

The ORDNANCE SERGEANT

VOLUME 4

OCTOBER 1942

NO. 4



R E S T R I C T E D

Published by the Ordnance School in the interests of Ordnance Sergeants

21-I-4

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Cover drawing of the Heavy Wrecker, M1, in the field, by Private First Class Robert V. Griffith, of the Art Section of The Ordnance School, based on action photographs by the Photographic Section of The Ordnance School.

HIGHLIGHTS

Beginning in this issue is a two-month study of the Ordnance vehicles in current use. Actually these are the principal implements by means of which the Ordnance renders service to combat units. It is a vast array of equipment which no man is likely to understand completely. This issue, and the next, are intended to help acquaint you to a greater degree with the possibilities and the limitations of these vehicles and their equipment. You might be vitally interested in any one of them in the future.

Lt. Medlin presents the second of his articles on foreign materiel with a discussion of two Japanese machine guns on page 360. Of special interest in direct connection with this article is that written by Private DuCharme under the Small Arms heading, on page 373, "Vickers Machine Gun, Cal. .303, Model of 1915".

An article on a basic subject, but one which should prove useful and interesting to many readers is "Explosive Trains" by Master Sergeant Parker, on page 356. It simplifies something which might otherwise remain complicated.

Following up the discussion of Ordnance Service in the Field which appeared in the September issue, is "The Modern Ordnance Setup" on page 366. Other changes are to be made, and more can be expected on associated subjects in future issues.

Among the regular monthly articles, the Artillery Section begins the presentation of "Fundamentals of Artillery Weapons" on page 377. This will be a very worth while series, for beginners and for those of wider experience.

Don't overlook Lt. Seisholtz's article on the "Storage of Ammunition" on page 397. It provides some very helpful information.

The aircraft torpedo makes its first appearance in these pages in this issue. A general description and maintenance hints will be found on page 399. Following page 368 is a double-page drawing of the Mark 13-1 Torpedo. More information regarding this materiel will be provided in future issues.

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

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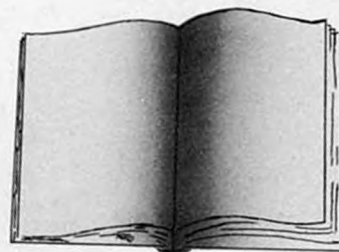
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Editorial



In reading a recent article in July's issue of THE ORDNANCE SERGEANT a very important fact was brought forcefully to my attention. Approximately 90% of our Ordnance officers and enlisted men are still living and trying to conduct this war under so-called peace time conditions with all the red tape and paper work involved.

"We will do the work IF you bring us the right papers" or "You will get the spare parts or supplies BUT you must bring us a properly made out, signed and approved requisition". It does not seem to matter that perhaps the supplies may be urgently needed to preserve some expensive item of Ordnance materiel which is liable to rust or deteriorate while the book is literally followed to the letter.

Why must there always be an "if" or a "but" when Ordnance Service is mentioned? Why must the average Ordnance man insist that the fighting arms first "fight" the battle with typewriter and paper before they can actually obtain the implements of war? Is it because of existing regulations, or is it because the regulations are improperly interpreted?

Army Regulations and our Ordnance publications are written to be a guide rather than a whip in the hands of a green or uninitiated Ordnance officer or enlisted man to be used as fancy may dictate. Certainly each individual case should be carefully diagnosed before a soldier is sent back to his organization without the Ordnance parts or supplies he desires because he does not have the proper "papers".

I have seen cases where Ordnance supplies were denied the using arms because some supply sergeant did not get the signature of his supply officer in the proper place on his requisition, or because the requisition was improperly made out. It did not matter to the "man behind the desk" wielding his fancy whip that the supplies were urgently required by the unit concerned. He did not take into consideration that a requisition is nothing more or less than a request, which could be verbal as long as it was clearly known what was wanted. I have heard an Ordnance Officer remark to his stock clerk, "If the requisition is not

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made up properly, send him back, and keep that up until it is correct — maybe he will get tired and not come back any more!" Ordnance Service? Well — perhaps in his own little mind this officer thought that he was doing a wonderful and glorious thing for his country — conserving some machine gun repair parts. Actually, he was the stumbling block, a monkey wrench in the wheels of progress — for while all this was going on, a machine gun lay idle and some student was doubling up on another gun — holding up a very important training program.

Conservation of equipment and supplies is to be encouraged, but not to the extent practiced by some of our Ordnance officers in the field. Here is a good example of this abuse — and again I cite an actual happening. An armament sergeant at one of our flying fields sent a mechanic to the Base Ordnance Office for some machine gun lubricating oil. The man came back with this message: "No requisition — no oil." The armament sergeant, although he knew his aircraft armament, was not a typist, so he scribbled a pencil message to the Ordnance Sergeant that he needed the oil badly and would get a requisition later. In army language he got the answer "No soap". Not to be deterred, this young man drove to the gas station and drew a couple of gallons of oil, presumably for his truck, but actually this oil was used on aircraft machine guns — good oil, undoubtedly, but certainly not intended to be used on small arms.

The Ordnance Department has good officers, bright clerks, exceptional mechanics. The quality of work put out by Ordnance personnel is beyond reproach but that is not good enough. The Ordnance Service includes not only labor but also cheerful cooperation with our comrades in arms. Let us make the following our motto: "If you are authorized to have the materiel or supplies we will give them to you NOW! If you are not authorized to have the equipment or supplies but have a good reason for your request and it is earthly possible for us to do so you will get them!" If this is followed by each and every representative of the Ordnance Department our service to the line will be just what the words imply and not some fancy saying which in actual practice does not mean a thing.

by

BOLESLAUS KRUPINSKI, Capt., Ord. Dept.
Ordnance Officer, AAFGS, Eglin Field, Fla.

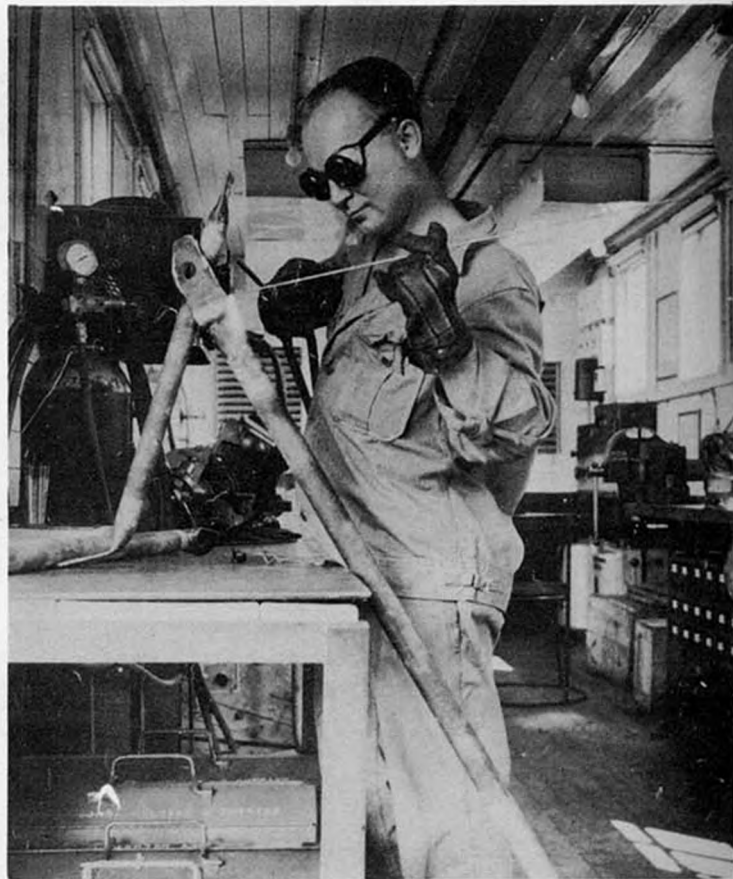
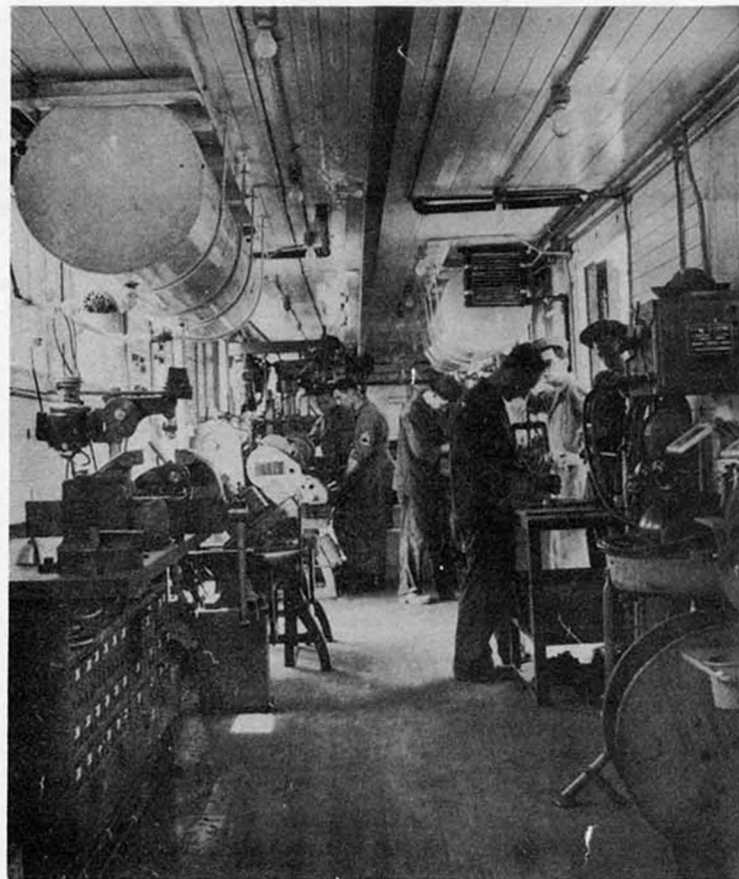
CAR, RAILWAY, MACHINE SHOP, M1

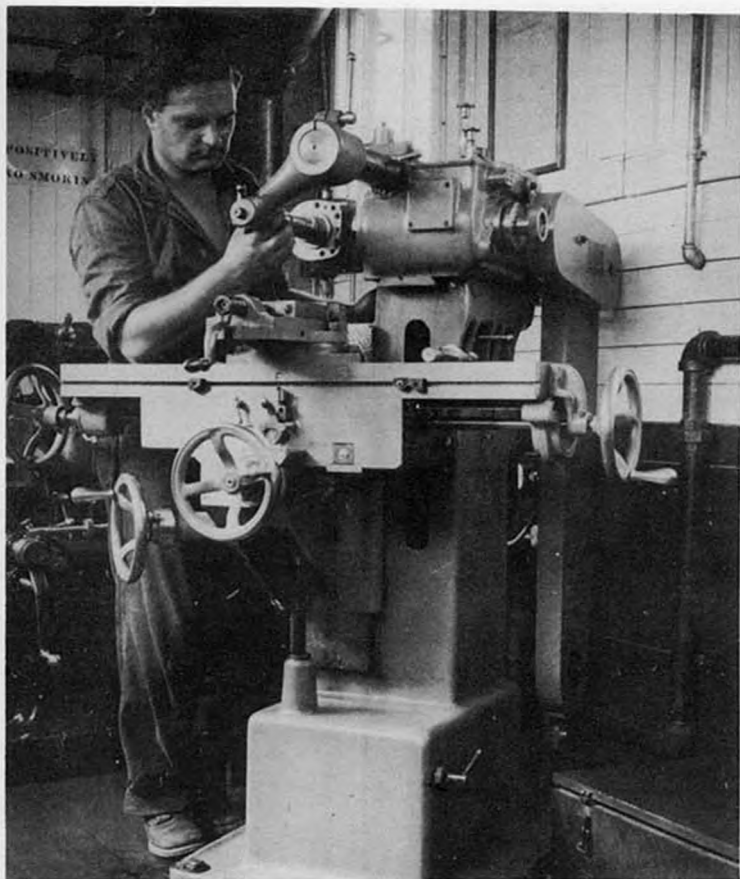
by C. L. LIPSCOMB, Capt., Ord. Dept.
Commanding 95th Ord. Co. (MRA)



The Railway Machine Shop Car, M1, was designed by the Ordnance Department for use as an all-purpose mobile repair shop. The extent of its use, flexibility and maneuverability is unlimited. One machine shop

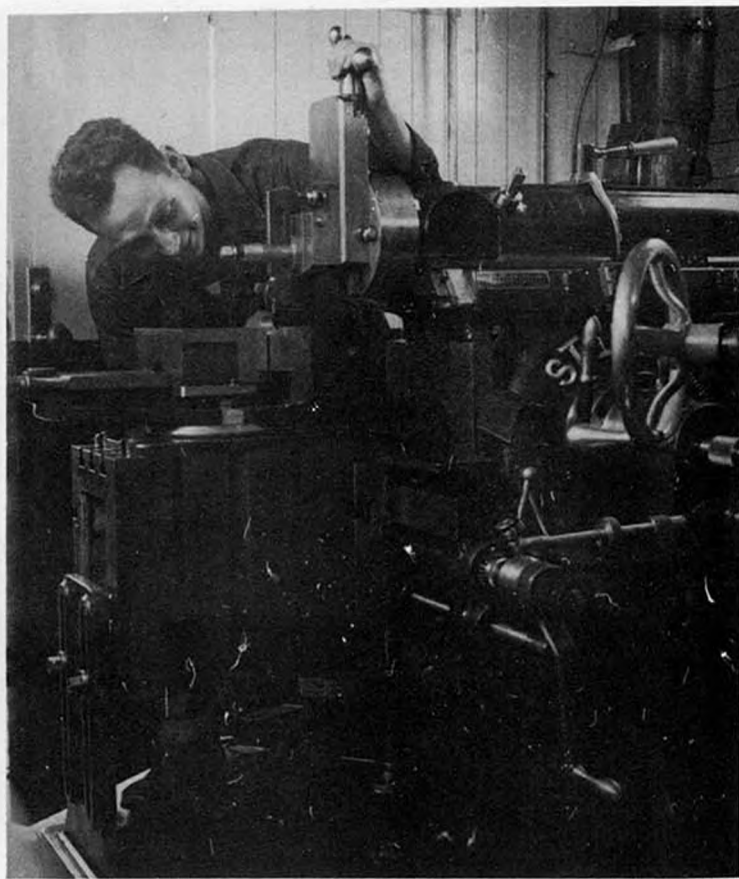
car is ordinarily assigned to a battalion of major caliber railway artillery. The first railway machine shop car placed in active service with a railway regiment was assigned to the 95th Ordnance Company (Maint Ry Arty),





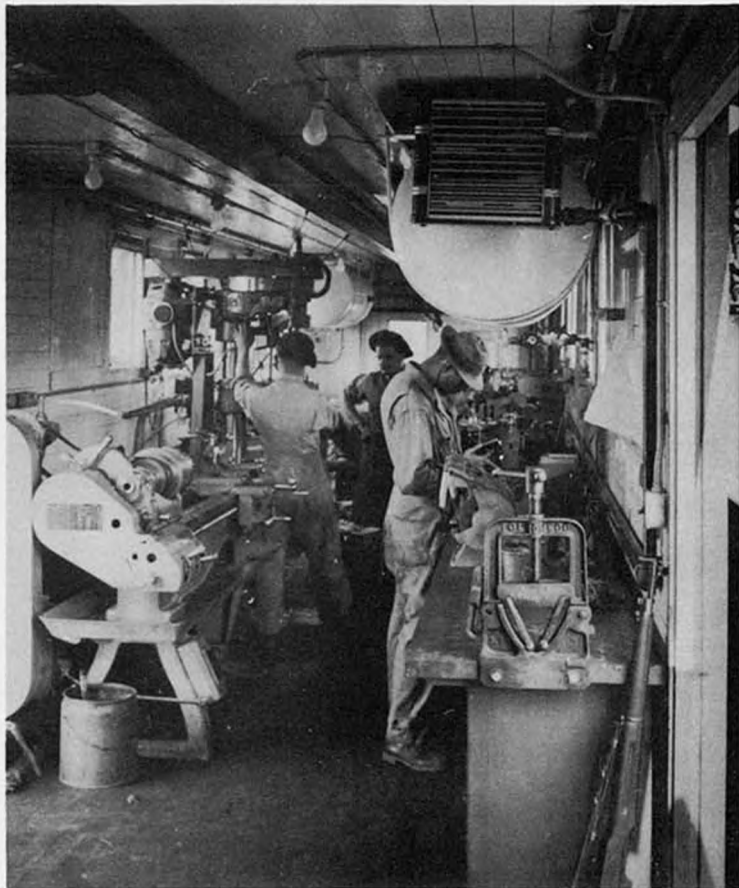
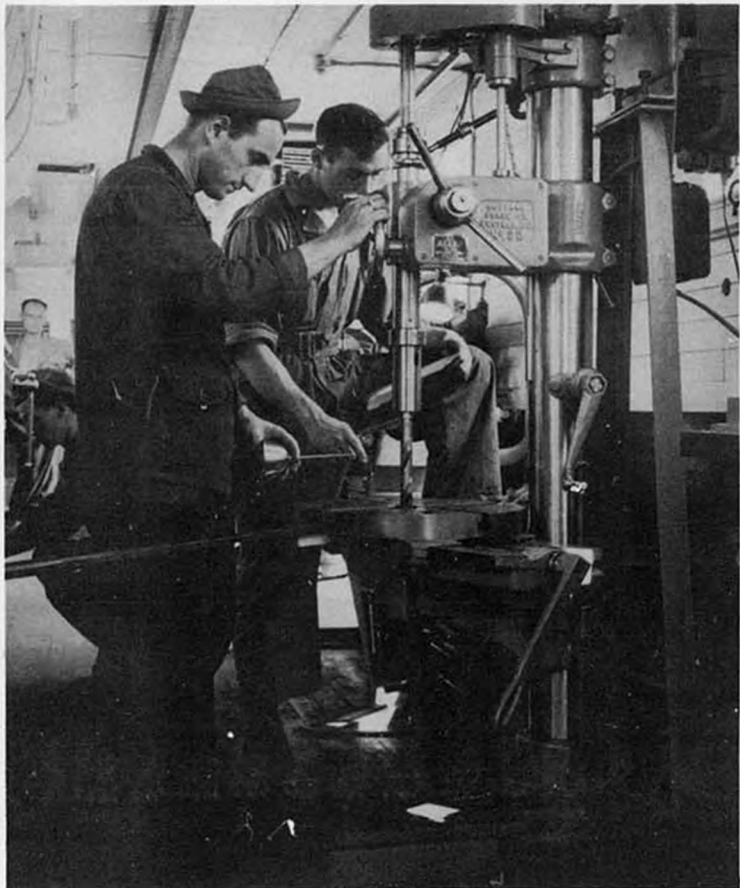
Fort Hancock, New Jersey. This car has, on several occasions, been attached to 8" railway artillery battalion trains and has operated many miles from its home station.

The car is completely equipped with machine tools such as lathes, drill presses, milling machines and shapers. Measuring, testing, and



welding equipment, as well as a large assortment of hand tool appurtenances, are used in the machine shop car.

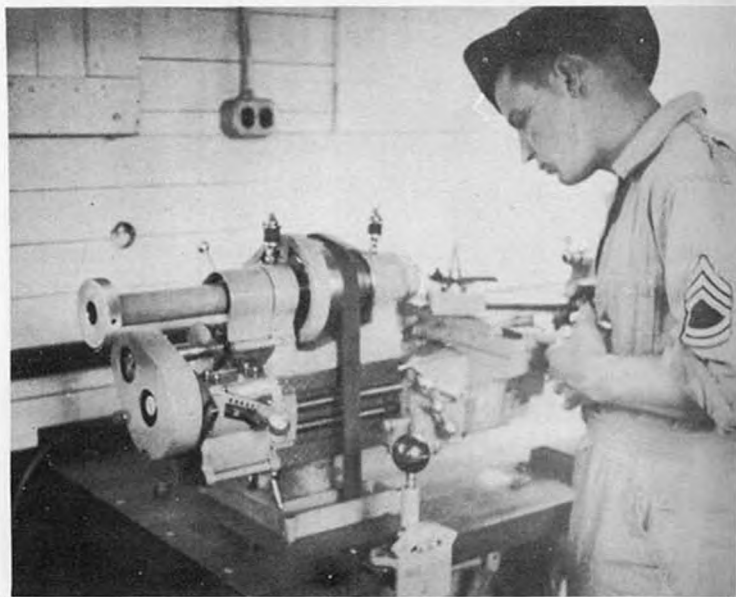
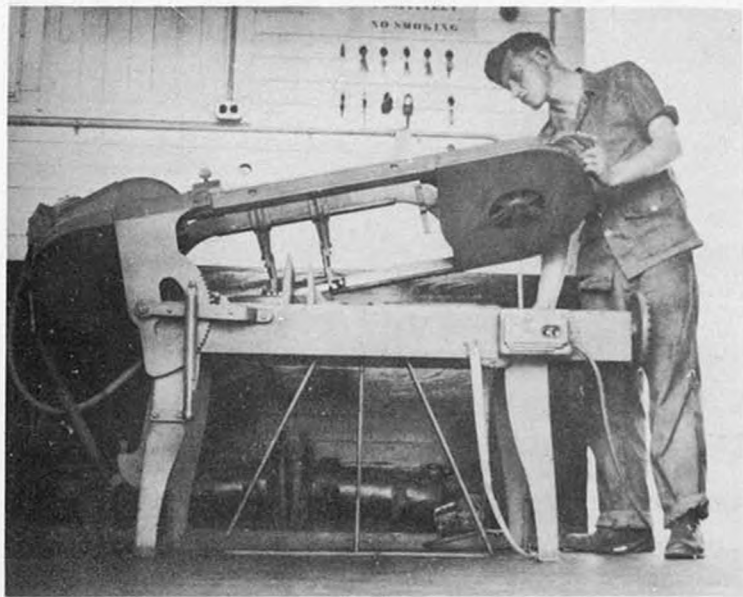
One compartment of the car contains the motor generator equipment for operations distant from sources of electric power. An air compressor, arc welding set, and power and light generators are permanently

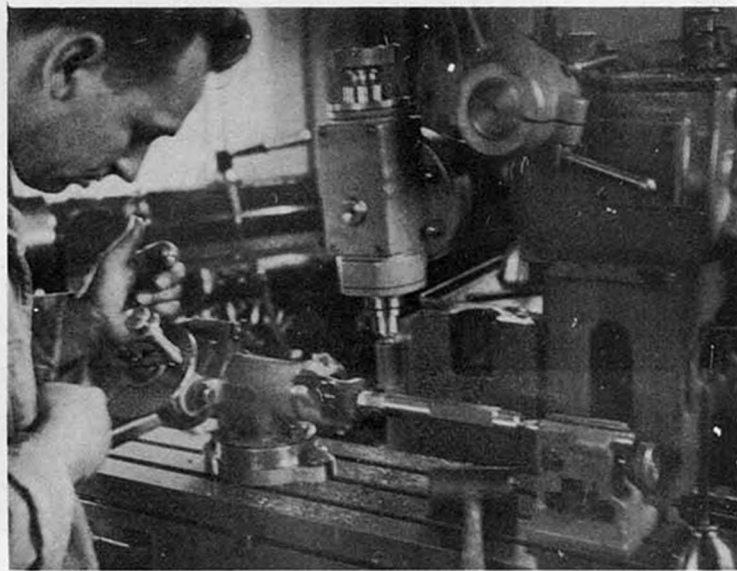
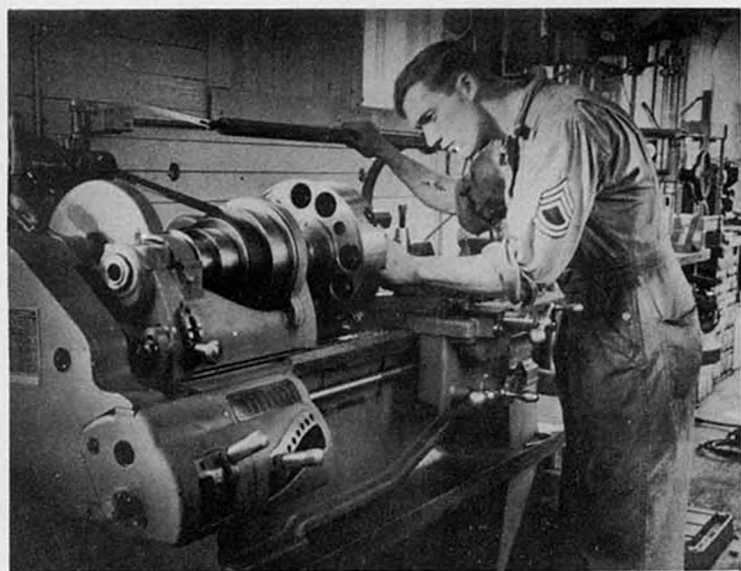
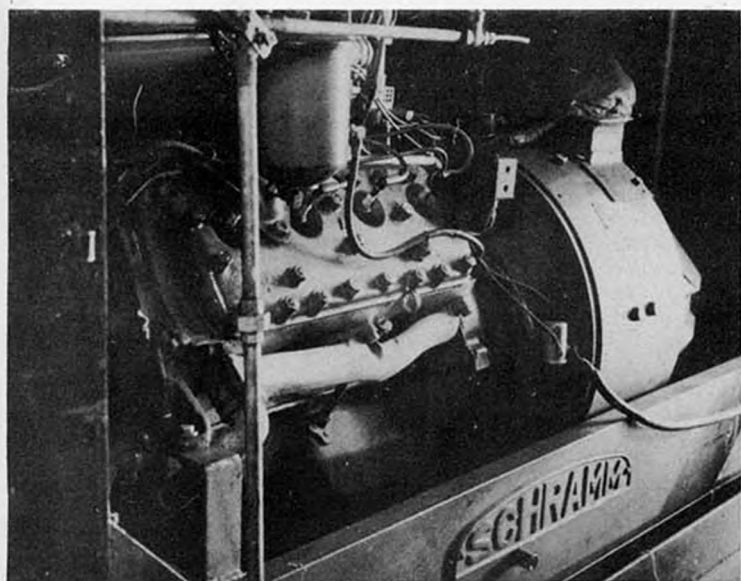




installed. There is a transformer for utilizing commercial power to run all machine tools.

The railway machine shop car was built and equipped to operate on any standard gauge railroad. It is heated, air conditioned, and may be used in any climate.





The responsibility of a railway company is to maintain all Ordnance materiel belonging to a railway regiment. The equipment to be maintained comprises railway and antiaircraft armament, fire control cars and am-

munition cars. A small arms section of the company takes care of automatic weapons, while the instrument section keeps all fire control equipment, sights, directors and data transmission systems in operation.

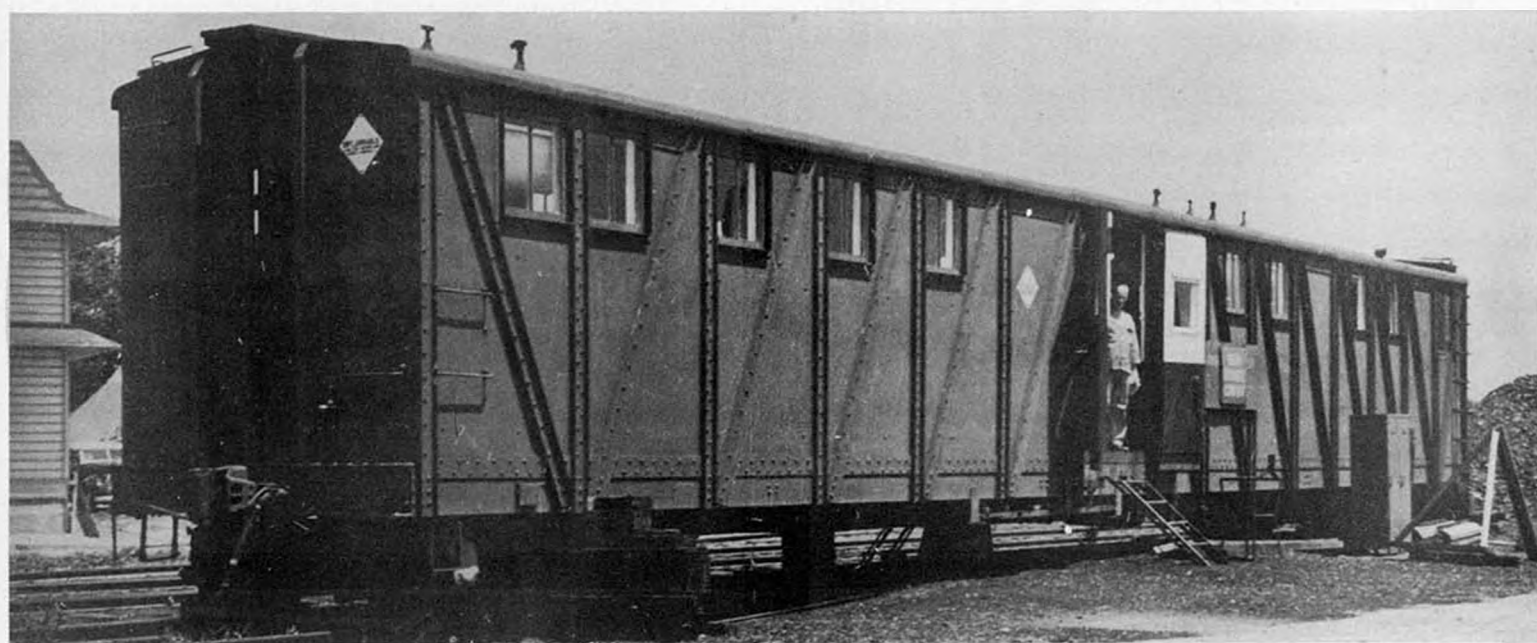




Fig. 1

This article is intended to familiarize Ordnance men with the Small Arms Repair Truck and some of its facilities. This equipment makes close to an ideal situation in the field, but we must also take into consideration the number of men available, orders, weather conditions, shifts, etc. Letters addressed to THE ORDNANCE SERGEANT on this subject proved invaluable in the preparation of this article.

Shown in Figure 1, above, is the Small Arms Repair Truck, M1, a GMC 1-1/2 to 3-ton vehicle having a 4x4 chassis, and a 6-cylinder engine whose horsepower rating is S. A. E. 33.19. Its various fuel and lubricant capacities are as follows:

Fuel tank	30 gallons
Engine crankcase and refill	10 quarts
Cooling system	23 quarts
Transmission	6-1/2 quarts
Transfer case	2-1/2 pints
Front axle differential	7 pints
Rear axle differential	7 pints
Oil bath air cleaner	1 quart

Figure 2 shows the interior space in the vehicle. The cabinet benches (a) and (b) contain four armorer's tool kits, twenty tool and spare parts boxes, space for extension cords, and other equipment. The truck equipment and its location on the truck is listed at the end of this article. A pioneer set, consisting of a shovel, mattock, axe, and hatchet are secured on the bracket (c).

Figure 3 shows the machinery and machinists' vises available for use in the truck. The drill is an electric portable 3/8-inch, 110-volt, Universal, with a 10-foot cord, and attached to a stand. The bench grinder is a 6-inch, 110-volt, 60-cycle, A. C., single-phase, 1/4-h.p., complete with light and two 6"x3/4"x1/2" wheels. The bench vises are of the machinists' type and have 4-1/2-inch jaws with swivel bases and swivel jaws.

Shown in Figure 4 is the armorers' kit with tool contents. The tools in the kit may not be sufficient to do all the repair work that is sometimes necessary, and arrangements should be made to add whatever tools may be needed. The kit consists of the following:

- 1 box, tool and spare parts, type V, class A
- 1 Cleaner, file, combs, brush and card W/scorer
- 1 Chisel, hand, cold, 3/8-inch
- 1 Drift, brass, taper, 3/16-inch, point
- 1 Drift, brass, taper, 5/16-inch, point
- 1 Extractor, ruptured cartridge, Mk II (Not shown)
- 1 Extractor, ruptured cartridge, Mk IV (Not shown)
- 1 File, flat, smooth, 4-inch
- 1 File, flat, second cut, 6-inch
- 1 File, half-round, smooth, 6-inch
- 1 File, mill, second cut, 10-inch
- 1 File Set, Swiss pattern needle, round handle, assorted, cut #0, 4" long, 12 files to a set
- 1 File, round, smooth, 6-inch

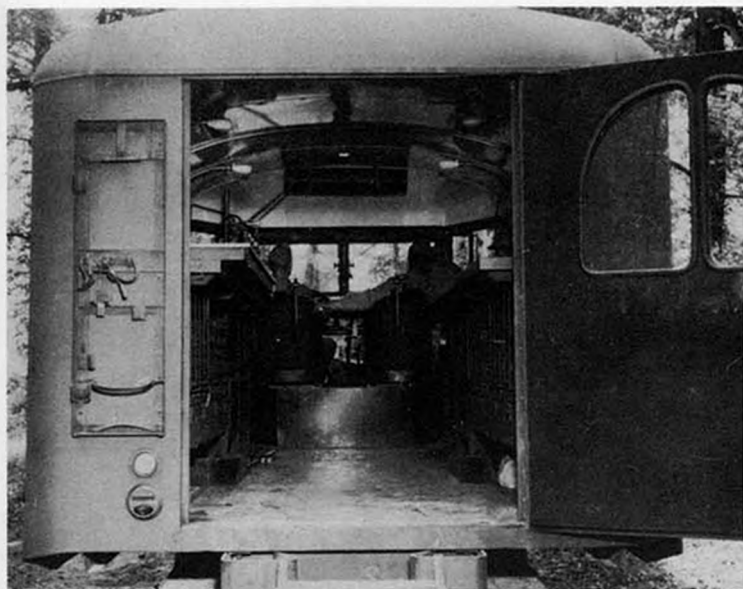


Fig. 2

- 1 Hammer, babbitt, 6-ounce
- 1 Hammer, brass, 3-ounce
- 1 Hammer, machinists', ball peen, 4-ounce
- 1 Hammer, machinists', ball peen, 8-ounce
- 1 Handle, file, adjustable (Not shown)
- 1 Oiler, oval, 3-ounce, w/cap and chain
- 1 Pliers, combination, slip joint, 8-inch
- 1 Pliers, side cutting, long needle nose, 6-inch
- 1 Pliers, side cutting, 8-1/2-inch
- 1 Pliers, side cutting, parallel jaws, Bernard type, 6-inch
- 1 Punch, center, 5-inch (Not shown)
- 1 Punch, drive pin, .030-inch, point (Not shown)
- 1 Punch, drive pin, .050-inch, point (Not shown)
- 1 Punch, drive pin, 3/32-inch, point (Not shown)
- 1 Punch, drive pin, 1/8-inch, point (Not shown)
- 1 Punch, drive pin, 3/16-inch, point (Not shown)
- 1 Punch, drive pin, 1/4-inch, point (Not shown)
- 1 Reamer, front sight stud, .094-inch, U. S. Rifle, Cal. .30, M1903 (Not shown)
- 1 Rule, steel tape, rapid, 6-foot, Mezurall type
- 1 Screwdriver, combination, M1, Browning Machine Gun, M1919A4 (Not shown)
- 1 Screwdriver, common, normal duty, 4-inch blade
- 1 Screwdriver, common, normal duty, 6-inch blade
- 1 Screwdriver, common, normal duty, 8-inch blade
- 1 Screwdriver, radio, 6-inch blade
- 1 Screwdriver, reversible blade
- 1 Set, stacking, swivel screw No. 1 (Not shown)



Fig. 4

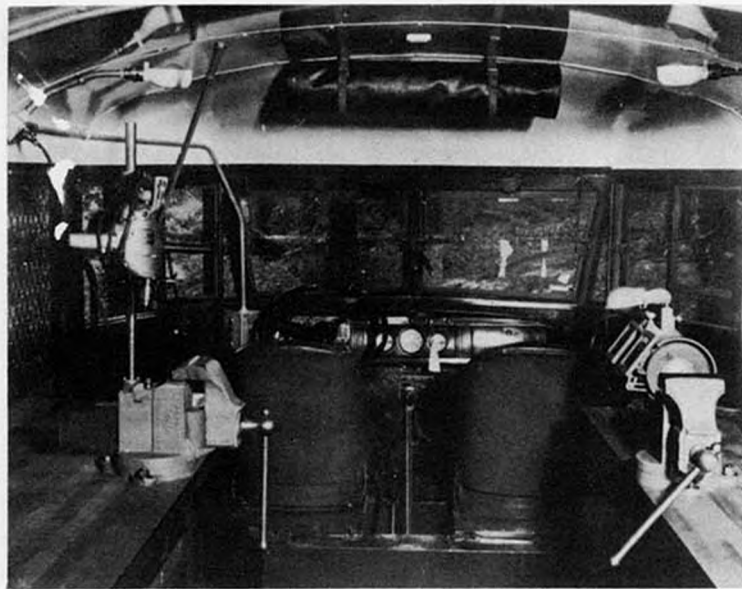


Fig. 3

- 1 Stone, sharpening, oil, India, square, 3/8" x 4"
- 1 Stone, sharpening, unmounted, Art., fine, half round, 4" x 3/8"
- 1 Stone, sharpening, unmounted, Art., fine, round, 4" x 3/8"
- 1 Stone, sharpening, unmounted, Art., fine, 3 square, 4" x 7/16"
- 1 Stone, sharpening, Arkansas fine, square, 4" x 1/2" (Not shown)
- 1 Stone, sharpening, pike, oil, Arkansas, natural, hard, round edge, slip, 3" long, 2" wide, (Not shown)
- 1 Tap, thread, .117-inch, 43-thread, R. A., U. S. Rifle, Cal. .30, M1903 (Not shown)
- 1 Vise, bench, 1-1/2-inch jaw width, 1-1/2" jaw opening, clamp base, steel jaws
- 1 Tool, assembling, safety lock, M1903 rifle (Not shown)
- 1 Tool, combination (special hook, spanner and screwdriver), Browning Automatic Rifle (Not shown)
- 1 Tool, combination (special box wrench, screwdriver and punch) Browning Machine Gun (Not shown)
- 1 Tool, combination, M3 (Not shown)
- 1 Wrench, adjustable, single end, 4-inch
- 1 Wrench, adjustable, single end, 8-inch
- 1 Wrench, combination, M6, Browning Machine Gun, M1919A4
- 1 Wrench, combination, M3, Mount, Tripod, M1917A1
- 1 Wrench, elevating knob nut, Mount, Tripod, M1917A1 (Not shown)
- 1 Wrench, rear sight windage screw, M1903 rifle
- 1 Wrench, socket, assembly, Browning Machine Gun, M1919A4 (Not shown)

Two kits with gages are available on the repair truck. The contents of these kits are listed at the end of this article.



Fig. 5

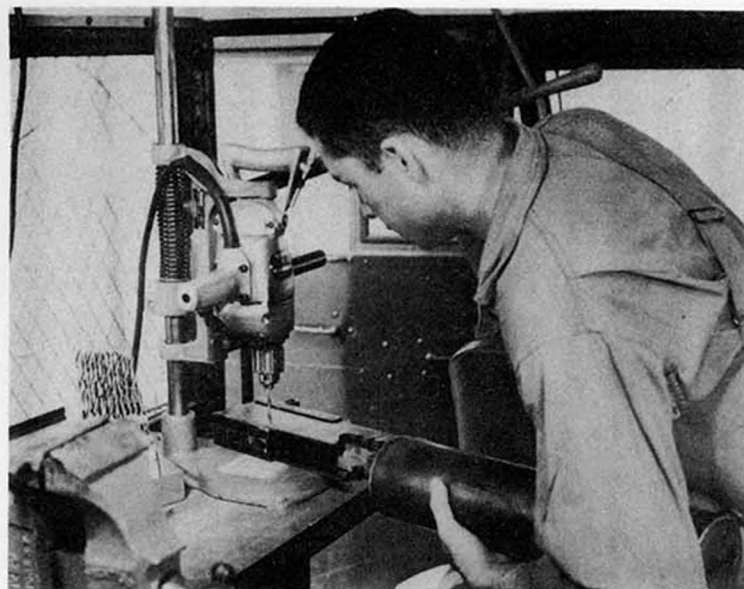


Fig. 6

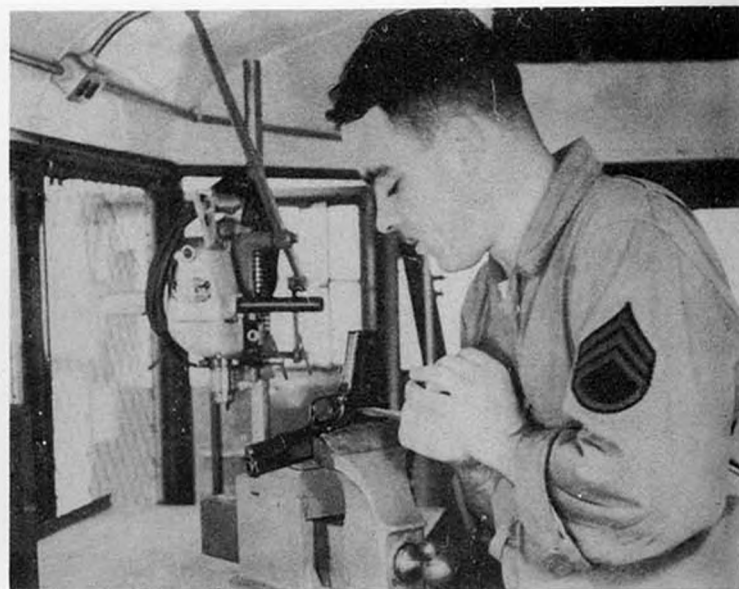


Fig. 7

In Figure 5 the generator is shown attached to the control box. The generator is a portable, 1-1/2-kw, 110-volt, A. C., 60-cycle. After taking the generator from its packing case, remove the bolts which fasten the unit to the wooden base. Never run the engine unless the unit is free to float on the four shock-absorbing foot springs. If a wooden base is to be used, fasten securely with screws or nails through the foot spring eyes, thereby allowing the springs to work freely. Mix thoroughly one-half pint of S.A.E. #30 motor oil with each gallon of gasoline (reg.), before pouring into the tank. Keep the breaker points set at .020 inch. Use a reliable spark plug. Set the gap at .025 inch.

Starting the generator:

1. Cut the rheostat out fully (turned completely in a clockwise direction) before starting the engine.
2. Open the fuel line shut-off cock on the gasoline filter bowl assembly. (Full counter-clockwise direction is open.)
3. Close the carburetor choke. (The choke is open when the lever is against the stop pin.
4. Wind the starting rope on the starting plate, brace one hand on the fuel tank, and pull the rope hard, giving a quick spin to the engine. Repeat if necessary until engine starts. Then immediately open the choke partially, easing to full open throttle position as the engine warms up.



Fig. 8

To obtain current for lights and machinery simply plug into the receptacles as is done in any house lighting circuit.

To stop engine:

1. Press stop button mounted on magneto stator plate and hold firmly until engine stops.
2. It is good practice to close the fuel line shut-off cock so that gasoline will not spill out through carburetor when handling unit. (Closed when in full clockwise position.)

(Some use the choke for a throttle. The automatic governor keeps the engine operating at the proper speed at all loads, including no load (idling).)

Figure 6 — Using the portable drill for removing an unserviceable top plate from a Machine Gun, Cal. .30, M1917.

Figure 7 — Using one of the machinists' vises to remove a stock screw bushing from the automatic pistol, Cal. .45, M1919.

Figure 8 — Using the other machinists' vise to clamp the gas cylinder from a Cal. .30, M1 rifle, to remove the seal and make a repair on the front sight.



Fig. 9



Fig. 9

Figure 9 — The man shown is the driver, who is also an armorer, helping out by sharpening tools after his other duties have been performed.

Figure 10 — The two men in the background are assembling the front end cap to the water jacket of a Machine Gun, Cal. .30, M1917. The man in the foreground is assembling the side plates to the trunnion block of a Machine Gun, Cal. .30, M1917.

Figure 11 — Five men are at work. Four of them are making use of the machinery and vises, while the fifth is doing a repair job on the right bench. Note: The man at the left is using a special wrench on a Browning Automatic Rifle, a tool improvised to remove and replace the barrel on that weapon. This tool has attracted considerable attention since its description in an earlier issue of THE ORDNANCE SERGEANT, and additional information regarding it will be found on the Small Arms page of this issue.

The truck is equipped with a folding table which is carried on the "A" bench. It is shown in Figure 12. The table can be readily removed and used outside the truck. Whenever practicable men can use this table to good advantage as shown here.

The men shown in Figure 13 have made good use of a discarded tarpaulin for shelter to provide a suitable if not exactly ideal place for cleaning and inspecting weapons.



Fig. 12



Fig. 11

NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASS'Y.	LOCATION ON TRUCK
TRUCK EQUIPMENT					
J-8	W	3	RA-DD-E110 BENCH, cabinet, type VI, class A, complete (Consisting of: 1 BENCH, cabinet, type VI, class A 12 DRAWER, cabinet bench, type I 6 DRAWER, cabinet bench, type II 4 DRAWER, cabinet bench, type III 4 DRAWER, cabinet bench, type IV)	1	A-bench
J-8	W	3	RA-DD-E110 BENCH, cabinet, type VI, class B, complete (Consisting of: 1 BENCH, cabinet, type VI, class B 12 DRAWER, cabinet bench, type I 6 DRAWER, cabinet bench, type II 4 DRAWER, cabinet bench, type III 4 DRAWER, cabinet bench, type IV)	1	B-bench
M-1	W		RA-DD-D104 BOX, control, weatherproof, type II —	1	Left front side of truck
M-8	W		RA-DD-D120 RA-DD-C106 BOX, tool and spare parts, S., type V, class A, complete (Consisting of: 3 BOX, spare parts, transparent, type VI (carried in drawers)	16	Under A&B
M-8	W		RA-DD-C109		
M-8	W		RA-DD-D120		
M-8	W		RA-DD-D120		
			1 BOX, tool and spare parts, S., type V		
			1 DRAWER, tool and spare parts box, type I		

(Continued on page 405)



Fig. 13

TRUCK, MACHINE SHOP, M4

(LOAD A)

by FRANK P. BINGERT, M.Sgt., Ord. Dept.

For the benefit of organizations in the field not equipped with the Machine Shop Truck, or those organizations which have received this vehicle only recently, this article is intended to acquaint, or better acquaint, interested personnel with this vehicle, its equipment, capabilities, etc. Until the present time the machine shop at The Ordnance School has been furnished with the Machine Shop Truck, M4, load "A" only, and little is known about loads "B" and "C" except for the descriptions found in OFSC's.

The work which can be produced on the machinery found in the Machine Shop Truck, M4, appears to be limited. This is true to a certain extent only because of the size of the work which can be handled and the capabilities of the machinists. However, a surprising amount of work can be produced, as will be evident after a careful study of the tools furnished. The most flexible of the limitations, therefore, but one which can be reduced in its effectiveness by the gaining of experience, is the abilities of the personnel using the truck and its equipment. This has been proven at The Ordnance School, where the Machine Shop course includes a certain amount of work by the students in this vehicle.

The major machine tool equipment consists of a lathe, shaper, drill press, hydraulic portable ram, bench grinder, tool post grinder, and a lathe milling attachment. The lathe, which is a South Bend, is

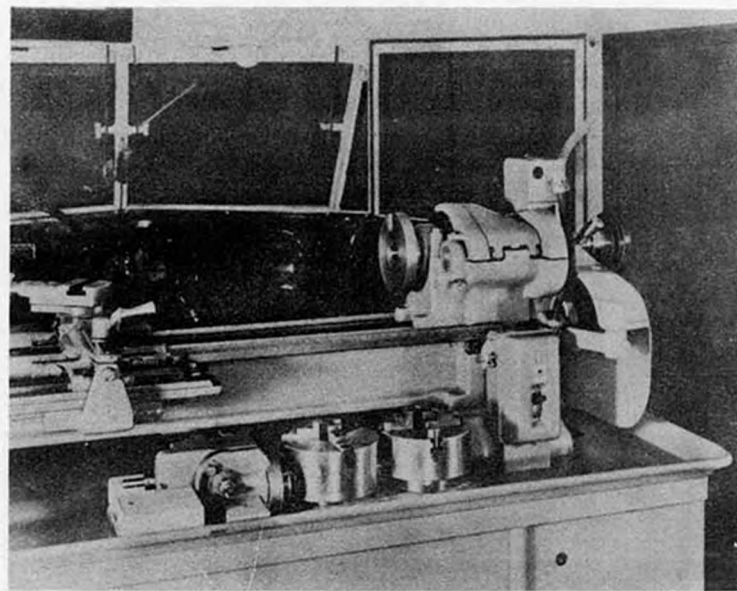


Fig. 1 -- Lathe, 10-inch, South Bend, front view

complete, emphasizing a quick-change gear box, taper attachment and a metric conversion attachment for cutting metric threads. Although the latter attachment is not used frequently, it is nevertheless important because it does enable work to be done in the metric system. This is especially important in view of the possibilities of work to be accomplished on foreign soil. A metric transposing chart is fastened to the gear train cover guard at the left end of the lathe. Conversion to the metric system is simple - if the directions are carefully followed. The lathe itself will safely swing a piece of work ten inches in diameter, and the bed, which is considerably longer than most lathes of the same size, is 4' 6" overall. This is advantageous in view of the fact that longer pieces, such as shafts, screws, etc., which probably could not be machined otherwise, are made possible.

Accessories, such as the tool post grinder and milling attachment sometimes prove to be indispensable, but the shaper rather than the milling attachment should be employed whenever possible. The principal reason for this is the time required to set up the milling attachment, time

which may often prove the use of the milling attachment to be impracticable. Another objection to its use is the fact that while it is set up no other lathe work can be done. As for the tool post grinder, when the nature of the work is such that a ground finish is absolutely necessary is the only time it should be used. Here again, the time element renders the use of certain equipment objectionable.

The shaper is a very sturdy machine, considering its size, and a very efficient one if it is not abused. Like any machine tool, its capacity should never be exceeded. The maximum length of ram stroke is seven inches. The number of strokes per minute is controlled by a four-step "V" belt pulley. The machine itself has but one defect, which is a minor one. The ratchet pawl in the feeding mechanism wears out through fair wear and tear and the automatic feed cannot be used. This can be corrected by duplicating the ratchet pawl with tool steel properly heat treated. After this has been completed, the mechanism will operate indefinitely. A large variety of work can be accomplished with this machine because of the attachments which are furnished with it.

More bench space on the truck would be desirable, more of everything would be beneficial, but for its size and purpose it is very close to perfection so far as machinery is concerned. A letter received by THE ORDNANCE SERGEANT, and to be found elsewhere in this issue, contained the following remarks regarding the Machine Shop Truck.

"This vehicle has been used more than any of the others. Several special tools, fixtures, etc., have been made with the facilities of this vehicle. One lathe is not enough to accommodate the great variety of work which is expected of this vehicle. One lathe, of the type now used, plus a

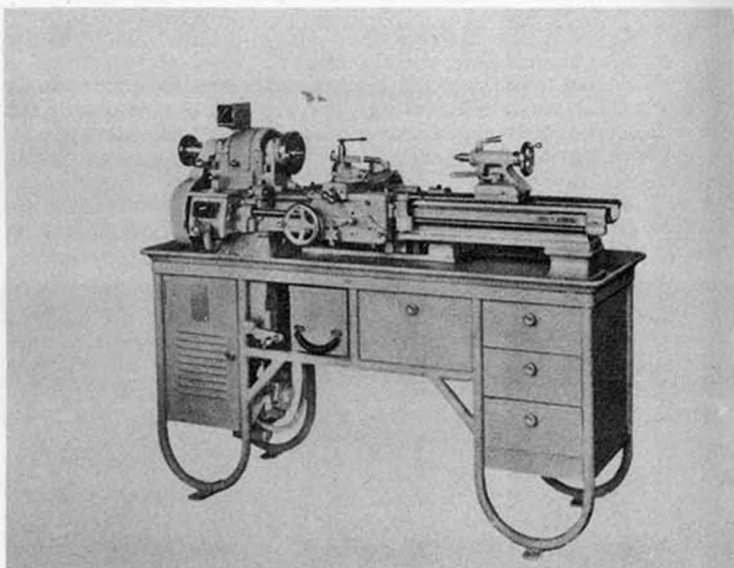


Fig. 2 -- Lathe, 10-inch, South Bend, rear view

smaller lathe (such as a Hardinge), would facilitate operations. The placing of the equipment should be altered somewhat. Outrigger jacks should be permanently mounted with a provision to swivel them out of use and secure them for traveling."

The suggested outrigger jacks would be a considerable advantage if they were mounted on the vehicle. When the men begin to work vigorously with file and hacksaw, which is often the case, there is a great deal of swaying which does affect men who may be operating machines.

The machine tools on the vehicle are powered by a 5 KW generator producing 110-volt alternating current, but whenever possible the use of

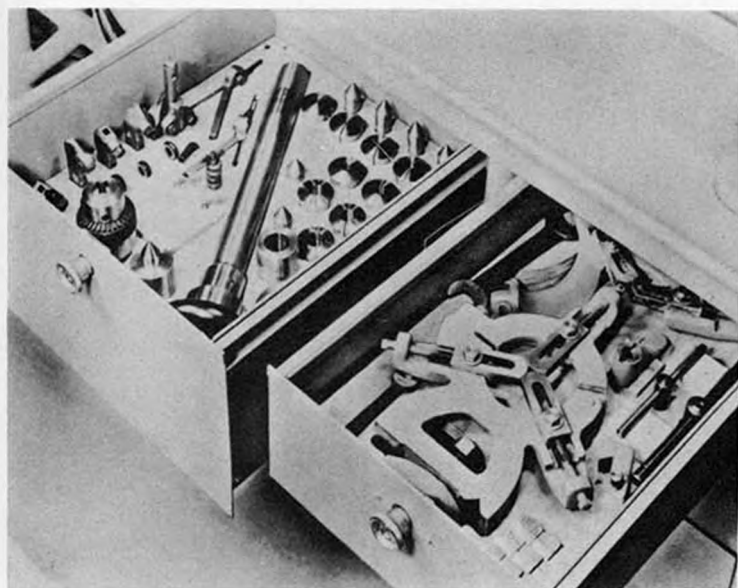


Fig. 3 -- Accessories, 10-inch South Bend lathe
(Right hand top lathe drawers)

current from an outside source should be used. This will decrease wear and tear on the engine, in addition to reducing fuel consumption. If this is not possible, there is no reason why the current could not come from another vehicle, providing it is equipped with a generator supplying 110-volt AC. This procedure could then be reversed, and the operation of engines alternated.

Nothing need be mentioned about the controls for engaging and disengaging the power take-off, for the directions are clearly illustrated by a diagram of the controls on the dash.

When transporting the vehicle by rail to some distant point, it is generally mounted on a flat car. When this is done, the machinery may not be used for a considerable time, and therefore all surfaces susceptible to rust must be protected by an approved rust preventative compound. All equipment should be fastened securely, and the carriage and tail stock on the lathe locked or tightened in place. Blocks should be placed between the chassis and axle, both front and rear, to eliminate bouncing and sway while in transit, and, of course, the vehicle itself must be fastened to the flat car.

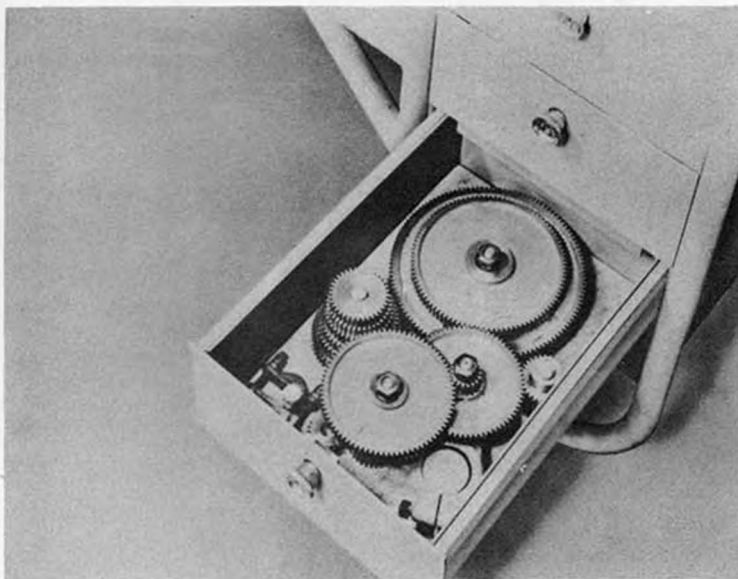


Fig. 5 -- Gears, Metric transposing, thread cutting, 10-inch South Bend lathe (R.H. bottom drawer)

At the present time the Machine Shop Truck, M4, is the limited standard vehicle until the supply on hand is exhausted. It will then be replaced by the M16. According to information received, the vehicle is no longer of the cab-over-engine variety. The arrangement of the equipment has been slightly altered, and the power is generated by a V-8

engine, which is a separate unit operating independently of the engine of the vehicle. The capacity for work on the M16 is identical to the M4.

The equipment on the vehicle, the quantity, and location on the truck are as follows:

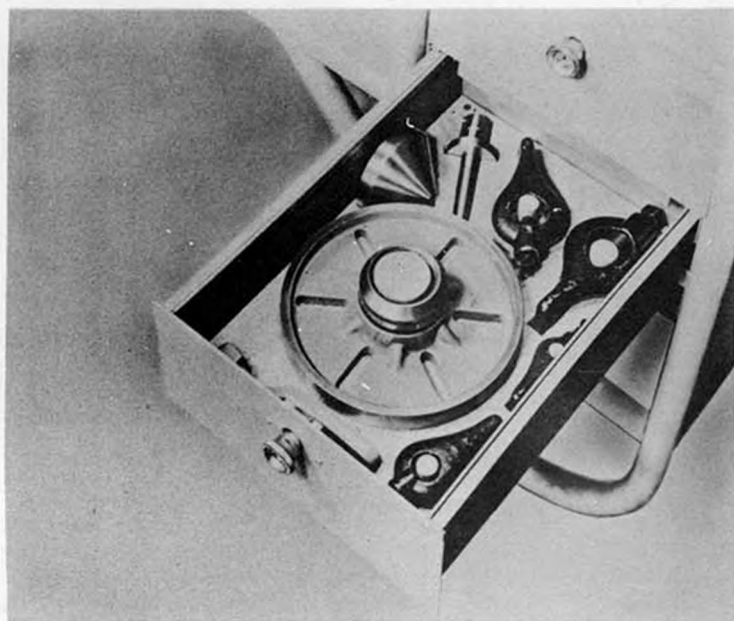


Fig. 4 -- Accessories, 10-inch South Bend lathe
(Center lathe drawer, R.H.)

NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASS'Y.	LOCATION ON TRUCK
TRUCK EQUIPMENT					
J-8	W	6	RA-DD-EL10 BENCH, cabinet, type V, class A, complete (Consisting of: 1 BENCH, cabinet, type V, class A 16 DRAWER, cabinet bench, type I 4 DRAWER, cabinet bench, type II 8 DRAWER, cabinet bench, type III 2 DRAWER, cabinet bench, type IV)	1	A-bench
J-8	W	5	RA-DD-EL10 BENCH, cabinet, type V, class B, complete (Consisting of: 1 BENCH, cabinet, type V, class B 4 DRAWER, cabinet bench, type I 10 DRAWER, cabinet bench, type II 2 DRAWER, cabinet bench, type III 5 DRAWER, cabinet bench, type IV)	1	B-bench
J-8	W	6	RA-DD-EL10 BENCH, cabinet, type VII, class A, complete (Consisting of:	1	C-bench

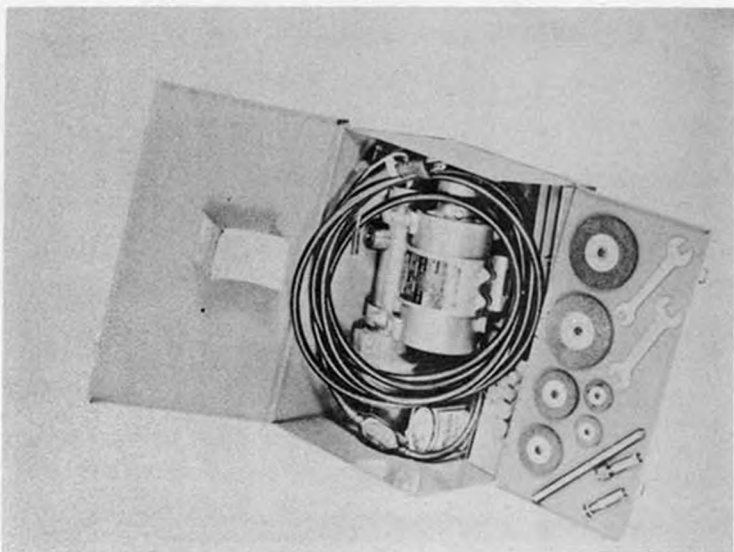


Fig. 6 -- Grinder, tool post

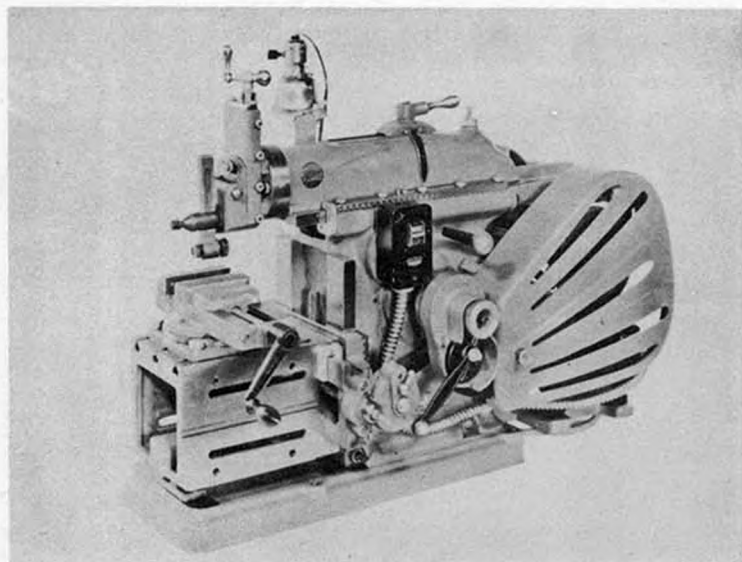


Fig. 7 -- Shaper, bench, 7-inch (Atlas type)

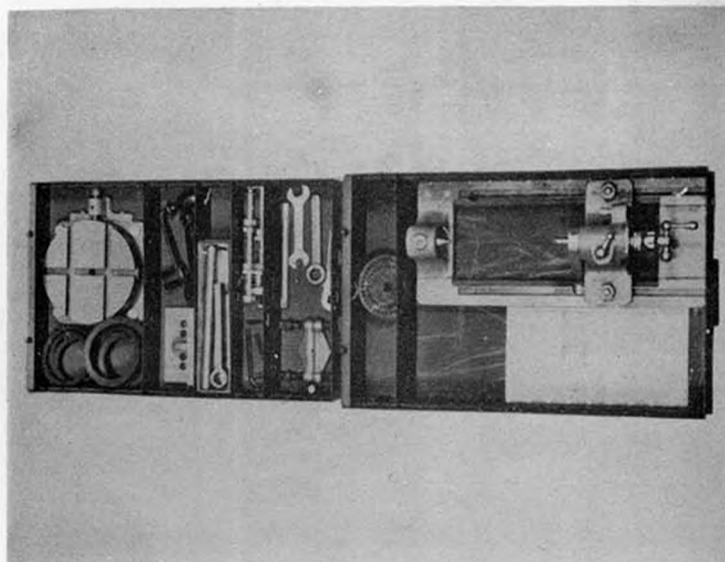


Fig. 8 -- Accessories, 7-inch Atlas shaper

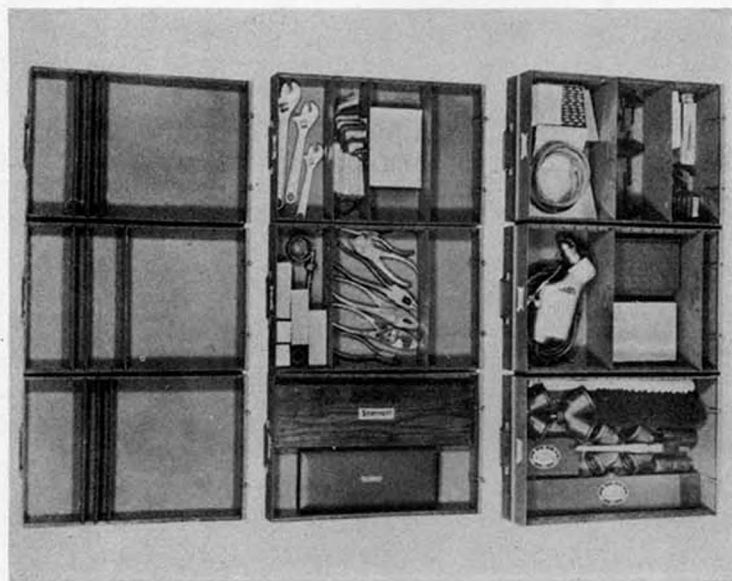


Fig. 9 -- Contents of bench drawers, assorted tools and accessories

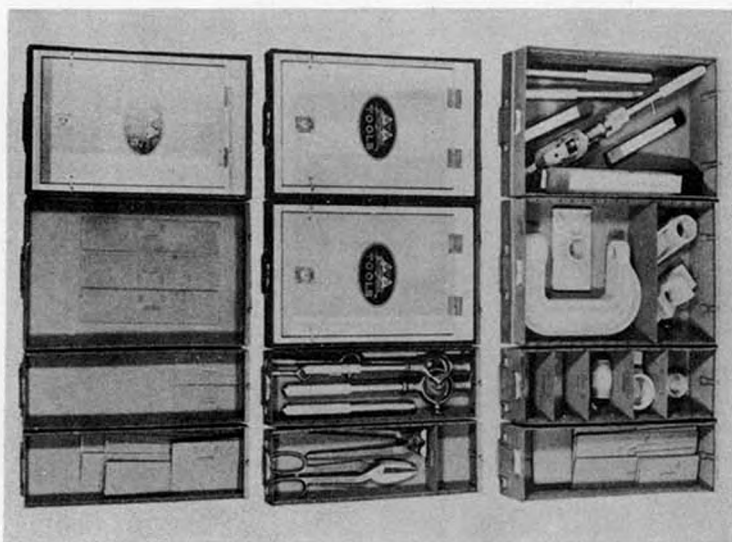


Fig. 10 -- Contents of bench drawers, assorted tools and accessories

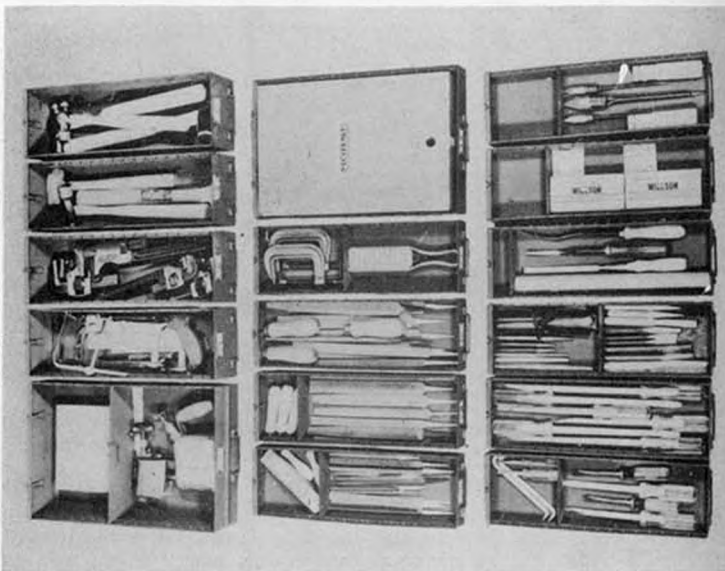


Fig. 11 -- Contents of bench drawers, assorted tools and accessories

NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASS'Y.	LOCATION ON TRUCK
			TRUCK EQUIPMENT - Continued		
		RA-DD-E110	1 BENCH, cabinet, type VII, class A		
		RA-DD-D127	1 DRAWER, cabinet bench, type VII		
		RA-DD-D127	2 DRAWER, cabinet bench, type VIII)		
M-1	W	RA-DD-D104	BOX, control, weatherproof, type II -	1	Left front outside
			CHEK-CHART, lubri. guide, No. 47	1	
M-8	W	6 RA-DD-C147	COMPARTMENT, milling head, 10 in. lathe	1	Under lathe
M-1	W	22 RA-DD-B100	CORD, extension, hv-duty., rubber, 2-cond., #12-AWG, 25 ft., w/male and female connectors	2	A-34
M-1	W	22 RA-DD-B100	CORD, extension, hv-duty., rubber, 2-cond., #12-AWG, 50 ft., w/male and female connectors	3	A-34
M-1	W	22 RA-DD-B101	CORD, extension, light, rubber, 2-cond., #18-AWG, 25 ft., w/male connector and soft rubber med. base screw socket and lamp guard	2	A-34
M-3	W	RA-DD-B116	LADDER, steel	1	Compartment under truck
H-4		22 RA-DD-A101	PLUG, adapter	4	B-5
H-4	W	22 RA-DD-A100	PLUG, dble-outlet	4	B-5
M-1	W	--	SWITCH, overload, 25 amp. (Square D Co. #111633-S type)	1	Left of driver
M-1	W	--	SWITCH, overload, 50 amp. (Square D Co. #16955 type)	1	Rear of lathe

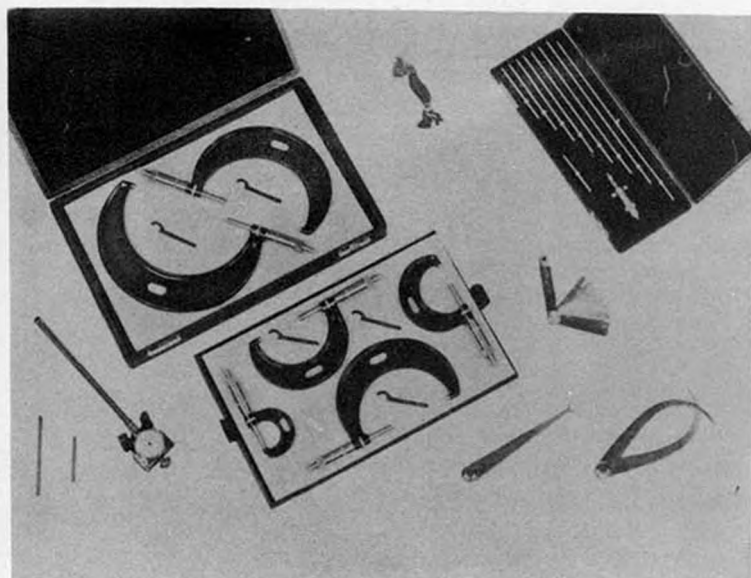


Fig. 12 -- Contents of bench drawers, precision instruments and gages

NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASS'Y.	LOCATION ON TRUCK		
M-1	W	--	SWITCH, two pole, dble-throw., 60 amp. (Square D Co. #82252 type)	1	Rear of lathe		
MACHINE UNITS							
J-11	W	14	DRILL, elec., port., 1/4 in., 60 deg. angle, 110 v, a-c d-c, complete (Sioux #1495 type)	1	B-8		
ACCESSORIES:							
J-10	W	TMCKLG	1 CHUCK, drill, med. duty, 0 - 1/4 in., 3/8-24NF hole (w/key)	1	C-top		
J-11	W	13	DRILL, elec., port., 1/2 in., sgle. speed, 110 v, a-c d-c, complete (RAED Spec. 727-26-40) (Sioux #R.A. 1546 type)				
ACCESSORIES:							
J-11	Y	--	1 CHUCK, drill, light duty, 5/64 1/2 in., 5/8-16NS hole (w/key) (for replacement use CHUCK TMCKLK)				
J-10	W	TMCKLK	CHUCK, drill, med. duty, 0 - 1/2 in., 5/8-16NS hole (w/key) (for replacement)	1	1_		
J-11	W	--	DRILL, elec., port., 1/2 in., sgle. speed, 110 v, a-c d-c, complete (RAED Spec. 727-26-40) (Cincinnati #UH-105 type)				

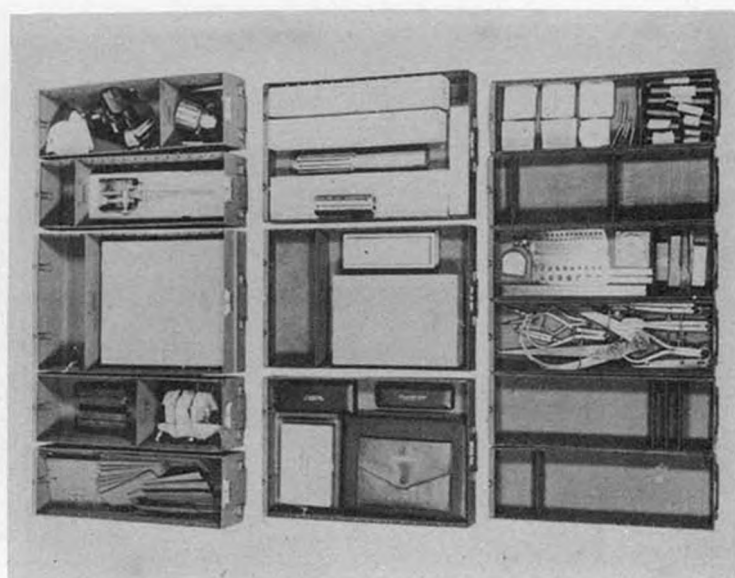


Fig. 13 -- Contents of bench drawers, assorted tools, accessories, instruments and gages

NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASS'Y.	LOCATION ON TRUCK
ACCESSORIES:					
J-10 W		TMCKLK	1 CHUCK, drill, med. duty, 0 - 1/2 in., 5/8-16NS hole (w/key)	1	B-front top
J-11 W	11	RA-DD-D109	DRILL, press, floor, 1/2 x 14 in., 110 v, 60 c, sgle. ph., complete (RAED Spec. 727-20-40) (Delta type) -		
ACCESSORIES:					
J-10 (b) W		--	1 CHUCK, drill, ball bearing, 0 - 1/2 in., w/o arbor (w/key) (Jacobs #14 type)		
J-11 Y		--	1 WRENCH, combination, 7/16 & 9/16 hex. box and 7/32 flat (Delta #SES-47 type) (for replacement use WRENCH TKKXKH)	1	
J-4 W		TKKXKH	WRENCH, engrs., dble-hd., alloy-S, 7/16 & 9/16 (for replacement)		
J-4 W		BCTXLK	1 WRENCH, socket head set screw, 5/32 in. hex.		
J-4 W		BCTXIM	1 WRENCH, socket head set screw, 7/32 in. hex.		
J-11 W	12	--	DRILL, press, floor, 1/2 x 15 in., 115 v, 60 c, sgle. ph., complete (RAED Spec. 727-20-40) (Buffalo #15 type)	1	

(Continued on page 406)

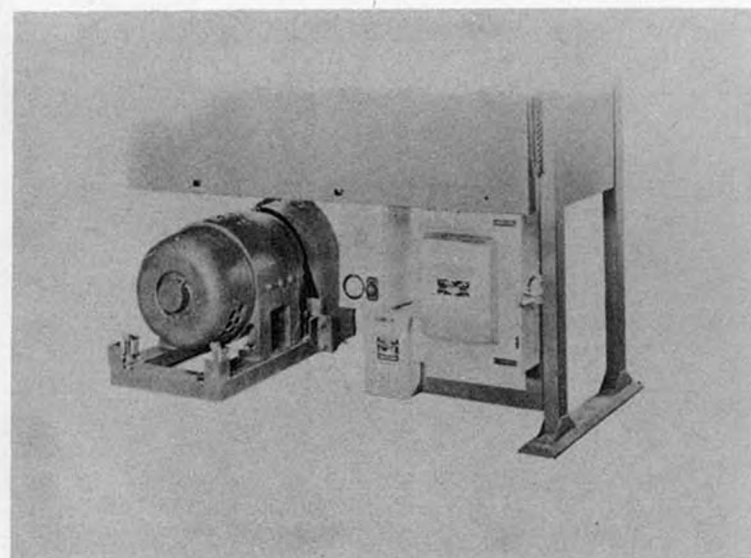


Fig. 14 -- Generator, SK.W., 110-volt, A.C., and control box for Truck, Machine Shop, M4 (Load A)

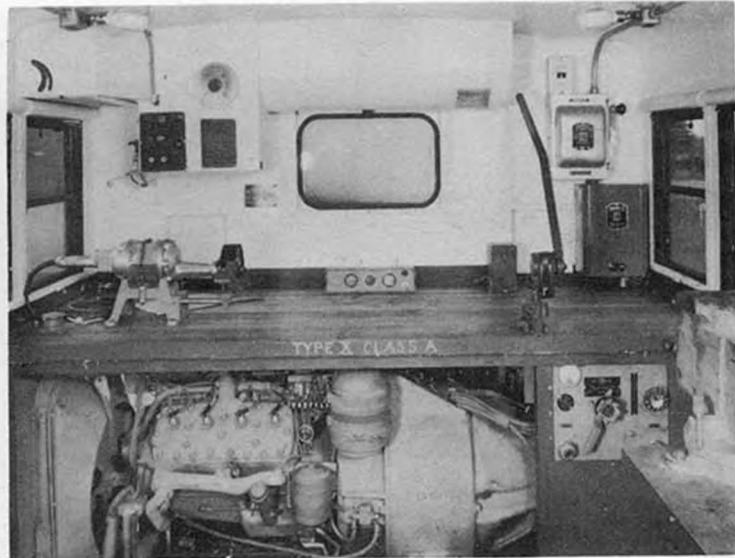
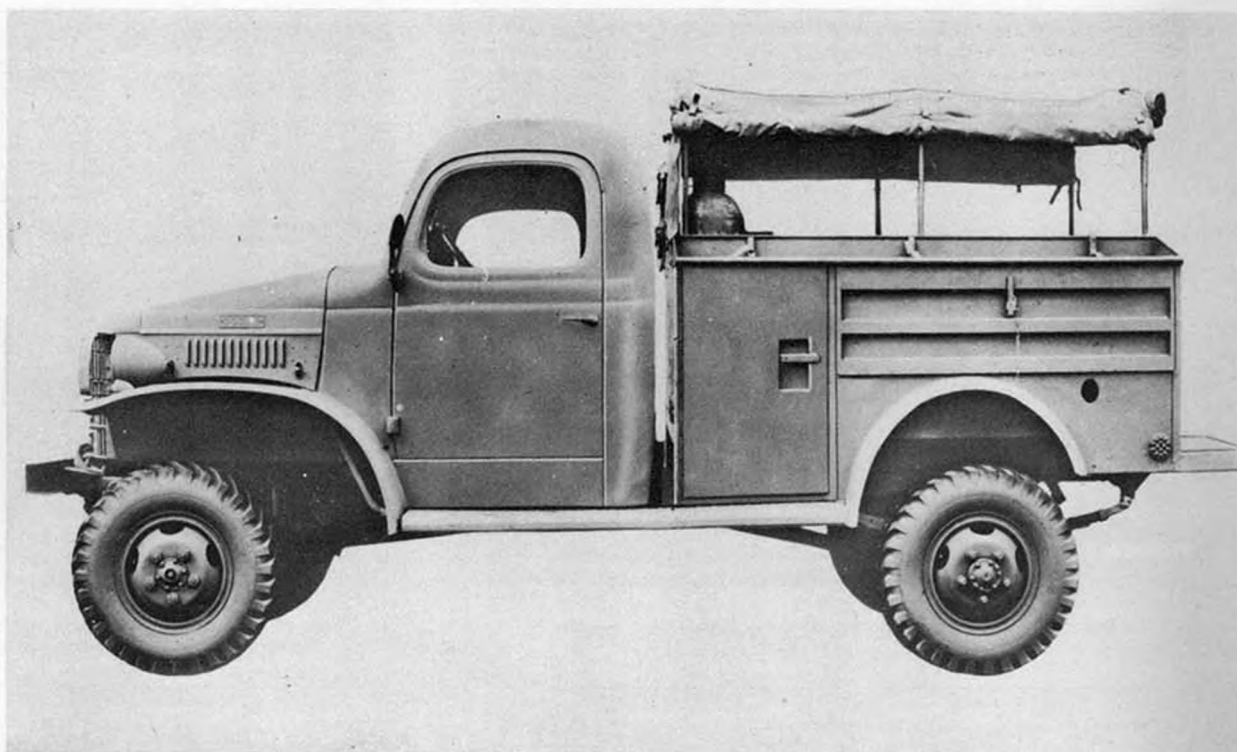


Fig. 15 -- Power unit and control box for Truck, Machine Shop, M16

USE OF THE EMERGENCY REPAIR TRUCK

Ce



by

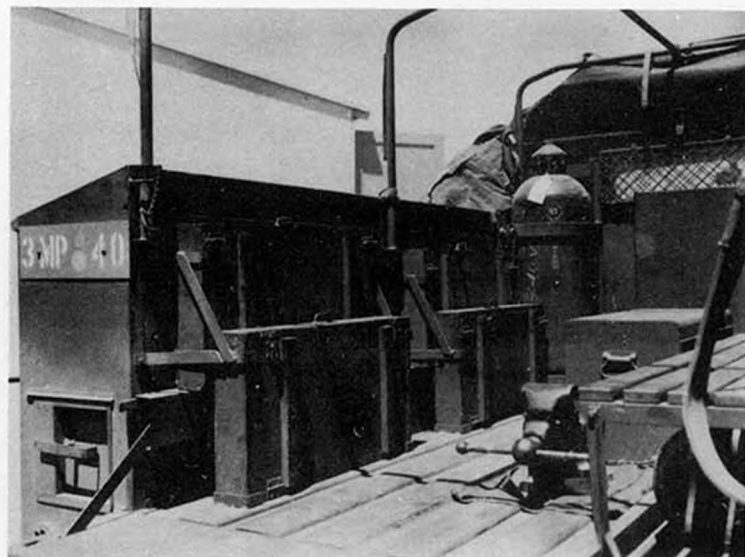
WAYNE H. SNOWDEN, Capt., Ord. Dept.
Asst. Ordnance Officer, Third Infantry Division

In general the best means of using the facilities incorporated in the emergency repair truck are self-evident to the men who work with it. Where and how to employ the trucks themselves are determined by principles set forth in FM 9-10. Left to the individual Ordnance or maintenance officer, however, is the problem of exactly how to carry and keep track of spare parts.

