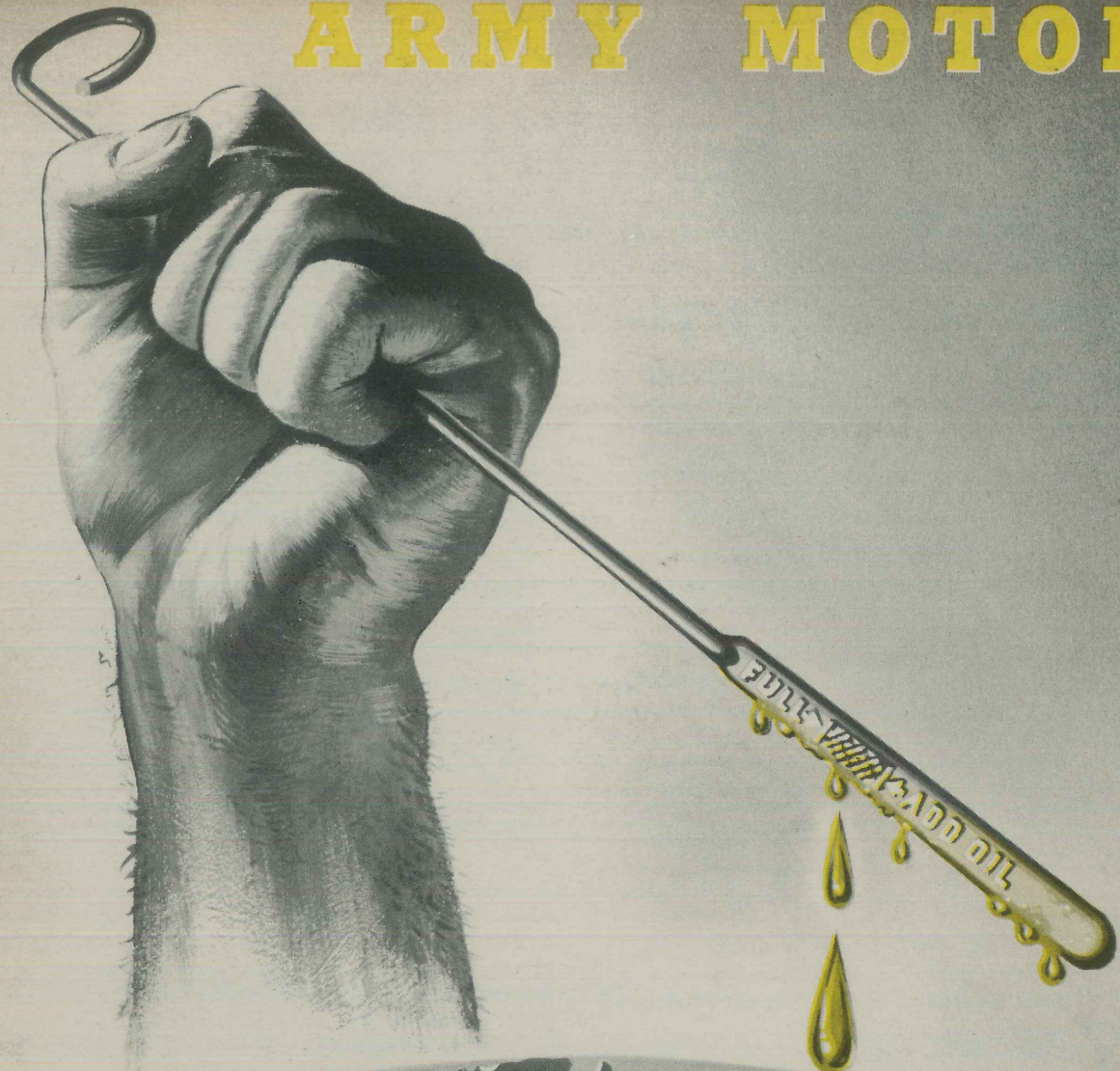


# ARMY MOTORS



VOLUME 4 JULY 1943 NUMBER 4

# COLONEL BRUNO W. BROOKS

(1888 - 1943)

ARMY MOTORS pauses to pay tribute to its founder, Bruno W. Brooks, who although a colonel when he died, never forgot his earlier years as a yardbird.

In the outline of his life is the key to what ARMY MOTORS is and hopes to be.

Nine years Colonel Brooks spent as an enlisted man in Coast Artillery, Ordnance, and QM...nine years of close-order drill, KP, the manual of arms, and spit-and-polish.

He learned that a well-disciplined soldier will do his work well, but a well-disciplined and well-informed soldier will do better.

He learned to distinguish those who know from those who pretend to know.

He also learned that everybody likes an occasional laugh.

Naturally, when he was commissioned a first lieutenant in the QMC in 1918, he made a good officer, because he understood his men.

When the war ended, he stuck with the Army and watched it sprout wheels. Convinced that future wars would be campaigns of swift movement, depending on rapid transportation for men and supplies, he became an expert in motor transport.

On the eve of another war, he found himself a captain, teaching his favorite subject at the then Quartermaster Motor Transport School at Holabird.

Textbooks were few and skimpy. So he started the Technical Service Division, which wrote, edited, illustrated, and published its own textbooks, many of which are now published as Technical Manuals and are the standard authorities in their fields.

In April 1940, ARMY MOTORS was born. Captain Brooks set its course - to serve the man in the field; to tell him the truth, the whole truth, and nothing but the truth; to explain the 'why' whenever possible; and to keep all articles simple and readable.



He remained with us a year and a half and advanced to the grade of lieutenant colonel before being transferred to other duties. Motor transport and the Quartermaster Corps parted ways. What was once the Technical Service Division of Holabird Quartermaster Depot is now the Preventive Maintenance Unit of the Tank-Automotive Center at the Holabird Ordnance Depot. ARMY MOTORS narrowed its field to Preventive Maintenance and widened its coverage to include first and second echelon outfits everywhere.

In this year of 1943, however, the ideals of the late Colonel Brooks still stand high in the background of ARMY MOTORS' purposes and methods. If the magazine can be considered one of his memorials, we are proud of the honor.

The Editors.



ARMY MOTORS is published monthly in the interest of Preventive Maintenance by the Preventive Maintenance Unit, Tank-Automotive Center, at the Holabird Ordnance Depot, Baltimore, Maryland. Your contributions of ideas, articles and illustrations are welcome. Address all correspondence to the Editor, at the above address.

# OE

## To you it means Oil, Engine To a truck it means everything

### Part I

#### When to drain OE

Come on now — how often do you change your crankcase oil? Every 500 miles? — 1,000 miles? — 2,000 miles? — on odd Thursdays?

Whenever it is, chances are that you're not too far off the beam — because the crankcase drain period is affected by a whole flock of conditions. The age and design of the engine, type of vehicle it's in, the load, weather, terrain, kind of operation (whether fast or

slow, continuous, or off-and-on) — and the driver and the way he drives. All these are factors in the situation.

So it's not surprising if some greaseballs fix their own drain periods by fingering, sniffing, and tasting the oil — in addition to giving it a look-see. How else, they stammer, is a guy to know.

Well, it isn't quite as haphazard as all that. In the first place, you're supposed to string along with your War Dept. Lubrication Guides — which prescribe an oil change for wheeled vehicles every 1,000 miles. Of course, that figure applies to average operating conditions. For extreme service in dust, sand, or water — or for off-and-on use in cold weather — the mileage between oil changes (for trucks) should be reduced.

Remember that actual operating conditions, no hard-and-fast rules, determine when a crankcase should be drained. Military vehicles (and who should know better than you) take a beating far beyond anything encountered in normal commercial operations. It's quite possible, in certain extremes, that you might have to change your oil every day. Anytime you find obvious contamination, such as grit or sand, it's time to change your OE. In any case, crank or otherwise, when you're faced with the choice of ruining the engine or changing the oil — brother, *change the oil!*

You shouldn't be faced with that choice too often. If you are, go after the cause of the trouble. Maybe somebody is handling your OE carelessly,

exposing it to dirt before it goes into the crankcase. Maybe your oil filter is not being kept up to snuff. During every 1,000-mile drain job, you know, the filter drain plug should be removed — to clean out any old dirt, water, Nazis, Japs, or other foreign matter, which has collected at the bottom of the filter. During every 6,000-mile service, the filter element should be replaced by a new one, after you've washed out the filter case with dry-cleaning solvent (Fed. Spec. P-S-661a).

As you've no doubt gathered by now, there's no absolute fixed drain period for all vehicles and conditions. But here's news for Constant Readers who have been writing us letters about stretching the basic interval to save oil. A test project, sponsored by the Fuels and Lubricants Section of Ordnance Field Service, is under way at this very moment to determine the best basic drain period — and filter change period — for the Army's wheeled vehicles. Thanks to the proved stamina of our U.S. Army all-purpose OE, you can bet your prize pin-up that the drain period will wind up considerably longer. We'll give you the figures as soon as they're official. In the meantime, follow your Lubrication Guides — and, in severe situations, your own jolly good judgment.

### Part II

#### How to drain OE

Draining crankcase oil is a pushover for a big boy like you — but there's a lot more to it than just removing a

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plug and letting the stuff run out. The main points to remember are six:

1. *Drain OE only when the engine is hot.* That's not done just for the hell of it, either. It happens that many oil contaminants (dirt, sand, fuel, lead from gasoline, water, carbon, or other products of the natural deterioration of oil) are not intercepted by the oil filter, but keep churning around in the crankcase. The only way to get rid of these contaminants (which are the big reason for changing OE) is to drain them out with the oil. And the only way to do that is to drain the oil while all such stuff is in suspension. Your detergent OE dissolves gums, varnish, and other carbon binders — so don't add any concoction of your own to help do the job. Just remember to drain while the engine is thoroughly warm — never more than 15 minutes after it's stopped running.

2. *Drain the engine and oil filter completely.* Remove the crankcase drain plug — and go about your other lubrication business while it's draining. Take out the filter drain plug, too — as we seem to have said before. After the crankcase is drained, see whether the used oil is excessively dirty or gritty. If it is, put back the drain plugs and fill the crankcase to half-capacity with OE#10. Run the engine at fast idle long enough for the flushing oil to get warm. Then drain the engine again.

3. *Replace the crankcase and filter drain plugs.* We needn't explain why that's a good idea.

4. *Refill the crankcase (to the FULL mark on the gage) and run the engine a few minutes.* Refill, of course, with new OE, the grade specified for the particular vehicle and season. See your Lubrication Guide. (Fig. at right).

5. *Stop the engine and recheck the oil level.* If

it's still FULL, okay. If it isn't, add more engine oil as required. (There are exceptions to this, such as certain Dodge vehicles. When their oil level is rechecked, it should be at *running level*, half-way between the FULL and the ½-FULL marks. But unless your Lubrication Guide tells you that, the level shouldn't be below FULL.)

6. *Keep everything 'hospital clean' during the whole*

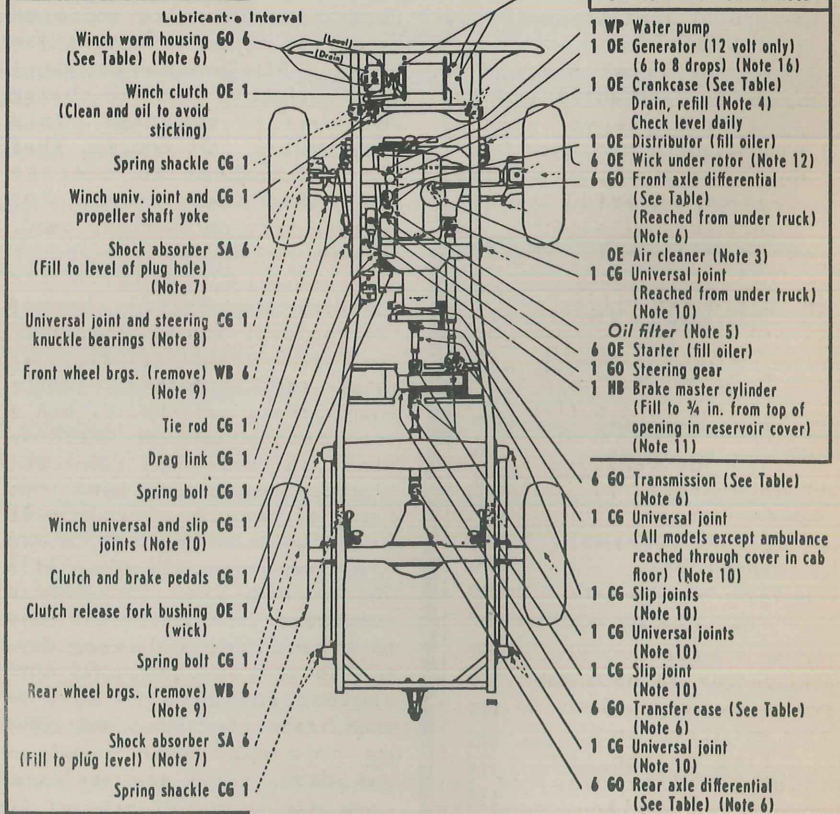
*procedure.* This is terrifically important. Too many grease-balls throw more sand, pine-needles, and assorted junk into the engine with the new oil than they remove by draining the old. So make it a habit to clean all oil measures, filler spouts, funnels, and containers — *before* the new oil comes near 'em. (Heed the Lube Contamination story in the June ARMY MOTORS.)

## WAR DEPARTMENT LUBRICATION GUIDE

### TRUCK, ¾-TON, 4x4 (DODGE)

MANUFACTURER'S SERIAL NUMBER located on plate on dash.

**CAUTION**—Lubricate Dotted Arrow Points on Both Sides. Points on Opposite Side are Indicated by Dotted Short-Shaft Arrows.



#### KEY

LUBRICANTS	
OE	OIL, engine Crankcase grade
CG	GREASE, general purpose No. 1 (above +32° F.) No. 0 (+32° F. to 0° F.)
GO	LUBRICANT, gear, universal
WB	GREASE, general purpose No. 2
WP	GREASE, water pump
HB	FLUID, brake, hydraulic
SA	SHOCK ABSORBER FLUID, light

INTERVALS	
1	1,000 MILES
6	6,000 MILES
<b>CHECK DAILY</b>	
Crankcase Air cleaners	

# Save Your Antifreeze!

At long last ---- the official word on what to do with your antifreeze ---- and how to do it.

