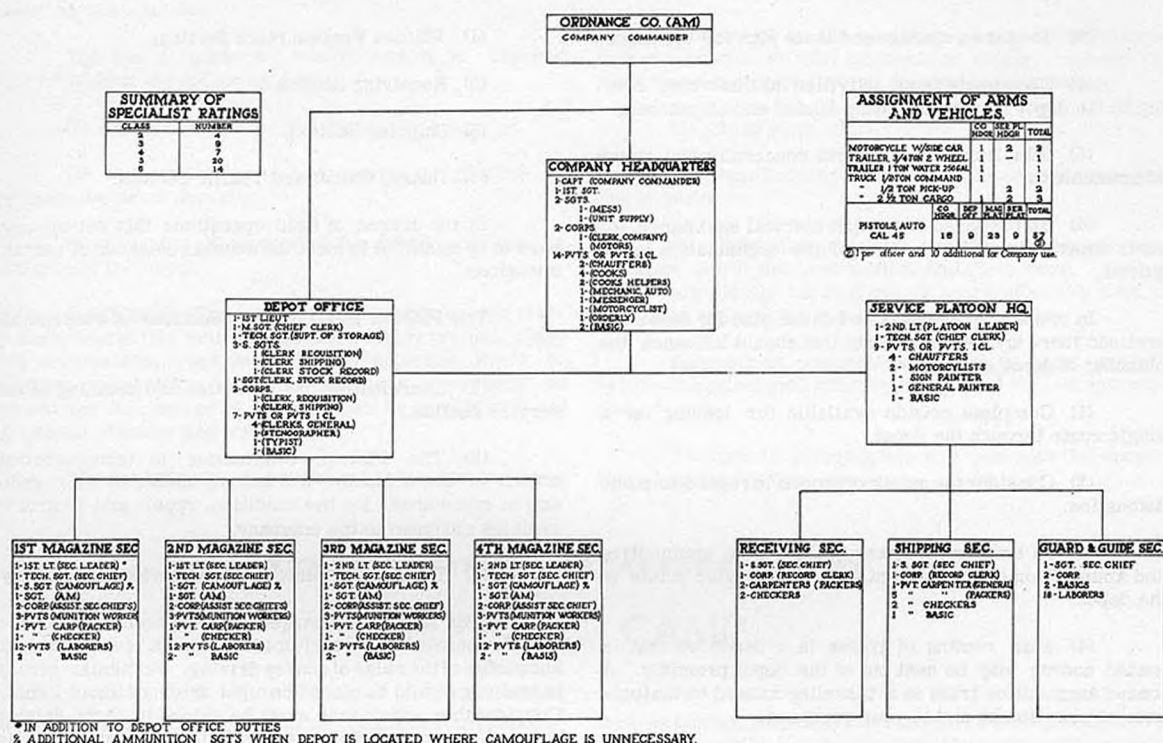


Figure 1. -- Suggested Ammunition Company Organization
(From T/O 9-17)

- (1) The military administration of the company.
- (2) Supply of clothing and personal equipment.
- (3) Rationing.
- (4) Internal security.
- (5) Transportation of rations, baggage and personnel.

nel.

This section generally works with the unit personnel section of the battalion or next higher headquarters in keeping with the personnel records. Specifically, the company headquarters is charged with the preparation of the following records:

- (1) Company morning reports.
- (2) Daily sick reports.
- (3) Duty rosters.
- (4) Individual clothing and equipment records.
- (5) Company council book.
- (6) Vouchers to stock record account.
- (7) Memorandum receipts.
- (8) Company orders and training schedules.
- (9) All other records prescribed by proper authority, or considered to be necessary for the efficient operation of the company.

Messing is always of primary concern to an ammunition company commander. The organization may be required to function in several different ways, each requiring special messing measures to be positive that all members of the company are properly cared for. As an ammunition company in operation works long and hard,

it is of the utmost importance that appropriate action be taken by company headquarters to insure the proper messing of all sections of the command.

THE DEPOT OFFICE: The depot office is responsible for the operation of the depot and for coordinating the activities of the depot sections. This office is also responsible for all the paper work of the depot; this includes records of all ammunition transactions with troops, railheads, other depots, etc. It is imperative that these records be accurately maintained. Ammunition plans are based on depot reports.

Unannounced periodic audits of depot records should be conducted by the responsible depot officer to satisfy himself that the records are being properly maintained.

The depot office personnel must also be trained and prepared to operate more than one depot. This, of course, will necessitate training of such personnel in all depot office functions.

It may also be necessary, in order to provide a sufficient number of clerical workers, to train selected members of other sections in office procedure.

Some of the functions of the depot office are:

- (1) Maintain complete records of all ammunition transactions of the depot.

- (2) Maintain a record of lot numbers.
- (3) Prepare a storage and issue plan for the depot.
- (4) Coordinate depot activities so that trains coming to the depot may be promptly loaded and dispatched.
- (5) Submit required reports concerning the status of ammunition.
- (6) Be prepared to furnish clerical assistance for other depot offices if a division of the organization is required.

In preparing a storage and issue plan for depot operations there are several points that should influence the planning of depot stacks:

- (1) Complete rounds available for loading on a single route through the depot.
- (2) Consider the safety of stores in regard to mass detonation.
- (3) At least two stacks of all types of ammunition and ammunition components at widely separated points in the depot.
- (4) Plan routing of trains in a depot so that a loaded convoy may be sent out of the depot promptly. A loaded ammunition train is a traveling hazard to the balance of your stacks and to your personnel.
- (5) Prepare stacks against chemical attack.

THE MAGAZINE PLATOON. The magazine platoon is the functional portion of the ammunition company. All other units of the company (company HQ, depot office and the service platoon) operate toward the end that the magazine platoon will efficiently accomplish its mission of receiving, storing and issuing ammunition. This platoon must be capable of extreme flexibility of operation, possibly breaking into four separate independent sections on different missions. This platoon should be trained so that it may be employed in any mission required of such a platoon with the assurance that efficient results will be obtained. To meet this end, Figure 1 shows that the various magazine sections are organized to function, with very few changes, as a part of the company on problems involving the entire unit, or as small compact organizations capable of independently rendering efficient ammunition service. In general, the duties of this platoon include:

- (1) The receipt of ammunition from the service section.
- (2) The storage in, and issue from, the magazine area of such ammunition.
- (3) The construction of adequate camouflage.
- (4) The technical supervision of all munitions work within the depot.

SERVICE PLATOON. The Service Platoon is required to perform many varied duties within the ammunition company. Tables of organization divide this platoon

into four sections for operations:

- (1) Platoon Headquarters Section.
- (2) Receiving Section.
- (3) Shipping Section.
- (4) Guard, Guide, and Traffic Section.

In the course of field operations this set-up may have to be modified to meet the unusual demands of certain situations.

The Platoon Headquarters Sections is responsible for:

- (1) Coordinating the activities and training of the service section.
- (2) The Platoon commander is transportation officer of the company, and is responsible to the organization commander for the condition, repair and control of vehicles assigned to the company.
- (3) Training of vehicle operators for the company.

This section is charged with the training of motor vehicle operators. All such operators must have a thorough knowledge of the rules of convoy driving. Particular stress in training should be placed on night driving without lights. Considerable experience must be gained in night driving before a convoy can safely and efficiently be employed in night operations.