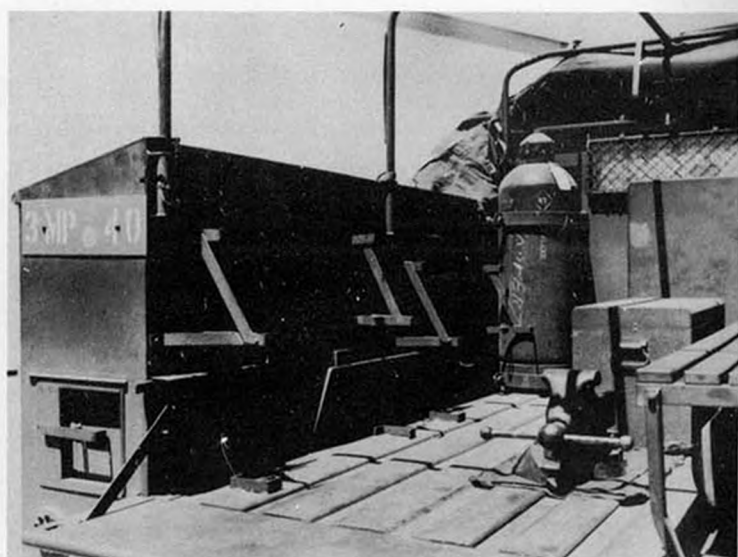
It is no problem at all to dump into the emergency repair truck ten times as many parts as the crew could possibly distribute or install during a period when they might reasonably be expected to operate without contact with the maintenance office. But, in the case of the Infantry division at least, it is a problem to so carry the parts that they may be reached immediately when the occasion demands.

To solve this problem the Third Infantry Division originated the spare parts chests illustrated in the accompanying photographs. These consist of six chests — four mounted on the inside left wall of the truck body, and two (not shown) which fit into the upper left rear bin. Each chest is designed to carry parts for one weapon or a group of similar weapons, and each chest is portable — an important point in cases where a group of weapons needing repair are at some distance from the truck.

The inside of each chest is divided up with movable plywood partitions, so that the various parts can be arranged in an orderly manner for instant availability. Parts which are small enough to be carried in envelopes are so carried. The chest illustrated, for example, accommodates BAR parts.



Emergency Repair Truck with spare parts chests in place. Two other chests, not shown, are carried in the upper left rear bin.



Emergency Repair Truck with spare parts chests removed, showing brackets for holding the chests.

Certain irregularities appear in the photographs because of the experimental character of the installation. For instance, the barrel bolts used to lock the lids of the boxes should be horizontal in all cases. For the same reason, further details of design are not discussed because the one shown was limited by availability of materials and shop facilities. For instance, angle iron slides would make it easier to slide the chests into place; latches on the chest would be superior to barrel bolts, the chests themselves would be better if made of metal instead of wood.

The brackets which carry the four inside chests are bolted through the sheet steel of the truck to stiffeners on the opposite side of the sheet. Each stiffener, of 1/4 x 1-inch steel strap, runs from the left bracket for a given chest, to the right bracket, four stiffeners being used per truck.

The foregoing design has been submitted as a suggestion to the Office of the Chief of Ordnance.

In an endeavor to solve the problem of keeping track of parts and at the same time reduce paper work to the absolute minimum, this division is now experimenting with the following system.

Consider one emergency repair truck. A basic load of maintenance parts is first worked out with an even number of each part. There is then created for each kind of part either (1) two envelopes (for parts which will go into envelopes) or (2) two cards of the same size (for parts which are too big to go into envelopes).

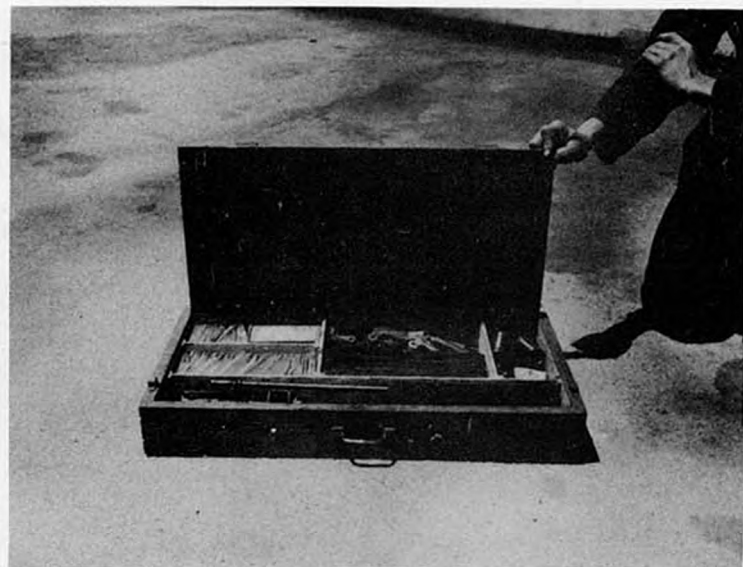
For example, the basic load of screws, butt plate, small, for M1 rifle, for one emergency repair truck is currently being figured by this office at six (6). For this item, two envelopes are marked as follows:

Team 1	B-21
3 ea. B146873 SCREW, butt plate, small	

The two envelopes together constitute the basic load of that part for the one emergency repair truck. One envelope in effect represents a minimum stock and is marked with a red band. Parts are not expended from the envelope with the red band until the unbanded envelope is empty.

When a maintenance team (contact party) reaches the maintenance office it simply turns in its empty envelopes. The maintenance clerk then files these according to SNL number and according to alphabet within SNL number groups. He then has a consolidated list of expenditures, properly arranged. To make up a request for replenishment he has simply to run through the cards and envelopes. After making up the request he transfers the cards and envelopes to another box, marked "parts on request".

When parts are received, he has only to put them in the envelopes, or with the appropriate cards. When a team (contact party) arrives at the office it picks up the parts accompanied by cards or envelopes bearing its own team number.



Typical spare parts chest, this one arranged to carry BAR parts.

The advantages of this system seem to be as follows:

1. It is possible for repairmen in the field under combat conditions to keep an exact record of expenditures simply by dropping envelopes or cards into a box provided for that purpose.
2. It is possible for the maintenance clerk to keep a continuous, consolidated record of shortages without doing any writing.
3. It is not necessary to consult SNL's for correct nomenclature.
4. Parts can be received in bulk and distributed to a group of emergency repair trucks without paper work and without the necessity of cross references to different records in order to determine exactly which parts go to which trucks.

The disadvantages seem to be that the system requires a great number of envelopes and cards. Another disadvantage is that the repairman must remember to extract a card when he has expended down to the minimum number of a large part which is not in an envelope and which therefore does not automatically give him any indication that a minimum has been reached.

So far this system has been applied only experimentally to one SNL group number, but it has proved so satisfactory that it is now planned to extend it to all maintenance parts carried on the emergency repair truck.

Note regarding general use of emergency repair truck



THIS IS REALLY "ALL OUT" DEFENSE

It should be remembered that a number of incidents of a warlike nature occurred during the prelude to the present world-wide conflict. Remember the German occupation of the Rhineland, the Japanese protection of Manchuria, and Benito Mussolini's freedom of the slaves in Ethiopia. Then came the Jap's even-still-continuing friendship campaign in China. Then following the Munich settlement came the invasion of Poland, and the war became world-wide in its scope.

Some of these efforts on the part of the Axis, of course, have been successful, if a temporary advantage can be looked upon as a success. Others are not proving so successful, as we well know, and as the Axis will know eventually. Some of the victims of aggressors didn't have a chance from the very beginning, such as Ethiopia.

But in many instances a spirit which should not be forgotten has been shown, even in the face of hopeless odds. Consider, for instance,

the order issued from Addis Ababa before that capital fell to Muss's settlers and farmers, by the Lion of Juda, Haile Selassie.

"Everyone will now be mobilized and all boys old enough to carry a spear will be sent to Addis Ababa. Married men will take their wives to carry food and cook. Those without wives will take any women without husbands. Women with small babies need not go. The blind, those who cannot walk or for any reason cannot carry a spear are exempted. Anyone found at home after receipt of this order will be hanged."

This is real "all out" defense. That this spirit continued even in apparent defeat is shown by the fact that Italian farmers who settled in Ethiopia were never able to harvest their crops, Mussolini's garrison's were slaughtered time and time again, and Ethiopia is no longer in the hands of the Axis. It takes a lot of sacrifice to win a war, and any man who could do even a little more than he is doing is not doing enough.

TRUCKS, AUTOMOTIVE REPAIR AND TANK MAINTENANCE

by W. R. GRIMME, Warrant Officer, U. S. Army,
and P. A. IMPHONG, T. Sgt., Ord. Dept.



Fig. 1

In this article the writers are not endeavoring to give all the specifications covering these trucks, but only wish to give the readers a general idea of the characteristics, tool lists, and a few pictures of the tools being used, and other information that may prove of immediate value to anyone who will receive one of these trucks in his shops in the future. The information given here will be very general, and of necessity the exact use of any of the tools will not be shown in detail.

1. General characteristics that pertain to either of the vehicles (See photograph at top of this page).

A conventional 6-cylinder GMC engine, common on Army vehicles, provides the power for driving the vehicle, and also for operating the generator (5 KVA), which in turn provides a source of current for operating the power tools on the truck.

The chassis is a standard 1-1/2 to 3-ton, 4 x 4, GMC model AKFX-352 Truck Chassis, with a cab-over-engine body. Power from the engine is transmitted through a four speed forward one reverse transmission. A low range is provided in the transfer case in order that the truck may have additional power when operating on rough terrain. A front axle engaging and disengaging mechanism is included in the transfer case so the truck may be driven either in four-wheel or in two-wheel drive as desired.

The trucks are usually painted a lusterless olive drab color. Some, however, designed for desert use, are painted a light sandy color.

All trucks are, or should be, equipped with black-out curtains, so that work may be continued during air raids.

Ordinarily, when being used by a maintenance unit, the maintenance trucks are parked in a bivouac area under cover, and the repair work is brought to the trucks. Obviously, because of limited space within the truck, not all the repair jobs can be accomplished within the truck body. Exterior shelter, such as tents, etc., may be utilized to the fullest extent to allow the maximum number of mechanics to work with the tools available on the trucks.

2. Care and maintenance.

In the care and maintenance of these trucks, lubrication properly and systematically preformed is most important. Definite responsibility for the lubrication of the truck and tools on the truck should be assigned to the individuals who ordinarily work in or around the truck. Suitable lubricating equipment such as guns, etc., are part of the truck equipment.

Figures 12, 13, and 14 are lubricating charts that apply to these trucks, and are self-explanatory.

NOTE:

Figure 12 has been changed by a War Department letter, Adjutant General's Office, dated April 15, 1942. This letter, A. G. 412.27 (4-10-42) MO-SP-M, states that only Universal Gear Lubricant will be used in gear boxes (except tanks). This lubricant must meet Federal Specifications VV-L-761. Refer to the August issue of THE ORDNANCE SERGEANT for the detailed description of the use of the Universal Gear Lubricant.

Other important maintenance points follow:

a. Check and clean the air cleaner every day. This is most important in a dusty and sandy country.

b. A daily check on the gas filter will often forestall trouble with the fuel system.

c. A very common trouble has been bearing failure in the transfer case when the power take-off unit was used constantly. Various modifications and methods of use of the trucks have been applied to remedy this. It is, however, still important that the driver check constantly on the lubricant in the transfer case. Before use the power take-off shaft should be inspected for lubricant, and a check should be made also to determine if the lubricant is draining down into the transfer case and raising the level of the lubricant in the case so high that when the truck is driven the oil seals will be forced. In either case, the lubricant around the power take-off shaft should be checked when the power take-off is used (at least twice daily under constant use) and the level of the lubricant in the transfer case should be checked before the truck is driven on the road.

d. The governor on the engine which regulates the engine speed on the road and when operating the generator is very sensitive, and must never be tampered with by inexperienced personnel. If adjustment is necessary, adjustment as prescribed in TM 10-1401 should be followed exactly.

e. A thorough acquaintance on the part of the mechanic with the repair procedures as prescribed in TM 10-1401, and skilled application of the procedures, will be of maximum value in keeping these trucks in operating condition.

3. Receiving and shipping.

Immediately upon receipt of a truck a technical inspection of the vehicle and equipment should be made to determine any damage or loss. The vehicle should be thoroughly checked for lubrication, such parts as wheel bearings, etc.

In the event that a truck must be shipped by rail, Section III of Ordnance Storage and Shipment Chart, Group G, Major Items, should be consulted for information.

4. Sources of information.

TM 10-1401	Maintenance Manual
SNL G-83	Truck, Automotive Repair, M1 and M2, body, parts and equipment
SNL G-91	Truck, Tank Maintenance, M1, Body, parts and equipment
OFSC 214	Truck, Automotive, M2
OFSC 216	Truck, Tank Maintenance, M1

TRUCK, AUTOMOTIVE REPAIR, M2

A list of the equipment, tools, accessories and supplies pertaining to this vehicle will be found in SNL G-83.

A mechanic reading through this list may determine by the tools and equipment in the list just what work it is possible to do with them. If the truck is the sole source of tools and equipment, then the mechanic definitely is held down to doing only what can be done with what is on the truck. It has been the experience of the writer, however, on one post where he was a mechanic for a number of years, that all the automotive repair work was efficiently carried on using only the tools carried on the automotive repair truck.

From Figures 2 and 3 it may be noted that the generator sits well forward in the center of the truck under the front of the bench. The generator controls and switches are below the front bench to the left of the generator.

The valve refacer sits on the right hand bench. It is shown being used in Figure 4. The valve refacer is stored in one of the compartments in the front bench. It may be removed and used outside the truck as shown in Figure 5. Cylinder honing and other equipment is stored in drawers in the left hand bench. Its use is shown in Figure 6. The rod aligner and

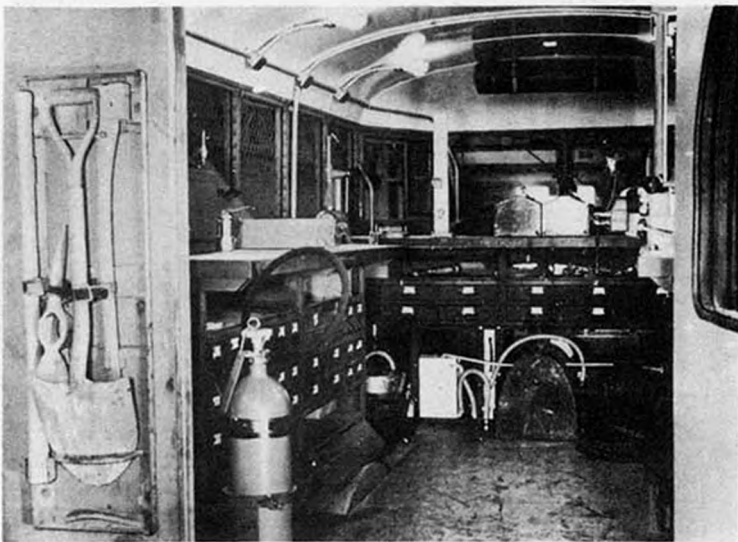


Fig. 3



Fig. 2

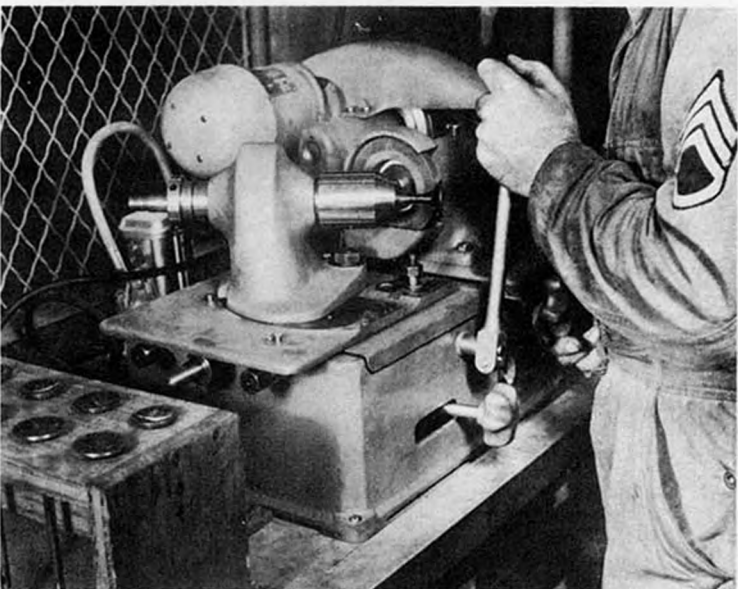


Fig. 4

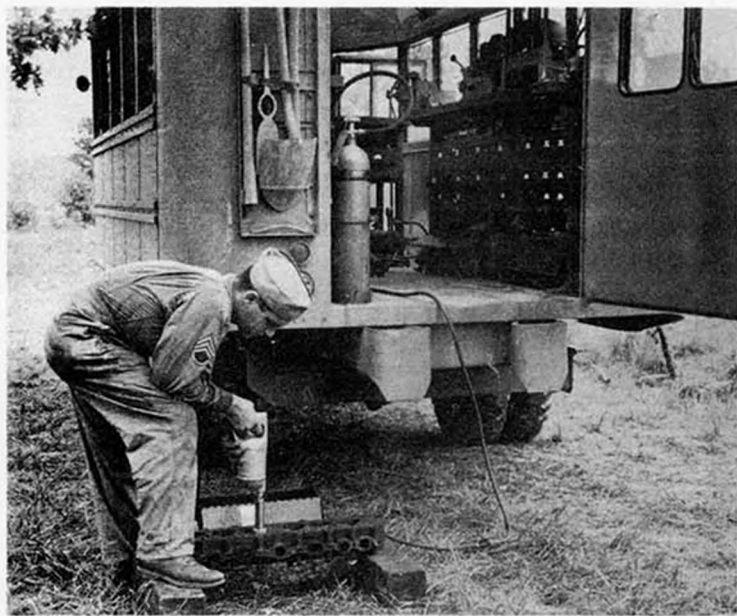


Fig. 5

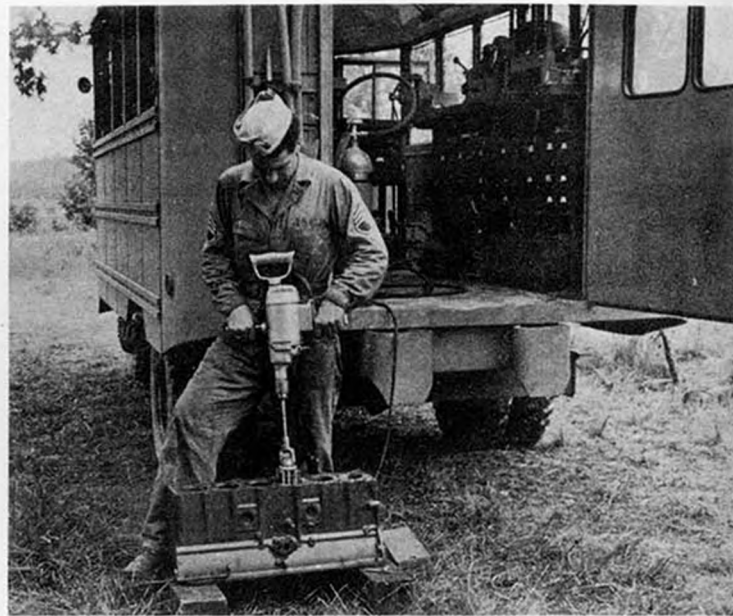


Fig. 6

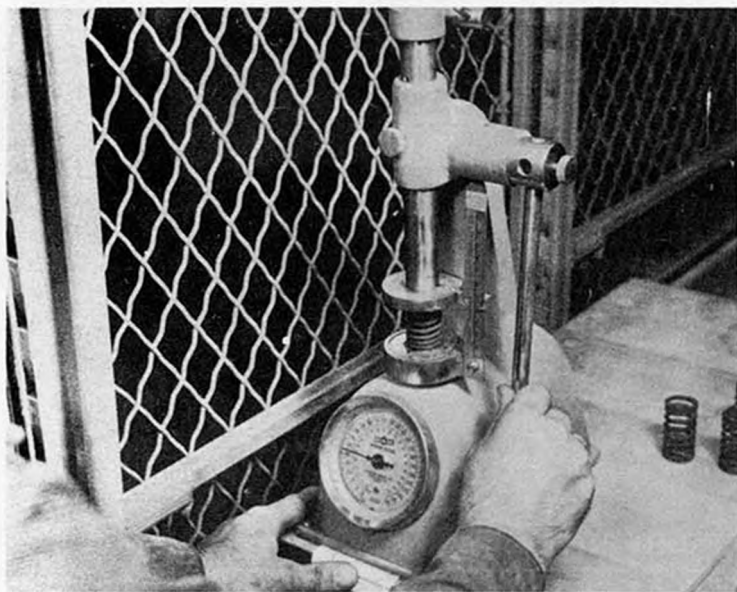


Fig. 7



Fig. 8

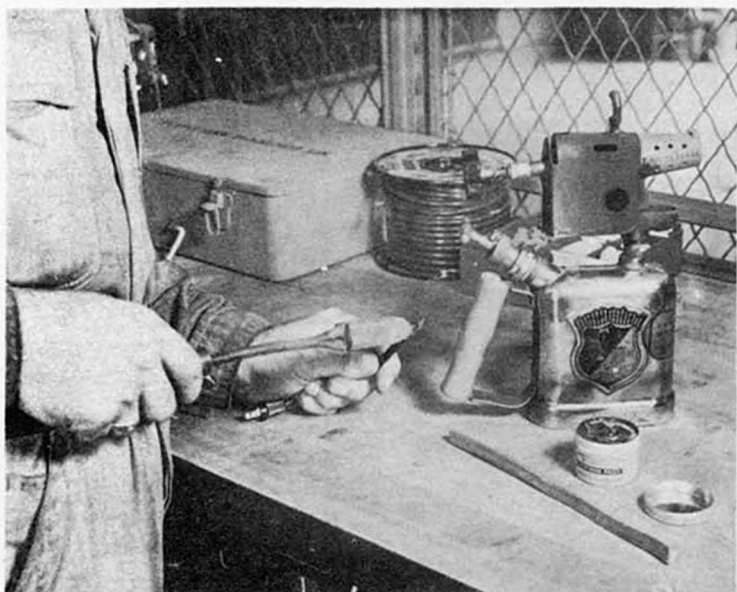


Fig. 9

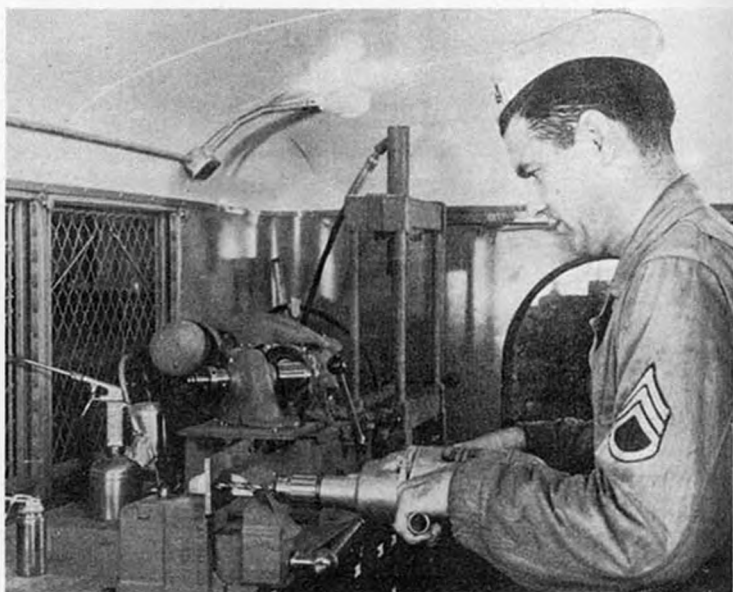


Fig. 10

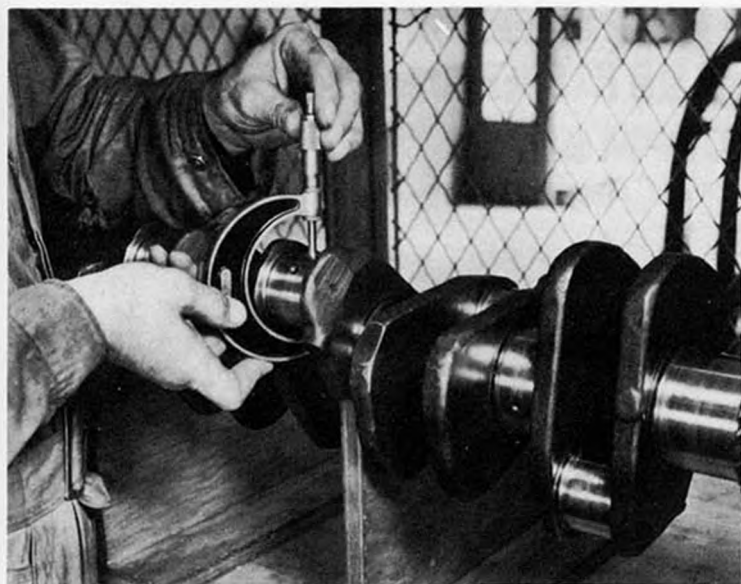


Fig. 11

valve spring tester are located on the front bench. Figure 7 shows the use of the valve spring tester. A large vise is mounted on the right bench, and it has many uses. In Figure 8 the mechanic is using it to replace piston rings. A power press is also mounted on the right bench. Figures 9, 10 and 11 show a mechanic doing work with tools that require a range of skill in use from the simple skill of soldering a connection to a terminal to the more exact operation of "miking" a crankthrow.

Although the tools on the truck are a limiting factor, the more skillful the individual mechanic is, the more he can do with the tools and equipment on the truck. The correct use and care of the tools and equipment on the truck cannot be stressed too often or too strongly. It isn't the matter of the cost as much as the fact that at the present time broken or damaged tools and equipment are difficult to replace. Very often a vehicle may await repair a long time, or may even be inadequately repaired because tools or equipment were carelessly damaged or broken.



TRUCK, TANK MAINTENANCE, M1

A list of the tools and equipment to be found on this vehicle may be found in SNL G-91, and indicates the scope of the jobs that can be performed on the truck when operating in the field.

The illustrations shown are intended to give the reader an idea of some of the work that can be performed on the truck. Figure 15 shows a view of the interior of the truck taken from the rear door. On the right hand side of the truck is a Type V Class B bench with Black & Decker Grinder and a Weidenhoff "off-on press" mounted on the top. The reader can determine the exact location of these tools by checking the tool list, which gives the location within the vehicle.

On the third shelf from the bottom the fitting and adapter for the Lux Fire Extinguisher are stored. All Tank Maintenance Trucks are equipped with the Lux charger. The charger, not shown in the picture, is located in the rear end of the truck just behind the bench at the right side. In the center of the truck a Type V Class C bench is located with a Weidenhoff Electrical Test Bench, a magnet charger, and a Mica Undercutting Tool mounted on top. Under the bench a 115-volt Voltage Regulator is mounted. It regulates the output of the 5 KVA generator, which is just to the right of the regulator. On the left side of the truck, looking from the rear, is a Type V Class A bench with a Growler and a Condenser Tester mounted on top. The drawers in the bench are used for storage of the various tools that are to be used in conjunction with the truck.

Figure 16 shows the use of the "off-on press" to press armature from the drive end frame of a Half Track generator. Figure 17 shows the worker testing the armature of the generator on the Growler. Figure 18 shows the worker undercutting the mica with the Mica Undercutting Tool. In Figure 19 the generator has been reassembled and, along with the voltage regulator, is put on the Electrical Test Bench and given a final adjustment and checks before being installed on the vehicle. There are enough tools and equipment on this truck to permit the men to make a complete overhaul, adjustment and check of generators and voltage regulators in the field. Figure 20 again shows the use of the Electrical Test Bench. In this case the worker is making a starter lock torque test, after the starter has been completely overhauled. The test is made before installation to determine if the starter is ready to be put into service. Figure 21 shows the worker recharging a rotating magnet of an aircraft magneto. In this case he is using the Magnet Charger which is standard equipment on all Tank Maintenance trucks. In Figure 22 we find the worker checking further the overhaul of the magnet. The condenser is being used to determine if the condenser meets the required specifications before being installed on the magneto. After the magneto has been overhauled the "Gap" must be checked. Figure 23 shows the worker using the Timing Disc and a Test Light to check the "E Gap".

Upon the assembly of a magneto it is necessary to check the unit for performance. Figure 24 shows the worker using the Electrical Test Bench along with the magneto adapter and variable spark gap rack to check the output of the magneto.

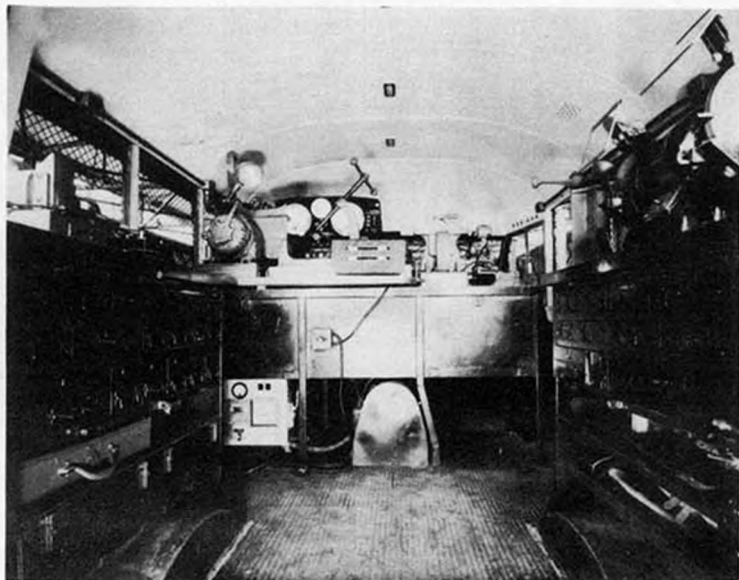


Fig. 15

From time to time it is necessary for the men using the maintenance truck to take the tools from the usual places and care for them so that they will give the best of service at all times. In Figure 25 we see a worker performing such a task, using the grinder to dress a chisel. The photographs shown with this article illustrate only a few of the many jobs that can be taken care of in the field, working from the Tank Maintenance Truck.

Organizations which have had the truck in their possession for some length of time will agree with the writer that the jobs they can perform from the truck are too numerous to mention. Those organizations that have only recently added the truck to their list of equipment will find that from day to day the jobs they can perform will increase as the men who are assigned to the truck become more familiar with all of the tools and equipment.

The writer has found that for field conditions the best results can be obtained by having the governor of the vehicle so adjusted that the A. C. generator speed is between 1800 and 1840 R.P.M. Likewise, the best performance of the test bench motor can be had if the pulley of the motor and the driven unit are matched. An example of this is an Eclipse Aviation generator with an output of 50 amps and 15 volts at 4200 R.P.M. This peak output of this generator may best be obtained by matching the pulley of the motor with the pulley of the generator so that the motor is turning over 1740 to 1800 R.P.M. when the generator is turning over 4200 R.P.M. and putting out 50 amps and 15 volts. By proper matching of the pulleys it will be found that the best results of the motor

WAR DEPARTMENT LUBRICATION GUIDE

UNITS OF EQUIPMENT

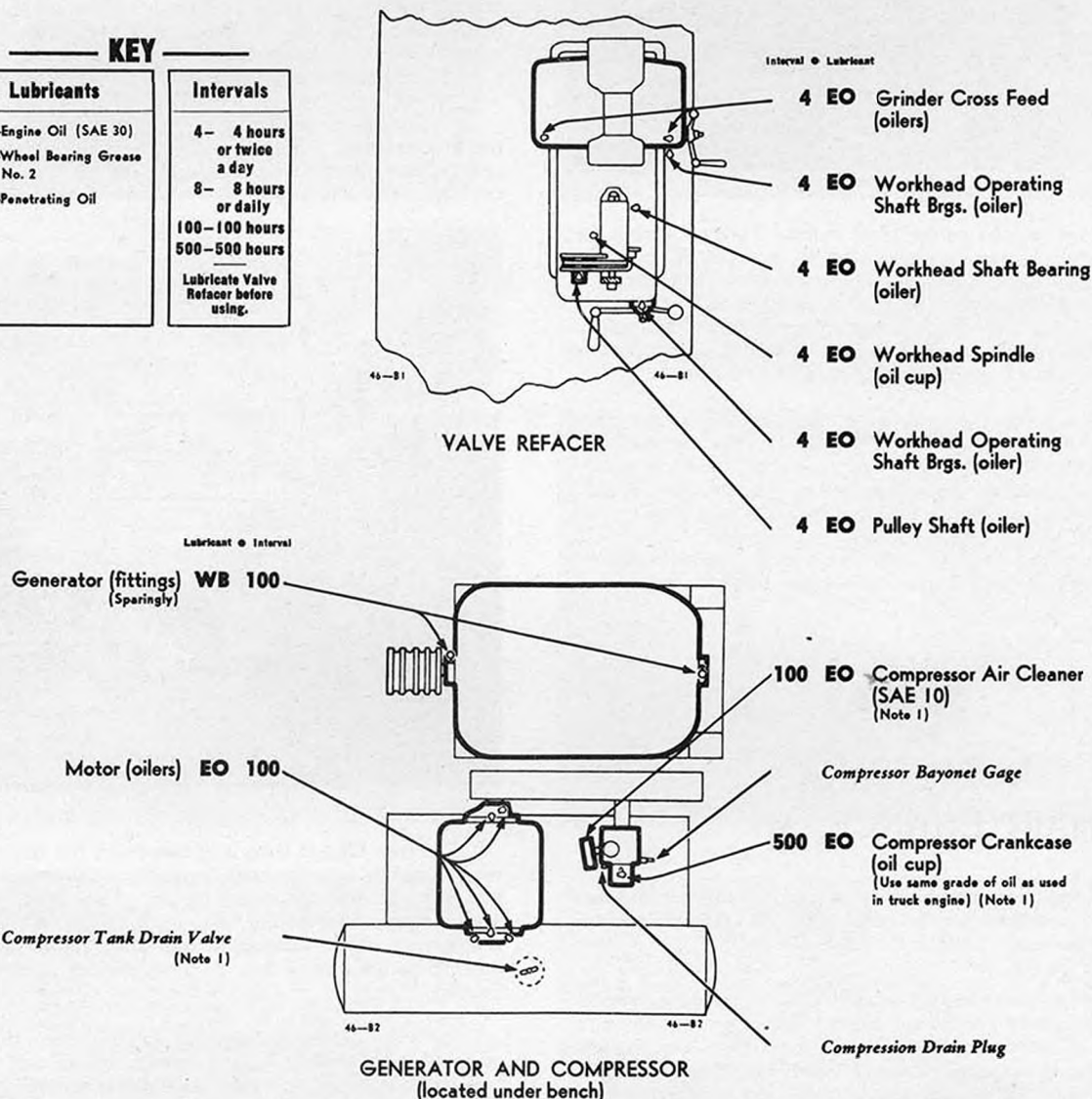
TRUCK, AUTOMOTIVE REPAIR, M1, M2
(GMC)

TRUCK STARTING SERIAL No.—001.
Located on plate on dash.

SNL G-83. Excerpt from TM 9-791.

NOTE—See Reverse Side for lubrication
of TRUCK

KEY	
Lubricants	Intervals
EO—Engine Oil (SAE 30)	4— 4 hours or twice a day
WB—Wheel Bearing Grease No. 2	8— 8 hours or daily
PO—Penetrating Oil	100—100 hours 500—500 hours
	Lubricate Valve Refacer before using.



NOTES Additional Lubrication and Service Instructions on Individual Units and Parts

1. COMPRESSOR—Fill compressor crankcase through oil cup to FULL mark on bayonet gage. Check oil level daily. (Air Cleaner) Remove, clean and reoil every 100 hours. (Tank) Open drain valve daily to drain water.

2. ELECTRIC DRILL—Lubricate the chuck spindle bearing through plug hole with EO every 100 hours. Oil chuck every 8 hours or daily with PO.

3. FITTINGS—Clean fittings before applying lubricant.

4. HYDRAULIC RAM—Once a month check oil level. Clamp cylinder in vise with filler plug end on top.

CHEK-CHART No. 46

Remove plug and check level with gage attached to plug. Refill, if necessary, to level of notch on gage, with EO, SAE 10.

5. VISE—Coat vise clamp screw lightly with WB monthly.

6. VALVE REFACER—Clean and oil arbor on diamond wheel dresser with PO when in use.

7. VALVE SPRING TESTER—Lubricate lever bearing through oil hole every 8 hours or daily with EO.

Once a month lubricate vertical gear rack with WB.

8. PISTON CLAMP—Lubricate clamp screw once a month with WB.

9. CONNECTING ROD ALIGNER—Lubricate slide every 8 hours or daily with EO.

10. CREEPER—Lubricate caster wheel and swivel bearings weekly with EO.

11. LUBRICATION POINTS REQUIRING DISASSEMBLY—Valve Refacer Grinding Spindle and Motor, Electric Drill Motor Bearings.

6-941

WAR DEPARTMENT LUBRICATION GUIDE

TRUCK, AUTOMOTIVE REPAIR, M1, M2

(GMC)

MFR'S STARTING SERIAL No.—001.
Located on plate on dash.

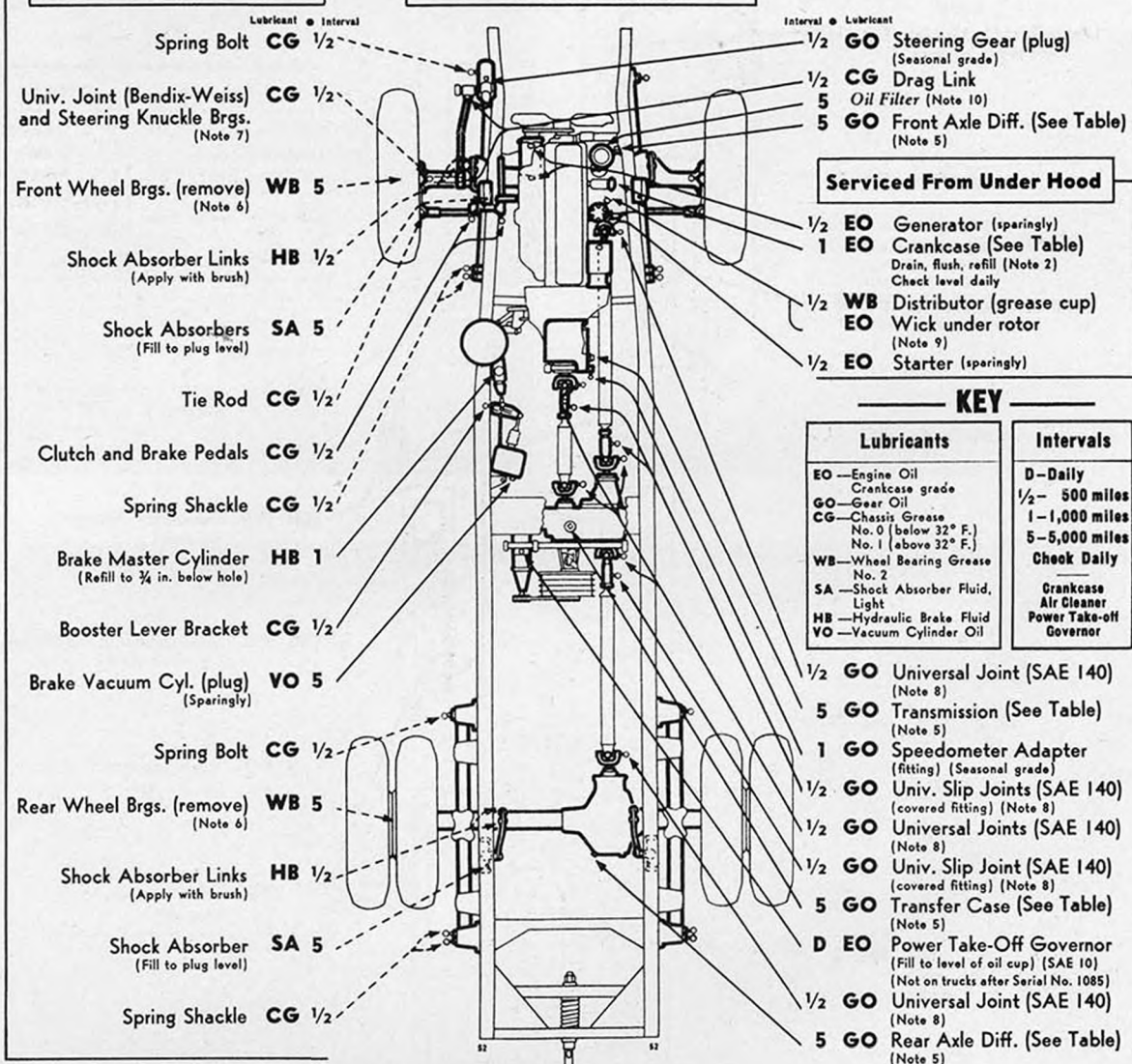
TABLE OF CAPACITIES AND RECOMMENDATIONS

SNL G-83. Excerpt from TM 9-791.

	Capacity	Above 90° C.A.C.	Lowest Expected Atmospheric Temperature			
			+32° C.A.C.	+10° C.A.C.	-10° S.A.E.	-30° Below -30°
Crankcase	10 qt.	For changes in these spaces see note on page 334.				For operation in these temperature ranges, refer to OFSB 6-G-3.
Transmission	3 1/4 qt.					
Differentials (each unit)	3 1/2 qt.					
Transfer Case	1 1/4 qt.					

CAUTION Lubricate Dotted Arrow Points on BOTH SIDES

NOTE—See Reverse Side for Lubrication of UNITS OF EQUIPMENT



NOTES Additional Lubrication and Service Instructions on Individual Units and Parts

- AIR CLEANER**—(Engine) Check level and refill oil cup to bead level daily with EO. Drain, clean and refill every 100 to 1,000 miles, depending on operating conditions. Every 2,000 miles, also remove air cleaner and wash all parts. (Brake Vacuum Cylinder) Every 3 months remove brake vacuum cylinder air cleaner, located near front of power cylinder, clean and refill with EO.
- CRANKCASE**—Drain only when engine is hot. Flush with 4 qt. SAE 10, idle engine 5 minutes and drain. Refill to FULL mark on gage. CAUTION: Be sure pressure gage indicates oil is circulating. See Table.
- INTERVALS** indicated are for normal service. For extreme conditions of speed, heat, water, mud, snow, rough roads, dust, etc., change crankcase oil and lubricate more frequently.
- FITTINGS**—Clean before applying lubricant. Lubri-

- cate until new grease extrudes from the bearing. CAUTION: Always lubricate chassis points after washing truck.
- GEAR CASES**—Check level every 1,000 miles, add lubricant if necessary. Check with truck on level ground. Drain, flush and refill at end of first 1,000 miles; thereafter as indicated on guide.
- WHEEL BEARINGS** (Front and rear)—Remove wheels, clean and repack bearings. CAUTION: Do not lubricate through plug holes in wheel hubs.
- BENDIX-WEISS UNIVERSAL JOINTS** (Front wheels)—Remove level plug in rear of joint and fill through upper steering knuckle fitting to level of lower plug opening.
- UNIVERSAL JOINTS AND SLIP JOINTS**—Apply lubricant to joint until it overflows at relief valve, and to slip joint until lubricant extrudes from vent

- hole at end of slip joint.
- DISTRIBUTOR**—Wipe distributor breaker cam lightly with CG every 500 miles.
- OIL FILTER**—Renew filter element every 5,000 miles or oftener if necessary. After renewing element, refill crankcase to FULL mark on gage.
- OIL CAN POINTS**—Lubricate pitman hook (if equipped), transmission and transfer case control rod ends, cross shaft, etc., parking brake connections, starter control rod ends, spark and throttle connections with EO every 500 miles.
- POINTS REQUIRING NO LUBRICATION**—Water Pump, Fan, Steering Column Bearing, Governor (after Serial No. 1085), Springs.
- POINTS TO BE LUBRICATED BY ORDNANCE MAINTENANCE PERSONNEL AT TIME OF GENERAL OVERHAUL**—Power Take-Off, Clutch Pilot Bearing, Clutch Shaft Spline, Clutch Release Bearing.

CHEK-CHART No. 46

5-21-41

Fig. 13

WAR DEPARTMENT LUBRICATION GUIDE

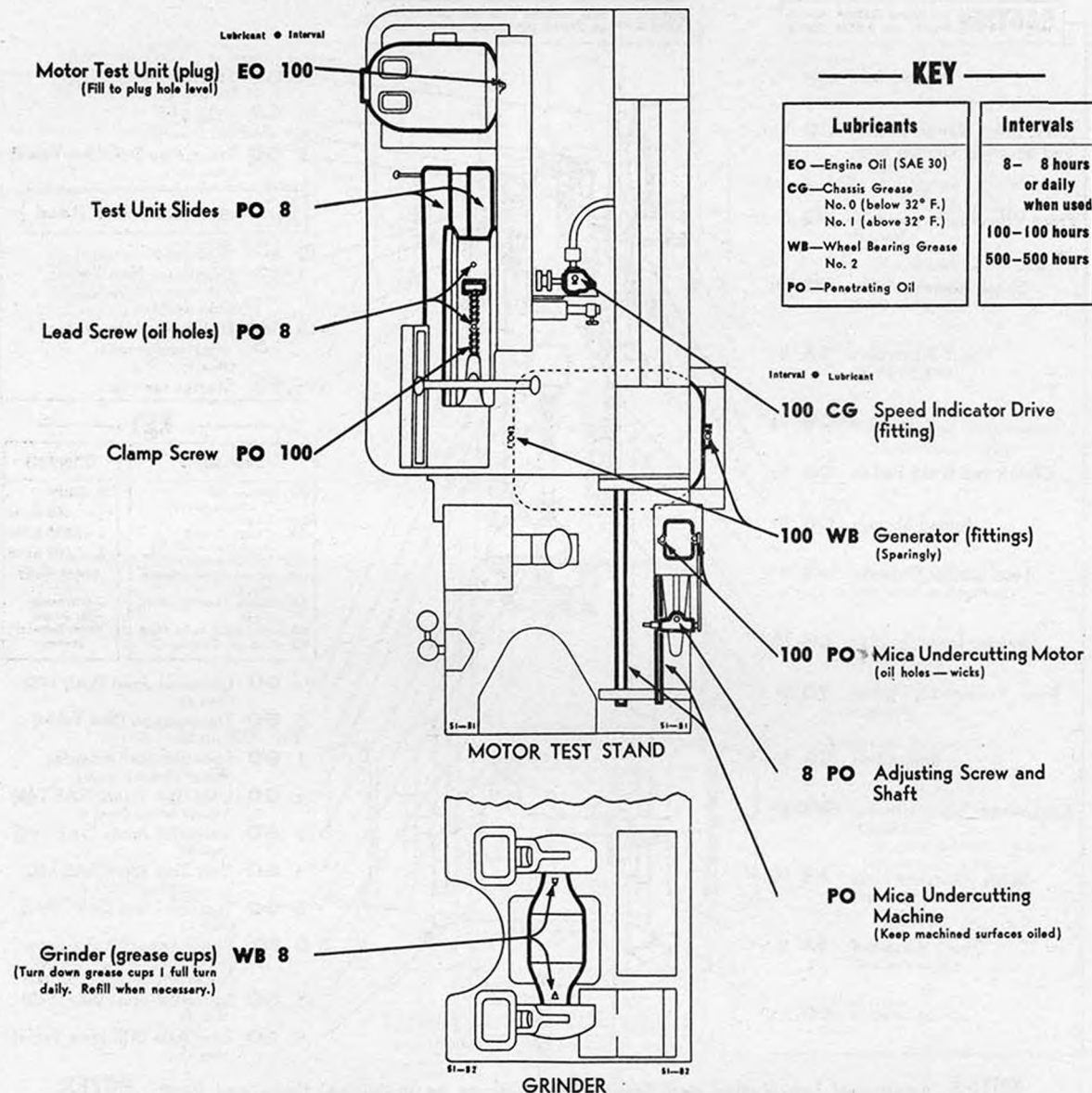
UNITS OF EQUIPMENT

TRUCK, TANK MAINTENANCE, M1 (GMC)

TRUCK STARTING SERIAL No.—001.
Located on plate on dash.

SNL G-91. Excerpt from TM 9-791

NOTE—See Reverse Side for lubrication of TRUCK



NOTES Additional Lubrication and Service Instructions on Individual Units and Parts

1. FITTINGS—Clean fittings before applying lubricant.

2. MACHINED SURFACES—Keep machined surfaces clean and oiled with PO to avoid rust.

3. VISE—Coat vise clamp screw lightly with WB every month.

4. POINTS REQUIRING NO LUBRICATION—Mica Undercutting Spindle, Motor Test Unit Bearing at commutator end.

CHEK-CHART No. 51

6-9-41

Fig. 14



Fig. 16

on the test bench can be attained. Always remember to keep the speed of the motor between 1740 and 1800 R.P.M. when the driven unit is at its peak output.

Ideal Crew Setup

The ideal crew setup for the Tank Maintenance Truck is a crew of four men broken down in the following manner: The driver, who would be responsible for the maintenance of the truck, which includes lubrication, storage, transportation, and general care of the truck while it is set up for field service; an electrician, who is qualified to make all the necessary repairs, overhaul, and adjustments on electrical units which are brought in for checks; an engine man, who is qualified to make overhauls on tank engines to the extent of tools and equipment on the truck; and a general mechanic, who is qualified to carry out the work that is required of a man acting in the capacity of general mechanic. These four men working as a unit in the field from the Tank Maintenance Truck should be able to keep vehicles in operation quite efficiently, providing the repairs that they must make are within the scope of the equipment carried on the truck.

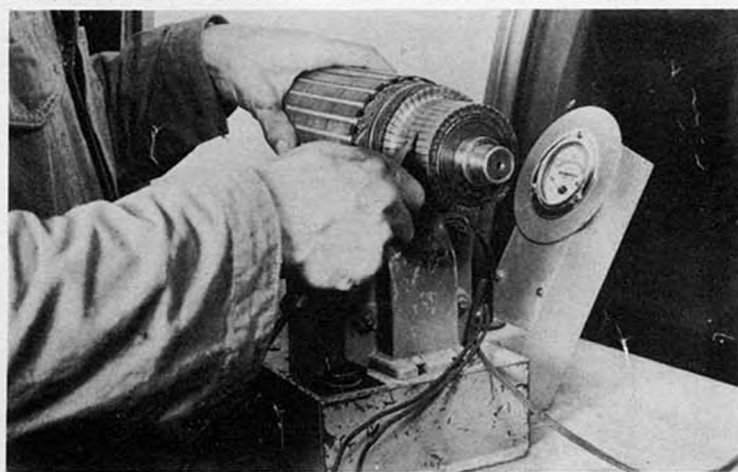


Fig. 17

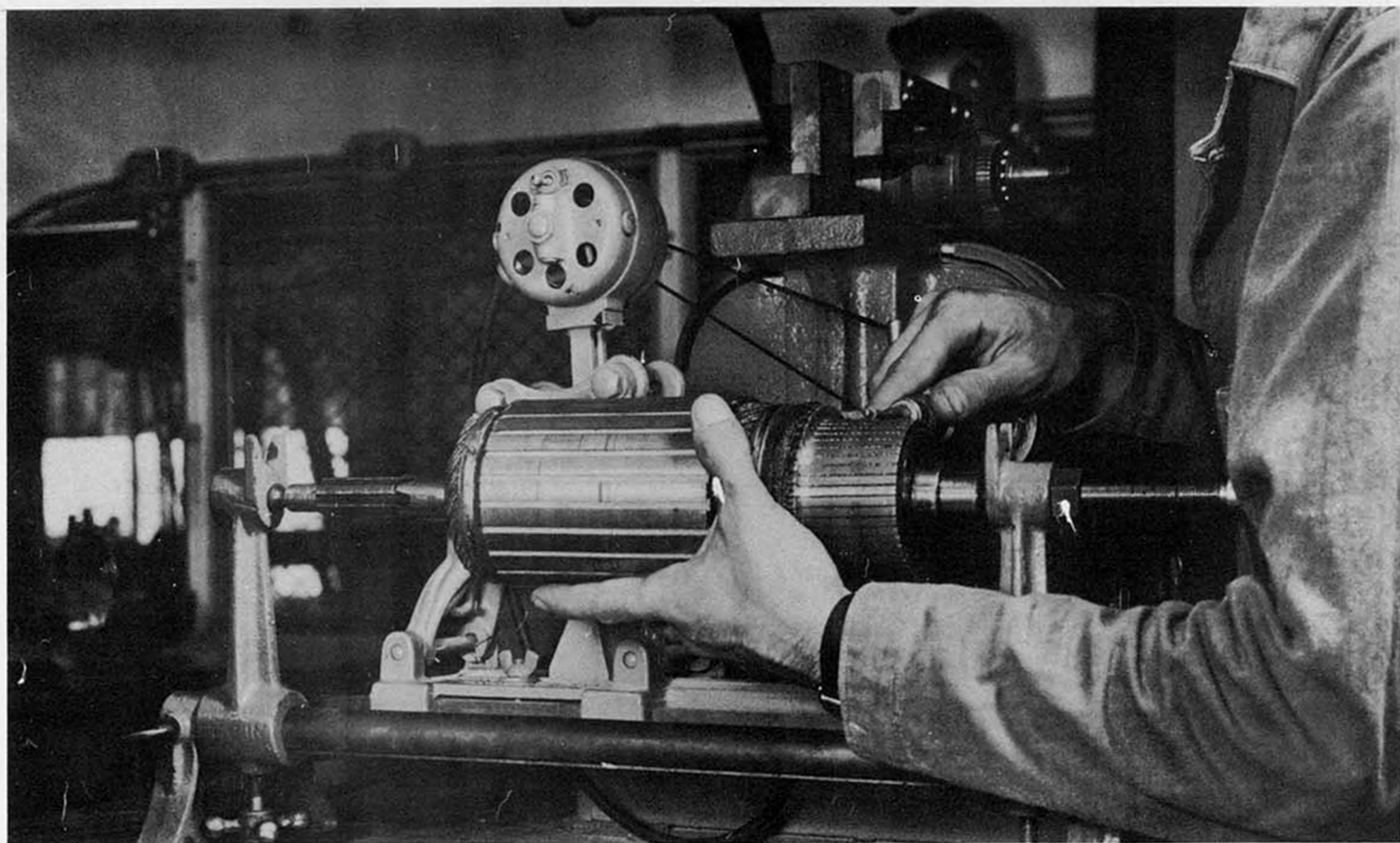


Fig. 18

Fig. 21

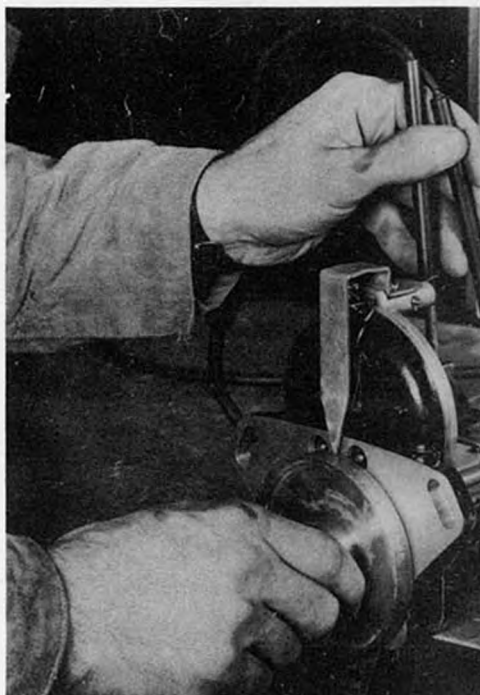
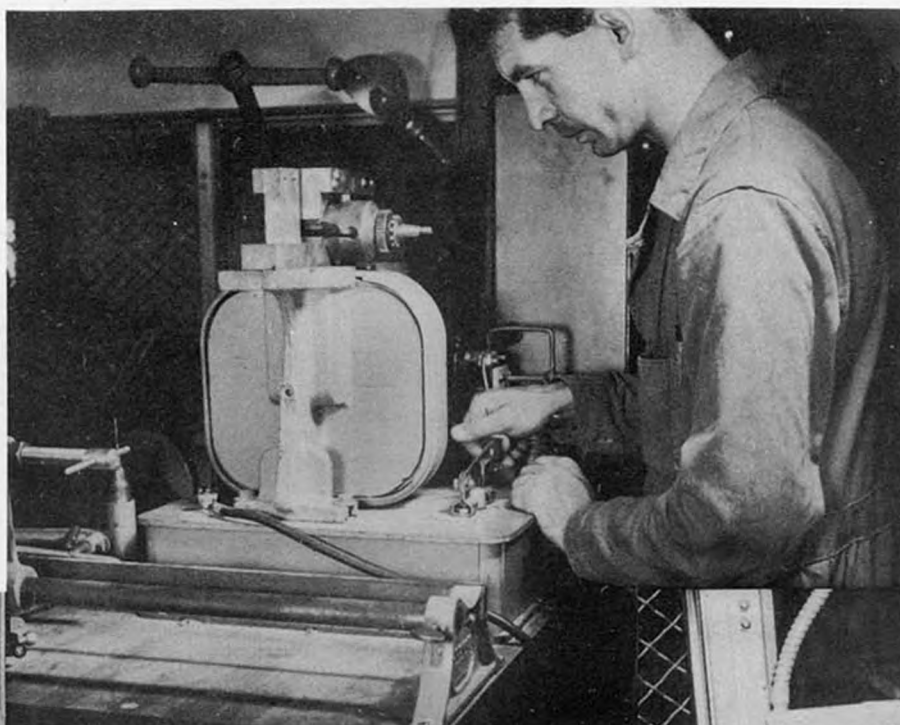


Fig. 23

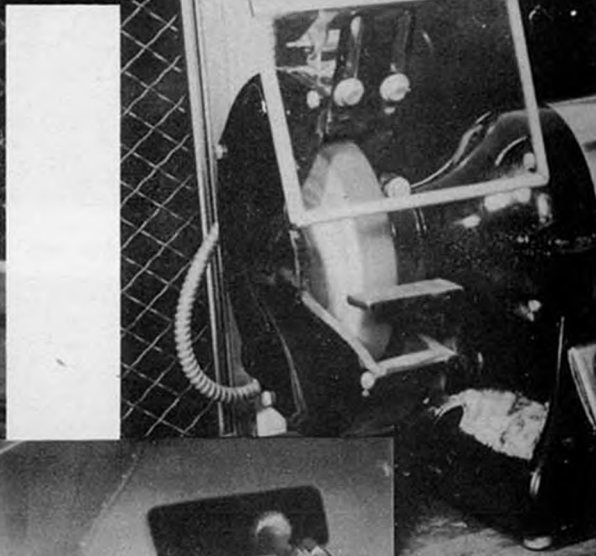
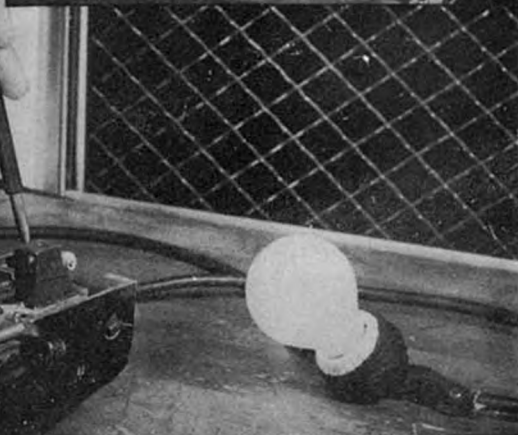


Fig. 25

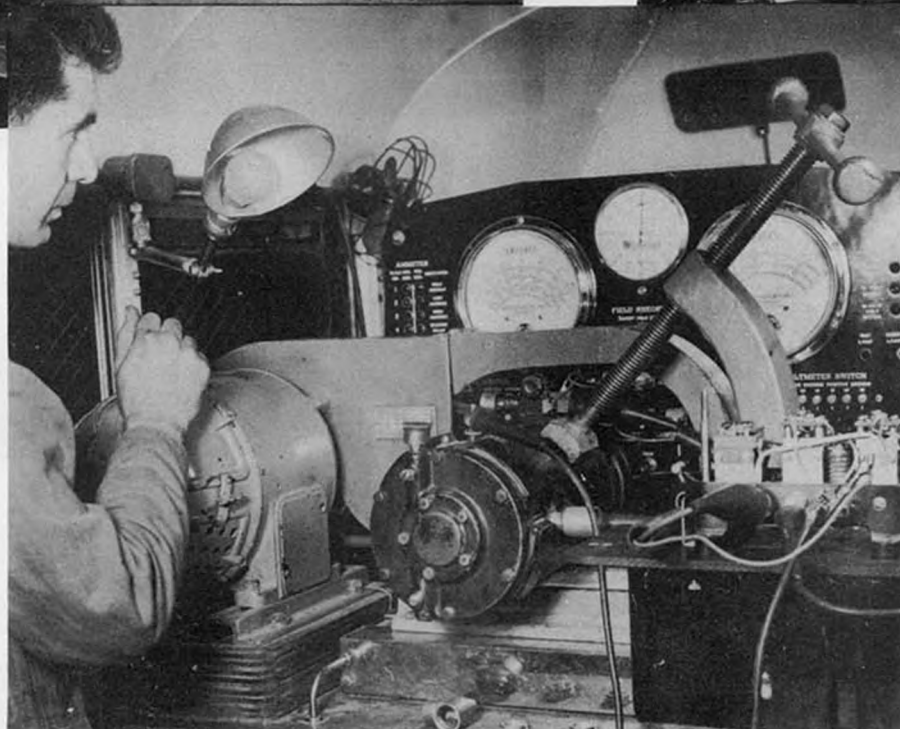


Fig. 19

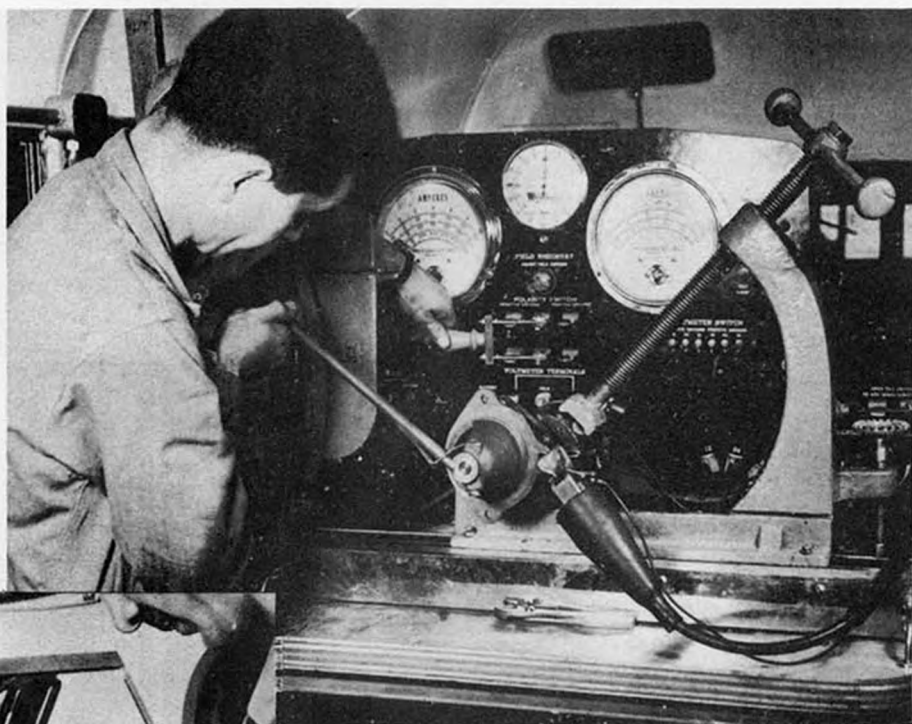


Fig. 20

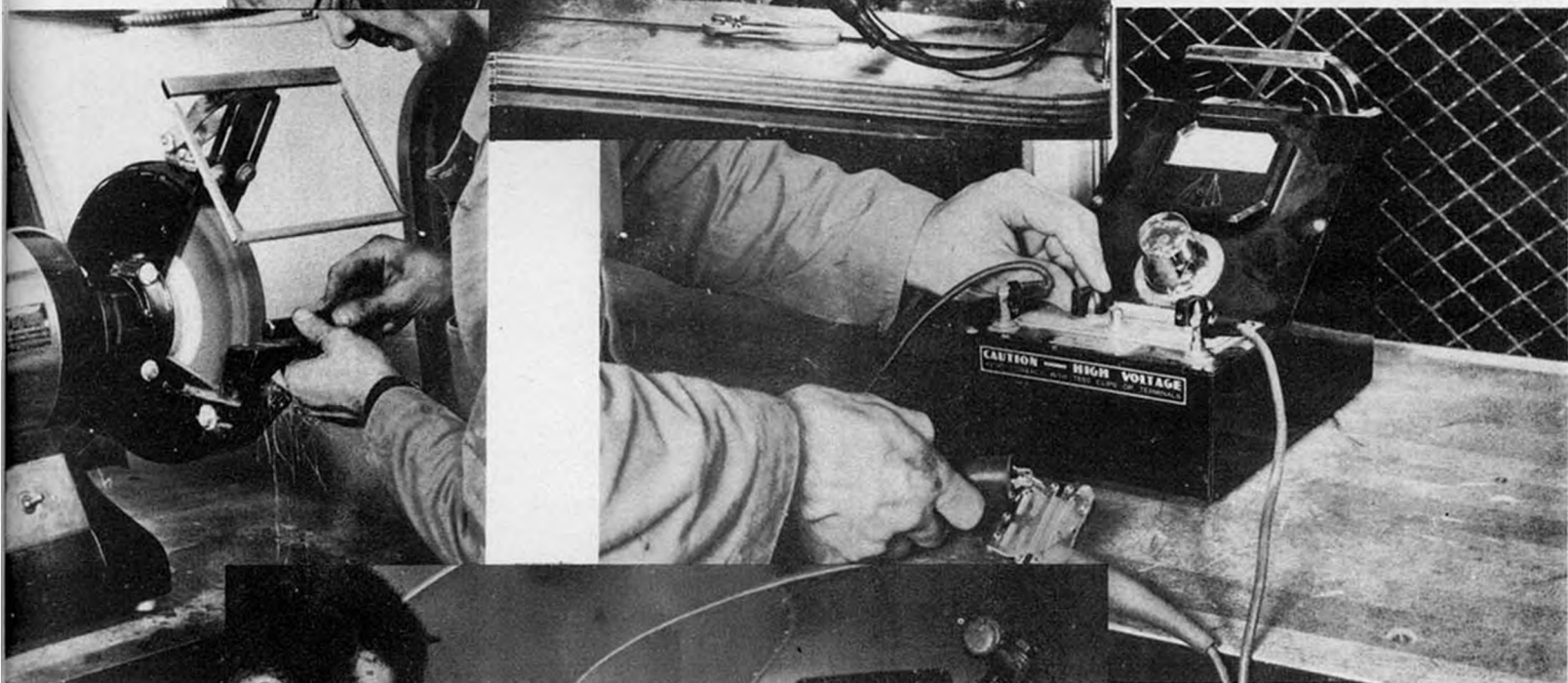


Fig. 22

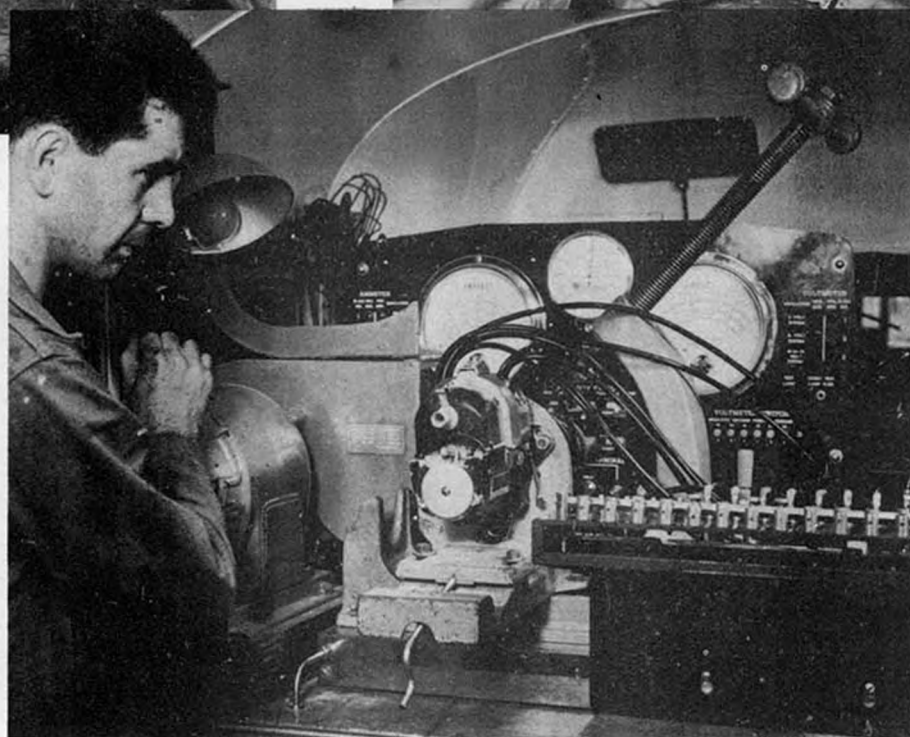
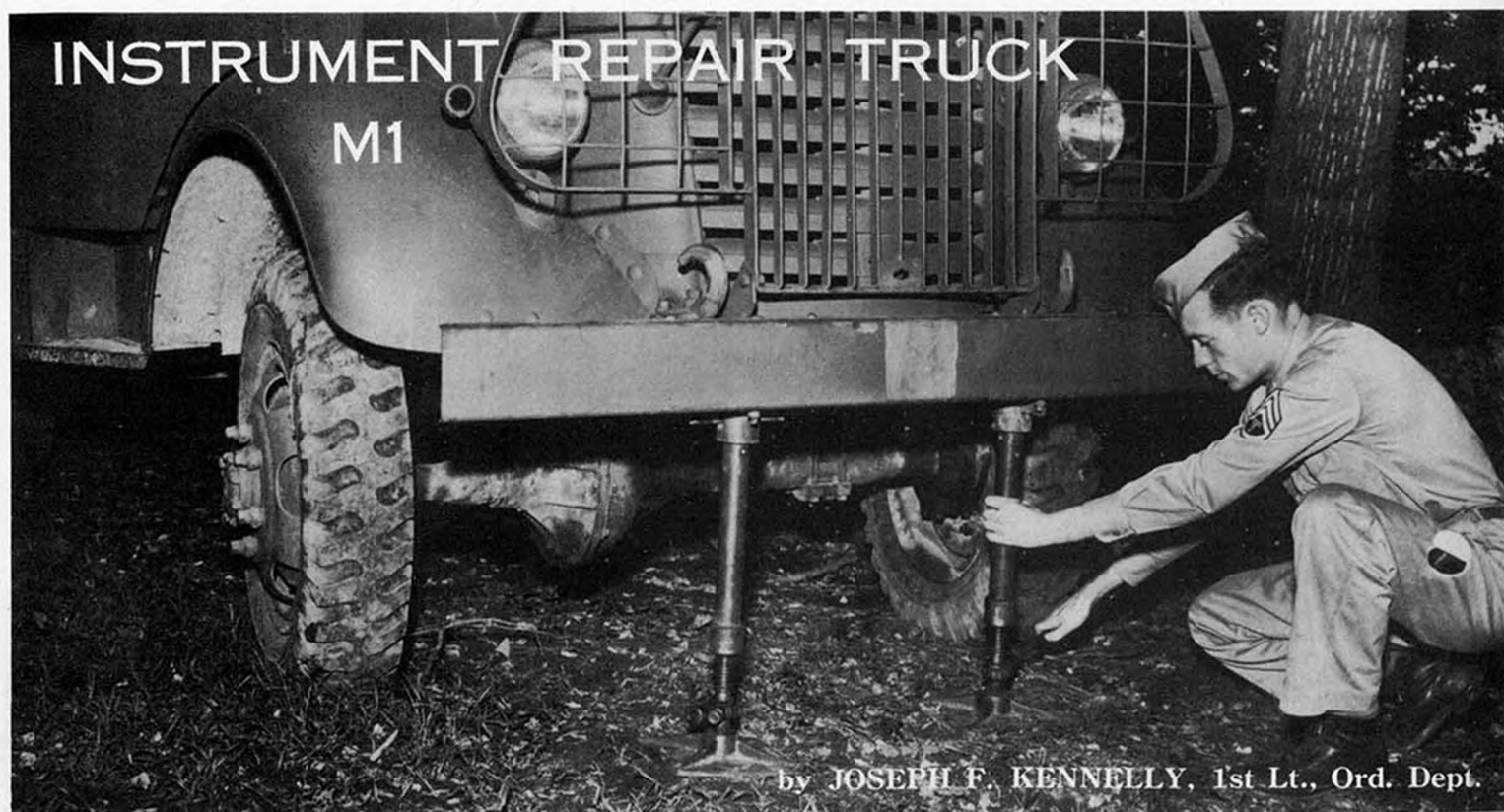


Fig. 24



by JOSEPH F. KENNELLY, 1st Lt., Ord. Dept.