We've been waiting a long time to be able to tell you exactly what to do with your antifreeze, but the official word on it has only just appeared in War Dept. Circular No. 137, 16 June 1943.

In a sentence, it tells you to RECLAIM IT, and STORE IT.

Since ethylene glycol antifreeze is a critical item, we know you'll want to handle the stuff properly.

In the first place, the *only authorized* antifreeze for use in Ordnance vehicles is the ethylene glycol type (Prestone, Zerex, Peak, etc.). Some outfits are still using a methanol (methyl alcohol) type base antifreeze. This is strictly NG. Under no conditions are two different types of antifreeze to be used or mixed together.

There are two ways to save antifreeze. The preferred, or gold-star way, is to drain it out of your vehicles and put it in storage, if you've got the facilities. The other way is to let it remain in your cooling system, and to treat it with respect.

Suppose you drain it and store it first. Right away, you've got to have handy some pots, pans and buckets to store the solution in.

Five gallon liquid containers (blitz cans) or *returnable* 55-gallon drums are *not* to be used for storing used antifreeze solutions, nor are new cans for this purpose available because of the critical shortage of these containers. If you write at once the OQMG, Petroleum Division,

you may get your share of a limited supply of suitable containers.

Solutions of the same brand (or all ethylene glycol type solutions) can be stored in the same drum. Everything will be ruined if ethylene and alcohol antifreezes are stored in the same drum...so don't.

You can tell the alcohol type by its smell and by the fact that when mixed with water, it turns a milky white color. The ethylene glycol type will be a nice cool green color and doesn't smell like Four Roses. Be careful that drums or containers are not lined with gas, oil, or dirt as gas, oil, or dirt and antifreeze don't mix.

Ready?

Drain the solution out of the radiator and engine, then test for strength with an antifreeze hydrometer. If the hydrometer shows that it won't give protection to +20° or lower, throw the solution out.

Your trucks will yield two kinds of solution: some will give a solution almost as clear as it was when you first put it in; others will give a brown rusty solution. Throw out the rusty solution.

As we have already mentioned, antifreezes of the same brand (or type) and condition can be stored in the same drum. Fill and seal the drum tightly and present it to the Post Ordnance officer for storage.

Jolly him into telling the Service Command how much he has stored, so it can be re-used next winter in administrative vehicles.

After the antifreeze is drained from a vehicle and stored as above, the cooling system should be flushed out with water to keep it from getting sedimental and rusty. If the drained antifreeze is rusty, use radiator cleaner, Federal Stock No. 51-C-1568-500.

Then refill the cooling system with water and rust inhibitor, Federal Stock No. 51-C-1600. One container of inhibitor is to be used with each four gallons of water required to fill the cooling system.

Now, if you're in an area where storage facilities are something less than non-existent, go ahead and keep the solution in your vehicle. Naturally, you'll keep the antifreeze in all year if you're in the Arctic.

As we explained last October, a good antifreeze does two things: It protects your cooling system from freezing up and it contains an inhibitor which protects your cooling system against rust and corrosion.

The inhibitor spreads over the walls and surfaces of the cooling system like a protective blanket against rust and sludge. But in the course of time, depending on the kind of water put into the cooling system (soft water is the best) and the kind and amount of driving done, the inhibitor gets used up. This can happen in about six months, then rust and sludge start to clog the works.

If the antifreeze is kept in your vehicle, it should be reinhibited every six months with 'Inhibitor, Antifreeze Compound, Federal Stock No. 51-I-136-85' or 51-B-669-75. Use one container of antifreeze reinhibitor for each four gallons of cooling system capacity.

**DO NOT DRAIN ANTIFREEZE FROM VEHICLES IN STORAGE.**

Either store your usable antifreeze, or keep it in your vehicle, properly reinhibited, but please, please, don't just drain it into the ground.

It ain't good for the soil.



## Restrictor Plates

An advance copy of a TB which comes to my pink-and-white hands tells me that all new half-track vehicles equipped with the White 160AX engines delivered after 25 May 1943, will have a restrictor plate between the carburetor and intake manifold. The restrictor plate is nothing more than a permanently set governor — the idea being to keep the speed fiends from racing the new engines at speeds beyond 2600 rpm.

After the vehicle has 500 miles on it, the restrictor plate is to be removed. Just remove the carburetor flange nuts and raise the carburetor enough to slip out the restrictor plate and gasket. Be sure the remaining gasket is OK before reinstalling the carburetor.

In addition to the restrictor plate, these new half-tracks will have a windshield sticker warning the

driver not to exceed 2600 rpm for the first 500 miles.

## Disconnect Voltmeters

Voltmeters are not to be replaced in any vehicle (wheeled, half-track, or full-track) according to a TB now in preparation. This new bulletin supersedes TB 705-11, 11 April 1943, which gave instructions on installing new voltmeters on scout cars.

So, when your voltmeter goes haywire, just disconnect the battery wire at the voltmeter and tape it up. Make sure you make a good job on the taping because this wire is hot and carries enough amps to burn things up if shorted. The voltmeter is to remain on the instrument panel, though.

It might also be a good idea to write the word 'DISCONNECTED' on a small piece of paper and stick it on the face of the voltmeter. This will prevent others from griping

about the voltmeter that doesn't work.

## 100-Hour Tank Inspections

Following up our April News Flash, here's some more words, from a TB, on removing tank engines for inspection and service:

### Radial Engines

1) As stated in April, do not remove the engines of Light and Medium tanks at 100-hour intervals for service as recommended by the Technical Manuals. Just perform that part of the 100-hour service that can be performed without removing the engine. However, if for some reason — such as pronounced loss in horsepower, excessive oil consumption, etc., — it's necessary to remove the engine before the 100-hour interval, give it the full 100-hour service before reinstalling it.

2) Replace with a new or rebuilt engine, radials which are removed after 300 hours of operation (medium tanks), or 400 hours operation (light tanks). Ship the old engine to a base shop for overhaul.

### Inline Engines

1) Don't remove inlines for the purpose of performing a 100-hour servicing. Furthermore, you're not to perform the 100-hour service after 100 hours of operation — perform it after 200 hours of operation. (That part of it that can be performed without removing the engine.)

As above, when it's necessary to remove an inline engine due to loss of horsepower, etc., before the 200-hour interval, give it the complete 100-hour works.

Replace inline engines, removed after 400 hours of operation due to unsatisfactory operation, with a new or rebuilt engine. Ship the old engine to a base shop for overhaul.

If either a radial or inline engine, when removed and given a 100-hour inspection, looks like it won't last for another 100-hours, don't re-install it in the tank. Send it away for an overhaul.

## *AC* "Victorygrams"

The AC Sparkplug Division of GMC publishes the newsheet 'Victorygram' for its field service representatives. The questions and answers that are bandied back and forth between the editors and the GMC representatives in the field, are published in the Victorygram. Many of them will be of considerable interest to you. As follows:

**Q. CAN THE CRANKCASE VENTILATING VALVE, ON THE GMC, CHATTER AND CAUSE UNSTEADY VACUUM READING?**

**A.** Some of our first production of crankcase ventilator valves had springs which were too strong - as a result the valves did not close at idle and would flutter. Also, they allowed too great an air flow at peak vacuum.

Our production troubles have now been cleared up and we feel that the present and future assemblies will perform satisfactorily. Ventilating valves in which the spring has been checked are identified by means of a dab of white paint or a groove on the outside. In the future the size of the letters rolled on the body will be changed to 1/16" high and serve as a future means of identification.

It is our recommendation that when trouble is experienced, a new ventilating valve be installed, if available, rather than try to change the spring rate, as this spring is a calibrated device and although cutting off one coil helps at idle, it may harm the operation of other manifold vacuums.

In an emergency if a new

assembly is not available the spring length can be reduced by cutting. One half of a turn should be sufficient.

**Q. CAN A RADIATOR PRESSURE CAP BE THE CAUSE OF COLLAPSED RADIATOR HOSE?**

**A.** If the vacuum valve of the cap becomes plugged and does not open at the correct vacuum the hose is very apt to collapse under the suction created.

When an engine is warming up, the water and air in the cooling system expand and the excess pressure is discharged through the exhaust valve of the cap.

When the engine cools off, the vacuum valve opens to allow outside air to enter and equalize the pressure in the cooling system. If the vacuum valve of the radiator cap is plugged, the atmospheric pressure on the outside of the engine will press against the radiator hose causing it to collapse.

**Q. DOES THE ARMY SPECIFY THAT NEW GASKETS ARE TO BE USED WHEN PLUGS ARE REPLACED AFTER CLEANING?**

**A.** TM 9-2810, a new service manual for Motor Maintenance, will be released shortly. This manual will specify that during the periodic 6000-mile inspection the spark plugs are to be removed and cleaned and are to be replaced using new gaskets.

**Q. WHAT IS THE EFFECT OF RADIO SHIELDING EQUIPMENT IN THE IGNITION SYSTEM OF TRUCKS AND OTHER VEHICLES?**

**A.** Several months ago the Army directed that various components of their vehicles be equipped with radio shielding devices. This program called for the application of suppressors to the spark plugs, coil, and other ignition parts, and also equipment to ground the hood, radiator, and other parts of the vehicle so that electrical waves, which would otherwise interfere with radio operation, would be suppressed.

The question has been asked as to what, if any adjustments, must be made to the spark plugs and the ignition system to compensate for the suppressors used. Answer: No special adjustments should be required to assure satisfactory engine performance.

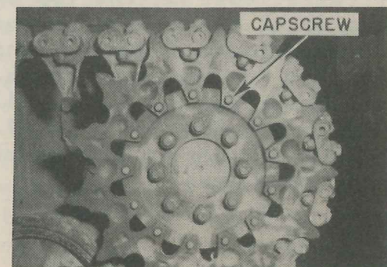
It will, however, be more important that normal adjustments recommended be given careful attention, that is, the spark plug gaps must be kept in adjustment and the distributor points should also be checked more frequently because if the gaps become worn or pitted poor engine performance will result.

In other words, the engine requires no different adjustment to compensate for the suppressors, but it will be found that the engine will be more sensitive to improper adjustments than it would be in absence of the radio interference suppressors.

## *Track-Sprocket Capscrew*

Reports from the field tell me that you're having a lot of trouble keeping the track-sprocket capscrews (A222801) tight on the medium tank chassis (below). A new Technical Bulletin (TB 700-70) tells you to replace these capscrews (if you can't keep them tight) with self-locking bolts (A246629). These self-locking bolts require no lockwashers. However, it is important that you tighten them to 100-110 foot pounds torque.

Requisition your self-locking bolts through your usual source of supply.



## Disk-Type Idlers

From an advance copy of a TB (1700-31), I see that all medium M4 tanks, all full-track motor gun carriages (M7, M10, M10A1, M12), Recovery Unit T-2, and T-14 Cargo Carrier, when earmarked for overseas shipment are to have the spoke-type rear idlers removed and disk-type idlers installed in their place.

The disk-type idler offers more strength and durability for rough terrain than the spoke type. But don't requisition the disk-type idler until you receive the formal TB. They're not ready in large quantities just yet. However, if you have some in stock, you can start making the change-over now.

Forget about the whole thing if your vehicles are going to remain in the U.S. for training purposes — no change-over is necessary.

## Track Sag

Regardless of previous instructions, the tracks on all vehicles using the medium tank chassis are to be adjusted to permit a 1/2" to 3/4" track sag midway between the second and third track support rollers. The second and third support rollers are figured by counting from the front of the vehicle.

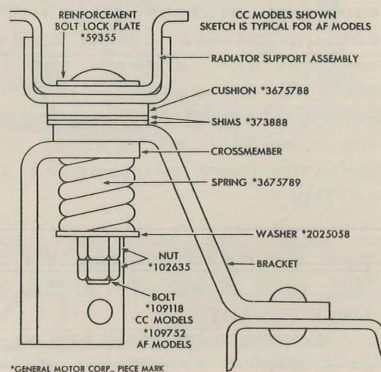
Measure the track sag by laying a 3-foot or longer straight edge on the top of the track and measuring the distance between the straight edge and the sag in the track.

These instructions will soon hit the field in TB 700-67. They will apply to both steel and rubber tracks.



## Broken Radiator Frames

I've received many, many complaints about radiator frames breaking on the 2½-ton 6x4 and 6x6 GMC's. The apparent cause is the fact that the radiator frame is bolted solidly to the chassis crossmember with two carriage bolts. Another gripe is that these bolts cannot be tightened when the square shank below the head wears off (which is a common occurrence for this type of bolt).



However, a new TB (800-9) should put a stop to all this radiator frame breakage. It calls for a spring-type radiator mounting in place of the bolts. The drawing (above) shows the installation. You'll be glad to know that the old type mounting is no longer available. As soon as the present stock of old type parts is exhausted, your requisition will be filled by the spring-type parts kit. Requisition new kit No. 2188343 from the Fort Wayne Ordnance Depot.

## Half-Track Kits

Tire pumps and vulcanizing kits are now available from the Fort Wayne Ordnance Depot. The initial issue of one pump and one vulcanizing set can be

requisitioned by the following numbers:

Pump, tire, hand-type —  
Federal Stock No. 8-P-5000

Set, vulcanizer — Ordnance  
Drawing No. A323516

The initial order includes 25 patches, 13 round ones and 12 oval ones. But when additional patches are needed they can be requisitioned in lots of 25 with the following numbers. Patches, vulcanizing, large round #3 E.S. #601, Federal Stock No. 8-P-210; patches, vulcanizing, large oval, #4, E.S. #601, Federal Stock No. 8-P-215.

## Distributor Filter

They tell me that the radio suppression filter mounted on the distributor of the 2½-ton GMC 6x6 breaks the fuel line connection at the gasoline filter, when the truck is operated over rough terrain.

And anyway, recent tests made by the Signal Corps show that the filter is not needed, and it has been eliminated in production.