The receiving section is responsible for the following duties:

- (1) Planning transfers of ammunition from transshipment points (rail or truck) to the magazine platoon, arranging for transportation and labor necessary to accomplish such receipts.
- (2) Physically checking such shipments.

The shipping section is responsible for the following operations:

- (1) Preparation and shipment of unserviceable ammunition to base depots.
- (2) Repair of containers received in a damaged condition, so that they may be available for issue by the magazine platoon.
- (3) General carpenter work for all sections of the depot.
- (4) Preparations for disposition of excess ammunition components if such accumulate at the depot.
- (5) Arrangement and preparation for disposition of such salvaged material as may be turned into the depot (fired cartridge cases, cartridge storage cases, etc.)

This section will normally carry its heaviest load during changes in the location of the depot. At such times, it will be charged with the preparation of the necessary

shipping details concerned with the actual transfer of ammunition to a new site.

The guard, guide and traffic section is charged with furnishing the following details:

- (1) Guide Service for the depot.
- (2) Preparation of guard orders and placing of sentries for depot security.
- (3) Training of personnel for traffic control in and around the depot.

SUMMARY: The ammunition company, as generally described in this article, must be a highly trained, flexible organization, capable of rapidly adjusting itself to perform ammunition service. Mistakes are bound to happen, but the number of mistakes can be greatly reduced by proper planning and training.

The assignment of functions to platoons and sec-

tions has been as specific as facts will permit at this time.

It would be to the advantage of non-commissioned officers concerned with ammunition supply, to bear in mind these few points before undertaking a problem:

- (1) Study your job.
- (2) Familiarize yourself with the organization you are to serve.
- (3) Check the possible ways to accomplish your mission; select the best method and go to work. A poor plan energetically carried out is more effective than a good plan carried out in a half hearted manner.

Suggestions, comments and criticism on this article by non-commissioned officers in the field will be appreciated.

The article following this will deal with the operation of an Ammunition Depot.

R. O. T. C. CAMP

(Continued from page 20)

as marksman and many of these will qualify as sharpshooters and experts.

The most interesting phase of the camp no doubt will be the trip to Frankford Arsenal where the students will observe the manufacture of small arms ammunition. They have already studied small arms ammunition in school and their observations at the arsenal will round out their knowledge relative thereto.

Adequate facilities have been provided for recreation

such as boxing, baseball, soft ball, horse shoes, badminton, etc. A recreation hall is provided where the students may occupy their leisure time reading newspapers, magazines, letter-writing and enjoying the radio-phonograph. The above activities will produce a stronger physique and in view of the sunshine and exercise these men will leave camp in a much better physical condition than when they arrived, thus making them better qualified to accept commissions in the U. S. Army and serve their country during the present emergency.

THE EFFECT OF SUPPRESSOR RESISTORS ON AUTOMOBILE OPERATION

Recent dynamometer tests disclosed that whether suppressor resistors were used or not, tests in cold rooms running as low as 30 deg. below zero showed no noticeable difference when the suppressor resistors were used.

It is known that suppressor resistors do reduce the maximum current values that may be reached when the spark gap breaks down. However, it is also known that ignition occurs at the breakdown of the gap before the current reaches its maximum value. Consequently, whether or not the current reaches its maximum value is immaterial.

If difficulty in starting is experienced, particularly in cold weather, this may be due to a partially discharged battery. It is most certainly true that in many cases the average car battery is not in a good state of charge when the battery is equipped with a radio and that radio is used a great deal. A depleted storage battery materially re-

duces the voltage available in the primary of the ignition coil during the cranking or starting period. In warm weather or when the carburetor adjustment is correct, this depleted charge condition may not cause any trouble. But, when these adjustments get out of line, low cranking speeds and low primary voltages result in trouble.

This leads to but one answer. When suppressor resistors are used, the ignition and charging circuit must be kept in good condition. The battery must be kept in good condition. The battery must be kept in a good state of charge. When suppressor resistors are added, the engine must be properly tuned up prior to adding them.

If the engine is kept in a tuned-up condition, no starting or operating difficulties are experienced in the modern car, because suppressor resistors are added to their design.



AVIATION ORDNANCE

Conducted by: H. M. Randel, 2d Lt., Ord Dept.

THE DEVELOPMENT OF AIRCRAFT BOMBS

(Continued from the June issue)

An article appearing in the June issue of THE ORDNANCE SERGEANT entitled "Development of Aircraft Bombs" stated that prior to the first World War the demolition bombs in use were discarded artillery shells renovated to be used as aircraft bombs. On the outbreak of the World War an urgent need arose for a more satisfactory bomb since the renovated artillery shell bombs did not fulfill the many conditions necessary for a desirable demolition bomb. Necessity being the mother of invention, it was not long after the start of the war until the belligerents had designed and put into production bombs for use by their aircraft.

The first World War contributed the following developments in aircraft bombing:

- Making of special purpose bombs as demolition, fragmentation and incendiary.
- Increasing the size of demolition bombs.
- Improvements in bomb sights.
- Use of bomb racks.
- Development of torpedoes and planes to launch them.
- Increased performance so that bombing could be done from higher altitudes with planes traveling at greater speeds.

During the first phases of the war the standard sizes of demolition bombs which were made by the British and French, were 45, 112, and 230 pound bombs. When the war ended no bombs of American design had reached the war zone, however 25, 50 and 100 pound demolition bombs were in mass production in this country. They were of the type which has since been designated as the Mark I Series. They were of streamline or tear-drop design and made with a cast-steel nose section and a pressed-steel rear section welded to a curved steel central section. All were joined by both circumferential and longitudinal welds. The forward sections were thicker and heavier than the center and rear sections. The nose section was threaded to receive a closing plug and the tail section was threaded to take a firing mechanism or fuze. The purpose of the nose

plug was primarily for ease in handling. The Mark I series had only one fuze, which was in the tail end of the arming pin type. In order to fuze the bomb the conical-like tail fin had to be removed before the operation. The chief defects of the Mark I series were: mechanical body weaknesses due to the welds, fins too weak, small size and poor ballistics due to the welds and weak fins. As has been stated before, the aerial bombs during the early stages of the past war were of a relatively small size. Twenty-five pound and fifty pound bombs were common to both of the opposing forces. Some photographs of World War I materiel have been brought out of the dusty files, and we feel that it would be of value to compare the sizes, construction, shape and other general characteristics of these early bombs with the general features of our present "M" series of bombs known to all ordnance men.

The Germans had an interesting series of small size demolition bombs, three of which are seen in the photograph below. Reading from left to right we have bombs of approxi-

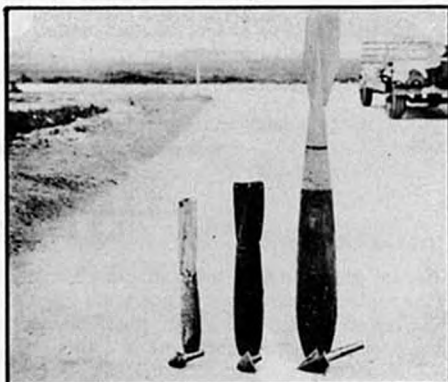


Fig. 1 - German demolition bombs

mately 10, 20, and 50 kilograms, or approximately 22, 44, and 110 pounds. Note that these German bombs were equipped with nose fuzes.