The Instrument Repair Truck, M1, is issued to Medium Maintenance Companies with Load A. It is issued to Heavy Maintenance Companies with Load B. Tools and supplies comprising equipment of this vehicle are listed in OFSC #242, dated Sept. 18, 1941. This circular is a temporary expedient pending the publication of SNL G-92 which will review the Instrument Truck, M1 and its supplies and equipment. Until this SNL is published OFSC 242 will be used as the basis for issue, accounting and supply.

Fig. 1 -- Four stabilizing jacks permit the Instrument Truck, M1, to be leveled and stabilized. This is an essential requirement for the adjustment and repair of delicate optical instruments. (Above) Front jacks being adjusted.

Load A includes all of the supplies and equipment included in Load B; the salient difference between the two loads being the absence of fixtures for adjusting purposes on Load A. Load B contains 19 fixtures



Fig. 2 -- The Instrument Repair Truck, M1, with stabilizing jacks in place; windows open, and grating up; rear door open. Optical instru-

ments are never adjusted through glass windows. It may result in errors which would render instruments optically inaccurate.

which are not included in Load A. Reference to OFSC #242 will make the difference between the two loads immediately obvious.

While the Instrument Repair Truck, M1 has been recently classified as limited standard it will be quite a while before the new, standard, M10 vehicle is available for issue to the field. The detailed specifications of the new M10 vehicle are not as yet available for publication. It may be anticipated, however, that most of the objections and criticisms which have been initiated by the M1 will have been corrected by necessary improvements.



Fig. 3 -- Blackout curtain, shown being adjusted above, are an integral part of the equipment of the Instrument Repair Truck.



Fig. 5 -- A portable generator is furnished for use when current cannot be obtained from the machine shop truck or an outside source. The generator shown above is a portable, 1-1/2 KW, 110-volt, 60-cycle, AC, gas engine driven generator. It is small, compact and easily concealed for use.

The versatility of the M1 Instrument Truck is best shown by pictures. The scope of its equipment can be found in OFSC 242.

It should be kept in mind that the pictures shown here were taken specifically for this issue of THE ORDNANCE SERGEANT, and are not to be regarded as actual field photographs of the truck in operation.



Fig. 4 -- With blackout curtains in place the maintenance operations are limited to those involving no use of outside targets. Above: instrument repairman working on a range finder, with blackout curtains in place.

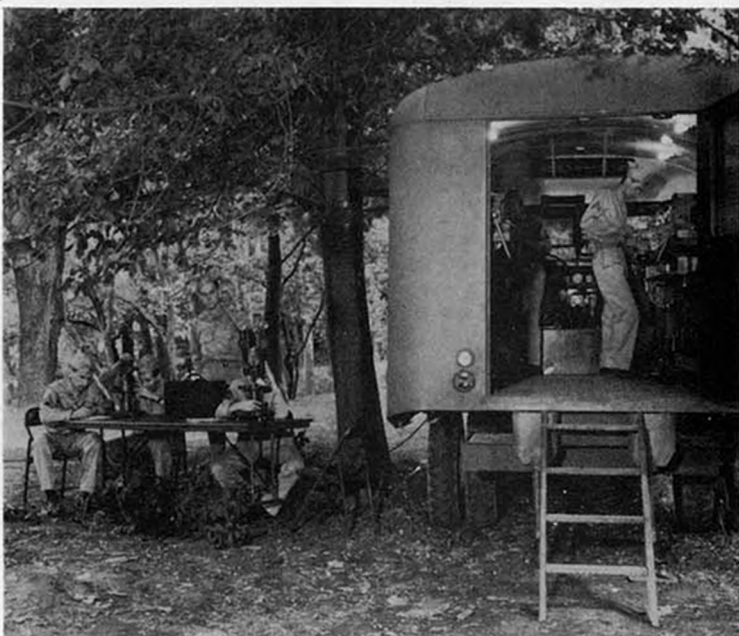


Fig. 6 -- When conditions allow, tables and adjusting benches can be set up outside the truck, allowing a maximum number of men to work at one time. This should always be done when the lathe and other machine tools are in use in the truck, to allow the instruments to be cleaned and adjusted away from flying chips and dust, etc.



Fig. 8 -- In addition to the large number of tools and other equipment on the truck, four complete kits for instrument repairmen are included. These kits form a complete working set of tools for inspecting and maintenance parties on detached missions, as well as being of valuable use to supplement the equipment on the truck.



Fig. 9 -- When it is not necessary to use blackout curtains, instruments may be adjusted inside the truck. Even at night adjustment is possible. The moon and stars furnish excellent targets for "infinity" adjustments.

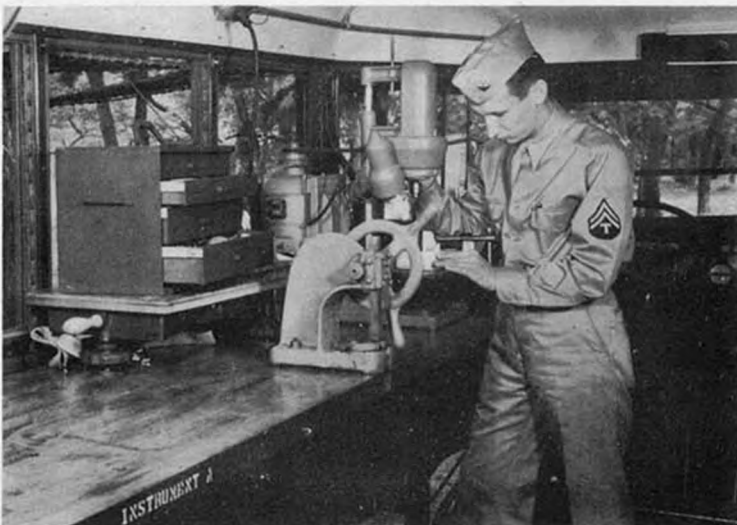


Fig. 10 -- An electric drill of 1/4-inch capacity is one of the machine tools included in truck equipment.



Fig. 7 -- Most operations involving optical instruments require that testing targets be at a given distance. In certain operations, such as



Fig. 11 -- A close-up of the drill press in use.



testing of level lines, the distance may be diminished in emergency. Above: a testing target in use. Note instrument repair kit on table.

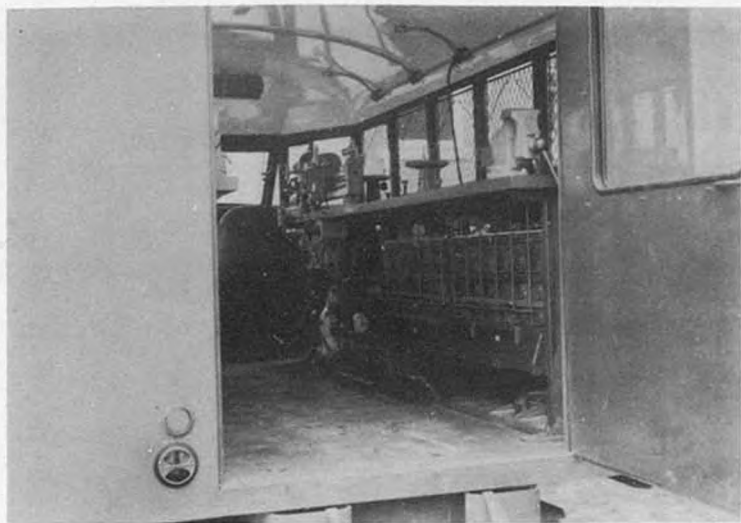


Fig. 12 -- Some of the many compartments for storing tools and equipment. Note arrangement for locking compartments securely. Also visible is a vise, pedestal type adjusting fixture, and a rear view of the precision, screw cutting lathe.



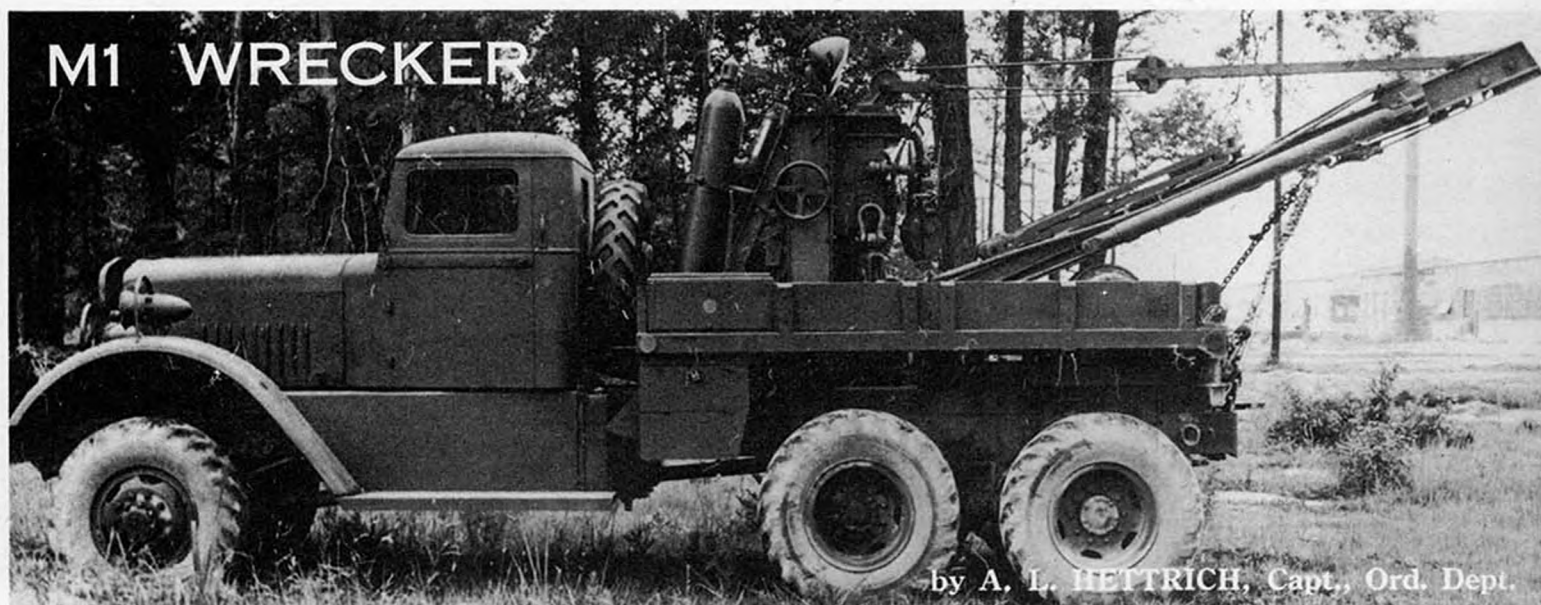
Fig. 13 -- One of the most important items of equipment on the truck is the precision bench lathe, back geared, screw cutting, 8-1/2 x 40 inch, with 1-inch collet capacity, quick change gear box, taper attachment, 1750 r.p.m., 3/4 hp., 110-volt, 60-cycle, single-phase AC, repulsion induction motor with reversing switch, complete with all necessary accessories for extensive field maintenance operations.



Fig. 14 -- Showing an instrument kit partially open, and beside it, some of the many precision measuring and other tools, comprising the equipment of the instrument truck.



Fig. 15 -- An instrument kit, and the drill press being set up.



GENERAL

The M1 wrecker (See Figure 1) is classed as an emergency vehicle, and is used for repairing (where lifting is required), towing, salvaging, and recovering heavy military equipment. It is powered by a six-cylinder, dual ignition gasoline engine. Power to the front axle and the two rear axles (rear bogie) is transmitted through a five-speed-forward-one-reverse transmission and a high-low range transfer case which delivers drive and traction on all 10 wheels and tires (2 single pneumatics in front and 4 dual pneumatics in the rear). Dual wheels and tires may be mounted in the front, providing drive through 12 tires, if required. A crane, with a 2-speed-forward-1-reverse hoisting speed winch and a swinging boom, is mounted on the chassis, complete with all accessories for various operations requiring direct lifts. Power driven winches with cables, chains and hooks are provided on both front and rear of the vehicle for a number of purposes. Both winches are capable of being driven in low, high, or reverse speeds.

In addition to this basic attached equipment there is a large assortment of loose miscellaneous equipment for repairing, towing, and salvaging — a tow bar, tow cable, tow chains, single and double snatch blocks, ground anchors and spades, welding and cutting equipment, rope and rope blocks, shovels, crow bars, sledge hammers, axes, saws, etc. together with a large assortment of smaller hand tools.

CLUTCH

The wrecker is equipped with a 14", single plate clutch, mounted in the conventional manner and operated by a foot pedal at the left of the

Figure 1

steering column. An air clutch on the crane winch and an air clutch on the rear winch operate the clutch pedal in the cab to dis-engage and engage the clutch when these two units are being used.

TRANSMISSION

The transmission is a conventional five-speed-forward-and-one-speed-reverse transmission. First and reverse are locked off from the other speeds, it being necessary to depress a latch under the gear shift lever knob in order to shift. Shifts into first and reverse should only be made when the vehicle is at a halt.

TRANSFER CASE

The transfer case is mounted in the rear of the transmission and power to it is transmitted by a short propeller shaft. The winch lay shafts are driven from the transfer case by a number of chains. The front and rear propeller shafts are driven directly from the transfer case.

Power to the winch lay shafts may be engaged and disengaged directly at the transfer case by means of the "crane and winch power take off" lever. A "Front Winch Tow Clutch" lever operates on the front winch lay shaft, allowing the operator to engage and disengage that lay shaft individually from the cab.

The "Transfer Case Shift" lever, mounted to the right of the parking brake lever, allows the operator to operate the wrecker in "High"



Figure 2 Wrecker anchored in front for rear recovery operations.

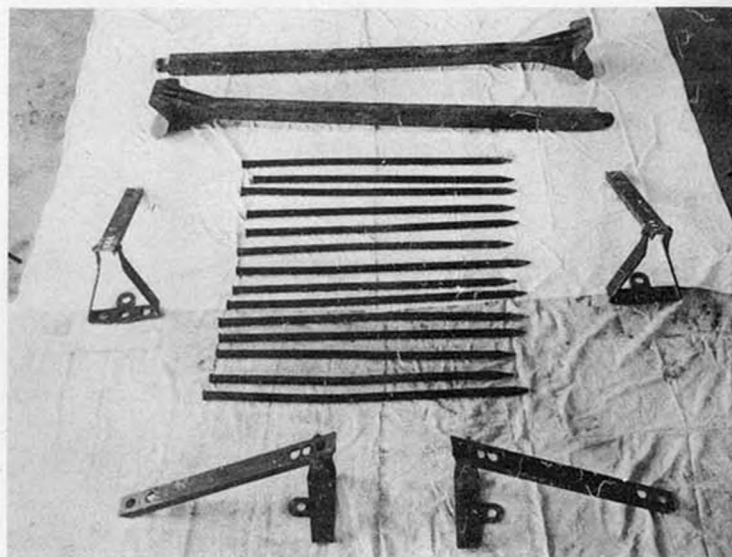


Figure 3 Equipment for recovery operation laid out.



Figure 4 Wrecker in position for rear recovery operation with spades out.

when speed is required, in "Neutral" when the winches are being used, and in "Low" when a reduced speed but more pulling power is required. As was the case with first and reverse, the vehicle must not be in motion when the transfer case is shifted.

The "Front Axle De-Clutch" lever is mounted immediately to the right of the transfer case shift lever. It disengages the front axle in the forward position (OUT) and engages the front axle in the rearward position (IN). The transfer case shift lever and front axle de-clutch lever are interlocked so that it is impossible to shift the transfer case into "LOW" unless the front axle is "clutched", or vice versa, it is impossible to "De-Clutch" the front axle if the transfer case is in "LOW". The reason for this arrangement is that the "torque" or pulling power, of the engine must be divided between the front and rear axles when the transfer case is in "low range".

BRAKES

All wheels are equipped with air brakes. The parking brake consists of a flat, circular disc, fastened between the universal joint flanges directly behind the transfer case. There are two pairs of shoes which clamp this disc on both sides when actuated through rods connected with the parking handle.

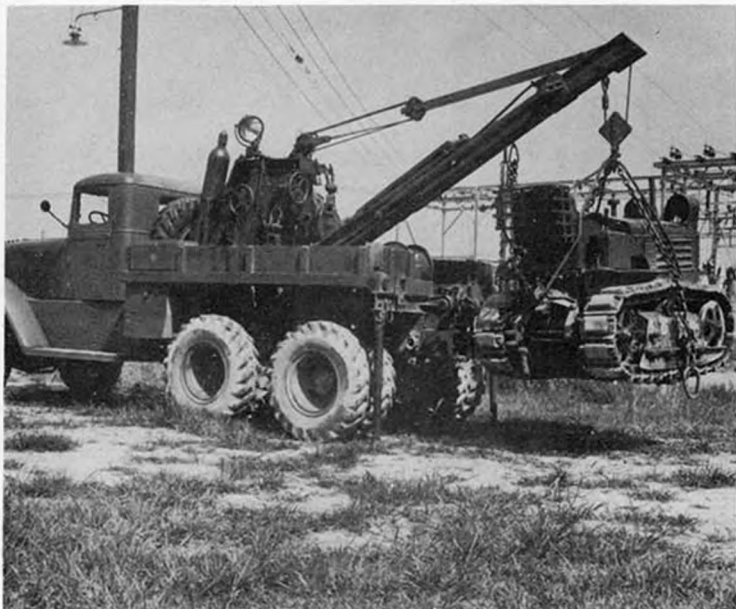


Figure 6 Wrecker being used to hoist light tractor.



Figure 5 Wrecker with boom swung out laterally, A-Frame down and body jacks in place.

THE FRONT WINCH

The front winch is power driven and has a direct pull capacity of 20,000 lbs. on a single line. The front cable is 300 feet long and 5/8" in diameter. This cable is of preformed plow steel with filler wire and an independent wire rope center. It is equipped with 4 feet of 5/8" chain with a hook at the free end. This winch is used for medium and light recovery operations, for holding the truck when the rear winch is being used, and for pulling the wrecker itself out of bad holes when the wrecker is mired down.

THE CRANE AND WINCH EQUIPMENT

The crane and winch equipment consists of a crane with a swinging boom having a lift capacity of 5 tons. The boom can be swung through an arc of approximately 180°, when the truck is on level ground, by turning a hand wheel. The boom can be raised and lowered by a hand wheel, operating through a small winch drum and a "topping cable" to the end of the boom. The lift or load cable is 100 feet long and 5/8" diameter. This cable is made of preformed plow steel with filler wire and independent wire center. It is equipped with a lift hook on the free end and a single sheave block.



Figure 7 Towing hookups for Medium tank



Figure 8 Towing hooks for Medium Tank

REAR WINCH

The rear winch, used for all heavy recovery operations is power driven and has a direct pull capacity of 47,500 lbs. on a single line. The rear cable is 350 feet long and 3/4" diameter. This cable is made of preformed plow steel with filler wire and an independent wire rope center. It is equipped with 6 feet of 3/4" chain having a hook on the free end.

SHEAR PINS

All winches are equipped with "Shear Pins" to protect the winches from overloading. When the normal pulling capacity of the winch is exceeded, the pin will shear, thereby disengaging the power to the winch.

OPERATION OF CRANE AND WINCHES

The mechanical operation of the crane and winches, that is, the shifting of the levers, etc., is quite simple. Recovery operations involving "rigging", care of cables, aligning the wrecker, etc., are, however, more complicated, and require study and judgement on the part of the operator.

Generally speaking, when heavy loads are to be handled, the power required to safely and efficiently handle the load may be multiplied by



Figure 9 Towing hookup that may be used to tow a wheeled vehicle with a damaged front drive. This hookup is especially suitable for crossing rough terrain.

using the snatch blocks provided for this purpose. This not only makes for safe and efficient operation, but also saves the cables from crushing as they wind on the drums.

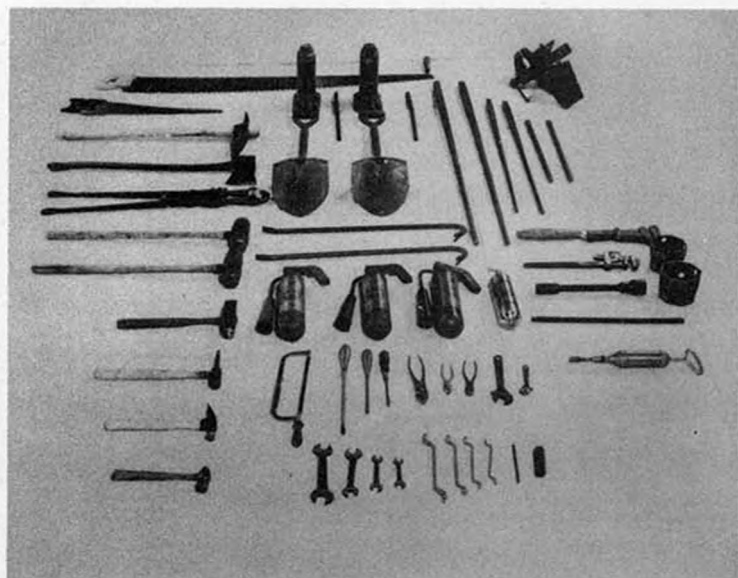
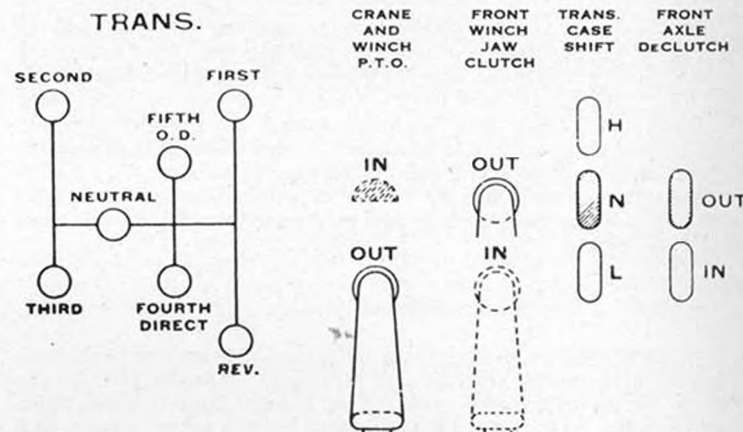


Figure 10 Pioneer tools and some of the larger tools that are part of the equipment on the wrecker.



Figure 11 Equipment used for recovery work that is part of the equipment on the wrecker.



Figure 12 Tank mired.



Figure 13 Same tank being pulled out by wrecker.

TABULATED DATA:

Weight with gas, oil, water and all equipment, less men	21,130 lbs.
Length, Overall body	26' 6"
Length, Overall boom	29'
Width, Overall	8' 3"
Height, Overall	10' 2"
Ground Clearance	12'
Tread, front wheels	73"
Tread, rear wheels	82"
Turning circle diameter	88'
Bumper heights (ft)	45"
" " (rear)	45"
Fording depth	42"
Limiting factor	Carburetor
Gov. speed engine	2400 RPM
Gov. speed truck	45 M.P.H.
Fuel capacity	100 gal.
On one filling	250 Mi.
Engine oil capacity	10 Qts.
On one filling	250 Mi.
Cooling capacity	31 Qts.
Tires, balloon	11:00 - 20
Tubes, puncture seal	11:00 - 20
Tire pressure	
Hard ground	85 lb.
Sand Operation	65 lb.

Truck speeds at 2400 RPM in Miles Per Hour

	Low Range	High Range
1st	1.93	4.9
2nd	3.9	9.9
3rd	7.9	20.2
4th	13.6	34.7
5th	17.6	45

EQUIPMENT

Location - In tool box under seat.

- 1 - Coil, Welding Hose, 50'
- 1 - Torch, Welding
- 4 - Tips, Welding, 2" - 4" - 6" - 8"
- 1 - Cutting Attachment
- 2 - Tips, Cutting, #1 - #3
- 1 - Mixer
- 1 - Regulator, Acetylene
- 1 - Regulator, Oxygen
- 1 - Wrench
- 1 - Sparklighter
- 1 - Pair Goggles

- 1 - Hose, Trailer Air Connection
- 1 - Bucket, Canvas

Location - In Rear Body Tool Box

- 1 - Rope, Manila, 300'
- 1 - Tackle Block, Rope, double
- 1 - Tackle Block, Rope, single
- 1 - Crank, Starting

Location - In Rear Tool Box Under Floor.

- 1 - Pick, Mattox, with Handle
- 2 - Shovel, Round Point with Handle
- 2 - Sledge, 10 lb. with Handle

Location - Long Tool Box Mounted on Right Side Body.

- 1 - Crosscut Saw, 5' with Handle
- 2 - Bar, Crow pinch point 7/8" x 42"
- 2 - Bar, wrecking 3/4" x 30"
- 1 - Axe, single bit, with Handle
- 1 - Hacksaw, 12" with Handle
- 12 - Blades, hacksaw 12"
- 1 - Cutter, Bolt 5/8" Capacity
- 2 - Chisel, 1" x 24"
- 1 - Chisel, Blacksmith 1-3/4" with Handle
- 1 - Punch, Blacksmith 3/8" point
- 1 - Wrench, Pipe 18"
- 1 - Wrench, Monkey 21"
- 1 - Screwdriver - 6"
- 1 - Screwdriver - 12"
- 1 - Screwdriver - 18"

Location - Long Tool Box Mounted on Right Side Body.

- 1 - Pliers, heavy duty 10"
- 1 - Cutters, Diagonal
- 1 - Hammer, Straight Claw
- 1 - Saw, Hand
- 6 - Pins, Shear, Rear Winch
- 6 - Pins, Shear, Front Winch
- 6 - Pins, Shear, Crane Winch

Location - Left under Body Tool Box.

- 3 - Pair Chains, Tire, Nonskid 11:00 x 20 H.D.
- 2 - Chain, Tow 12' x 3/4"

Location - Right under Body Tool Box.

- 2 - Jack, 8 ton

1 - Grease Gun, 9 oz.
 1 - Wrench, Wheel Budd
 1 - Wrench, Wheel Bearing, Front
 1 - Wrench, Wheel Bearing, Rear
 6 - Clamp, Wire Rope 3/4"
 6 - Clamp, Wire Rope 5/8"
 6 - Thimble, 3/4"
 6 - Thimble, 5/8"
 2 - Shackles

1 - Hook, for Boom Cable
 1 - Vise, 5"
 1 - Kit, Hand Tools (in bag)
 Consisting of following:
 1 - Hammer, ball peen
 1 - Wrench, Crescent 10"
 1 - Wrench, Crescent 6"
 1 - Wrench, Open End 7/16" x 1/2"
 1 - Wrench, Open End, 9/16" x 5/8"

1 - Wrench, Open End, 3/4" x 7/8"
 1 - Wrench, Open End, 15/16" x 1-1/16"
 1 - Wrench, Box End, 7/16" x 3/8"
 1 - Wrench, Box End, 1/2" x 9/16"
 1 - Wrench, Box End, 5/8" x 11/16"
 1 - Wrench, Box End, 25/32" x 3/4"
 1 - Pliers, Round Nose, 6"
 1 - Screwdriver, Heavy Duty 11"
 1 - Screwdriver, 10"



Figure 14 Tank at top of grade

- 1 - Sparkplug Wrench, 31/32" x 1-1/32"
- 1 - Sparkplug Wrench Handle

Location - Mounted on truck

- 2 - Anchor, Ground, Holmes, 4 pcs. with 14 stakes
- 2 - Snatch Blocks, Single 8" x 3/4" (w/shackle)
- 2 - Snatch Blocks, Double 8" x 3/4" (w/shackle)
- 1 - Cable, Tow
- 2 - Bar, crow, 1-1/4" x 60"
- 2 - Spade & Leg

Location - Mounted on Truck

- 1 - Directional Pulley Attachment Assembly
- 5 - Padlocks and three keys
- 1 - Oil Can
- 1 - Acetylene Tank
- 2 - Oxygen Tanks
- 1 - Block Square 8" (for Crane)
- 2 - Spare Wheels and Tires
- 1 - Tow Bar
- 1 - Whiffletree Assembly
- 1 - Tool Box & Hand Tools (Blackhawk), Mounted left side body.

Consisting of following:

- 1 - Handle Bar, 4" long, 7/32" Dia.
- 1 - Handle Bar, 7" long, 3/8" Dia.
- 1 - Handle Bar, 11" long, 1/2" Dia.
- 1 - Handle Bar, 18" long, 3/4" Dia.
- 1 - Hinged Offset Handle, 5" long, 1/4" drive
- 1 - Hinged Offset Handle, 8" long, 7/16" stock
- 1 - Hinged Offset Handle, 15-5/8" long, 1/2" drive
- 1 - Hinged Offset Handle, 19" long, 3/4" drive
- 1 - Standard Extension Bar, 5" long, 7/16" stock, 3/8" drive
- 1 - Standard Extension Bar, 18" long, 7/16" stock, 3/8" drive
- 1 - Standard Extension Bar, 6" long, 1/2" drive
- 1 - Standard Extension Bar, 10" long, 1/2" drive
- 1 - Standard Extension Bar, 8-1/2" long, 3/4" drive
- 1 - Reversible Free-Wheeling Ratchet, 7" long, 3/8" drive
- 1 - Reversible Free-Wheeling Ratchet, 10-1/2" long, 1/2" drive
- 1 - Reversible Free-Wheeling Ratchet, 18" long, 3/4" drive
- 1 - Speeder Handle, 18" long, 3/8" drive
- 1 - Brace Handle, 19" long, 1/2" drive
- 1 - Tie Rod & Screwdriver Attachment, 11/16" x 1/16", 1" long, 3/8" drive
- 1 - Tie Rod & Screwdriver Attachment, 15/16" x 7/64", 1-1/2" long, 1/2" drive
- 1 - Universal Joint, 3/8" Square Drive
- 1 - Universal Joint, 1/2" Square Drive
- 1 - Release Key

EXTRA SMALL SERIES, 1/4" SQUARE DRIVE

- 1 - 3/16" Thin Wall Double Hex Socket
- 1 - 7/32" " " " " "
- 1 - 1/4" " " " " "
- 1 - 9/32" " " " " "
- 1 - 5/16" " " " " "
- 1 - 11/32" " " " " "
- 1 - 3/8" " " " " "
- 1 - 7/16" " " " " "
- 1 - Plastic case (For above Set)

SMALL SERIES, 3/8" DRIVE "LOCKON"

- 1 - 5/16" Single Hex Socket
- 1 - 3/8" Double " " "
- 1 - 7/16" " " " "
- 1 - 1/2" " " " "
- 1 - 9/16" " " " "
- 1 - 5/8" " " " "
- 1 - 11/16" " " " "
- 1 - 3/4" " " " "
- 1 - 1/2" Double Hex Universal Joint Socket, 3/8" Drive
- 1 - 9/16" " " " " 3/8" Drive
- 1 - 5/8" " " " " 3/8" Drive

STANDARD SERIES, 1/2" SQUARE LOCKON DRIVE

- 1 - 7/16" Double Hex Socket
- 1 - 1/2" " " " "

- 1 - 9/16" " " " "
- 1 - 19/32" " " " "
- 1 - 5/8" " " " "
- 1 - 11/16" " " " "
- 1 - 3/4" " " " "
- 1 - 25/32" " " " "
- 1 - 13/16" " " " "
- 1 - 7/8" " " " "
- 1 - 15/16" " " " "
- 1 - 1" " " " "
- 1 - 1-1/16" " " " "
- 1 - 3/8" Double Square Socket
- 1 - 7/16" " " " "
- 1 - 1/2" " " " "
- 1 - 9/16" " " " "
- 1 - 5/8" " " " "
- 1 - 3/4" " " " "
- 1 - 1/2" Long Double Hex Socket
- 1 - 9/16" " " " "
- 1 - 5/8" " " " "
- 1 - 3/4" " " " "
- 1 - 13/16" " " " "
- 1 - 7/8" " " " "
- 1 - 1-1/8" " " " "
- 1 - 1" " " " "

HEAVY DUTY SERIES, 3/4" SQUARE "LOCKON" DRIVE

- 1 - 1-1/8" Double Hex Socket
- 1 - 1-1/4" " " " "
- 1 - 1-3/8" " " " "
- 1 - 1-7/16" " " " "
- 1 - 1-1/2" " " " "
- 1 - 1-5/8" " " " "
- 1 - 1-3/4" " " " "
- 1 - 1-13/16" " " " "

SHORT DOUBLE OFFSET BOX-TYPE WRENCHES

- 1 - 3/8" x 7/16" Double Hex
- 1 - 1/2" x 9/16" " "
- 1 - 5/8" x 11/16" " "

LONG DOUBLE OFFSET BOX-TYPE WRENCHES

- 1 - 3/4" x 25/32" Double Hex
- 1 - 13/16" x 7/8" " "
- 1 - 15/16" x 1" " "

TAPPET OPEN-END WRENCHES

- 1 - 1/2" x 9/16" Tappet Wrench
- 2 - 5/8" x 11/16" " "
- 2 - 3/4" x 7/8" " "

OPEN-END WRENCHES

- 1 - 5/16" x 3/8" O.E. Wrench
- 1 - 7/16" x 1/2" O. E. Wrench
- 1 - 9/16" x 5/8" O.E. Wrench
- 1 - 11/16" x 7/8" O.E. Wrench
- 1 - 3/4" x 13/16" O. E. Wrench
- 1 - 15/16" x 1" O.E. Wrench

IGNITION OPEN-END WRENCHES

- 1 - 3/16" x 7/32" Ignition Wrench
- 1 - 1/4" x 9/32" " "
- 1 - 5/16" x 13/32" " "
- 1 - 3/8" x 7/16" " "

- 1 - Extinguisher, Hand Vaporizing Liquid
- 3 - Extinguishers, Hand, 2 lb. CO₂
- 2 - Flare, Truck, Kerosene, 40 oz. 12 hour in Box with three flares to box
- 1 - Jack, Hydraulic, 30 Ton
- 1 - Pair Asbestos Gloves
- 1 - Lamp, Trouble, 12 Volt, 50' Cord (with bulb and connector)

(Continued on page 407)

DO YOU LIKE YOUR VEHICLES?

During the preparation of these articles pertaining to Ordnance vehicles a large number of letters were received. All of these letters were very useful in the preparation of the articles. While a great many of the letters received contained praise for certain vehicles, or for certain items of equipment contained in vehicles, a large number of criticisms were also received.

Obviously some users of this equipment are not entirely satisfied. This is not surprising. Thousands of individuals are involved in the use of these vehicles and their equipment. Problems encountered vary for many reasons. Local conditions often have an influence. And — it would be most surprising if, in an age of constant development and improvement, any so large a collection of equipment could exist in a state of perfection.

Ordnance maintenance equipment certainly is not all that it could be, when we compare it with "perfection". But it is constantly being improved. Experience is a dear teacher, but a thorough one. We have the best, and it will constantly become better.

There would be no point in printing letters of praise. There is a point, however, in printing letters of criticism. Space permits the reproduction of only a few. Are these problems local? Have you experienced the same difficulties? Have you corrective suggestions to make? Do you like your vehicles? If you do, use them to the best advantage. If you don't, tell us what is wrong with them — others may agree with you — and real improvement may result.

Articles pertaining to a number of additional Ordnance vehicles will be included in the November issue of THE ORDNANCE SERGEANT.

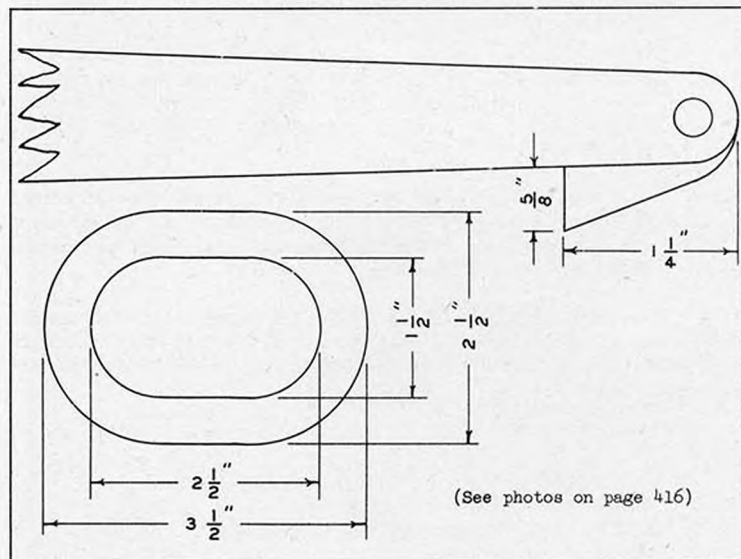
88th Ordnance Co. (HM) (Field Army)
Fort George G. Meade, Maryland

July 21, 1942

SUBJECT: Safety lock link

TO : THE ORDNANCE SERGEANT, The Ordnance School, Ordnance Training Center, Aberdeen Proving Ground, Md.

1. A recent issue of THE ORDNANCE SERGEANT requested that any interesting data on ordnance vehicles be forwarded for your inspection and possible use in your magazine.



2. On the M1 series 2, Heavy wrecker, it has been noted that there is no method of locking the tension lever arm of the boom sway chain. In very rough terrain, it has been found that this arm will release.

3. Technician 4th Grade Howard T. Collins, of this organization, has made the following changes in this bar and it is felt that it is very successful:

A wedge shaped piece, as shown in the inclosed picture, has been welded on the end of the tension arm. This piece is about 1-1/4" long and 5/8" high at the highest end. A welded link has been slipped through the triangular link at the bottom of the sway chain as shown, so as to enable anyone to slip this link over the wedge-shaped piece on the tension lever arm, and lock it in position.

B. W. JOHNSON
Capt. 88th Ordnance Co. (HM),
Commanding

4-Incls.
4-Pictures

31st Ordnance Company (HM)
Ft. Benning, Ga.
August 11, 1942

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

Subject: Cord extension two conductor, #12, A.W.G. with male connector on one end, with female connector other end, 25 & 50 ft. Drawing #RA-DD-B101

Dear Sir:

These cords are very poorly constructed and too small to carry the load sometimes required. Also in the field trucks are required if possible to be 50 yds apart. Under these conditions a 100 ft. cord would be much better and as for maintenance of the cord we haven't been able to get connector male and female to repair with.

Yours very truly,

H. G. PADGETTE
Tech. Sgt. 31st Ord. Co. (HM)
Chief of Machine Shop Section

31st Ordnance Company (HM)
Ft. Benning, Ga.
August 5, 1942

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

Subject: Artillery Section

Dear Sir:

Artillery mechanics, have no end wrenches or socket wrenches while there is an excess of adjustable wrenches which have proven unsatisfactory. Nuts that are on tight, and especially small nuts, are almost impossible to remove with adjustable wrenches without rounding the corners of the nut. Regardless of how tight an adjustable wrench is fitted, if the nut is tight the wrench will invariably give enough to round the corners of the nut or bolt. This is particularly true when the nut or bolt is made of soft material. Also the use of end and socket wrenches helps a great deal in teaching new men the sizes of nuts and bolts.

The punches, drive pins provided in this kit are found to be of very inferior grade. Common wire nails are of as much value as punches now provided.

The hoist, chain, ratchet lever with the chain roller type chain is, in the opinion of everyone I have seen use it, of no value at all. The hoist, chain triplex spur geared, is more easily operated and requires much less space in transport.

The collapsible tripod serves its purpose while the scissors do just the opposite. The scissors require too much space in transport and the collapsible tripod can be used as a scissors as well.

Every artillery piece requires a set of special repair tools. If the heavy maintenance company had the repair kits for all the guns they are likely to be called on to repair in the field it would present a load that could not be transported by the means available. The artillery section is allowed one repair truck and this would be seriously overloaded if made to carry all the section's special tools. More space should be given to this section.

Very truly yours,

ARTHUR F. COSBY
St. Sgt., 31st Ord. Co. (HM)
Chief of Section

115th Ordnance Company
Camp San Luis Obispo, California
July 10, 1942

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

1. Pursuant to your mimeographed request of June 11, 1942, the enclosed copy of a letter dated November 1, 1941, suggesting improvement of the Instrument Repair Truck is submitted.

2. Other members of this organization are also preparing comments on the other Ordnance Trucks which will be submitted later.

E. B. Cooley
1st Sergeant, #20903866

Camp San Luis Obispo, Calif.
November 1, 1941

Subject: Instrument Repair Truck

To: THE ORDNANCE SERGEANT, Ordnance School, Aberdeen Proving Ground, Maryland

1. The following alterations and additions are suggested to improve the operation of the instrument repair truck:

a. Tools and attachments for use with the lathe, grinder, and drill press be mounted or otherwise placed within reach of the operator.

b. Arrange for individual benches for each workman assigned to the truck. Benches to have seats, leg room, tops adjustable to level and the height above the seat similar to a jewelers or watch makers bench. Drawers to be installed alongside of leg room for instrument repair kit tools, parts of dismounted instruments, spare parts, and materials.

c. Provide racks or other suitable space for placing instruments ready to be worked upon.

d. Make a field desk of the glove compartment with a sliding board beneath for necessary accounting work.

e. Provide suitable storage space for spare parts and material stocks.

f. Design a collimating stand containing optical elements arranged to eliminate the necessity for a distant field of view. A stand for adjusting range finders could also be developed to eliminate the use of distant stations.

g. Drawers for files, measuring tools, and wood chisel should be specially fitted or lined for protection of these tools from damage.

h. Racks or hangers for self defense weapons and equipment issued.

2. The following changes in the issue of tools are recommended:

a. Additions:

1. Pin vises of several sizes.

2. Washer cutter.

3. Alcohol torch.

4. Magnet or electric compass needle charger.

5. Glass cutters, plain and circular.

6. Additional sized or adjustable leather wrenches.

7. Orange or other harder wood sticks for lens cleaning.

8. Electric soldering iron.

9. Small sized pin punches.

10. Triangular shaped hacksaw with blades about 1/4" x 6".

11. Pliers or holding tools similar to surgical hemostat.

12. Breast drill with chuck 1/2" maximum capacity.

13. Small hand drill.

14. Wire drills, 60-80 sizes.

15. Thread chasers.

16. Assorted counter-bores with pilots.

17. Heavy solid square.

18. Small wire brushes.

19. Brass screw drivers.

20. Scribers.

21. Bench Blocks.

22. Small Chisels, (cold)

b. Deductions:

1. Drills and solid reamers over 1/2".

2. The four screw jacks which neither level nor stabilize the truck.

3. All lathe attachments which need additional, non-issue items, to put into operation.

4. Large socket wrench set.

EDWIN B. COOLEY
Sgt. 115th Ordnance Co. (MM)

31st Ordnance Company (HM)
Ft. Benning, Ga.
August 10, 1942

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

Subject: Tank Maintenance Truck

Dear Sir:

The Weidenhoff 300 series test bench on the tank maintenance truck is well designed for checking six and twelve volt generators, starters, relays, regulators, cutouts and magnetos. However, since the twenty-four volt system is now being used some of this equipment is of little use. The motor on the 300 series test bench is too small to check twenty-four volt generators.

An air compressor is needed very badly on Tank Maintenance Truck for checking and cleaning spark plugs. This new type plug cannot be disassembled and therefore it is impossible to clean them without a sand blaster. The handpump type spark plug testing machine is very unsatisfactory.

It is my opinion that this truck should also have a 110 volt, 60 cycle, single phase, AC, 1/4 hp., electric drill press, like the one now installed on an Instrument Repair Truck. This press is located at the Top-front of "A" Bench and is manufactured by the H. F. Allen Co. Inc. New York, N. Y.

The 110 volt, 9 amp, type BR, Electric Nut Runner, manufactured by Black & Decker, Towson, Md. is not practicable for use on Medium & Light Tanks. When put in a strain, it jumps and three heavy men cannot hold it. Would suggest an Air Wrench for this work.

Too, the 100 ton hydraulic portable Ram w/press installed on this truck is by no means acceptable as it will only fit the Light Tank bogie wheel. We have no way at present of compressing tires on the Medium Tank bogie wheel.

Yours very truly,

WADE W. PRINCE
Sgt. 31st Ord. Co. (HM)
Chief of Section

More letters on page 391

EXPLOSIVE TRAINS

by

W. L. PARKER, M.Sgt., Ord. Dept.

During the study of ammunition there is usually much discussion, and confusion, over the subject of explosive trains. In reality those explosive trains contained in ammunition are very simple: most of the confusion is a result of the numerous components which may be interposed in the basic train to gain the functioning desired from a particular train. An explosive train is nothing more than a series of explosions, the arrangement being such that control is gained over the explosions and the desired effect is accomplished.

There are numerous explosive trains found in ammunition, some of which are closely related and others which differ in many ways. Any of the explosive trains may, however, be roughly divided into one of the two general classes below:

1. Propellant Charge Explosive Trains

a. Low explosive trains.

2. Bursting Charge Explosive Trains

a. Low explosive trains.

b. High explosive trains.

In all explosive ammunition one or both of the above trains will be found.

Propelling charge explosions are utilized to force the projectile from the weapon toward its target. A simple example of this train is found in a round of small arms ammunition. (See Figure 1.) The components used in this train are a percussion primer and a propelling charge. The primer converts the mechanical energy received from the firing pin of the weapon into a flame. The flame passes through the vent leading to the powder chamber and ignites the propelling charge. The gases from the propelling charge explosion push the bullet out through the bore of the weapon. The train of explosions present in this series are the explosion of the primer and the explosion of the propelling charge.

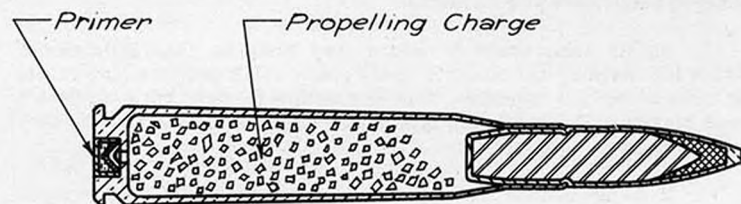


Fig. 1 -- Components used in the explosive train of small arms ammunition

The propellant charge explosion of a round of artillery ammunition will show a slightly different train from the one in small arms. In this train we have a primer and a propelling charge as above but in addition to these components it is necessary to place an auxiliary charge of black powder between the primer and the propelling charge. (See Figure 2.) The addition of the auxiliary charge is necessary because the small flame produced by the primer is not of sufficient intensity to properly

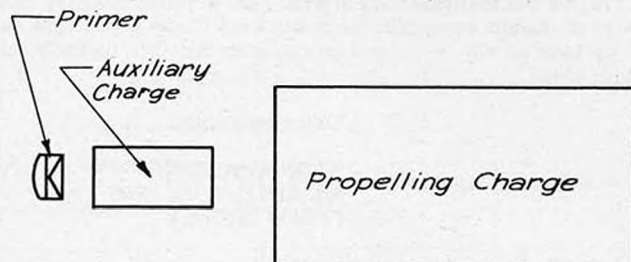


Fig. 2 -- Components used in the propellant charge explosive train of artillery ammunition

initiate the large amount of propelling charge powder which is normally contained in a round of artillery ammunition.

The auxiliary charge may be contained in the body of the cannon primer, making an assembly of the primer and auxiliary charge (see Figure 3), or it may be divided between the primer body and the igniter pad (see Figure 4). In either case its function is the same, the arrangement being such as to give the best ignition to the propelling charge. The

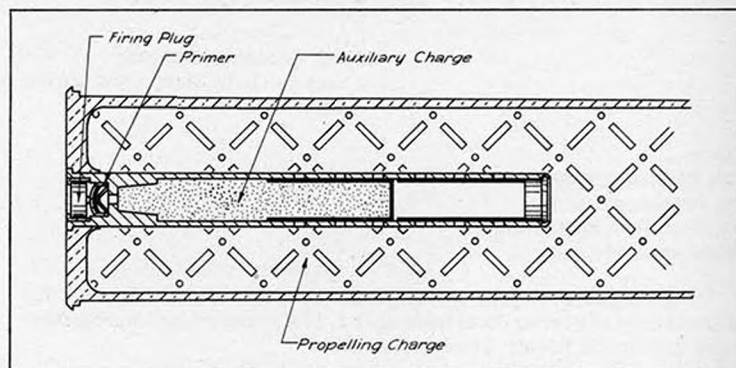


Fig. 3 -- Primer for 75mm ammunition showing auxiliary charge contained in the primer body

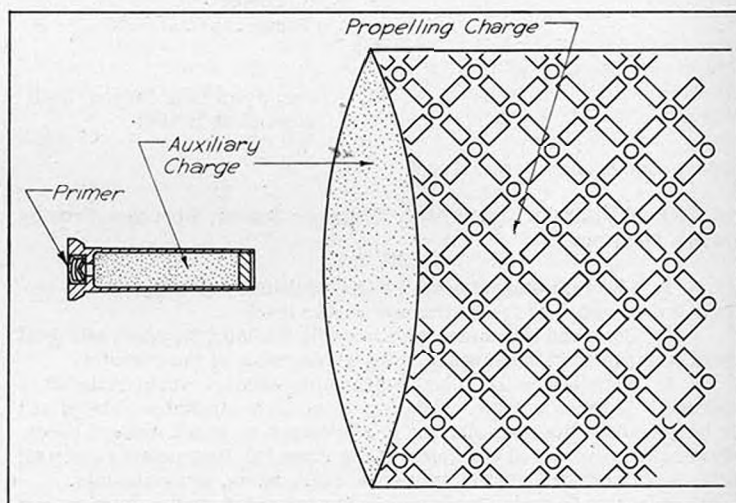


Fig. 4 -- Primer for 155mm ammunition showing auxiliary charge divided between primer and igniter charge

series of explosions in this train are the explosion of the primer, auxiliary charge, and propellant charge.

Bursting charge explosive trains may be classified as high explosive trains or as low explosive trains. Shrapnel projectiles and fragmentation hand grenades are examples of those containing low explosive trains. Rifle grenades, bombs, and artillery shell are examples of those containing high explosive trains.

In the case of shrapnel the components contained in the explosive train are a percussion primer, a powder time train of black powder, a magazine charge of black powder, and a base charge of black powder. (See Figure 5.) The action is initiated by the firing pin within the fuze striking the primer, the flame thus set up is transmitted through the components named to the base charge. The explosion of the base charge forces the lead balls out of the body of the projectile.

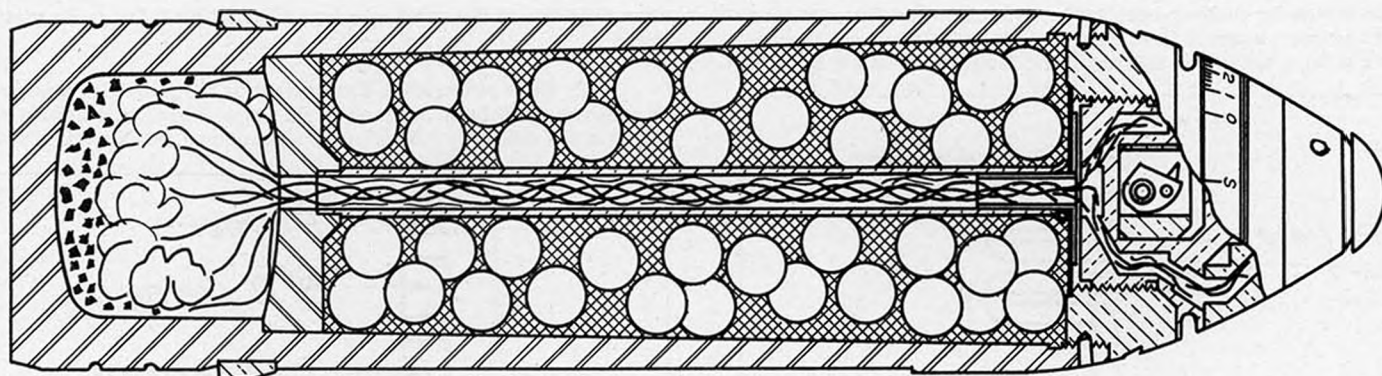


Fig. 5 -- Explosive train contained in shrapnel projectile

The low explosive train contained in the fragmentation hand grenade may be easily traced by reference to Figure 6. The action of this train is started by a spring driven firing pin striking the primer in the fuze. The flame from the primer is transmitted through a length of safety fuze to the black powder igniting charge at the end of the fuze. The explosion of the igniting charge initiates the action of the bursting charge of E. C. Black Powder.

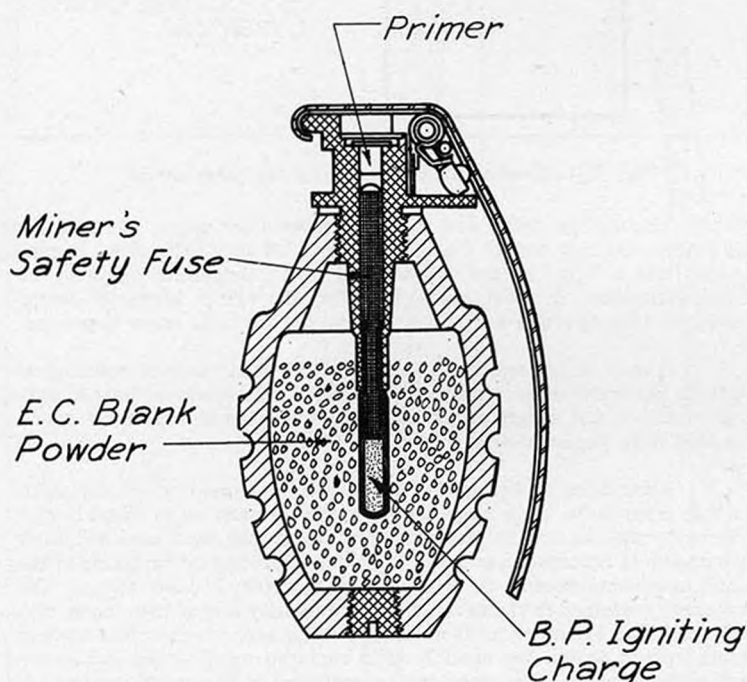


Fig. 6 -- Explosive train contained in fragmentation hand grenade

High explosive trains are very simple basically but as the need for various actions arise the train becomes complicated. If we remember the basic chain of components which must be present in all high explosive trains the picture will be clearer. (See Figure 7.) The basic chain of components which must be present in all high explosive trains used in ammunition are:

1. A detonator
2. A booster
3. A bursting charge

The detonator sets up a high explosive wave when initiated by the stab action of a firing pin or a flame. This detonation is so small and weak that it will not initiate a high order detonation in the bursting charge unless a booster is placed between the two. The booster picks up the small explosive wave from the detonator and amplifies it to such an extent that the bursting charge is properly initiated. See Figure 8.

To gain the action necessary to control the time and place at which an explosive projectile will function it is necessary to incorporate other components in the high explosive train. The action desired may be a burst in the air, a burst instantly upon impact with the target, or a burst shortly after the projectile has penetrated the target. The components which may

be used to give these various actions are a primer, a black powder delay pellet or train, an upper detonator, or any combination of these components arranged in such an order that the desired effect is gained. Regardless

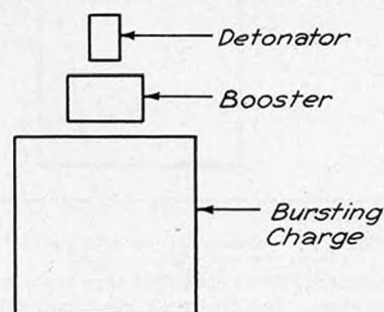


Fig. 7 -- Basic chain of components contained in a high explosive train

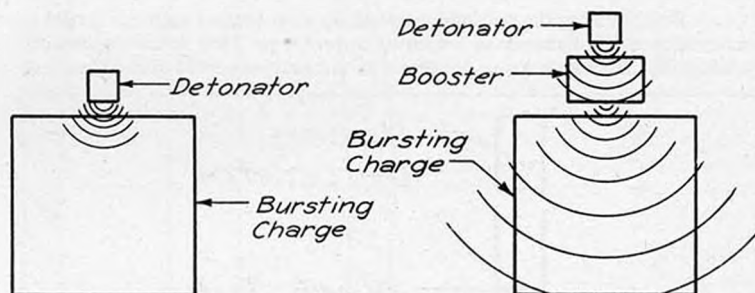


Fig. 8 -- A booster is necessary to amplify the explosive wave from the detonator

of the arrangement of the components the basic chain will remain the same, other components being placed in front of the basic chain.

THE HIGH EXPLOSIVE TRAIN

STEP	ACTION	COMPONENT	EXPLOSIVE USED
1.	Initiating	* Detonator	Lead Azide or Mercury Fulminate
		* Primer	Priming Composition
		* Delay	Black Powder Pellet
		* Time Train	Black Powder Ring
2.	Boosting	<u>Detonator</u>	Lead Azide or Mercury Fulminate
		<u>Booster</u>	Tetryl
3.	Bursting	<u>Bursting Charge</u>	TNT, Amatol, etc.

NOTE: Those components marked with an asterisk (*) are optional; those underlined are the basic chain.

The action for causing a projectile to burst in the air is obtained by placing a primer, which is fired when the projectile leaves the weapon, and a black powder time train in front of the basic chain. See Figure 9.

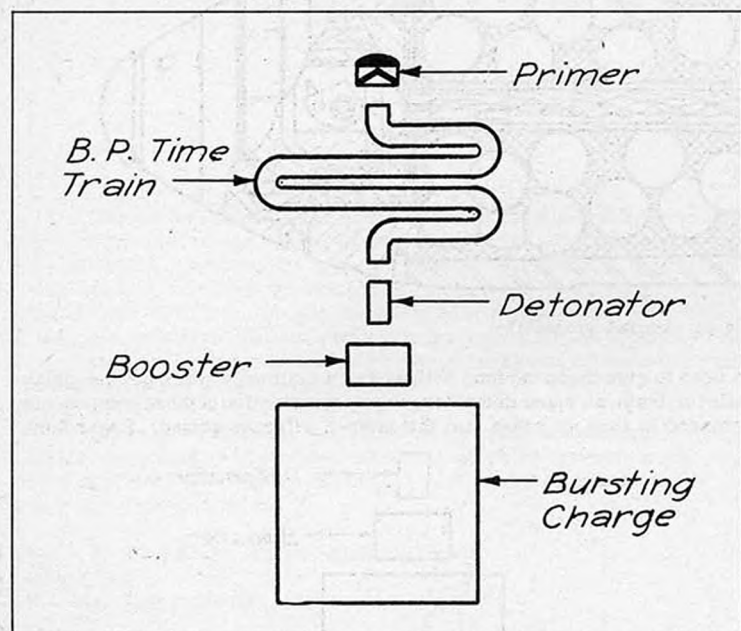


Fig. 9 -- Arrangement of components for time action

The primer is fired upon discharge from the weapon, thus igniting the time train rings. The time train rings burn for the length of time for which they were set previous to firing and then initiate the action of the detonator, booster, and bursting charge.

For bursting the projectile promptly upon impact with the target a superquick or instantaneous action is necessary. This action is usually obtained by placing an upper detonator in the extreme front of the fuze and

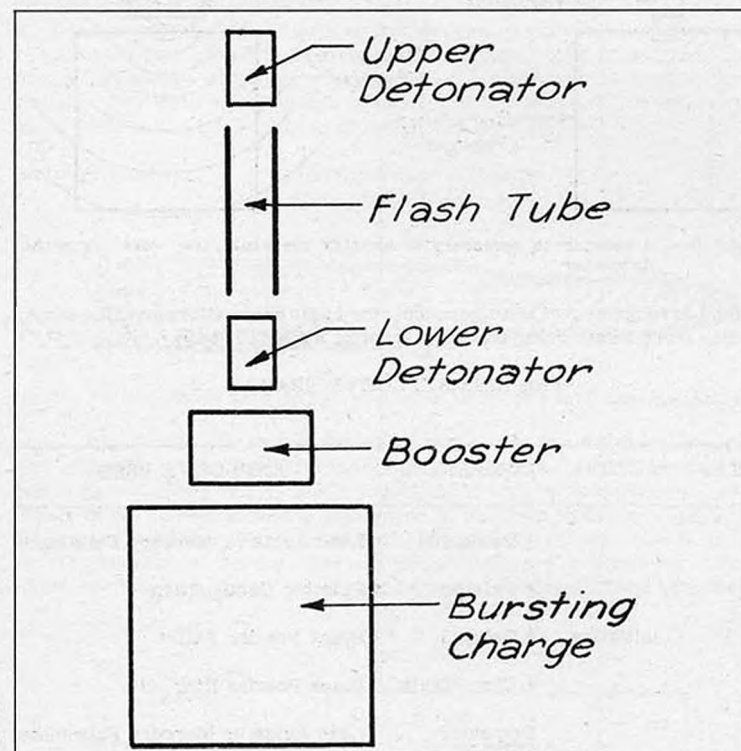


Fig. 10 -- Arrangement of components for superquick action

a lower detonator in the body near the booster charge. See Figure 10. Upon impact with the target the upper detonator is fired by the stab action of the firing pin which is set directly above it. The explosive wave thus started passes through the flash tube of the fuze to the lower detonator, to the booster, and in turn to the bursting charge. By placing an upper detonator in the extreme front of the fuze the wave is started instantly

upon impact and the mechanical problem of fuze design is greatly reduced.

To allow penetration of the target by the projectile a delay action is necessary. This is obtained by placing a primer and a delay element ahead of the detonator. See Figure 11. In some instances this combina-

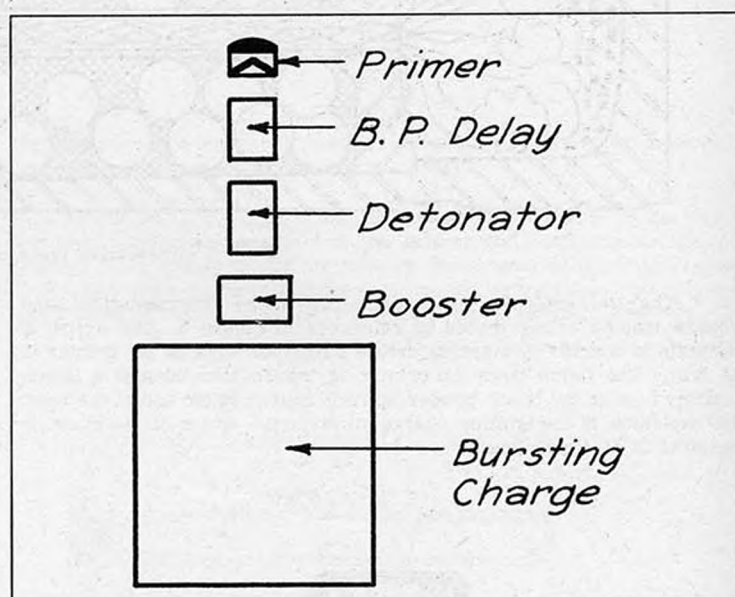


Fig. 11 -- Arrangement of components for delay action

tion of primer and delay are inserted between an upper and a lower detonator. In such cases the action starts off as a detonation, is converted into a flame by the primer, and into a detonation again by the lower detonator. In most cases, however, the action is started by the action of a firing pin on the primer without the use of an upper detonator.

It may be noticed that no mention has been made of mechanical actions utilized to effect bursting in the air. Action produced by mechanical means is not a part of the explosive train, hence only time action derived from explosive action is given.

A variation of the high explosive train is found in chemical shell. In this train there is no large bursting charge such as is found in high explosive shells as it is only necessary to rupture the shell case and allow the chemical contents to escape. The actual bursting or rupturing of the shell is accomplished by the booster or an auxiliary booster charge. The boosters contained in chemical shells are usually larger than those contained in high explosive shell of corresponding size. In chemical shell of more recent design the shell body is ruptured by an added component called the burster. The components contained in the explosive train of the older type chemical shell are the detonator, usually upper and lower as superquick action is needed, and a booster. See Figure 12.

The components used in the newer type chemical shell are the detonator, usually upper and lower, a booster, and a burster. See Figure 13. The burster is a charge of tetryl which is contained in a thin aluminum case. This charge extends through the chemical filler to the base of the shell body. Upon functioning a better rupturing effect is obtained than with the older type in which all of the explosive charge was concentrated in the nose of the shell.

In conclusion it may be well to state that an explosive train will be found in the functioning of any round of ammunition which contains an explosive charge. Tracing these trains and visualizing the explosive actions contained in each is one of the quickest and most simple means of becoming familiar with explosive trains.



When your organization moved did you send a change of address? If not, maybe the magazines your outfit didn't receive were returned. And if that happened, the address of your organization has now been cancelled. Make it your business to remind your 1st Sergeant or organization commander to forward every change of address.

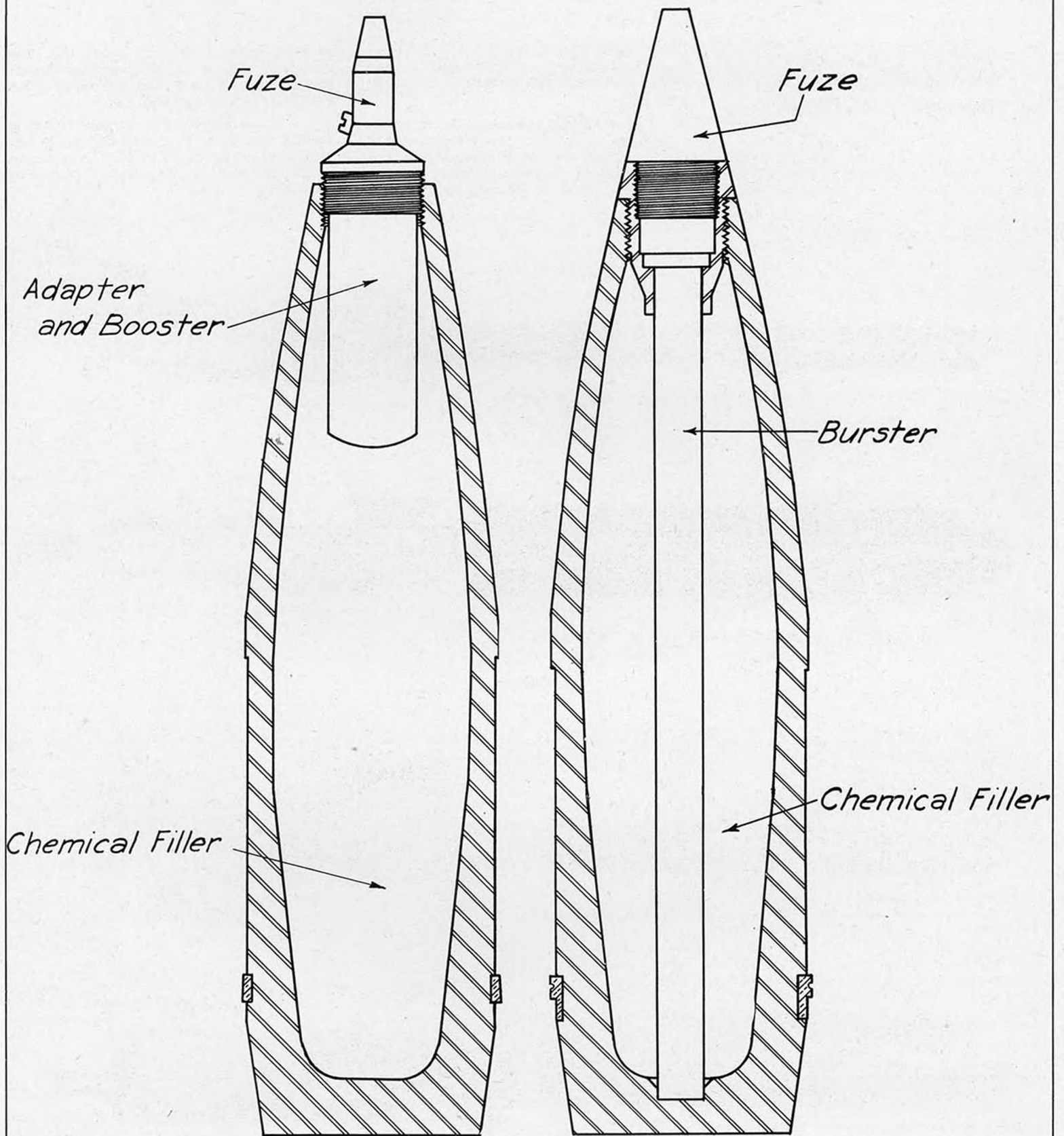


Fig. 12 -- Old type chemical shell

Fig. 13 -- New type chemical shell

JAPANESE MACHINE GUNS

by M. F. MEDLIN, 2nd Lt., Ord. Dept.

7.7mm (Vickers type)

Japanese M. G. (fixed)

As shown in Figure 1, 2, and 3 we can readily see that the Japanese 7.7 mm Aircraft Gun is almost identical with American Vickers

Cal..30 and the British Vickers 11 mm, M1918. The Vickers used by this country and the Vickers used by the British differed only in the caliber of the weapon.

The fixed Japanese Guns (shown in Figure 4 and 5) are practically a part-for-part copy of the British Vickers M1918. The similarity is striking, when the two guns are viewed together. The internal parts of the Japanese gun are inter-

changeable with those in the British Gun. The main points of difference are in external appearance only and include (1) smaller cooling jacket and (2) absence of back plate buffer.

These guns may be mounted on any of standard cal..30 or .50 tripods and may be held at the rear by fastening the elevating mechanism on the side by a long bolt instead of directly under the gun.