Remove the distributor filter and reconnect coil wire to the distributor terminal stud. To keep dirt from entering the distributor body, replace the filter attaching screws and tighten securely.

That's all there is to it.

## Painting Shafts

I got a nice note from Diamond-T asking me to warn you guys to mask the power take-off shifter shafts, auxiliary transmission shifter shafts, etc., at the point where they contact the oil seals, when you're doing a paint job.

The paint ruins the oil seals, which starts a lube leak between the shaft and the seal.

So keep 'em covered

(Continued on page 128)



The St. Louis Ordnance Depot reports that 'this depot has found the negative terminal clamps of storage batteries on amphibian 1/4-tons are over-size and cannot be tightened properly - with the result that slight corrosion would soon make the connection unsatisfactory. Clamps are being replaced by one of smaller size.'

\* \* \*

Daily Activity Report of the Ordnance Field Service Division says,

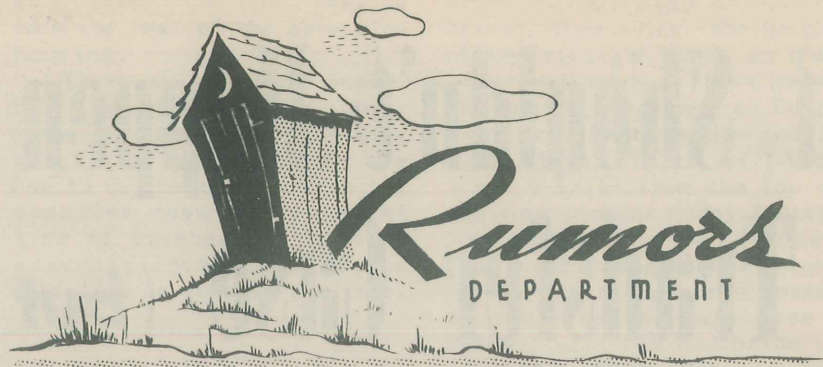
"Need for a better oil seal in 1/4-ton amphibians is recited in reports of representatives of Fuels and Lubricants Section, after trip to two camps, where numerous inspections of this type of vehicle were made. In one group of vehicles observed after having been in the water about two hours and being road-driven six miles after leaving the water, there was a considerable amount of mud, sand, and grit in the hubs, around the bearings and on the brake linings of every wheel of every vehicle. Opinion of observers was unanimous that a better seal was needed, since entrance of sand, mud, or grit to the bearings will make a grinding compound of any lubricant, even if it is waterproof. Automotive Section is being asked to initiate a PCR to provide a more adequate seal." In the meantime, keep PM-servicing these jobs as soon as they emerge from the water.

\* \* \*

From an old friend comes the following dispatch sent out over the wires of the Associated Press:

Ephrata, Wash., May 2 (AP) - Lt. John S. Thomas, Ephrata airbase supply officer, said his truck drivers had to spend too much time on kitchen police duty.

Thomas' commander brushed him off with the reply that such complaints should be accompanied by soft music.



Undaunted, Lt. Thomas returned with a violin-playing soldier who fiddled 'Hearts and Flowers' while the protest was repeated.

The truck drivers no longer labor among the pots and pans.

Music hath charms to soothe the savage breast, but we can't recommend this approach - your old man may not have the savage breast, M1, complete w/ hair, necessary to the deal.

\* \* \*

Extra gasoline is not to be carried on armored vehicles in 5-gallon cans, mess kits, or what-have-you. The Armored Force, Army Ground Forces, and the Army Service Forces all agree that carrying extra gasoline on these vehicles is very unhealthy.

They point out that cans on the outside are targets for shell fragments, small arms fire, etc. And placing the cans inside the vehicle doesn't solve the problem, because there's little enough storage room now.

If you're wondering where you are going to carry extra gas on long approach marches when there aren't established fuel points, the Armored Fuel and Ammunition Trailer M8 is the answer.

By using this vehicle, stowage space is saved and the danger of gasoline fire from enemy fire is reduced.

\* \* \*

Got any preference between big parts books and little parts books? Service Parts Catalogs have been coming out

in 8-1/4 x 10-3/4 size, like the old CM parts lists, until recently. Now the SPC for M5 and M5A1 light tanks is being published in standard SNL (Standard Nomenclature List) size (6x9), as an experiment. Same contents; just a different page size.

Let us know which size you like best and we'll pass the word along to the decision-makers.

\* \* \*

That question of 'What's the status of Motor Transport Technical Service Bulletins?' is soon to receive a new and complete answer. OFSB 1-8 (5 February 1943) left you with word that all of these former Quartermaster publications 'remain in force until specifically rescinded or superseded.'

Now we learn that some MTTSB's are being revised as Ordnance Field Service publications, and the rest will be rescinded.

\* \* \*

The Armored Force Board has recommended to Army Ground Forces that standard kits of cleaning and preserving materials be carried on all Armored Force vehicles. One type kit will give the items and amounts of materials for use in vehicles which carry or tow cannons; the other type kit for vehicles carrying small arms only. These standardized unit packs will contain enough material to maintain cannons, arms, and sights on Armored Force

(Continued on page 128)

# It Shouldn't Happen to a Transfer Case (but it does)

## 1 1/2-Ton Chevrolet Modifications

The tempers and temperature of the boys in the higher echelon shops have been rising higher and higher lately. Why? They've been receiving Chevrolet 1-1/2 ton transfer cases for overhaul from the lower echelon with *rusty* Main Extension Shaft Rear Bearings (#901208). On top of that, the bearings also show signs of being run without oil.

Some yahoos are accused of putting water in the cases instead of oil. As a matter of fact, some yahoos are putting water in the transfer cases - *but they didn't know it.*

Here's how it happened. While washing a truck, the man at the hose playing fireman, would playfully squirt the hose at the vent assembly. The rivet on top of the vent would cock sideways and water would find its way into the transfer case.

To prevent the transfer

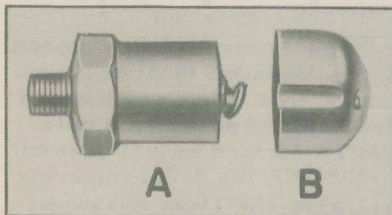


Figure 1

A. Transfer case vent assembly, Part No. 3661566

B. Transfer case vent cover, Part No. 3672566

NOTE: Vent cover is pushed over vent when installed on vehicle.

case from being watered and to save the higher echelon mechanics from busting a blood vessel, there is now available a cover (#3672566) to fit over the vent assembly (Fig. 1). Slip it on the vent and your

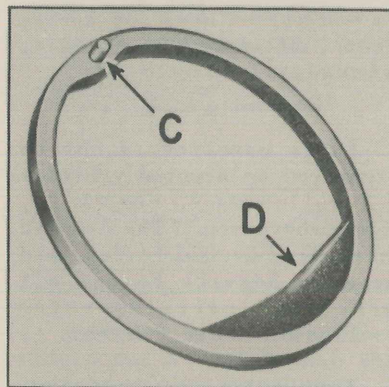


Figure 2

Transfer case rear bearing retainer pilot ring, Part No. 591371

C. Dowel Pin

D. Dam section

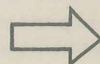
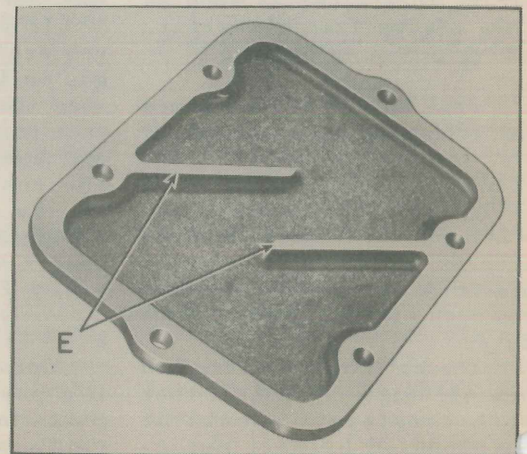
shop will be changing transfer cases less frequently.

The second part of the problem, the bearings running without oil, also wasn't the fault of the 2nd-echelon boys. The transfer cases had plenty of oil in them, but at low speeds, the oil was not staying in the extension housing where it could lubricate the rear bearing.

So Chevrolet has developed a new pilot ring (#591371) (Fig. 2) to replace the old one (#591281). This new ring has a section built into it which dams the oil in the rear extension housing up to the level of the ball race of the rear bearing. By keeping a quantity of oil dammed back there the bearing doesn't run dry at low speed. To keep the fellow who makes the installation from installing the dam section upside down, there is a dowel pin on the rear face of the pilot ring that fits into the cored passageway at the top of the rear extension

Figure 3  
Transfer case cover (with two cast ribs), Part No. 3659555

E. Two cast ribs



housing. There is a new transfer case cover available (#3659555), to make sure the oil gets sent back to the extension housing. The new cover carries the same number as the old one but can be identified by two slanting cast ribs on the underside (Fig. 3). The ribs act as oil deflectors, directing oil from the mainshaft extension

gear through the front bearing into the rear of the extension housing.

These new parts are available through the regular supply channels. But, the pilot ring and transfer case cover are not to be installed unless the transfer case fails, or at time of overhaul. The vent assembly cover ought to be installed as soon as possible.

member (indicated on sketch below). Then adjust the height of the straight edge, so that its upper edge is 14½" below the top of the frame on Dodge ½-ton jobs (with engine models T-202, T-207, T-211, or T-215) - and 9-5/16" from the top on 3/4-tons (engine model T-214). Now, measure the exact distance from your straight-edge to one of the lower-cap-screw bosses on the transfer case (see A below). If this dimension is less than that shown on the sketch, your transfer case has probably been bounced from its rightful spot.

## 1/2-Ton and 3/4-Ton Dodge Alinement\*

We have a Fargo Technical Bulletin to thank for the understatement-of-the-week. It refers to the outlandish landscapes you guys drive over as 'unimproved terrain.' Point is that low-slung transfer cases, in particular, take plenty of slugging from rocks, stumps, stream banks, and assorted other obstacles encountered on cross-country spins. Sooner or later, that dull thud you hear may well be your transfer case rocking back on its heels from the shock and staying there.

When that happens, the proper alinement between the transfer case and the front axle goes haywire. The working contact between the front propeller shaft and the splined yoke is reduced, resulting in too much play and a nasty

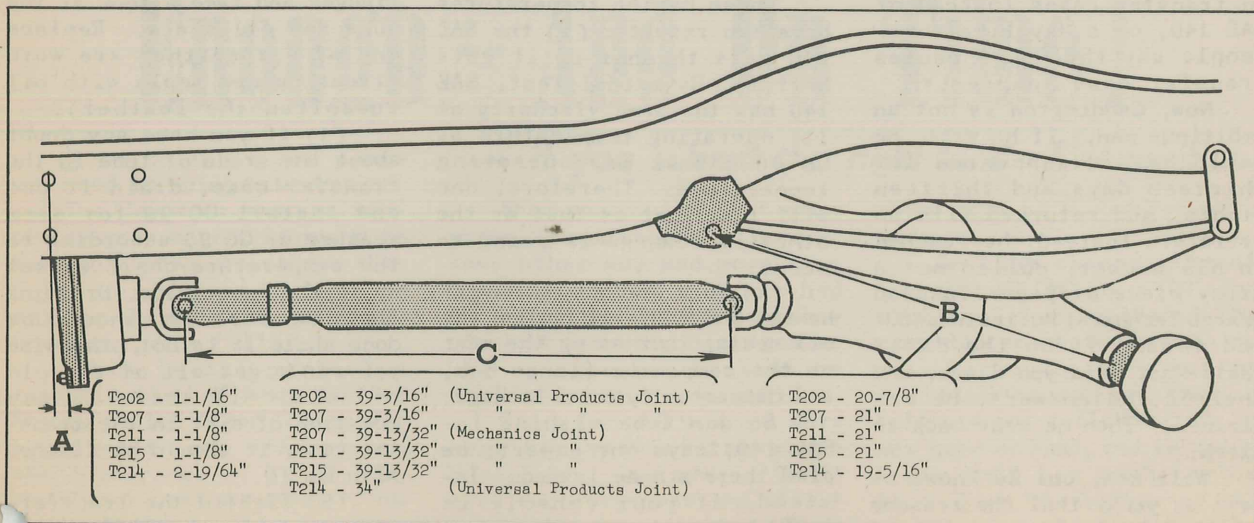
tendency to whip.

Reversing the order of cause and effect, the Fargo Technical Bulletin points out that too little spline contact in the front propeller shaft is *usually* due to an impact on the transfer case which has forced it back out of position. So it's wise to make a careful check after every jolting journey. On ½-ton and 3/4-ton Dodges, the procedure boils down to this:

Park the vehicle on a smooth level surface, if you can find such a thing. Fetch a straight-edge, long enough to stick out beyond both frame side rails, and support it on blocks beneath the vehicle - just back of the transfer case. Line it up carefully, at both ends, with the two rear rivets of the transfer-case cross-

Checking front-axle alinement and the length of the front-propeller-shaft assembly will clinch that conclusion. So take a peek at the front spring-leaves, to make sure they're all in place. Then measure the distance from the machined surface of the front-axle trunion-socket housing tube to the center of the front-spring rear bolt. Compare your measurement with the figures under B in the sketch. Last but not least, check the length of the propeller-shaft assembly - between the universal-joint bearing centers - against the dimensions under C. If the figures don't agree, it's time to face the fact that your transfer case is off-base. And it's high time you had

(Continued on page 128)



\* This article suggested by a contribution from Private Stanley Perkins.

# THE CASE OF THE Leaky Transfer Case

It was a very hot day in the ARMY MOTORS' office. The Editor was mopping his face with next month's 'Contribution' section and leering at Connie Rodd who was wearing a blue denim playsuit. Half-Mast had disappeared in the general direction of Bill's Place, and the technicians sat in a circle on the floor playing a vicious game of parcheesi.

Suddenly two tiny men, one purple and one green, both with pink mustaches and GI haircuts, leaped out of the ashtray, one yelling "NINETY"! and the other screaming "EIGHTY-ONE-FORTY". Beating each other over the head with paper clips, they scurried across the desk and under the telephone.