The British had a series of demolition and fragmentation bombs which are of interest. The 25 pound Cooper fragmentation bomb was designed to be suspended from wing racks. The arming vane was prevented from rotating by an arming wire which was retained in the shackle when the bomb was released. The arming vane then rotated. Through a gear train the firing pin was moved into a position



Fig. 2 - Cooper fragmentation bomb

which aligned the propeller shaft, the firing pin, and the detonator. Upon impact, the propeller shaft was driven against the firing pin, which in turn punctured the detonator, and detonated the bomb. This bomb could also be suspended

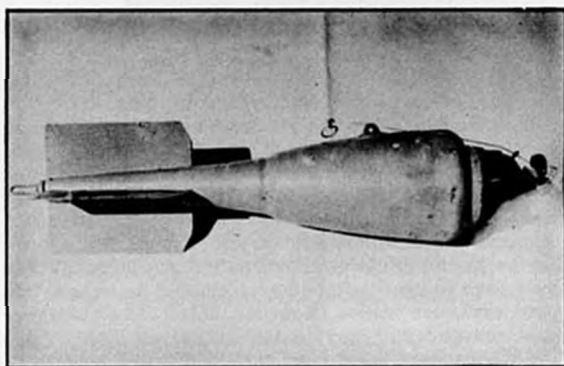


Fig. 3 - Cooper fragmentation bomb, showing eye on tail assembly

ed from vertical racks within the plane by means of the eye on the tail assembly.

Three British demolition bombs of this period are of interest. The first of these three weighed approximately 100 pounds. It was suspended horizontally by means of a suspension band bolted about the bomb body, or suspended vertically by means of the suspension lug located on the rear end of the bomb. This bomb had an extremely heavy

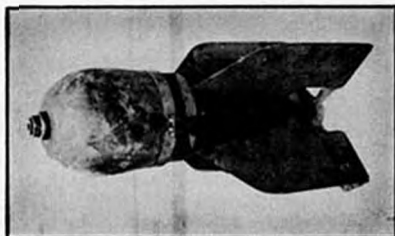


Fig. 4 - 100-lb. British demolition bomb

case as did the 200 pound bomb (approximate weight) of this same design. This bomb was intended to be suspended hor-



Fig. 5 - 200-lb. British demolition bomb

izontally by means of the lug which is clearly visible in the photograph. The two bombs of this particular design were nose fuze. The third British demolition bomb to be mentioned in this article is shown below. This bomb was a 250



Fig. 6 - 250-lb. British demolition bomb

pound demolition bomb and it had a rather heavy case with a very heavy and solid nose. This bomb was equipped with a tail fuze, and designed to be suspended horizontally.

French bombs were of a somewhat different design than either the British or those of the Germans. In this

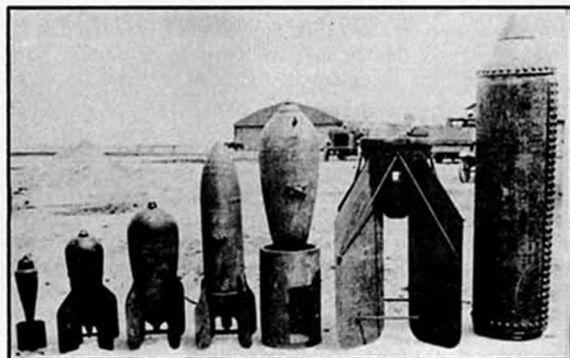


Fig. 7 - French and British bombs

photograph we see, from the right to the left, a French 2000 pound bomb. Note the riveted construction. The next bomb was approximately a 150 kilogram (300 pound) bomb. Note the unusual construction of the tail assembly. The remaining four bombs on the photograph are the four British bombs described in the preceding paragraphs.

The French had two other bombs of approximately 250 kilograms and 50 kilograms each. These two bombs



Fig. 8 - French bombs

are shown as the first two bombs on the left side of the photograph.

The 12 kilogram French fragmentation bomb is shown in the photograph below and was intended to be suspended from horizontal racks. This bomb is also shown



Fig. 9 - 12-kilogram French fragmentation bomb

in preceding photograph, the third bomb from the right.

The "Michelin Flare" was an interesting bombardment flare used by the Allies during the first World War. It was of French design and functioned by an arming vane. This flare is shown in figure 8, the first from the right.

Two other interesting bombs appear in figure 8. One of them is the bomb fourth from the left, which was constructed from a 6-inch artillery shell and the other bomb is fifth from the left. This latter bomb was constructed from a 4.7-inch artillery shell. These two bombs were the experimental bombs tried out by this country during the early days of World War I. While World War I was in progress, the United States manufactured many bombs for the various allied powers. Out of this vast number of different styles and types of bombs, the United States chose the best bombs, and then modified them and tested them so that they

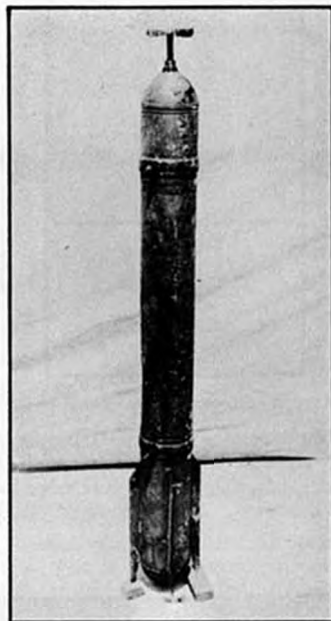


Fig. 10 - French Michelin Flare

functioned and served the specific purpose intended by this country. The Mark I series of bombs was adopted too late to be of any use during World War I, because by the time the Mark I bombs were put into production the war had ended. The Armistice permitted the peace time development of the Mark I series of bombs to progress in the attempt to improve the unsatisfactory series. From this development the Mark IMI series of bombs was produced. These bombs were equipped with both nose and tail fuzes and improved explosive trains. However, these bombs still remained unsatisfactory and the Mark II series of bombs developed because of this dissatisfaction. These bombs were known as the "thick case" bombs. The Mark II series of bombs proved to be very unsatisfactory, consequently they were never put into construction. Following this series was the Mark III series of bombs. The bombs of the Mark III series, were designed to eliminate the longitudinal welds. They were equipped with fin assemblies designed as units, capable of easy assembly in the field, and these tail fins were rigidly braced. Approximately five years ago the "M" series of bombs were adopted. These bombs were of a cylindrical body type of design, and equipped with "box" fins. These bombs combined many needed modifications and the following advantages resulted from their adoption:

- Greater body strength due to the absence of welded joints.
- Economy and ease of manufacture.
- Ease in field handling.
- Ease in loading with TNT or other explosive fillers.

A few of the general characteristics of the bombs developed by the United States are shown in the following series of photographs.

The Mark I, 100 pound bombs. Note how the fins were bolted to the bomb body, and the lack of rigid support for the fins. Note also how the "belly-bands" were bolted to the bomb body.