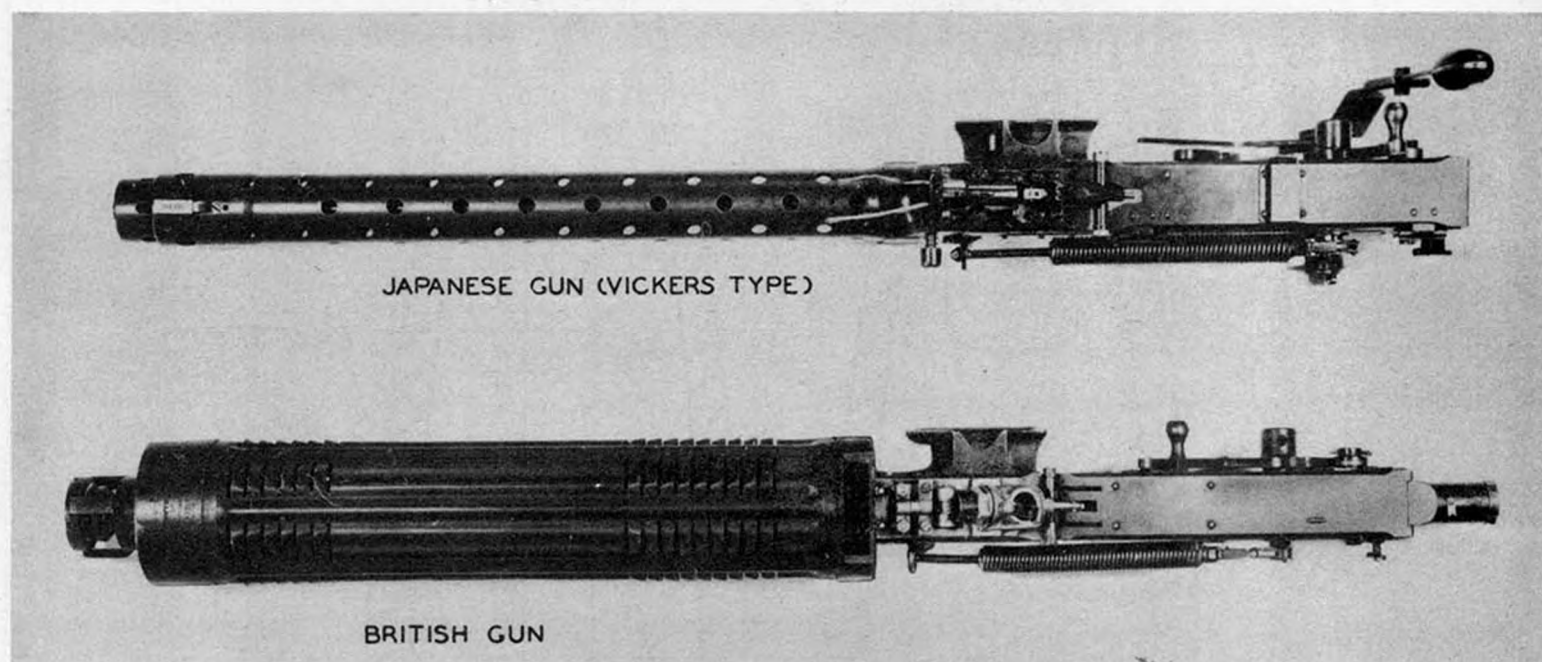


Figure 1

Top View

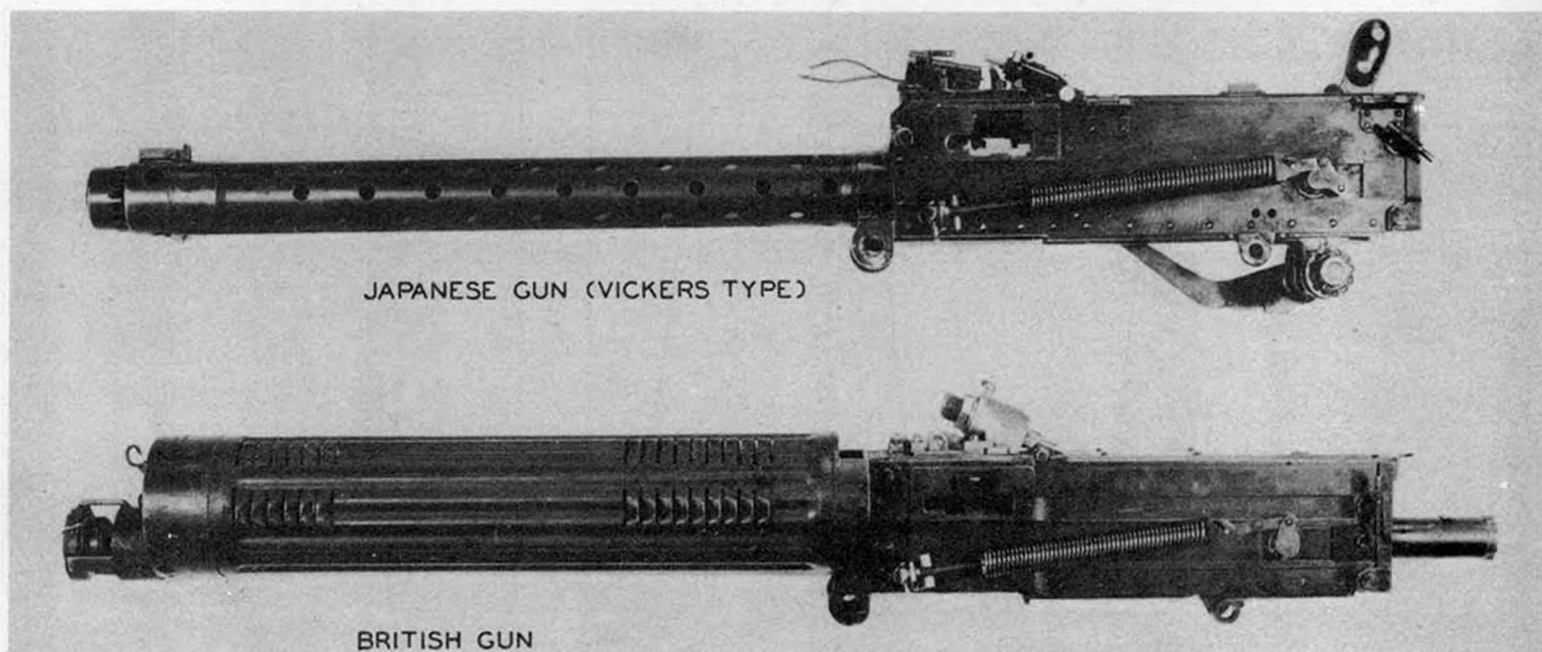


Figure 2

Left View

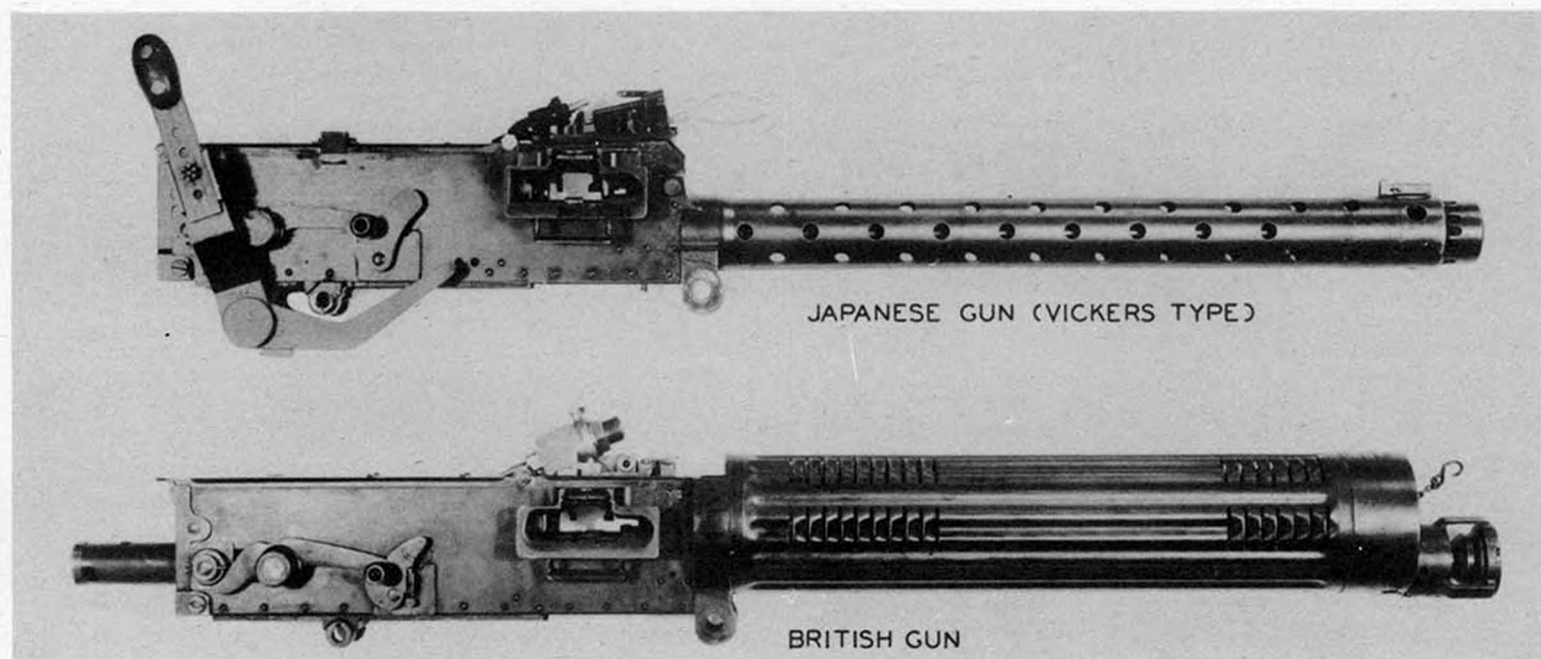


Figure 3 Right View

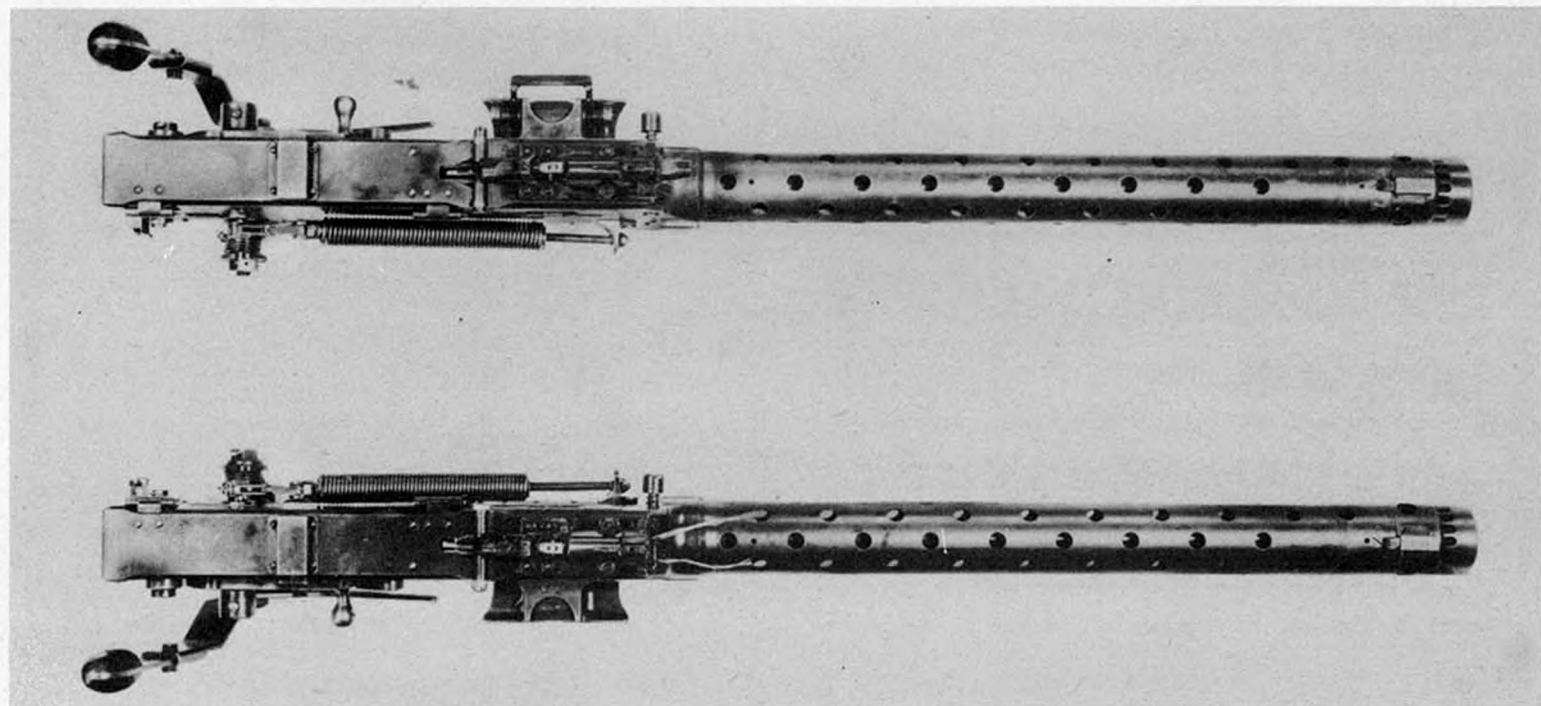


Figure 4

The guns use the familiar recoil operated Vickers action which has proved satisfactory over a period of years since these guns were used by the U. S. and the British during World War I and earlier.

Unlike our M2 cal..30, Aircraft gun, they are not, of themselves, interchangeable to feed from either side. However, the feedways may be changed from gun to gun and work satisfactorily. The cocking handles are not interchangeable and the covers open from opposite sides, so that presumably they are only fed from the side intended, which, after all, shows us that the Japanese had to make a right hand and left hand gun, making the small degree of interchangeability of little value.

The guns are chambered for the Japanese 7.7 mm cartridge which is an exact copy of British .303 ammunition. Even cal..303 metallic links may be used.

The Proving Ground mounted these guns on a suitable mount and test fired them, using cal..303 Mk. VII Ball ammunition. The right hand feed gun was fired first. Several failures to feed resulted until it was found that the smooth side of the belt must be up for correct feeding. This makes it double loop loading for left hand feed and single loop loading for right hand feed.

The gun functioned perfectly for several hundred rounds from then on. Cyclic rate was from 850 to 900 rounds per minute. One rate was recorded at 1000 rounds per minute.

The feedways of the two guns were interchanged and both guns fired from either side, although they are more adapted to feed from the side intended.

The Vickers type guns were functioned

upside down as some doubt was expressed that they would do so. This was based on the fact that, while upside down but no cartridge in the feedway, the feed guide would not drop into alignment with the chamber. It proved correct when tested that the guns would fire upside down. This inconsistency between the feeding in actual operation and feeding by hand is no doubt due to the force of recoil being sufficient to throw the feed guide of the bolt upward during the firing cycle. Cams are provided for this purpose but they will not come into play unless sufficient force is applied rearward.

Average instrumental velocity at 78 feet using cal..303 Mk. VII bore ammunition was 2449 feet per second.

Figures 6 and 7 show the weapon field stripped. The following nomenclature might be applied to the field strip shown in Figure 6 and 7.

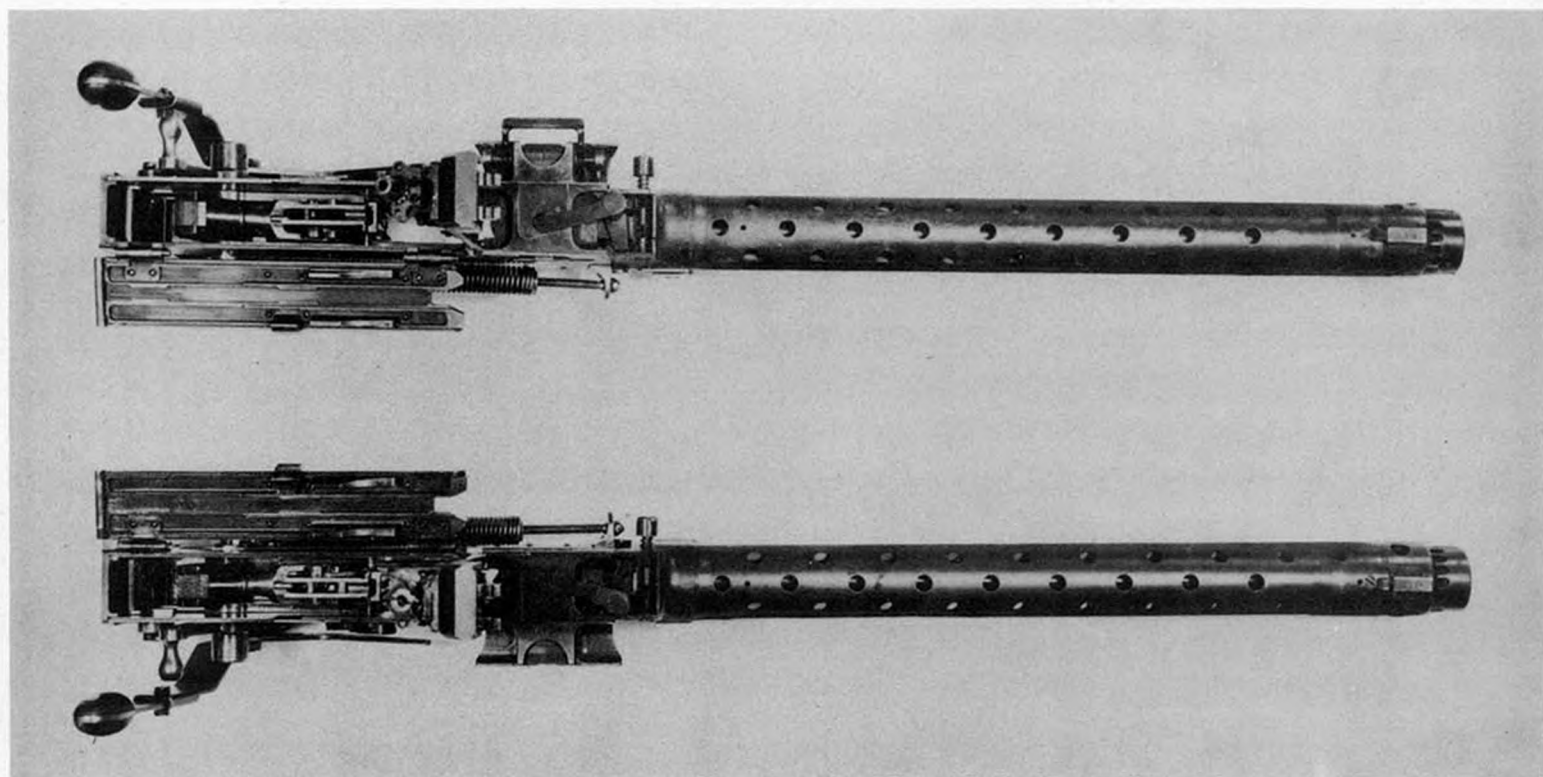


Figure 5

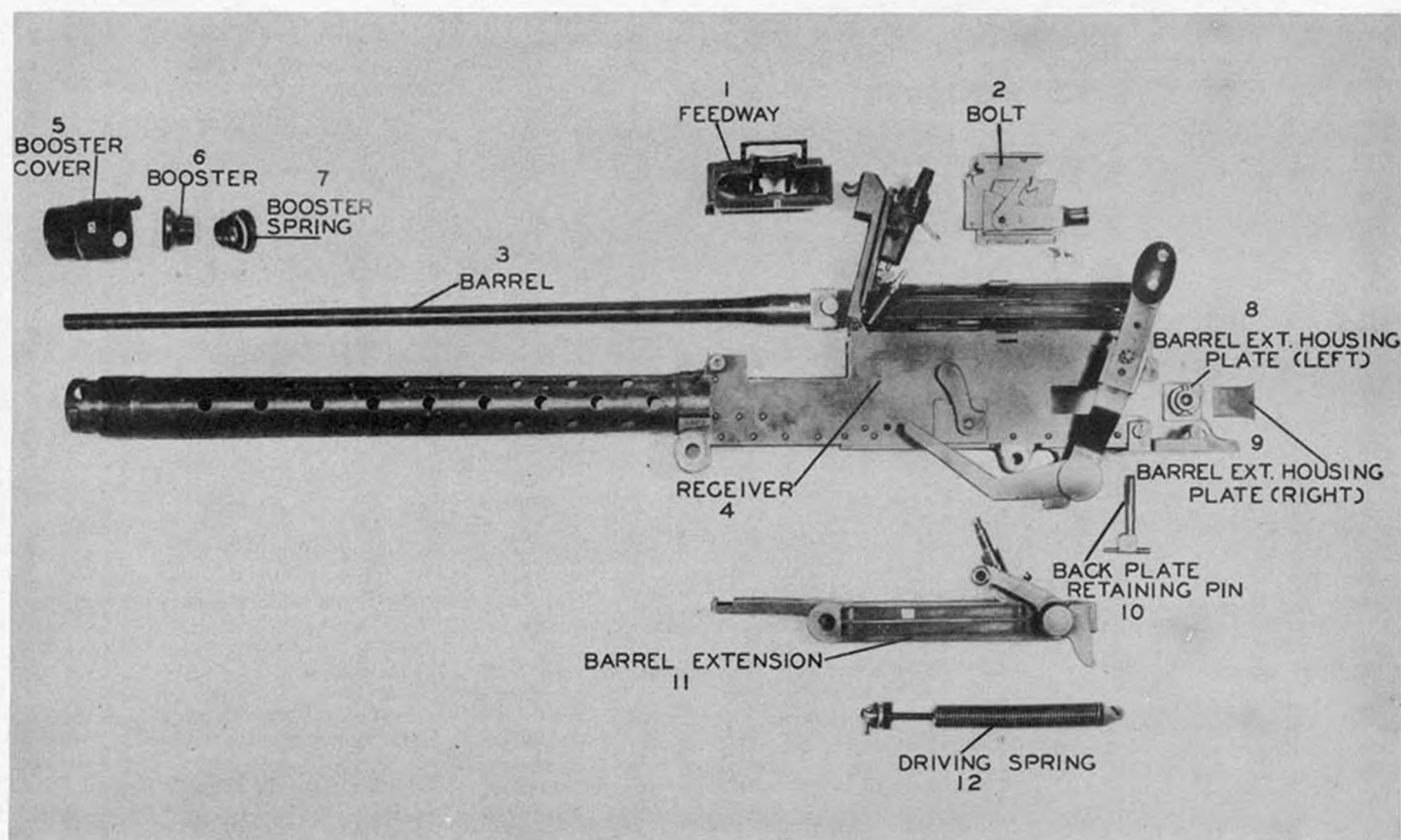


Figure 6

1. Feedway
2. Bolt
3. Barrel
4. Receiver
5. Booster cover
6. Booster

7. Booster spring
8. Barrel extension holding plate (left)
9. Barrel extension holding plate (right)
10. Back plate retaining pin
11. Barrel extension
12. Driving spring

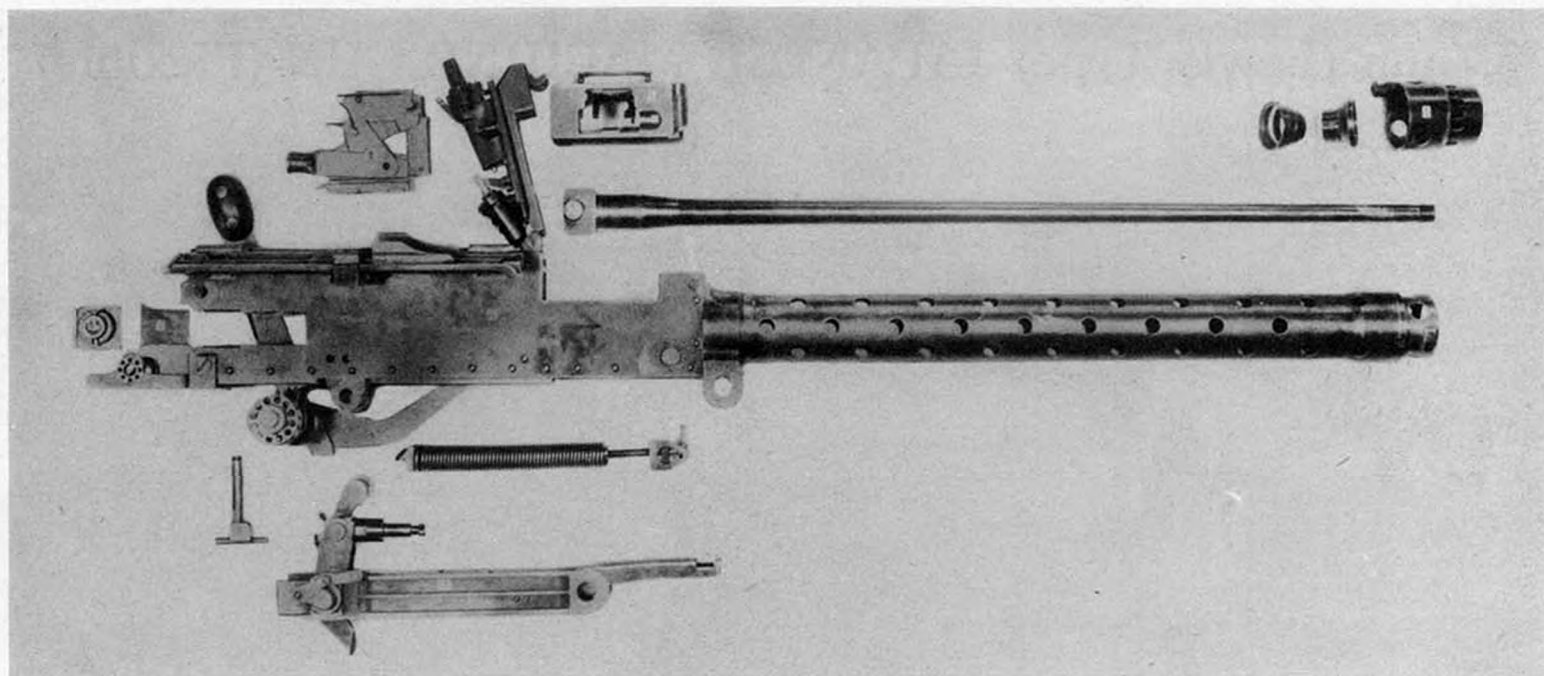
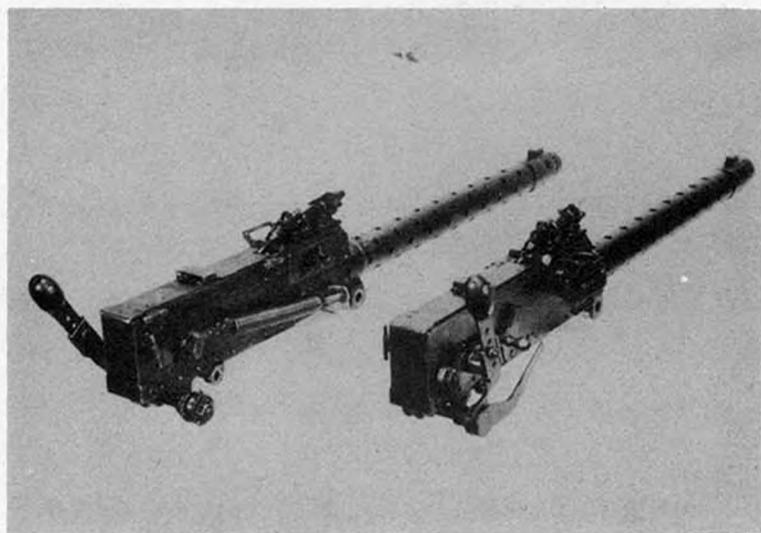


Figure 7



Caliber 7.7mm Japanese Aircraft Machine Gun (Vickers Type), left and right feeds.

Figure 8

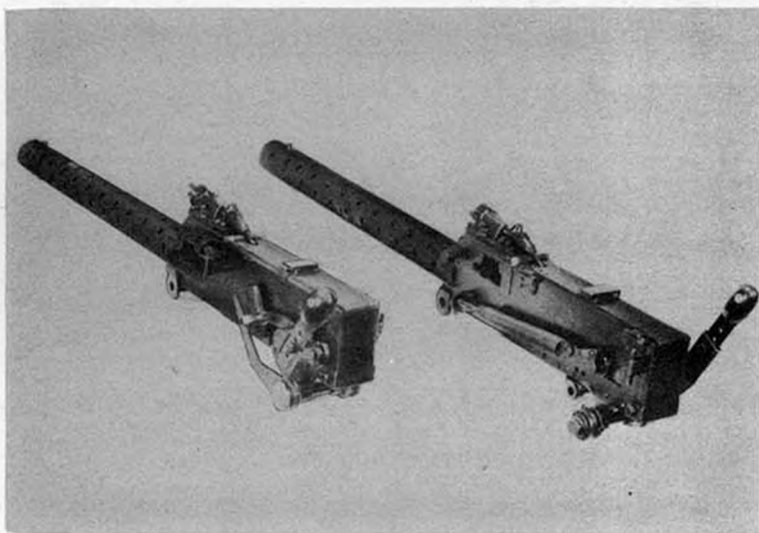
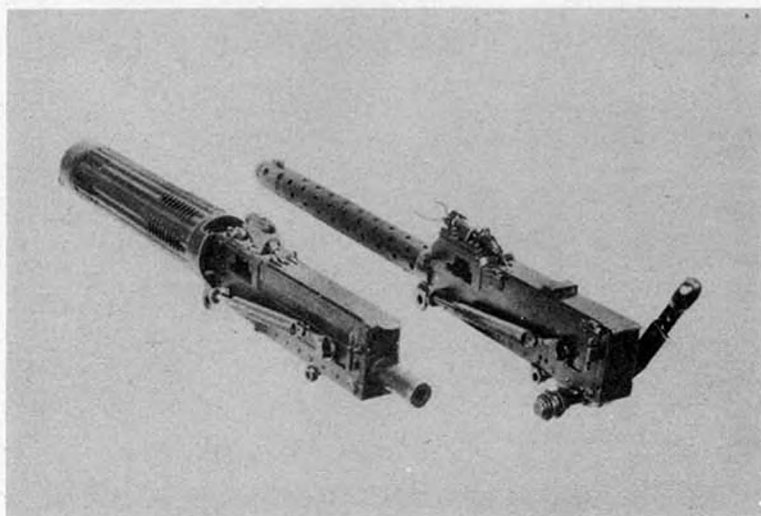


Figure 9



Left: Caliber .30, 11mm M18 (British). Right: Caliber 7.7mm Japanese Aircraft Machine Gun (Vickers Type)

Figure 10

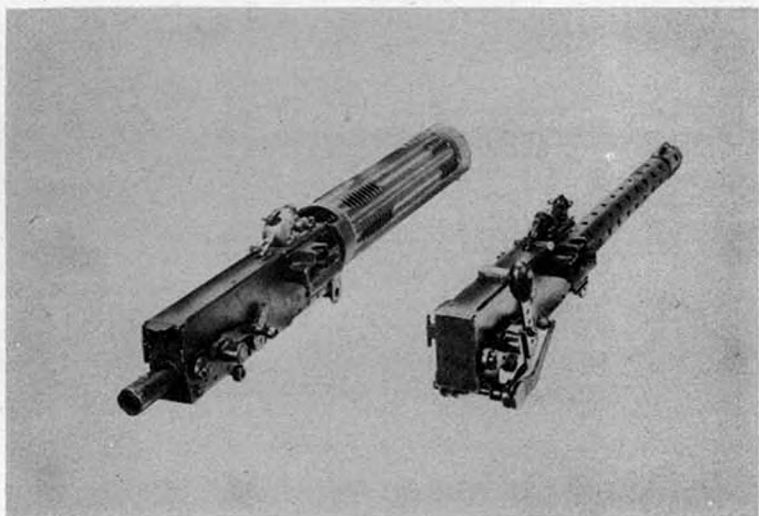


Figure 11

7.7mm (Lewis Type) JAPANESE MACHINE GUN (Flexible)

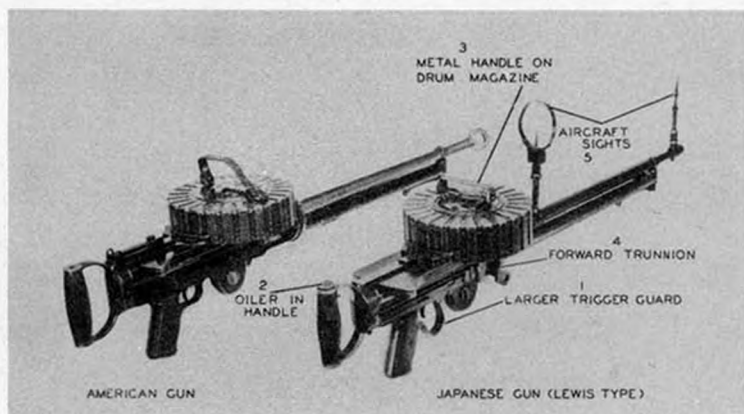


Figure 12

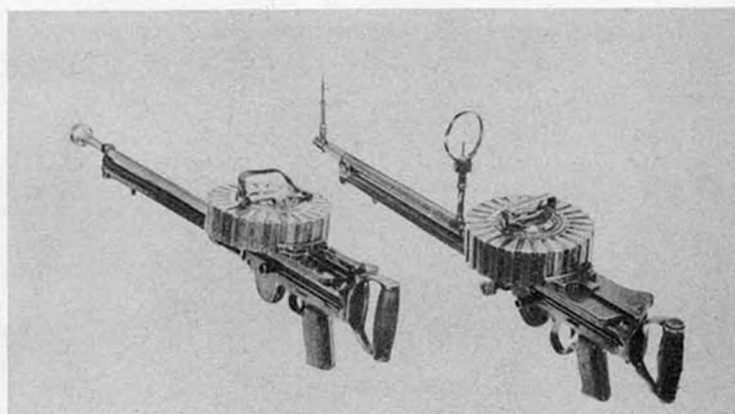


Figure 13

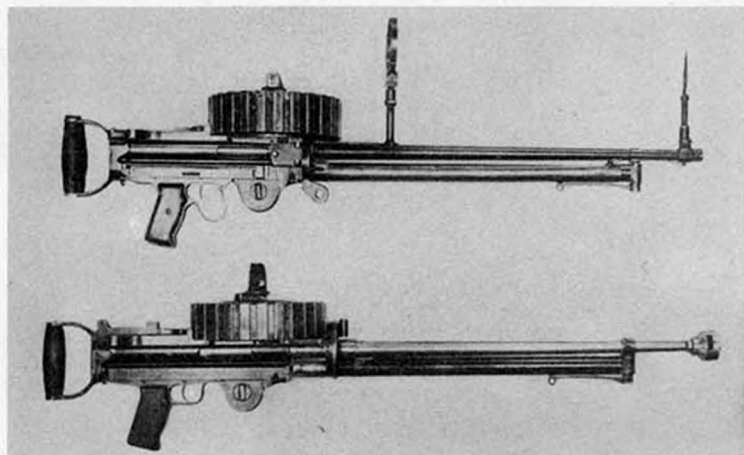


Figure 14

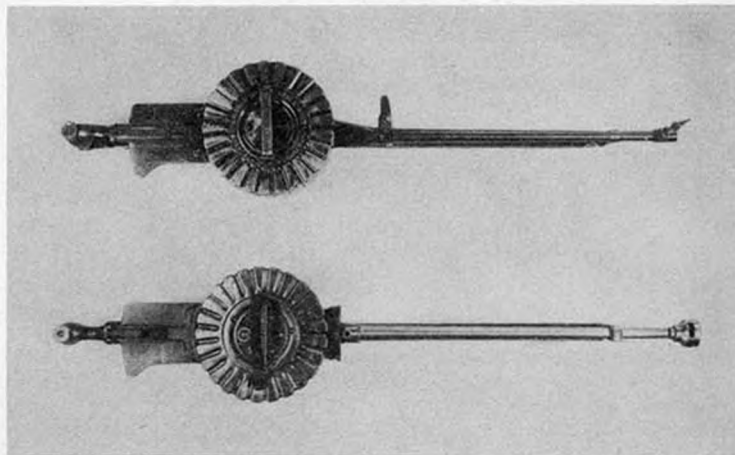


Figure 15

This gun is practically a part-for-part copy of the American Cal..30 Lewis Machine Gun. The similarity is striking when the two guns are viewed together. It uses the familiar gas-operated Lewis action and is used by the

Japanese as a flexible gun. See Figure 12, 13, 14, 15, and 16.

The main points of difference are in external appearance only and include (see fig. 12):

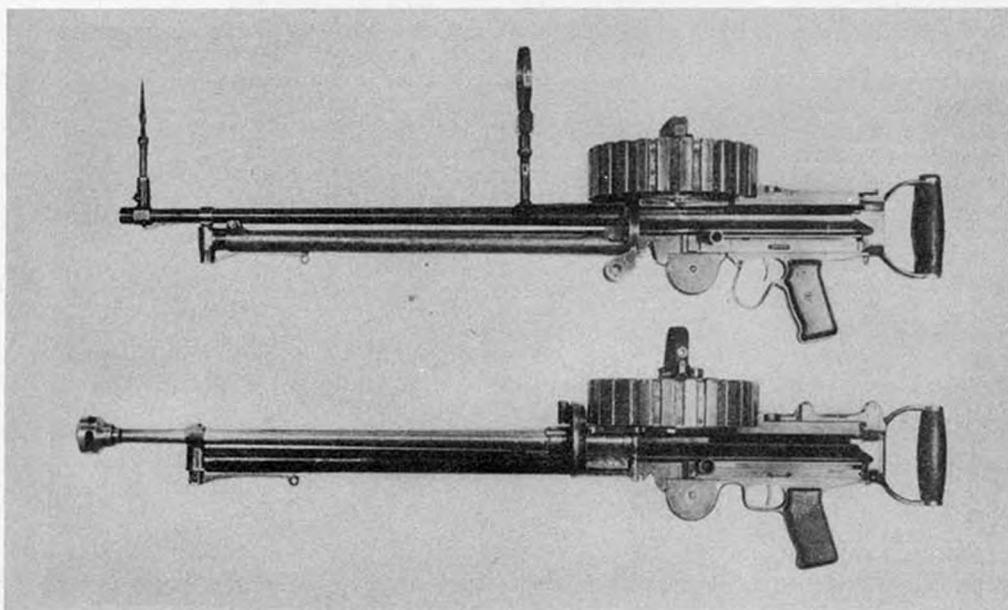


Figure 16

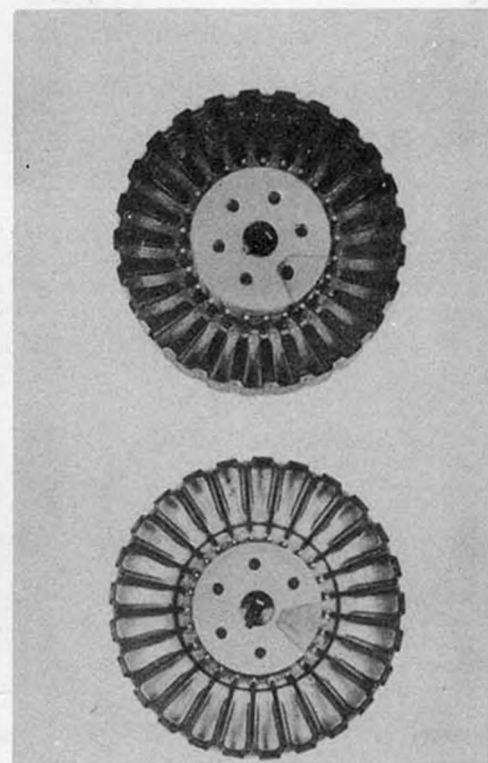


Figure 17

1. Larger trigger guard
2. Oiler in handle
3. Metal handle on drum magazine
4. Forward trunnion
5. Aircraft sights

The gun mounts on any Standard cal..30 or .50 tripod and must be held in the rear by the gunner. It is chambered for the 7.7 mm cartridge which is an exact copy of British .303 ammunition.

This gun was tested at the Proving Ground. 150 rounds were fired for general functioning.

No malfunctions were recorded. The cyclic rate is very regular at 600 rounds per minute. Average velocity at 78 feet using cal..303 Mk. VII ball ammunition was 2411 feet per second.

The conclusions of the Proving Ground were that the Lewis and Vickers type cal. 7.7 mm Japanese M.G. functioned very well under a variety of conditions. There is no reason why they should not do so since the mechanisms of both guns have been under intensive development and constant use for at least 30 years.

It might be well at this point to note that the gun shown in figures 1 to 11 inclusive, as a

comparison to the Japanese gun, is the British Vickers, Aircraft, 11 mm M1918. The British also used a watercooled Vickers cal..303 as a ground gun. All of these Vickers guns, used by America and Great Britain differed only in caliber and in minor external difference so that the gun could be used for the purpose intended.

The disassembly, assembly and mechanical operation of these Japanese weapons will not be covered in this article since it is identical with the Vickers and Lewis guns covered in the series of articles by Pvt. Du Charme which begins in this issue. (See the Small Arms page).

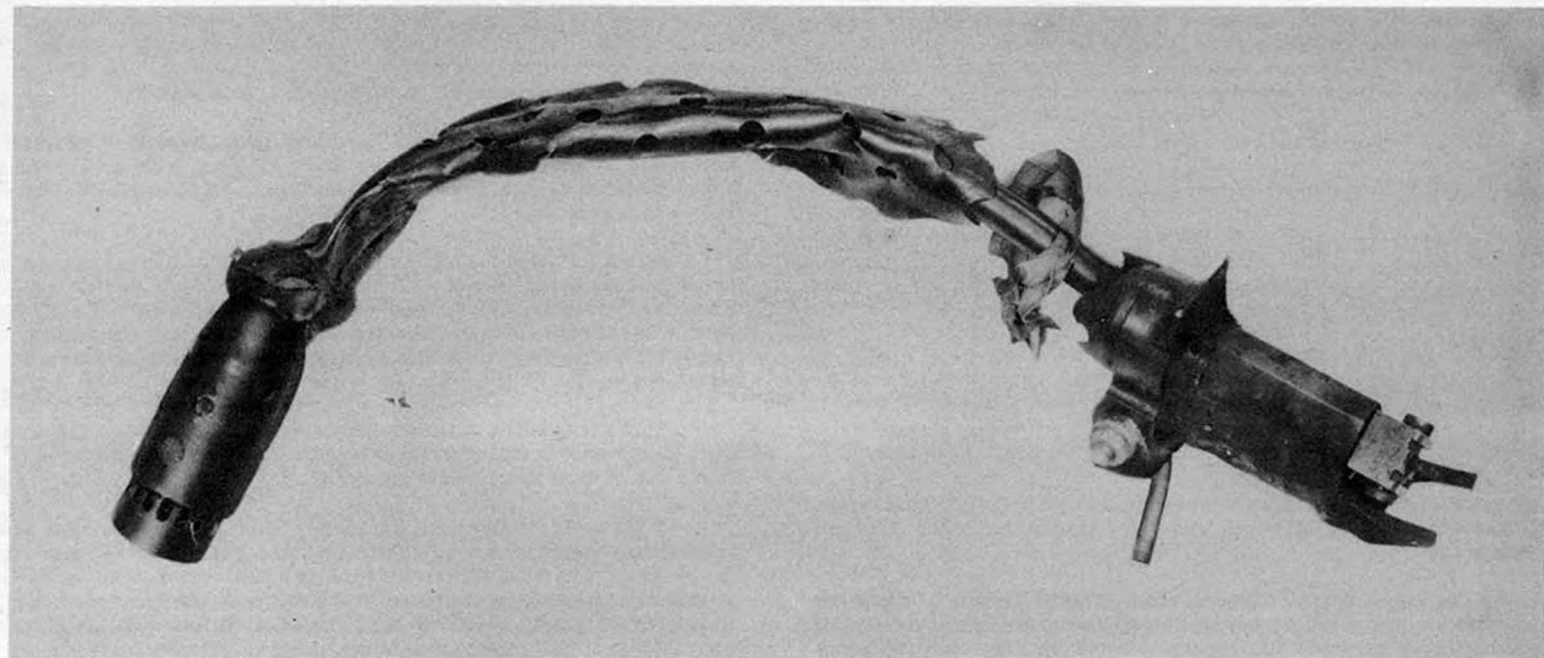


Figure 18

WHAT DO YOU KNOW ABOUT ORDNANCE SERVICE?

THE ORDNANCE SERGEANT is not in desperate need of articles. We are referring to the ordinary run of articles. Regular monthly articles are provided automatically, and special feature articles come in rather often. You read a few of the latter in every issue. Some, however, are saved, and sometimes two or three or more which are similar are used as a basis for the feature material of a later issue, possibly with the addition of other material.

So — THE ORDNANCE SERGEANT will probably have material for use for an indefinite time, for we sincerely hope that every individual who has something to contribute will continue to do his part by our readers.

But there is another type of article which THE ORDNANCE SERGEANT desires very much. This is the article which is unusual. We have had a few of them, and every day we hope for more and more and more.

In the September issue we find a solution to one problem. Many readers have written that they would like to tell of their experiences, but because of their location it is impossible. Yet an article in the September issue told almost all there is to tell about the arrangements for adequate Ordnance Service at one of our base commands.

The base command used as an example in this case was not disclosed, but the information could be usefully applied to almost any base. The author furnished something very useful for many of our readers.

Also in the September issue, another article discussed a German machine gun. The same author comes through this month with an article on two Japanese machine guns. You may find them useful some day. And we may expect more of these articles on foreign materiel in the near future. Have you encountered any such materiel? We don't care where it was. But we would like to know what Ordnance knowledge you gained which would be useful to other readers.

In this issue you will find an article on "Explosive Trains". According to the author it is a basic subject. Probably every experienced ammunition man knows all about it. But many Ordnance men are not ammunition men, and they don't know about it. It will be useful to them. Are you well informed on some simple basic subject? If so, why don't you explain it for the benefit of the thousands of new men who are entering the Ordnance Department? Put it on paper, add any necessary drawings, rough drawings if you are not a draftsman or artist, add any illustrative photographs you have or can obtain, and send it in. After you have mailed it you can gloat over the fact that you have done something useful.

There are so many Ordnance subjects which would make interesting and useful articles for many readers. What do you know about the loading, shipment and unloading of Ordnance materiel in overseas shipments? Of course, certain rules are prescribed, but what have your experiences been? Maybe you have unloaded Ordnance materiel at a point where adequate facilities were not available. What did you learn? Tell us about it.

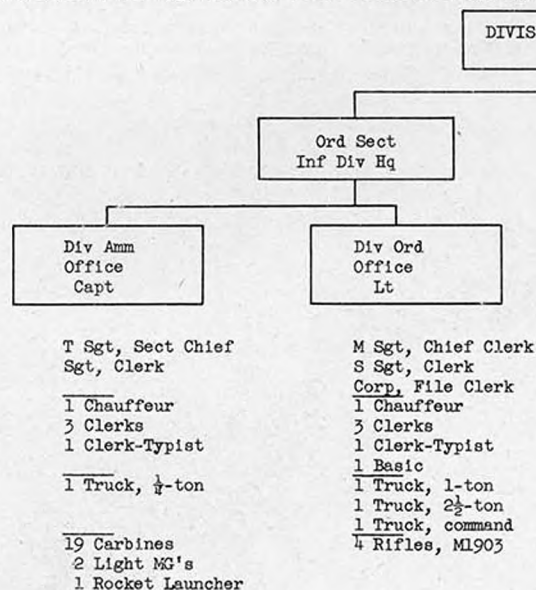
It is common knowledge that several new type units are in training, and very few Ordnance men know anything about the Ordnance Service these units demand and must receive. Do paratroops offer problems which are a little different? Who knows about the Ordnance Service required by a unit of Mountain troops? What are the special Ordnance problems of desert warfare? Are you cooperating with the Ordnance troops of any of our allies? How is it being done, and to what degree of success?

These are not secret subjects. We don't care where your experience was encountered, nor how many troops were involved, nor what units they were, nor what their specific mission might be. But we do care about the little items of Ordnance knowledge you acquired. Why don't you donate them to other readers of THE ORDNANCE SERGEANT?

THE MODERN ORDNANCE SETUP

Two items appeared in the September issue of THE ORDNANCE SERGEANT which may have excited the interest and curiosity of some readers.

(1) Published with an article titled "Our Ordnance Department", which described in detail the organization of the Ordnance Department,



were extracts from War Department Circulars stating that certain types of Quartermaster organizations were being transferred to the Ordnance Department.

(2) Two Ordnance Officers, one a Division Ordnance Officer and the other the Executive Officer of a Corps Maintenance Battalion, engaged in a discussion regarding the organization and functions of the Ordnance Section of the Infantry Division. One suggested that the personnel of the Ordnance Section be increased so that it could perform more adequately, while the other believed that a proper adjustment of the problem could be made by reducing the functions of the Ordnance Section.

Although to the knowledge of THE ORDNANCE SERGEANT no definite and official decisions have been made regarding the Ordnance setup in the division, certain forecasts can be made. They won't be far from wrong.

The two problems mentioned above are likely to be combined and solved as one. The past organization of the division included in its headquarters an Ordnance Section, and in the Headquarters Company of its Quartermaster Battalion a Maintenance Platoon. The former, of course, was concerned with certain of the Ordnance functions required by the division, including matters pertaining to Ordnance vehicles. Actually the Ordnance Section was intended for the purpose of performing those

Although a revision of the organization of the headquarters of the infantry division will be necessary, it seems generally agreed that the maintenance unit of the Ordnance Section and the Quartermaster Platoon will be consolidated to form a Light Maintenance Company (T/O 9-8). The company probably will be under the command of the Division Ordnance Officer for training and operations. Charts showing the Ordnance setup

of the division are shown here, and are worth a little study.

It appears that a few men have been taken from the Ordnance Section and added to the Maintenance Platoon. Then, with the addition of a very few more men, the Maintenance Platoon has become the Light Maintenance Company.

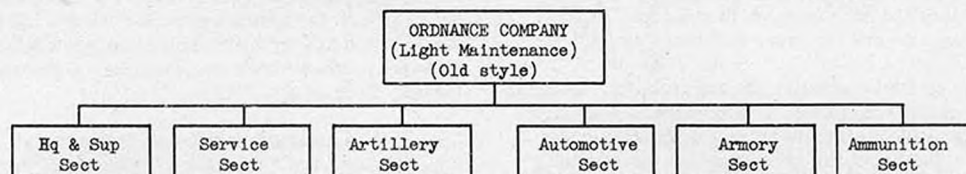
Do not confuse this Light Maintenance Company with the organization of the same designation of a few years ago. The old unit was assigned to the Cavalry Division, and it consisted of only 2 officers and 45 enlisted men. It was divided into a Headquarters and Supply Section, Service Section, Artillery Section, Automotive Section, Armory Section, and Ammunition Section.

This was a mobile outfit designed to service a horse unit. The new Light Maintenance Company will also be mobile, but it will be designed to fit into our modern motorized army.

That word "mobile" calls for special attention. It is one of those words whose definition progresses through various stages as the years go by. In the old days we might have thought of a horse outfit as being mobile. We now realize that those earlier armies moved very slowly and clumsily, even though doggedly. Mobility has been an ever increasing factor in military operations. The new light maintenance company has been referred to as being "mobile", but this does not mean "completely mobile". To meet this requirement a unit must have sufficient organic transportation to move itself in one stage, and a tabulation of the transportation of this unit indicates that this is not quite possible. But it can move quite rapidly, given a little help or a little time. Like most units of our modern army it can run rings around a similar unit of yesterday.

Notice that its largest component is the Repair Section of the Automotive Platoon. Motor vehicles to be serviced by the Ordnance personnel of the division have increased suddenly almost beyond our comprehension. Notice, too, that the Automotive Platoon includes a Recovery Section. This is a phase of Ordnance operations which is to be stressed in the immediate future. This subject will be considered in considerable detail in an early issue of THE ORDNANCE SERGEANT.

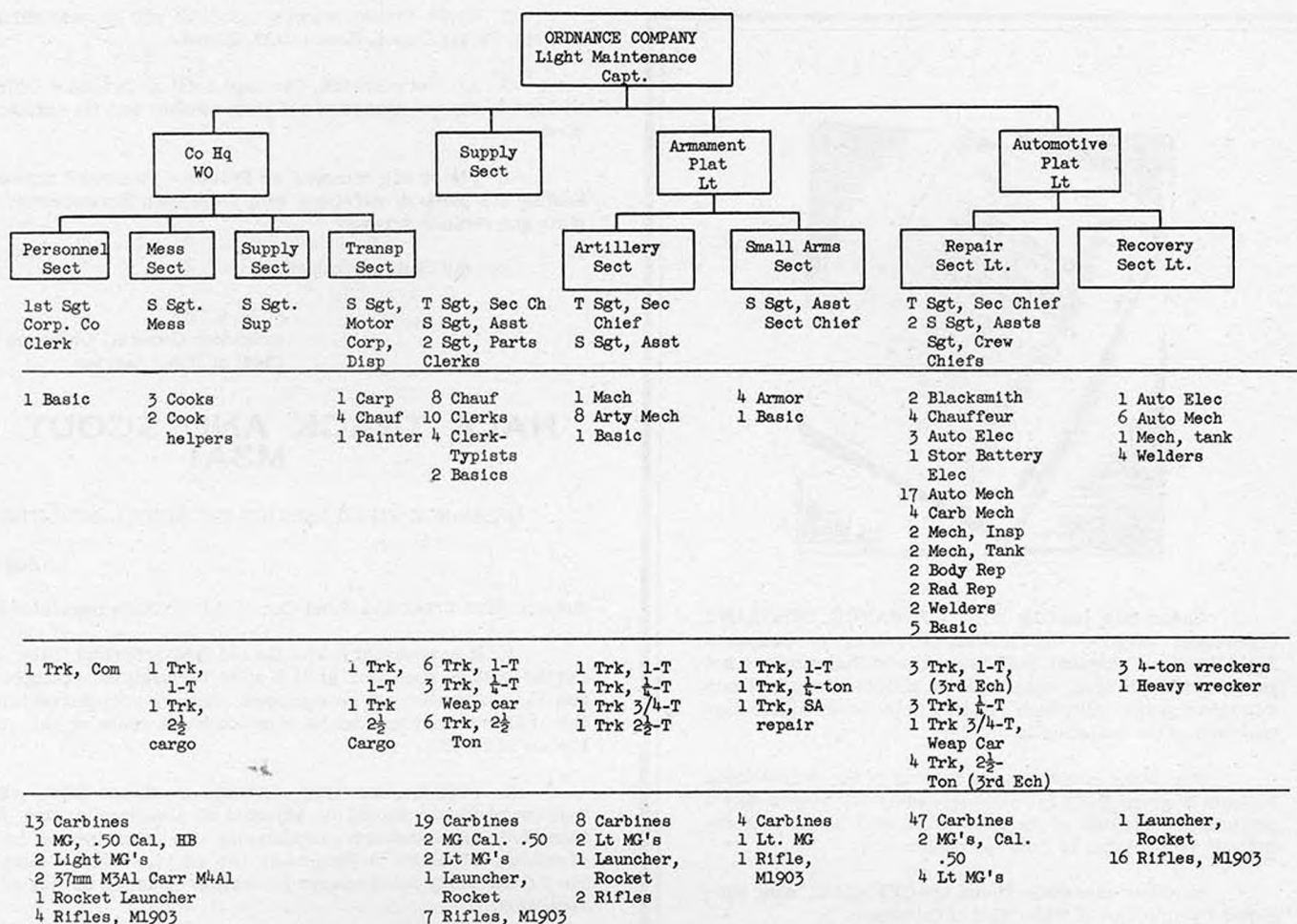
The transfer of Quartermaster units to the Ordnance Department will, of course, affect other echelons of Ordnance Service. It is under-



Ordnance duties which were permitted by personnel and facilities, and the shunting of all additional Ordnance Maintenance duties back to the Corps Maintenance Battalion.

The Quartermaster Platoon was concerned with the maintenance of Quartermaster vehicles. How it functioned makes but little difference, for the fact remains that it has been transferred to the Ordnance Department, along with its vehicles and responsibility for the maintenance of all vehicles. The combined maintenance problem of the future will be vastly different.

stood at present that the organization for the corps is under study. It is certain that some former Quartermaster maintenance units must be absorbed in the corps Ordnance setup. The method by which this will be accomplished, however, is not yet determined. It seems quite likely that a Corps Maintenance Battalion of four medium maintenance companies will be decided upon. Even so, the exact use of these companies is questionable. The entire battalion may be left with the corps, while on the other hand only one company may remain with the corps for service to corps troops, but under the command of the battalion which will move back into the army with the remaining three of its four companies.



In the army, too, the Quartermaster Maintenance Units will be consolidated with Ordnance units. No official decision has been made, but it seems possible that the army organization will comprise three maintenance and supply battalions, each composed of three (3) heavy maintenance companies, two (2) depot companies, and one (1) medium maintenance company; and two (2) ammunition battalions.

As already mentioned the Ordnance Section of the Infantry Division has in the past performed those functions which were made possible by available facilities and personnel. When the demand exceeded these limitations the excess was sent back to the corps maintenance battalion. In the new setup it may be assumed that the light maintenance company will be able to service the division much more completely, even with the added automotive load. As a result, less work will be sent back from the divisions to the corps, and the need for a large corps setup will be lessened. Hence, it may become logical to remove a considerable portion of the corps battalion, enlarged to four companies by the absorption of Quartermaster personnel, from the corps itself, leaving only one medium maintenance company to care for those problems which originate within the corps itself. The army setup thus becomes enlarged, although the enlargement is made merely by the absorption of Quartermaster personnel and the reassignment of units from corps to army.

Attention might be invited to one fact. A top-heavy Ordnance organization would not necessarily result from this arrangement. In the past the Army Ordnance Service has always supported Ordnance units in the corps and the divisions. Remember that the army area includes not only the area occupied by army service troops, but also embraces all of the corps and division areas.

We have already entered into a day of unorthodox organizations. Modern warfare is not standardized. Organizations can not always be standardized if they are to meet modern combat conditions. Task forces which are greatly out of proportion, from the T/O viewpoint, are now necessary. In some cases certain components of a corps, for example, must be expanded greatly to meet special requirements, and we then have what may be called a task force. On the other hand, the demands to be made upon a certain corps may be light, yet highly specialized in some details. As a result, certain elements of the corps may be removed to

increase the mobility of the entire unit, while certain highly specialized units may be added. Then we have a corps which can hardly be recognized as a corps, but one which is quite capable of performing a special task. It is also a task force.

We may expect the Ordnance setup in an army consisting of corps and divisions to vary considerably from time to time, in the distribution of Ordnance elements if not in the total of personnel and facilities. We live and fight in a flexible age, and we must look upon a flexible army from a flexible viewpoint.



When definite information is available regarding the new Ordnance setup THE ORDNANCE SERGEANT will tell you all that can be learned about it.

Readers in the field will be the first to encounter changes which are certain to be made. Many new problems will be encountered, and it is hardly possible that the same solution will be used in every case for similar problems. Army, Army Corps, and Division Ordnance Officers are invited to tell us how the changes affect them and the service they render, and how the revamped organizations are best adapted for the provision of adequate Ordnance Service.

Do NOT write for the index to Volume 4. No separate index for this and later volumes will be issued. The December issue will contain an index for the six issues of the volume, July to December, inclusive. It is hoped that this will not only reduce the effort involved in the preparation of an index, but that it also will give it a much wider distribution than has been possible in the past.



Under this heading THE ORDNANCE SERGEANT reproduces advance information pertaining to Ordnance Field Service Technical Bulletins. These Bulletins are not yet published in most cases, and in almost every instance this information will reach readers prior to complete distribution of the Bulletins in the field.

For some items the exact form of the forthcoming Bulletin is given (less its number), while for others only a preliminary version of the text which will be used in the Bulletin is available in time for publication.

In either case these items are OFFICIAL, being published by direction of The Chief of Ordnance.

RIFLE, AUTOMATIC, M1918A2

Ordnance Field Service
Technical Bulletin

War Department, Ordnance Office
Washington

RIFLE, AUTOMATIC, CAL. .30, BROWNING, M1918A2 MODIFICATION OF BIPOD ASSEMBLY

1. It has been reported that difficulty is encountered by the using arm in attempting to carry Browning Automatic Rifle, Cal. .30, M1918A2, with the legs folded parallel to the barrel since the legs cannot be locked positively in this position. To overcome this, a slot should be milled in joint, bipod, leg (B147338). This slot should be machined on a milling machine or shaper. However, if neither is available, it may be filed.

2. This information is published pending revision of and publication of

By Order of the Chief of Ordnance:

H. R. KUTZ
Brigadier General, Ordnance Department
Chief of Field Service

105MM HOWITZER, M4

Ordnance Field Service
Technical Bulletin

War Department, Ordnance Office,
Washington, August 18, 1942

1. Vehicles in the field with serial numbers from 1701 to 1876 inclusive, carry T2 or M3 Name Plates. These plates are to be changed to M4 plates.

2. Name Plates, drawing A233209 will be requisitioned at Field Service, Supply Depot, Rock Island, Illinois.

3. Artillery Branch, Carriage Section, Ordnance Office, should be advised at time of change of old plate number and M4 numbers replacing them.

4. Plates are removed as follows: Remove 2 screws BCN2AF holding old plate on carriage, with a common screwdriver. Attach new plate and replace screws.

For the Chief of Ordnance:

H. R. KUTZ
Brigadier General, Ordnance Department
Chief of Field Service

HALF TRACK AND SCOUT CAR M3A1

ORDNANCE FIELD SERVICE TECHNICAL BULLETIN

August 22, 1942

Subject: Half Track and Scout Car M3A1: Voltage Regulator Maintenance

1. It is necessary with the old type generator filter assembly to set the voltage regulator at 15.5 volts for vehicles equipped with radio, and 15.0 volts when not so equipped. Battery overcharge occurring with the 15.0 volt setting, can be eliminated by reducing the voltage to as low as 14.5 volts.

2. With the new type rectangular shaped filter assembly, the voltage regulator should be adjusted to a voltage setting of not more than 15.0 volts. Battery overcharging can be corrected by a reduction of voltage regulator setting to as low as 14.5 volts. Voltage setting of the cut out relay must always be smaller than the setting of the voltage regulator.

3. Adjustment of the generator regulator should be accompanied by extreme care in replacement of the cover to prevent contact with the units and shorting of the circuit.

4. Generator regulators occasionally fail as a result of reversed polarity in the generator. To preclude possibility of reversal of polarity in the generator, the battery cable should be disconnected before loosening any wire in the generator circuit.

5. To assure correct polarity of the generator, reconnect the battery and the regulator, then connect a jumper lead momentarily between the terminals marked "Armature" and "Battery" on the generator regulator, BEFORE starting the engine. The momentary surge of current will polarize the generator correctly with respect to the battery it is to charge.

SPARE RADIAL TANK ENGINES

Ordnance Field Service)
Circular No.)

War Department, Ordnance Office
Washington, August 15, 1942

SHIPMENTS OF INCOMPLETE SPARE RADIAL TANK ENGINES

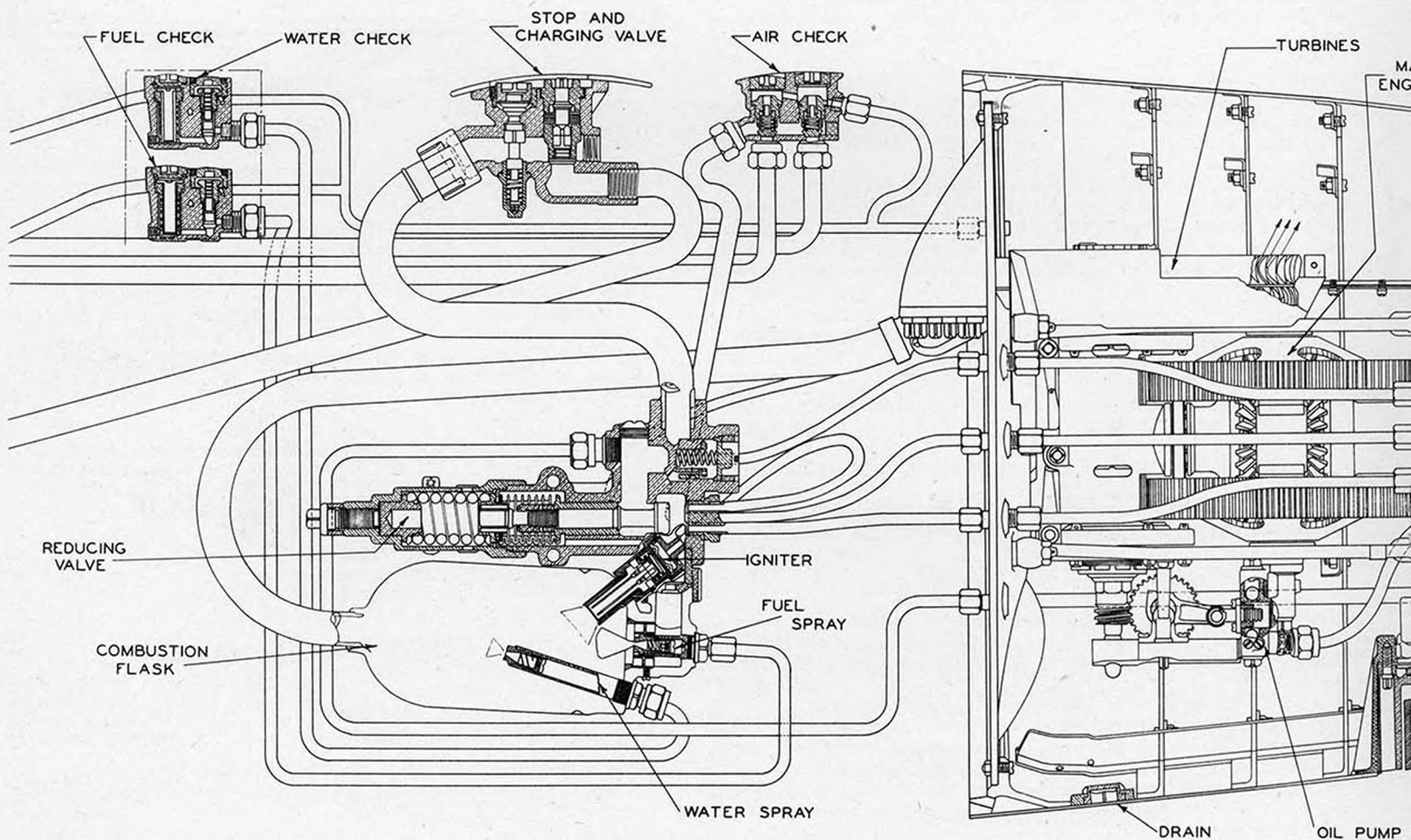
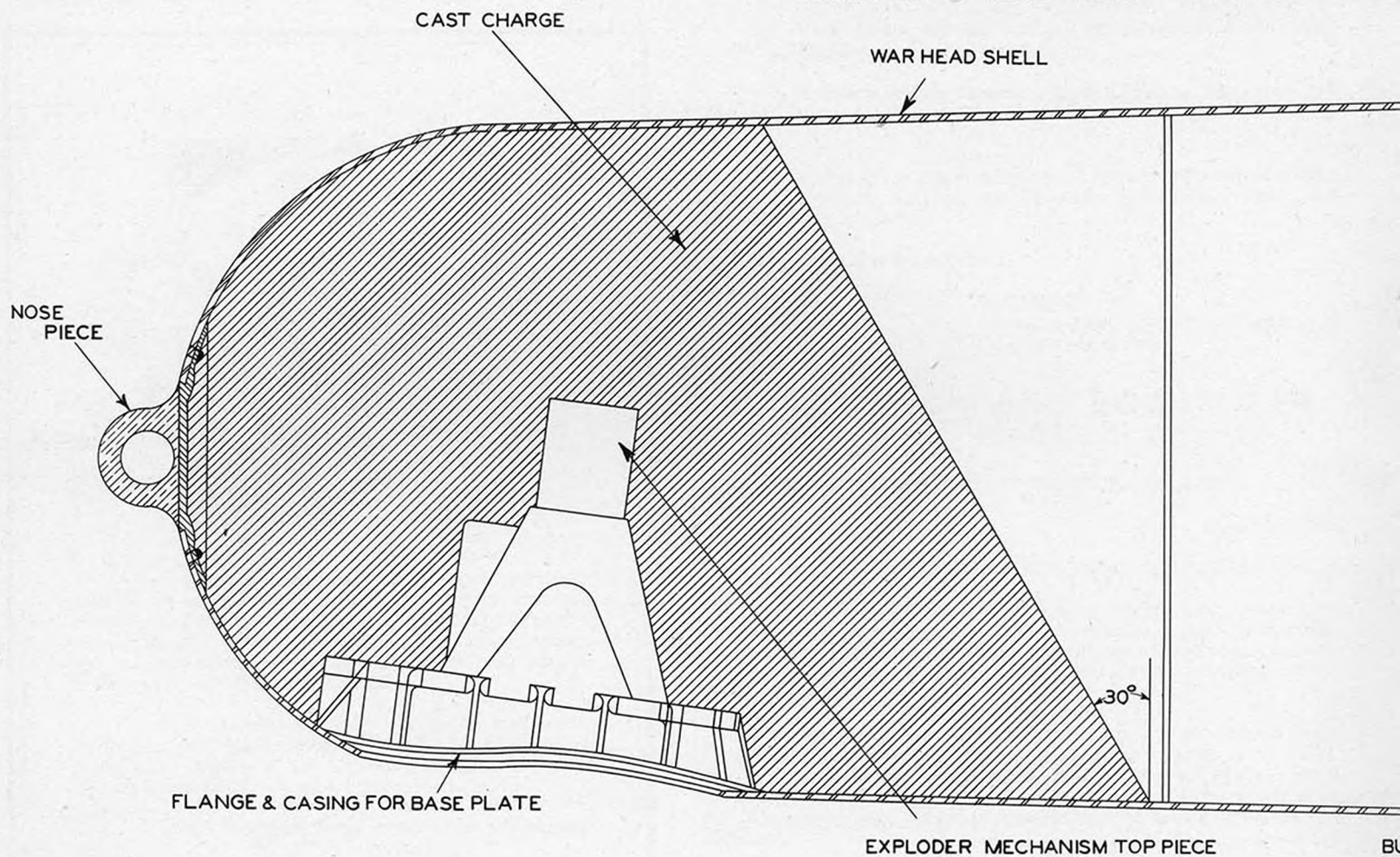
1. When radial engines are shipped from, or returned to overhaul establishments, the following instructions will be observed to the fullest extent possible:

a. If accessories are available, radial engines will not be shipped from overhaul establishments to the field for replacement purposes except as complete assemblies, that is, all accessories and mounting brackets will be attached.

b. If accessories are not available, stripped engines (less accessories) should not be shipped to the field until it is first ascertained, by wire or telephone, that stripped engines are acceptable to the consignee.

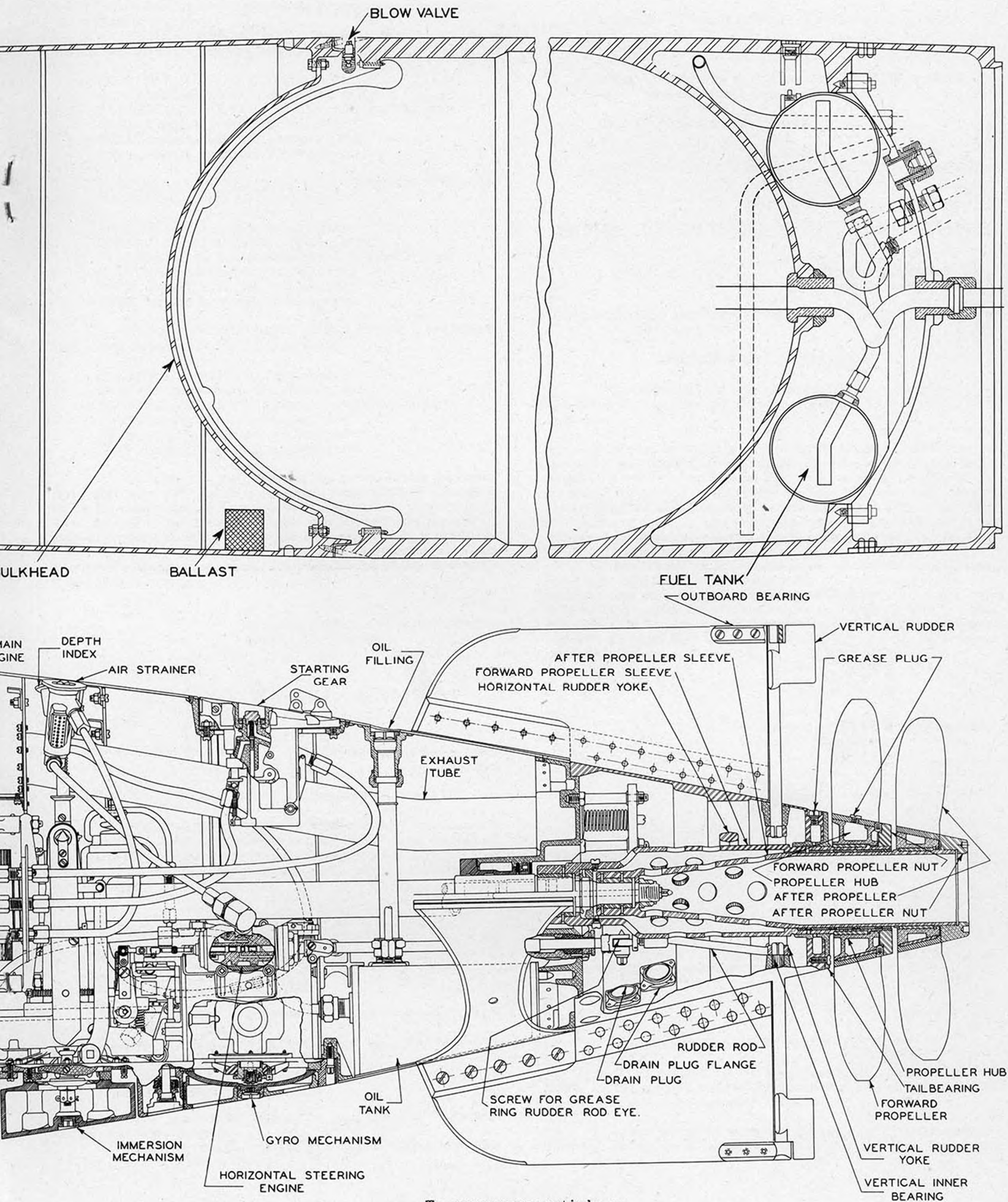
c. When unserviceable engines are shipped from the field to overhaul establishments they should be accompanied by all accessories, either assembled to the engine or in separate containers.

MARK 13-1



Reproduced in
THE ORDNANCE SERGEANT
October, 1942

TORPEDO



To accompany article on
page 399
(AIRCRAFT TORPEDOES)

TORPEDO

2. In order that the personnel of overhaul establishments and the field may both have the same definition for a complete engine, the following information is given:

a. ENGINE WRIGHT R-975-EC2 - Stripped as furnished by Engine Manufacturer, plus the following items:

STARTER assembly, with attaching parts
GENERATOR assembly, with attaching parts
FLYWHEEL, HUB & FAN, assembly, with attaching parts
CLUTCH assembly, with attaching parts
BEAM, support, rear, with attaching parts
TUBE, support, front, with attaching parts

b. ENGINE CONTINENTAL W 670-9A - Stripped as furnished by Engine Manufacturer, plus the following items:

STARTER assembly, with attaching parts
GENERATOR assembly, with attaching parts
FLYWHEEL, HUB & FAN, assembly, with attaching parts
CLUTCH assembly, with attaching parts
BEAM, support, rear, with attaching parts
TUBE, support, front, with attaching parts

c. ENGINE GUIBERSON DIESEL T1020 - Stripped as furnished by Engine Manufacturer, plus the following items:

STARTER assembly, with attaching parts
GENERATOR assembly, with attaching parts
FLYWHEEL, HUB & FAN, assembly, with attaching parts
CLUTCH assembly, with attaching parts
BEAM, support, rear, with attaching parts
TUBE, support, front, with attaching parts

3. Due to the fact that spare engines procured with the earlier tanks were not equipped with accessories, it has not been possible to follow the policy outlined herein to the fullest extent. However, in a short time, it is anticipated that there will be sufficient accessories available to equip all spare engines now in stock. Until such time as all spare engines are so equipped, it is imperative that overhaul establishments resort to any expedient that will minimize the amount of work required by field personnel in replacing engines.

H. R. KUTZ
Brigadier General, Ordnance Department
Chief of Field Service

TESTING SMALL ARMS

Ordnance Field Service
Circular No.

War Department, Ordnance Office
Washington

AMMUNITION FOR TESTING SMALL ARMS AFTER OVERHAUL

1. Ammunition should be issued to Ordnance Maintenance Companies only in sufficient quantities to test function weapons that are being overhauled. The quantity of ammunition that should be fired through each weapon after overhaul is listed below. Issues of ammunition should be in accordance with this table.

Pistol, Automatic, Cal. .45, M1911

6 rounds

Rifle, Automatic, Cal. .30, Browning

M1918 or M1918A1 - 4 rounds to be fired semi-automatic; 6 rounds full automatic.

M1918A2 - 4 rounds to be fired without using rate reducer; 6 rounds using rate reducer.

Browning Machine Gun (All Types)

10 rounds (dummy) fed by hand for each type feed to which the machine gun may be adapted.

10 rounds (ball ammunition) fired from each side if gun is capable of firing from both sides.

Submachine Guns

10 rounds - 5 rounds automatic; 5 rounds semi-automatic.

Rifles

1 clip - 5 rounds for U. S. Rifle, Cal. .30, M1903 or M1917.
8 rounds for U. S. Rifle, Cal. .30, M1

By Order of the Chief of Ordnance:

H. R. KUTZ
Brigadier General Ordnance Department
Chief of Field Service

BORE SIGHTING OF TANK GUNS

War Department, Ordnance Office
Washington, September 7, 1942

ORDNANCE FIELD SERVICE TECHNICAL)
BULLETIN NO.)

BORE SIGHTING OF TANK GUNS

1. Due to the fact that bore sighting equipment is not to be supplied with 75mm Guns in tanks, the following method may be used to bore sight these guns:

a. Distant targets provide satisfactory alignment checks. As the line of fire will converge in the azimuth direction at the distance of the target, it is well to select a target if possible, at a long distance, so that the axis of the gun, and the axis of the telescope will be sensibly parallel. If converging fire is desired, the target should be selected at approximately the converging range. In this method, the axis of the gun is aligned on the target and the telescope adjusted to center the same target in its field, by using the adjustments provided.

b. For aligning the bore on the target crossed threads are placed in the bore sight lines on the muzzle of the gun, the firing pin hole, or a cartridge case with primer removed may be used in the chamber: care being taken to center the eye, when using the firing pin hole or empty cartridge case, by observing the tube walls, and moving the eye, until concentricity of the light circle, at the muzzle, and the tube walls is obtained.

By Order of the Chief of Ordnance:

H. R. KUTZ
Brigadier General, Ordnance Department
Chief of Field Service



MISCELLANEOUS PUBLICATION NOTES

August 29, 1942

IGNITION COIL IDENTIFICATION

1. The ignition coil as used on the 12 volt system has a red glazed band on the insulator, whereas the insulator on the 6 volt system is plain white.