"Hmmm," said Ed, pouring another beer.

"Looks like some more of that business about transfer case lubes."

"Caddington" he cried, pointing a bony finger at Caddington, "Caddington, find out for once and for all WHY the men have to use GO 90 in transfer cases instead of SAE 140, on a day like this. People say the GO 90 causes transfer case leakage."

Now, Caddington is not an ambitious man. If he were, he would have disappeared for thirteen days and thirteen nights, and returned with an article. Instead, he reached in his pocket, pulled out a grimy piece of paper labeled 'Fargo Technical Bulletin #46G' and tossed it on the desk. "Half-Mast said you'd ask, and there's the answer", he explained. Then he went back to sleep.

Well now, our Ed knows as well as you do that the reasons for using GO 90 instead of

**Or, why you'll use GO 90 instead of SAE 140, which you can't get.**

SAE 140 in transfer cases are mostly military. We don't use any more different varieties of lube in the army these days than we absolutely need; result, fewer kinds to supply, less shortages, everybody happier. And GO 90 is at least an acceptable substitute for SAE 140.

But our expert has proof that GO 90 is *better* in transfer cases than SAE 140, because GO 90 is *less* likely to leak. It's all on account of the heat which SAE 140 generates when the vehicle is in operation. The gears of the transfer case have to do more work on the SAE 140 oil (because it's a heavier oil), thus generating more heat in the oil. This lubricant usually warms up to a temperature of 235 to 260 degrees Fahrenheit, whereas GO 90 seldom gets above 190 to 210.

These higher temperatures have two results: (1) the SAE 140 gets thinner as it gets hotter. By actual test, SAE 140 has the same viscosity at its operating temperature as GO 90 has at its operating temperature. Therefore, one will leak just as fast as the other if leakage is going to occur.

(2) More serious, the overheated SAE 140 will harden the oil seals, increasing the wear on the companion-flange hub, and thus actually cause leakage.

So don't be wishing for SAE 140, says our expert; be glad there's none issued. Instead, if your vehicle is troubled with transfer-case

leaks, try this:

(1) Check the lube level; maybe you have too much and the extra pressure is forcing the leaks. The level should be at the plug opening immediately after operation, or 1/2" below the opening if the oil has had time to cool.

Always check the vent in the transfer case to be sure it is open. This should be done each time the lube level is checked. If this vent is closed, leakage is bound to occur at the oil seals.

(2) Check the universal-joint companion flanges for up-and-down play in the bearings. If they are loose, remove the transfer case and get the bearings adjusted (you can't get a proper adjustment while the case is still in the vehicle).

(3) If it isn't the bearings, remove the companion flanges and take a look at the hubs and oil seals. Replace any of either that are worn (treating new seals with oil to soften the leather).

(4) If you have any doubt about the grade of lube in the transfer case, drain it out and install GO 90 for warm weather or GO 80 according to the temperature chart as set up in the lube guide. Draining the transfer case should be done while it is hot, otherwise you won't get all of the old oil out. If there is any question of dirt in the transfer case, it should be flushed with OE 10.

(5) Tighten the transfer-case mounting bolts.

# HOW'S YOUR FIRE EXTINGUISHER?

EVERY DAY, LOOK AND SEE—

## IS IT FILLED?

Shake it and listen. When refilling, use Fluid 51-F-352 (1-gal. container) or 51-F-353 (55-gal. container). Be sure the handle is locked after filling, or fluid will leak out.

## IS IT CLEAN?

Look at the nozzle closely. A clogged nozzle won't squirt.

## DOES IT PUMP FREELY?

Don't pump it every day; that's a waste of fluid. Instead, look for damage such as a bent handle or dented cylinder, and pump it only if you find new damage.

## IS IT SECURELY MOUNTED?

If it's loose, it will soon be battered and dirty — or maybe lost.

## DOES IT LEAK?

Shake after handle is in locked position to determine whether lock is leak-proof. Defective seals on locks often allow fluid to escape while being transported in the vehicle rack.



EVERY MONTH, MAKE THIS TEST—

1. Smell the fluid to make sure it's pure uncontaminated carbon tetrachloride.
2. Squirt some of the fluid into a clean, dry container.
3. If the fluid is clean, pour it back into the extinguisher.
4. If the fluid is dirty, empty the extinguisher and fill with clean fluid.
5. If the extinguisher won't pump, get Supply to swap it for a new one.

NEVER ALLOW ANY WATER TO MIX WITH FIRE EXTINGUISHER FLUID (CARBON TETRACHLORIDE). IT WILL FORM HYDROCHLORIC ACID, WHICH IS CORROSIVE AND WON'T PUT OUT ELECTRICAL FIRES.

## Enough -- And On Time!

Getting the spare parts you need is going to be easier.

The depot or station supplying your outfit is going to have more adequate stocks than before, and you'll have an easier time getting your requisitions filled.

This is all part of a gigantic plan of Army Service Forces called 'Stock Control,' which went into effect with the appearance of TM 38-220, the Stock Control Manual, on May 1943.

---- if you submit the right kind of requisition.

When you couldn't get spare parts, it was generally because some other guy had more than his share. And when you had more than you needed, he probably had tears in his eyes as big as cupcakes because he couldn't get any parts.

Stock Control takes a very sensible view of the whole business. It says: "We'll give each organization all it needs, and no more. Then

there will be enough for everybody."

So they changed the old familiar WD QMC Form 400 (Requisition). In column 3 they provided space for you to put down how much stock you are entitled to carry; then in column 4 you tell how much you now have on hand, and in column 5 you tell how much is 'due in.' From these figures it's no trick at all to figure how

much stock you can get on this requisition. It protects your requisition from the trembling pencils of requisition editors.

Let's suppose you have a 2nd-echelon regimental service company which has to take care of 68 Willys and Ford quarter-ton jeeps. How would you order oil filter elements under the new procedure?

Well, first of all you'd have a certificate signed by the unit supply officer on the requisition stating (1) what kind of vehicle the parts are for, (2) how many of these vehicles you have, and (3) that this requisition won't bring your stock above the authorized level.

Next, for each item, you'd have the correct *stock number*. This will be the Item Stock Number in column 1 of the SNL (or the manufacturer's piece mark or Ordnance drawing number if no item stock number is given). For the filter element, the stock number is G503-01-69092. If you got one of these figures wrong, there's no telling what you'd get.

(Note: For the present you'll be doing yourself a favor if you make a practice of giving the manufacturer's number in addition to the Item Stock Number. The reason for this is that some former QM motor transport supply outfits have not yet put the Ordnance Item Stock Number system into effect, and may have to delay your requisition while they are figuring out what number they are using for the same part. Incidentally, of course you'll have to continue using the TM 10-series parts lists for requisitioning on those vehicles for which no SNL's have been published.)

The nomenclature also comes from the SNL, and that too must be correct. Include the unit of measurement by which quantities of this item are counted - for instance, 'each,' 'quart,' or 'dozen.' For example, 'Element, assembly oil filter, each.'

Now comes the business. The Master Minds Dept. has very

thoughtfully decided how many elements you'll need, and printed it in the 'Organizational Spare Parts and Equipment' section of the vehicle SNL. This is the *authorized or maximum stock level*, and it is the law for overseas or alerted organizations. (Organizations in training have a lower stock level as prescribed in their training allotment.) In this case, because you are providing regimental maintenance for 68 vehicles,

ALERTED OR OVERSEAS ORGANIZATIONS FIGURE THEIR AUTHORIZED LEVELS THIS WAY; UNITS IN TRAINING GET THEIR LEVELS FROM TRAINING ALLOTMENTS.

the quantity you are allowed to stock is shown in Set No. 6, Col. 10. The quantity is 12.

The balance *on hand* you can determine by simply counting what's in the bins, or you can take it off a spare parts record, if you keep one.

AR 850-15 authorizes the use of WD 00 Form 7356 (Bin and Locator Card) for keeping track of parts received, ordered, and issued, but since that form isn't yet available, we suggest doctoring up the old WD QMC Form 424 (Stock Record) for the purpose (as authorized in WD Circular 405, 15 Dec. 1942). The one in the picture tells you at a glance that you have 3 filter elements still available for issue.

(Note: Ordnance supply depots, of course, will be using WD AGO Form 421, as prescribed in TM 38-220, but this is quite a bit more complicated than the 2nd echelon needs).

*Due in* quantities can be kept on the same sheet, by changing the "voucher number" column. As you can see, 5 filter elements were ordered on 3 June, and haven't yet been received; therefore, you'll write "5" in the "due in" column of the requisition.

The *required* number of parts is figured by adding the "on hand" and "due in" parts and subtracting that total from the "authorized or maximum

level." In this case, it's 3 plus 5, subtract from 12... which would be about 4.

This requisition is practically editor-proof. You've proved that you're allowed to carry 12 filter elements and that only 8 of these are accounted for by stock 'on hand' and 'due in.' And therefore, there's no reason why you shouldn't get 4 - unless the depot is out of 'em, which stock control is supposed to prevent.

When is the proper time to reorder? There's a rule on that. The reorder point (or minimum level) is set at 2/3 of the maximum level. Therefore, whenever your total of 'on hand' plus 'due in' for filter elements equals 8, which is 2/3 of 12, you should reorder. Therefore, the filter element stock had reached the reorder point when this requisition was written.

If you use a Spare Parts Record, it's a good idea to note the maximum and reorder (or minimum) levels on the sheet for each part. If not, better write them on a sticker and paste it in the bin.

One more thing - this procedure is for times when for some good reason you can't get your parts by direct exchange. TM 38-220 says you needn't bother with a requisition when you're direct-exchanging, and AR 850-15 says you can get away with a tally-in or tally-out made out at the supply room, instead of a requisition. This is because direct-exchange is in itself proof that you needed the parts you exchanged.

However, all direct-exchange transactions should be entered as 'received' on the Spare Parts Record, so the requisition will be accurate. Remember, the lieutenant sticks his neck out when he signs that certificate.

# REQUISITION

Sheet No. 1

No. of Sheets 8 Perfed Current

Applicant: Supply Officer, Fort Henry Aldrich

Date: 16 June 1943

Destination: 101st Serv Unit, Fort Henry Aldrich, Md.

Authority: F. J. Smith, 2d Lt., Inf. Supply Officer.

Item: WD QMC FORM 400 REQUISITION REVISED

Approved by: F. J. Blank, Capt., Inf. Commanding.

Organization: 101st Serv Unit, Fort Henry Aldrich, Md.

Authorized: F. J. Smith, 2d Lt., Inf. Supply Officer.

Author: F. J. Smith, 2d Lt., Inf. Supply Officer.

Memo: [Handwritten]

Maximum: 12

Minimum: 5

Stock No. G503-01-69092

DATE	ISSUED	BALANCE
4/27	1	11
5/4	2	9
5/19	1	8
5/19	4	4
5/26	1	3
5/28	0	3
6/3	4	7
6/3	5	2
6/9	2	4
6/11	1	3
6/16	1	2

I certify that the following items required for replenishing unit (Ford GPW and Willys MB), will not result in quantities in excess of authorized allowances.

1/4-ton, 4x4 (Ford GPW and Willys MB), will not result in quantities in excess of authorized allowances.

Element, assembly, oil filter

Mfrs. No. FM-GPW18632, WO-A1236

ea. 12

Supply Officer.

ITEM STOCK NO.	PIECE MARK OR DRAWING NUMBER	Manufacturer	ORGANIZATIONAL BREAK-DOWN	
			COMPANY	REGIMENT OR SEPARATE BATTALION
G503 01 69092	FM-GPW18632	Col. 3	10-25 (26-Up)	10-35 (36-75)
	WO-A1236		76-150 (151-Up)	
G503 01 94018	FM-GPW6521	1-9	Set. No. 6	
G503 01 94021	WO-638678	Set. No. 4	Set. No. 7	
G503 01 94033	FM-GPW18688	Set. No. 8	Set. No. 10	
G503 01 94019	WO-B12410	Col. 7	Col. 10	
G503 01 94020	FM-GPW18512	Col. 8	Col. 11	
G503 01 94022	WO-A1538	Col. 9	Col. 12	
G503 01 94022	FM-GPW6505	Col. 5	Col. 10	
G503 01 94032	FM-GPW6555	Col. 5	Col. 10	
G503 01 94032	FM-GPW6766B	Col. 5	Col. 10	

### ORGANIZATIONAL SPARE PARTS

**NOMENCLATURE**

**ENGINE GROUP**

ELEMENT, assembly oil filter.

GASKET, cylinder head

GASKET, manifold

GASKET, oil filter cover

GASKET, oil pan drain plug

GASKET, oil pan act.

GASKET, valve cover

GASKET, valve cover screw

GASKET, valve cover cap & level

INDICATOR, oil filler cap & level

**ORGANIZATIONAL SPARE PARTS**

Article: Element, assembly, oil filter

Unit cost: 1.2

Maximum: 12

Minimum: 8

Stock No. G-503-01-69092

WAS DEPARTMENT

Q. M. C. FORM NO. 424

Revised April 6, 1941

3-9322

WD QMC FORM 424 AS ADAPTED FOR ORGANIZATIONAL SPARE PARTS RECORD

L G-503 Spare Part Equipment

SNL G-503 OSP&E SECTION

8 9 8 7 11 7 5 2 1 1 3

10 10 8 8 8 8 16 2 4 4 6 6 8 8 10 10 10

# Pamper Your Starter Switch

**It won't last long if you don't. Neglect leads to "arcing" - - - "arcing" leads to trouble.**

The starter switch and starting motor being among the lowly species of the automotive kingdom, is stepped on quite frequently. They require little attention and very seldom get any. But let the starter switch or motor lay down on the job and see what happens. While the driver bellows to the high heavens the mechanic snatches out the culprit and puts a new starter switch in its place. And who has been getting blamed? The manufacturer, of course. "The design's not right - poor material" have been the reasons given by some armchair mechanics. So we made an investigation and here are the results.