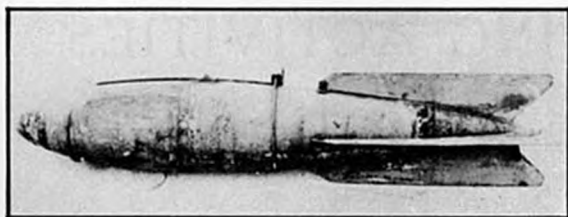


Fig. 11 - Mark I, 100-pound bomb



Fig. 12 - Mark IMI, 100-pound bomb

The Mark IMI, 100 pound bomb was equipped with a nose fuze, clearly shown in the photograph.



Fig. 13 - Mark IMIII, 100-pound bomb

The Mark IMIII, 100 pound bomb. Note the nose and tail fuzes and the modification of the "Box" type of tail fins.

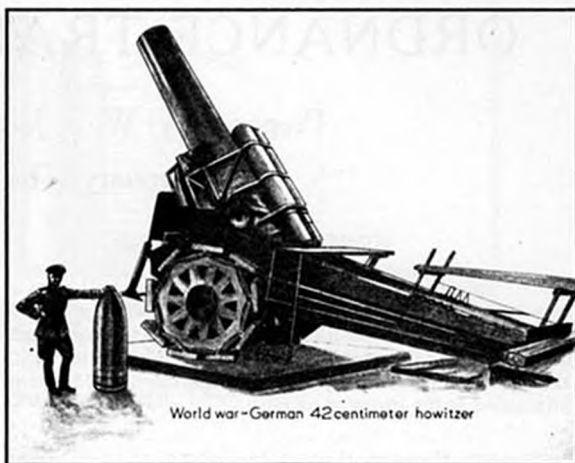
Please note that all of the weights assigned to the foreign bombs listed in the article are approximate weights.

FIELD ARTILLERY MATERIEL

(Continued from page 23)

advantage in the matter of light and medium howitzers. Almost from the outset, the flat trajectory of their 75's put them at a disadvantage. To overcome this disadvantage the French were forced to place a disk of heavy metal in front of their 75-mm shell in order to increase air resistance and thus obtain the necessary curvature.

The first surprise of the war was the speedy reduction of the great Belgian and French fortresses. This was accomplished by large mobile howitzers and mortars which the Central Powers had secretly built before the war. Steel and concrete defenses constructed to be proof against 8-inch projectiles crumbled within a few days when subjected to the high-angle fire of the Austrian 12-inch mortars. Later, at the siege of Antwerp, the Germans brought into action an even larger weapon, the famous Krupp 420-mm howitzer. These huge howitzers, trans-



German 42-cm. howitzer

ported in sections behind mechanical prime movers, threw a shell weighing 1570 pounds to a range of six miles.

Numerous innovations in materiel and technique appeared during the years of the war. Chemical shell was introduced by the Germans in 1915. Smoke shell was extensively used after 1916. Observation by balloon and airplane for medium and heavy calibers became necessary. The airplane made use of camouflage and cover a matter of prime necessity, and brought forth a new form of artillery with a superflat trajectory, the antiaircraft gun. The power of defense had grown so great that no advance could be made without a tremendous superiority in artillery fire, which in turn necessitated an enormous increase in artillery weapons in proportion to infantry. In 1917, in certain sectors, there were actually more artillery men than infantrymen. In most attacks, guns were used in proportion of one per ten yards of front, and in some cases one per 5 yards of front. By 1918, the proportion of artillery had grown to 10 cannon per 1000 rifles. American Artillery at St. Mihiel fired 1,000,000 rounds in a single four-hour preparation.

The World War demonstrated that under the conditions then prevailing no military force could hope to execute a successful attack against an entrenched enemy without an overwhelming superiority in field artillery.

The most unique technical development during the war was the German long range guns used in the shelling of Paris. From March to August, 1918, a succession of these guns fired a total of 367 rounds of high explosive shell into Paris and its suburbs, from ranges as far as 75 miles. A total of nine of these guns were manufactured, of which seven were actually fired at the front. One of these burst on its third round. The caliber of the guns was initially 210-mm (8.26 inches); when worn out after about 50 or 60 rounds at maximum range firing, they were re-bored to 232-mm (9.14 inches). The guns were constructed of two 15-inch naval guns screwed together, fitted with a smoothbore extension at the muzzle about 20 feet long. The total length of the bore, including the powder chamber, was 118 feet, which necessitated supporting the tube by means of a truss to prevent droop. In firing, the gun was set at a constant elevation of about 50 degrees the ranges being

(Continued on page 67)

ORDNANCE TRAINING ACTIVITIES

Prepared by: W. S. Johnson, 2nd Lt., Ord. Dept.

Secretary, The Ordnance School

SUMMER R. O. T. C. CAMP

This year the summer R.O.T.C. camp will open on June 19th and will last until July 30th. Major Raymond O. Ford, P.M.S.T. at Cornell University, will be the commanding officer. It is expected that approximately 160 R.O.T.C. students will attend, of whom about one-third will be commissioned at the close of camp.

The schools that will be represented are as follows: M.I.T., Cornell, Lehigh, University of Pennsylvania, Georgia Tech., University of Cincinnati, University of Michigan, and the University of Illinois.

All practical and theoretical instruction will be given by The Ordnance School. Since it is expected that most of the graduates will become field service officers, the course has been rearranged so that the instruction will be centered on fitting the students for service with troops, rather than stressing proof work as was done in the past.

SPECIAL ELECTRICAL COURSE

On May 21st, a special electrical course was begun in Baltimore, Maryland, with 20 selectees and 2 regular army enlisted men enrolled. The course was initiated at the request of The Ordnance School, and is run under the supervision of the Vocational Training Section of the Baltimore Board of Education. The students attend classes daily, Monday thru Friday, from 10:00 A.M. to 4:00 P.M.

The course is organized in such a manner as to primarily teach electrical maintenance, paying particular attention to the equipment on the special technical vehicles found in the Medium and Heavy Maintenance Companies. The students receive instruction in the servicing of the power take-off generating units, the generator for the welder, the motors and controls for all the power machinery, and the conduit and panel boards for the electrical system in the trucks.

The courses are two months duration. The present one, which started on May 21st, will be completed on July 20th, at which time another class will be organized.

"THE ORDNANCE SERGEANT'S LIBRARY"

A list of references appeared in the May issue of THE ORDNANCE SERGEANT. This list was referred to as "The Ordnance Sergeant's Library," and it was suggested that the list be preserved, "at least until superseded by later information."

Changes pertaining to this list were printed in the June issue, and THE ORDNANCE SERGEANT will endeavor to provide other changes as they become necessary.

The following revision of that part of the list pertaining to "Ammunition" has become advisable, and it is suggested that all readers mark their lists accordingly:

AMMUNITION

Military explosives	TM 9-2900 Ord. Safety Manual 00-7224
Small arms ammunition	TM 9-1990* (TR 1350-A), SNL's of Group T
Grenades, hand & rifle	TM 9-1985* (TR 1350-B) & 1350-C; SNL S-3
Trench warfare ammunition	TM 9-1935* (TR 1350-3A, SNL R-4

Artillery ammunition

TM 9-1940* (TR 1350-37A), TM 9-1950* (TR 1355-75A), TM 9-1960* (TR 1355-155A), TM 9-1925* (TR 1355-155B), TM 9-1920* (TR 1360-3A), TM 9-1930* (TR 1355-240A), TM 9-915* (TR 1365-14A); 137 OD Pamphlet 2036, 5981. SNL's of Groups P & R. AR 700-10, O.O. Form #7224, TM 9-1900* AR 30-1270, ICC Reg; O.O. Form #7224, TM 9-1900* TM 9-1980* (TR 1370-G), SNL S-1 TM 9-980 TM 9-900* (TR 1370-A), O.O. Safety Manual Form #7224, 9-1900*, 9-2010* AR 750-10

Storage

Transportation

Aircraft bombs and bomb fuzing
General

Range regulations for firing ammunition. In time of peace.