August 29, 1942

INSTRUMENT PANEL PLUG CONNECTIONS

1. It is possible to connect the electrical plugs improperly. The larger conduit connects to the right hand side of the junction box, but to the left hand side at the instrument panel.

2. Latest production tanks have the large conduit and the corresponding receptacles in the boxes marked with red paint for proper identification.

August 29, 1942

LUBRICATING THROTTLE VALVE LINKAGE

1. Under dusty operating conditions the throttle valve linkage that extends from the carburetor down to the throttle valve on the Hydra-matic transmissions will stick. To avoid sticking, the trunnions on the throttle linkage should be thoroughly cleaned before reoiling at the 250 mile lubrication period, or cleaned and oiled more often if sticking occurs.

August 17, 1942

TANKS, LIGHT
GOVERNOR SETTING ON W-670 SERIES, CONTINENTAL ENGINE

1. It is advised that the approved governor setting for all Continental Engines, W-670 Series, Tanks, Light, is 2400 RPM at no load.

2. All governors set at speeds other than 2400 RPM (no load) will be correctly reset and sealed by Ordnance Maintenance Personnel at the time of the 100 hour check.

Revision of TM 9-710

(Memo)

Field Service Division, Maintenance Branch, Automotive, August 10, 1942
To: Field Service Division, Executive Branch, Mil. Org. Pub. & Training Section.

1. The manuscript of TM 9-710 has been reviewed and the contents thereof are concurred in by this office with certain exceptions. Suggestions for the correction and clarification of the draft are listed below.

a. Paragraph No. 7a (7).

(1) Delete last sentence reading:

(a) "The engine should idle around 400 to 500 R.P.M. as indicated by the tachometer."

(2) Add the following to the end of the paragraph:

(a) "During the engine warm-up period the radiator louvers should be closed and the engine should be operated at a speed of 800 to 1000 R.P.M."

b. Paragraph No. 8c (1).

(1) Delete last two sentences reading:

(a) "Low or first speed cannot be used with the transfer case in low gear when the front axle drive is disengaged. Shift into second gear when using low gear in the transfer case with the front axle drive disengaged. (These statements do not apply to the new production vehicles nor to the vehicles modified in the field.)"

(2) Figure No. 12.

(a) Should be changed (Removal of the interlock mechanism has altered the front wheel drive shafting diagram).

c. Paragraph No. 8c (2).

(1) In the first sentence change the word "second" to "any".

(2) * * * *

(3) Change second sentence as follows:

(a) "Thereafter shift main transmission as the ratios permit, all regular speed ratios being reduced."

(4) Change third sentence as follows:

(a) "The low gear of the Transfer case should be utilized when the vehicle is operated at extremely low speeds for considerable distances."

d. Paragraph No. 8d (1).

(1) Should be deleted and add the following:

(a) "If the engagement cannot be made readily, the mating teeth of the gears involved are not in proper position due to a lack of difference in their speeds. The gears involved revolve in the same directions and at approximately the same speeds, one of the gears being driven or turned by the front propeller shaft and the other by the rear propeller shaft. Under these circumstances the engagement can be facilitated by attempting the shift while the vehicle is operated about a turn either to the right or to the left. The gears involved turn at slightly different speeds while the vehicle negotiates the turn. The difference in their speeds permits the shifting clutch gear to enter into engagement with the driven gear. Only a moderate manual effort need be applied to shift lever to accomplish this shift."

e. Paragraph No. 50a (5).

(1) Substitute the following:

(a) "Inflate tires to 50 pounds when standard mud and snow grip

casings and bullet sealing tubes are used and to 55 pounds when combat type casings and standard heavy duty tubes are used."

f. Paragraph No. 51c.

(1) Add sub-paragraph (c) as follows:

(c) Replacement of steering knuckle boot.

1. Tools: A screw driver is required for this operation.

2. Procedure:

a. Remove old rubber boot (Ord. No. C85749, White Part No. 382160) by removing the outer clamp (No. C85751) and the inner clamp (85750).

b. Clean the grooved seats of all grease and dirt.

c. Unzip new boot (White Part No. 395330), place around axle and refasten.

d. Rotate boot around the axle until the ribbed flat section is at the bottom. This will place the zipper in the upper front section when the boot is installed on the left front steering knuckle, and in the upper rear section when the boot is installed on the right front steering knuckle.

e. Replace inner clamp.

f. Replace outer clamp.

g. Paragraph No. 58 c (2) (b).

(1) Omit the following:

(a) "Rubber track assemblies for the Half-Track car, M2, will be supplied with track guide assembly studs of two sizes. In any one of these tracks, one or more of the guide assembly studs will be 9/16-18NF-2, instead of 5/8-18NF-2. These studs will be fitted with standard 9/16-18NF-2 nuts. This variation in stud sizes will require the use of two wrench opening sizes to accommodate the different nut sizes when servicing these rubber track assemblies." (The information in the latter portion of this paragraph applied only to the first 300 tracks made by the B. F. Goodrich Rubber Company. These tracks were accepted for use due to a critical need for tracks at that time. This situation no longer exists.)

h. Paragraph No. 58c. (2) (e)

(1) Insert the following:

(a) "The tracks on Half-Track vehicles have a life expectancy of about 3200 miles of service. Operation over terrain covered with volcanic or unweathered rock will cause a more rapid deterioration of the tracks, and will reduce the life expectancy of the tracks. To secure maximum service from the tracks, and yet promote maximum salvage of the components in worn tracks, the tracks should be replaced when three (3) of the metal cross bars are exposed. The tracks should not be used after the bond between the metal cross bars and the adjoining rubber has broken, so that the cable is exposed."

i. Paragraph No. 60a.

(1) Delete entire paragraph and insert the following:

(a) "A steel idler wheel is mounted on the side of the frame near the rear end. These idlers support the rear end of the track. Each idler wheel is mounted on an idler shaft that is carried in an idler shackle which is mounted on an idler post. Adjustment of the track tension is accomplished by means of a threaded adjusting rod which is attached to the lower end of the shackle by an anchor pin, and which passes through an idler adjuster bracket attached to the frame. Increased rigidity of the idler post and shackle has been accomplished by installing idler braces and shackle reinforcing plates on the idler adjusting mechanism."

j. Paragraph No. 64a.

(1) Add the following to the end of the paragraph:

(a) "Protection against damage of the vacuum power booster cylinder and the brake linkage is afforded by a steel booster lever guard which is bolted to the left frame rail and to the left side body plate."

k. Figure No. 69.

(1) Hydraulic brake pedal linkage on page 114 should be corrected in accordance with Bulletin No. 16, dated June 15, 1942. The change is required because the pin to valve link bushing side wall clearance (F) is erroneously shown in Figure 69.

l. Page 132.

(1) The clutch assembly illustration should be changed to show the clutch release bearing spacer blocks in place.

m. Paragraph No. 82a.

(1) Change the last sentence to read:

(a) "The engine should not be operated without the thermostat."

(2) Add the following to the end of the paragraph:

(a) "If the engine must be operated with the engine thermostat removed, it is very important that the bypass pipe (extending vertically from the oil cooler housing on the left side of the engine to the elbow on the left side of the thermostat housing) be plugged. If this is not done, a considerable volume of the cooling water will bypass the radiator and result in overheating of the engine."

n. Paragraph No. 101a.

(1) Add the following to the end of the paragraph:

(a) "The front blackout marker light is so constructed to give the appearance of one point of light at distances over 60 feet in advance

of the vehicle and of two points of light at closer than 60 feet, indicating caution to the driver."

o. Paragraph No. 102c.

(1) Add the following as a new paragraph:

(a) Current production vehicles are equipped with improved rear lights as follows:

1. "Combination service tail and stop light (upper unit Ord. No. A226179) and blackout tail light (lower unit Ord. No. A226173) is provided at the left rear of the vehicle. Combination blackout stop light (upper unit Ord. No. A226174) and blackout tail light (lower unit Ord. No. A226173) is provided at the right rear of the vehicle. The upper and lower units are separate, sealed replaceable units. The blackout lamp is so constructed that when viewed from a distance of 100 feet or more it appears to emit a single beam of light. When viewed from between 60 and 180 feet it appears to emit 2 beams of light. At distances less than 60 feet, it appears to emit 4 beams of light. This blackout lamp feature enables drivers to follow vehicles at safe distances."

p. Paragraph No. 112a.

(1) Substitute for this paragraph the following:

(a) "Tools required include 9/16", 5/8" and 3/4" sockets, speed wrenches, ratchet handle, and 4" extension."

c. Paragraph No. 112b.

(1) Change this paragraph to the following:

(a) "Drain oil."

(b) "Remove bolts which attach engine oil pan shield to frame and remove the shield."

(c) "Remove all cap screws and lock washers. Note that the three front screws have copper washers since steel washers will not retain oil at these points. (Figure 124.)"

(d) "Lift off pan with gasket."

(e) "In replacing use new gasket."

(Illustration of the Oil Pan Shield should be provided in the text.)

r. Paragraph No. 118a (1).

(1) Insert the following:

(a) "It is very essential that the heat riser valve and shaft located in the riser section of the exhaust manifold be absolutely free to the action of the thermostatic spring that controls the opening and closing of this valve. The duty of this valve is to control the amount of heat or hot exhaust gases that preheats the fuel going into the carburetor, so that it is more easily vaporized. This valve becomes stuck from carbon and condensation and can be freed by using penetrating oil or kerosene and motor oil mixed, and tapping gently on the end of the shaft with a hammer, and working the valve back and forth with the fingers. This valve should be checked every 6000 miles."

s. Paragraph No. 118e (5).

(1) Insert the following:

(a) "The engines in the Half-Track vehicles of early production were built with a 7 to 1 compression ratio and were intended to use a high grade fuel. These engines were equipped with cylinder heads (White Part No. 364133) and cylinder head gasket (White Part No. 346797). This change in cylinder heads reduces the compression ratio to 6.4 to 1 and permits the use of a lower grade fuel without inducing the engine to 'Ping'."

t. Paragraph No. 142a.

(1) Delete this paragraph and insert the following:

(a) "Two springs are used to suspend the vehicle on the front axle. They are anchored at the front end and shackled at the rear. Two types of front springs are in current use. The early type of front spring (B184104), was so constructed that a joint was formed between the center section and the outer section of the second leaf. The appearance of this joint gives the impression of a broken spring leaf. The later type spring (B184530), is so constructed that the top leaves wrap about the shackle pin bushing and the center section of the top leaf is articulated with the two end sections."

u. Paragraph No. 142c.

(1) Insert the following to form this new paragraph:

(a) "SPRING SHACKLE STOP. - A bracket is attached to the right frame rail behind the front spring rear shackle to prevent a rearward shifting of the front axle in the event that the front spring fails."

v. Paragraph No. 143a (1).

(1) Delete this paragraph and insert the following:

(a) "Hard Riding. - Insufficient lubrication, broken shackle pins, broken bracket bolts, excessively tightened shackle bolts, overloading or uneven load distribution are possible causes of hard riding."

w. Paragraph No. 150c.

(1) Omit the third sentence which reads "Front wheel drive control is interlocked so that it can be used only with low (first) and reverse speeds of the transmission." (The interlocking mechanism is being removed in the field and is no longer being supplied in production.)

x. Paragraph No. 151a.

(1) Omit the phrase "and internal damage to the synchronizing mechanism" - (There is no such mechanism in these units.)

y. Figure No. 153b.

(1) Should be changed to show current model of "Transmission and Transfer Case - Sectionalized".

z. Paragraph No. 153b.

(1) Delete the paragraph and insert the following:

(a) "Two types of tires, both having mud and snow grip tread are in use on these vehicles. Their size is 8.25 x 20."

1. "Standard casings of 10 ply construction, weighing 95 lbs. each fitted with a bullet sealing tube weighing 52 lbs. each were original equipment on these vehicles. This type of tire should be inflated to 50 pounds."

2. "Combat casings of 12 ply construction weighing 145 lbs. each, fitted with a standard heavy duty tube, a flap, and a metal bead-lock, are now being used with the new divided rim wheel. This type of tire should be inflated to 55 lbs."

aa. Paragraph No. 153c.

(1) Delete the entire paragraph.

ab. Paragraph No. 154a.

(1) Change sentence to the following:

(a) "Inflate to correct pressure."

ac. Paragraph 158a.

(1) Delete entire paragraph and insert the following:

(a) "Preparation for shipment by water - The preparation is, with certain modification, the same as that indicated for shipment by rail. However, the engine requires special attention to prevent internal corrosion."

(b) "Spark plugs will be removed and the interior of the cylinders sprayed thoroughly with oil, lubricating, preservative, medium (preferably while the motor is warm). The spray must be directed to the valve parts and pistons while the engine is being cranked to get thorough internal surface coverage. This operation can also be carried out while the motor is running, by spraying oil, lubricating, preservative, medium into the carburetor air intake with the motor at idling speed. The engine is speeded up and when smoke starts to issue from the exhaust, the ignition is cut off and spray continued until the engine stops."

(c) "Fuel and cooling system will be completely drained, as indicated in shipment by rail."

(d) "All apertures, such as spark plug holes, crankcase breather, front and rear axle breather, bell housing air vent, exhaust pipe, etc., will be sealed. If carburetor is removed the opening of intake manifold will be sealed. Threaded metal plugs, corks, wooden plugs or tape may be used for this purpose."

(e) "The crankcase will be drained completely and a large tag reading: 'Crankcase drained, refill with new oil before starting the engine' must be firmly wired to the steering wheel."

(f) "Opening in generator and starter will be sealed with adhesive tape."

(g) "The clutch pedal must be blocked with the clutch the released position in order to relieve pressure on clutch plates. Unless this is done serious difficulties may result due to corrosion."

(h) "All exposed, unpainted metal and working parts should be protected by a coat of compound, rust preventive, light, or oil, lubricating, preservative, medium."

(i) "Batteries will be removed and shipped dry or packed in such a way that the unit will be handled in an upright position at all times. Leads should be taped and terminals coated with compound, rust preventive, light."

ad. Paragraph No. 163b (2).

(1) Add the following to the paragraph:

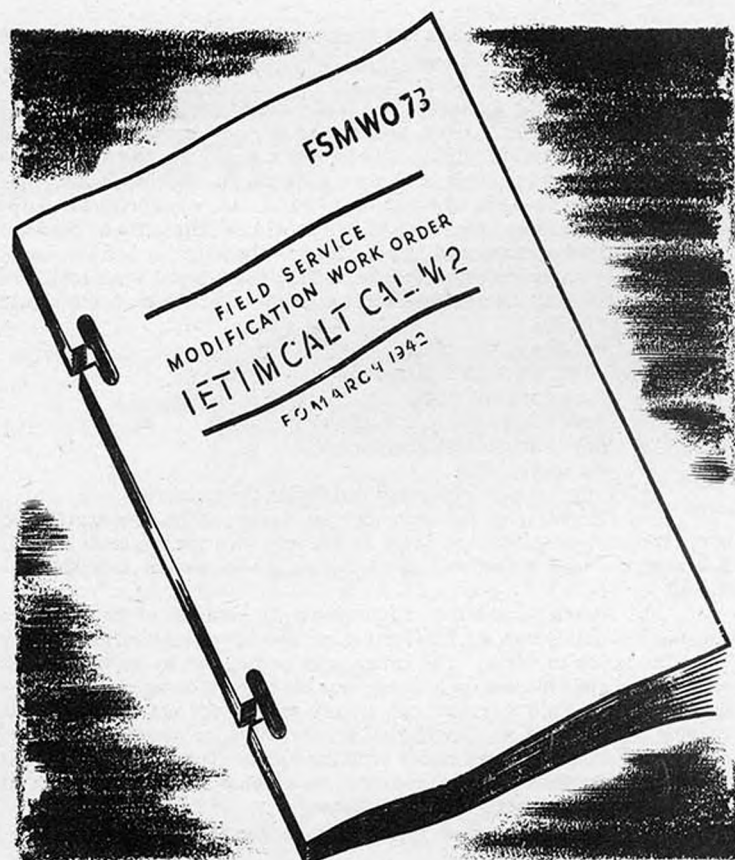
(a) "Close both fuel shut-off valves to preclude flooding of the carburetor and crankcase dilution due to the accumulation of gasoline vapor pressure in the gasoline tanks."

Jas. A. B. Gibson
Colonel, Ordnance Department



What do you know about Evacuation and Recovery Operations? This will become an important matter in the very near future. THE ORDNANCE SERGEANT for December will provide some more or less preliminary information regarding the problems involved, and the methods and organizations which will be used in their solutions.

The Second Anniversary issue is being planned for January, 1943. Issues planned for next year include an Infantry issue, a Coast Artillery Corps issue, an Air Force issue, a mechanical issue, and others. Look for them, one each month.



LIGHT TANK, M3

RA PD No. 107)
FSMW0 G103-B)

FSMW0 G103-B
Ordnance Department
Washington, August, 1942

FIELD SERVICE MODIFICATION WORK ORDER

1. Major Item Affected:

Name	SNL
Light Tank, M3	G-103

2. Part Modified:

Name	Drg. (current)	Drg. (superseded)
Plate, Installation, Side	D38593	D38593

3. Purposes of Modification:

To provide vehicle with lubrication chart holder.

4. Drawings required to Apply Modification:

NOTE: No drawings are required in applying this work order as sufficient sketches are incorporated in the work itself. However, the following drawings are listed as a matter of record for the office Chief of Ordnance.

Drawing No.	Revised	Date
C74681		2/18/42
D38593	"	2/18/42

5. Parts Affected by Modification:

a. New parts required:

Name	Pc. Mk. or Drg. No.
Holder, Chart	D193728
Rivet, Steel, B.Hd., 3/16" x 5/16"	BMCX1

b. Discarded parts: None

c. Procurement of parts required:

- (1) Where procured: Rock Island Arsenal.
- (2) Date available: Now

6. Special Tools, Jigs and Fixtures:

Name
Drill, Twist, 13/64"

Drill, Electric Hand

(THE ABOVE TOOLS SHOULD BE AVAILABLE)

7. Special Instructions:

- a. Applied by: Automotive mechanic
- b. Time Required: One (1) hour
- c. Procedure of Operation:

(1) By referring to Sketches 1 and 2, remove the side plate C74681 and modify by laying out and drilling the four 13/64" holes for chart holder B193728.

(2) Rivet the chart holder to side plate using four rivets BMCX1, 3/16" x 5/16".

(3) Replace side plate to hull.

d. Arsenal or field operation: Both

e. Comments with reference to published FSMWO's: None

f. Disposal of discarded parts: None

g. "This Work Order is classified in the RED Group, and therefore will be completed at the earliest practicable date. A monthly Progress Report should be forwarded to this office listing the number of each of the Field Service Modification Work Orders, classified in the RED group, applied during the current month and the number yet to be applied in your Service Command".

8. Remarks:

This work order is to be applied to all Light Tanks, M3, which are not equipped with this type of lubrication guide holder.

9. Date Approved for publication: August 10, 1942.

H. R. KUTZ
Brigadier General, Ordnance Department
Chief, Field Service Division

MEDIUM TANK, M4

RA PB Bo. 107)
FSMW0 G104-B)

FSMW0 G104-B Ordnance Department
Washington, August, 1942

FIELD SERVICE MODIFICATION WORK ORDER

1. Major Item Affected:

Name	SNL
Medium Tanks M4 - Series	G104

2. Part Modified:

Name	Drawing
Race, Turret Hatch	D-51050

3. Purpose of Modification:

To remove shoulder pads, C97328 and C97329, shown in drawing, D51050.

4. Drawings Required to Apply Modification: None.

5. Parts Affected by Modification:

- (a) New Parts Required: None
- (b) Replacement Parts Required: None
- (c) Substitute Parts Required: None
- (d) Discarded Parts:

Name	Piece Mark	Quantity
Pad Shoulder	C97328	1
Pad Shoulder	C97329	1

(e) Procurement of Parts Required: None

6. Special Tools, Jigs and Fixtures: None

7. Special Instructions:

- (a) Applied by: Mechanic
- (b) Time Required: 1/2 hour
- (c) Procedure of Operation:

1. Remove Screws BCBX1EA

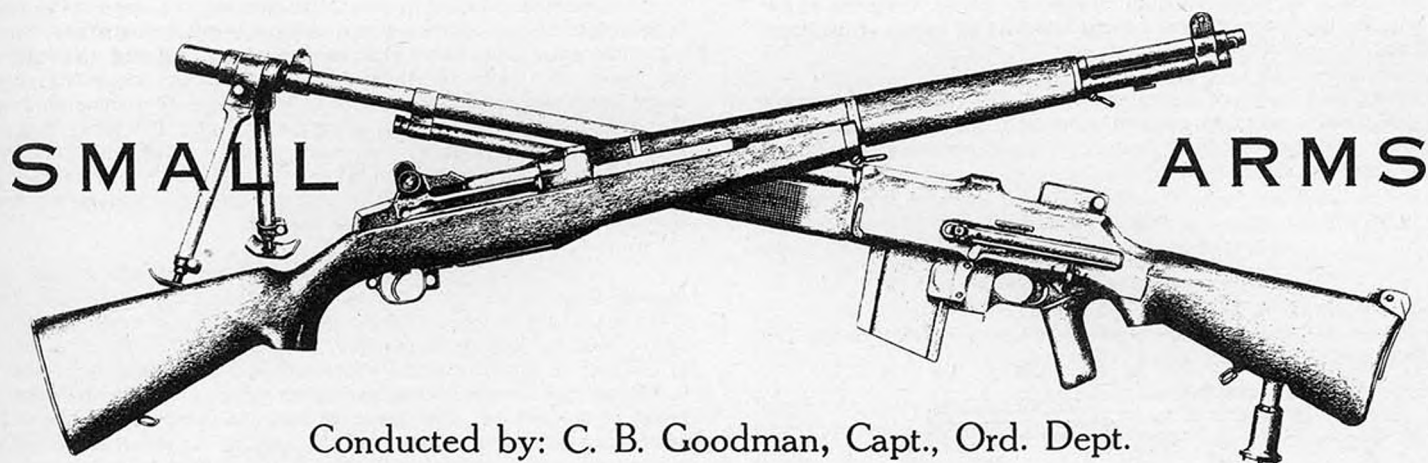
2. Remove Shoulder Pad C97328

3. Remove Shoulder Pad C97329

(d) Arsenal or Field Operation: Either

(e) Comments with Reference to Published FSMWO's: None

(Continued on page 407)



Conducted by: C. B. Goodman, Capt., Ord. Dept.

Vickers Machine Gun, Caliber .303, Model of 1915

by Pvt. CHARLES E. DU CHARME, Ord. Dept.

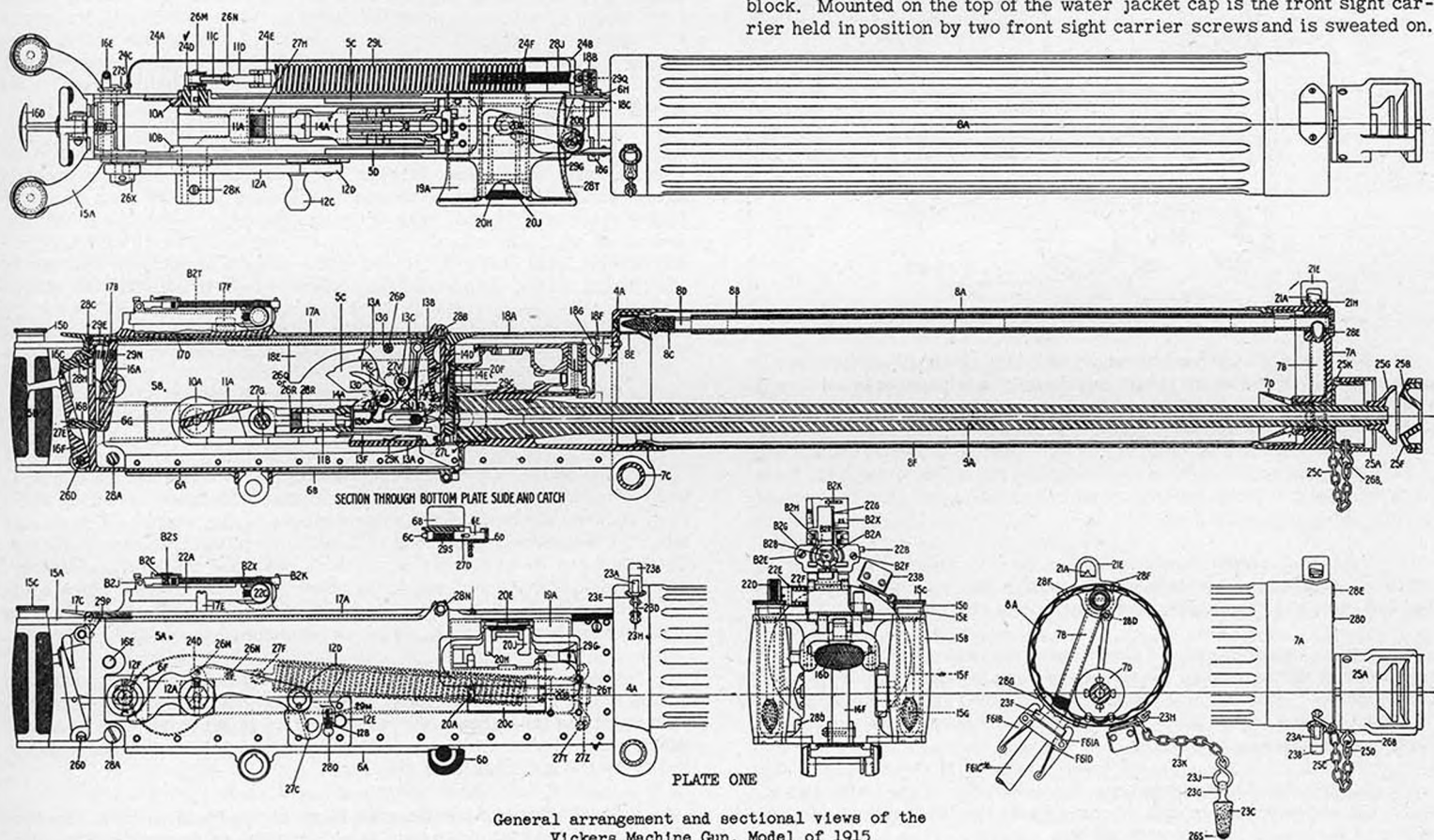
The Vickers Machine Gun, Caliber .303, Model 1915, is web belt fed, water cooled and recoil operated.

The web feed belt has a metal tag on its end to facilitate loading. It holds two hundred and fifty rounds of .303 caliber cartridges and is similar in appearance and in construction to that of the Browning.

The water jacket is corrugated to give it strength and to afford greater air cooling surface. It holds about seven and one-half pints of water. It is threaded on both ends, the rear being screwed into the trunnion block and the front into the water jacket cap.

When the gun has fired, automatically, about six hundred rounds, the water in the water jacket, due to its absorption of heat from the barrel, reaches its boiling point and, if automatic fire is continued, the water evaporates at the rate of one and one-half pints every thousand rounds. The rate of evaporation will, of course, vary according to the rapidity of fire. Starting with a full water jacket, if short intervals are allowed between each belt, about two thousand rounds may be fired without replenishing the water. Care must be observed to assure the barrel being fully immersed at all times.

Screwed into the water jacket cap is a stuffing box which provides the front bearing for the barrel, the rear bearing being in the trunnion block. Mounted on the top of the water jacket cap is the front sight carrier held in position by two front sight carrier screws and is sweated on.



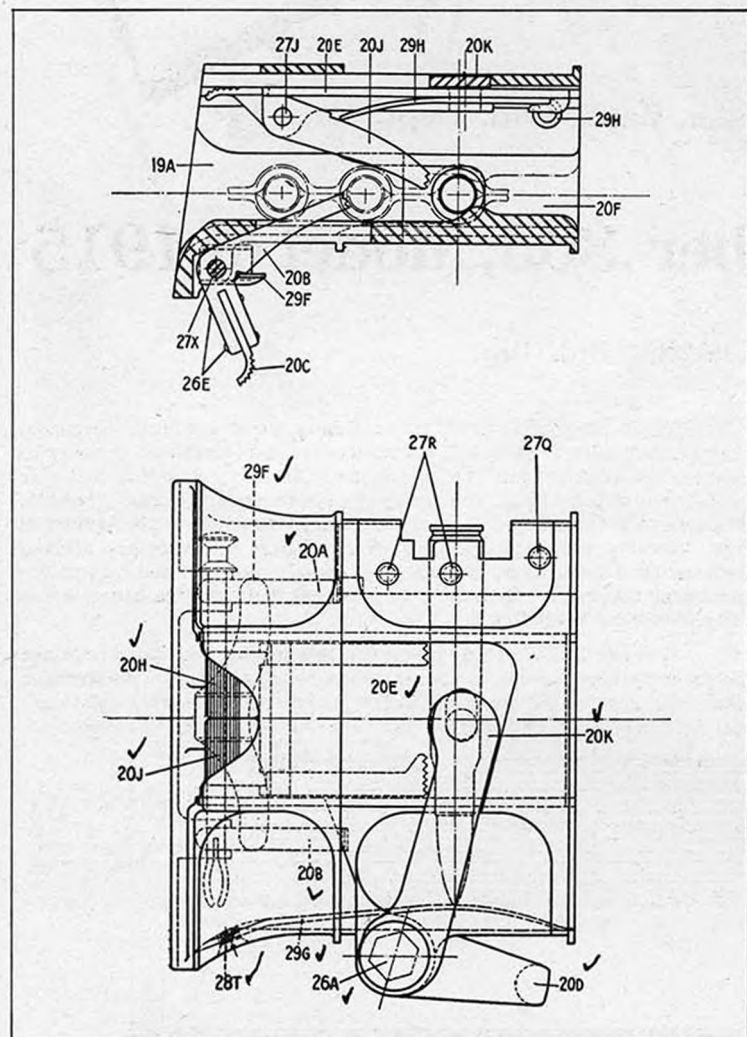
General arrangement and sectional views of the Vickers Machine Gun, Model of 1915

It "carries" the front sight which is dovetailed into it and when in its proper position is prevented from moving laterally by means of the front sight screw.

Inside, near the top of the water jacket, is the steam tube arrangement which permits the steam generated during firing to escape, to prevent damage to the water jacket from that source, whether the gun be horizontal, elevated or depressed.

PLATE TWO

Feed box of
the Vickers Machine Gun, Model of 1915



The steam tube arrangement consists of a steam tube socket at the upper rear end of the water jacket interior. It is triangular in shape and is fastened in position by three steam tube socket rivets. A steam tube plug fits into it. At the upper front end of the water jacket interior there is a steam tube front plug held in a socket cast in the water jacket cap by the front plug screw which passes through the water jacket cap, from the front, and positions the steam tube front plug so that its port is opposite the steam outlet tube.

The inner steam tube has an aperture in either end and is so positioned that these apertures are always in its upper surface. It fits over the front and rear steam tube plugs and is stationary.

Fitted, loosely, over the inner steam tube is an outer steam tube, free to fall to the rear when the weapon is elevated and to the front when it is depressed. Its length precludes its ever covering both apertures in the upper surface of the inner steam tube at the same time, preventing the escape of steam.

A strip fitted into the bottom of the interior of the water jacket, called the water jacket trough, forms a guide for leading the recoiling portion of the barrel into the stuffing box.

At the rear, top, of the water jacket there is a water in-take opening fitted, from the exterior, with a removable water plug group, consisting of the water plug, water plug washer, water plug ring and water plug top piece. The latter is a heat resisting fiber cap which fits over the metal water plug to permit handling without danger of burning the fingers. It is fastened with two water plug top piece rivets. The water plug group is made fast to the weapon by two water plug fastening links through one of which the water plug passes and the other, to which the first is linked, passes through the eye of the water plug eye-bolt which is screwed into the water jacket near the water in-take opening.

At the front, bottom, of the water jacket there is a water outlet opening fitted, from the exterior, with an identical water plug group. It is the purpose of this opening to provide a means of draining the water jacket when the weapon is inactive. A securing chain linked at one end, by one loop of an "S" hook, to a water plug eye-bolt which is screwed into the water jacket near the water outlet opening, fastens the water plug group to the weapon. The securing chain is composed of eleven links which pass through the water plug ring leaving the water plug group free to pass over the securing chain, from the "S" hook at its upper end where it is fastened to the water plug eye-bolt to an "S" hook on its lower end to which is fastened the steam outlet plug group. This latter group consists of a cork plug stem, cork plug stem cork covering and cork plug stem washer. It is used, when the weapon is inactive, to close the steam outlet tube opening to prevent the loss of water. The steam outlet tube opening passes through the front, bottom, of the water jacket cap, close to the water outlet opening. The steam outlet cork plug group hangs, suspended freely, at the end of the securing chain while the weapon is in use.

The steam outlet opening is encircled by a water jacket cap hose connection which is fastened to the water jacket cap by two water jacket cap hose connection screws. When the weapon is in use the steam outlet cork plug group is replaced by a hose connection group, composed of a hose connection which snaps over the water jacket cap hose connection by means of two hose connection pawls actuated by two hose connection pawl springs. One end of a flexible hose is fastened to the hose connection while its other end, when the weapon is in readiness for use, is immersed in water contained in a condensing device, separate from the weapon, used to condense the escaping steam and to catch the overflow of water from the active weapon.

The condensing device serves the dual purpose of conserving the original supply of water and to prevent the vapor, from the escaping steam, from rising. It serves an important purpose. Water is difficult, frequently impossible, to obtain during combat action and the conservation of the supply on hand is imperative. From the visibility of rising vapors emerges the hazard of disclosure of the position of the weapon and its crew, to the enemy.

The muzzle opening in the water jacket cap is threaded and fitted with a muzzle attachment follower which presses the asbestos packing, wound around the barrel to prevent the leakage of water from the water jacket at the muzzle end, against the stuffing box. A muzzle attachment sleeve, in which the muzzle attachment front disc is held to the muzzle attachment front disc cap, is held to the muzzle attachment follower by attachment sleeve. The muzzle attachment sleeve is locked to the muzzle attachment follower, by means of the lugs and slots referred to, the locking being effected by a quarter turn of the muzzle attachment sleeve to the left. It is made fast by a muzzle attachment stop pin.

COMMENT, All reference to right and left hand position, or direction, is based on the breech end of the weapon, looking forward to the muzzle end.

A muzzle attachment sleeve locking pin, to which a muzzle attachment securing chain is attached by a muzzle attachment securing chain ring, secures the muzzle attachment sleeve to the weapon. The muzzle attachment sleeve locking pin is fastened to the muzzle attachment sleeve. The other end of the muzzle attachment securing chain, which is composed of ten links, is fastened to the other loop of the "S" hook which holds the water outlet plug group and the steam outlet cork plug group, by means of the securing chain, to the water outlet plug eye-bolt.

The muzzle end of the barrel extends through the water jacket cap and to its threaded front end is screwed the muzzle attachment barrel disc which, in its extreme forward position, is separated by about one-quarter of an inch from the rear end of the muzzle attachment front disc and muzzle attachment front disc cap.

On the base of the trunnion block is the trunnion block distance piece, the pivot point of the weapon's elevation and depression, by which

the weapon is mounted in the cross head of the Mark IV tripod where it is fastened in position with the cross head joint pin which, in turn, is fastened to the tripod by the cross head joint pin chain.

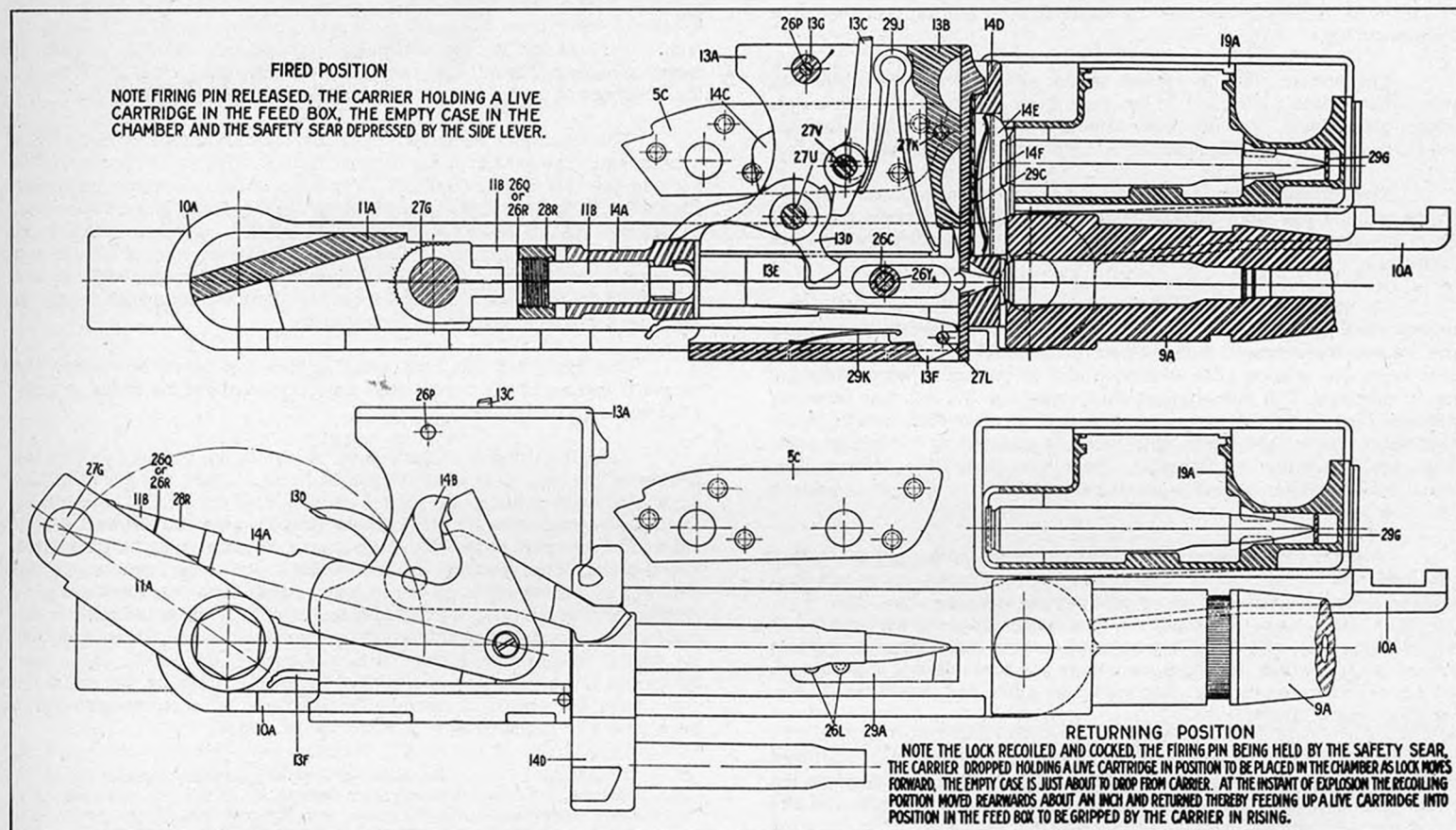
This completes the description and the nomenclature of the parts forward of the breech casing . . . to which has been added incidental mention of parts of the mount for the purpose of further identifying the trunnion block distance piece . . . all of which, with the exception of the barrel and the muzzle attachment barrel disc, are non-recoiling parts.

The breech casing consists of the two outside plates, riveted to the bottom plate and to the trunnion block, which makes connection with the water jacket. The outside plates form the right and left side enclosures of the breech casing, the bottom plate, the bottom plate slide and the trunnion block encloses the bottom and the trunnion block closes

The front cover raises, opens, to the rear while the rear cover lifts, opens, to the front.

The rear sight fixed base is an integrant part of the rear cover. The rear sight moveable base pivots on the rear sight moveable base trunnion. Its movement to the right is limited by a moveable base screw, screwed into the rear cover at the right of the rear sight fixed base, which prevents the removal of the rear sight moveable base when moved in that direction. The primary purpose of the screw is to prevent the rear sight moveable base from being moved so far to the right as to permit its being struck by the bolt handle when the latter is in action.

The rear sight consists of the parts mounted on, and includes, the rear sight moveable base. These are the leaf, the leaf joint pin, the slide, the slide cap, the slide cap screws (large and small), the slide catch head,



the forward end while the handle block closes the rear end. The upper opening is closed by the front and rear covers.

The front cover is immediately behind the trunnion block and consists of the front cover, the front cover catch bracket and four front cover catch bracket rivets. . . Passing through the forward upper end of the left outside plate and through the upper open space of the forward end of the breech casing and out through the forward upper end of the right outside plate is the front cover catch. It engages the front cover catch bracket and locks the front cover down, against the front cover stop, in its closed position.

It has a knurled handle on its left end inside of which there is a front cover catch snib and a front cover catch snib spring.

COMMENT: A snib, in English terminology, is a plunger in American nomenclature.

When the front cover catch is engaged with the front cover catch bracket and the front cover is locked against the front cover stop, the front cover catch snib, actuated by the front cover catch snib spring, is forced into an opening provided in the front cover stop and locks the front cover catch handle in downward position.

Behind the front cover is the rear cover. The front and rear covers inter-lock and are hinged on the same cover hinge pin which is secured in position by a cover hinge pin nut and cover hinge pin nut cotter pin.

the slide catch pin, the aperture disc, the aperture disc pivot, the aperture disc pivot spring, the drift slide, the elevating screw, the elevating screw head, the half nut, the half nut spring, the windage screw, the windage screw spring, the windage screw knob and the base spring.

The moveable base has, at its forward end, a worm gear which engages the threads of the windage screw. At its rearward end are the wind gauge graduations, each point of which corresponds to a lateral deviation of four inches for each hundred yards.

The leaf is hinged to the rear end of the moveable base and operates under the tension of the base spring. It is graduated, from zero to two thousand, six hundred yards, in mills on the right edge. The aperture disc has peep holes of four sizes and one large aperture containing an open sight. On the rear face of the slide cap is the open, or battle, sight.

On the lower surface of the rear cover are the cover guides, right and left hand, each held in position by two cover guide rivets. Running the full length of the cover, on its under surface, is the trigger bar; in the right hand rear corner of the rear cover is the trigger bar spring while in the left rear end is the cover catch spring.

PLATE THREE

Positions of the mechanism of
the Vickers Machine Gun, Model of 1915

Inserted in the slot at the rear end of the left hand outside plate is an outside plate filling piece to which the spring box rear stud is riveted. The left hand cam is riveted, with two left hand cam rivets, to the inner surface of the left hand outside plate in an upper, central, position. There are two spring box front studs riveted to its forward, outside, end.

Inserted in the slot in the rear end of the right hand outside plate is the roller bracket holding the roller washer which is secured by the roller cotter pin. The right hand cam is riveted, with two right hand cam rivets, in an upper, central, position on the inside surface of the right hand outside plate. Just to the rear of a, lower, central position on the outside surface of the right hand outside plate is the dead stop bracket which is held by four dead stop bracket rivets. The dead stop is held in position, on the dead stop bracket, by the dead stop pin. Its forward movement is limited by the dead stop plunger stop while its rearward movement is actuated by the dead stop plunger and dead stop plunger spring.

The bottom plate is riveted to the left hand outside plate with nine bottom plate rivets and to the right hand outside plate with seven bottom plate rivets. The two lower dead stop bracket rivets pass through and also serve to rivet together the bottom and right hand outside plates.

The righthand outside plate is held to the trunnion block by eleven rivets and the left hand outside plate is held to the trunnion block by seven rivets, one of which also serves to hold the front cover stop in position.

On the lower surface of the bottom plate is the elevating gear stirrup above which the bottom plate is recessed to permit the forward and rearward movement of the bottom plate slide which is drawn to the rear when the weapon is in operation and is pushed forward while the gun is inactive. The bottom plate slide stop is at the extreme forward, left hand, end of the bottom plate. The bottom plate slide catch, on the right hand side of the bottom plate slide, is engaged by the bottom plate slide catch pin which is actuated by the bottom plate slide catch spring. It is disengaged when sidewise pressure, to the left, is brought to bear on the slide catch head.

Under the front cover is the feed box group, composed of the feed box, feed box lever, feed box lever pin, feed box slide, upper left hand pawl, upper right hand pawl, upper pawl spring and upper pawl pin. Also, the upper slide lever, bullet guide spring, bullet guide spring screw, left hand bottom pawl, right hand bottom pawl, bottom pawl connecting plate, bottom lever, bottom pawl pin, bottom pawl rivets (four), bottom pawl spring, cartridge guide and stop, cartridge guide and stop rivet and two cartridge guide rivets.

The handle block is hinged, at the bottom, with a handle block hinge pin secured with a handle block hinge pin nut and handle block hinge pin nut cotter pin. It is fastened, in its closed position, at the top with a handle block pin. Its double handles are hollow and serve as reservoirs for lubricating oil. They are closed at the top with oil reservoir caps, each having a reservoir cap washer, to each of which there is attached a brush holder and a brush for the application of the oil. Each handle is encased in a handle grip.

Between the handles is the trigger, hinged at the bottom with the trigger pin, and, at the top, it has a trigger thumb piece. The trigger is engaged, near its bottom, by the trigger pawl, set in a recess in the forward surface of the trigger and secured by the trigger pawl pin. The trigger pawl, which is operated by a trigger safety catch pin against the trigger lever spring, actuates the trigger lever which, in turn, operates the trigger bar, engaged with the hand sear which effects the firing of the weapon.

The parts already designated and the spring box, of which one rear and two front spring box fixings are a part; and the recoil spring of which the tension screw handle and tension screw washer are a part of the recoil spring tension screw; constitute the non-recoiling parts of the weapon. The spring box, which houses the recoil spring, is attached to the outer surface of the left hand outside plate, by the engagement of the one rear and two front fixings with the rear and front spring studs.

COMMENT: The inclusion of the "recoil spring" as one of the non-recoiling parts would appear to be an error, or indicate a misnomer. The recoil spring does, in fact, recoil. However, the movement of the recoiling parts of the weapon, to the rear, stretch the recoil spring beyond the limits of its normal condition, to the rear and, upon the cessation of rearward movement, when the recoil force has been completely

expended, the recoil spring "recoils" supplying the necessary force to return the recoiling parts to their forward position.

The barrel, with the barrel attachment barrel disc screwed on the muzzle, the lock, the cross head, the crank with the roller handle and fuzee and the right and left hand recoil plates constitute the recoiling parts of the weapon.

The barrel has parallel cylindrical surfaces for about four inches, at the front end, and one and one-quarter inches, at the rear end, which take bearing in the stuffing box and in the trunnion block respectively. It works to and fro in these bearings when firing, the blow of the forward motion being taken up by a block formed at the breech end of the barrel. On the same block, one on each side of it, are two trunnions to which the right and left hand recoil plates are attached. At the rear end of the barrel there is a cannellure to receive the asbestos packing which prevents the escape of water from the water jacket, at the breech end. At the muzzle end, to prevent the leakage of water from that end, asbestos packing is wound around the barrel and is kept in position against the stuffing box by the pressure of the follower, as above described.

The muzzle is threaded to receive the barrel disc of the muzzle attachment. The barrel of the current British Vickers is chambered to receive the .303 caliber British service cartridge, as it was during the First World War when those used by the United States were chambered to receive the .30 caliber service cartridge then, and now, used by the United States armed forces. The current Japanese copy of the British Vickers is chambered to take their 7.7mm service cartridge which, as has already been mentioned, differs from the British ammunition only in system of measurement and in terminology.

The right and left hand recoil plates are bored to receive the barrel trunnions at their front ends and the journals of the crank at their rear ends.

Along the bottom of their inner surfaces are guides in which the flanges of the lock slide when the gun is firing. There are gaps in these guides, on each of the recoil plates, which permit the lock to be removed from the weapon when it is withdrawn almost to the full extent. A hook extends to the front, at the end of an arm on the front end of the left hand recoil plate, which engages with the bottom lever of the feed box. On the rear end of both recoil plates and on their outside surfaces, there are projections with horizontal surfaces which take bearing in the caps of the gun casing. A carrier supporting spring, riveted with two carrier supporting spring rivets on the inside surface of each of the recoil plates near the barrel trunnion holes, insures that the carrier does not fall below the cams when the weapon is operated by hand with no cartridge gripped in the grooves of the carrier.

EXPLANATION: The presence of these carrier supporting springs is made necessary by the gap which exists between the forward end of the cams and the rear end of the feed box, a space of approximately one-half inch in which the horns of the carriers are centered and occupy approximately one-quarter of an inch when the lock is in its extreme forward position. When a chambered cartridge and a new round, in the belt, are held in the grasp of the carrier they hold the carrier in its extreme upper position and the carrier supporting springs could be dispensed with, but they are necessary at all times the carrier is clear of supporting cartridges.

On the left hand outside plate there is a strong spiral spring, designated as the recoil spring, consisting of the recoil spring, a recoil spring hook, held in engagement at the rear end by the last coil of the spring through a recess in the base of the hook, and, at the forward end, a recoil spring nut. This is a brass split nut having a threaded outside surface, comparable to a screw, and is screwed into the first four or five coils of the recoil spring, as a screw is turned into a nut. Passing through the front end of the spring box and screwed into the recoil spring nut, at its rear end, is the recoil spring tension screw. On its forward end, outside the spring box it is fitted into a recoil spring tension screw washer where it is retained by a recoil spring washer pin. The recoil spring tension screw washer is a "T" shaped piece, having a hole through its cross bar, at right angle to the upright bar.

The recoil spring tension screw handle, peened on each end, is fitted loosely through this hole. The recoil spring group is housed in the spring box, already described with the left hand outside plate to which it is fastened, but easily removeable.

(Continued on page 408)



Artillery

Conducted by: W. C. Minshaw, Major, Ord. Dept.

FUNDAMENTALS OF ARTILLERY WEAPONS

by D. A. WERBLIN, 2nd Lt., Ord. Dept.

PART I

This is one of a series of articles dealing with the fundamentals of artillery weapons without regard to any particular weapon. The basic construction and operation of various components of artillery weapons are discussed, but mechanical details are not described except when necessary to illustrate principles. Automatic weapons are not covered in this series of articles.

ARTILLERY

Artillery is a general term referring to three main types of cannon, namely: guns, howitzers, and mortars. The term denotes weapons which are mounted upon fixed or mobile mounts, and which have calibers equal to or greater than 0.60 inch. All other weapons, with calibers less than 0.60 inch, are classified as small arms, and include machine guns, guns fired from the shoulder, pistols, and revolvers.

The "caliber" of a cannon, as used in the preceding paragraph, is the diameter of the bore, usually in inches, measured between the lands as shown in Figure 6. The term is employed in two ways, however:

- "Caliber .50" defines a cannon whose bore diameter is .50 inch.
- "50-caliber gun" indicates a gun whose length, measured from the front end of the gun to the front face of the powder chamber, is 50 diameters; e.g., a 14-inch, 50-caliber gun is 700 inches long ($14 \times 50 = 700$).

Artillery may be classified under such broad headings as field artillery, seacoast artillery, anti-aircraft artillery, etc. It may be further classified as fixed artillery or mobile artillery.

Fixed Artillery. - This type is permanently installed on land and sea frontiers for the protection of important areas.

Mobile Artillery. - This type is designed for movement from place to place; it may be divided into three main categories as follows:

- Railway Artillery.** - This is designed to be transported on, and fired from, railway cars. Some types of railway artillery may be transported on railway cars and fired from prepared ground positions.
- Self-propelled Artillery.** - This combines the weapon and motive power into a single vehicle.
- Towed Artillery.** - This depends upon outside motive power (primer mover) such as a truck or tractor.

TYPES OF CANNON

A mortar is a comparatively short, stubby weapon which operates between elevations of approximately 45° and 85° and has a low muzzle velocity.

A howitzer is a medium-length cannon which operates at elevations of 0° to approximately 65° and has a medium muzzle velocity.

A gun, sometimes referred to as a rifle, is a long-barrelled cannon which operates at elevations of 0° to 65° and has a high muzzle velocity. The gun of today possesses practically all of the characteristics of the howitzer and might be called a long-barrelled howitzer.

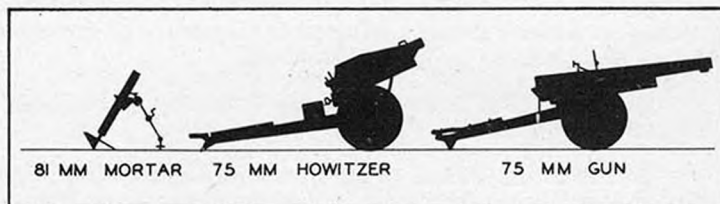


Fig. 1 -- Types of cannon

In many instances of practice firing of cannon, guns of smaller caliber are employed to reduce the expense of ammunition. These auxiliary guns are called subcaliber cannon, of which there are two types:

- Subcaliber guns.** - A subcaliber gun is a gun which is mounted on the outside of, and above, the parent cannon.
- Subcaliber tubes.** - A subcaliber tube is a tube (see definition below) which is mounted in the bore of the cannon with which it is used.

COMPONENTS OF AN ARTILLERY WEAPON

Essentially, an artillery weapon consists of a cannon, a breech mechanism, and a carriage. These components are described in this and later articles of this series.

CANNON

The tube, or barrel, of a cannon generally refers to the entire cannon assembly less the breech mechanism. The term tube may also be used to denote the inner cylinder of the cannon, around which strengthen-

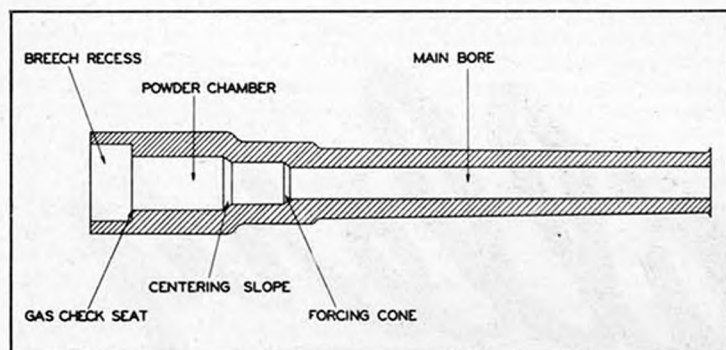


Fig. 2 -- Interior components of a tube

ing hoops may be shrunk or reinforcing wire may be wound (See Figures 3 and 4.)

The interior of a tube (see Figure 2) is subdivided into six parts as follows:

Breech recess. - This is the space at the rear of the tube which is prepared to receive the breechblock.

Gas check seat. - This is a seat against which the obturator fits to form a gas-tight seal.

Powder chamber. - The powder chamber is that portion of a tube which receives the powder charge, or, in the case of fixed ammunition, holds the cartridge case.

Centering slope. - The centering slope is the portion of the bore just forward of the powder chamber. It slopes forward to lift the projectile from the powder chamber floor and centers it on the main bore.

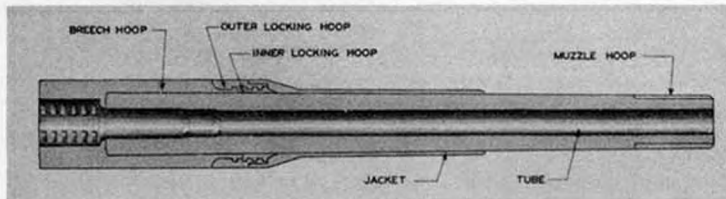


Fig. 3 -- Built-up cannon

Forcing cone. - The forcing cone, which is made by cutting away the rifling at the rear of the main bore, assists in centering the projectile and stops its forward motion when it is rammed.

Main bore. - This is the forward part of the tube, containing the rifled portion of the bore.

Mention has been made of fixed ammunition. According to the method of assembly and the manner of loading into the cannon, ammunition is classified into three main types as follows:

a. **Fixed Ammunition.** - This type comprises a cartridge case (which contains the propellant) whose base contains the primer, and whose forward end is crimped to the projectile so that the entire round is integral and all components are loaded into the cannon as a unit.

b. **Semifixed Ammunition.** - This type differs from fixed ammunition in that, while the projectile and cartridge are issued assembled and are loaded into the cannon as a unit, the cartridge case is not permanently attached to the projectile, but may be removed from it at the firing point for the purpose of varying the amount of the propelling charge.

c. **Separate-loading Ammunition.** - This type is ammunition in which the round consists of a primer, a propelling charge, and a projectile, each of which is separately loaded into the cannon.

CANNON CONSTRUCTION

A built-up cannon is one in which the tube is reinforced by means of hoops shrunk around it. The number and arrangement of these hoops vary with different types and calibers of cannon. Hoops are named according to their position on the tube, e.g., breech hoop, muzzle hoop, etc. Locking hoops are used to join adjacent hoops.

A wire-wrapped cannon is one in which the tube is reinforced by winding wire of high tensile strength around it. The number of layers of wire will vary according to the strength requirements of different cannon. Depending upon the design of the cannon, the wire is incased in either of the two following ways:

By placing a jacket over the wire wrapping.

By shrinking on hoops as in the built-up cannon.

A monobloc cannon is one which is formed in one piece from a forging or casting. The casting may be either a simple casting or a centrifugal casting (made by pouring molten steel into a horizontal cylindrical mold which is rotating at high speed). The forging or casting is subjected to either or both of the following processes:

Heat treatment.

Cold-working or autofrettage. In this process, the forging or casting is initially stressed by applying hydraulic pressure to the inside of the bore.

DANGER!

If you haven't heard about this, read it carefully and REMEMBER IT. If you know about it, read it again, and impress it further upon your mind.

The equilibrator chains on the 90mm AA Gun Mount, M1A1, may wear out and break after as few as 3000 cycles of elevation travel from maximum to minimum.

Any individual standing in front of the equilibrator cylinder within a distance of 125 feet from the mount will undoubtedly be severely injured if the chain breaks.

It is advisable to replace all equilibrator chains in all mounts which have received considerable working. It is "better to be safe than sorry."

It is imperative for safety purposes that no individual under any circumstances stand in front of an equilibrator cylinder at the time the gun is being elevated or depressed to any degree, either by hand or by remote control.

BREECH RING

A breech ring (see Figure 5) is a ring, or bushing, which is screwed or shrunk onto the rear end of a cannon. It provides a seat for the breechblock. This seat is of greater diameter than that of the tube and hence provides a greater screw-thread bearing area than the tube could provide. The increase in thread area allows the length of the block to be reduced.

RIFLING

Rifling (see Figure 6) consists of a number of spiral grooves in the surface of the main bore. Its purpose is to impart rotation to a

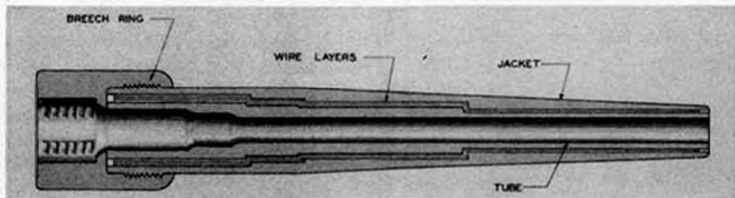
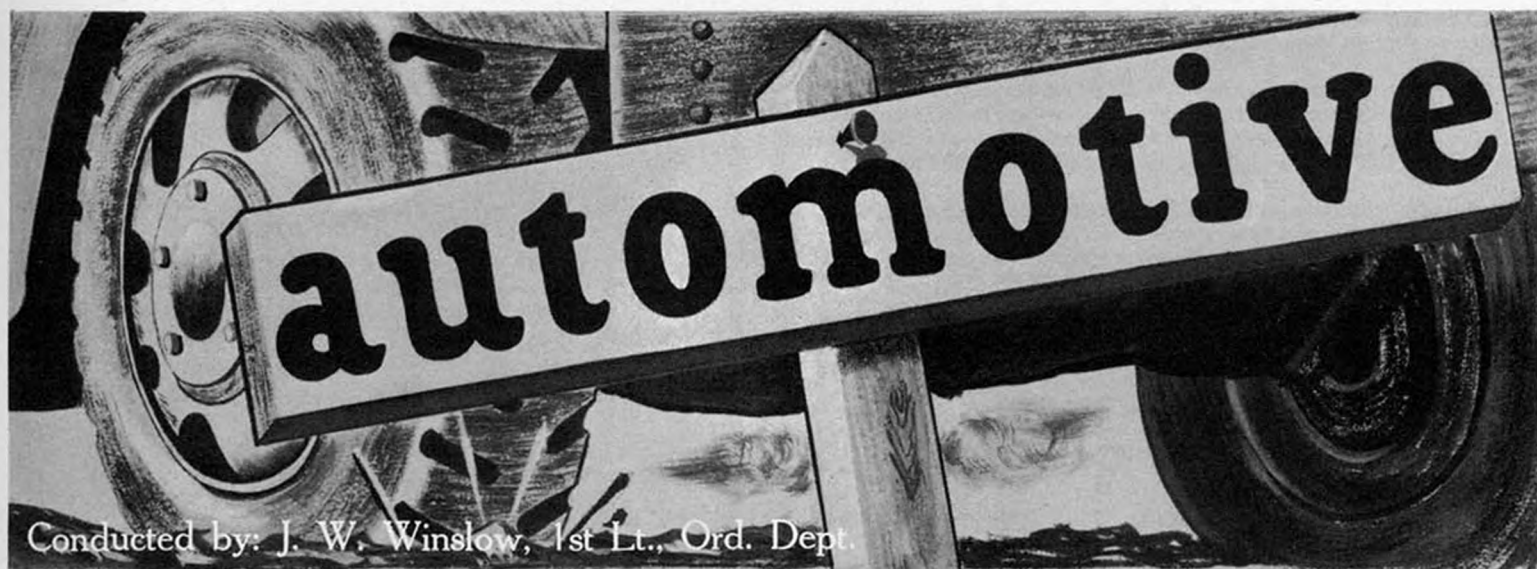


Fig. 4 -- Wire-wrapped cannon

projectile, thereby stabilizing it in flight. The terms pertaining to rifling are as follows:

Grooves. - The grooves are the depressed portions of the rifling. The number and depth of grooves vary with different cannon. The usual number of grooves is from six to nine times the caliber (in inches).

Twist. - Rifling twist is defined as the inclination of the spiral grooves with respect to the axis of the bore. Twist may be uniform or (Continued on page 408)



Conducted by: J. W. Winslow, 1st Lt., Ord. Dept.

Disconnect the unit and all linkages within the tank in the usual manner: (subparagraphs a and (1), (2), (3), (4) and (5) b of paragraph 7, Section III, pages 9-11, TM 9-1750).

The preliminary procedure of disconnecting the unit having been accomplished, three (3) bolts (final drive studs) are removed from each side. By using special bolts at least an inch longer than the studs, the lifter assembly may be attached as shown in Figure 1. The tow bar is then connected and the wrecker crane hook engaged as shown in Figure 2.

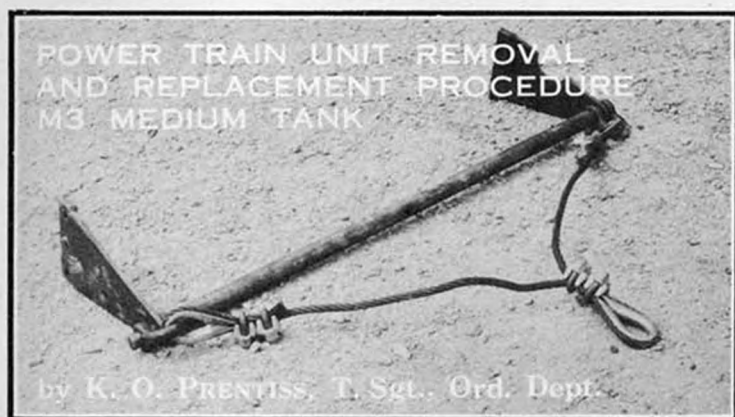


Fig. 3

Fasten a block to the boom and run the rear winch line through it. Pass a cable around the tow shackles, forming a sling as shown in Figure 3, and fasten the rear winch line to this sling. Using two means of hoisting the unit permits better control of the unit, since it often must be tipped forward or backward. This is particularly true when the unit is being replaced.

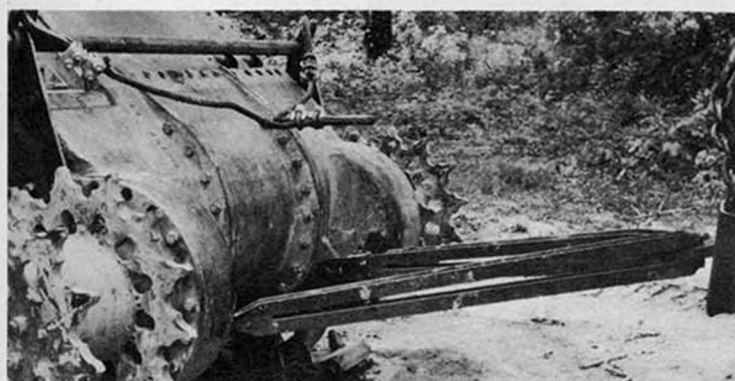


Fig. 1



Fig. 2



Fig. 4

The bolts fastening the unit to the hull having been removed, the unit is now ready for removal as shown in Figure 4.

The unit is moved forward by moving the wrecker forward. In order to accomplish this effectively it may be necessary to raise or lower the unit by using either or both of the boom lines. Various steps in the removal of the unit from the hull are shown in Figures 5, 6, 7 and 8.

Figure 9 shows the unit entirely removed and ready for transportation to the shop. Or, a unit being replaced would appear as shown in this figure, with the wrecker being backed toward the hull which is to receive the replacement unit.

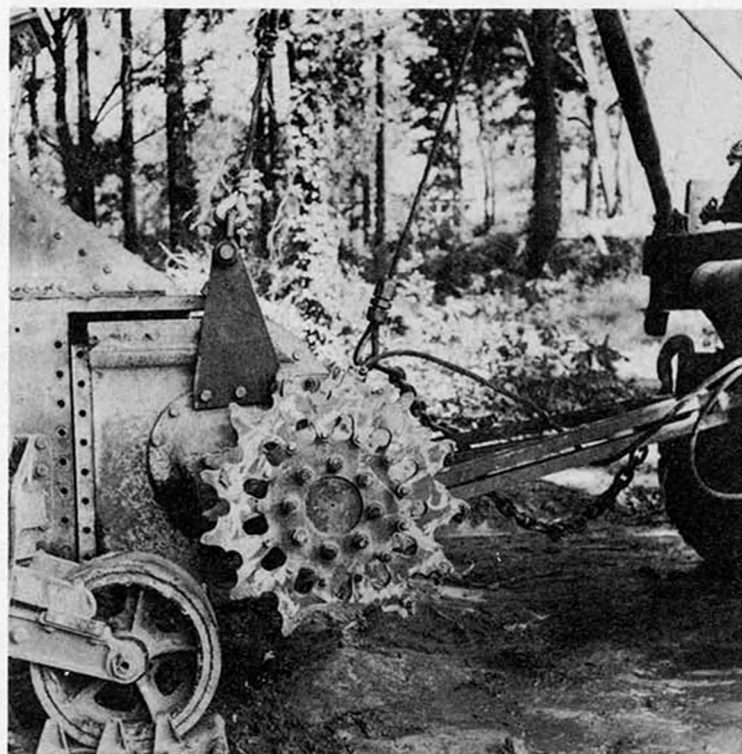


Fig. 5

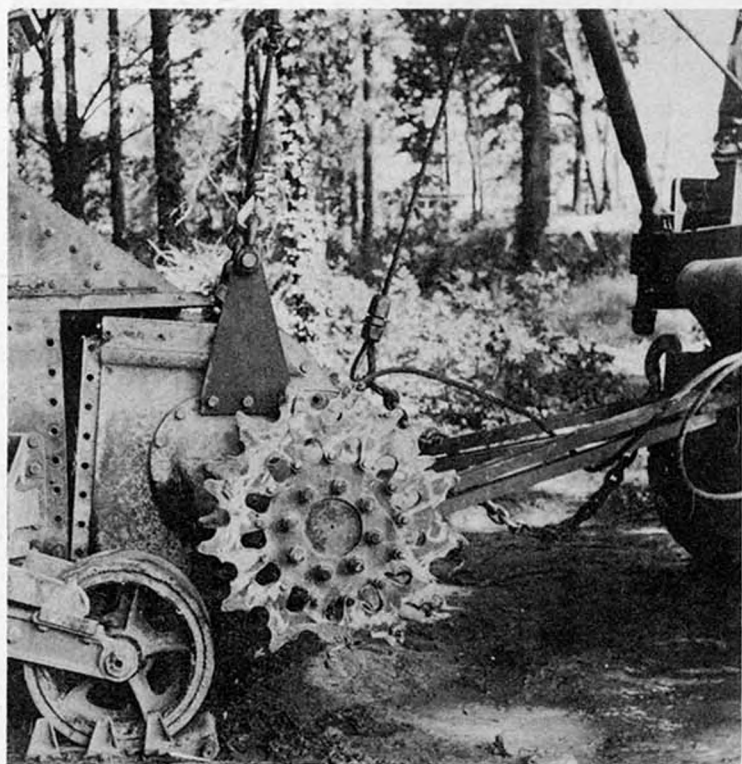


Fig. 6

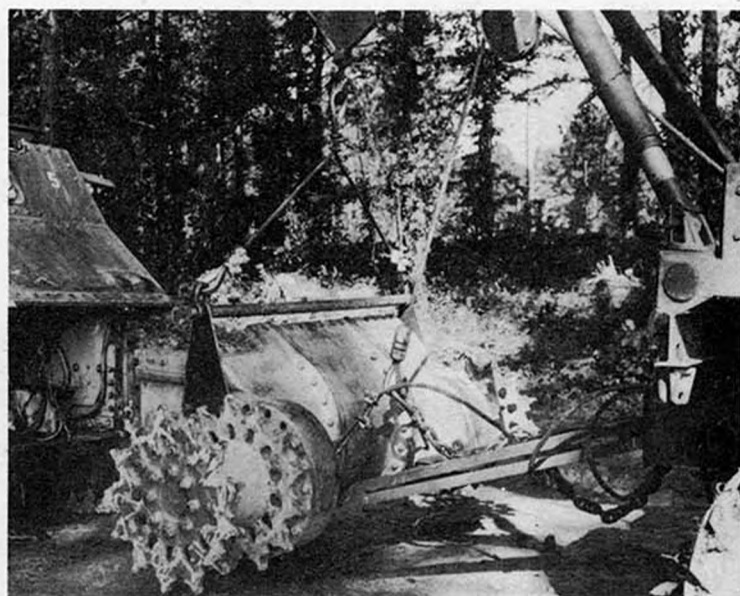


Fig. 7

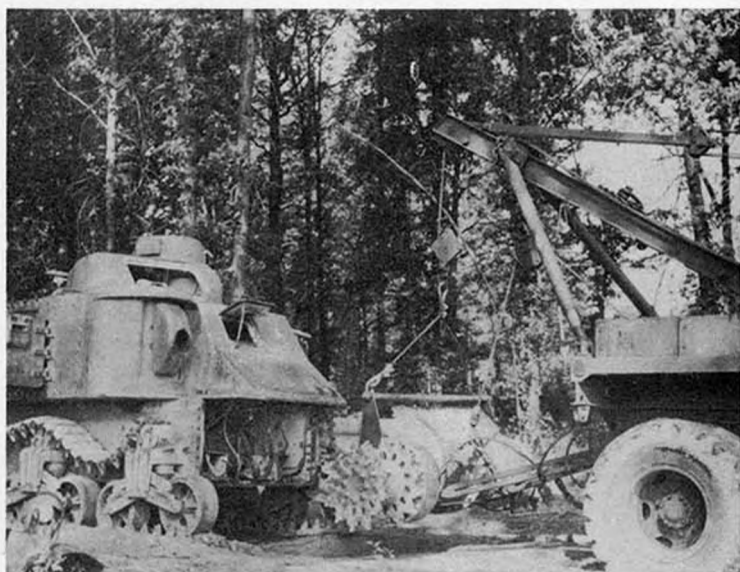


Fig. 8

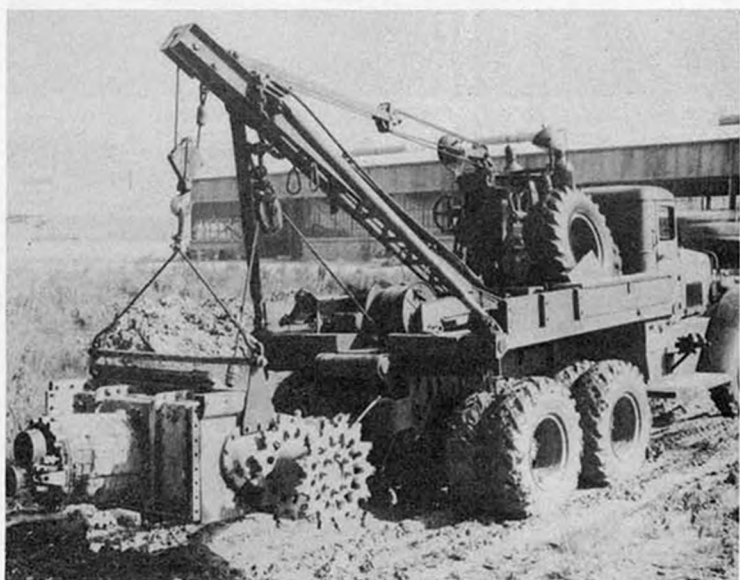
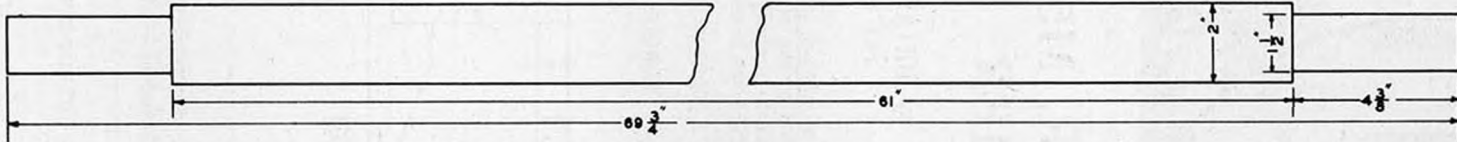


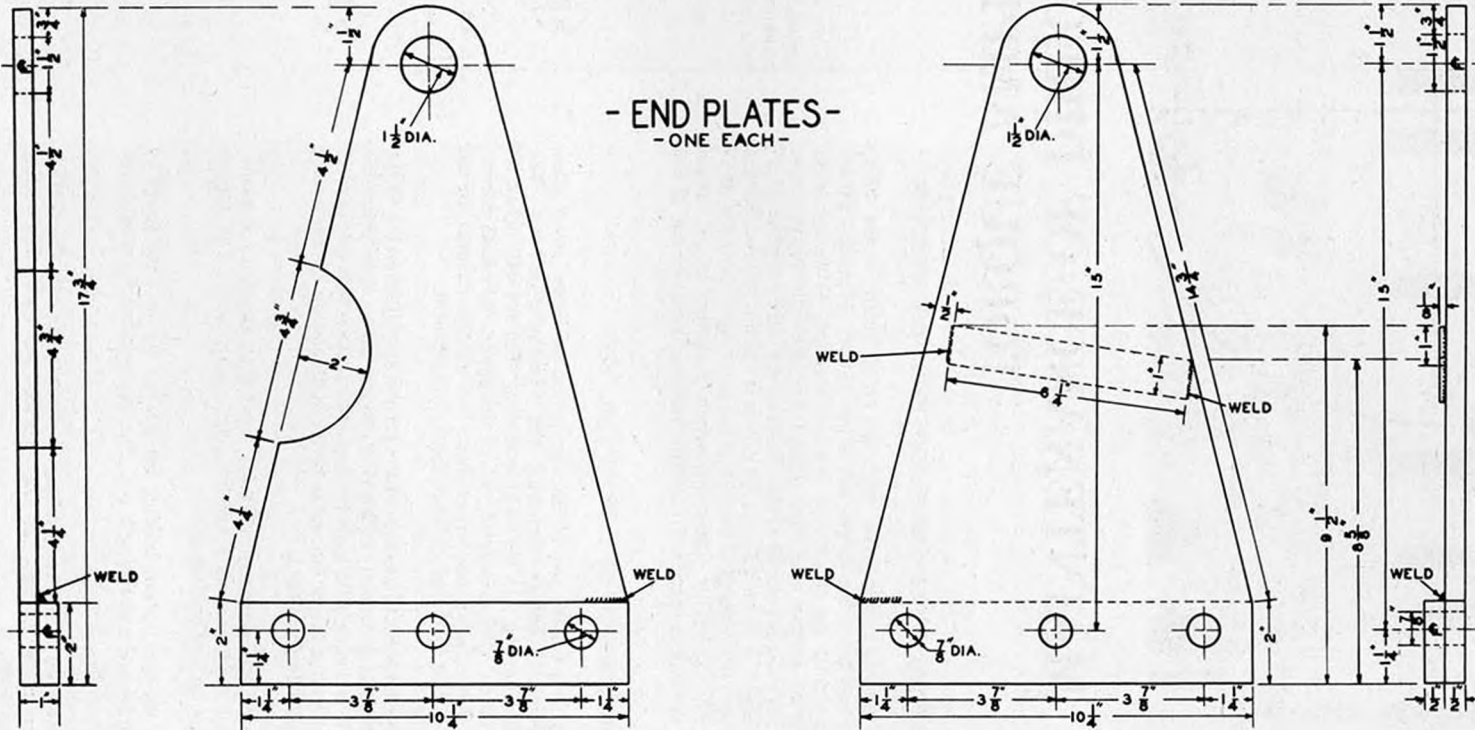
Fig. 9

LIFTER-POWER TRAIN

MEDIUM TANK



- SHAFT-





MAINTENANCE OF DIRECTOR, M5 AND M6 TORQUE AMPLIFIER

REMOVAL OF THE TORQUE AMPLIFIER FROM THE DIRECTOR

Remove the top cover plate. Note the color coding of the wires and disconnect them from the torque amplifier motor. Manually rotate the input coupling until the set screw can be loosened. Slide the input coupling toward the torque amplifier until it becomes disengaged with the cylinder of the variable speed drive. Remove the three screws holding the torque amplifier to the base of the director. If the azimuth torque amplifier is being removed, turn the elevation handwheel until the telescopes are at 90°. Manually rotate the output coupling of the torque amplifier until the slot is vertical. Lift the torque amplifier out of the director.