We found the condition that generally shortens the life of starting motors and switches is *arcing* - the flow of current across an air gap between two electrical conductors. You see, when current is flowing along a wire it hates to stop. This is OK when we want the current to flow, but there are times when we want to stop it. So a switch is put in the circuit. The switch puts a break in the wire to provide an air gap as an obstacle to the current. But as the switch is being opened, the air gap is not as large as when the switch has reached the full open position. The current racing madly down the wire overcomes the small air gap and jumps across to the opposite conductor. When that happens we get a hot flashing arc of electricity. If something causes the switch to make and break the circuit

in rapid succession and if the wire is carrying heavy amperage, these hot arcs will quickly melt and perhaps weld the contact points of the switch.

This we found happening to starter switches when they 'stuck'. In most cases the switch material or construction was condemned by the fixer-upper and no check was made to discover the reason for the 'stuck switch'.

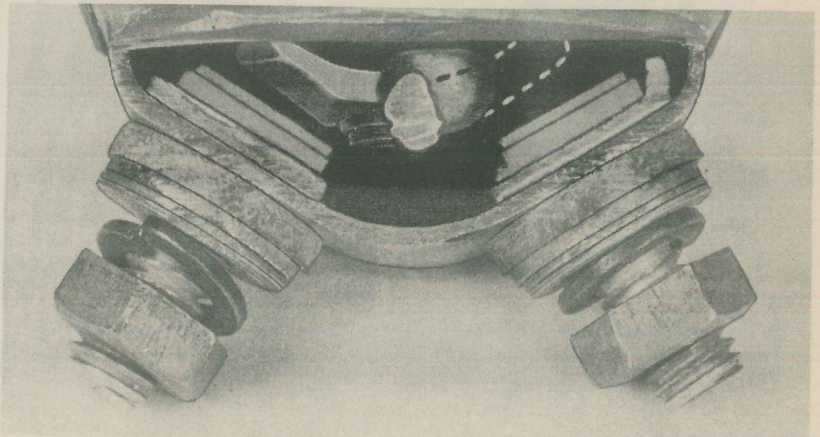
The manufacturers knew that arcing causes the switch contacts to fuse, so they designed the switches to break the circuit quickly, thus cutting down on the amount of arcing. They also used materials that will stand a considerable amount of heat. Therefore we can't blame the manufacturer for what happens.

True, some arcing can't be helped and the switches are designed to take it. But, excessive arcing can be pre-

vented. When you get a stuck switch, look for what caused the arcs, before you replace the switch. Look for anything that is likely to cause rapid interruption of the starting circuit. Some of the things that we've found are:

An undercharged battery on vehicles equipped with magnetic switches will cause an interrupted circuit. If the voltage is too low to hold the magnetic switch contacts closed, they will vibrate. This rapid opening and closing will cause the starter switch contacts also to vibrate. And with each vibration a hot arc occurs. If this is continued somebody will be running around in his vehicle, stomping his feet and yelling 'stuck switch'.

Another thing that causes interrupted circuits is the fellow that uses a 'timid touch' on the starter button or switch when starting the vehicle. He is the fellow that isn't sure if he should start or shouldn't start. He starts to push on the starter button, then he stops. But his quivering hand or foot is causing the starter contacts



*Arcing melted the contact on this starting switch.*



to make and break in rapid succession. In a short time this egg will also be yelling 'stuck switch'.

Listed under the timid touch as reasons for stuck switches, is the 'inching touch'. The fellow who uses this touch is generally helping some guy who is adjusting valves, points, etc. To each signal from the mechanic, helpful Henry gingerly pushes the starter switch, trying to control it so the engine turns over just a teensy, weensy bit. Doing this will arc and weld the switch contact points as good as any 3rd-echelon welder could. So when you want the engine turned over for any reason get Henry to do it with a crank. He will have better control and will be less likely to kill the battery or weld the starter switch.

So with these few examples we've given, you should be able to see that some investigation is needed when a driver with a stuck switch starts haunting you. Find the cause and remove it. Then install the new switch.

The arcing that does so much damage to starter switches will cause even more trouble in the starting motor. But in every case investigated it was found that the cause of arcing could be traced back to lack of preventive maintenance.

For example, in several cases it was found that the motor commutator was being burned due to arcing between the brushes and commutator. Some of these starters had worn brushes which didn't make a firm contact with the commutator. When the starting motor was operated the flashes between the brushes and commutator looked like a welder's bad dream. Other starting motors had commutators with the mica higher than the copper segments. This caused the brushes to hop off and on the commutator causing very pretty but damaging arcs. In cases like this, the generator should be turned in for unit replacement before it is too

far gone. A higher echelon shop will turn the commutator on a lathe, and install new brushes. If the commutator is just dirty, clean it with a piece of 00 sandpaper. Make sure you blow the filings out after the job is complete.

On some of the vehicles checked the cause for the trouble was not found in the starting switch or motor itself. But upon checking a little beyond the motor, it was found that battery cables and other wires in the starting circuit were loose, corroded or broken. This of course caused an interrupted circuit which damaged both the starter switch and motor. Loose or

corroded wires indicate lack of preventive maintenance. Keep all these wires tight and free of corrosion.

Aside from the damage done to the starter switches and motors, excessive arcing is extremely dangerous in the combat zone. This is because every time an arc jumps interfering radio waves are broadcasted to all receivers within the vicinity. This is enough to garble an important message or to permit a nearby radio equipped enemy to know your whereabouts.

There is a full story on this angle of arcing in the June and July, 1942 issues of ARMY MOTORS.

## Letter From Africa

... (NUMBER TWO) ...

Not having seen a copy of ARMY MOTORS since leaving the States we wonder if it would be possible to get your excellent magazine to troops overseas. The magazine contains many articles of interest and value to Army Motor Maintenance in general and is much appreciated by us.

Why aren't our new trucks equipped at the factory with gas and water can brackets? This is a small matter, but an important one. We've only been able to obtain a few of the G. I. brackets and scrap iron was scarce in England.

A suggestion which might help unit Motor Officers leaving the States for England is this. Obtain (perhaps ARMY MOTORS could print this) a comparative list of oils and greases used in England compared on a basis of S.A.E. ratings. It seems to us that this would be a big help to all motor personnel who are likely to be moved to England.

As for actual battlefield motor maintenance we cannot stress too highly the value of thorough 1st-echelon driver training.

All Motor Officers and Motor Sgts. should ram into their drivers all they can of FM 25-10 and other manuals. Care and use of winch and cables is especially important. This North African mud has been plenty heavy and has put an extra burden on our winch equipment. Care and maintenance of tires is also important. All maintenance sections should carry a good stock of tubes, tires and patching equipment. You use up a lot of patches when you get shrapnel or steel in tires.

Also drivers should get all the training possible in night driving with blackout lights. Some sort of test for night vision of drivers should be thought up and made standard throughout the Army.


Here's hoping that we will be able to obtain some copies of ARMY MOTORS in the near future. Wishing you continued success with your magazine, I remain

Yours truly,

1st Lt. J.R.G.

Bn. Motor Officer

# A Great Offensive W



**GEN. SOMERVELL, CHIEF of ASF,**  
hammers home the urgency of  
**PREVENTIVE MAINTENANCE**  
in today's crucial phase of this  
war. The vehicles of victory  
are now in your hands.  
Keep 'em winning!

# Weapon!

WAR DEPARTMENT  
ARMY SERVICE FORCES  
OFFICE OF THE COMMANDING GENERAL  
WASHINGTON, D. C.

21 June 1943

MEN AND WOMEN OF THE ARMY SERVICE FORCES:

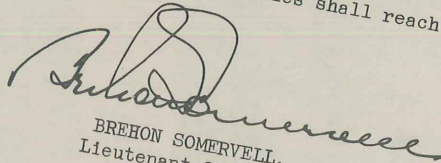
It is time, as we approach the decisive phase of this vast war, to change our basic attitude toward preventive maintenance.

It is time for us to think of preventive maintenance, not merely as a defense against deterioration, but as a great offensive weapon. Our trucks and tanks are on the high road to Berlin and Tokyo. It is your responsibility, through preventive maintenance, to keep them there -- and to keep them moving forward.

Our Army's vehicles are built thousands of miles from the actual theaters of war. But every single mile, from factory to front, is part of our advance on the enemy. That advance must not be impeded -- at any point -- by breakdowns resulting from neglect.

Preventive maintenance for all types of motor vehicles has been standardized in the new Preventive Maintenance Service and Technical Inspection Work Sheets, and in the Driver's Trip Ticket and PM Service Record. But no pieces of paper can do your work for you. Only the proper use of these forms -- the diligent performance of the schedules -- can make preventive maintenance as effective as it must be in this war.

Let us resolve now that every one of our vehicles shall reach its objective in fighting trim -- and on time.



BREHON SOMERVELL,  
Lieutenant General,  
Commanding.

# Rx for RXL Brake Valve

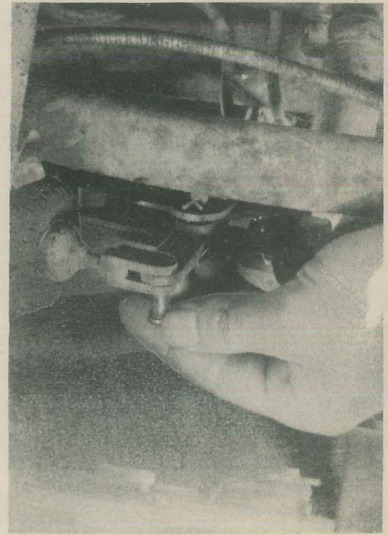
## Prescription for curing choked - up air cleaners

A lot of your GMC brake failures are your own fault.

Or maybe you didn't know that the brake-boosted air cleaner on your early model 2½-ton six-by-sixes is dying of silicosis. This air cleaner is part of the R.X.L. (reactionary external linkage) valve assembly, (located right under the driver's seat on all GMC's that don't have Hydrovac) and it rates the same service you'd give the Hydrovac air cleaner. This cleaner had all it could

do to hold back the dust in commercial, paved-road operation. Its job is ten times tougher on Army trucks that run over all kinds of roads...or over no. roads at all...trailing other trucks in a cloud of dust.

So to cut down power-brake failures, let's start giving these cleaners a break. A safe rule to follow is: *Service this cleaner element each time you service the carburetor air-cleaner.*



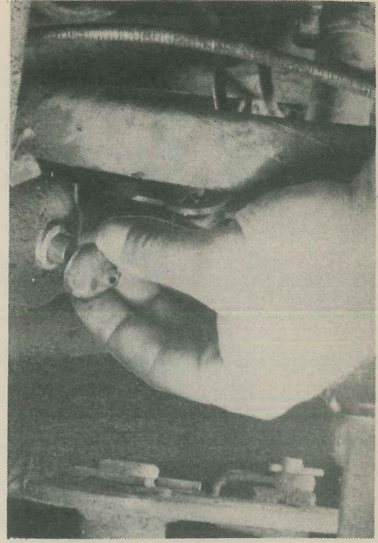
(2) Then pull out the clevis pin connecting the push-rod linkage.



(3) Next remove the push rod from within the rubber boot. Gently!



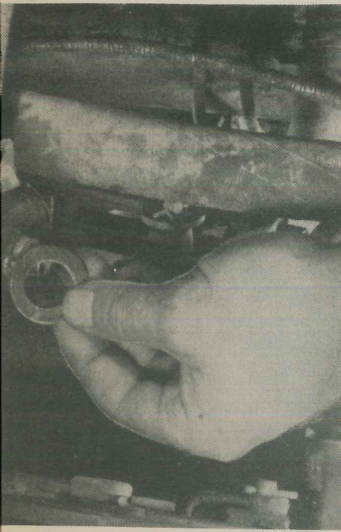
(1) Begin at the beginning by yanking the cotter from the clevis.



(4) Now the rubber boot itself. And, by Gad, Sir, it's rubber.



(5) One place it's OK to use a screwdriver as a pry. The snap ring.



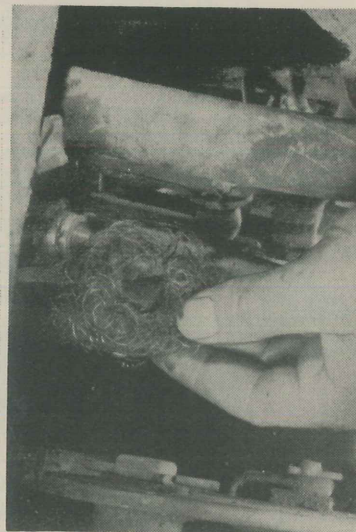
(6) And then the big flat washer that holds the shell in place.



(7) A look at the outer shell tells how recently it was serviced.



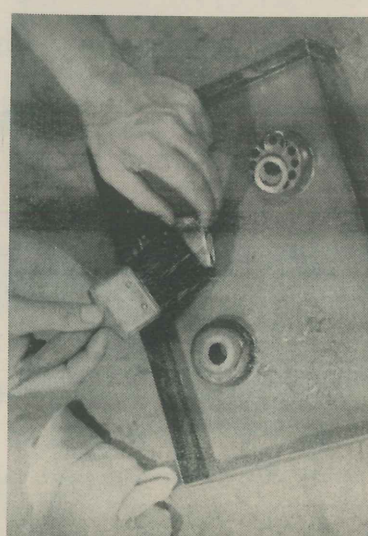
(8) The inner shell has also seen a large share of grit and mud.



(9) Easy on the pulled-curled hair if you expect to put it back.



(10) The screen element is made this way. You needn't reshape it.



(11) Lay the whole works in a pan and brush it with solvent (P-S-661a).