*When published.



LIBRARY

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

The answer to where your outfit will be stationed together with a map showing the locations of the Ordnance Field Service Units may be found in "Ordnance Field Service - The Army's System of Armament, Maintenance and Supply", reprinted from the May - June, 1941 issue of Army Ordnance.

A complete discussion of all phases of welding is found in a Technical Manual, prepared under the direction of the Chief of the Air Corps. (TM #1-430) Welding.

"Instruction Guide for the Generating Unit, M1 (TM #9-2615)" prepared under the direction of the Chief of Ordnance, is a valuable addition to the Fire Control Section of Medium and Heavy Maintenance Companies.

Training Films #5-145, (Armored Combat Vehicles), and #5-146 (Means of Anti-Mechanized Defense), present a vivid picture of tanks in action, and the obstacles they must overcome.

Training Film #6-127, the 75mm Gun (M2A2, Truck-drawn), (The Section: Duties at the Gun Pack and on the March), shows and discusses in detail the various duties of personnel of the 75mm Gun Section on the march.

All of the preceding training films mentioned are available in 16mm sound.

Film Strip #7-17, Parts I & II (The Automatic

Pistol, Cal. .45, M1911 and 1911A1), presents interesting information for training purposes.

The following extract from "Training Circular No. 37, War Department, May 26, 1941", contains some valuable information, namely:

Personnel possessing certificates of successful accomplishment of any of the following courses of instruction are authorized to perform routine maintenance and servicing of antiaircraft directors, as outlined in paragraphs 161 and 162, "FM #4-110" (Gunnery, Fire Control, and Position Finding, Antiaircraft Guns.)

1. Antiaircraft Fire Control Course, Enlisted Specialists' Division, The Coast Artillery School.

2. Director, Maintenance Course, Sperry Gyroscope Company.

3. Instruction course in director repair at the Ordnance School.

The following information is gathered from the May 15th issue of Army Motors, published at the Holabird QM Depot, Baltimore, Maryland:

Pending their issue as War Department Technical Manuals, the publications below can be obtained from the Editor, "THE 'AM'", Holabird Quartermaster Depot, Baltimore, Maryland.

T/M NUMBER	M.T.S. TEXT NO.	BASIC MOTOR TRANSPORT SCHOOL TEXTS	DATE OF
			PUBLICATION IN 'AM
*10-510 (10/1/40)	1	THE MOTOR VEHICLE - (Automotive nomencl. terminology military motor vehicles-vehicle units and assemblies.)	1/1/41
*10-570 (2/4/41)	2	THE INTERNAL COMBUSTION ENGINE - (Princ. of operation, types, parts and their func. incl. eng. lubrication and cooling.)	1/1/41
*10-550 (12/27/40)	3	FUELS AND CARBURETION - Fuels fuel systems, physics of carburetion, princ. types of carb., intake and exhaust pistons superchargers and governors.)	8/31/40

*10-580 (1/29/41)	4	AUTOMOTIVE ELECTRICITY-(Princ. of elec. and magnetism, storage battery, battery ignition, magnetoign. starter and generator, light sys., horn, elec. acc.)	1/1/41
10-585	5	AUTOMOTIVE POWER TRANSMISSION UNITS-(Power trans. clutches, transmissions, propeller shafts and universal joints-rear axles.)	1/1/41
10-560	6	CHASSIS: BODY AND TRAILER UNITS-(Frames, springs-front axles, steering gear, wheel alignment, wheels, rims and tires.)	2/15/41
*10-565 (3/8/41)	7	AUTOMOTIVE BRAKES - (Principles, mech. hydraulic, air, vacuum, electric.)	1/1/41
*10-540 (12/26/40)	10	LUBRICATION - (Principles and Practices.)	9/30/40
*10-545 (12/30/40)	11	INSPECTION - (Command, Preventive & Tech.)	9/30/40
10-590	12	HAND, MEASURING AND POWER TOOLS	2/1/41
10-530	13#	TUNE-UP AND ADJUSTMENT-(Trouble shooting.)	To be revised.
10-525	15	ECHELON SYSTEM OF MAINTENANCE-(Organizational and service maintenance.)	2/1/41
10-505	16	MILITARY MOTOR TRANSPORTATION-(Organization, principles, supply and maintenance. Section on "Principles of Operation.")	Being revised. 9/30/40
10-555	21	SHOP SCIENCE - (Arithmetic-algebra geometry-physics-mechanics-blue print reading, - metallurgy) REVISED.	To be published about 6/30/41.
10-360	22#	FIRE PREVENTION, SAFETY PRECAUTIONS, ACCIDENTS	To be published about 6/30/41.
10-575	8 #	DIESEL ENGINES AND FUELS-(Principles of oper. types, incl. semi-Diesel, parts and their functions, including lubrication and cooling, fuels and fuel systems.)	To be published about 6/30/41.
*10-515 (12/13/40)	9	THE MOTORCYCLE-(Nomenclature, operations inspection, maintenance, driver training, COURSE OF INSTR. AND GUIDE IN MOTORCYCLE OPERATION)(Supplement to text No. 9.)	9/30/40 Revised
10-520	14#	MAINTENANCE AND REPAIR-(All units and assemblies of the motor vehicle.)	Publ. 6/1/41 To be revised.
10-440	17	THE BLACKSMITH AND THE WELDER, revised.	To be published about 6/30/41
10-450	18	THE RADIATOR REPAIRER AND THE SHEET-METAL WORKER.	Being revised.
10-445	19	THE MACHINIST, revised.	To be published about 6/30/41
10-455	20	THE BODY FINISHER - (Carpenter-upholsterer, painter.	Being revised.

SUPPLEMENTARY INSTRUCTIONAL MATERIAL

MOTOR REPAIR SHOP MANUAL, OQMG	2/1/41
MOTOR TRANSPORT SUPPLY, OQMG	3/25/41
TENTATIVE GUIDE AND REFERENCE FOR QMC LIGHT MAINT. UNITS (MO- TOR TRANSPORT) OQMG	1/1/41
TABLES OF ORGANIZATION AND FUNC- TIONAL CHARTS, MOTOR TRANSPORT SERVICE	3/15/41
TROOP SCHOOL PROBLEMS, ARMY EX- TENSION COURSE -	1/1/41
1. Organ. of a Truck Co. Triangular Div.	
2. Training and Operations, QMC Truck Co.	
3. Truck Transportation of Supplies.	
4. Troop Movement by Truck.	

Not available for issue.

* Date following T/M No. indicates publication as a War
Dept. Tech. Manual.