DISASSEMBLY OF TORQUE AMPLIFIER

If a lead seal covers one of the screws on the large cover plate it should be removed before removing the remaining screws. The counterbored shoulder on this screw hole is very thin and will break off unless care is taken. Three screws, two in the upper right hand corner and one in the lower left hand corner, hold the grease channel to the cover and need not be removed. Do not damage the gasket.

Remove the two bolts which hold the torque amplifier motor to the casting. Slide the motor directly to the rear, taking care not to injure the spiral gear as it is brought through the recess. It may be necessary to turn the vertical shaft a slight amount in order to disengage the two spiral gears as the motor is pulled out.

Remove the four screws holding the input shaft assembly in place. Remove the input shaft assembly and the four separators. The rubber gasket should not be lost or damaged.

Remove the two screws holding the guard. Remove the guard by reversing it end for end and lifting it out. The two separators should also be removed.

Remove the three screws holding the bronze gear on the shaft at the lower portion of the casting. The gear may now be removed by pulling it straight to the front.

Remove the two short and the two long screws which hold the vertical shaft assembly to the casting. If the assembly is pinned, drive out the upper dowel pin. Shift the vertical shaft assembly from side to side, working it loose and pulling it forward at the same time.

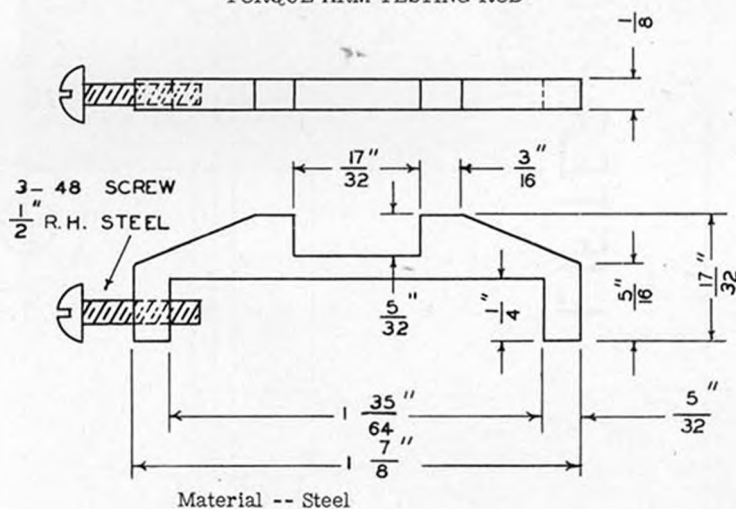
If sealed, remove the lead seal covering the screw on the small cover plate, then remove the remaining screws and the cover. Do not damage the gasket.

by BRIAN O. MONTGOMERY

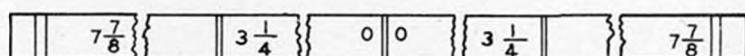
1st Lt., Ord. Dept.

Remove all grease, oil or moisture from your hands. Clamp the torque arms apart by use of the special holding tool or wrap a strip of masking tape which is about 1/2" by 10" between the two torque arms. This is to hold the arms in position while the bands are being removed.

TORQUE ARM HOLDING TOOL
and
TORQUE ARM TESTING ROD



ARM FOR OUTPUT COUPLING OF TORQUE AMPLIFIER

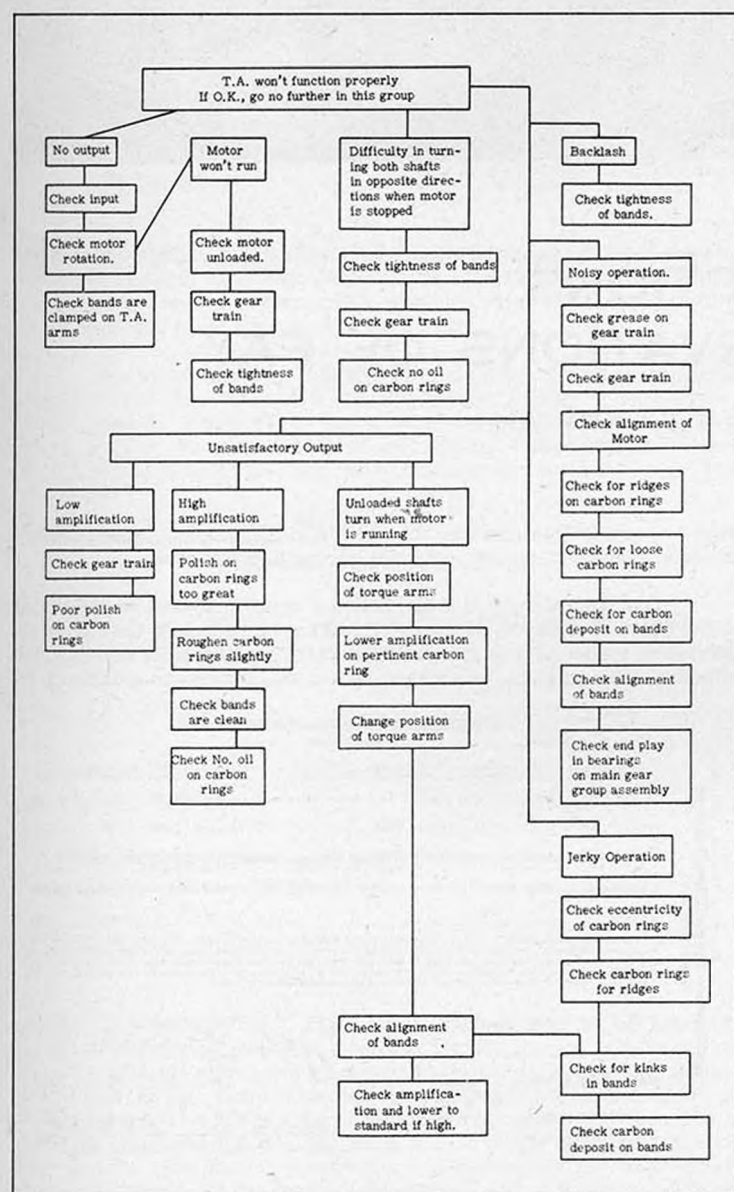


Material -- 3/16" x 3/16" x 14-3/4" Steel

The following nomenclature should be learned prior to further disassembly. Turn the torque amplifier until the small recess is facing

you. The carbon ring on the right is part of the input drum assembly. The carbon ring on the left is part of the output drum assembly. The two assemblies are not connected except by the ends of the bands which are clamped to the torque arms. The long arm, having one screw at each end, is the input torque arm and is also part of the input drum assembly. The short arm, having two screws at each end, is part of the output drum assembly. The steel bands are wound around the carbon rings, one band on each ring. The humps along the bands are called "solder blobs" and

TORQUE AMPLIFIER TROUBLE SHOOTING



serve to keep the band in alignment. For reference in reassembly note the direction in which each band leaves the output torque arm.

Turn the input torque arm (long) until it is facing you. Place the index finger of the left hand on the solder blob farthest to the right above the input torque arm. This is to prevent the band from unwinding. Use a screwdriver of the correct size and loosen the screw on the right end of the input torque arm. Do not let the screwdriver slip and damage the carbon ring. Grasp the band with the fingers of the right hand and pull it to the front. Use the left hand to hold the output coupling and prevent slack in the band. Slip the band under the input torque arm each time it comes around, taking care not to kink or otherwise damage the band. Place the band on a clean flat surface. Remove the band on the output drum in a similar manner.

Remove the screws and clamps from both torque arms. Remove the special holding tool or masking tape. Wrap a strip of clean paper which is about 5/8" by 10" around each carbon ring in order to protect

it during the remaining disassembly. Secure the paper in place with a short piece of masking tape. Do not touch the carbon ring with the tape or with the fingers.

Scribe a reference mark on the input drum assembly aluminum collar in relation to the casting, when looking from the front of the torque amplifier. This is to allow the drum to be returned to the casting in the proper position for assembly of the input shaft assembly which is held to the aluminum collar. Remove the four screws which hold the input drum assembly to the casting. Turn the input torque arm opposite the small recess in the upper part of the casting (about 11 o'clock when facing it from the side). Remove the input drum assembly by easing it out to the right. Do not cramp the assembly against the casting during removal as a sudden withdrawal may cause irreparable damage to the carbon ring. If the assembly becomes cramped, tap it gently back into place and try again.

The bearing assembly on the right end of the intermediate gear group assembly (idler) may now be forced out to the right. Some of these come very tight and may have to be driven out with the aid of a wooden block or brass drift. Do not bend the shaft or damage the bearing if this becomes necessary. Remove the spring, shaft, and gear by pulling them to the right after the bearing assembly has been removed.

Turn the torque amplifier until the rear is facing you. Remove the four screws which hold the output drum assembly to the casting. Gently loosen the output drum assembly and start it out to the left. Do not cramp the assembly against the casting. Turn the output torque arm until the end on which the band was clamped is facing you. Note whether there is a slight recess cut in the casting on the inside at about 11 o'clock. If there is, place the end of the output torque arm opposite this recess. Gently twist the output drum assembly so that the opposite end of the output torque arm starts through the casting first. Be extremely careful that the carbon ring is not damaged. Pull the output drum assembly out to the left. The clearance for this assembly is quite small. Care and patience are needed to successfully perform this operation.

Remove the main gear group assembly by driving out the spring pin and pulling the shaft toward the front of the torque amplifier. The composition and steel gear can then be lifted out through the side recess. It may be necessary to replace the screws which held the bronze gear on the end of the shaft in order to give some means of grasping the shaft to pull it out. Do not burr this shaft. The bearing and bushing may be removed by removing the screw and plate (A182273) and driving it toward the front. Upon reassembly of this part it is well to note that the input drum assembly has been left sufficient room to clear when it is reassembled.

To replace the carbon ring on the input drum assembly the following procedure should be followed: Drive out the spring pin holding the gear to the torque arm. Slide the torque arm out of the drum assembly. In the event it is desired to remove the bearings the retainers must also be removed. To do this, remove the external retaining ring (spring clip) holding the carbon ring assembly on the spindle assembly and lift off the carbon ring assembly by grasping the fiber gear and working the assembly off the bearings. Remove the three screws going through the carbon ring into the retainer. Remove the retainer. Remove the carbon ring.

Replacement of the carbon ring is accomplished in a similar manner by reversing the procedure.

The output drum assembly may be accomplished in the same manner, the only difference is that the output coupling is removed instead of the gear. Drive out the pin holding the output coupling to the output torque arm and slide the coupling off.

Reassemble the torque amplifier in the reverse order, with one exception. The bands should be replaced after all other parts have been replaced. This is done chiefly to safeguard the carbon rings and bands from getting oil or moisture on their surfaces.

ADJUSTING THE TORQUE AMPLIFIER DURING REASSEMBLY

Assemble all mechanical parts and check each gear train for free operation before replacing the bands. This is done to prevent getting grease, oil or moisture on the bands or carbon rings due to handling. Reassemble individual parts in the reverse order of disassembly.

Check that the following conditions are satisfactorily met before replacing the bands: Bands are clean, free of grease, oil or moisture. (Continued on page 408)



Conducted by: J. E. Dempsey, Capt., Ord. Dept.

ALLOTMENTS, DEDUCTIONS, AND RESERVATIONS OF PAY

by GUS L. KREISCHER, Sgt., Ord. Dept.

In civilian life, financial transactions between employer and employee are usually confined to the payment and receipt of a salary or wage. The War Department, however, provides a number of services of a financial nature to officers and enlisted personnel of the Army in addition to this primary one of making payment for services rendered. The soldiers' privilege of making allotments from his pay is one of the most valuable of these services. While serving in the United States, the man who has an allotment is relieved of the troublesome details connected with making monthly remittances, but upon embarking for a combat area overseas, the importance of this privilege assumes greater significance. There he will find that facilities for personal communication back home, and especially for the transmission of money, are few, and at best irregular. As many Ordnance men will see foreign service, it is incumbent upon each one to determine his situation with regard to allotments before he embarks. This exercise of foresight will serve two purposes: First, it will prevent delay in effecting payments to allottees and second, it will relieve administrative offices overseas of a great deal of work necessary in the preparation of applications, etc., which can ill be spared from more vital operations.

Allotments, deductions, and pay reservations may be made by military personnel for a number of specific purposes. These are classified as listed below, and will be discussed individually under each heading:

- Class "E" Allotment
- Class "D" Allotment
- Class "N" Allotment
- Class "F" Deduction
- Class "A" Pay Reservation

CLASS "E" ALLOTMENTS. - Probably the allotment most familiar to men in the Army is the long established Class "E" Allotment. Deductions from the pay of officers and enlisted men may be authorized under this class for three purposes: First, to make remittances to individuals for the support of the allotter's family or dependent relatives; second, to banks in the United States for the purpose of establishing accounts for the benefit of the allotter's family or dependent relatives, or for his own benefit to commercial life insurance companies for the purpose of paying premiums on commercial life insurance on the life of the allotter.

Application for Class "E" allotment will be prepared in duplicate on W.D., A.G.O. Form No. 29 (See Figure No. 1) which will be disposed

of as follows: Original copy to be forwarded to the Chief of Finance, Allotment Division, Washington, D. C. (disposition indicated on left edge of form reading (Send directly to Finance Officer, U. S. Army, Washington, D.C.) to be amended to show Chief of Finance, Allotment Division as recipient. See Fig. 1); the duplicate copy to be retained by the allotter

when he certifies his own pay voucher (as in the case of officers) and by the commanding officer or personnel officer in other cases.

The original copy of W.D., A.G.O. Form No. 29 will be forwarded to the Chief of Finance, Allotment Division, in sufficient time to reach that office by the 10th of the month in which the allotment is to become effective. For instance, an application for an allotment to commence on

AUTHORIZATION FOR ALLOTMENT OF PAY
(See AR 38-5220)

Don (Last name) John (First name) J. (Middle initial) 32178678 (Army serial No.) S/Sept (Grade) 150th Ord. Co. (M) (Company, regiment, or unit or service)

The (Name of allotter) named above hereby authorizes a Class E allotment of his pay in the amount of \$ 20.00 per month for the period of 6 months, commencing Sept 1, 1942, and expiring Feb 28, 1943

to Mrs. Caroline Don (Name of allottee) 775 Talip Avenue, Franklin Square, New York (Address) (City, town, or post office) (State)

Date of allotment Oct. 23 1942. When other than "Pay of the Army" is selected, state P. A. chargeable

I hereby state that the purpose for which this allotment is granted is solely for the support of wife, child, or dependent relative; or if made for the payment of life insurance premiums, the insurance (including endowments and/or twenty (or other) payment policies) is on the life of the allotter only; that a policy therefor has been issued and the first premium paid thereon; that the insurance constitutes the major and not a merely incidental or collateral element of the transaction; and that the allotment is made in favor of the insurance company issuing the policy and not in favor of a bank or other agent. I also state if allotment is in favor of a bank that deposit should be made to the credit of

(Name) John J. Doe (Signature of allotter)

Place Fort Blank, Illinois Date Sept 2, 1942

Entered on service record 9/2/42

W.D., A.G.O. Form No. 29
October 10, 1941

(Signature of commanding officer or personnel officer, with grade and approval)
D. O'Connell, Capt. Inf.

Fig. 1

September 1st must reach the office of the Chief of Finance, Allotment Division, by September 10th. Receipt of the application will be acknowledged by the Chief of Finance, but the amount is entered on the payroll without waiting for the acknowledgment. Class "E" Allotments must be made for a definite period of full months beginning with the first day of the month for which deduction will be made from the allotter's pay, and terminating on the last day of the month in which the allotment expires, e.g., an allotment commencing in September for a period of six (6) months would begin on September 1st and terminate on February 28th.

Changes in the amount of Class "E" allotments may be made at the option of the allotter, and will be accomplished by requesting such change on W.D., A.G.O. Form No. 29, marked "Substitute" (See Fig. 2 which illustrates the filling out of the form required to reduce a Class "E" allotment from \$20.00 to \$10.00). The procedure followed in submitting these forms will be identical with that followed in the case of the original application. If the change requested is a decrease in the monthly rate of the allotment, deductions will continue at the old or higher rate

Chief of Finance, Allotment Div., Washington, D. C.
Send directly to ~~Personnel Officer, Headquarters, 1st Div.~~

SUBSTITUTE **AUTHORIZATION FOR ALLOTMENT OF PAY** **SUBSTITUTE**
(See AR 35-5520)

Doe, John J. 32178678 S/Sgt. 150th Ord. Co. (M4)
(Last name) (First name) (Middle initial) (Army serial number) (Grade) (Company, regiment, or unit or service)

The ~~enlisted man~~ named above hereby authorizes a Class E allotment of his pay in the amount of \$ 10.00 per month for the period of 6 months, commencing November 1, 1942, and expiring April 30, 1943.

To Mrs. Caroline Doe 775 Tulip Avenue, Franklin Square, N. Y.
(Name of allottee) (Number and street or rural route) (City, town, or post office) (State)

Date of enlistment October 23, 1941. When other than "Pay of the Army" is affected, state P. A. chargeable.

I hereby state that the purpose for which this allotment is granted is solely for the support of wife, child, or dependent relatives; or if made for the payment of life insurance premiums, the insurance (including endowments and/or twenty (or other) payment policies) is on the life of the allottee only; that a policy therefor has been issued and the first premium paid thereon; that the insurance constitutes the major and not a merely incidental or collateral element of the transaction; and that the allotment is made in favor of the insurance company issuing the policy and not in favor of a bank or other agent. I also state if allotment is in favor of a bank that deposit should be made to the credit of

(Name) John J. Doe (Signature of allottee)
(Signature of allottee)

Place Fort Blank, Illinois Date NOV. 3, 1942

Entered on service record 11/3/42 J. D. O'Connell
W. D., A. G. O. Form No. 29 October 11, 1941 "Strike out words not applicable."
J. D. O'CONNELL, Capt., Inf., Per. O.

Fig. 2

until acknowledgement of receipt of change has been received from the Chief of Finance, Allotment Division. If, on the other hand, the change requested is for an increase in the allotment rate, the deduction will be made immediately at the new or higher rate.

The suspension of a Class "E" allotment may be made for a short period of time upon request of the Commanding Officer or the Unit Personnel Officer. Requests for suspensions will be made on W.D., A.G.O. Form No. 30-1 (See Fig. 3) in duplicate, sending the original to the Chief of Finance, Allotment Division, and retaining the duplicate copy. Sus-

Chief of Finance Allotment Div., Washington, D. C.
Forward directly to ~~Personnel Officer, Headquarters, 1st Div.~~

NOTIFICATION OF SUSPENSION OF ALLOTMENT
(See AR 35-5520)

Doe, John J. 32178678 S/Sgt. 150th Ord. Co. (M4)
(Last name) (First name) (Middle initial) (Army serial number) (Grade) (Company, regiment, or unit or service)

The Class E allotment of the ~~enlisted man~~ named above in the amount of \$ 10.00 per month commencing November 1, 1942, to Mrs. Caroline Doe, 775 Tulip Ave., Franklin Square, N. Y. (Name and address of allottee)

entered on pay rolls of 150th Ord. Co. (M4) (Company or detachment) is hereby suspended for a 6 months effective from January 1, 1943, to 1943, because of Sk NLD AR 35-1440 (Not exceeding 2 months)

Address for future reference (Number and street or rural route) (City, town, or post office) John J. Doe (Signature of allottee)

Place Fort Blank, Illinois

The ~~enlisted man~~ was last paid to December 31, 1942 and allotment deducted to December 31, 1942

Deduction for allotment will be continued on pay ~~rolls~~ until acknowledgment is received of this notification, as required by AR 35-5520.

Date January 4, 1943 J. D. O'Connell
W. D., A. G. O. Form No. 30-1 November 1, 1939 "Strike out words not applicable."
J. D. O'CONNELL, Capt., Inf., Per. O.

Fig. 3

pension of payments under Class "E" allotments may be for a definite period of full months or for an indefinite period. If for a definite period, the Chief of Finance will resume payments on the allotment at the expiration of that period. If the suspension is requested until further notice, no further payments will be made until request is received by the Chief of Finance, Allotment Division, on W.D., A.G.O. Form No. 30-1 (Reverse) (See Fig. 4). This form is prepared in duplicate by the personnel officer concerned, who sends the original copy to the Chief of Finance, Allotment Division, and retains the duplicate copy. In either case (if suspension is for a definite or indefinite period) the first payment of the allotment upon resumption of payments will include the back payments which accrued during the period for which suspended as well as the allotment for the current month. For example, if a Class "E" allotment of \$20.00 per month were suspended for two months, the payment for the third month would be for \$60.00.

When a Class "E" allotment has run for the period designated in the application, deductions and payments will cease without notification to the Chief of Finance. If, however, discontinuance is desired before the expiration of the normal term of the allotment, formal notification of that fact must be sent to the Chief of Finance, Allotment Division. This notice is prepared on W.D., A.G.O. Form No. 30 in duplicate (See Fig. 5). The original is sent to the Chief of Finance, Allotment Division, Washington, D.C., and the duplicate is retained by the personnel officer. This notice of discontinuance must be sent so that it will reach Washington, D. C., by the 15th of the month following that in which discontinuance is to become effective. For example, if discontinuance is requested effective

on October 31st, Form 30 must be in the office of the Chief of Finance, Allotment Division by the 15th of November. Deduction for these allotments will continue until acknowledgement has been received from the Chief of Finance. Class "E" allotments may be discontinued prior to the normal date of expiration at the request of the allotter, or without his request in the following cases: Upon death, discharge, desertion, or mental incapacitation of the allotter; whenever the available pay of the allotter is insufficient to meet the deduction for an allotment; and whenever the status of an allotter changes from that of an enlisted man to that of a Warrant Officer or Commissioned Officer, or vice versa. Normally any amount deducted for a Class "E" allotment subsequent to date of discontinuance is refunded to the allotter.

Chief of Finance, Allotment Div., Washington, D. C.
Forward directly to ~~Personnel Officer, Headquarters, 1st Div.~~

NOTIFICATION OF REINSTATEMENT OF ALLOTMENT
(See AR 35-5520)

Doe, John J. 32178678 S/Sgt. 150th Ord. Co. (M4)
(Last name) (First name) (Middle initial) (Army serial number) (Grade) (Company, regiment, or unit or service)

The Class E allotment of the ~~enlisted man~~ named above in the amount of \$ 10.00 per month commencing November 1, 1942, to Mrs. Caroline Doe, 775 Tulip Ave., Franklin Square, N. Y. (Name and address of allottee)

entered on pay rolls of 150th Ord. Co. (M4) (Company or detachment) which was suspended indefinitely beginning January 1, 1943, is hereby reinstated effective March 1, 1943. Deductions for period of suspension will be made on pay ~~rolls~~ for the month of March 1943, in which reinstatement becomes effective.

Place Fort Blank, Illinois John J. Doe (Signature of allottee)

The ~~enlisted man~~ was last paid to December 31, 1942, and allotment deducted to December 31, 1942

Date March 4, 1943 J. D. O'Connell
W. D., A. G. O. Form No. 30-1 November 1, 1939 "Strike out words not applicable."
J. D. O'CONNELL, Capt., Inf., Per. O.

Fig. 4

CLASS "D" ALLOTMENTS. - This class of allotment was provided for the purpose of enabling Army personnel to make premium payments on U. S. Government Life Insurance. This type of insurance was inaugurated by the World War Veterans Act of 1924 which made available to officers and enlisted men the following types of life insurance policies: Ordinary Life, twenty payment life, thirty payment life, twenty year endowment, thirty year endowment, endowment at age sixty-two, and a five year convertible term policy. The monthly premiums for each \$1,000 of insurance taken at age 21 varied from \$.65 for the five year term policy to \$3.31 for the 20 year endowment policy. The National Service

Chief of Finance, Allotment Div., Washington, D. C.
Forward directly to ~~Personnel Officer, Headquarters, 1st Div.~~

NOTIFICATION OF DISCONTINUANCE OF ALLOTMENT
(See AR 35-5520)

Doe, John J. 32178678 S/Sgt. 150th Ord. Co. (M4)
(Last name) (First name) (Middle initial) (Army serial number) (Grade) (Company, regiment, or unit or service)

The Class E allotment of the ~~enlisted man~~ named above in the amount of \$ 10.00 per month commencing November 1, 1942, to Mrs. Caroline Doe, 775 Tulip Ave., Franklin Square, N. Y. (Name and address of allottee)

entered on pay rolls of 150th Ord. Co. (M4) (Company or detachment) is hereby discontinued, effective March 31, 1943, because of Soldier's desire. Date of separation Not separated.

† Address for future reference (Number and street or rural route) (City, town, or post office) John J. Doe (Signature of allottee)

Place Fort Blank, Illinois

The ~~enlisted man~~ was last paid to March 31, 1943, and allotment deducted to March 31, 1943

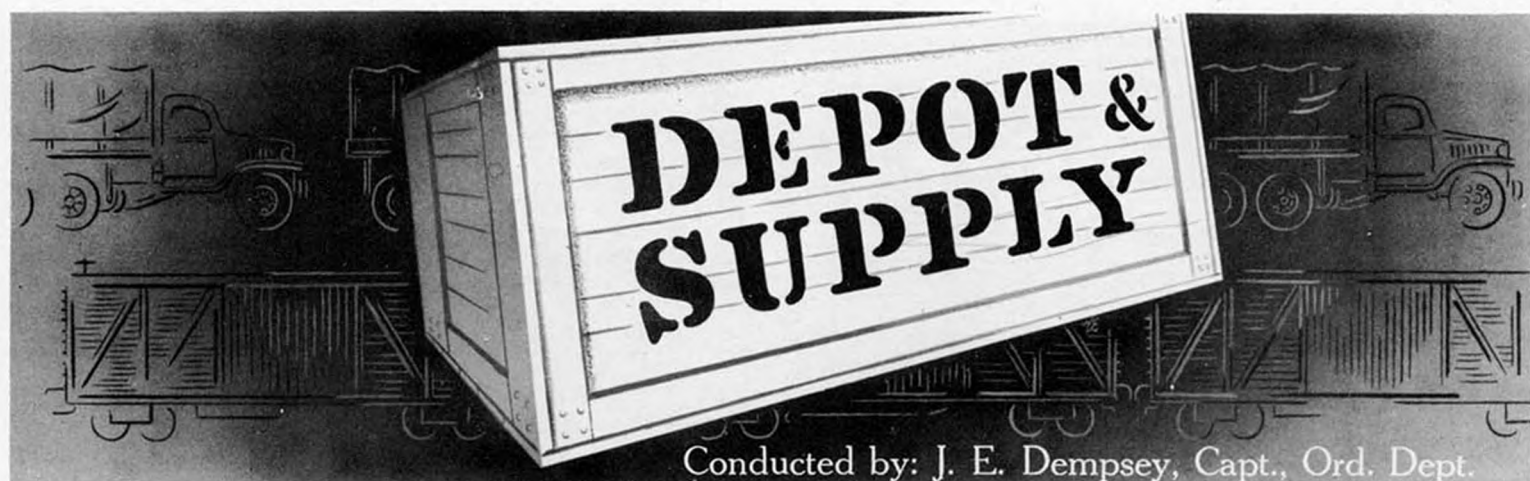
† Deduction for allotment will be continued on pay ~~rolls~~ until acknowledgment is received of this notification, as required by AR 35-5520.

Date April 4, 1943 J. D. O'Connell
W. D., A. G. O. Form No. 30 March 1, 1941 "Strike out words not applicable."
J. D. O'CONNELL, Capt., Inf., Per. O.

Fig. 5

Life Insurance Act of 1940 provided that after the effective date of the act, October 8, 1940, no further applications would be accepted for U. S. Government Life Insurance. An exception was made in the case of veterans of the First World War, who are, under existing regulations, permitted to apply for U. S. Government Life Insurance and for Class "D" allotments. In addition, individuals who had, on October 8, 1940, any of this insurance in effect, may continue to pay the premiums thereon by means of a Class "D" allotment.

Application for and requests for discontinuance of Class "D" allotments are handled in the same manner as that prescribed for Class "E" allotments with a few exceptions. The application form, W.D., A.G.O. Form No. 29, is amended by crossing out the letter "E" and substituting (Continued on page 409)



ORDNANCE COMPANY, MEDIUM MAINTENANCE (ORGANIZATION AND MISSION)

by MILTON G. SNYDER, S.Sgt., Ord. Dept.

It is a well established fact that modern warfare demands modern armies. In order to engage in a campaign of rapid movement a great amount of highly mechanized equipment is essential. Such equipment, having been constructed of many intricate mechanisms and subjected to service under adverse conditions, will be in need of frequent repair. In order to furnish this service to the combat troops, Medium Maintenance Companies have been organized.

Primarily, a Medium Maintenance Company is designed for the purpose of having numbers of personnel trained in all phases of repair work on all types of equipment that are stored and issued by the Ordnance Department. The fundamental mission of maintenance men is to provide maintenance of ordnance materiel, the personnel must be familiar with systematic supply procedures as maintenance companies have the additional responsibility of supplying the troops they serve the Ordnance supplies and equipment they need to properly fulfill their mission, namely, the supply of replacement items, the replenishment of spare parts that the units have used, and the furnishing of cleaning and preserving materials.

The outstanding characteristic of a Medium Maintenance Company is its flexibility. Although a Table of Organization (T/O 9-7) is published to provide a basis for activating this type of unit, it is intended that it be used primarily as a guide for establishing new companies. Due to the fact that Medium Maintenance Companies are subject to operation under varied and sometimes rapidly changing conditions, it is imperative that the number of enlisted men and their several assignments called for in the organizational set-up be not subordinate to any strict or rigid requirements. In a campaign of rapid movement, tactical conditions may dictate that a modification in the organization would be advantageous in successfully completing an approved plan. Because the element of time would be a definite handicap if it were necessary to procure the authorization for such a modification from higher headquarters, the authority to assign duties and distribute grades and technician ratings has been delegated to the company commander of each Medium Maintenance Company. This responsibility is important, as company commanders will have to base all decisions on their own judgement and past experience under similar conditions. For example, if a Medium Maintenance Company were attached to an Infantry unit for service, there would be a greater number of men required in the Armory Section than in the Artillery and Automotive Section, or the Instrument Section. In a case of this kind, the commanding officer has the authority to allocate a certain number of men from each of these sections to the Armory Section, depending on the size of the unit to be supported and the amount of equipment that is found to be unserviceable.

Due to similarity in type of repair work and tools required, the Automotive mechanics and Artillery mechanics are assigned to one Section, the Artillery and Automotive Section, with one officer in charge

of both groups of mechanics. This arrangement provides greater flexibility and more economical use of the mechanics than would be the case were the Artillery mechanics assigned to an "Artillery" section, and the Automotive mechanics assigned to an "Automotive" section, for the reason that the mechanics from either group can be utilized in either phase of repair activity according to the repair and maintenance load to either activity.

The versatility of a Medium Maintenance Company is exemplified by the consideration that the term "service to troops" means all activities that may be necessary to maintain Ordnance materiel in a serviceable condition for all the units that the company is assigned to support. This service includes the inspection, repair, storage, and issue of Ordnance general supplies. A few additional functions of an Ordnance Maintenance Company are the inspection and actual repair of salvaged Ordnance equipment, in order that it can be made available for reissue to the using troops, the furnishing of transportation to the rear service areas for all materiel that cannot be repaired in the forward field areas, and the establishment of schools for combat units in order to teach the using troops the technical uses and the proper methods of the care and preservation of Ordnance equipment. Medium Maintenance shops are required to service all motor vehicles that are brought into the shop for repairs, regardless of the type of vehicle and whether or not the unit is one which the Maintenance Company is assigned to support.

The Shop Officer has his headquarters in the Shop Office, and from this location, assisted by the Shop Foreman, a Master Sergeant, he directs the various activities of the Company Shop.

The Chief of the Stock Section, who is responsible to the Shop Foreman for the maintenance of proper stock levels and the preparation and dispatch of the necessary forms and records, also carries on his duties from the Shop Office.

We have already considered that a Maintenance Company will function as a supply agency for the using troops in the unit to which the Company is attached, to replenish the stocks of supplies, such as cleaning and preserving materials, maintenance parts and accessories, and the replacement of certain major items. The amount of supplies of this nature that is carried by the Company must be adequate to support the combat unit efficiently in its accomplishment of the tactical plan. Accurate information and careful planning is essential, and reference must be made to past records in order to determine the amount of these supplies to be carried in stock. A basic load of maintenance parts and equipment will be authorized in the addenda to Standard Nomenclature Lists, but modifications may have to be made in these amounts due to local conditions that will be encountered during operations. These addenda to SNL's have been published in order to assist the Company Commander

(Continued on page 411)



EARLY AMERICAN MECHANICS

PART I

by WALTER GREENE OGDEN, Jr., 2nd Lt., Ord. Dept.

The pioneers and trail blazers of a nation are not alone those who pushed back the frontier in canoe or covered wagon. Rather are they the geniuses who in the lonely vigil of the night explore the possibilities of new inventions and thus contribute to the security and advancement of civilization.

We who are the beneficiaries of their accomplishments too often fail to appreciate the difficulties under which they labored. Theirs was no easy task to be sure.

They were rugged Yankees. They founded little machine shops to build crude turret lathes and other machines they had dreamed. They and the men who came after them worked no eight hours a day but ten, fifteen, eighteen hours into the night to improve and perfect the products they had conceived.

A bomber an hour from this plant, two tanks a day from that one, a shell a minute from another, are miracles of production . . . not one of them would have been possible without the free American industry these two hundred or so men founded fifty and seventy-five years ago.

The phrase "Yankee ingenuity" has become a part of the English language. If New England no longer holds all the good mechanics in the United States, there was a time when she came so near it that the term "New England mechanic" had a very definite meaning over the whole country.

One of the earliest American mechanics was Joseph Jenks, who came from Hammersmith, England, to Lynn, Massachusetts, about 1642. With the backing of Governor Winthrop, he set up an iron foundry and forge near a bog-iron mine. The very first attempt in America to start an iron works had been made in Virginia more than twenty years before, at the settlement of Jamestown. It was hardly started, however, before it was destroyed in the general sack of the settlement, and for one hundred years there was no further attempt at producing iron in Virginia.

From the little forge and foundry started at Lynn, there is no break in the spread of iron manufacturing in this country. A young Scotchman, Hugh Orr, settled in Bridgewater about 1738. He was a pioneer in the manufacture of edged tools, and is said to have introduced the trip hammer into this country. In 1748, he built 500 stand-of-arms for the province, the first made in America, and later did much casting and boring of cannon during the Revolution. Weeden credits Hugh Orr with being "perhaps the most conspicuous" American iron worker in the eighteenth century. His son, Robert Orr, was also a skilled mechanic, and was one of the very early master armorers of the Springfield Arsenal.

Nearly all the cannon for the early American frigates were cast in and about Providence. Capt. Stephen Jenks was making arms in North Providence at the beginning of the Revolution. In the enterprises centering about Pawtucket and Providence, one finds continually the names of Jenks, Wilkinson, Brown, and Greene, among the latter that of Nathaniel Greene, the Revolutionary general, who had a cannon factory at Coventry.

The interchangeable system was developed by gun makers. Of the typical articles, such as firearms, bicycles, typewriters, sewing machines, and the like, now produced by the interchangeable system, guns and pistols are the only ones which antedate the system itself. These were used in great numbers, and in military arms especially interchangeability was of the highest value. Under the old system with hand-made muskets, in which each part was fitted to its neighbors, the loss or injury of a single important part put the whole gun out of use until it could be repaired by an expert gunsmith. Eli Whitney, in a letter to the War Department in 1812, stated that the British Government had on hand over 200,000 stands of muskets, awaiting repairs. The desirability, therefore, of some system of manufacture by which all the parts could be standardized and interchangeable, was well recognized. There existed a demand for military arms which could meet this condition, but it was felt at the time that it was impossible to meet it.

In 1789 and 1799 two contracts were let by the United States Government for firearms, one to Eli Whitney in 1789, the other to Simeon North in 1799. These contracts are of the greatest importance. Whitney had invented the cotton gin in 1792. This invention, as is well known, had a profound economic effect on the whole civilized world, but the condition of the patent laws at that time and the very value of the invention itself made it impossible for him to defend his rights; and, although he had practically created a vast industry, he actually lost more money by the invention than he gained. By 1798 he made up his mind that he must turn to something else. He chose the manufacture of muskets, and addressed a letter to Oliver Wolcott, Secretary of the Treasury, in which he said:

"I should like to undertake the manufacture of ten to fifteen thousand stand of arms. I am persuaded that machinery moved by water, adapted to this business would greatly diminish the labor and greatly facilitate the manufacture of this article. Machines for forging, rolling, floating, boring, grinding, polishing, etc., may all be made use of to advantage."

In another place it is stated that the object at which he aimed and which he accomplished was "to make the same parts of different guns, as the locks for example, as much like each other as the successive impressions of a copper-plate engraving."

Mr. Whitney's determination to introduce this system of manufacturing was ridiculed and laughed at by the French and English Ordnance Officers to whom he explained it. They said that by his system every arm would be a model and that arms so made would cost enormously. Even the Washington officials were skeptical and became uneasy at advancing so much money without a single gun having been completed, and Whitney went to Washington, taking with him ten pieces of each part of a musket. He exhibited these to the Secretary of War and the army officers interested, as a succession of piles of different parts. Selecting indiscriminately from each of the piles, he put together ten muskets, an achievement which was looked on with amazement. We have not the exact date of this occurrence, but it was probably about 1800.

In person Mr. Whitney was tall and dignified. He had a cultivated mind and a manner at once refined, frank and agreeable. He was familiar with the best society of his day and was a friend of every president of the United States from George Washington to John Quincy Adams. He had a commanding influence among all who knew him. Seldom has a great inventor been more sane, for his powers of invention were under perfect control and never ran wild. Unlike those who devise many things but complete few, he left nothing half executed. Robert Fulton said that Arkwright, Watt and Whitney were the three of his contemporaries who had done the most for mankind. Whitney contributed immeasurably to the agriculture and the manufacturing methods of the whole world and few mechanics have had a greater influence.

The city of Hartford, Connecticut, has been more closely identified with the later development of interchangeable manufacture than almost any other city. The gun makers have been so vital an element in its industrial life that before leaving them, we will trace their influence.

The building of the Colt Armory in 1853 marks a definite era in Hartford's history and the beginning of manufacturing there on a large scale. Samuel Colt was born in Hartford in 1814. He had a rather stormy career as a school boy and shipped before the mast to Calcutta before he was sixteen.

He made the first crude model of his revolver on his voyage to Calcutta and from the spark of his inventive genius came the modern firearms of today. Samuel Colt's effort to market his invention is a record of courage, ingenuity and perseverance that is amazing. That one so young in years and so handicapped by poverty and lack of prestige could prevail against such odds, is one of the marvels of individual American enterprise.

In 1836 he organized the Patent Fire Arms Company at Paterson, New Jersey, and tried to get the revolver adopted by the United States Government. In 1837 an army board reported "that from its complicated character, its liability to accident, and other reasons, this arm was entirely unsuited to the general purposes of the Service."

The Seminole War in Florida gave Colt an opportunity to demonstrate the value of the revolver. In 1840 two government boards gave it a qualified approbation and two small orders followed, one for one hundred and the other for sixty weapons. The pistols, however, were expensive, the sales small and in 1842 the Paterson company failed and ceased business.

In the next few years the tide turned. The superiority of the revolvers outstanding was creating a great demand. With the outbreak of the Mexican War in 1846 came two orders for one thousand pistols each, and from that time onward Colts' career was one of rapid and brilliant success.

As his Paterson plant had closed, Colt had the first of the large government orders made at the Whitney Armory in New Haven, where he followed minutely every detail of their manufacture. The following year, 1848, Colt moved to Hartford and for a few years rented a small building near the center of the city. With rapidly increasing business, larger quarters soon became necessary.

After failure of his first venture at Paterson, Colt had seen the advantage of interchangeable manufacture at the Whitney shop, and determined to carry it even further in his new plant. So thoroughly was this done that the methods crystallized there, and many of the tools installed have undergone little change to this day. Machine work almost wholly superseded hand work. Modern machines were developed, and interchangeability and standards of accuracy given an entirely new meaning. Many rivals have sprung up in the past ninety years, but the Colt Armory is still one of the leading gun factories of the world.

One of the elements of Colt's success was his ability to gather and hold about him men of the highest order. Among these was Elisha K. Root, one of the ablest mechanics New England has ever produced. Root was a Massachusetts farmer's boy, a few years older than Colt. He served an apprenticeship and came to the Collins Company, axe makers, at Collinsville, Connecticut, in 1832. He began work there as a lathe hand in the repair shop, but very soon became foreman and virtual superintendent. His inventions and methods converted a primitive shop into a modern factory and gave the Collins Company control, for a long time, of the American market. In 1845 he was made superintendent and that same year was offered three important positions elsewhere, one of them that of master armorer at Springfield Armory.

In 1849 Colt offered him the position of superintendent at a large salary. Root moved to Hartford, designed and built the new armory and installed its machinery. Many of the machines devised by him at that time are still running, holding their own in accuracy and economy of production with those of today. Almost every process used in the plant felt his influence. He invented the best form of drop hammer then in use, machines for boring, rifling, making cartridges, stock turning, splining, etc., and worked out the whole system of jigs, fixtures, tools and gauges. The credit for the revolver belongs to Colt; for the way they are made, mainly to Root.

One would have to search diligently through the pages of history to find a figure more romantic . . . and more glamorous than that of Samuel Colt. His was the mind of a genius, a planner and a dreamer, all in one. His vision was not local, but world-wide. His ambition exceeded mere prosperity and power . . . complete satisfaction could only be his when he had reached the pinnacle in his chosen field. His own deeds and the life he lived have immortalized him . . . and the products that still bear his name represent a constant tribute to his ability and his resourcefulness.

Four of the Colt workmen formed two partnerships of wide influence: Charles E. Billings and Christopher M. Spencer, who organized the Billings & Spencer Company, and Francis A. Pratt and Amos Whitney, of the Pratt & Whitney Company.

Charles E. Billings was a Vermonter, who served his apprenticeship in the old Robbins & Lawrence Armory at Windsor, Vermont. When twenty-one, he came to Colt's, in 1856, as a die sinker and tool maker and became their expert on the drop forging process. In 1862 he went to E. Remington & Sons, where he built up their forging plant, increasing its efficiency many times, saving \$50,000 by one improvement in frame forging alone. At the end of the war he returned to Hartford as superintendent of the Weed Sewing Machine Company, which had taken over the old Sharps Rifle Works, built by Robbins & Lawrence. For a short time in 1868 Mr. Billings was at Amherst, Massachusetts, associated with Spencer in the Roper Repeating Arms Company. The venture was not a success, and the next year, 1869, they came back to Hartford and formed the Billings & Spencer Company. This company has probably done more than any other for the art of drop forging, not only in developing the modern board drop hammer itself, but in extending the accuracy and application of the process.

Christopher M. Spencer was born at Manchester, Connecticut. He served his apprenticeship in the machine shops of the silk mills there from 1847 to 1849, and remained for several years as a journeyman machinist with Cheney Brothers. In 1853 he went to Rochester, New York, to learn something of the other kinds of machinery, working in a tool building shop and a locomotive shop. After some years at the Colt Armory he went back to Cheney Brothers and soon obtained his first patent for an automatic silk-winding machine. This was adopted by the Willimantic Linen Company, with some modifications made by Hezekiah Conant, and was the machine which Pratt & Whitney began manufacturing in their first rented room in Hartford.

Mr. Spencer had a passion for firearms from boyhood. In 1860 he obtained a patent for the Spencer repeating rifle. The Civil War created a tremendous demand for it, and the Government ordered first one thousand, then ten thousand, and before the war was over it had purchased about two hundred thousand rifles.

At the close of the war Spencer went to Amherst and was there first associated with C. E. Billings in the Roper Company, as we noted. A year later he joined in starting the Billings and Spencer Company and cooperated with him in the development of the drop hammer.

(Continued on page 411)



Conducted by: W. G. Sylvester, Capt., Ord. Dept.

CHARACTERISTICS OF THE OXYACETYLENE FLAME

The successful welding of metals by either the oxyacetylene or electric arc welding methods requires a knowledge of the characteristics of the oxy-acetylene flame and the electric arc. These sources of welding heat energy are capable of control to suit particular welding conditions as required by the size, shape and composition of a given weldment.

THE OXYACETYLENE FLAME

In oxyacetylene welding the heat intensity of the welding flame can be controlled by varying the flow of welding gases. This can be adjusted by selective use of the proper tip size and oxygen and acetylene operating pressures. The flame temperature however can be controlled for any given flow of oxygen and acetylene by varying the volumetric ratio of oxygen to acetylene in the gas mixture being burned. This aspect of control is attained by manipulating the torch valves and noting the appearance of the oxy-acetylene flame.

Flame adjustment. - To light the welding tip, first open only the acetylene valve. The flame is obtained by striking the sparklighter in front of the tip, keeping the hand well to one side. The torch should be held so as to direct the flame away from the operator, gas cylinders, hose or other inflammable material. The pure acetylene flame is long and

The welding flame, when so adjusted, is stable and free from flash-backs and back-fires.

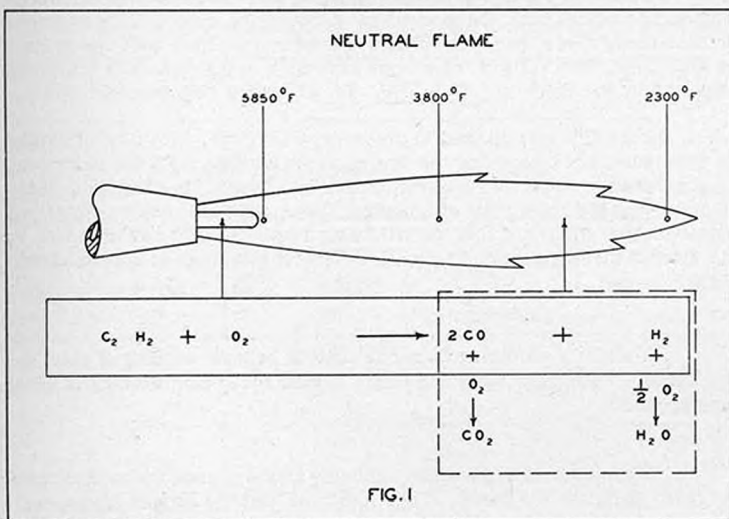
When the oxygen valve is opened the acetylene flame is shortened and the mixed gases burn in contact with the tip face. The flame changes to a bluish-white color and burns to form a bright inner cone surrounded by an outer flame envelope or sheath flame. The inner cone develops the high temperature required for welding while the outer envelope contains varying amounts of incandescent carbon soot depending upon the proportion of oxygen to acetylene.

The theoretical mixture of oxygen and acetylene for complete combustion consists of 2-1/2 volumes of oxygen to one volume of acetylene. Mixtures of oxygen and acetylene cannot burn completely to form a single cone. The temperature produced is so high (up to 6300°F) as to decompose the products of complete combustion, carbon dioxide and water vapor, into their elements. Thus the acetylene, burning in the inner cone of the flame with the oxygen supplied through the torch, forms carbon monoxide and hydrogen, both combustible gases. These gases, as they cool from the high temperature of the inner cone flame, burn completely with the oxygen supplied from the surrounding air to form the lower-temperature sheath flame. The carbon monoxide burns to form carbon dioxide, and the hydrogen burns to form water vapor. Actually, to burn one volume of acetylene, the torch supplies one volume of oxygen, while the surrounding air supplies 1-1/2 volumes of oxygen to burn the acetylene completely. Since the inner cone of the flame contains only carbon monoxide and hydrogen, which are reducing in character (able to combine with oxygen and remove it) oxidation of the metal does not occur. The chemical reactions for a neutral flame are shown in Figure 1.

Types of Flames. - There are three flame types commonly used for welding. These are the neutral, reducing or carburizing, and oxidizing flames as shown in Figure 2. Also included is the pure acetylene flame.

Neutral Flame. - The welding flame should always be adjusted to neutral before either the oxidizing or carburizing flame mixture is set. There are two clearly defined zones in a neutral flame. The inner portion consists of a luminous cone which is bluish-white in color. Surrounding this is a large flame envelope or sheath, which is faintly luminous and has a light bluish tint. The neutral or balanced flame is produced when the mixed gases have approximately one volume of oxygen and one volume of acetylene supplied from the torch. This type of flame is obtained by gradually opening the oxygen valve to shorten the acetylene flame, until a clearly defined inner luminous cone is visible. For a strictly neutral flame, no whitish streamers should be present at the end of this cone. The actual ratio of the volume of oxygen to acetylene supplied by the torch to produce a neutral flame is 1.04 - 1.14. This flame

adjustment is used for most welding and for the preheating flames during cutting operations. When welding steel with this flame the molten metal puddle is quiet, clear and the metal flows easily without boiling, foaming, or sparging. In some cases it is desirable to leave just a slight acetylene streamer or "feather" (1/16 to 1/8 inch long) at the end of the inner cone to insure that the flame is not oxidizing. In a neutral flame the temperature at the tip of the inner cone is approximately 5850°F, while at the extreme end of the outer envelope or sheath flame the temperature drops to approximately 2300°F. This permits some temperature control in making



bushy and has a yellowish color. Since the oxygen valve is closed at this point, the acetylene is burned by the oxygen in the air. This is not sufficient to completely burn the acetylene, therefore the flame is smoky, producing a soot of fine unburned carbon. The pure acetylene flame is unsuitable for welding, however it has certain industrial applications such as mold smoking and the manufacture of carbon black.

Before opening the oxygen valve, the acetylene valve should be opened slowly until the pure acetylene flame leaves the end of the tip so that the base of the flame is approximately 1/16" to 1/8" away from the tip face. At this adjustment, the velocity of the gas issuing from the tip is greater than the burning velocity of the acetylene back to the tip face.

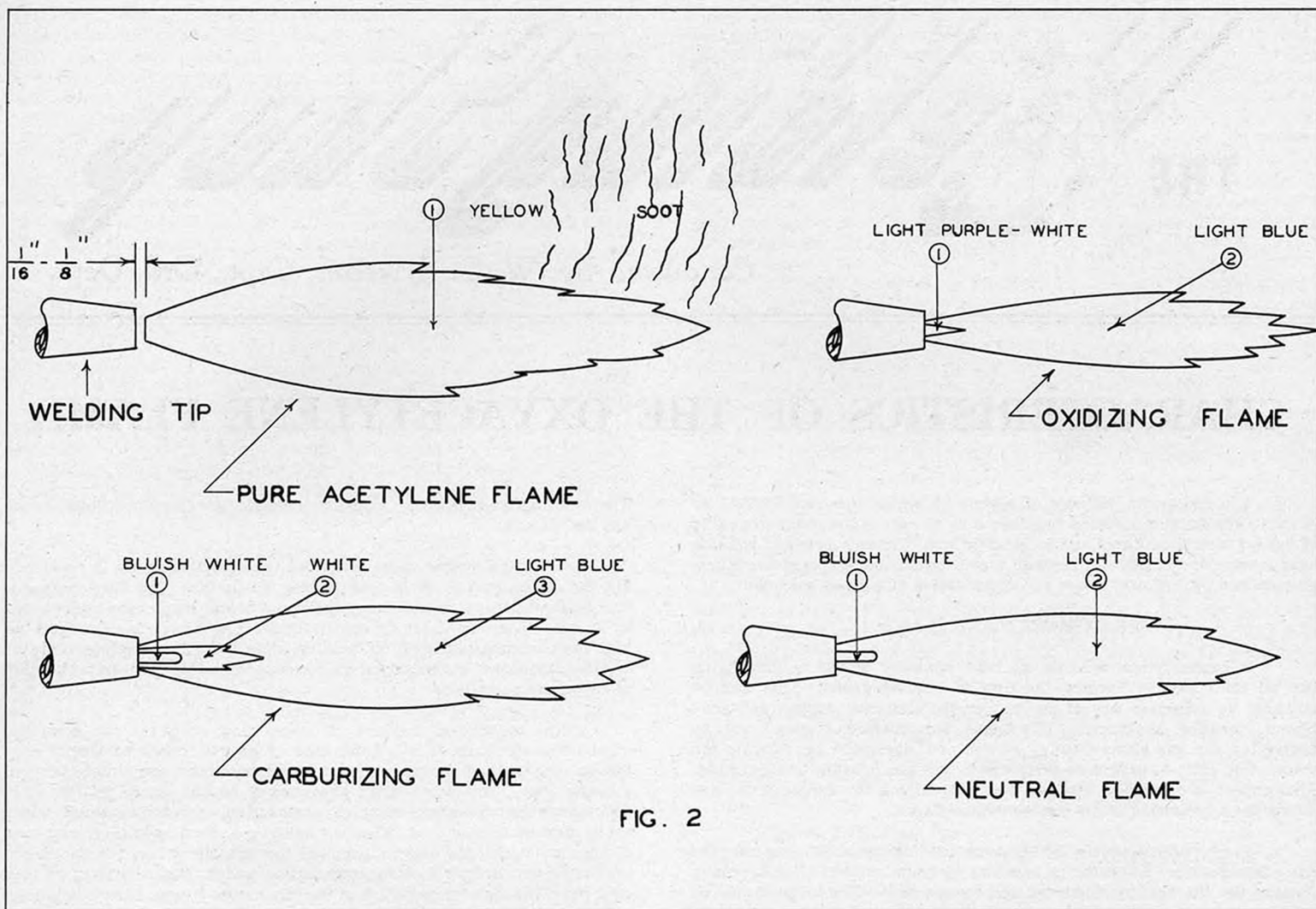


FIG. 2

a weld, since the position of the flame with respect to the molten puddle may be changed.

Reducing or Carburizing Flame. - The reducing or carburizing flame is produced when slightly less than one volume of oxygen is mixed with one volume of acetylene, or more specifically when these gases are mixed at the ratio of $0.85 - 0.95$. This adjustment is obtained by first

adjusting the welding flame to neutral and then further opening the acetylene valve slightly so as to produce a white streamer or "feather" of acetylene at the end of the inner cone. The length of this excess streamer can be taken as a measure of the degree of carburization obtained with the flame. For most welding operations, the length of this excess streamer should be equal to approximately twice the length of the inner cone. The reducing or carburizing flame can always be recognized by the presence of three distinct flame zones. These are the clearly-defined bluish-white inner cone, a white intermediate cone indicating the amount of excess acetylene, and the light blue outer flame envelope. This flame type burns with a coarse rushing sound and has a temperature of approximately 5700°F at the tip of the inner cone.

When a strongly carburizing flame is used for welding steel the metal boils and is not clear. The boiling action is caused by the heat given off by the steel in absorbing carbon from the flame. When cold, the weld will have the properties of high carbon steel, being brittle and subject to cracking. A slight feather of acetylene is sometimes used for welding steel by the back-hand welding process.

A more carburizing flame is used for welding high carbon steel, for hard-facing operations, and for welding such non-ferrous alloys as nickel and monel. It is also used for silver soldering operations. In the latter operation only the intermediate and outer flame cones are used in order to impart a low temperature soaking heat to the parts being joined by silver soldering.

Oxidizing Flame. - The oxidizing type of welding flame is more difficult to adjust than the neutral or carburizing types. It is produced when slightly more than one volume of oxygen is mixed with one volume of acetylene. The ratio of the volume of oxygen to the volume of acetylene supplied by the torch is $1.15 - 1.70$. To adjust for this type of flame the

torch should first be adjusted to give a neutral flame. The flow of oxygen is then increased by opening the oxygen valve further, until the inner cone is shortened by about one-tenth of its original length. In addition to being shorter than the inner cone of a neutral flame, it is also more pointed and somewhat purplish in color. An oxidizing flame can also be recognized by its distinct hissing sound. The temperature of this flame is approximately 6300°F .

A slightly oxidizing flame is used in bronze welding of steel and cast iron. A stronger oxidizing flame is used for fusion welding of brass and bronze.

When applied to steel, an oxidizing flame causes the molten metal to foam and give off sparks. This indicates that the excess oxygen from the flame is combining with the steel and burning it. An oxidizing flame should not be used for welding steel as the deposited metal will be porous, oxidized, and brittle. This flame is ruinous to most metals and should be avoided except as noted above.

In most cases the exact amount of excess oxygen used in this type of flame adjustment must be determined by noting the action of the flame on the molten metal.

A study of the characteristics of the electric arc will be contained in the November issue of THE ORDNANCE SERGEANT.

DO YOU LIKE YOUR VEHICLES ?

(See other letters on page 354)

46TH ORDNANCE COMPANY (MM)
Fort Custer, Michigan

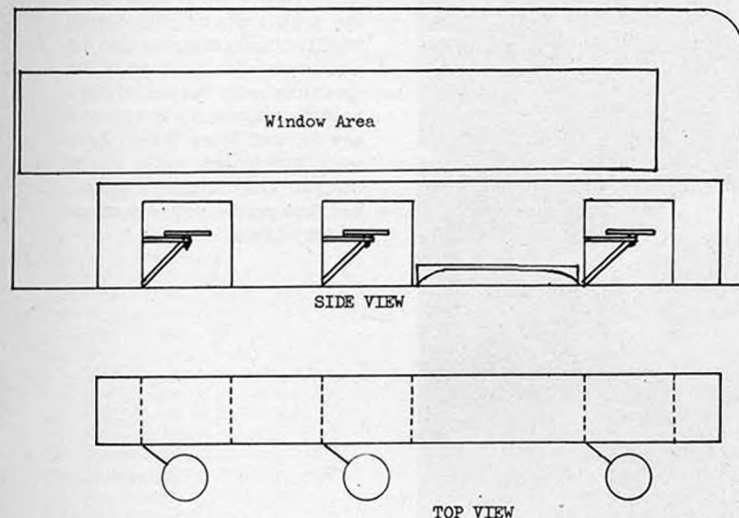
To: Editor
THE ORDNANCE SERGEANT
The Ordnance School
Aberdeen Proving Ground, Md.

1. In compliance with circular letter, your office, dated June 11, 1942, the following is submitted for your information and use:

2. General. - Technical vehicles of the type now in use by the Ordnance Department are, generally, practical, useful, and labor saving, not to mention adequate protection against the elements. It is thought that many improvements could be planned into future vehicles of this type which would greatly enhance their mobility and usefulness. Primarily, they would be easier to handle on soft and uneven ground if they are mounted on a 6 x 6 chassis with a low center of gravity. It is further thought that there are too many windows in certain types. Paneling of the sides would add more storage space. The heavier vehicles, such as the machine shop truck, should be provided with a power winch. All cabinet drawers should have latches such as are installed in the drawers of spare part trucks. This would do away with the grating which is used to hold the drawers in place on other vehicles. Provision could be made for the storage of Technical publications on all vehicles.

3. Truck, spare parts. - One of these vehicles is now in use as a shop office and company headquarters for field problems. This type of vehicle should not have windows on the sides. It is thought that more storage space could be provided if the walls were paneled and more bins added. This would eliminate the need for so many black-out curtains.

4. Truck, instrument repair. - This vehicle, with present installations, is inadequate for normal section operations. It is thought that this vehicle should be used as a machine shop for the section where small parts could be fabricated and tools maintained. The section should have at least one vehicle which should be planned for instrument repair only. Such a vehicle could be longer and provide knee-holes and seating for the mechanics. (See sketch.) Instrument repair tools and a set of spare parts



Proposed design of benches for Truck, instrument repair (6 x 6 chassis)

could be carried as well as fixtures, etc., for which there is no space provided on the present vehicle. Outrigger jacks should be permanently mounted on the vehicle, provision being made to swivel them up and fasten them when not in use.

5. Truck, automotive repair. - This vehicle has been used for the purpose intended at this station and on field problems. It has been deter-

mined that the storage compartments are, in some instances, too small to accommodate several of the tools and equipment.

6. Truck, wrecking, heavy, M1. - This vehicle has been on hand only a short while. It has been used for towing operations and lifting of heavy materiel. The winches should have an apparatus for level winding the cables. The cables tend to cross if not guided with a crow-bar, which is a strenuous operation indeed. A device, similar to that which is used on fishing tackle reels, would wind the cables level. The floor tool boxes cannot be opened without elevating the boom. Larger side boxes would eliminate this difficulty.

7. Truck, machine shop (Load A). - This vehicle has been used more than any of the others. Several special tools, fixtures, etc., have been made with the facilities of this vehicle. One lathe is not enough to accommodate the great variety of work which is expected of this vehicle. One lathe, of the type now used, plus a smaller lathe (such as a Hardinge), would facilitate operations. The placing of the equipment should be altered somewhat. Outrigger jacks should be permanently mounted with a provision to swivel them out of use and secure them for traveling.

8. Truck, artillery repair. - This vehicle is thought to be excessive and could be replaced with a cargo truck equipped with cabinets for tools, etc. Such a truck, if adopted, should have an "A" frame and auxiliary jacks, for pulling the tubes on heavy field pieces.

9. Truck, small arms repair. - This vehicle is inadequate for the type of work expected of it. Either additional vehicles or a larger vehicle is needed. Only four men can work in this vehicle at one time, which is insufficient.

10. Truck, tool and bench. - As far as can be determined by our experience with this vehicle, it is thoroughly satisfactory with the applicable exceptions of Par. 2.

11. Truck, welding. - This vehicle has been used to great lengths by this organization for the purpose intended and the only recommendation is for a larger welding screen or at least one more of the type now used.

JOHN M. LEAVITT
M. Sgt., 46th Ord. Co.

1st. Ind.

46th Ordnance Company, Fort Custer, Michigan, July 10, 1942
TO: Editor, THE ORDNANCE SERGEANT, The Ordnance School, Aberdeen Proving Ground, Md.

1. Approved and forwarded.

JACK E. GILLELAND
1st Lt., Ord. Dept.,
Commanding

31st Ordnance Company (HM)
Ft. Benning, Ga.
August 6, 1942

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

Dear Sir:

Attached is a drawing of a portable engine stand. It was designed by me and constructed by Technical Sergeant H. G. Padgett, Chief of Machine Shop Section, of this organization to provide a suitable device to carry out a 100-hr check on all models of Medium & Light Tank radial

(Continued on page 412)



FORGING

Conducted by: W. G. Sylvester, Capt., Ord. Dept.

PRACTICAL FORGING PROBLEMS

All practical forging problems require the use of one or more of the following basic forging operations:

Straightening
Bending
Upsetting
Drawing out
Punching
Twisting
Forge welding

combined as required in the fabrication of a chain swivel or other item.

Dimensional control of the forging problem is dependent upon careful stock calculation, proper sequence of operations, and proper execution of each of the basic forging operations required of the finished piece.

A rational approach to this goal can be had only through repeated forging of simple practical problems designed to develop proficiency in the basic forging operations. The successful accomplishment of more com-



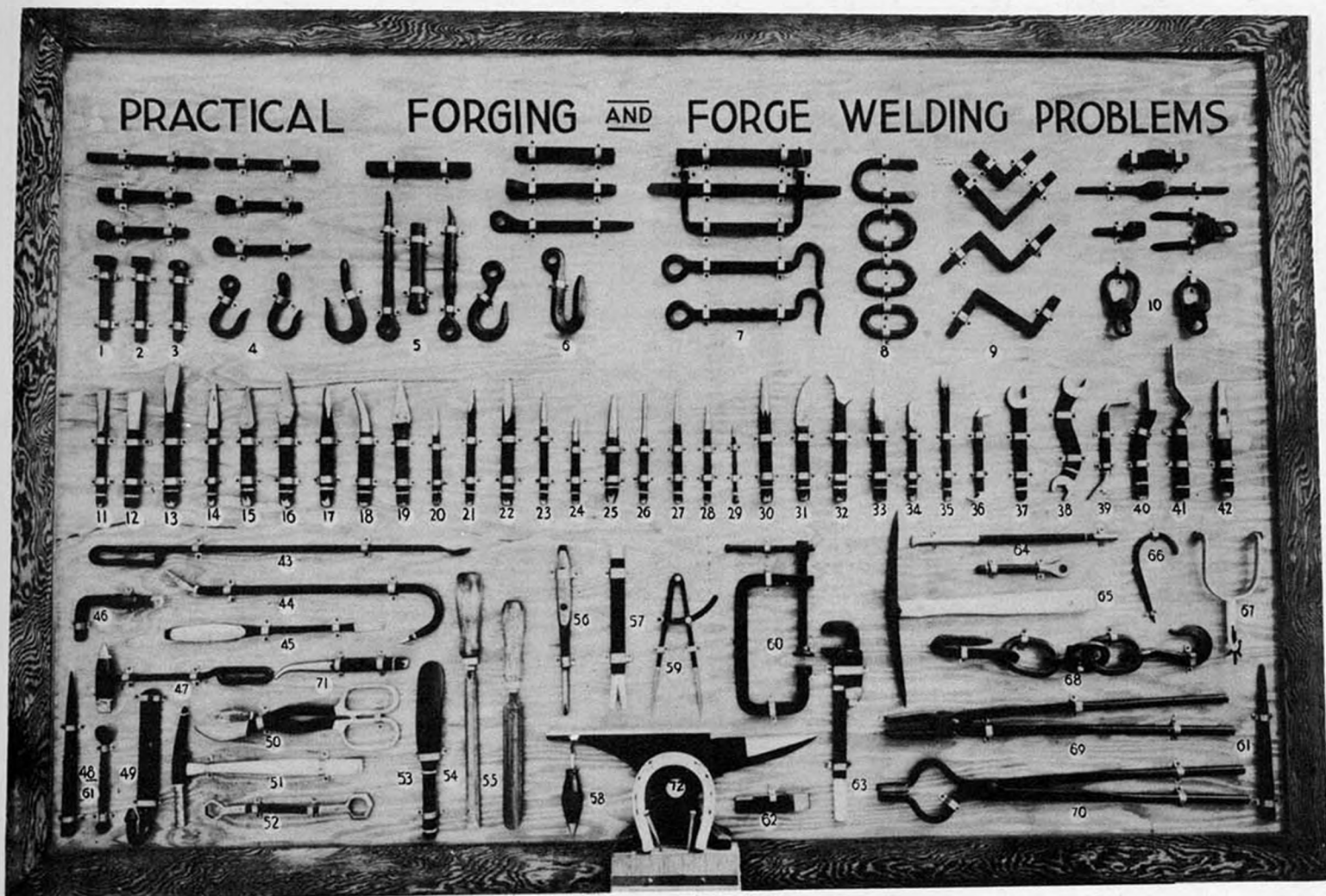
This photo shows how the competent blacksmith might actually manufacture the equipment with which he works (possibly with the aid of borrowed equipment). The forges, anvils, and tools shown here were fabricated in the Forge Shop at The Ordnance School, and have proven entirely satisfactory in use.

In addition to the above, tool forging requires heat treatment to complete the problem and render it serviceable. This requires a knowledge of hardening and tempering — operations which can be satisfactorily accomplished using the facilities normally available with a forge.

The more simple forging problems involve but one or two of the basic forging operations. These, having been accomplished, can then be

plicated forging problems will then depend on the blacksmith's experience and ingenuity to combine these basic operations.

Figures 1, 2 and 3 illustrate diagrammatically the more simple upsetting operations required in the fabrication of square and hexagon headed bolts and the button head rivet.



The photograph above shows a number of practical forging and forge welding problems fabricated using only the forge and its accessories. Notice that this board shows not only elementary problems which require only the principles discussed in this article, but also more advanced

processes as heat treatment and hardening, to be discussed in the November issue of THE ORDNANCE SERGEANT. The number and variety of such special tools satisfactorily fabricated by the accomplished blacksmith is limited only by his ingenuity, versatility and experience.

- | | | |
|---|--|---|
| 1- Square Headed Bolt. (development) | 25- Center Punch, Heavy Duty | 49- Wall Hook |
| 2- Hexagon Headed Bolt. (development) | 26- Drift Punch, $\frac{1}{4}$ " | 50- Tin Shears |
| 3- Button Headed Rivet. (development) | 27- Punch, $\frac{1}{8}$ " | 51- Tack Hammer |
| 4- Sling Hook. (development) | 28- Punch, $\frac{1}{4}$ " | 52- Offset Box End Wrench |
| 5- Hoist Hook. (development) | 29- Scriber | 53- Body Spoon |
| 6- Stop Hook. (development) | 30- Round Nose Chisel, $\frac{3}{8}$ " | 54- Wood Chisel, $\frac{3}{4}$ " |
| 7- Door Hook. (development) | 31- Half Bent Round Nose Chisel, $\frac{1}{4}$ " | 55- Wood Gouge, 1" |
| 8- Forge Welding, Link. (development) | 32- Key Drift. | 56- Phillips Screwdriver |
| 9- Square and Round Outside Corner. | 33- Gouge | 57- Box Chisel |
| 10- Chain Swivel. (development) | 34- Oil Grooving Chisel. | 58- Plumb Bob |
| 11- Cold Chisel, $\frac{1}{2}$ " | 35- Star Drill | 59- Dividers |
| 12- Cold Chisel, $\frac{3}{4}$ " | 36- Offset Screwdriver | 60- "C" Clamp |
| 13- Cold Chisel, Long, $\frac{3}{4}$ " | 37- Open End Straight Wrench | 61- Exercise, Drawing Out, $\frac{3}{4}$ " rd. to $\frac{1}{4}$ " rd. |
| 14- Cape Chisel, $\frac{3}{8}$ " | 38- Open End "S" Wrench | 62- Sheet Metal Hammer |
| 15- Cape Chisel, $\frac{1}{4}$ " | 39- Brake Adjusting Wrench | 63- Monkey Wrench |
| 16- Cape Chisel, long, $\frac{1}{4}$ " | 40- Chalking Iron | 64- Stone Plug Drill and Wrench |
| 17- Side Cutting Chisel, $\frac{3}{4}$ " | 41- Valve Guide Knocker. ("A" Ford) | 65- Coal Pick |
| 18- Bent Round Nose Chisel, $\frac{1}{4}$ " | 42- Hollow Punch | 66- Pipe Hook |
| 19- Half Round Nose Chisel, $\frac{1}{4}$ " | 43- Flux Spoon | 67- Spur |
| 20- Diamond Point Chisel, $\frac{1}{4}$ " | 44- Wrecking Bar | 68- Forge Welding Problem |
| 21- Diamond Point Chisel, $\frac{5}{16}$ " | 45- Screwdriver | 69- Flat Lip Tonge |
| 22- Diamond Point Chisel, $\frac{3}{8}$ " | 46- Lathe Dog | 70- Single Pickup Tonge |
| 23- Pin Punch | 47- Slag Hammer | 71- Staple Puller |
| 24- Center Punch | 48- Short Flux Spoon | 72- Horse Shoe |

Upsetting, drawing out and punching operations are combined in the fabrication of the sling, hoist, and stop hooks shown in Figures 4, 5 and 6.