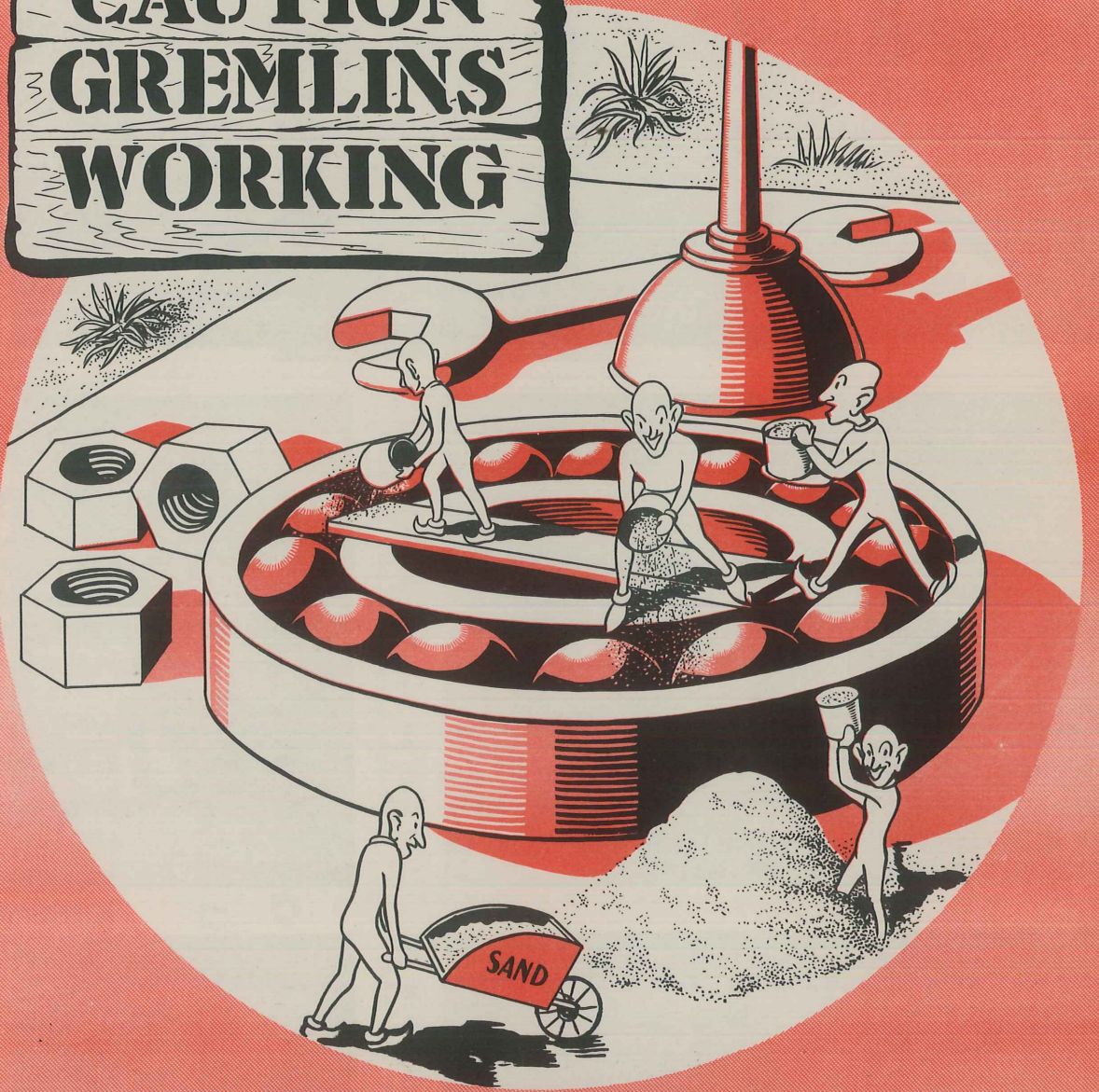


(12) Saturate pulled-curled hair thoroughly with engine oil.



(13) Reverse the order to reassemble and DON'T MESS WITH THE LINKAGE.

**CAUTION  
GREMLINS  
WORKING**



**dirt spells damage  
KEEP PARTS CLEAN!**

Everybody knows by this time that the only Gremlins there are spend their full time, twenty-four hours a day, plaguing the Air Forces.

The funny little men that throw sand in the bearings of tanks and trucks... leave mud on grease fittings... stick dirty spouts into filler pipes... and screw in rusty pipe plugs, are little doggies that just don't give a damn. The trouble with us is, we've missed part of our education. We should all have spent a little time polishing steel balls in a bearing factory. Or sweating out the fit of a few piston pins and rod inserts. Or milling out gears and keyways with an artisan's tender care.

As it looks from here, it's mostly our distance from the workbench — our forgetting the workmanship in the thousand little parts that make a truck.

What we need to do is think of these things once in a while in terms of what we did before we got into OD's. If we were a bookbinder we never bent back page corners. Or if we were a greenskeeper we never dug a divot. We camera bugs wiped our lens with the softest tissue, and lubed our shutter mechanism with the finest, cleanest graphite.

Of course, we know it's tough, when there's nothing all around but sand, or coral, or limestone dust, and it's blowing in our ears and eyes and mouth and nose. And when we gulp our chow it grates like glass between our teeth and we say hot words under our breath.

Most of the time, guys, it's not too tough to find a clean hunk of paper to wrap a bearing in, or a rag to wipe off an oil-can spout, or a cover that fits the grease barrel tight enough. And you know it.

## Keep Parts Clean

DON'T TAKE OUR WORD FOR IT...TRY IT YOURSELF. NEXT TIME YOU DO A JOB OUT IN THE OPEN, OR EVEN IN THE SHOP OR UNDER A TENT, HANDLE IT ACCORDING TO THIS PROCEDURE GIVEN US BY A COLONEL FRESH FROM THE HOT SPOTS.

"WE FOUND IT BEST TO WRAP ALL EXPOSED PARTS AND ASSEMBLIES IN CLEAN PAPER OR LINT-FREE RAGS, AND WHEN AT ALL POSSIBLE PUT THEM INTO CONTAINERS; EITHER WOOD OR PAPER OR TIN — WHATEVER WE COULD FIND WHERE WE HAPPENED TO BE."

FOR THE LITTLE EXTRA WORK IT TAKES, AND YOU'LL ADMIT IT ISN'T MUCH, IT'S THE DIFFERENCE BETWEEN KNOWING THE JOB WILL LAST AND HOPING IT WON'T BREAK DOWN TOO SOON.

## Shock Absorbers Are No Good

**...unless you give 'em the regular 1,000 mile and 6,000-mile PM servicings.**

Skipping the job of servicing shock absorbers is the easiest thing in the world. All you've got to do is make a pass at it with a rag, or, if you're the conscientious type, you can say 'Hell, that's a 3rd-echelon job — let those guys take care of them'. But no matter which method you use it's going to cause you more work in the end.

As any mechanic knows, properly serviced shock absorbers mean longer periods between broken springs and also better steering control of the vehicle. The double-acting-type shock absorbers (used on most of our vehicles) keeps a large part of the force created by a bump from ever reaching the spring. It also prevents excessive rebound after the vehicle spring has been compressed by a bump. So if you'd rather look the other way when it comes to giving shock absorbers their 1000-mile and 6000-mile servicings, you can look forward to sweating it out changing springs, changing worn-out shock absorbers and listening to the drivers gripe about the lousy way their trucks steer.

There are two types of shock absorbers used on Army vehicles: (1) Direct-Acting (Fig. 1), and (2) Double-Acting (Figs. 2 and 3).

You can forget about the direct-acting type (used on some passenger cars and 1/4-ton 4x4 trucks) because servicing these is *not* a 2nd-echelon job. They are either sealed by the manufacturer or require specific amounts of fluid and must be referred to higher echelons. Of course you can do a 'Unit Replacement' on them in 2nd-echelon.

*But servicing the double-acting type shock absorber is definitely a 2nd-echelon job.* And in case you're a little hazy about what the 1000-mile and 6000-mile services are, we've listed them below.

**1000-mile Service (Double-Acting Type)**

Inspect shock absorbers for fluid leaks. Fluid seepage on the shock absorber body and arm indicates a leak; take them off and install new ones.

Test the bolts that hold the shock absorber to the frame for tightness. Put a wrench on the bolts and pull up on them — a loose shock absorber

will give you plenty of headaches.

Test shock absorber linkage for wear. Work the top of the arm up and down. Then watch the joints in the linkage for lost motion. If the linkage is excessively worn - yank them off and install new ones.

If the link joints are rubber or fabric, coat the exposed parts with brake fluid. This will prevent the rubber or fabric from drying up and cracking.

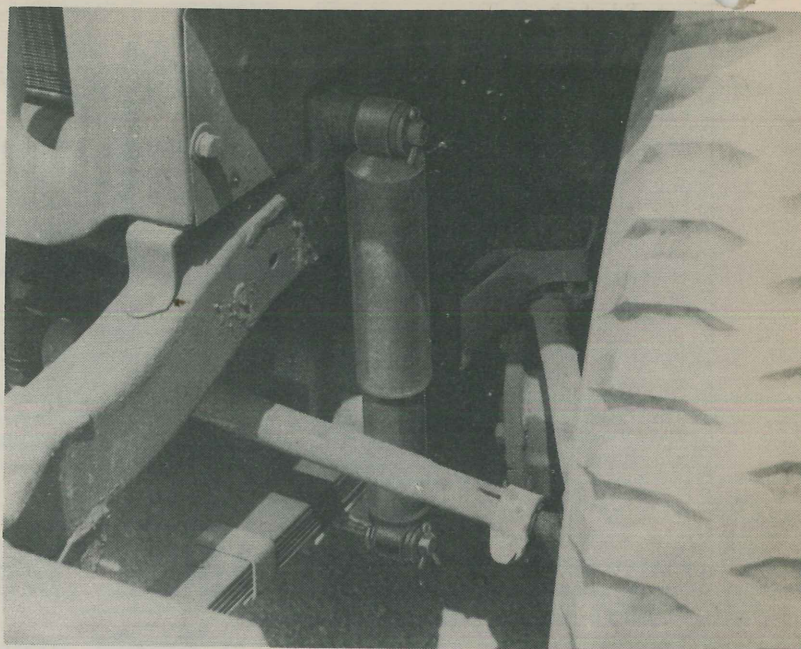
**6000-mile Service (Double-acting Type)**

Perform 1000-mile Service.

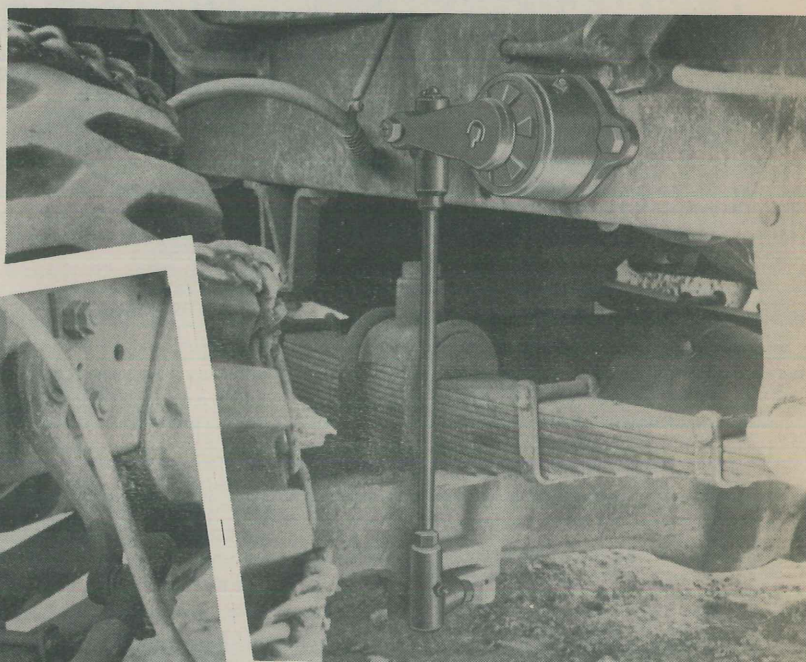
Fill shock absorber with fluid.

Now, don't get excited - this job isn't as bad as it's cracked up to be. To fill a shock absorber, disconnect the shock absorber link at the axle housing. Wipe all dirt away from the shock absorber filler plug, remove the plug, and fill the shock absorber body until fluid flows from the filler hole. Work the shock absorber arm up and down several times. This allows air trapped in the shock absorber cylinder to find its way out. If air comes out, the level of the fluid will drop down. Refill the shock absorber. Repeat the operation of working the arm and then refilling until the fluid remains level at the filler hole. Replace the filler plug and test the action of the shock absorber by working the arm up and down. The resistance on the compression stroke (pushing arm up) should be greater than on the rebound stroke (pushing arm down).

(Cont. on page 128)

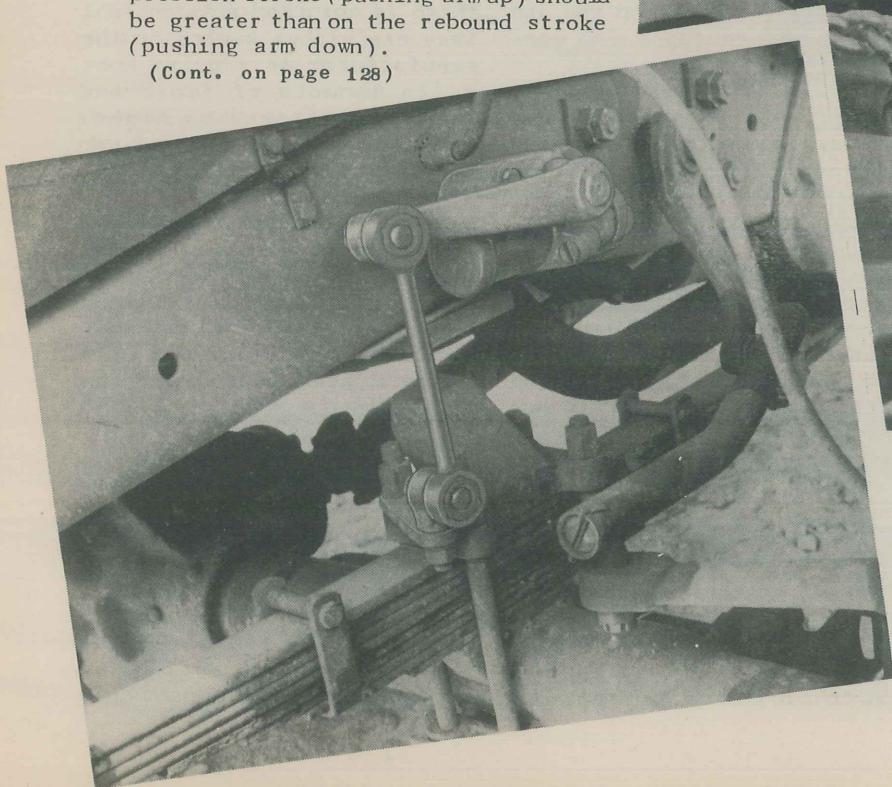


*Fig. 1 - Direct-acting type shock absorber. Servicing this type is not a 2nd-echelon job, so don't try it.*



↑ *Fig. 2 (above) - Double-acting (Houdaille). Service this.*

← *Fig. 3 (left) - Double-acting (Lovejoy). Service this, too!*





Dear Editor,

Here's a way to install distributors on the earlier model V8 Fords without standing on your head or frothing at the mouth. Screw two 5/16" x 1-1/4" standard studs (or capscrews with the heads cut off) into the block finger tight, before installing the distributor. Then slide the distributor on the studs. Move the rotor with your finger 'til it (the rotor, not your finger) lines up with the camshaft and the distributor will then fall into place. A capscrew can then be started in the third hole. This will keep the distributor in place until the other studs are removed and the installation is complete.