Holabird Quartermaster Depot, Baltimore, Maryland,
May 15, 1941. Motor Transport School Texts are fur-
nished on the basis of three sets per organization or per
headquarters; and other material on the basis of one each
per military unit. Requests for quantities in excess of these
amounts should be explained in detail.

"LETTERS FROM THE FIELD"

102nd Ordnance Company,
A. P. O. 27,
Camp Forrest, Tenn.
(May 31, 1941)

Dear Sergeant:

This is the first chance I've had to send you any
description, pictures, etc., of the utility stand I made from
the scrap heap.

The center upright is part of an old type tire chang-
ing stand. The triangle at the base is made from scrap
structural steel welded together. The adjusting screws
were taken from an old two-wheel litter cart, the remain-
der of the cart being utilized for a work-bench. The column
in the center is a piece of a broken axle from a ditch digger,
and the surface plate itself was found in the scrap heap just
as it appears in the photograph. I don't know what it is
from. The idea of the whole thing was to give me a sub-
stantial base in the field on which I could use the leveling
surface plate that is in the field artillery optical chest.
Also, I could put on the collimating stand which I made.
We are situated on a very sandy spot of ground here, and
the stand is a huge success. The washers on the adjusting
screws are two inches in diameter, which gives a large
area for contact with the ground.

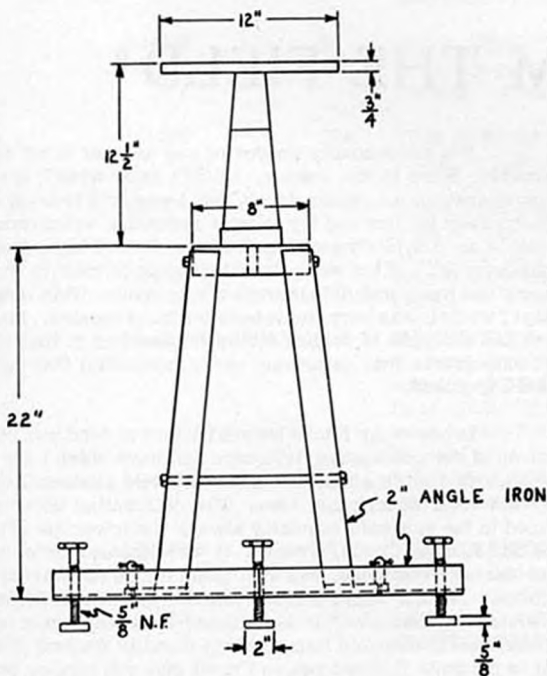
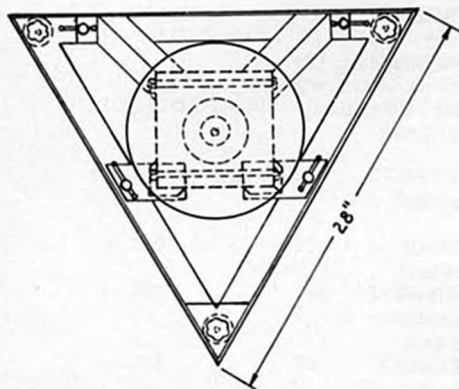
You are probably wondering why we went to all this
trouble. Here is the reason. I didn't know when I would
get an instrument repair truck, and I was told to train an
instrument section and try to have something which would
enable us to do fairly good repairs in the field. I have found
that over 50% of the work is the replacing of vials in gun-
ners' quadrants and vials in angle of site levels. This meant
that I would need a very stable base for these repairs. Since
we had a couple of folding tables for benches in the field,
it was obvious that something more substantial than these
were required.

In one of my future letters I intend to send you pic-
tures of the collimating telescope and base which I use in
conjunction with the stand for adjusting field glasses. I will
give a brief description here. The collimating telescope
used in the arsenals is nearly always the telescope of the
M1916 Aiming Circle, French. It was impossible for me
to obtain one of these, so I sent home for an old Warner &
Swazey musket sight, M1913, which I had bought for ex-
perimental purposes. It is fastened to a heavy cast iron
base made from an old flange which I found in the junk heap.
It is not quite finished yet, so I must give you further par-
ticulars at a later date.

I also intend to send in pictures and sketches of a
front sight adjusting gage for the Browning Automatic

Rifle, which I designed and made over six years ago. I am also sending information on this through channels to the Chief of Ordnance so that if adopted I may get recognition as its originator.

The Pencil sketch is by my assistant chief of section, St. Sgt. Laurence De Julius, whose comments, criticism and advice have been found extremely helpful. Please



excuse the smearing, etc., as it is raining very hard and our igloo leaks like a sieve. Please feel free to call on me for any help on technical questions, as I have had a pretty good background in machine work and instrument repairs, and am a gunsmith by trade. Hoping you can use the enclosed information and picture, I remain,

PAUL V. BECKER,
Technical Sergeant

(Editors Note: THE ORDNANCE SERGEANT can use this kind of material, and is glad to receive it. A great many ordnance men must have encountered difficulties of many kinds, and it is probable that many of them devised ingenious solutions. If they help one man, or one organization, they will help others. There is no better way of circulating ideas than through the pages of THE ORDNANCE SERGEANT. It's all "for the good of the service".)

HEADQUARTERS FOURTH AIR FORCE
Office of the Ordnance Officer
Riverside, California

June 2, 1941

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

My dear Editor:

I have just finished reading my May copy of THE ORDNANCE SERGEANT, and would like to commend you on the tremendous improvement which you have made in such a short time. I was so greatly pleased that I immediately passed it around to the other enlisted men in my department. They all found it most interesting and an education in itself. The illustrations, which could not be made in such detail nor as legibly in the old edition, greatly simplify things which words cannot explain. This is one of the greatest aids the enlisted men of the Ordnance Department have ever had, and I sincerely hope that it will continue -- explaining and illustrating the latest developments and improvements for ordnance service.

I am enclosing a picture of headquarters, 4th Air Force, in which the office of the Ordnance Officer, 4th Air

Force, is located. This office now has a personnel of two officers, sixteen enlisted men and two civilian secretaries. It is hoped that this picture can be published in the near future.

Hoping for continued success, I remain,

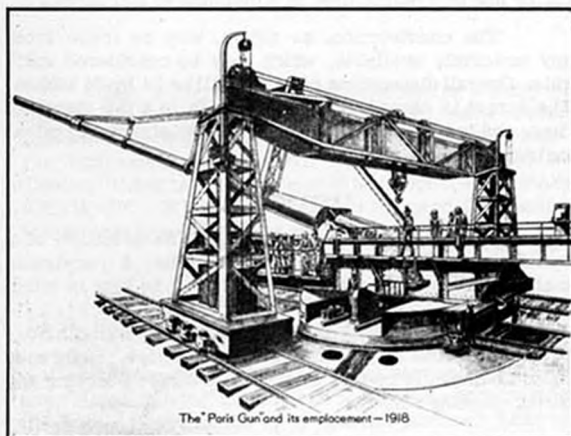
Yours truly,

W. ST. AMOUR,
M. Sgt., Ord. Section,
Hq. 4th Air Force,
Riverside, California

FIELD ARTILLERY MATERIEL

(Begins on page 21)

changed by varying the powder charge. The probable point of impact was determined by measuring the chamber pressure at each shot, which varied between 42,000 and 69,000 pounds per square inch, and the position of the projectile when loaded. The plotting was then checked from the Paris newspaper accounts received via Switzerland the following day. Firing data had to be computed with great care for each round. In addition to usual weather corrections, computations had to be made for the curvature of the earth