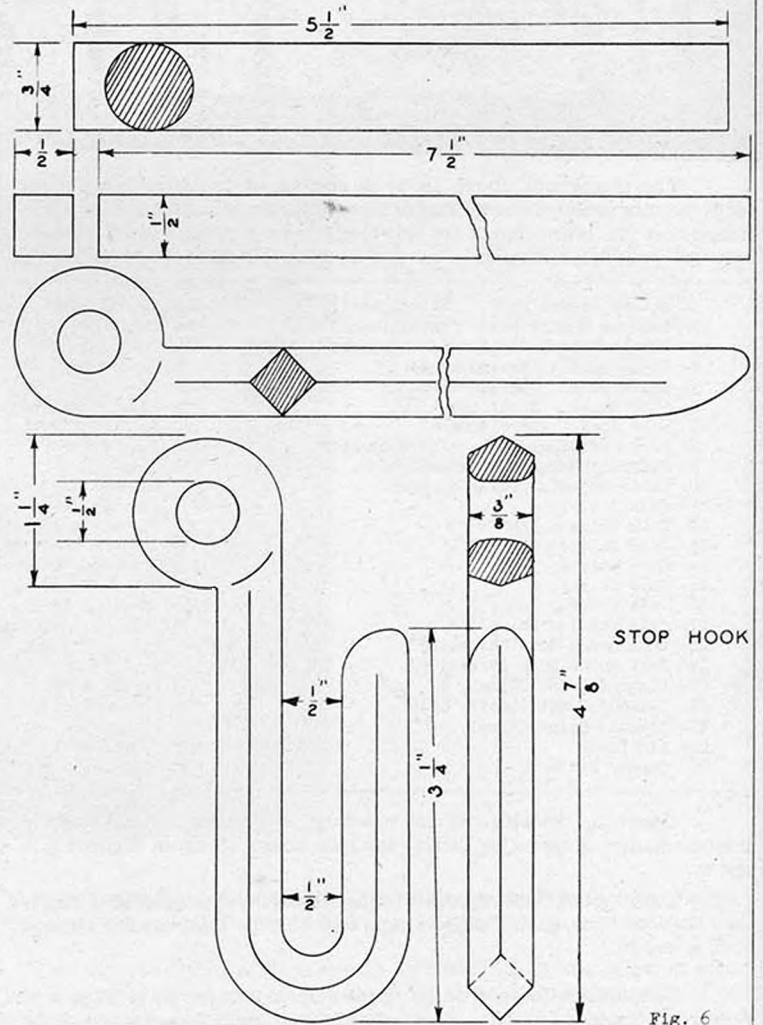
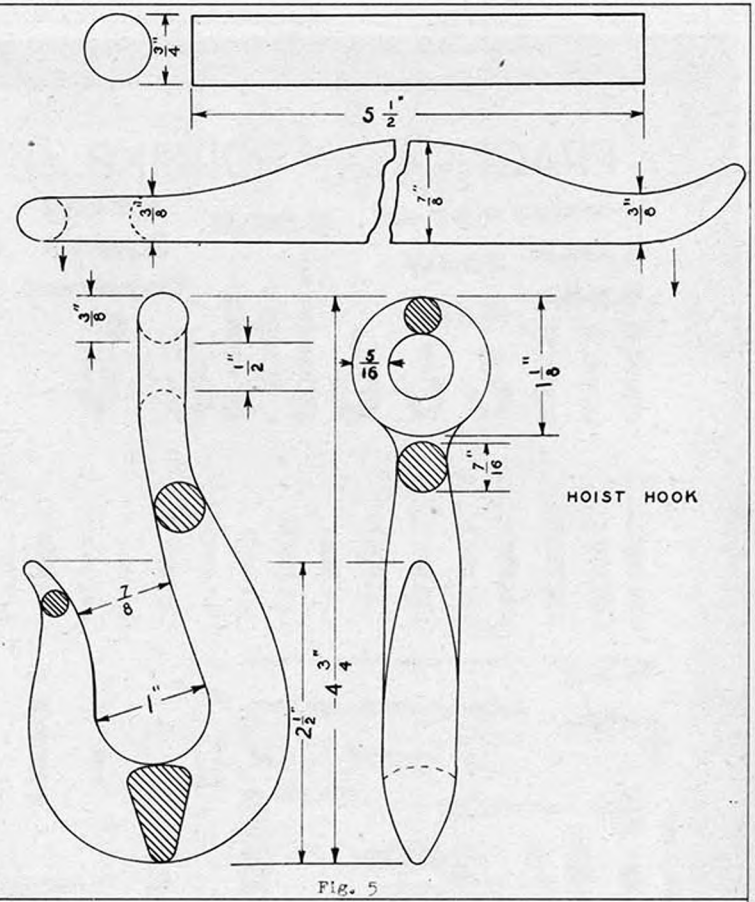
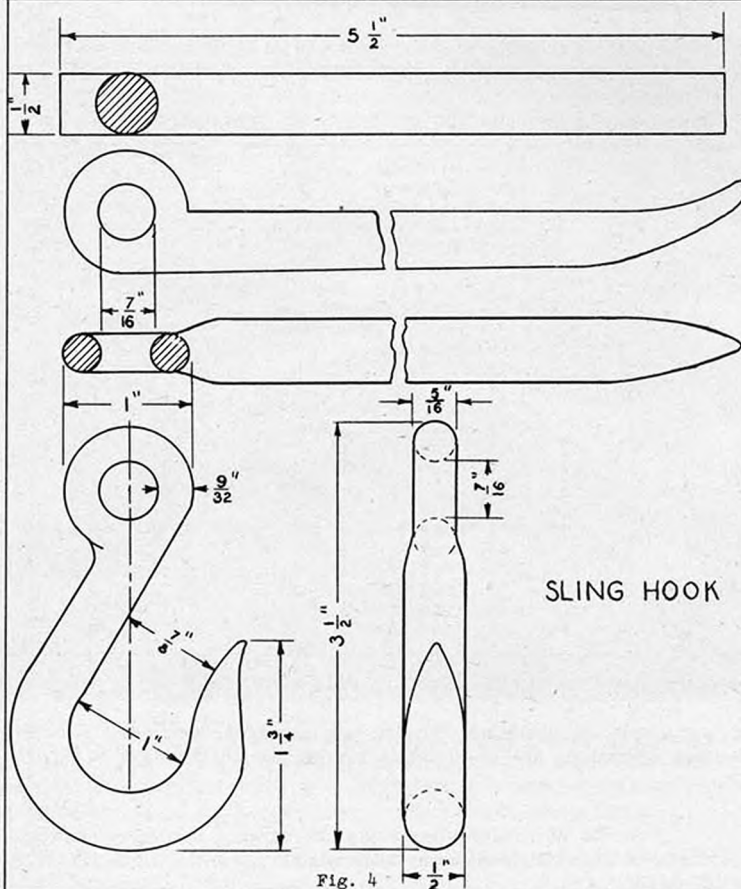
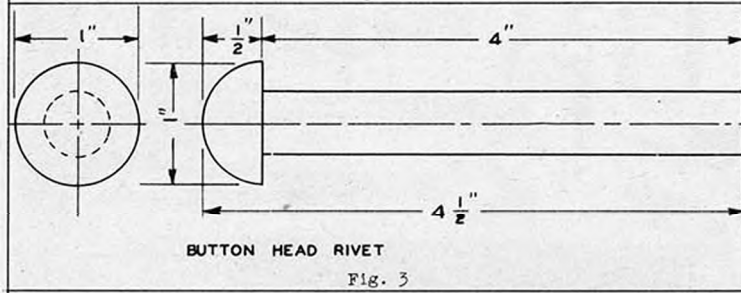
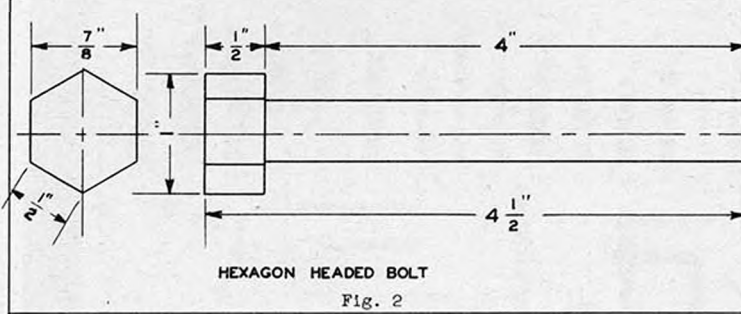
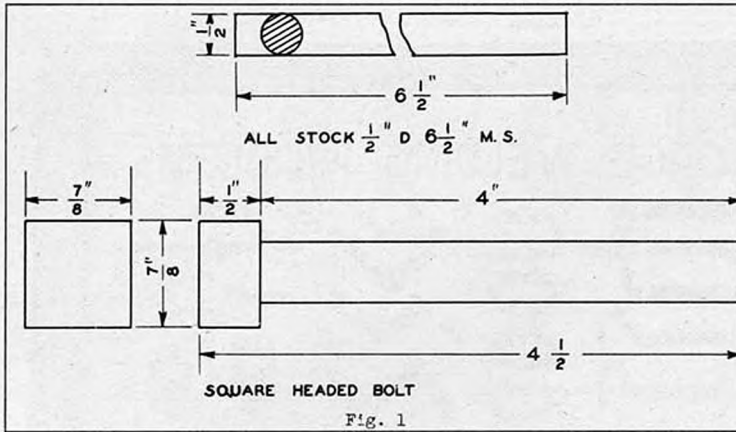
Drawing out, bending, and twisting operations are required to fabricate the door hook, chain link, and right angle bends illustrated in Figures 7, 8, 9 and 10.

The fabrication of a forge welded chain link shown in Figure 11 requires combined upsetting, bending, and forge welding operations. The

stock requirements for this problem are shown in Figure 9.

Combined upsetting, drawing out, punching, bending, and forge welding operations are essential in making the chain swivel in Figure 12.

A series of problems involving tool forging, hardening and tempering operations will be shown in the November issue of THE ORDNANCE SERGEANT.



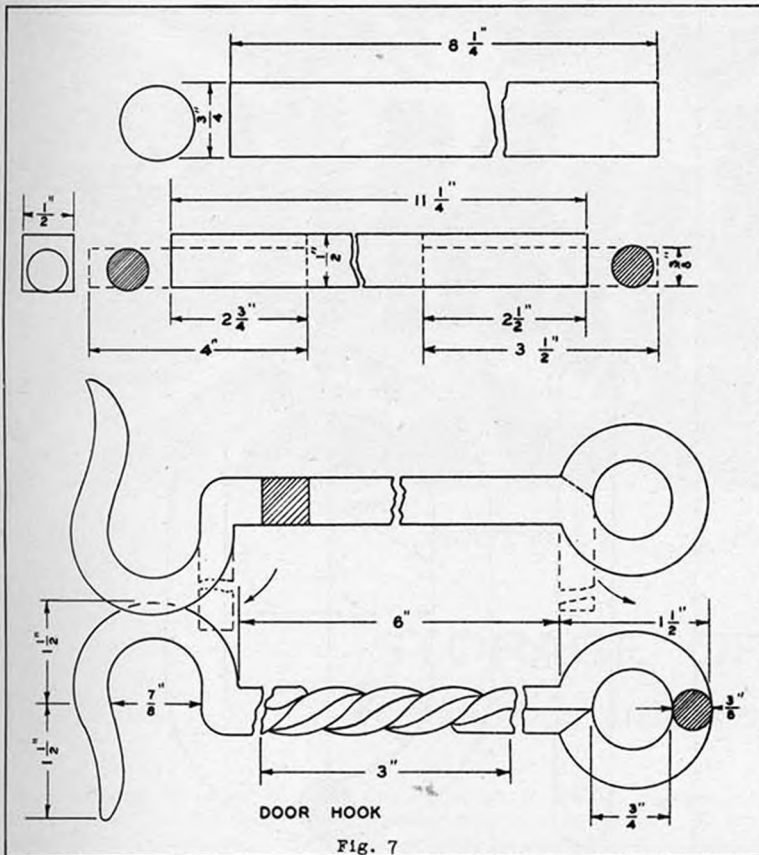


Fig. 7

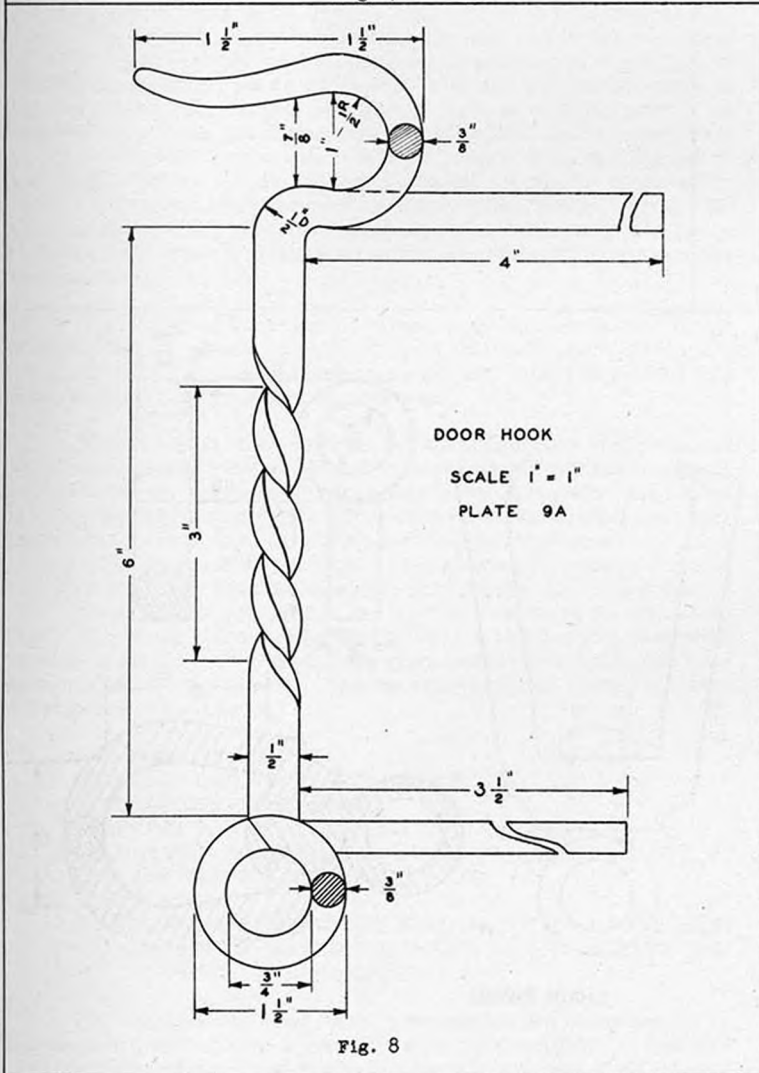


Fig. 8

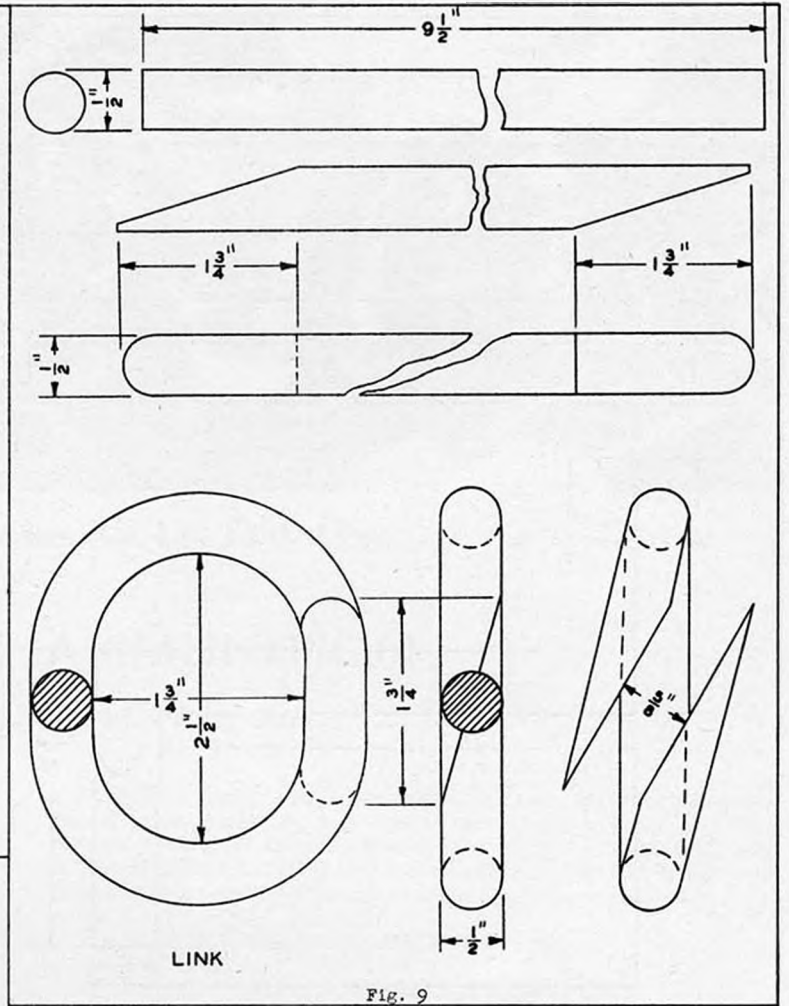


Fig. 9

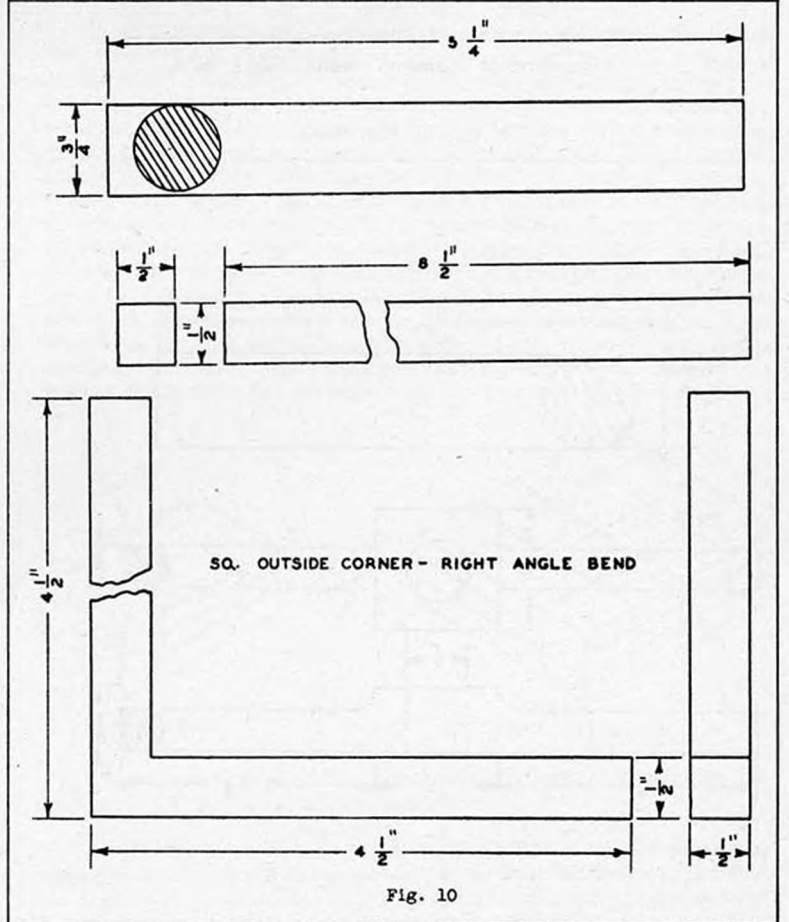
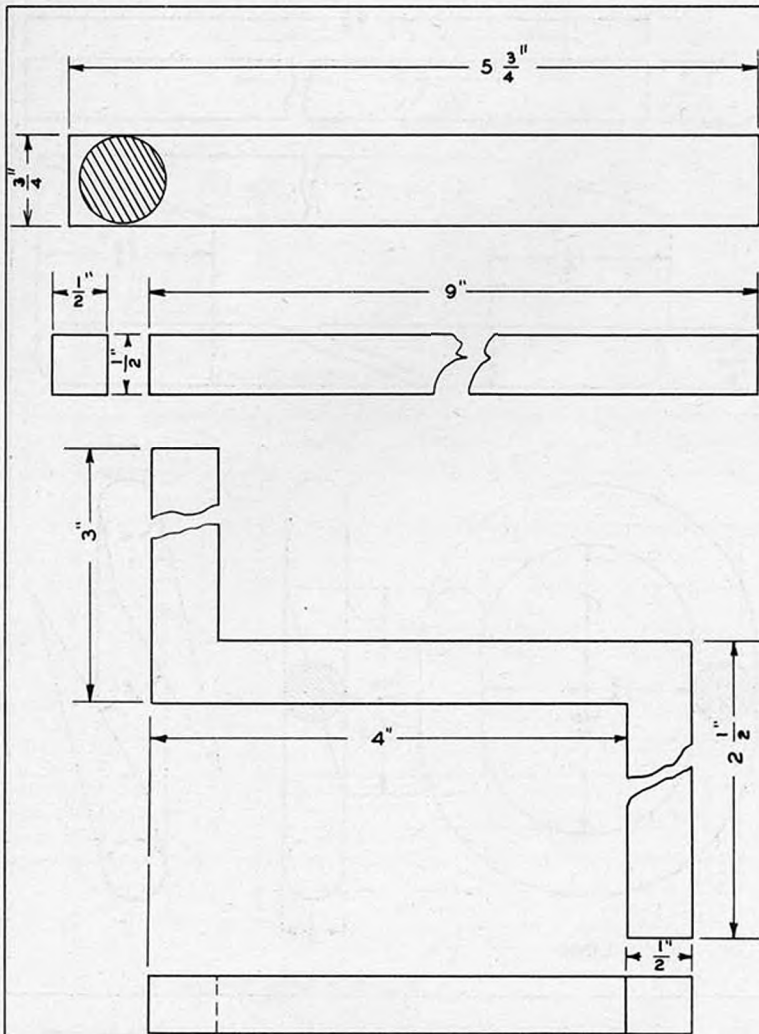


Fig. 10



2 SQ. OUTSIDE CORNERS RIGHT ANGLE BEND

Fig. 10 (Continued)

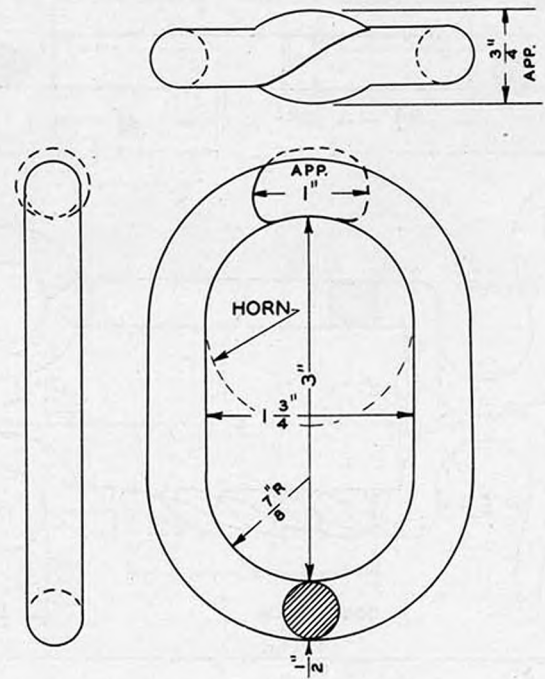
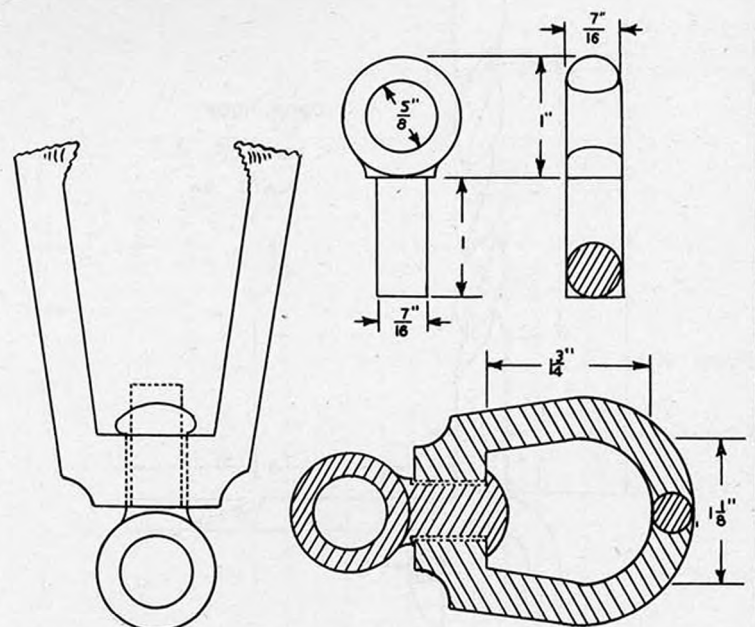
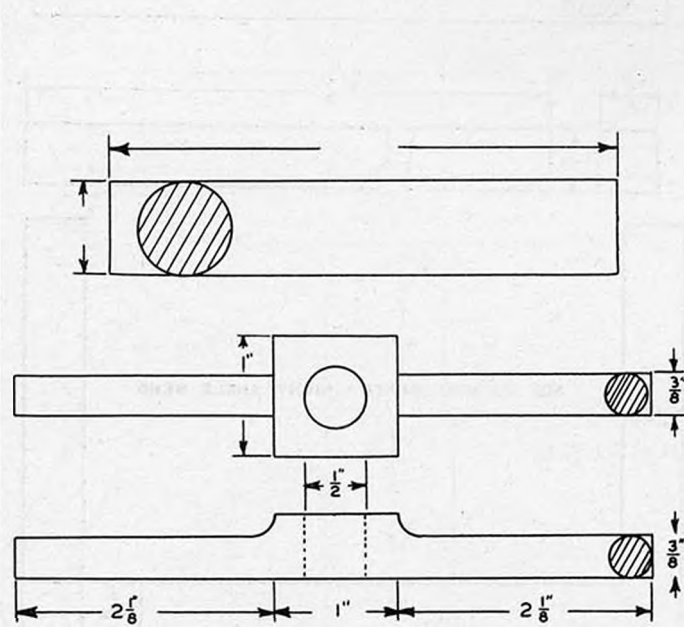
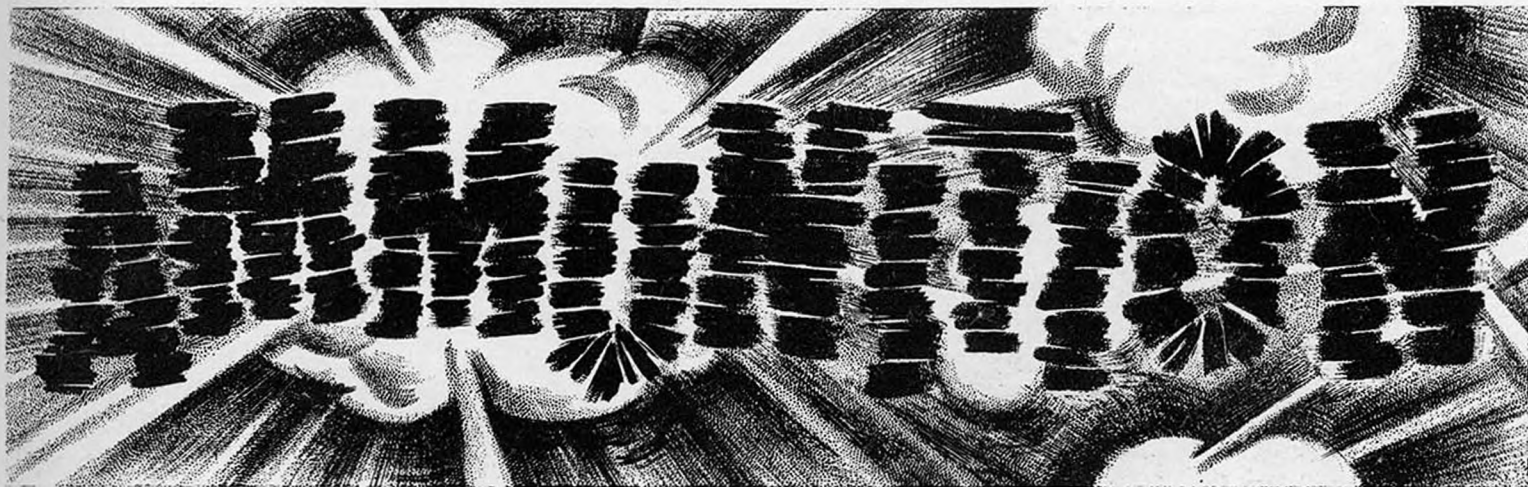


Fig. 11



CHAIN SWIVEL

Fig. 12



Conducted by: R. J. Russo, 1st Lt., Ord. Dept.

STORAGE OF AMMUNITION

by H. W. SIESHOLTZ, 2nd Lt., Ord. Dept.

Storage of ammunition at Posts, Camps, and Stations presents a problem which is similar in scope to that met at Ammunition Depots. This problem is, in the main, a different one from that encountered in field storage of ammunition in the Communication Zone and the Combat Zone itself. This difference resolves from the fact that up near the front lines of battle, safety precautions are secondary to expediency; in the Zone of the Interior, however, where our Depots and Posts are located, Safety is the rule — and a hard and fast one. This is so, because in the interior we have relatively large, permanent reserves of ammunition as compared to the rapid turnover of ammunition supplies where battle operations are occurring. Further, we are concerned with the possibility of damage to civilian institutions, railways, permanent structures, and personnel, both military and civilian. For this reason, definite rules have been set up to govern the storage of ammunition in the Zone of the Interior according to sound Safety Principles.

The purpose of this article is to present these rules for the storage of ammunition. It should be borne in mind, that even where these rules are not binding, they should serve as a guide and should be relaxed only when combat efficiency is thereby increased.

The principles of Ammunition Storage are simply a combination of the common-sense principles of any storage system with the necessary requirements for safety precautions. Since the purpose of this article is to present only such specific information as is concerned mainly with these latter precautions, very little detailed information will be given on general storage principles beyond pointing out where such information may be found. It is possible, however, to group the main requirements of an Ammunition Storage System in a general scheme of classification. This listing which follows, should be used as a check-list to determine whether or not the system used in any given establishment includes these important "must" requirements. Common-sense tells us that any adequate storage system must have:

A SYSTEM OF RECORDS

MEANS OF INVENTORY AND INSPECTION

ECONOMICAL USE OF SPACE

STACKING TO FACILITATE RECEIPT AND ISSUE

PROTECTION AGAINST THE ELEMENTS (LIGHTNING, ETC.)

FIRE PROTECTION AND PREVENTION

VENTILATION

MEANS OF MINIMIZING LOSSES AND EFFECTS OF EXPLOSION

SEPARATION OF MATERIALS WHICH MIGHT INITIATE AND PROPAGATE AN EXPLOSION

RECORDS. - The need for an adequate system of records is an obvious one. Without such a system it would be impossible to maintain property accountability or to insure an adequate stockage of all types of

ammunition. These records comprise stock records, master magazine record cards, magazine data cards, surveillance records, and other records of a similar nature. Reference is made to the April, 1942, issue of THE ORDNANCE SERGEANT. The article on page 324 of that issue presents the necessary information on the use of these records.*

MEANS OF INVENTORY AND INSPECTION

ECONOMICAL USE OF SPACE

STACKING TO FACILITATE RECEIPT AND ISSUE

In the storage of ammunition the problem of adequate space is an ever-present one; therefore, our stacks of ammunition should be built up as compactly as possible to utilize space most efficiently. On the other hand, the necessity of making inventories and inspections of the ammunition, and also of issuing from the stacks, requires that the size of the stacks be kept down to a convenient, reasonable size. This, in effect, means that a compromise must be resorted to in order to satisfy all these requirements. The two basic systems of stacking are the Numerical system and the Block system. In the numerical system, the stacks are no more than two containers wide (see Figure 1), and are placed back to back. This permits ready identification and inventory, and also enables stock to be issued most efficiently. The block system of stacking is used where the primary consideration is space. In this method (figure 1), the stacks are three or more containers wide and can, therefore, provide the maximum in compactness. Inspection and inventory of the containers is readily seen to be more difficult in the block system than in the numerical system.

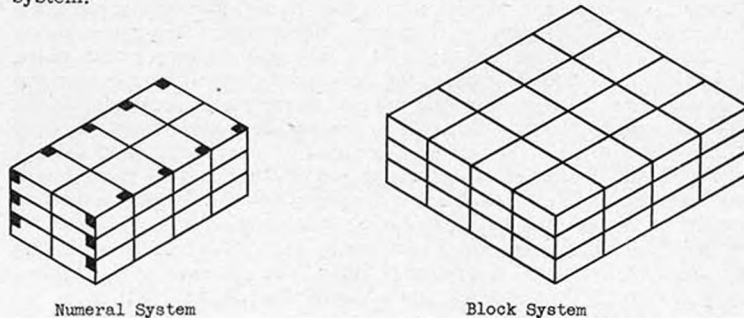


Fig. 1

For a more detailed description of the principles of stacking and warehousing A. R. 700-10 should be consulted.

PROTECTION AGAINST THE ELEMENTS. - It is a universal rule that all types of ammunition and explosives are affected adversely by water and dampness. In some cases, the degree to which a particular type may

* Because of great demand, back issues are not available.

be affected is not great; but, nevertheless, there is some deterioration that takes place. For this reason, all magazines containing ammunition and explosives must have full protection to prevent the entrance of rain, and dampness, and provisions for proper drainage of water away from the magazine. In addition, the possibility of fire and explosion resulting from lightning striking a magazine is always present during an electrical storm. All magazine construction, therefore, should have properly erected lightning protection systems. The proper construction of these systems may be obtained from the pertinent Ordnance Department drawings and specifications for magazine construction. It should be remembered that inadequate protection is worse than no protection at all, for the lightning

out. A small fire in a magazine can be put out with ease and safety if immediately attacked, but once it makes headway it may be necessary to forego any attempt to extinguish it, and to use available equipment to prevent spread of the fire. All personnel who may have the necessity of fighting these fires should be taught the dangers involved. The tendency exists to be over-cautious in instances where such over-caution is unnecessary and may lead to greater danger if a fire is permitted to spread. For this reason, a brief list of the dangers involved with the various types of important military explosives is included in the second installment of this article. A further discussion may be found in the Ordnance Safety Manual.

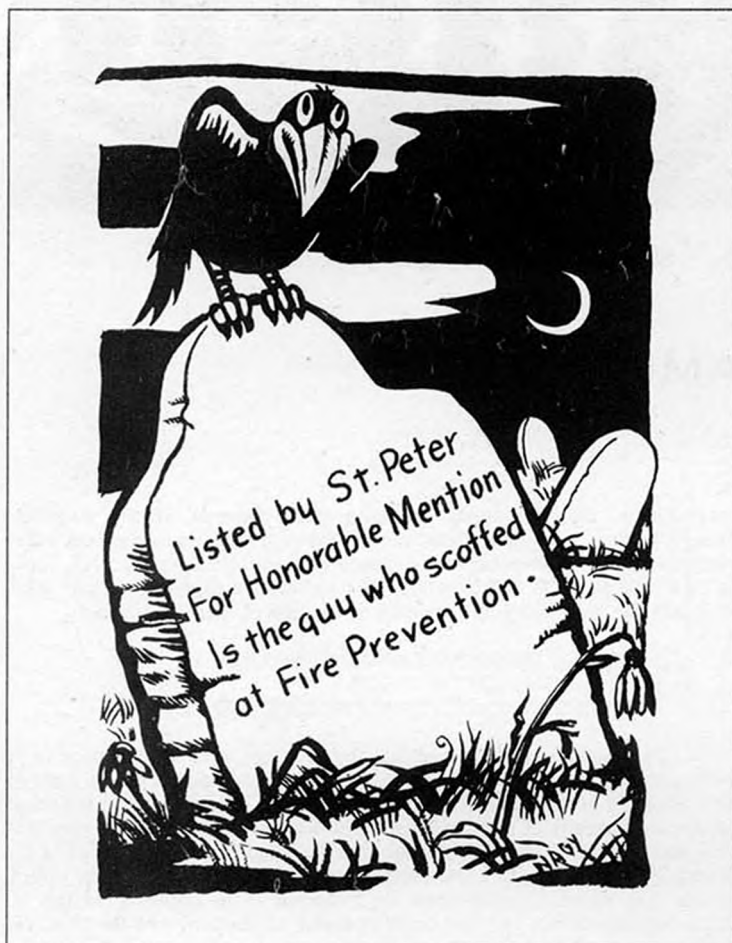


Fig. 2

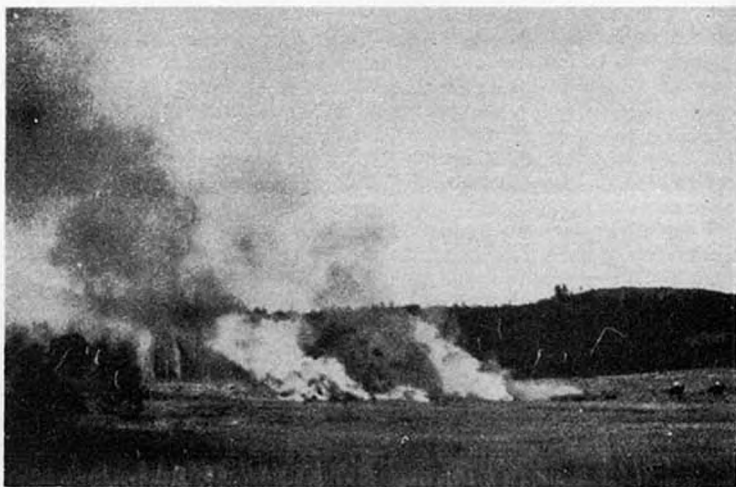
may be attracted to the magazine by the lightning rod with no provisions made for properly carrying away the high current safely. In this event, fire will inevitably break out.

FIRE PROTECTION AND PREVENTION. - The greatest single danger in the storage of ammunition lies in its inherently inflammable nature and relative sensitivity to heat. Further, if a fire starts and is not immediately brought under control, it may reach the proportions where it will be impossible to control the fire, and there will be a subsequent explosion and disaster. For this reason, extreme vigilance must be observed around all magazine areas to prevent fires from starting. Only authorized personnel should be permitted to carry matches, and the ground in the vicinity of a magazine should be cleared of all grass, brush and leaves lest a grass fire endanger the magazine. Similarly, combustible materials in magazines should be cut to a minimum amount. The problem of fire-prevention is one which is solved by common-sense and unceasing carefulness; additional treatment of rules to be observed in this matter may be found in the Ordnance Safety Manual (O.O. Form 7224).

Even with the utmost of care and sound safety practice, a fire may start in a magazine containing ammunition and explosives. In the majority of cases, it is perfectly safe to fight a fire in an ammunition or explosives magazine provided the fire-fighting crews go into action immediately and get the fire under control. For this reason every consideration should be given to the first line of defense in fighting fires by making sure that the necessary hand fire extinguishers, gunny sacks, sand buckets, and water buckets are immediately available in any vicinity in which fire might break



"Temporary" post war magazine holding 200,000 pounds of dry picric acid in wooden barrels, holding 400 pounds each.



Result of tractor backfiring, starting grass fire which spread to wooden shed containing explosive.

VENTILATION. - Inasmuch as most ammunition and military explosives will become deteriorated if stored at a high temperature over a long period of time, it is necessary to provide some means for free circulation of air. During very hot weather, it may be necessary to close all doors and ventilators during the day and open them at night to permit cool air to circulate. For this reason magazine construction should include ventilators which are of the type which may be opened or closed at will. In addition, these ventilators should have some type of screening in front of them to prevent entrance of sparks from passing trains or nearby smokestacks. In very extreme cases, where the temperature in a magazine goes up to about 100° Fahrenheit for long periods, it may even be necessary to resort to watering down the roof of the magazine.

MINIMIZE LOSSES AND EFFECTS OF AN EXPLOSION. - Strict adherence to all safety rules, and the use of care and common sense will prevent the start of a fire or subsequent explosion. It is a matter of military foresight and necessity, however, to make provisions for the possibility of an explosion. If an explosion does occur in a magazine, or if fire breaks out in it, two very important factors must be taken into account. First, it is necessary to limit the amount of ammunition and explosives lost by an explosion in any magazine to as small a quantity as is possible. In these days, when every shell and every pound of explosives is vital to our national security, such a fact is self-evident. Secondly, as a corollary

(Continued on page 411)



AIRCRAFT TORPEDOES

by K. E. TURNER, 1st Lt., Ord. Dept.

With the release by the Navy of the Mark 13-1 Torpedo to the Army for use with Army aircraft, many problems have arisen for the Ordnance personnel with the Air Forces. It is very difficult to publish any information which will be of value to totally inexperienced personnel. Information must necessarily be of a semi-technical nature at best. However, in an attempt to make information available to the field where trained personnel do not exist, the following information and sketches are put forth.

NOTE: A two-piece drawing of this torpedo will be found in the center of this issue of THE ORDNANCE SERGEANT. If one sheet of this drawing is removed from the magazine and pasted to the edge of the other sheet a complete drawing will result. Or, both sheets may be removed and pasted together to make the drawing more useful for study.

The sole purpose of the torpedo upon being released from the plane is to carry its charge to the target and upon arrival at the target to detonate its charge. The Mark 13-1 torpedo, the only one used at present with aircraft, is used with the A-20C, the B-25 and B-26 army bombers. It weighs 1927 pounds and carries a charge of 400 pounds of T.N.T. It is approximately 13-1/2 feet long and 22-1/2 inches in diameter. It has an effective range of 6000 yards and a speed of 33-34 knots or about 40 m.p.h. The motive power is furnished by a steam and gas driven turbine engine which develops between 93 and 98 horsepower.

For our purposes the torpedo may be divided into three parts: (a) the head, either exercise or war head, (b) the air flask, including the main air compartment, the fuel and water compartments, and the midship section, and (c) the afterbody to which the tail is already assembled.

The war head contains the main explosive charge of T.N.T. This charge when cast in the head is poured at an angle of 30 degrees in order to keep the center of gravity below the central axis of the torpedo and hence reduce the tendency of the torpedo to roll. Also in the war head is the tetryl booster and the mercury fulminate detonator. This explosive train is actuated upon impact with the target by the exploder mechanism. Since this exploder mechanism is not to be repaired in the field, only those tests insuring proper operation will be mentioned here.

The air flask contains the main air compartment, the fuel and water compartments, and the midship section. The main air compartment is a tapered steel forging capable of withstanding a 4000 lb./sq.in. hydrostatic test. It is in this compartment that 9.16 cu. ft. of air is stored under 2800 lb./sq.in. pressure. Just aft of the air compartment is the water compartment used for storage of water until it is required. Contained in the water compartment is the fuel flask, shaped very similarly to a doughnut and mounted by brackets on the forward side of the after bulkhead of the water compartment.

Riveted and sweated to the air flask is the midship section which contains the valve and superheater group. Included in these groups are the stop and charging valve, the air check valves, the fuel and water delivery valves, a strainer, the regulator, consisting of the starting valve, the reducing valve, the combustion pot, the fuel and water sprays, the igniter and the nozzles.

The stop valve furnishes a means of sealing the air in the air flask until shortly before the torpedo is to be launched. The charging valve simply furnishes a means of charging the air flask. The air delivery checks and the fuel and water delivery checks are installed in the air lines to the fuel and water compartments and the fuel and water lines respectively in order to seal the fuel and water in their compartments during handling of the torpedo or maneuvers of the plane. The reducing valve has the function of changing high pressure air at a constantly decreasing pressure to a constant and lower pressure. The combustion pot furnishes a pressure tight chamber for thorough combustion of the fuel and mixture of the steam and hot gases to be transmitted to the turbines through the nozzles. The fuel and water sprays in the combustion pot furnish a means of regulating the flow of the fuel and water. The igniter ignites the fuel when the torpedo first begins to operate.

The afterbody of the torpedo contains the turbines, the driving gears, the propeller shafts, the starting gear, the pallet mechanism, the gyro, the depth mechanism, the steering engines, and the oil tank. Attached to the afterbody is the tail. The tail is secured to the afterbody and includes the tail vanes, the rudders, and the rudder connections. The main engines, the driving gears and propeller shafts, the gyro, the depth mechanism and the steering engines will be discussed later in this article. The starting gear merely provides a means for starting the torpedo to operate when released from the plane. The pallet mechanism amplifies the action of the gyro and transmits this action to the steering engine (vertical) which further amplifies this action and operates the vertical rudders accordingly. The oil tank of course contains the lubricating oil of the torpedo, known as "Hot Running Torpedo Oil".

When the torpedo is released from the plane, the firing toggle trips the starting spindle arm, opening the starting piston and permitting air to start the functions of the various mechanisms in the torpedo. Upon its release it immediately performs several functions. First, it gives the gyro, which is the main directing instrument in the torpedo, its initial spin of 20,000 r.p.m. The gyro is locked by a spinning and unlocking mechanism which secures the gyro until it has completed 60 revolutions. By this time the gyro will be rotating on its proper course and it must be freed to perform its proper function. At the same time, after passing through the reducing valve and being reduced to between 400-450 lbs./sq. in., it passes some air into the combustion pot, also fires the igniter, forces the fuel and water from their respective compartments into the

combustion pot. Upon entry of the fuel, water and air into the combustion pot, the igniter which has already been fired, ignites the fuel. The heat generated by the burning fuel converts the water to steam. The combination of the combustion products of the alcohol (gaseous) and the steam expands rapidly and with increasing velocity through the nozzles striking against the turbine buckets. This impact of these gasses and steam against the turbines cause the turbines to rotate at approximately 10,000 r.p.m. The rotation of the turbines is transmitted through the gear train, rotating the propellers at the speed of 1100 r.p.m. and hence driving the torpedo through the water.

There are still other functions of the air while the above operations are being performed. The air at reduced pressure is transmitted through an air strainer to the steering engines. The steering engines merely amplify the directive forces of the gyro and the depth mechanism and transmit them to the rudders. The air from the vertical or gyro steering engine is led through a reducer, is reduced to 125 lbs./sq. in., and conducted to the gyro, where its stream is directed against the buckets cut in the gyro wheel and keeps the gyro rotating constantly during the run.

The torpedo is held at a constant set depth while in the water by the operation of the depth diaphragm and the pendulum. The depth diaphragm responds to outside sea pressure working against spring pressure. When these two pressures are approximately equal the rudders are neutral, when there is a difference in pressure, the rudders act to neutralize these two pressures. Working in conjunction with the diaphragm is the pendulum. This pendulum, balanced on knife edges, has the function of correcting, via the rudders, either a nose up or nose down attitude of the torpedo. Thus the pendulum assists in keeping the torpedo level in the water.

To insure satisfactory operation in the water, however, the torpedo must be dropped properly. The angle of entry of the torpedo into the water is all important. If it enters the water with too much of a nose down attitude it may make such a deep initial dive that it will never recover, or it may through improperly absorbed shock of impact run in exactly the opposite direction from that desired. If dropped with too much of a nose up attitude the force of impact will be spread over parts of the torpedo too weak to withstand the shock, resulting in a smashed torpedo. To further increase the problem of proper dropping, the question of air stabilization must be considered. The torpedo is entirely too streamlined to be stable in a fluid such as air, consequently without some additional control, proper dropping would be more a matter of luck with most pilots. The additional control is acquired by the addition of air stabilizers.

The stabilizer is a biplane surface very similar in some respects to a box kite. It is made of plywood and fitted over the tail vanes of the torpedo. This additional air supporting surface is sufficient to give a satisfactory stabilizing effect to the torpedo, causing it to approximately follow its vacuum trajectory. This gives the torpedo, when released at the proper altitude and speeds, an entrance angle of about 24 degrees. This entrance angle will generally result in a good run of the torpedo, all other factors being satisfactory.

When received in the field, the torpedo will generally be in either the fully ready state, or ready to be loaded on the plane, or it will be in the ready state. The ready state requires the preliminary and final adjustments before it is in the fully ready state. At the present time, the torpedoes have been turned over to the Ordnance personnel from the Navy in a fully ready state. Normally, however, it will be received in the ready state. In order to prepare the torpedo for a war shot the following steps and adjustments must be made. The understanding of these operations will be greatly clarified by reference to the drawing.

PREPARATIONS FOR A WAR SHOT:

Preliminary Adjustments:

1. Charge Air Flask

Install propeller locks, remove water and fuel compartment filling plugs, remove charging valve plug, seat starting piston by rotating starting index spindle, open stop valve, install charging line and wing nut securing the wing nut with the safety strap, admit air to charging line and charge air flask to 1000 lbs./sq.in. Remove wing nut and strap, after closing stop valve.

2. Drain Air Flask

Rotate torpedo 180 degrees, remove air lead from blow valve to exercise head, open blow valve. All condensed water should be forced out through the blow valve. For a war shot do not replace air lead.

3. Oil and Grease

Fill oil tank, stir gently after filling to remove all air bubbles. Remove after propeller sleeve and bushings, clean thoroughly and grease with tail bearing compound. Remove grease packing plug from after

propeller shaft and grease with gun. Replace grease packing plug and after propeller sleeve, bushings, hub and propeller. Secure with lock nut. Fill tail bearing with tail bearing compound and also forward propeller hub. Drain afterbody and tail from drain plugs.

4. Clean and Oil Check Valves and Strainers

Remove fuel and water air checks, clean, blow dry with air, oil with gyro oil, replace. Remove fuel and water delivery checks, clean, blow dry with air, oil with gyro oil, replace. Remove fuel and water strainers, wash with gasoline, or cleaning fluid, blow well with air and inspect for cleanliness, replace.

5. Check Speed Ring

Remove speed ring and check thickness with figure in record book. If satisfactory, replace and tighten.

6. Check and Adjust Depth Control Mechanism

Remove air strainer and install adapter. Test atmospheric chamber for leaks—should hold, with test fixture and gauge installed, 15 lbs./sq. in. air pressure for 5 minutes. If not, renew diaphragm and repeat. Remove test fixtures. With stop valve closed, install test gauge and reducer and connect to adapter. After checking alignment of rudders by hand with scribe marks on tail cone, and with transportation pin still installed, open stop valve (air is reduced to 400-450 lbs./sq.in. by reducer in gauge) and note position of valve in relation to valve stop. The mid-graduation should be in line with scribe mark on valve stop. If not, adjust. Check neutral position of depth rudders by tail cone scribe marks (should be 1-1/2 down). If out, adjust. Set depth index at 10 ft. Hoist torpedo clear of truck, and remove access plug. Using screw hook, secure 16 lb. weight. Remove transportation pin and using spirit level, level torpedo. Then with weight on mid graduation on depth engine, valve connecting rod should be in line with reference mark on valve stop. Adjust until this is so by changing depth setting. If depth setting does not read 10 feet when marks are aligned disengage tide gear spindle and reset index. Check by moving pendulum several times. Reference marks should always realign themselves. Remove weight and screw hook and replace access plug. Set depth index on 0 and give torpedo a tilting test. Pendulum should begin to move at no more than 1/2 degree up or down and reach full travel at 2-1/2 degrees tilt. Check full throws of rudders by moving pendulum by hand. Replace transportation pin.

7. Check Vertical Rudder Adjustment

Move propellers by hand until cam pawl is in its furthest position from the cam. Move steering engine valve by hand, recording rudder throws on vernier scale (both upper and lower rudder should be checked). Check vernier readings with record book. Lower torpedo on truck, close stop valve, remove test fixtures, wash and replace air strainer.

8. Test Gyro Mechanism

With torpedo upside down, remove gyro clamp plate and bottom head. Clean and inspect pot, oil, top and bottom bearings, move cam pawls to out position and install gyro. Replace bottom bearing. Rotate torpedo right side up and test locking and unlocking of gyro to see that it is free. Rotate torpedo 180 degrees and install gyro clamp plate and again turn torpedo right side up after locking gyro. Center vertical engine valve by hand and then rotate propellers by hand. Vertical engine valve should not move unless top plate is incorrectly centered.

9. Test Depth Engine, Spinning and Unlocking Mech., and Steering Engine with Air.

Install dummy igniter lead, install propeller locks, remove transportation pin and install replacement pin. Install firing toggle, and hoist torpedo clear of truck. Trip starting spindle arm. Open stop valve smartly, spinning gyro, and close immediately. Remove propeller locks, and reopen stop valve starting main engines for operation of pallet mechanism. Swing torpedo in azimuth and vertically, noting operation of rudders. If satisfactory, rotate starting gear index spindle, close stop valve, and replace propeller locks. Replace transportation pin and permit gyro to run down by itself. When gyro has run down, remove, replace fuel filling plug after removing water filling plug and then replace water filling plug. Remove tension on speed ring and replace hand hole cover plates.

Final Adjustments: (Note: Many of the steps in final adjustments are repetitions of those in preliminary adjustments since quite often there is considerable lapse of time between the preliminary and final adjustments).

1. Oil and Grease

Remove grease packing plug and grease bearings with grease gun. Fill tail bearings with tail bearing compound, fill forward propeller grease cavity with tail packing compound. Fill oil tank with Hot Running Torpedo Oil. Wire propellers for flight and install standard propeller locks. Oil reducing valve. Check speed ring.

2. Check Starting Mechanism

Rotate starting gear index spindle; click should be heard. Install

safety strap on starting gear spindle arm.

3. Charge Air Flask

Remove fuel and water filling plugs, remove charging valve plug, install charging line and wing nut. Secure wing nut safety strap. Open stop valve and begin to charge. Charge to 2800 lbs./sq.in. Rotate torpedo 180 degrees and open blow valve to drain air flask. Check pressure and charge to 2800 lb/sq.in. Attach war head.

4. Inspect Check Valves

Remove, clean, blow dry, inspect, and oil lightly with gyro oil, the fuel and water air checks and the fuel and water delivery checks. See that action is not sluggish. Clean fuel and water strainers.

5. Check Afterbody Fittings

Check all joint screws, check lock nut on after propeller sleeve, check all drain plugs, replace hand hole cover plates.

6. Open Stop Valve

7. Fill Fuel and Water Compartments

Fill fuel compartment, replace fuel filling plug. Fill water compartment, replace water filling plug. Rotate torpedo 180 degrees to port and drain combustion pot through igniter hole, keeping igniter lead clear.

8. Install Gyro

Remove gyro clamp plate cover and bottom head. Oil top and bottom bearings with gyro oil. With cam pawls in after position install gyro. Replace bottom head. Check gyro for freedom of movement and clearance. Lock gyro, being sure it is fully locked. Finger trip flush against pot wall will indicate this. Replace gyro clamp plate after inspecting gasket.

9. Prepare Depth Mechanism

Set depth index to required depth. Remove transportation pin and install replacement pin.

10. Install Exploder Mechanism after Testing

Assemble exploder mechanism after checking all serial numbers for match. With idler gear removed, arm mechanism and fire by push balance against firing ring. Should fire 3-1/2 to 5-1/2 lbs. pressure. Clearance between Anti-countermining push rod and bell crank should be .003" to .009". Cock and unarm exploder mechanism. Grease impeller shaft and test for turning pressure, should be 18 to 20 oz. Replace idler gear, assemble detonator to exploder mechanism. Clean exploder cavity thoroughly and install booster. Install gasket and exploder mechanism and secure. Secure Arming wire, after testing impeller turning pressure once more. With test fixture, check exploder mechanism with 5 lbs/sq.in. air pressure put in through test plug. Should be no leaks. Replace impeller guard.

11. Install Stabilizer

Rotate stabilizer 45 degrees and slip over tail vanes. Rotate back and slip onto tail vanes. Should fit securely against outboard bearing shoes. Torpedo is now ready for loading.

Loading Procedure

1. Make Final Inspection

Replacement pin installed, propeller locks on, propellers wired for flight. Starting spindle arm safety strap secured, and stop valve open.

2. Hoist Torpedo to Plane

Secure hoisting band to center of gravity line on torpedo. Secure hoisting cables to hoisting band and hoist torpedo into place. Install centering pin, and hoist torpedo snugly against chocks or sway braces. Secure torpedo with supporting cables. Tighten turnbuckles on supporting cables to remove any possible chance for shifting or torpedo. Check alignment of axis of torpedo with axis of plane by measuring from wing tip to center of nose ring. Distance should be the same from each wing tip. (This is only necessary where torpedo is aligned by adjustable sway braces.) Remove hoisting cables and bands. Secure detaching cables to supporting cables.

3. Secure Arming Wire

From loop in arming wire just above nose ring, secure the arming wire to some stationary, permanent fitting in the plane. (This may be done with any strong wire or cord).

4. Install Firing Toggle

Remove one of the pins in the firing toggle brackets and slip firing toggle into place. Be careful not to trip starting spindle arm. Replace pin. Secure firing toggle to lanyard or fixture to which it is attached.

5. Install Igniter

Remove dummy igniter if still installed, and install live igniter. Attach igniter air lead securely.

6. Remove Standard Propeller Locks

7. Remove Starting Spindle Arm Safety Strap

8. ADDRESS "WITH LOVE AND KISSES" TO ADOLPH, HIROHITO, OR BENITO.

This completes the operations necessary to put a ready torpedo into a fully ready stage and load on the plane.

With the torpedo in a fully ready condition, whether on a plane or not, if it is held in this stage for any length of time, certain routines must be followed. These routines are set for daily, weekly, and monthly periods and are as follows:

DAILY:

1. Gauge air charge. Boost if necessary.
2. Check oil level in oil tank. Fill if necessary.

WEEKLY:

1. Turn propellers 50 turns, then refill oil tanks.
2. Repack propeller sleeves with grease.
3. Operate depth index spindle from 0 feet to 50 feet. Reset at required depth setting.

MONTHLY:

1. Remove igniter, inspect for any signs of deterioration.
2. Remove drain plugs and drain.
3. Rotate torpedo 180 degrees, drain combustion flask enroute.
4. Remove exploder mechanism and booster. Turn torpedo right side up.
5. Remove check valve plugs, oil, and operate check valves. Clean fuel and water strainers. Clean air strainer. Reassemble.
6. Check action of starting gear by removing safety strap, tripping, and reseating. Replace Safety strap.
7. Operate depth setting mechanism from 0 feet to 50 feet and reset at required depth.
8. Remove one hand hole cover plate and operate pendulum by hand.
9. Work both vertical and horizontal rudders by hand, checking freedom of movement.
10. Remove propeller lock and rotate propellers 50 turns. Check pallet and slide, that pallet does not engage pallet pawls while gyro is locked. Move vertical steering engine control valve by hand and note that while propellers are being turned pallet blade does not strike pallet pawls. Listen for any unusual noises. Replace propeller lock.
11. Lubricate torpedo. Fill oil tank and grease all fittings.
12. Open stop valve gradually, rotate torpedo and drain combustion pot.
13. Inspect gyro and gyro mechanism. Remove gyro, unlocking before removing bottom plate. Inspect gyro, noting that balance nut is tight, apply two drops of gyro oil with syringe to each bearing. Lock and unlock spinning mechanism by hand and by spinning. Replace and lock gyro. Replace hand hold cover plate and drain plugs.
14. Install booster, detonator, and exploder mechanism. Turn torpedo upright.
15. Gauge and boost air flask.
16. Check level of fuel, oil, and water.
17. Load on plane if required.

These routines should be followed meticulously if the torpedo is to be kept available in the fully ready state at all times.

Finally we are faced with the problem of storage of ready torpedoes and war heads. Storage of war heads is a fairly simple matter. They are generally stored with bombs and other ammunition in the magazine area. The afterbodies should have inside storage where at all possible. At best they should be protected from the elements. However, it will depend upon the situation and the best that can be done should be done.

It cannot be emphasized too much that extreme care must be taken with all adjustments and work done on the torpedo. Careful investigation has proven that over 80% of torpedo failures are due to carelessness. If sufficient care is taken our torpedoes will all run "Hot, Straight, and Normal".

It is contemplated that additional articles pertaining to aircraft torpedoes will be published in early issues of THE ORDNANCE SERGEANT. These articles will, of course, be planned to discuss those phases of the subject which will be most troublesome to personnel handling this materiel.

You are invited to send in your questions on this subject. Tell us what points you want discussed in articles. Every effort will be made to provide all the information desired in the field, and to answer all questions received.

ORDNANCE TRAINING ACTIVITIES



Conducted by: G. D. Meixel, 1st Lieut., Ord. Dept.
Secretary, The Ordnance School

STUDY OF OFFICER CANDIDATES EXPLODES "SUPERMAN" MYTH

by R. W. McQUISTON, 1st Lt., A.G.D.,
Classification Officer

Because so many hundreds of soldiers believe that Officer Candidates are supermen, considerable research has been undertaken by the Classification Section of The Ordnance School to prove that it isn't so. Figures prove that OCS students are average citizens and soldiers, even though it's hard to realize that they curse extra details, swear when they are caught in the rain, and otherwise act as much like human beings as any other soldier.

The study of 1,000 OCS students turned up some rather surprising dope about the "average" officer candidate. Of course, this average student doesn't exist anywhere since he is the unreal composite of one thousand officer candidates, but here are his attributes in terms of average:

AGE: 25 years
HEIGHT: 5 feet 9
WEIGHT: 158 pounds
CIVILIAN SALARY: \$30.00 per week
EDUCATION: 4 yr. high school, 1 yr. college
INTELLIGENCE: 28% above the Army average
ARMY SERVICE: 1 yr. and 1 month

But no two soldiers are alike, and the very fact that these figures are averages means that half are better, half not as good. In height, these thousand men ranged from 5 feet 4 to 6 feet 3; in weight from 117 to 210 pounds. It is unfortunate that this study could not include intangibles like leadership, aggressiveness, appearance, which are often the influencing factor in selecting officers. Among the attributes that can be measured, however, most soldiers should be able to get an inkling of their possibilities as officers.

Age is less important in Ordnance than in some branches of service, by the very reason of its high degree of specialization and need of intensive training. For this reason some men over 30 are accepted if their education and experience can be directly used in Ordnance. However, this does not alter the fact that Ordnance will continue to be led by young men, as this table shows:

9% are under 23
54% are from 23 to 26
26% are from 27 to 30
11% are above 30

Civilian occupations do not carry extensive weight with the board unless they are closely linked with some Ordnance specialty. The main

factor is the success of the applicant in tackling his job and the leadership and sense of responsibility contributed to it. Salary is also taken into consideration, although with due allowance made for the type of work and natural geographical differences. By occupational groups, the thousand men were divided in this proportion:

PROFESSIONAL (teachers, lawyers, engineers, architects)	10%
SEMI-PROFESSIONAL (draftsmen, technicians, photographers)	19%
COMMERCIAL (clerks, buyers, salesmen, inspectors)	26%
TRADES (mechanics, machinists, plumbers, electricians)	25%
UNSKILLED (apprentices, chauffeurs)	16%
LABORERS (farmers, loaders, handy men, etc.)	4%

The 13-month figure for army service prior to OCS should be explained, because even at this writing, it is being substantially reduced. At the time of the study, a large number of candidates came in from the field after waiting as much as two years for the necessary expansion of officer training facilities. By easing restrictions last February, the school cleared a backlog which had held up newer applicants, and at the same time lowered the rather forbidding average length of army service. Some men with deficiencies in education or experience find it more profitable to wait a longer period in order to compensate with skilled army specialists ratings. For the outstanding soldier, however, who may be impatient with a year's wait, there should be plenty of incentive in the knowledge that nearly 400 of the 1000 men studied had been in the army nine months or less.

What about education? Here again, a prevailing notion is knocked into a cocked garrison hat. Acknowledging that a college degree is highly desirable, it is by no means a necessity. Of 1000 successful candidates, fewer than 300 could boast college degrees. It should be more encouraging still to the self educated man to learn that 7% of these men never had more than a grammar school education. For the most part, the men with less education made the grade because they had the initiative to go to night school, to take correspondence courses, or in other practical ways to compensate for the formal education that was denied them. Every soldier can be thankful that our streamlined, democratic Army breaks down educational lines to discover and reward ability in the quickest possible way. Numerically, the group was divided this way:

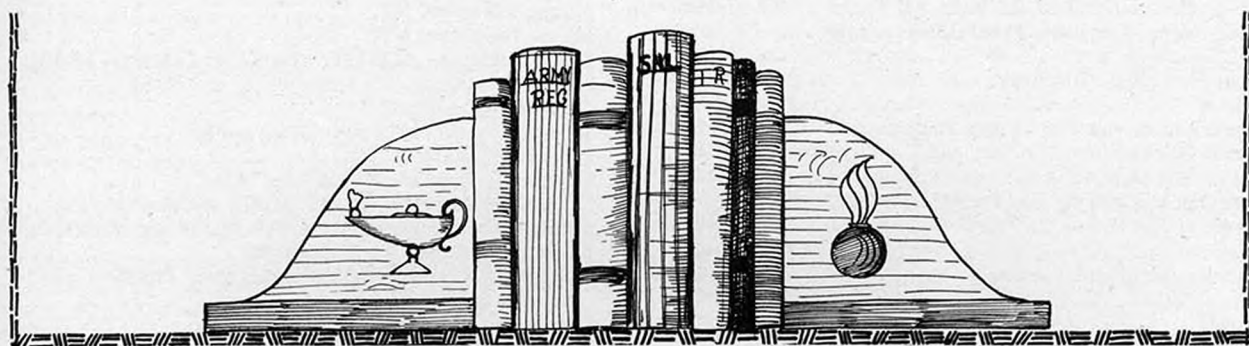
32 had post graduate degrees
258 had college degrees

644 had completed high school, but not college
67 had grammar school or less.

Among all these flexible attributes, one requirement is rigid. Call it "Intelligence Quotient", "brain power", or as the army does, call it the "Army General Classification Score". Whatever its name, it merely means "mental temperature" above the normal 100. For obvious reasons, the army is reticent about giving out scoring data, but some generalizations may be helpful. Of the five recognized levels of intelligence, Grade I is "Very Superior" and is scored by only 7 men in 100 while Grade II is "Superior" and is earned by 24 men in 100. All officer candidates automatically fall within these two top brackets. With scores based on native intelligence rather than knowledge or experience, the test discovers the soldier's ability to think fast and accurately, to follow instructions, to analyze new situations — the fairest possible standard of admission to Officer School.

One word of caution. — The OCS examining board takes into consideration many more factors than have been considered here. Appearance, leadership, previous military experience, even hobbies of military value are all weighed in the balance because no two soldiers who have ever appeared before the board have possessed the same qualifications and skills. In an army where the human equation is so vital, these intangible assets may be the key to a soldier's success as an officer. And let it be emphasized that the skilled officers who compose the board are as much on the alert to discover potential ability as to judge the record of past performance. Any soldier can size up his measurable qualifications against the findings of the Ordnance School Classification Office, but only the board can estimate the intangibles that can mean promotion for an otherwise "average" applicant.

For the soldier who is hiding his light under a bushel, there is no better counsel than the maxim "There is no defeat, except in no longer trying".



LIBRARY

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

The following list of technical manuals pertaining to Ordnance Materiel and related subjects have been arranged in alphabetical order to facilitate their use.

Technical manuals on motor vehicles issued under the direction of the Quartermaster General in the "10" Series have not been included. These manuals should accompany the particular vehicle to which they have been assigned.

Publications contained in this list may be ordered from the Superintendent of Documents, Government Printing Office, Washington, D. C. Prices are indicated where they are known. Remittance should be made by postal money order, express order, coupons, or check. Coupons (value 5 cents each) may be purchased in quantity and used to transmit small remittances conveniently, and are good until used.

	TM NO.
Administration	\$1.00 12-250
Administration (The Division and Large Installations)	12-220
Agent Officers	10-325
Aircraft Armament and Pyrotechnics	1-409
Aircraft Cameras (Machine Gun)	1-505
Aircraft Electrical Systems	1-406
Aircraft Engine Operation and Tests	1-408
Aircraft Engines	1-405
Aircraft Induction, Fuel, and Oil Systems	1-407
Airplane Hydraulic Systems and Miscellaneous Equipment	1-411
Air-Ground Communication	1-465
Airplane Structures	1-409
Ammunition General	9-1900
Ammunition, Coast Artillery	4-205
Ammunition, Small Arms	9-1990
Angle of Site Instrument, M1917	9-1525
Armament Controls, Electrical	1-490
Armament and Pyrotechnics, Aircraft	1-409
Automotive Brakes	10-585
Automotive Electricity	10-580
Automotive Lubrication	10-540
Automotive Power Transmission Units	10-585
Batteries, Storage, for Signal Communication except those Pertaining to Aircraft	11-430

Blacksmith and the Welder	25¢ 10-440
Board, plotting, M1, Sound Ranging	9-2684
Boards, plotting, M3 and M4	10¢ 9-2681
Board, plotting, M5	10¢ 9-2683
Board, plotting, M1918A1	9-2571
Board, plotting for Field Artillery	10¢ 9-1569
Board, plotting for Seacoast Artillery	20¢ 9-1570
Board, spotting, M3	9-2682
Body, Chassis, and Trailer Units	15¢ 10-560
Body, Fender, and Radiator Repairs, Sheet Metal Worker	20¢ 10-450
Body Finisher, Woodworker, Upholsterer, Painter and Glassworker	10-455
Bomb Racks, Tow Target Equipment, and Flare Racks	1-500
Bombardiers, Handbook for	1-251
Bombs for Aircraft	9-1980
Brakes, Automotive	15¢ 10-565
Browning Automatic Rifle, Cal..30, All Types	9-1211
Browning Machine Gun, Cal..30, All Types, U.S. Machine Gun, Cal..22, and Trainer, Cal..22	10¢ 9-1205
Browning Machine Gun, Cal..50, M2, Aircraft, Fixed and Flexible	10¢ 9-225
Browning Machine Gun, Cal..50, All Types	9-1225
Browning Machine Gun, Cal..50, Water-Cooled and Mounts	15¢ 9-226
Chassis, Body, and Trailer Units	15¢ 10-560
Chemicals, dangerous, Storage and Shipment of	20¢ 3-250
Chemistry and Chemical Agents, Military	25¢ 3-215
Circle, aiming, M1	9-2530
Circle aiming, M1, M1918 (French), M1916 and M1916M1	10¢ 9-1530
Cleaning, Preserving, Lubricating, and Welding Materials and Similar Items Issued by the Ord. Dept.	20¢ 9-850
Coast Artillery Ammunition	15¢ 4-205
Coast Artillery Weapons and Materiel	4-210
Communication Systems, Target Range	10¢ 11-431
Compass, Prismatic	5¢ 9-1595
Continental Engine, Model W670-9A	9-1726
Diesel Engines and Fuels	20¢ 10-575
Director, M3	9-1650
Director, M4	9-1655
Director, M4	9-2655
Driver's Manual	10-460

	TM NO.		TM NO.
8 in., Gun, Mk. VI, Mod. 3A2 and Mount, Railway, Gun 8 in., M1A1	9-463	Military Explosives	9-2900
Electrical Armament Controls	1-490	Milling Machines, Shapers, and Planers	1-421
Electrical Fundamentals	25¢ 1-455	Mortars, Light Field and Mounts-all types	9-1260
Electrical Systems, Aircraft	1-406	Motor Transport Inspections	10-545
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Elevation Quadrant, M1	9-2674	Motorcycle	10-515
Engine Operation and Test, Aircraft	15¢ 1-408	Mount, quadrant, M1	9-2553
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Field Artillery Trainer	10¢ 6-225	Mount, telescope, M16	9-1547
Field Glass, Type EE	10¢ 9-1611	Mount, telescope, M18A1	9-2553
Field Glasses	9-575	Mount, telescope, M18A1	9-1553
Finder, depression position, M1	10¢ 9-1695	Mount, telescope, M20	9-2674
Finder, depression position, M1907	10¢ 9-1685	Mount, telescope, M19	9-1578
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Finder, range, 1-Meter Base and 80-cm Base, All Types	15¢ 9-1585	Mount, telescope, M21	9-2551
Fire Control Instruments, Auxiliary (Field Glasses, Eye-glasses, Telescopes, and Watches)	9-575	Mount, telescope, M22	9-1552
Fire Control Equipment, Field Artillery	6-220	Mount, telescope, M23 (For 75mm Gun Carriage, M2A3)	9-1552
Fish Nets, Repair of	5-268	90mm Antiaircraft Gun Materiel M1 and M1A1	9-370
Flare Racks, Bomb Racks, and Tow Target Equipment	1-500	Oil Systems, Aircraft	1-407
40-mm Antiaircraft Gun Materiel M2, Gun and Top Carriage of	9-1252	105mm Howitzer Materiel, M1A1 and M2	9-325
40-mm Antiaircraft Gun Materiel M2, Lower Carriage of	9-1253	155mm Gun Materiel M1	9-350
40-mm Automatic Gun M1, and 40-mm Antiaircraft Gun Carriage M2	9-252	155mm Gun and Carriage M1 and M1A1	9-1360
Fuels and Carburetion	15¢ 10-550	155mm Gun Materiel, M1917, M1918 and Modifications	9-345
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Gas Mask	25¢ 3-205	Operation and test, Aircraft Engine	1-408
Generating Unit, M1	10¢ 9-2615	Painter, Upholsterer, Woodworker, Body Finisher, and Glassworker	10-455
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Generator, auxiliary (Homelite Model HRH-28) for Medium Tanks, M3	9-1752	Planers, milling Machines, and Shapers	1-421
Glassworker, Painter, Upholster, Woodworker, and the Body Finisher	10-455	Pneumatic Tires and Rubber Treads, Maintenance and Care of	31-200
Grinding Machines	15¢ 1-422	Power, Hand, and Measuring Tools	10-590
Guiberson Engine, Model T-1020	9-1727	Power Train Unit, Three Piece Differential Case, for Medium Tanks M3, M4 and Modifications	9-1760
Half-Track Vehicles, Car, Half-Track, M2; Carrier, Personnel Half-Track M3; Carrier, 81mm Mortar, M4; Carriage, Motor, 75mm Gun, M3	9-710	Preserving - Cleaning, Lubricating, and Welding Materiels and Similar Items Issued by the Ord. Dept.	9-850
Hand, Measuring, and Power Tools	20¢ 10-590	Projector, signal, ground, M4	9-292
Heat Treating and Inspection of Metals	10¢ 1-423	Property Accounting	10-310
Height Finding, Stereoscopic	4-250	Protective Concealment, Materials for	5-269
Homelite Model HRH-28, Auxiliary Generator, for Medium Tanks M3	9-1752	Protective Concealment for Seacoast Fortification	5-285
Hydraulic systems and miscellaneous equipment, airplane	15¢ 1-411	Power Train for Light Tanks M3 and M3A1	9-1728
Incendiary Bombs	3-330	Preservation and Care of Seacoast Defense Materiel	4-245
Induction Systems, Aircraft	1-407	Propellers, Aircraft	1-412
Inspection Guide, Aircraft	15¢ 1-415	Pyrotechnics, Aircraft and Armament	1-409
Inspection of Shoes	10-227	Pyrotechnics, Military	9-981
Instrument Repairman	9-2602	Quadrant, elevation, M1	9-2674
Instruments, azimuth, M1910 and M1910A1 (Degrees)	10¢ 9-1875	Quadrant, elevation, M1	9-1557
Instruments, azimuth, M1910A1	9-2675	Quadrant, range, M1	9-1549
Instruments, azimuth, M1918A2	9-2680	Quadrant, range, M3	9-1547
Instruments, azimuth, M1918	10¢ 9-1680	Quadrant, range, M4	9-1551
Instruments, binaural training, M1 and M2	10¢ 9-1662	Quadrant, range, M4	9-2551
Instrument, binaural training, M2	10¢ 9-2662	Quadrant, range, M5	9-2552
Instrument, flank spotting, M1 Rule, Flank Spotting, M1	10¢ 9-1610	Quadrant, range, M6	9-1552
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Lacrimators and Smokes, Use of, in training	10¢ 3-305	Range Finding, Stereoscopic	4-250
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Light Instrument, M5	9-1551	Rifle Range Construction, Targets, and Target Materials	9-855
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Materiel, and Weapons, Coast Artillery	4-210	Setter, fuze, T15 (For 90mm Gun, M1)	9-2641
Materiel, Seacoast Defense; Preservation and Care	4-245	Setter, fuze, T15	9-1641
Materiel, sound locators M1A1 to M1A8, Inclusive	9-1661	Setter, fuze bracket, M1918 Series	9-1590
Materiel, sound locator, M2	9-2660	Setters, fuze, hand, M1912 and 1913 Series	9-1590
Materiel, sound locator, M2	9-1660	75mm Gun and Carriage, M1917, and Modifications	9-315
Measuring, Hand, and Power Tools	20¢ 10-590	75mm Gun Materiel, M2 and M3 (Tank)	9-307
Metals, Heat Treating and Inspection of	15¢ 1-423	75mm Gun Materiel, M1897 and Modifications	9-305
		75mm Gun and Carriage, M1897 and all Modifications	9-1305
		75mm Howitzer Materiel	9-320
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		Shapers, Milling Machines, and Planers	1-421
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	TM NO.
Shotgun and Skeet Shooting	1-1100
Sight, M1901 (French)	104 9-1550
Sighting System M2 with Telescope M7 for 37mm	
Antiaircraft Gun	9-1606
Sight, telescopic, M1	9-2581
Sights, telescopic, M1 and T3	104 9-1581
Sights, M4, M3 (For 60mm and 81mm Mortar Materiel; Sights, M2A3, M2A1, M2 (For 81mm Mortar Materiel)	104 9-1535
Sights, quadrant, M1917, M1917A1, M1918, and M1918A1	104 9-1555
Site Instrument, M1917, angle of	9-1525
Skeet and Shotgun Shooting	1-1100
Small Arms Ammunition	9-1990
Small Arms Data	9-2200
Smokes and Lacrimators, use of, in training	104 3-305
Sound Locators M1A1 to M1A8, Inclusive	9-1661
Sound Locator, M2	9-1660
Sound Locator, M2	9-2660
Stereoscopic Range and Height Finding	4-250
Storage and Issue	304 10-250
Storage and Shipment of Dangerous Chemicals	204 3-250
Storage Batteries for Signal Communications Except Those Pertaining to Aircraft	104 11-430
Submachine Gun, Thompson, Cal. 45, M1928A1	9-1215
Switchboards BD-71 and BD-72	11-330
Synchronizing	1-510
System, data transmission, M3	9-1651
System, data transmission, M4	9-1656
System, sighting M2 with Telescope M7 for 37mm Antiaircraft Gun	9-1606
Tank, Light, M3	9-726
Tank, Light, M5	9-732
Tanks, Light	9-725
Tanks, Medium, M3, M3A1, and M3A2	9-750
Tanks, Medium, M3 and M4 and Modifications, Power Train Unit, Three Differential Case	9-1750
Target Range Communication Systems	104 11-431
Targets, Target Materials, and Rifle Range Construction	204 9-855
Telephones EE-8-A and EE-8	11-333
Telescope M6	9-1578
Telescope M7 for 37mm Antiaircraft Gun with Sighting System M2	9-1606
Telescope T15	9-2579
Telescope, B.C., M1915A1	104 9-1580
Telescope, elbow, M5	9-1547
Telescope, elbow, M14	9-1552
Telescope, elbow, M16	9-1551

	TM NO.
Telescope, panoramic, M1	104 9-1548
Telescope, panoramic, M5A3 and M12A2	9-1551
Telescope, panoramic, M5A4	9-1552
Telescope, panoramic, M5A5	9-1553
Telescope, panoramic, M8	9-2554 - 9-2674
Telescope, panoramic, M12A1	9-1552
Telescope, panoramic, M12A2	9-1551
Telescopes, panoramic, M1917M1, M2A1, M3A1, M4, M5A2, M5A3, M5A4, M5A5, M5A6, M6	9-1583
Tester, stereoscopic, M1A1	104 9-2653
37mm Aircraft Gun Materiel M4	104 9-240
37mm Antiaircraft Gun M1A2 and Carriage M3	9-1235
37mm AA Gun Materiel	354 9-235
37mm Automatic Gun, M4 (Aircraft)	9-1240
37mm Gun, M3 and Carriage, M4	104 9-1245
37mm Gun Materiel (Tank) M5 and M6	9-1250
Thompson Submachine Gun, Cal. 45, M1928A1	9-1215
3-inch Antiaircraft Gun Materiel, M2A2, M2A1, M1A2, M1A1, T1A2 and T1A1	104 9-1360
Tires and Rubber Treads, Pneumatic, Maintenance and Care of	31-200
Tow Target Equipment, Bomb Racks, and Flare Racks	1-500
Tractor, Heavy, M1	9-777
Tractor Model T-6	9-2778
Tractor Heavy (Diesel Model TD-18)	9-2777
Trailer, Units, Body, Chassis	154 10-560
Transmission Units, Automotive Power	154 10-585
Transportation, Rail, Zone of the Interior	354 10-370
Transportation, Water	154 10-380
20mm Aircraft Gun Materiel M1 and M2	104 9-227
20mm Aircraft Gun Materiel, M1 and M2	9-1227
U.S. Rifle, Cal. 22, M1922, M1922M1 and M2	104 9-280
U.S. Rifle, Cal. 30, M1	9-1275
Upholsterer, Woodworker, Body Finisher, Painter, and Glassworker	10-455
Watches	9-575
Water Transportation	154 10-380
Weapons and Materiel, Coast Artillery	4-210
Welder, and the Blacksmith	254 10-440
Welding	1-430
Welding, Lubricating, Preserving, and Cleaning Materiels and Similar Items Issued by the Ord. Dept.	204 9-850
Wheeled Motor Vehicles Preventive Maintenance Schedules	10-522
Wood worker, Body Finisher, Upholster, Painter and Glassworker	10-455
Wright Whirlwind Engine Model R97EC-2	9-1751



TRUCK, SMALL ARMS REPAIR

(Continued from page 327)

NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASS'Y.	LOCATION ON TRUCK
M-8	W	RA-DD-D120	3 DRAWER, tool and spare parts box, type II		
M-8	W	RA-DD-D120	1 DRAWER, tool and spare parts box, type III		
J-2	W	RA-DD-A104	3 FORCEPS, spring, flat wire, 3-3/4 in. overall (carried in box, type VI))		
M-8	W	(RA-DD-D120) (RA-DD-C106)	BOX, tool and spare parts, S., type V, class B, complete ----- (Consisting of:	4	
M-8	W	RA-DD-C109	3 BOX, spare parts, transparent, type VI (carried in drawers)		
M-8	W	RA-DD-D120	1 BOX, tool and spare parts, S., type V		
M-8	W	RA-DD-D120	2 DRAWER, tool and spare parts box, type I		
M-8	W	RA-DD-D120	4 DRAWER, tool and spare parts box, type II		
J-2	W	RA-DD-A104	3 FORCEPS, spring, flat wire, 3-3/4 in. overall (carried in box, type VI))		
M-1	W	4	CHEK-CHART, lubr. guide, No. 48 -----	1	
M-1	W	4	CORD, extension, hv-duty., rubber, 2-cond., #12-AWG, 25 ft., w/male and female connectors -----	2	A-42
M-1	W	4	CORD, extension, hv-duty., rubber, 2-cond., #12-AWG, 50 ft., w/male and female connectors -----	3	A-42

NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASS'Y.	LOCATION ON TRUCK
M-1	W	4	CORD, extension, light, rubber, 2-cond., #18-AWG, 25 ft., w/male connector and soft rubber med. base screw socket and lamp guard -----	2	A-42
M-3	W	RA-DD-B116	LADDER, steel -----	1	Compartment rear under truck
H-4	W	4	PLUG, adapter -----	4	A-32
H-4	W	4	PLUG, dble-outlet -----	4	A-32
B-16	W	8	RACK, rifle, portable (for U.S. Rifle, cal. 30, M1903 and M1) -----	2	On floor under A-bench
M-1	W	--	SWITCH, overload, 25 amp. (Square-D Co. #111633-S type) -----	1	
M-3	W	3	TABLE, folding, 72 x 30 x 30, depth when folded 2-3/8 in., loading cap. 1000 lb. (RAED Spec. 727-8-41, w/exception of depth when folded) -----	1	Top-rear A
MACHINE UNITS					
J-11	W	5	DRILL, elec., port., 3/8 in., 115 v., a.c.-d.c., complete, w/stand (RAED Spec. 727-30-40) (Milwaukee #B-238 type) -----	1	Top-front A-bench
M-1	W	7	GENERATOR, port., 110 v., a.c., 60 c., 1-1/2 kw., gasoline engine drive (RAED Spec. 727-42-40) (Homelite Corp. type) -----	1	On floor front of A

NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASSY.	LOCATION ON TRUCK	NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASSY.	LOCATION ON TRUCK	NOTE SYMBOL	PLATE NO.	PIECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASSY.	LOCATION ON TRUCK
J-1	W	6	--			J-1	W	6	--			J-1	W	6	--		
			MACHINE UNITS - Continued														
			GRINDER, bench, elec., 6 in., 110 v., 60 c., sgl. ph. (RA-DO-011) (Brown-Brookmeyer Co. B-Line #00610 type) -	1	Top-front of B												
			ACCESSORIES:														
			POT, water, bench grinder, w/STUD (Brown-Brookmeyer Co. B-Line type)	1													
			KIT - GAGE														
B-20	W	11	B6302														
			BOLT, field test (for U.S. Rifle, cal. .30, M1)	1													
B-20	W	11	B6302														
			BOLT, field test (for U.S. Rifle, cal. .30, M1)	1													
B-20	W	11	B6302														
			BOLT, field test (for U.S. Rifle, cal. .30, M1)	1													
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NOTE SYMBOL	PLATE NO.	PECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASSTY.	LOCATION ON TRUCK	NOTE SYMBOL	PLATE NO.	PECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASSTY.	LOCATION ON TRUCK	NOTE SYMBOL	PLATE NO.	PECE MARK OR DRAWING NO.	ITEM	QUAN. PER UNIT ASSTY.	LOCATION ON TRUCK
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 48 teeth (South Bend part #32M type)			J-11	W	28	1 SLEEVE, spindle, 10 in. bench lathe, No. 2 Morse taper, inside (South Bend type)			M-1	W	19	REGULATOR, voltage (for 110 v, a-c, 5 kw generator) (RAM Spec. 727-5-41) (Ward-Leonard Elec. Co. type)	1	Rear of lathe
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 54 teeth (South Bend part #32M type)			J-11	W	28	1 SLEEVE, spindle, 10 in. bench lathe, No. 3 Morse taper, inside (South Bend type)			M-1	W	--	REGULATOR, voltage (for 110 v, a-c, 5 kw generator) (RAM Spec. 727-5-41) (Ward-Leonard Elec. Co. type)	1	
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 54 teeth (South Bend part #32M type)			J-11	W	30	1 STOP, carriage, all-iron, 10 in. bench lathe (South Bend type)			J-11	W	9	SHAPER, crank, bench, 7 in., 110 v, 60 c, engr. ph., complete (RAM Spec. 727-15-40) (Atlas #78 type)	1	C-bench
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 54 teeth (South Bend part #32M type)			J-11	W	30	1 STOP, cross feed, 10 in. bench lathe (South Bend type)						ACCESSORIES:		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	--	1 UNDERCUTTER, armature, w/110-125 v, a-c 4-6 motor, tool post adapter, spare belt, and 10 ft. cord, complete (St. Joe Lathe Co., "Little Joe" #200 type)			J-11	W	--	2 BELT, countershaft (Atlas #27-126 type) (spare part)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	--	1 BELT, motor (Atlas #37-126 type) (spare part)			J-11	W	--	2 BELT, T-tail, complete (for Atlas #78 type shaper)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	--	1 BELT, T-tail, complete (for Atlas #78 type shaper)			J-11	W	--	2 BELT, T-tail, 3/8-1/2-2 x 1-1/2		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	--	1 BELT, T-tail, 3/8-1/2-2 x 1-1/2			J-11	W	--	4 BELT, T-tail, 3/8-1/2-2 x 1-1/2 (for replacement - use 1-1/4 in. long bolt)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	--	1 BELT, T-tail, 3/8-1/2-2 x 1-1/2			J-11	W	--	2 BELT, T-tail, 3/8-1/2-2 x 1-1/2		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	--	1 BELT, T-tail, 3/8-1/2-2 x 1-1/2			J-11	W	--	2 BELT, T-tail, 3/8-1/2-2 x 1-1/2		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	--	1 BELT, T-tail, 3/8-1/2-2 x 1-1/2			J-11	W	--	2 BELT, T-tail, 3/8-1/2-2 x 1-1/2		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	--	1 BELT, T-tail, 3/8-1/2-2 x 1-1/2			H-1			12 NUT, regular, hex., w/1/2 in. sq. hole		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	--	1 BELT, T-tail, 3/8-1/2-2 x 1-1/2			H-1			12 WASHER, plain, 3/8 in. x 1/2 in.		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 FITTING, indexing, 3 x 6 in., complete (to fit Atlas #78 type shaper)			J-11	W	32	1 FITTING, indexing, 3 x 6 in., complete (to fit Atlas #78 type shaper)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
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J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
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J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)			J-11	W	32	1 HOLDER, tool, extension, shaper, 3/8 x 7/8 shank, 7/16 diam. bar, complete (Armstrong #206 type)		
J-11	W	--	1 GEAR, change, S., 14-1/2 deg., 16 D.P., 1/2 in. face, 3/8 diam. hole, 3/16 x 3/32 keyway, 60 teeth (South Bend part #32M type)			J-11	W	32	1 HOLDER, tool,								

M1 WRECKER

(Continued from page 353)

- 2 - Lantern, Electric, Portable, 6 Volt
- 2 - Extra Batteries (for electric lantern)
- 1 - Rope, War sisal, 3 Strand, 3/4" x 100'
- 1 - Rope, War Sisal, 3 Strand, 3/8" x 50'

SOURCES OF INFORMATION

TM 9-776 Truck, Heavy Wrecking, M1
SNL G-116
Training Film 9-614
Operations and Maintenance Manual for Model 1000, Heavy Wrecking
Truck, M1, "Ward La France Truck Corporation"
Parts list for Model 1000, Heavy Wrecking Truck, M1, "Ward La
France Corporation"

FSMWO's

(Continued from page 372)

- (f) Disposal of Discarded Parts: To be turned in for salvage, in accordance with AR 35-6640, 10-C.5.
- (g) "This Work Order is classified in the RED Group, and therefore will be completed at the earliest practicable date. A monthly Progress Report should be forwarded to this office listing the number of each of the Field Service Modification Work Orders, classified in the RED Group, applied during the current month and the number yet to be applied in your Service Command".
8. Remarks:
- This work order applies to all Medium Tanks M4 Series manufactured prior to this modification.