Pfc Gilbert Shuman  
314th Bombardment  
Squadron

*(Ed. Note - On the current sixes and V8's, you shouldn't have any trouble installing the distributor.)*

From Lt. William H. Wilkerson, Hq. 13th Armored Division comes a good way to protect the main battery switch on the M7 Gun Motor Carriage from being mauled by heavy-handed feet. However, our personal G2 at TAC tells us that Field Service Modification Work Order G128-W16 (FSMWO, pronounced "fizmo") is being processed that will not only protect the switch handle, but also provide a means for stowing the M12 Bore Brush and the M5 Cleaning Rammer.

We owe a special nod to Mr. George R. Oliver, Manager, War Products Training Activities at GMC and his Service Managers for the following contributions.

Mr. H. B. Tomlinson, of the Sixth Service Command reports many generators and voltage regulators are being burned out in the field. This is a result of installation of the wrong voltage regulator when the vehicle is serviced. There are two types of genera-

# CONTRIBUTIONS

Dear Ed,  
Got a good idea? Invented something lately? Got a gripe? Shoot it along to us. Maybe you've solved a problem everybody else is worrying about. Pass it to us, and we'll buck it to the rest of the boys in the field. You'll get a personal subscription if we like your idea - you lucky thing.



tors and voltage regulators in general use:

(1) 25 ampere type which is used on vehicles having the positive terminal of the battery grounded, and

(2) 40 ampere type which is used on vehicles having the negative terminal of the battery grounded.

To prevent burned out generators and regulators, check the identification plate on the cover of the voltage regulator to see whether the positive or negative is grounded. Then make sure the battery ground is the same as the ground shown on the identification plate of the voltage regulator. Best of all, check with the vehicle manual or SNL [Parts Book] to do the job right.

\* \* \*

Another contribution from GMC covers oil loss from hot oil running down the threads in the spark plug recesses above the spark plug terminals on the right side of the engine.

Oil loss, a dirty engine, and direct damage to insulation of the plug and coil wires are the results. And frequently the oil loss is mistaken as originating at the rocker cover gasket. Actually the oil runs from the interior of the rocker arm cover to the engine ex-

terior by way of the space between the threads of the rocker-arm-shaft bracket attaching capscrews and the threads of their tapped holes.

To correct this condition, GMC tells you to remove the rocker arm cover and take out the six attaching capscrews one at a time. Thoroughly dry the threads of the capscrews and the tapped hole, and coat the threads with hard-drying Permatex cement (Fed. Stock #52-C-649, 1 oz; 52-C-650, 2 oz; 52-C-675, 8 oz.) or a suitable substitute. After the capscrews have been reinstalled, smear a small amount of the cement to the underside of each tapped hole to further guard against leakage.

Incidentally, the capscrews attaching the rocker-arm-shaft bracket are installed in production with Permatex; so this leakage will only occur on engines from which these brackets have been removed and reinstalled without treating the capscrews as described.

\* \* \*

From Mr. F. T. Wilson, Service Representative for the Sixth Service Command comes a tip that may save many a greaseball's arm or hand. He points out that despite the safety catch, on a windy day a hood in a raised position

may be unlatched by a sudden gust of wind, with disastrous effect on anyone working on the engine. Mr. Wilson suggests that either a prop be placed under the hood to hold it open or else a small stove bolt or nail be slipped through the hole in the safety catch. (Ed. Note - In checking over this contribution, our watch-your-neck authority stumbled on another safety device. He slipped off the radiator pressure cap and jabbed the handle of it squarely in the round safety catch. A perfect fit, and a sudden gust of wind will not unlatch the hood. We understand that this particular on some GMC's and Chevies. Next time you've got an engine job to do in the open, use your radiator cap. It may save your neck.)

\* \* \*

Back to Mr. Tomlinson again, who comes up with the news that rubber brake hoses are deteriorating rapidly because of paint. It seems that the brake hose is not covered while truck chassis are being painted in base shops, and start to crack and rot, shortening the life of the hose.

Protect your rubber brake hose with masking tape (Fed. Stock No. 53-T-1336-30) when repainting your vehicles. Incidentally, that's the way it's done at the factory.

\* \* \*

It has been reported some of you drivers are playing around with the governors on your vehicles to allow a top road speed of 35 miles per hour. Not only is this a bad policy, but it's strictly not in accordance with AR 850-15, Paragraph 19 d, which specifies, 'Regulated governors, when installed, will be set and sealed at the maximum speed considered safe and not to exceed that indicated on the name and caution plate. Tampering with sealed governors will be considered cause for disciplinary action.'

Our informant goes on to say, "When the governor is adjusted to lower the top road

speed to 35 miles per hour, the efficiency of the vehicle is reduced. Vehicles adjusted this way often can't keep their place in a convoy, causing the drivers to re-adjust the governor to a wide open position.

"On the 2 1/2-ton GMC, the governor should be set to allow even engine speed of 2750 rpm as indicated on the caution plate."

Dear Ed,

Tires and fenders were damaged when the wheels came off some of our 3/4-ton trailers. Investigation showed that the right drum was on the left wheel and vice-versa, causing the nuts to loosen and the wheels to fly off.

I hope you will call attention to the importance of installing the hubs on the proper side.

Lewis C. Hudson

Dear Ed,

I am stationed at the Boston Port of Embarkation, Preventive Maintenance Repair Center for Overseas Vehicles.

This shop's efforts are devoted entirely to giving each and every wheeled vehicle a 6000-mile preventive maintenance service and when we say every wheeled vehicle we mean everything from 1/4-ton trailers to D8 Caterpillar Bulldozers.

We have encountered many interesting service conditions. Some of these conditions are caused by the lack of preventive-maintenance service in the field and some conditions are production line failures. We find these shortcomings on both new and used vehicles because we service them all, new and old.

To remedy the shortcomings of the assembly line, which are lack of lubricants and improper clearance adjustments throughout the vehicle, we complain to the manufacturers' service representatives with ordinarily good results, but for the shortcomings of the

organizational equipment - what a headache!

The predominant shortcomings are improper lubrication and improper measures taken for rust prevention. In some cases these vehicles have actually operated in salt water and no action was taken to prevent rust action in the inner brake assemblies and - generally it's a lack of good PM service. The finding of all these conditions in vehicles has made it necessary for this Port of Embarkation to set up a large preventive-maintenance center.

I have two reasons for writing you this letter; one is to call to the attention of the general automotive personnel in the Army of several factory failures that no service bulletins have been issued on and the other is that I hope that if this letter is printed it will bring out the importance to organizational commanders and their personnel the need of good PM service. It is my belief that all Army motor vehicles should be kept on a strict PM schedule so that they would not have to be held up at the various Ports of Embarkation for long service delays. These last minute repairs give us a tremendous headache in the form of parts procurement and almost inevitably, because of the great number of special purpose vehicles, some have to be deadlined. I also believe that if everyone would get behind the very well planned PM service that the Army has established, from the General down to the Private, we would get this equipment overseas much faster and help to hasten the war's end.

The factory shortcomings that I think should be called to the attention of all Army personnel are the lack of rust proof coatings to the metal parts of the brake mechanisms and this is found in practically all Army motor vehicles with the exception of the late model Dodges, and another very serious condition that we have found very recently is a short oil dipstick in the Ward La -

France heavy M1 wrecking truck equipped with Continental Model 22 R engines. These dipsticks record full crank - case capacity with six to seven quarts and the actual capacity of the case is ten quarts. We have already contacted the manufacturer service representative and we believe that corrective measures are being taken but undoubtedly a number of these vehicles are in service today with this short dipstick.

R. A. Beauchemin  
Auto. Advisor

(Ed. note - Continental Motor Co. reports no other complaints of a short dipstick in the 22R engine - anybody else with this complaint is cordially invited to write and tell us about it. Continental requests that we publish the following 'recommended oil-change procedure for M-1 Heavy Wrecker using 22R engine' (resulting from a study made with a truck standing on level concrete floor).

1) New motors from which oil has been drained and on which new oil filters have been installed, will require 14 qts. to bring to proper level.

2) Motors regularly in use but on which filter units are being changed will require 14 qts. to bring to proper level.

3) For regular oil change where filters remain intact, 10 qts. are required to bring to proper level.

Note: It is to be expected on either of the above that before the engine has been run or several minutes after it has been stopped that the oil stick may show a level above the full mark. When engine is in operation, however, the level is within the proper range.)

Dear Ed,

My first contribution may save some grease seals.

We've found that less wheel-bearing grease seals are damaged if the wheels are removed from the hubs before removing the hubs to check wheel bearings. When the wheel and hub are removed as one assembly it is too heavy to handle and generally results with the seal being scraped on the axle housing.

We've also found that by always keeping a few wheel-bearing grease seals in a can of oil, the men are less likely to install a dry seal. Incidentally, we'd like to know if the rubber in the new type seals is affected by oil or grease.

(Ed. Note - Keeping a few grease seals soaking in a can

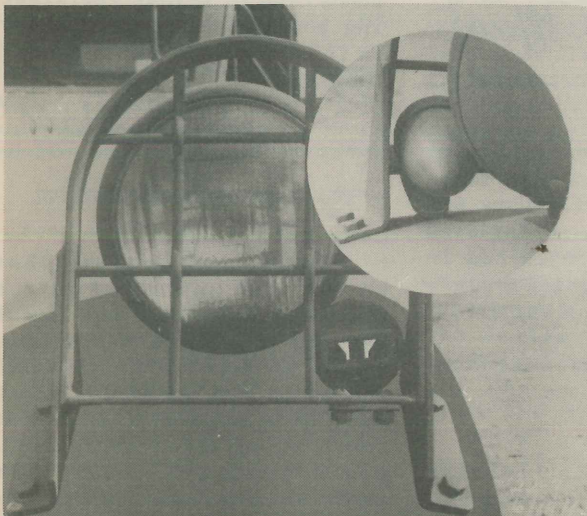
of oil is the only way to insure that the seal will not be burned when placed in service. It also prevents seals from being installed dry. However, this practice is not necessary with the neoprene (synthetic rubber) type seals. Neoprene is not deteriorated by oil or grease, nor will it absorb either. You don't have to soak neoprene seals. Just smear some oil around the edges.)

I've discovered that black-out lights have been causing short circuits on several of our half-tracks and scout cars because of improper installation at the factory.

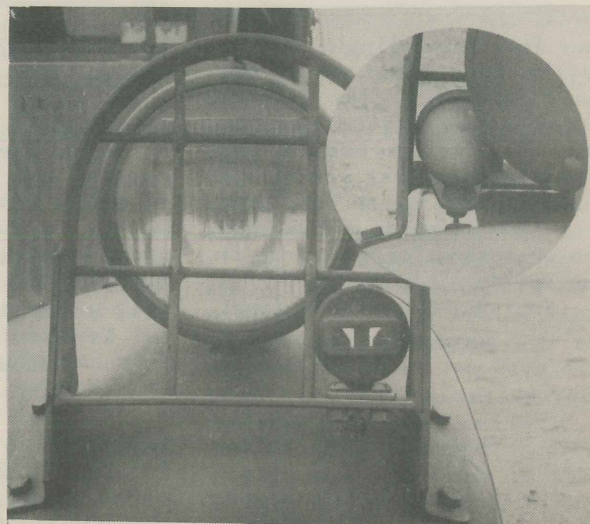
It seems that when the lamp bracket is placed under the spacer which is part of the brush guard, the lamp body is too close to the fender when the bolts are drawn up. This causes the insulation on the wiring to be cut where it passes through the fenders.

I've found that if the lamp bracket is placed on top of the spacer this trouble is eliminated. The photographs show the right and wrong way.

L. Boyd, 823 T.D. Battalion  
(Ed. Note - This condition exists only with the earlier models. Current models are being equipped with a new pedestal headlamp which eliminates shorts of this type.)



Lamp bracket improperly mounted.



Lamp bracket properly mounted.



What Half-Mast doesn't know you could put in a gnat's ear and, by the same token, what a gnat doesn't know you could put in Half-Mast's ear. Half-Mast is the answer man, he'll answer all those questions — technical, procurement, procedure — that have you up a tree. Write 'Dear Half-Mast.' Preventive Maintenance Unit, Holabird Ordnance Depot, Baltimore, Maryland.

Dear Half-Mast,

You're the only one to settle this argument.

Our original 1/4-tons have the clutch and brake pedal pads with the square end toward the outside of the car — in other words, the small ridge to keep your foot from slipping off is in the proper place, to our way of thinking. On some new 1/4-tons we just drew, the pedal ridge is toward the steering gear mast jacket and there is nothing to keep your foot from slipping off — and I see no reason for the ridge on the inside.

Your decision will be final.

Automotive Adv. W.A.H.

Dear W.A.H.,

Sorry, boys, but you're wrong. The small ridge on the edge of the brake and clutch pedals should be on the inside next to the steering column. The early models, as you say,

had this ridge on the outside, but it was changed, because of the possibility of the driver (with his boots or big shoes) jamming his foot between this pedal and the steering column.