The "Paris Gun" and its emplacement—1918

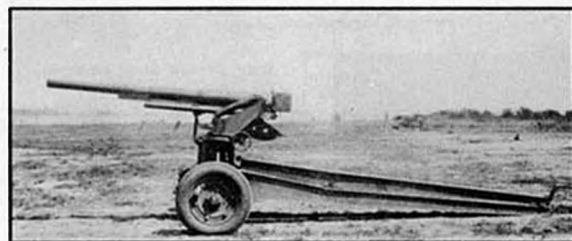
German long-range gun

and the rotation of the earth, the velocity of which varied between the gun and target. The projectile was about 40 inches long, containing a relatively small explosive charge, which was about the same as that in the 155-mm shell. The powder charge used was about 430 pounds. Time of flight for maximum ranges was about 186 seconds. The maximum ordinate of the trajectory was 24 miles. Maximum rate of fire was four rounds per hour. The secret of the phenomenal range lay in the great muzzle velocity--about 5500 feet per second--together with the ballistic efficiency of the projectile, and the high angle of elevation. During the greater part of its flight the projectile passed through the upper strata where the density was only about one-tenth that at the surface of the earth, a condition approaching travel in a vacuum. The last guns fired were mounted



on a huge railroad carriage which was run onto a turntable. At least three other heavy guns were fired simultaneously from the same general locality to confuse the allied sound-ranging stations. Although the approximate locations of the great guns were soon determined by the French, and the locality subjected to heavy bombardment, direct hits were obtained on only one emplacement, and that after the gun had been removed. Because of its cost, and the limited effect of its projectile, the Paris Gun did not pay for itself in material effect upon the enemy. However, it did have unquestioned morale effect in the early bombardments, causing frequent general alarms and virtually stopping all normal business activity for many hours. It is safe to assume that similar guns will appear again.

After the war much experimentation was done in all countries with pilot models. Considerable improvement was effected in mechanical means of transportation, with nearly all nations "modernizing" their horse-drawn carriages for automotive prime movers. Electrical directors appeared for use with antiaircraft artillery, per-



75mm. gun, No. 1, M1925-E1, on T2 carriage, travelling position

mitting rapid application of firing data, and the mechanical or electrical laying of the guns.

In the United States an attempt to realize the ideals of the Caliber Board resulted in the production of an "all purpose" 75-mm gun. Although a remarkable accomplishment in design, this weapon, as is often the case with compromises, proved inadequate for either of its primary



75mm. gun, No. 1, M1925-E1, on T2 carriage, firing position

purposes. It did not have the necessary characteristics of a first-class antiaircraft gun, and was too complicated as to fire control equipment for divisional supporting missions. The result of the experiment was a return to the specialization of weapons.

In summarizing the modern period of development,

beginning with the appearance of the French 75-mm gun in 1897, we find many advances which resulted in changes in tactics and technique. Guns and carriages of the present day have increased mobility, and have mechanical improvements that make for greater accuracy, stability, and faster firing. They have at the same time become far more complicated, more expensive, and heavier.

In all probability the future trend in the development of field artillery weapons will continue to follow these lines: greater mobility, both on roads and across country, through the use of motor transport; greater elevation, in order to obtain maximum range and reach behind cover; greater traverse, in order to fire effectively against rapidly moving targets, especially tanks; greater range, in order to reach further into enemy territory; greater facility in occupying and leaving position; and better means of conducting fire, especially against moving targets.

NOTE: References used in the preparation of this article were as follows:

Instruction Memorandum, Mat-2, The Field Artillery School.
Field Artillery Book No. 102.
Encyclopedia Britannica.

ELEMENTARY OPTICAL PRINCIPLES

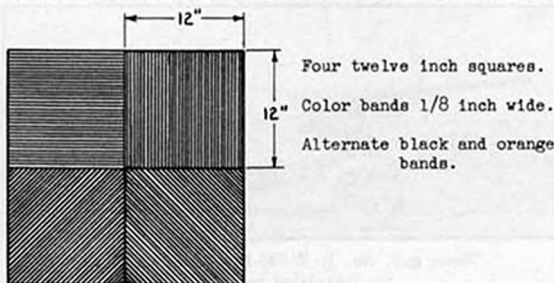
(Continued from page 28)

bookstore. Any questions or queries relative to any phase of this series will be welcomed and answered promptly. Address THE ORDNANCE SERGEANT.

"NOTES IN BRIEF"

Notice: The attention of all instrument personnel in the field is invited to War Department Training Circular #37, paragraph 2, May 26, 1941, which outlines the qualifications for the only personnel who will be permitted to perform routine maintenance and servicing of AA Directors. (See the "Library Page", this issue of THE ORDNANCE SERGEANT.)

Target for Obtaining Definition: An excellent target for obtaining clearness of definition and a sharply outlined field of view is shown in the sketch below. It may



be used for any telescopic instrument. It should be set up, by use of a plumb line, at a distance of 200 yards.

The construction, as shown, may be made from any materials available, which may be considered suitable. Overall dimensions of target will be 24 by 24 inches. The target is cheaply and easily made in a few moments time, and is a handy aid to the final adjustment of optical instruments.

Cleaning Metal Components: The selection of a suitable metal cleaning solvent is often a perplexing matter. The following requirements must be kept in mind:

- (1) The provisions of Ordnance Safety Bulletin No. 7 prohibit the use of gasoline for this purpose. Reference to this bulletin is invited prior to selecting or storing any metal cleaning solvent.
- (2) The solvent selected should meet all the requirements of the safety bulletin quoted above, as well as all local fire and safety regulations.
- (3) It should be inflammable to as little extent as possible.
- (4) It should be capable of storage with comparative safety.
- (5) It should clean and degrease metal components quickly, with a minimum of manual labor, and no harmful after effects.
- (6) It should dry quickly, leaving no residual wax, grease, oil, or corrosion inductive film on the parts cleaned.

The above stated requirements make the selection

of a suitable solvent quite difficult. Listed below, without comment, are some of the solvents that have been

used for this purpose, and remarks concerning them. The information below was furnished by Frankford Arsenal.

<u>SOLVENT</u>	<u>SOURCE</u>	<u>REMARKS</u>
1. Solvasol	Socony Vacuum Oil Co.	1. Suspected of being Stoddard solvent. See Fed. spec. P-S-661. 2. Leaves grease spots.
2. Sunoco Spirits	Sun Oil Company	1. Same as above.
3. Varsol #2	Standard Oil of Pa.	1. A Stoddard solvent. See remark for Solvasol. Recommended by Sperry Co.
4. Safety Kleen	Atlantic Refining Co.	1. Non-Inflammable. 2. Suspected of being carbon tetrachloride. 3. Used by arsenal to limited extent for metal cleaning. 4. More expensive than others.
5. Solvesso #2	Standard Oil of Pa.	1. Very quick drying. 2. A hydrogenated naptha. 3. Considered safe but not non-inflammable. 4. High solubility ratio.