9. Date Approved for Publication: July 30, 1942

H. R. KUTZ
Brigadier General, Ordnance Department
Chief, Field Service Division



VICKERS MACHINE GUN

(Continued from page 376)

The crank has journals on each side which pass through the holes in the rear end of the right and left hand recoil plates. A hexagon is formed on an extended portion of the journal on the right hand side on which the roller handle is driven and further secured by a roller handle securing screw. At the upper end of the roller handle is the roller handle knob. The journal, on the left hand side, is bored and slotted to receive the stem of the fuze and, extended to the front of the crank, an arm makes connection, by means of the crank pin, with the cross head. The crank pin is retained by a crank pin fastening pin.

The cross head, pivoted at its rear end to the crank arm by the crank pin, makes connection, at its front end, with the side levers of the lock by means of a bayonet joint. The cross head is threaded for a short distance near its center to receive the adjusting nut and, by placing suitable washers between this adjusting nut and the shoulder of the cross head the cartridge head space can be adjusted.

The adjusting washers are provided in two sizes: adjusting washer (thin) and adjusting washer (thick). The former is .003" and the latter is .005", the first having one small hole punched in it and the second having two, as identification marks.

The fuze makes connection between the crank and the recoil spring, the connection to the crank being made by means of a bayonet lock so arranged with large and small keys that its incorrect insertion in the crank is impossible. Connection between the recoil spring and the fuze is made by front and rear fuze links joined together by a fuze rivet. The front fuze link has an end link pin which is inserted in the hook at the rear end of the recoil spring. The rear fuze link is fastened to the fuze by another fuze rivet.

The roller handle is driven on the crank hexagon and is of a special curved form. In recoil, its rear end bears against the roller causing the crank to rotate to the rear. The roller handle securing screw passes through the roller handle and the hexagon of the crank. On the front end of the roller handle, a roller handle knob is provided to enable the mechanism to be operated by hand.

The lock consists of the lock frame, five lock frame rivets, a lock frame distance piece, side levers, side levers bushing and side levers pin.

COMMENT: The side levers is a "U" shaped piece having a shank, somewhat resembling a letter "Y". It is in one piece, but is designated in the plural by reason of the side, upright, arms of the "U" portion one of which fits over each side of the lock frame.

There are right and left hand lifting levers, a firing pin, safety sear, safety sear spring, safety sear pin, tumbler pin, tumbler, hand sear, hand sear pin, carrier, gib, gib spring, gib spring plate, filling piece and filling piece pin.

These are all recoiling parts of the weapon.



LUBRICATION
LENGTHENS
LONGEVITY

ARTILLERY

(Continued from page 378)

increasing, and it is usually expressed as one turn in a length of so many calibers. For example, a 12-inch gun having a twist of one turn in 25 calibers indicates a twist of one turn in every 25 feet of gun length.

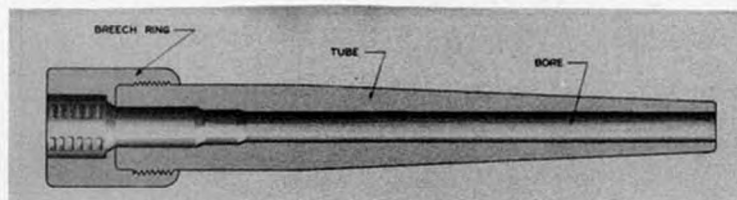


Fig. 5 -- Monobloc cannon

Lands. - The surfaces of the bore between the grooves are called lands.

REMOVABLE LINER

A removable liner is a cylinder, containing a complete rifle bore, which is inserted into and locked on the inside of the tube proper. In cannon of high muzzle velocity, the rifling becomes eroded rapidly. The purpose of the removable lining is to permit quick reconditioning of cannon by replacing worn liners with new ones.

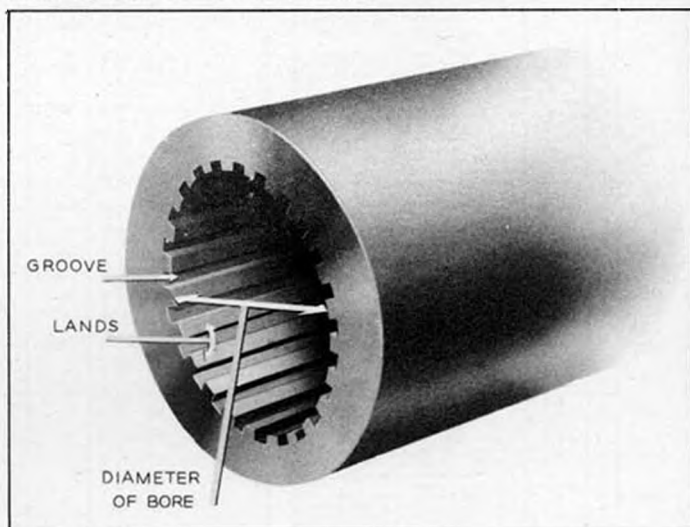


Fig. 6 -- Rifling

Erosion, the effect of which has been mentioned, is the gradual wearing away of the bore of a cannon - especially the lands - due to firing. It is evidenced by a rough and enlarged bore resulting in a loss of range and accuracy.



TORQUE AMPLIFIER

(Continued from page 383)

Bands have no carbon deposit on their under side. Bands are straight, free from kinks or bows. Solder blobs (14) are in place. Carbon rings are free from circumferential scores, broken edges, grease, oil or moisture.

Clean and dry your hands. Replace clamps and screws and check the static balance of the torque arms. Weight may be scraped away where necessary to bring the arms into balance. Replace the special holding tool or masking tape. The torque arms must be displaced 180° plus or minus 5°.

Loosen the clamp on the end of the output torque arm and insert the band so that about 3/8" extends through. The short end of the band should be toward the top of the torque amplifier or input drum side. The short end of the band should extend toward the bottom of the torque amplifier on the output drum side. Tighten the clamp so that the band leaves at an even angle and does not ride on the edge of the carbon ring. Turn the output coupling and slowly wind the band on the carbon ring, slipping the band underneath the input torque arm each time it comes around. Attach the other end of the band to the input torque arm and tighten the clamp. Very little slack should exist. Replace the other band in the same manner.

Remove the special holding tool or the masking tape. Slightly loosen the clamp and shift the band sideways until it rides evenly through the center of the carbon ring. Band should not spread apart upon change of direction of rotation. Adjust both bands until they meet this requirement.

Hold the output coupling and turn the input coupling. The backlash between the torque arms, measured at the torque arms, should be between 1/16" and 3/64". Adjust the amount of band extending through one of the clamps until this requirement is satisfied. Recheck the alignment of the bands. Excessive backlash may be caused in part by too much backlash between the input coupling and input torque arm. This can be corrected by changing the mesh of the gears between the input coupling and input torque arm.

Check that the output and input couplings can be turned in opposite directions simultaneously without excessive drag. The tightness of the bands will determine the amount of this drag, though oil or moisture on the carbon ring will also give a high degree of drag. Drag should not be sufficient to cause the carbon rings to be rotated when the input and output couplings are turned in opposite directions at the same time.

TESTING THE TORQUE AMPLIFIER FOR OPERATION

Connect power to the motor. Note that the phase connections are correct. When the motor is running and both the input and output couplings are unloaded neither coupling should rotate. If this occurs it indicates that the amount of friction between the band and carbon ring on one side is greater than the friction between the band and carbon ring on the other side.

Any tendency of the couplings to turn may be corrected by decreasing the amount of band extending through the clamp on one end of the input torque arm and increasing the amount of band extending through the clamp on the other end of the input torque arm by the same amount. This adjustment will change the position of the torque arms, so it will be necessary to note that the tolerance of 5° is not exceeded for the 180° displacement of the torque arms. The alignment of the bands and backlash will also have to be rechecked. This adjustment tends to equalize the amount of friction on both input and output sides.

As soon as the condition indicated above, known as bias, has been corrected, the torque amplifier must be checked for the ease of starting operation. A 1/8-ounce weight suspended from the input coupling must start smooth rotation of the output coupling in the opposite direction. Check both clockwise and counterclockwise rotation of the input coupling. This check is to determine only the ease with which the torque amplifier may be started. Note: The motor must be on during this check.

The requirement for amplification of torque is 90 to 220. In order to determine the amplification the following should be obtained: A scale which reads in ounces up to about 5 pounds, a 1-ounce weight, an arm for increasing the radius of the output coupling, and a device for holding the scale while readings are being taken. Turn off power. Suspend the 1 ounce weight from the input coupling. Insert the arm in the output coupling. Note: The arm will tend to rotate in an opposite direction from the input coupling. The appropriate end of the arm is placed in the hook of the scale. The distance between the center of the output coupling and the hook of the scale must be known. This distance will represent the radius of the output coupling. The radius of the input coupling is 1/2". Assume that the radius of the output coupling is extended to 6". Assume that the scale reading is 20 ounces. Using these assumed figures the amplification can be determined as follows:

$$\text{Torque amplification} = \frac{\text{Output torque}}{\text{Input torque}}$$

$$\frac{\text{Scale reading (oz)} \times \text{radius output arm (in)}}{\text{Weight used (oz)} \times \text{radius input coupling (in)}}$$

$$\text{Substituting the assumed values, } \frac{20 \text{ oz} \times 6"}{1 \text{ oz} \times 1/2"}$$

Cancelling through, we get $2 \times 6 \times 20 = 240 = \text{Torque amplification}$

The torque amplification under these conditions would therefore be 240. This is not within tolerance, since the requirements are 90 to 220. In proceeding with the test, note that the end of the output arm will not slip from the scale when the power is turned on. If this happens the band will be pulled loose from the clamps and a complete readjustment will be necessary.

Turn on power. Note the index of the scale and obtain the reading in ounces. The scale index should not jiggle up and down more than 2 ounces on the 6" arm. Check torque amplification in clockwise and counterclockwise directions. The requirements in each direction are the same. There are no requirements for equal output in each direction however.

In the event a scale cannot be obtained in the field the following alternate method may be used.

Obtain a piece of 3/32" square stock which is 16" in length. Scribe this arm with a mark in the center, marks 3-1/4" on either side of center and marks 7-7/8" on either side of center. This square stock is to be used to extend the radius of the output coupling.

Use 5 large cover plate screws and 1 small cover plate screw from the director M5 or M6 in place of the 1 ounce weight normally used on the input coupling. These screws weigh about 1 ounce.

Use any one of the 3 handwheels of the director M5 or M6 instead of the spring balance scale ordinarily used to check amplification. These handwheels average about 14 ounces each.

Turn off power. Suspend the required number of screws on the input coupling. Place the indexed arm in the slot of the output coupling with the center graduation opposite the center of the coupling. Suspend the handwheel from the 3-1/4" graduation on the arm.

Turn on power. The amplification must be sufficient to lift the handwheel until the arm is in a horizontal position. Turn off power. Suspend the handwheel from the 7-7/8" graduation on the arm. Turn on power. The amplification must not be strong enough to lift the arm to the horizontal position. Check the amplification in clockwise and counterclockwise directions. Do not let the arm slip and strike the base of the casting.

Highly polished, smooth drums, and clean, well adjusted bands are essential to proper amplification and to smoothness of operation. No positive means of increasing torque amplification appears available for field use, other than replacement of the carbon ring. If the amplification is too high it may be reduced by roughening the surface of the carbon ring. This must be done with the bands removed. Turn on power. Press crocus cloth or a clean rag against the ring. Proceed with extreme care when roughening the carbon ring. Remove the loose carbon from the ring and the residue from the bottom of the recess.

The bands may be cleaned of carbon deposit by polishing with crocus cloth. This is necessary when operation is noisy or jiggle is excessive.

In the event solder blobs are knocked off it is advisable to replace the band, however check the performance and note whether replacement is necessary. The fact that a solder blob is missing sometimes has no harmful effect upon performance of the torque amplifier.



ALLOTMENTS

(Continued from page 385)

the following: "D" - US Government Life Insurance" (See Fig. 6). The same change is made in W.D., A.G.O. Form No. 30, when used for discontinuance of Class "D" allotments.

Both of these forms are prepared in triplicate. The original is sent to the Chief of Finance, Allotment Division, Washington, D. C., the

duplicate is sent to the Veterans Administration, Washington, D. C., and the triplicate is retained by the Unit Personnel Officer.

CLASS "N" ALLOTMENTS. - Class "N" allotments were established by the National Service Life Insurance Act of 1940, to provide a premium payment plan for members of the Armed Forces. National Life Insurance

Chief of Finance, Allotment Div.
Send directly to
Washington, D. C.

AUTHORIZATION FOR ALLOTMENT OF PAY
(See AR 35-5230)

The (Last name) John (First name) J. (Middle initial) 32178678 S/Sgt., 150th Ord. Co. (M) (Company, Regiment, or unit or service)

The (Last name) John (First name) J. (Middle initial) 32178678 S/Sgt., 150th Ord. Co. (M) (Company, Regiment, or unit or service)

I hereby state that the purpose for which this allotment is granted is solely for the support of wife, child, or dependent relative; or if made for the payment of life insurance premiums, the insurance (including endowments and/or twenty (or other) payment policies) is on the life of the allottee only; that a policy therefor has been issued and the first premium paid thereon; that the insurance constitutes the major and not a merely incidental or collateral element of the transaction; and that the allotment is made in favor of the insurance company issuing the policy and not in favor of a bank or other agent. I also state if allotment is in favor of a bank that deposit should be made to the credit of

Date of enlistment January 25 1940 When other than "Pay of the Army" is affected, state P. A.

Chargeable

I hereby state that the purpose for which this allotment is granted is solely for the support of wife, child, or dependent relative; or if made for the payment of life insurance premiums, the insurance (including endowments and/or twenty (or other) payment policies) is on the life of the allottee only; that a policy therefor has been issued and the first premium paid thereon; that the insurance constitutes the major and not a merely incidental or collateral element of the transaction; and that the allotment is made in favor of the insurance company issuing the policy and not in favor of a bank or other agent. I also state if allotment is in favor of a bank that deposit should be made to the credit of

(Name) John J. Doe (Signature)

Place Fort Blank, Illinois Date February 4 1942

Entered on service record 2/4/42

W. D. A. G. O. Form No. 29
October 12, 1941

*Strike out words in parentheses which are not applicable.
1. 10-1-41
2. 10-1-41
3. 10-1-41
4. 10-1-41
5. 10-1-41
6. 10-1-41
7. 10-1-41
8. 10-1-41
9. 10-1-41
10. 10-1-41

Fig. 6

provides only one form of policy. It is a five year term policy with monthly premium rates about equal to the rates provided for the term policy under the U. S. Government Life Insurance Plan. This is the type of insurance which most of us have at the present time.

W.D., A.G.O. Form No. 29 and 30 are also prepared in triplicate with the same distribution provided for Class "D" allotments, to effect application and discontinuance of Class "N" Allotments.

CLASS "F" DEDUCTIONS. - Class "F" deductions are authorized by the Service-men's Dependents Allowance Act of 1942. The benefits provided under this Act may be paid to the relatives and dependents of enlisted men below the first three grades, and will continue, unless previously discontinued, until six months after the duration of the present war.

Two classes of beneficiaries are provided for under the Act: Class "A" and Class "B". Class "A" includes the following: a lawful wife or a divorced wife who has not remarried and to whom alimony has been decreed by a court and is still payable; unmarried children under the age of 18, or of any age if incapable of self-support by reason of mental or physical defects. Class "B" includes the following: dependent father, mother, grandfather, grandmother, or other persons who stood in the place of parents; unmarried brothers and sisters under the age of 18, or of any age if incapable of self-support through mental or physical defects, and to grandchildren to whom the enlisted man has stood in the place of parents.

The payments provided are made up of deductions from the soldier's pay and of the contribution by the Government. If the deduction is for a Class "A" or Class "B" dependent alone, \$22.00 will be deducted from the soldier's pay each month. If for both Class "A" and "B" dependents, \$27.00 will be deducted. Where more than one dependent is involved, the amount deducted from the soldier's pay will be prorated and added to the Government's contribution. For Class "A" dependents, the Government's share is as follows: For a wife but no child, \$28; for a wife and one child, \$40, with \$10 for each additional child; for a child alone, \$20, with \$10 for each additional child; for a former wife who has been divorced and to whom alimony must be paid, \$20. In the case of Class "B" dependents, the Government will contribute the following: For one parent, \$15; for two parents, \$25; for each grandchild, brother and sister, \$5.00. The total remittance to class "B" dependents (deduction from pay plus Government contribution) may not exceed \$50.00 per month.

Evidence in the nature of court records or other satisfactory proof must be submitted to support statements concerning marital status, and/or date of birth of children in case of Class "A" dependents, and of degree of relationship, and dependency for Class "B" dependents.

Application for Class "F" deductions may be made by the enlisted man or by his eligible dependents. If the application is submitted by a member of the soldier's family, or by a dependent relative, proof of marriage and/or birth of children, or relationship and dependency must

be filed along with the application. If the enlisted man files the application, such evidence need not be submitted before six months after date of filing.

The deduction from the pay of enlisted men who were in the Service on June 1, 1942, and who have applied for a Class "F" deduction, will begin with the pay due for June, 1942, if he desires to avail himself of the retroactive privilege provided in the Act. However, if he does not desire to avail himself of this retroactive privilege, deductions will begin from his pay for the month specified in the application. The amounts deducted from a soldier's pay since June, 1942, will accumulate until sometime after September 1st, when they will be paid, together with the Governments' contribution to the beneficiary. Deductions from the pay of eligible enlisted men who enter the Army after June 1, 1942, will be made beginning with the month in which he applies.

Application for Class "F" deductions will be made on W.D., A.G.O. Form No. 625, This is a four page form consisting of an instruction page, the "original" copy, the "official" copy, and the "applicant's" copy. The "original" copy is sent to the Allowance and Allotment Branch, Washington, D.C.; the "official" copy is filed by the Unit Personnel Officer; and the "applicant's" copy is retained by the soldier making the application. If the form is accomplished by a dependent relative, etc., the "original" and "official" copies plus all necessary papers and evidence required are sent to the Allowance and Allotment Branch, Washington, D. C.

Upon the filing and acceptance of W.D., A.G.O. Form No. 625, in the case of Class "A" dependents, the deduction may not be discontinued at the request of the allottee, on the other hand, deductions for Class "B" dependents may be discontinued any time by the applicant. In general, Class "F" deductions will terminate whenever the soldier or his dependents cease to be eligible for them upon notice of that fact given to the Allowance and Allotment Branch, A.G.O., Washington, D.C. This would include the death of the soldier, his discharge, or desertion from the Army, his appointment to the first three grades, the death of a beneficiary, the attainment of the 18th year or prior marriage of a child, and the cessation of dependency of any class "B" dependent.

CLASS "A" PAY RESERVATIONS. - In order to stimulate the sale of War Savings Bonds to officers and enlisted men of the Armed Forces, a pay reservation plan was set up in March, 1942. The payments under this plan are known as Class "A" Pay Reservations. Application for the reservation is purely a voluntary act on the part of the subscriber, the only restriction being that placed upon the minimum amount for which officers and enlisted men may subscribe. The monthly deduction must be in multiples of \$1.25, and in the case of officers, may not be less than \$3.75. Enlisted men may authorize a minimum of \$1.25 as deductions for each month. When the accumulated reservations become sufficient in amount, a War Savings Bond will be purchased for the subscriber, and disposed of in the manner designated by him.

Application for Class "A" Pay Reservations are prepared in quadruplicate on W.D. Form No. 29-5 (See Fig. 7), or W.D., A.G.O. Form 29-5 Revised. The original and duplicate of the form are sent to the Chief of

ORIGINAL (SEE INSTRUCTIONS AND CONDITIONS ON REVERSE)

APPLICATION FOR PAY RESERVATION FOR PURCHASE OF DEFENSE SAVINGS BONDS

The (Last name) JOHN (First name) J. (Middle initial) 32178678 S/Sgt., 150th Ord. Co. (M) (Company, Regiment, or unit or service)

I, the individual named above, hereby request and authorize a Class "A" reservation of pay for the purchase of Defense Savings Bonds, Series L, in the denomination of \$25.00 (MATURITY VALUE), and at the rate of \$ 6.25 per (month) (Quarterly, Half-yearly, or yearly) commencing with the January 25 1940 pay day. I further agree that in signing this form I understand and subscribe to the conditions stated on the reverse.

1. REGISTER bonds in my name AT 775 Tulip Ave., Franklin Square, N. Y. (City and State)

2. MAIL bonds to Do (Last name) Caroline (First name) (One instruction No. 4) (NMI) (Middle initial)

OR AT 775 Tulip Ave., Franklin Square, N. Y. (City and State)

3. List as my "CO-OWNER" Do (Last name) Caroline (First name) (One instruction No. 4) (NMI) (Middle initial)

4. I direct that when my Bond Account is closed out the unapplied balance thereof be refunded to me AT 775 Tulip Ave., Franklin Square, N. Y. (City and State)

... Fort Blank, Ill., June 5 1942 (Date)

*Entered on S.R. June 5/42 (Date)

*Strike out words, etc., not applicable.

Office of the Chief of Finance, Defense Bond Division, Washington, D. C.

For the following reasons: ☐ Serial number incorrect. ☐ Signature of subscriber does not agree with typed name. ☐ Not signed by subscriber. ☐ Not signed by officer. ☐ Form incorrect or incomplete as follows:

W. D. Form No. 29-5
Form approved by Commander, General, 1. 10-1-41
2. 10-1-41
3. 10-1-41
4. 10-1-41
5. 10-1-41
6. 10-1-41
7. 10-1-41
8. 10-1-41
9. 10-1-41
10. 10-1-41

Office of the Chief of Finance, Defense Bond Division.

Fig. 7

Finance, War Bond Division, Washington, D. C., the triplicate will be retained by the Unit Personnel Officer who prepares the form and the quadruplicate will be delivered to the subscriber. Deductions from pay

will begin with the month in which the application was filed. No acknowledgement of receipt of the form will be made by the Chief of Finance.

Changes in the amounts of these reservations or if a change in the name and/or address of a beneficiary or co-owner is desired, the request will be made on W.D., A.G.O., Form No. 30-5, prepared in quadruplicate and distributed in the same manner as W.D. Form No. 29-5.

Discontinuance will be effected by executing W.D., A.G.O., Form No. 30-5, in quadruplicate, the disposition of which will be the same as for the application. The request for discontinuance will be submitted in the following cases: upon request of the subscriber, upon his death, desertion, discharge, or mental incapacitation, and whenever for any reason, the available pay of the subscriber will not warrant continuance of the reservation. When such notification of discontinuance is made by the subscriber or the Unit Personnel Officer, the deductions from pay will cease at once. Any money which has not been obligated for the purchase of a bond at the time of discontinuance will be refunded to the subscriber upon request to the Chief of Finance. It will normally take approximately 90 days to effect this refund.



ORDNANCE COMPANY (MM)

(Continued from page 386)

in the computation of the proportionate amount of supplies to be stocked. They contain, in tabulated form, the estimated quantities of major items, maintenance parts, and equipment for the maintenance of a specific number of major items for 12 months in the Theater of Operations. From these Addenda, the Company can determine the approximate number of each spare part, major item, and cleaning and preserving material that should be carried as an initial load by multiplying the amount shown in the addenda by a fraction the numerator of which is the number of the major item in the unit to be served and the denominator of which is the amount of the major items on which the particular addenda is based, and this product is then multiplied by a fraction, the numerator of which is the period for which the supplies are to be furnished, and the denominator of which is the period shown in the particular addenda to SNL, usually 12 months. Subsequent loads of spare parts, and cleaning and preserving material are determined from the records of a like previous engagement or campaign.

In the operations of the Shop Office many forms and records are kept, and it is interesting to note that each one has been designed to augment the accuracy of one master record of the shop — The Shop Expenditure Record — which shows all the items that have been expended due to actual repair operations or issues by the company over a given period of time. The responsibility for the maintenance of all proper records belongs to the Shop Foreman, but the Shop Clerk, a corporal, normally makes all postings and entries to these records under the supervision of the Chief of the Stock Section, who has the necessary authority delegated to him by the Shop Foreman. It is easy to see that in order to establish a firm foundation in anticipating future requirements of the company's supplies and maintenance parts, up-to-date records would be invaluable. To this end, all records kept by the Shop Clerk must have the support of each member of the organization. Personnel of the company is instructed to be constantly on the alert in regard to supply levels and to submit any recommendations that may have a material effect upon the accuracy of any records.

In view of the facts that we have considered, it would not be erroneous to assume that the successful conclusion of any campaign depends largely upon the ability of maintenance personnel to cope with the problem of keeping combat equipment operating at the height of its efficiency. The speed in which these repairs must be accomplished demands highly trained and skilled repairmen, as expensive equipment serves no useful purpose while it is undergoing repair and not available to the unit for which it is intended.

Highly trained and skilled repairmen, be they automotive mechanics, artillery mechanics, armorers, instrument repairmen, or machinists and welders, are ineffective when they do not have the necessary

tools and repair parts to effect the needed repairs to the major items that are sent to the company shop for that purpose. It is the duty of the Stock Section that, with the assistance of stockmen and shop clerks, and with the closest of cooperation with the Shop Foreman, to see that supplies of spare parts, major items, cleaning and preserving material, and the necessary tools are available at all times to the various sections for the purposes for which intended, for without close attention to this phase of "maintenance" the various mechanics will be having repair work "pile up" in their sections, and the company will not be able to furnish that Ordnance maintenance service for which it was organized and which the using troops can rightly expect. Therefore the slogan for the supply personnel in an Ordnance Medium Maintenance Company should be: "Supplies to the mechanics of the company and to the using troops when they need them, and in the amount they need them".



EARLY AMERICAN MECHANICS

(Continued from page 388)

A successful machine which Spencer invented for turning sewing machine spools suggested to him the possibility of making metal screws automatically. The result was his invention of the automatic turret lathes. The importance of the blank cam cylinder, with its flat strips adjustable for various jobs, was wholly overlooked by his patent attorney, with the result that Spencer obtained no patent right on the most valuable feature in the whole machine.

The importance of his invention can hardly be overestimated. It ranks with Maudslay's slide-rest and the turret tool-holder, as it is an essential feature in all modern automatic lathes, both for barstock and chucking work.

Assured of the success of the machine, Spencer withdrew from active connection with the Billings & Spencer Company in 1874, and in 1876, with George A. Fairfield, then superintendent of the Weed Sewing Machine Company, and others, formed the Hartford Machine Screw Company, one of the most successful enterprises in the city. Unfortunately, Mr. Spencer withdrew in 1882 to manufacture a new repeating shot gun and rifle which he had invented. The gun was a success mechanically, but the Spencer Arms Company, which had been formed in 1883 at Windsor, Connecticut, was a failure, and Mr. Spencer lost heavily. In his later years Mr. Spencer returned to the field where he did his most brilliant work, automatic lathes. He represents the New England Mechanic at his best, and his tireless and productive ingenuity has made a permanent impress on modern manufacturing methods.



STORAGE OF AMMUNITION

(Continued from page 398)

to the first rule, the ammunition stores must be set up so that an explosion in one magazine will not explode ammunition contained in another or cause damage to railways and other such equipment and installations. Provision is made for these two important factors by the common-sense practice of providing a maximum limit on the amount of ammunition and explosives that may be stored in a magazine; and secondly, by regulating the distances between adjacent magazines containing a given amount of ammunition so that the explosion or fire may not be transmitted one to the other. These regulations are provided in the Ordnance Safety Manual and in TM 9-1900 (Ammunition, General). Those quoted in this article were taken from TM 9-1900 and are applicable only to posts, camps and stations. Depots and establishments under the control of the Chief of Ordnance will be governed by the Ordnance Safety Manual where the tables given differ. Exceptions to the regulations as quoted in this article will also pertain only to post, camps and stations. Those establishments under the Chief of Ordnance must have approval from the Chief of Ordnance to use them. The necessary data are set up under what are called the "Quantity-Distance Tables". These tables, as the name indicates, give:

- a. The list of explosives and types of ammunition to which any given table applies.
- b. The distance the magazine must be from other magazines for various amounts of explosives contained herein.
- c. The maximum amount of explosives that can be stored in the magazine.

For the purpose of using these tables, various explosives and ammunition types are grouped into definite classes in accordance with the hazard involved. For example, if a number of different types of ammunition components will explode with the formation of only very small and light fragments or missiles, they will all be grouped into one class. The reason for this is that the danger involved to nearby magazines will be due mainly to very light missiles which will be projected about the same distance for the different types of ammunition components listed in one class. Using a more specific example, the construction and general characteristics of primers, detonators, blasting caps, and grenade fuzes are about the same. They all have a small amount of explosive; and when they explode, they all form relatively small fragments which are hurled through the air only a short distance. This means that rules limiting the amount of any one of the above in a magazine, and specifying the distance the magazine must be from adjacent ones will also apply to the others. For this reason, they are grouped into a single class, and only one Quantity-Distance table need be set up for the whole class. The Ordnance Safety Manual groups the entire list of ammunition and explosives into twelve such classes. To determine how much of any given type of ammunition may be stored in a magazine and how far this magazine must be from adjacent ones, it is merely necessary to locate the ammunition in the proper class and then to look it up under the pertinent Quantity-Distance Table. It should be always kept in mind that grouping of various types of ammunition in one class for use with these tables does not mean they necessarily may be stored together in the same magazine. The means of determining whether or not different types of ammunition may be stored together is obtained by other methods which will be given in the second installment of this article in the November issue of THE ORDNANCE SERGEANT.

Since the hazard involved in the storage of ammunition rests primarily in the amount of explosive in the ammunition and not in the total weight of the complete assembly including metal parts, the Quantity-Distance Tables are so set up that the information obtained from them is the permissible amount of explosives contained by the ammunition stored in the magazine. For example, the Quantity-Distance Tables permit a maximum amount of 500,000 pounds of explosives in any magazine containing 75mm high-explosive shell. The shell for the 75mm gun contains 1.47 pounds of explosive. (This information as to the weight of the explosive in a shell may be obtained from the Complete Round Chart, O.O. 5981.) The number of rounds of this 75mm ammunition that may be stored in the magazine is not obtained by dividing the permissible amount of 500,000 pounds by the weight of the complete round. Instead, to find the number of rounds, since each shell contains 1.47 pounds of explosive filler, dividing 500,000 by 1.47, gives a result of 340,136 rounds of the 75mm ammunition that may be stored in a magazine.

Using this principle, four general rules have been set up for computing the amounts of various types of ammunition that may be stored in a magazine in accordance with the Quantity-Distance Tables.

1. Smokeless Powder. - To compute the amount of smoke-powder that may be stored in a magazine, use the net weight of the powder in the boxes. This also applies to propellant charges in containers.
2. Pyrotechnics. - Use the gross weight of the container and the contents.
3. Separate-loaded shell and bombs. - Use the net weight of the explosive in the shell or bomb as a basis for computing, neglecting the weight of the metal parts.
4. Fixed and semi-fixed ammunition (cartridge case assembled to shell): Use the net weight of the explosive in the shell. The smokeless powder is a minor hazard compared to the high explosive in the shell; and, therefore, it is not included in computing the number of rounds that may be stored in a magazine.

Using the above rules and principles as set forth above, it is then possible to use the Quantity-Distance Tables to determine permissible storage amounts and distances for the various types of explosives. Again, it is necessary to caution that the items of any of the classes set forth in these tables may not be stored together just because they may be members of the same class. Further, the classes and tables have been

built up with the understanding that the ammunition stored in a magazine is packed in accordance with standard drawings and specifications.

NOTE: The Quantity-Distance Tables referred to above will be reproduced in the November issue of THE ORDNANCE SERGEANT.

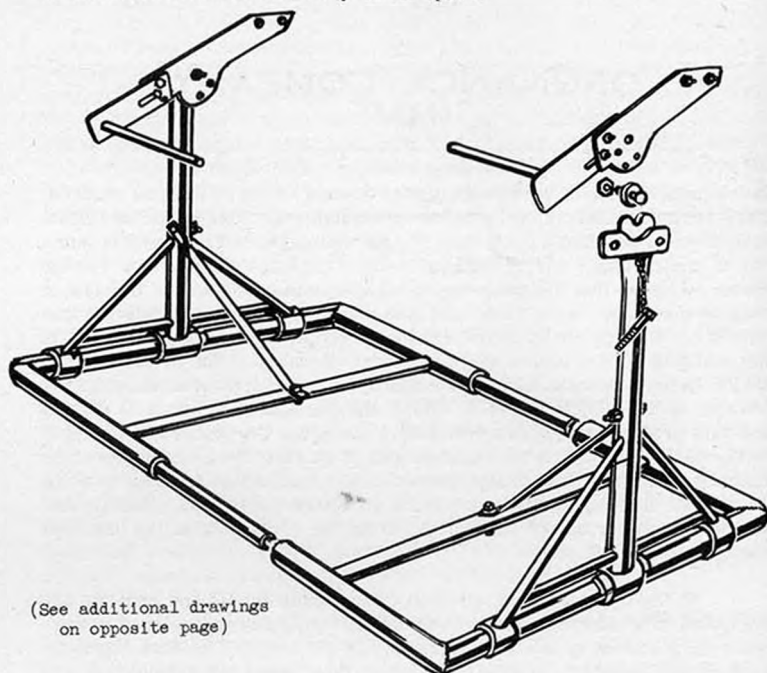


DO YOU LIKE YOUR VEHICLES?

(Continued from page 391)

engines. It has two (2) adjustments so as to accommodate either a seven or nine cylinder radial engine.

The frame, as shown in the drawing, can be carried by one man and can either be used in the field or in a base shop. One man can also rotate the engine to either of the two positions desired. It was also designed to be folded and carried in a very small space.



The Tank Repair Section of the Organization has used this stand and has found it very satisfactory in checking Medium and Light Tank engines.

Hoping that this will help others whose space is limited, we are sending you this drawing whereby other Ordnance Organizations can build the same.

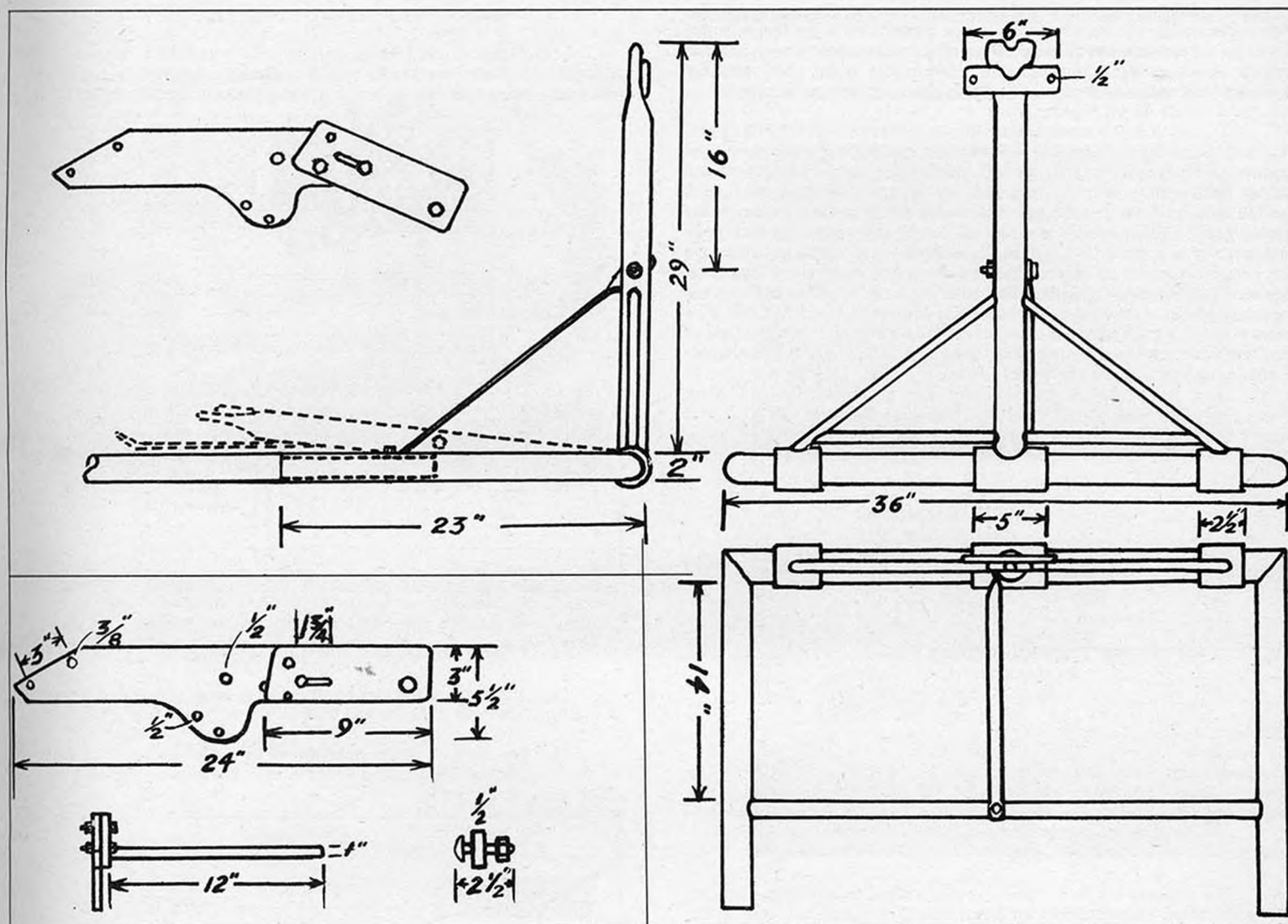
Very truly yours,

WILLIAM F. HEAD
Master Sgt. 31st Ord. Co. (HM)
Shop Foreman

ARE YOU PAYING ON

A WAR BOND

EVERY PAY DAY?



31st Ordnance Co. (HM)
Ft. Benning, Ga.
August 6, 1942

263rd ORDNANCE COMPANY (MM)
Camp Swift, Texas

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

Subject: Homelite Generating Units; Models HR & HRA

Dear Sir:

This item has proven totally unsatisfactory in that it invariably fails when needed most. This company being a field outfit requires the use of these units almost constantly. The failures are not in the power unit alone, the generating plant causes as much trouble. One reason it isn't practical is that it doesn't generate enough voltage and when stepped up burns itself out. Once one of these units are out of service it stays on deadline until a part can be fabricated or repaired. It has been found next to impossible to secure new parts.

The power unit is a two-cycle engine. It is this company's opinion that the lubrication and construction of the engine isn't suitable. A four-cycle two cylinder, two and one half KW unit would amply supply the need.

Out of four Homelite units now operating in the company, three are in the shop for repair. It was found new parts would be needed and our supply tried to draw them. No parts were to be had so the parts had to be interchanged between the units. This will leave at least one unit un-serviceable.

Very truly yours,

WILLIAM F. HEAD
Master Sgt. 31st Ord. Co. (HM)
Shop Foreman

August 10, 1942

Subject: (a) Trucks, Welding, Automotive, Machine Shop and (b) Small Arms.

To : The Ordnance School, Ordnance Training Center, Aberdeen Proving Ground, Md.

1. In compliance with basic communication, dated June 11, 1942, the following is submitted.

a. Welding, Automotive and Machine Shop Trucks.

1. Work on the 1941 Louisiana maneuvers which entailed the use of the arc welder was very satisfactory, but was only so because our welders had an intimate knowledge of the truck motor powering the arc welding generator. It is believed that with the abuse to come to these trucks in campaigning, the motor is not going to be able to serve its dual purpose satisfactorily, and from the past it is believed that it will first fail to deliver on the welding end of its job. For that reason this service section believes that a trailed, independently powered arc welding unit would be more satisfactory.

2. As an additional and very important tool, this service section would like very much to see two Porto-Power units added to the equipment on every welding truck. On maneuvers it was found that its use was unlimited in working on light and medium Field Artillery trails and shields, combat and scout cars and tractor parts. Due to its flexibility as a tool in fabrication and repair it was found hard to borrow from either the automotive or machine section. As a consequence, in numerous instances, the down time on some materiel was greatly increased due to waiting for one of the two units. As an added caution it might be well to add one or more hoses to each unit as these hoses are very hard to procure in the field.

As with the welding truck so with the machine shop and automotive trucks. This organization believes that the load on the motors of the trucks mentioned should be lightened by the addition of an independent power unit for serving power to the equipment, the truck motor being used only for powering the truck.

b. Small Arms Repair Truck.

1. As a unit, the small arms truck is most satisfactorily equipped, but there is always something a mechanic can think of to improve its function. After going on many contact parties during the maneuvers and finding numerous trigger guard screws which had to be drilled out, this section took it on itself to equip itself with a drill for the duration of the maneuvers. It would be well if all future small arms repair trucks were equipped with a portable bench drill. In addition to contacting active troops our schedule called for contacting and servicing evacuation hospitals. The rifles which came with the "casualties" to these establishments were continually found rusty due to neglect. It is this section's belief that wire buffers should be added to all small arms trucks to aid in the removal of rust from the neglected weapons that are going to be found at the evacuation hospitals throughout the world at war.

CHARLES C. GIBSON
Shop Foreman

WILLIE J. MOORE
Section Chief, S. A.

31st Ordnance Company (HM)
Ft. Benning, Ga.
August 10, 1942

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

Subject: Welding Truck Equipment

Dear Sir:

The Pioneer 5 x 5 in., type A.L.D., 115 volts, 4.5 amp, Capacity Power Hacksaw, manufactured by Louisville Electric Manufacturing Co. Inc., Louisville, Ky. installed on this truck is too slow, and too light to be of much use. So far we have not been able to draw blades for it and have had to use the common hand hacksaw blade.

The Hand Hacksaw is more practical than this machine.

Yours very truly,

OBED COKER
Staff Sgt. 31st Ord. Co. (HM)
Chief of Welding Section

115th Ordnance Company (MM)
APO #7, Desert Maneuvers
C/O Postmaster
Los Angeles, California
August 21, 1942

To the Editor
THE ORDNANCE SERGEANT
The Ordnance School
Aberdeen, Maryland

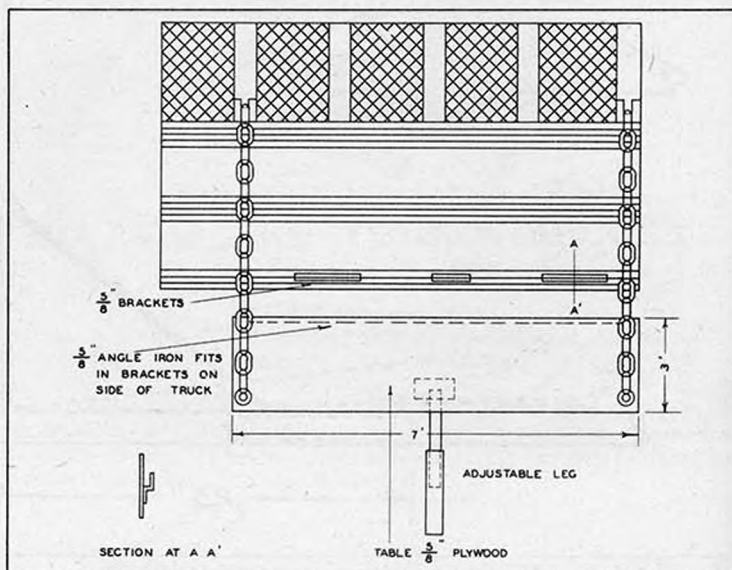
The maneuvers delayed the submission of the additional material mentioned in our previous correspondence and if it is useful, I hope it is not too late.

1. From Capt. Golden C. Guiver, Company Commander:

Belts with suspenders, similar to those used for ammunition, but provided with hand tools and spare parts, would be more useful to field mechanics on contact parties than the heavy tool kit which would never get any further than a truck would carry it.

2. From Sgt. Joseph Regan:

The table illustrated in inclosure #1 was built to fit on brackets alongside the bus type trucks and is a valuable addition in bench space available, takes little room and is little additional burden on the move.

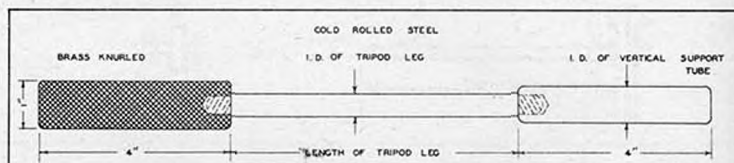


Enclosure #1

3. T/Sgt. John Simmerl offers the following:

a. The instrument truck needs only one large vise, near the center of the bench instead of at the end where its use blocks the door.

b. The position of the clutch lever on the lathe should be changed as the longitudinal feed screw lever hits it when using a face plate or doing close chuck work.



Enclosure #2

Tool to straighten and remove bumps from tripod legs and vertical tubes on Aiming Circle tripods.

It is inserted in the open end after unsoldering plug and the dents are pounded out with a soft hammer.

c. The following additions to the tool and supply list:

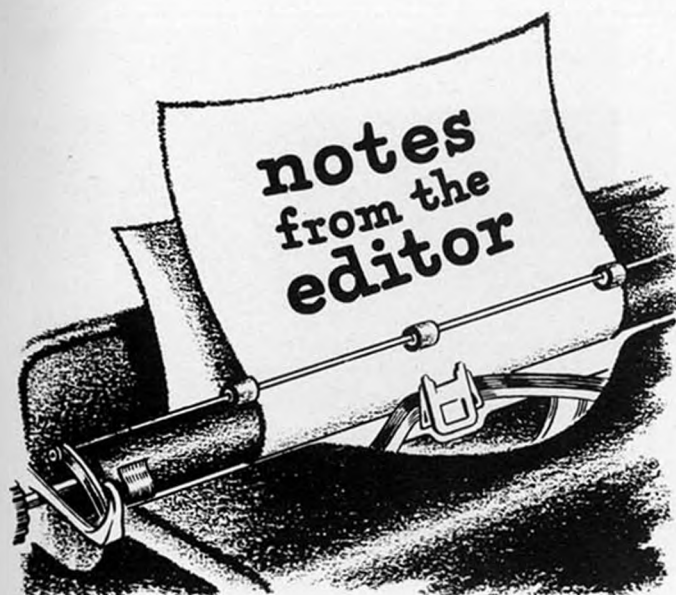
1. Additional kits
2. Special kits for contact parties
3. Special identification of the specific use of some of the special tools.
4. 5/16 and 7/16 collet for lathe.
5. Machine reamers 3/16, 1/4, 5/16, & 3/8".
- d. Enclosure #2 illustrates tool for taking dents from brass tripod legs.

E. B. Cooley, 20903866
1st Sgt., 115th Ord. Co.

2 Incls.



Vehicles to be discussed in the November issue of THE ORDNANCE SERGEANT include Bomb Service Truck, M6; Bomb Service Trailer, M5; Tractor Crane, M1; Artillery Repair Truck, M2; Tool and Bench Truck, M2; and the Spare Parts Truck.



Among the many interesting items which come to the editor's desk are some which cannot be published. Some are used as suggestions for articles which appear later. Still others contain ideas of undoubted values to Ordnance personnel. They are presented here for your benefit.

AIR BASE HEADQUARTERS
OFFICE OF THE BASE ORDNANCE OFFICER

A.P.O. #838. %Postmaster,
New Orleans, La.,
July 22, 1942

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

Dear Sir:

Concentrating on the war effort at this tropical Air Base resulted in our acquiring this mobile unit for defense of this Air Base. This information is not submitted as a suggestion for adoption by the Ordnance Department as a defensive unit, but rather as a suggestion for Air Corps stations experiencing difficulties in obtaining the more modern equipment furnished for such purposes.

The primary purposes that prompted the construction of this platform were:

1. To facilitate tactical and maintenance problems in positions where insufficient time and personnel were available for both manning and adequately maintaining ground guns. (Especially true at this Air Base where an Ordnance Company Aviation (Bombardment) is performing the additional duties of an Ordnance Company Aviation (Air Base)).
2. Convenient and flexible enough for hauling from airfield to beach or to other strategic positions under changing situations.
3. Facilitates maintenance on guns where untrained tactical crews may cause damage by not waiting for undermanned Ordnance Maintenance crews.
4. Provides dry concealed position for performing major repairs when towed. Emphasis might well be placed on the necessity for finding a dry position in this climate.
5. Suitable for tactical movements in that all equipment is laid out on wooden platform. Also aids in checking equipment and provides an area free from mud and dust for handling. Another "must" in this climate.

Deeds win battles — but words can lose them



Complete unit



Bomb truck lifting trailer. The cable is hooked on the mount at the turnbuckle.



The platform free of the trailer. Three men can handle the entire movement easily.

6. Platform is de-mountable instantly and does not interfere with the original purpose of the trailer. No defacing of the trailer in any manner was necessary. The platform merely "sits" on the trailer. It has been tested over rough bumpy dirt roads for endurance and showed no points of weakness. The gun has been fired from the trailer and showed no signs of not being able to produce "effective fire".

Capt. William J. Adams, Base Ordnance Officer, this station, is responsible for the construction of this platform. For the actual design and manual labor involved. Cpl. E. W. Boore (Armorer) is credited. Cpl. Boore is a recent pupil of the Ordnance School, Aberdeen Proving Grounds, Md.

Any pros and cons regarding this platform would be greatly appreciated, but it must be remembered that this organizations source of



The platform "in position". Spurs are provided for assurance against shifting while on the trailer, and they also prove useful as "spikes" when platform is on its ground position.

supply for tools and materials was limited to almost such tools and materials that are required for building an "outhouse".

JAMES R. GLOVER,
S. Sgt. Ordnance Dept.,
Chief Clerk.



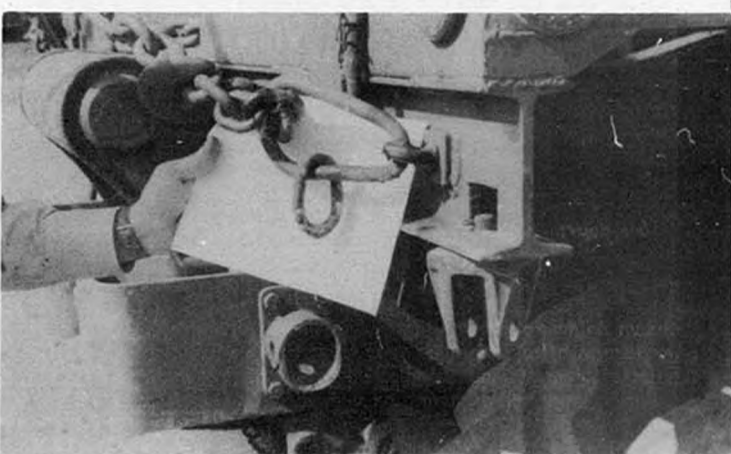
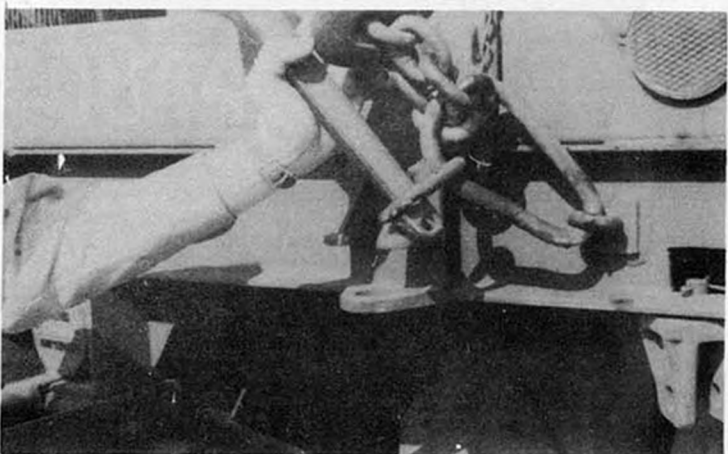
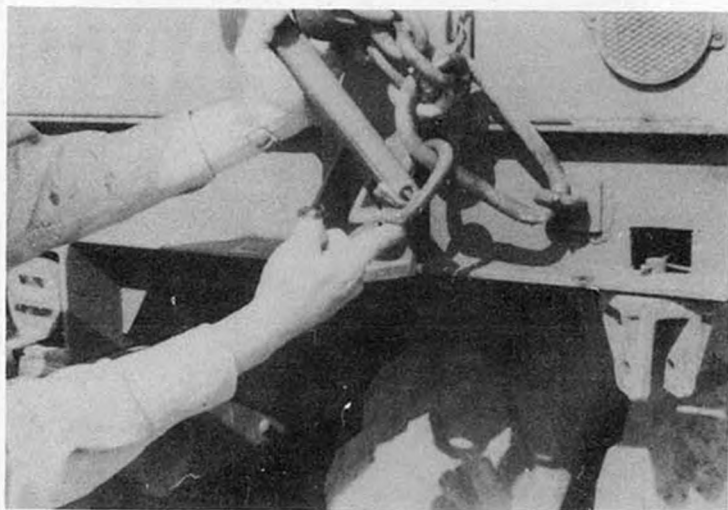
After the gun has been placed in position. Truck and trailer then proceed to deliver bombs.

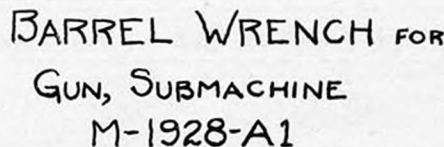
If you have discovered some little trick which makes your work a little easier or your efficiency a little greater, tell us about it. If it helps one other Ordnance man its value has been doubled, and it may help many other men.

A number of ideas prepared for publication in THE ORDNANCE SERGEANT in the past have been accepted officially and are now in wide use. Your idea may be very simple, yet very valuable.

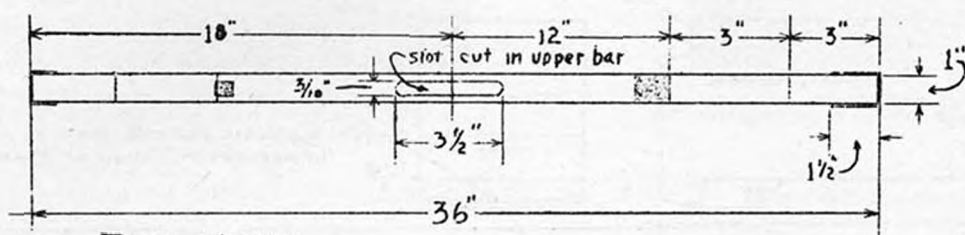
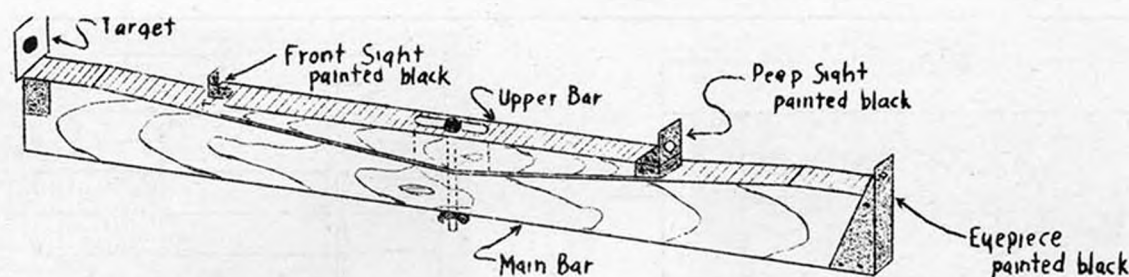
The photos below show a method of locking the tension lever arm of the boom sway chain on the M1 Heavy Wrecker, as developed by Technician 4th Grade Howard T. Collins, of the 88th

Ordnance Company (HM). Drawing and description of the device are shown on page 354 of this issue.

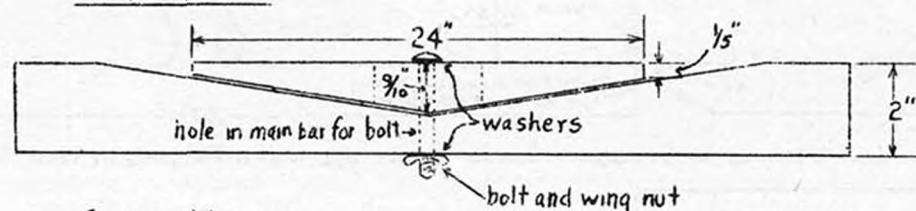




I. Reference page 97, photograph and letter from the Philadelphia Ordnance District, July issue, THE ORDNANCE SERGEANT. There may be some question as to whether the Philadelphia group was the first group to go into uniform. Administrative employees at this Headquarters went into uniform on May 20, 1942. We are enclosing a photograph of our group



TOP VIEW



SIDE VIEW

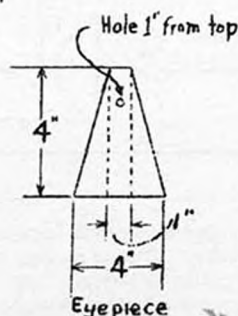
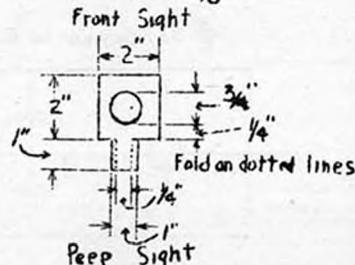
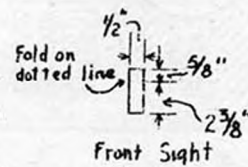
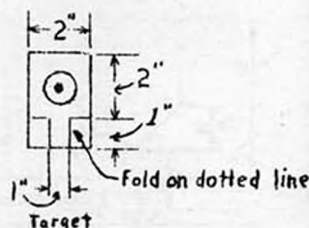
RIFLE SIGHTING BAR - P.M.G. SCHOOL, Ft. Oglethorpe, Ga.

DETAILS:

Eyepiece - thin metal 4"x4"; hole, 0.03" diameter

Peepsight - " " 3"x4", hole 3/4" diameter, as shown

Front sight - " " 1/2"x3" bent L shape



which we trust you will see fit to publish in the next issue of THE ORDNANCE SERGEANT.

JAMES S. JENKINS,
Captain, Military Intelligence,
Public Relations Officer,
Charleston Ordnance Depot.

THE ORDNANCE SERGEANT is thankful that the Charleston Ordnance Depot did not ask that it judge between the two groups of girls. The question of priority of uniforms is easily explained. The Charleston girls went into uniform, as stated in the above letter, on May 20th. The date on which the Philadelphia Ordnance District girls donned the militaristic garb (See THE ORDNANCE SERGEANT for July) was not stated, but the letter submitting their photo for publication was dated



March 17th. However, the Philadelphia girls claimed merely that they were the first "Ordnance District" group to appear in uniform. It appears that the two groups are in different classes, just as surely as are heavy- and featherweight boxers.

But both groups look mighty nice, in the opinion of THE ORDNANCE SERGEANT.

While THE ORDNANCE SERGEANT hopes that no reader will think any prejudice is involved, another group of girls is presented for careful consideration. These girls are the stenographic and reproduction typists of The Ordnance School. They don't wear uniforms, although they have on occasion considered doing so, but they are doing a bang-up job in the training program of the Ordnance Department.

The occasion for this photo was a "shower" in honor of Miss Dorothy Kahl, the "boss lady". She won't be a "Miss" by the time you read this.

Look them over, gentlemen, but don't make a rush to attend The Ordnance School. You must make application through regular channels, just as usual.



Recently an organization in the field asked for information regarding the 8" Howitzer, M1, and the Howitzer Carriage, M1. For the benefit of others who may be interested, the following limited information is taken from "Notes on the 8" Howitzer Carriage, M1" issued at Rock Island Arsenal (RIA-HC-29).

For information regarding the 155mm Gun Carriage, M1, refer to TM 9-350 and TM 9-1350.

8" HOWITZER CARRIAGE M1

The carriage is composed principally of the 8" Howitzer M1, mounted on the top carriage D5715, which in turn is mounted on the bottom carriage D34713. The latter is supported by the bogie D37505 and is assembled with the trails D5663 and D5825. The spade ends of the trails are mounted on the Heavy Carriage Limber which forms the connection between the carriage and the prime mover. The equilibrators D5774 are provided to neutralize the unbalanced weight, the elevating mechanism handwheel controls the elevation of the weapon, and the traversing mechanism handwheel controls the traverse of the weapon. The elevating mechanism brake is provided to lock the weapon in any position of elevation, and the cradle lock C76077 secures the weapon in travel position.

The bogie and limber are equipped with pneumatic tires for high speed transport, permitting the carriage to be towed at speeds up to 30 m.p.h. over improved roads.

The 8" Howitzer Carriage M1 and the 155mm Gun Carriage M1 are identical and interchangeable to the extent that the carriage will accept either weapon and its recoil mechanism. A travel lock, which is mounted on the closed trails and is provided to support the 155mm Gun when retarded for travel position, is not furnished with the carriage when used to mount the howitzer.

Road control of the carriage is by means of a power air brake system with equalized brakes for each of the four bogie wheels and controlled from the driver's seat on the prime mover. In addition, two hand brake levers are provided which operate the brakes on the two rear bogie wheels and are used when parking or in case of a break-in-two between carriage and prime mover or malfunctioning of the power brake system.

The recoil mechanism is the hydro-pneumatic type.

Stops are provided to control maximum elevation, depression, and right and left traverse.

Mounting and Dismounting

To change the carriage from travel to firing position, proceed as follows:

(1) Shut off the air at the prime mover, disconnect the air hose at the prime mover and the spade end of the trails, lock the ends of the hose together and place the ends of the hose on the trail in the dummy couplings provided.

Note. - This is important in order to prevent dust or dirt getting into the air lines and thereby causing malfunctioning of the brake mechanism.

(2) Disconnect the limber and set the hand brakes on the bogie.

(3) Remove the bogie elevating screw lock, release the two locking pins B167010 on the limber, attach the four cables B166592 and release the cradle lock. Attach the front spades and lower the bogie and trail end by operation of the bogie and limber lifting screws simultaneously digging in the front spades as the bogie is lowered. Raise the bogie wheels clear of the ground and remove limber.

(4) Attach the trail spades and spread the trails.

To change from firing to travel position, perform the above operations in the reverse order, taking care to attach the "Service" and "Emergency" air lines as marked on the hose connection and the prime mover.

HOWITZER AND RECOIL MECHANISM

Description of the weapon, instructions for servicing and maintenance instructions for the howitzer are being prepared. The Office of the Chief of Ordnance, Field Service, MOPD, Washington, D. C., should be contacted for information.

A.P.O. 827, c/o Postmaster,
New Orleans, La.
23 September 1942.

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

Dear Editor:

The July number of the Ordnance Sergeant has just arrived — a little late, but very welcome.

I received quite a "kick" from reading the "We Think Pretty Well of You" — especially since the 8th Ordnance Company which I organized at APG and commanded for 9 months did most of the maintenance referred to in that article.

The Ordnance Sergeant referred to by Major Halliday was, I believe, Staff Sergeant Joseph Kachinski. We believed that if we contacted units often enough that we would be able to make repairs before they became serious.

When I was taking the Refresher Course at Aberdeen they kept saying "The Ordnance is a Service. If we don't give service to the line, we have no excuse for existing". I believe that I have sold that idea to the 8th and to my present organization.

To those of you who are servicing British 40-mm guns and are having trouble with dampness rings in the cable connection of the gun here is a tip, scrape the paint off of the top plate, repaint with red lead and one coat of O.D. paint, then cut a piece of salvage canvas large enough to cover, fasten it down with shellac then put two more coats of O.D. paint on the canvas, you should have very little trouble with water as most of it had been going through the hole in the top of the assembly. This is avoided in the American models by a change in design.

Sincerely,

PAUL L. PURVINE,
Major, Ord. Dept.

ALL COMMUNICATIONS SHOULD BE ACCOMPANIED BY CARBON COPY AND ADDRESSED TO

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WASHINGTON

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September 19, 1942 SEP 22 3 13 PM '42

HEADQUARTERS
THE ORDNANCE DEPARTMENT
FILE 461/951

Subject: Ordnance Sergeant, August, 1942 - Inspecting and Repairing
Generators for Issue.

To: Editor, The Ordnance Sergeant
Aberdeen Proving Ground
Aberdeen, Maryland

1. The subject article, by Lt. C. S. Ireson, has been noted with interest. The information contained therein is considered most informative, concise and complete and should prove of practical value to those confronted with this problem in the field. However, it has been noted that the addition of GREASE, general purpose No. 0, after every 50 hours operation, has been prescribed for the ball type, antifriction bearings of the generator and exciter. This is not in accordance with TM 9-1616, Lubricating Chart, Paragraph 35, to which your attention is invited. The use of GREASE, lubricating, special, after every 200 hours of operation is prescribed therein.

2. You may notice the following in TM 9-1616, Paragraph 29b, "One turn of the grease cup (figure 5) provided for each bearing is required after every 12 hours operation." Steps have been taken to correct this error in compliance with the prescribed 200 hour interval in the next revision of this TM.

3. The addition of any but GREASE, lubricating, special, to these bearings may cause considerable damage, since they are initially packed with this or a similar type of grease. Care should be exercised not to over-lubricate these or any other antifriction bearings, as a churning action of the grease is caused when they are filled to over two thirds (2/3) of their capacities. This causes excessive heat which in turn causes a breakdown of the grease.

By order of the Chief of Ordnance:



E. D. Billings

E. D. Billings
Captain, Ordnance Department
Assistant