Gear Pullers: The specifications for a handy gear puller for removing obstinate knobs and handles, and which is adjustable to a wide range of work, done by the instrument section, will be discussed in the Fire Control "Notes in Brief" column in next month's ORDNANCE SERGEANT. If you have ever felt the need for a suitable tool of this type be sure to read it.

References for the Instrument Section: Next month the "Notes in Brief" column will be devoted, almost in its entirety, to a list of all the up to date and pertinent reference material available to the instrument section relating to its work. This list should prove of special value to section leaders. Don't miss it.

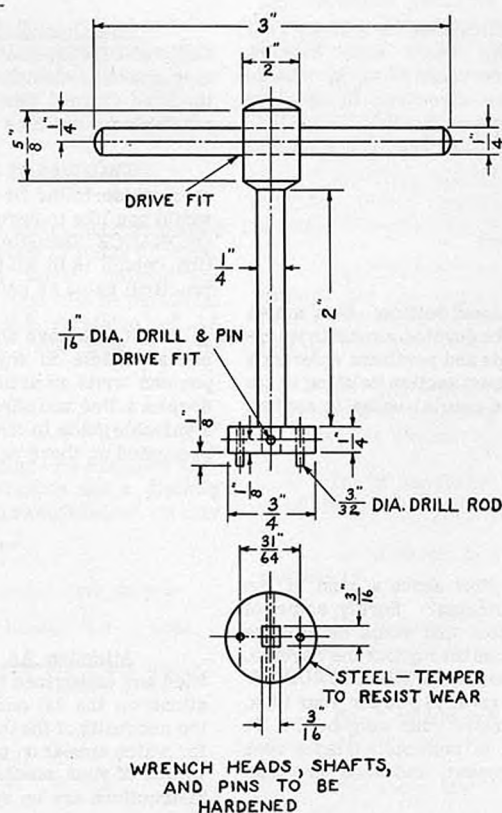
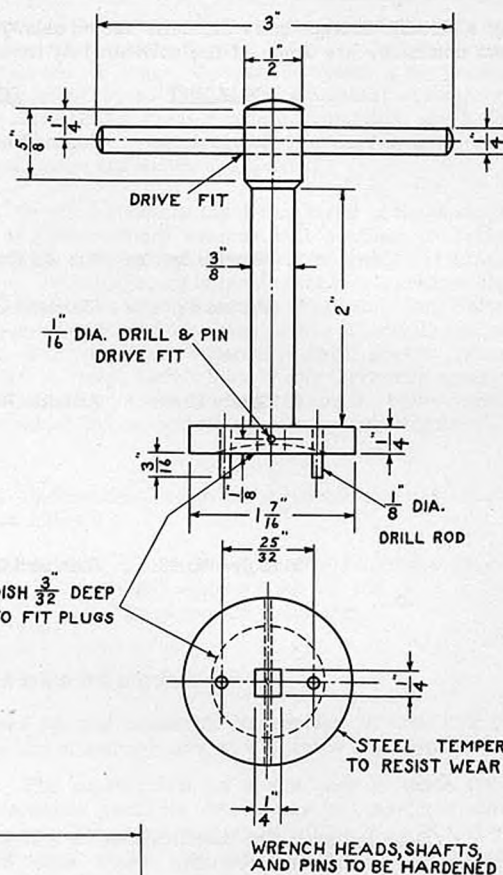
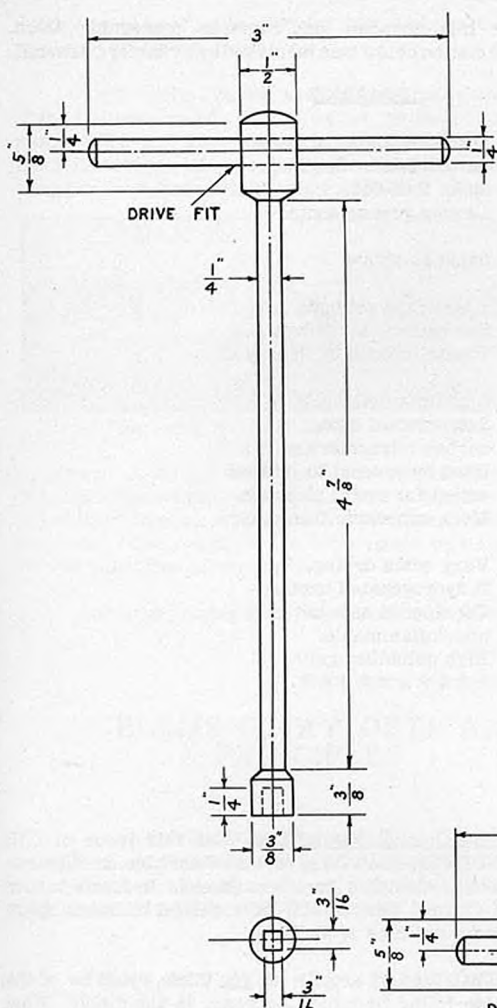
Instrument Personnel: How about a hand in the monthly construction of this column? Surely some of you have, or know of a brief item that would be of value and interest to instrument sections throughout the service. Send in anything you consider suitable to THE ORDNANCE SERGEANT. Full credit will be given to you for your idea. Why not help to lighten the work of your neighbor? He will appreciate it. Any subject is suitable. Glance over this page; think hard for a moment, and send us a line. Thanks!

Fire Control Specialists: With this issue of THE ORDNANCE SERGEANT the series of articles on Elementary Optical Principles comes to an end. In future issues the Fire Control Section will have quite a bit more space available for articles of all types.

What type of article do you think would be of the most value to the Ordnance Sergeant in the field? What would you like to have discussed in these columns? THE ORDNANCE SERGEANT is anxious to make this publication, which is in all reality your publication, of as much practical value as possible.

If you have an idea for an article --If you want to see an article on any particular phase of your work --If you can write an article concerning your work --Why not drop us a line and offer your suggestions. They will afford a valuable guide in the preparation of future material to be presented on these pages.

Attention AA Maintenance Men: Personnel qualified and authorized to perform routine maintenance operations on the M1 and M2 Height Finders will appreciate the necessity of the three special wrenches. Specifications for which appear on page 70. These wrenches can be made by one of your machinists, or by the machine shop. Full instructions are on specifications.



NOTICE

The attention of all concerned is invited to the fact that THE ORDNANCE SERGEANT was originated to meet a very definite need. The unprecedented expansion of the Ordnance Department has resulted in the appointment of hundreds of new noncommissioned officers. At the same time the normal processes of reproduction and distribution of Ordnance literature have become so congested that in a great many instances it has been impossible for the newly appointed noncommissioned officer to procure that information which is necessary if he is to perform his duties efficiently.

The primary purpose of THE ORDNANCE SERGEANT, therefore, has been and continues to be the dissemination of reliable and comprehensive information which is essential and broadening to every noncommissioned officer of the Ordnance Department, and, therefore, to the efficiency of the Department itself.

Recognizing the fact that each issue of THE ORDNANCE SERGEANT contains matter of interest to commissioned officers, The Ordnance School urges that all officers familiarize themselves with each issue. However, all copies mailed to organizations by franked mail must remain public property and be filed where they are accessible to all members of the command.