*Half-Mast*

Dear Half-Mast,

We've been having lots of trouble with front end shake on Dodge V.F. 1 1/2-ton 4x4 trucks. We have also followed all instructions contained in Bulletin No. N-2, 1 February 1941 without success.

Can you help us?

Shop Superintendent  
K.W.K.

Dear K.W.K.,

That's quite a question you've given me, but here goes.

(1) Check from tire wear; if the tread shows uneven wear,

the front tires and wheels should be exchanged with two of the rear which are in good condition.

(2) Use your tire gage. If the pressure isn't 55 pounds all around, make it 55 pounds all around.

(3) Check toe-in of front wheels with toe-in gage or Wee-Gee Board. Should be 1/16" toe-in with gage or zero if the Wee-Gee Board is used.

(4) Make sure the steering gear housing bracket to frame bolts are tight. Loose bolts will allow steering gear assembly to float and will only aggravate any front wheel shake. Put an extra nut on the steering gear housing bracket to frame bolts; this will help keep the assembly securely in position. Where the vehicle is operated over extremely rough terrain, and you have trouble in keeping the steering gear housing bracket to frame bolts tight, you might enlarge the steering gear bracket holes to 1/2" and enlarge the frame slots accordingly, so that 1/2" x 1 1/2" SAE capscrews can be installed in place of the 3/8" SAE capscrews that are the original equipment.

(5) Adjust steering gear if excess play is noticed.

(6) If these adjustments don't eliminate front-wheel shake completely, then you're gonna have to adjust the steering knuckle bearings, as described in the maintenance manual.

*Half-Mast*

Dear Half-Mast,

The rebuilt motors that we have had installed in our Chevrolet 1 1/2-ton 4x4 trucks have been leaking a sizeable amount of water at the throttle eccentric pin. Evidently there must be a copper washer that the boys at the fourth shops are forgetting about. If there is a special washer for that pin, could you give us the number of it?

Another thing that gets in our hair is the fact that our Willys 4x4's have the bad habit of leaking transfer-case lube up into the transmission. Is there anything that we can do in a 2nd-echelon shop to remedy this situation?

Sgt. P.A.

Dear Sergeant,

Nope, the boys in the 4th-echelon shops didn't forget to put in that copper washer. For one thing, Chevrolet doesn't use or even list a washer for this stud in their master parts book.

Instead, the production practice is to treat the stud threads with a sealing compound to prevent leakage around the stud. Howsomever, Sarge, I came up with a real nifty. There is a 5/16" copper washer (GMC parts number 394123, page 38 of TM 10-1185) which fits the block end of the stud swell. In chronic cases of leakage like yours, treat the threads with Permatex or white lead — then install this solid copper washer, tighten the stud, and forget about the leakage.

As for the transfer-case lube leaking into the transmission, Willys tells me that careful tests show the amount not great enough to cause trouble. But, starting with engine Serial No. 169756, an additional oil slinger was placed next to the rear transmission main bearing and the bearing reversed on the shaft. This change is clearly shown by Figure 4 in the transmission section of the Willys manual TM 10-1513, 15 January 1943.

*Half-Mast*

Dear Half-Mast,

There has been quite a lot of controversy on this post as to the proper 'flush' to use when cleaning out transfer cases, transmission, and differentials. Now, my own idea is to use a #10 engine oil, but I would like to know the test dope you have on the

subject. Also, what do you recommend to wash bearings with?

Lt. L.C.R.

Dear Lieutenant,

You are right on the #10 engine oil. (We call it OE #10.)

Wash ball and roller bearings on gasoline-powered materiel with 'Solvent, dry cleaning, Federal Specification P-S-661A'.

For Diesel-powered materiel, it's O.K. to use Diesel fuel, because it's handy.

Under no circumstances should you use gasoline for cleaning.

*Half-Mast*



Dear Half-Mast,

Please explain this one. The front axle inner oil seal on the Ford 1/4-tons are installed with the lip of the seal facing the outer end of the housing. It seems to me this defeats the purpose of the seal, which is to 'prevent leakage of differential lube into the universal housing'.

GMC, Dodge, and Chevy all install this same seal with the lip of the seal toward the differential. Is the method of installation of the jeep wrong or is there some hidden purpose?

J.K.

Dear J.K.,

It ain't entirely clear to me exactly which seal you have reference to. The oil seal at the differential end of the axle shaft is installed with the lip of the seal facing into the differential.

This is provided to prevent the differential lube from leaking into the axle tube.

In the earlier vehicles, there was an oil seal just

inside of the universal joint which has the lip of the seal facing the wheel end of the axle. The purpose of this seal was to prevent the universal joint lubricant from passing into the front axle tubing. This seal has been discontinued since the adoption of the 'tracta' type universal joint.

If this don't clear up your question, please send me a rough drawing, showing the exact location of the seal in question.

*Half-Mast*

Dear Half-Mast,

Why is it that the individuals responsible for the design of gasoline tank necks do not eliminate this bottleneck in the speed of convoy movements?

Capt. H.D.S., Jr.

Dear Captain,

You'll be glad to know that the individuals you speak of have seen the light, and as a result, all trucks now rolling off production lines have fast-fill gas tank filler necks. The new filler necks will take the 5 gallons of fuel in 40 seconds.

*Half-Mast*

Dear Half-Mast,

I have a 1/2-ton Dodge which has brakes that are very annoying by their incessant squealing. Practically all the 1/2-tons have the same trouble. Somebody told me that the brake linings became glazed and smooth and that I should remove the wheels and roughen the brake lining with emery cloth. This we did; it stopped for about two days and they started squealing all over again.

Cpl. R.C.D.

Dear Corporal,

Abrasive stuff like sand and grit in the brake lining

will help it become glazed. If this is the case, you can roughen the linings with a wire brush to remove the glaze, and criss-cross the linings to a depth of 1/16" with a hacksaw blade.

Of course, it may be that your brake shoes are not properly centralized, in which case, you'll have to make a major adjustment as called for in the maintenance manual.

*Half-Mast*

Dear Half-Mast,

Why does the 1942 GMC, CCKW 353-A2 get so much backlash in the differential side gears' in such a short time? All my trucks sound like hell when the gears are changed. The backlash is so excessive that the propeller shaft will turn 1/8 of a revolution and the ring gear won't even move. Why? They have had the best of lubrication and all have good drivers assigned to the vehicles.

Now, couldn't these bronze spacers be made out of a harder metal, or would the friction be too great? Wise me up, so I'll know what measures to take.

S/Sgt. R.P.

Dear Sergeant,

From your letter, it seems to me that a lot of wheel slippage has been going on or else your rear tires have been mismatched (two worn tires on one wheel and two good tires on the other wheel). Either of these conditions will cause rapid wear on the side gears and thrust washers and will eventually result in the backlash you mention.

To add to the normal service life of the spider and side gear assembly, I'd say mate your tires right, keep them filled with the right amount of air, and tell your drivers not to let one wheel spin around by itself for any length of time. As you know, this practice throws the thrust on the side gear and results

in undue wear to the bronze thrust washer and side gear.

Making the thrust washer out of material harder than bronze would defeat its purpose, because the use of a harder washer would cause the gear and housing to wear, and you'd pretty soon have to replace them. The bronze washer wears faster than the gear, but can be replaced at a much lower cost, by the higher echelons.

*Half-Mast*

Dear Half-Mast,

We have been having trouble with the radio shielding on the 1/2-ton C/R W-C-26 high tension wires breaking down (an average of once a month). It's mainly the high tension coil wire to the distributor cap; condensation or water seeps in between the wiring and shielding.

There is a lot of dampness and fog where we are located, it settles on the trucks each night. Strangely enough, the radio shielding is the only wiring we have trouble with.

Motor Sgt. B. J.

Dear Sarge,

Your trouble is no doubt due to the weather.

If your 1/2-tons are equipped with a copper high-tension coil wire, replace it with a steelductor cable. This change was made in later models to eliminate this exact trouble.

Another thing you can do is to drill a hole in the conical section at the forward side of the spark plug cover. This will provide ventilation, and the fan blast will help evaporate any condensation that may be on the spark plug.

You can get more dope on hard-starting and high-speed miss on your 1/2-ton Dodges by reading Motor Transport Technical Service Bulletin #D-1, dated 25 August 1941.

*Half-Mast*

Dear Half-Mast,

In making our daily motor pool inspections, we have found that a good many of the organization motor shops are changing good grease seals in the outer end of the 2 1/2-ton GMC banjo type rear axles. A close inspection of the seal showed that it is not making firm contact with the axle flange. To correct this, we are using an extra lock washer with the ears cut off between the outer nut and lock to space the grease seal out and make a firm seal with the axle flange. The clearance must be checked after this has been done to see if the seal makes contact or not. So far, this has worked out satisfactorily.

Another item we have difficulty with is the rear tail lights and guards which are too close to the end of the body on the new 2 1/2-ton GMC Cargo. When backing up to a platform, if the vehicle is backed up on an angle, the guard will strike the platform and bend the tail light. We are setting our lights and guard on the inside of the side.

What do you think of this method?

Automotive Advisor,  
F.A. McG.

Dear Mr. McG.,

If the grease seal is not making a good contact with the axle flange, it is usually due to wear. When this wear isn't great enough to need replacing, I'd suggest you place another thrust washer (GMC part No. 473628) between the bearing and adjusting nut, which will give you the same results without the need for cutting the ears off the locking washers.

As far as the location of the tail-lamp goes, almost any location selected would be subject to damage under certain conditions. However, I feel that there are some conditions where it might be necessary to move the lamps to meet local situations.

*Half-Mast*

## REVIEW OF TM 9-808

First chance you get, grab a copy of the new TM 9-808 (12 May 1943,) and feast your eyes on it. It's the new 1st and 2nd-echelon operation and maintenance manual for the 3/4-ton Dodge. And if this is typical of the surprise packages the Ordnance manual writers have for organizations using Motor Transport vehicles, we think you're going to be really happy.

Seven-star feature of the book in our prejudiced eyes is the section on Preventive Maintenance, which includes complete details of operations to be performed on this vehicle as prescribed by AR 850-15, W.D. Form No. 48 (Driver's Trip Ticket and Preventive Maintenance Service Record), and W.D. AGO Form 461 (Preventive Maintenance Service and Technical Inspection Work Sheet for Wheeled and Half-Track Vehicles). Lots and lots of clear, simple pictures too.

Another thing you've been waiting for - it has maintenance allocations. This manual tells exactly what types of maintenance jobs each echelon is normally supposed to do. (That word 'normally', you'll notice, still leaves you some leeway.)

Lube men will welcome the reproduction of the War Department Lubrication Guide for this vehicle, which is followed by sketches of the points to be lubricated, each sketch fully explained.

You'll discover the sections on 'materiel affected by chemicals' and 'demolition to prevent capture' to be downright interesting reading, completely apart from the fact that it might save your skin sometimes. But why should we rave on? You'll soon see for yourself. Two copies are authorized for each Infantry, Field Artillery, and Tank Destroyer company or battery, and 8 for each Ordnance company, in addition to those for higher headquarters and the copies which are riding along with the

# BOOKS



individual vehicles. Distribution is made by the Adjutant General Depot in each Service Command.

## MANUAL MIX-UP

On page 15 of our April issue, we blithely stated that the new maintenance manual for your M6 Gun Motor Carriage (Dodge) is TM 9-1809. It's amazing - but we're wrong! TM 9-1809 applies to a GMC 2 1/2-ton 6x6 (AFKWX-353) and none other.

The M6 Gun Motor Carriage, together with all Dodge 3/4-tons and the new 1 1/2-ton, 6x6, will be covered by maintenance manuals TM 9-1808A and 9-1808B. These manuals are now being whipped into shape.

So the last item on your M6 publications plate still needs changing. But see that you change it to TM 9-1808 (A and B) - not 9-1809.

The number is okay as is on the M6 operator's manual, the only one you'll have on the truck.

## DODGE SERVICE PARTS CATALOGS

As predicted in the May ARMY MOTORS (article on 'Standard Nomenclature Lists,' page 40), SNL-type Service Parts Catalogs are beginning to appear for the former QM motor transport vehicles instead of the old TM-type Parts Lists.

Just out is SNL G-502, Part II, covering Dodge 3/4-

ton trucks with serial numbers of 81,601,050 or higher. Even though your trucks may not have serial numbers as high as this, you'll find it worthwhile to sneak a look at this one, which your Ordnance Officer can get for you, to become acquainted with the big changes that are going on with parts publications for these vehicles.

Notice especially that *Item Stock Numbers* for all parts are given in this book, and according to 'Introduction to the Ordnance Catalog' (IOC), should be used in preference to Manufacturer's Numbers when requisitioning parts. However, since a few depots may not have changed over to the Item Stock Number system, it might speed the filling of your requisitions for the present if you give *both* numbers.

## REVIEW OF OFSB 1-1

Here's a lucky seven... one index covering 7 publications that used to send you running in 7 directions when you had to look something up.

It bears the jawbreaking title of 'General: Index to Technical and Administrative Publications for the Ordnance-man,' but you will probably remember it as OFSB 1-1. The books which 1-1 lists, cover any item of Ordnance materiel you can think of, from tanks to telescopes. Furthermore, it's available to *any* unit (not just Ordnance, as the name

suggests). If yours hasn't come through, your Ordnance Officer can get it for you from the nearest Ordnance Publications Depot.

This index includes:

Field Manuals (FM) and Technical Manuals (TM) on Ordnance materiel, which you used to look up in OFSB 1-20 (now superseded) or in FM 21-6 (still revised and republished by the AGO every 6 months).

Training Circulars (TC) on Ordnance, which didn't have any index at all.

Ordnance Field Service Technical Bulletins (TB), which used to be indexed in TB 10 (now superseded by OFSB 1-1).

Army Regulations (AR) of special interest to Ordnance men, which you could always look up in AR 1-5, or 1-10 (and still can, if you have the ambition).

Ordnance Field Service Bulletins (OFSB), which used to have two indexes, OFSB 1-1 and 1-2 (both superseded by the new 1-1).

Ordnance Field Service Circulars (OFSC), which until now you could find only through OFSC 1 (also superseded by OFSB 1-1).

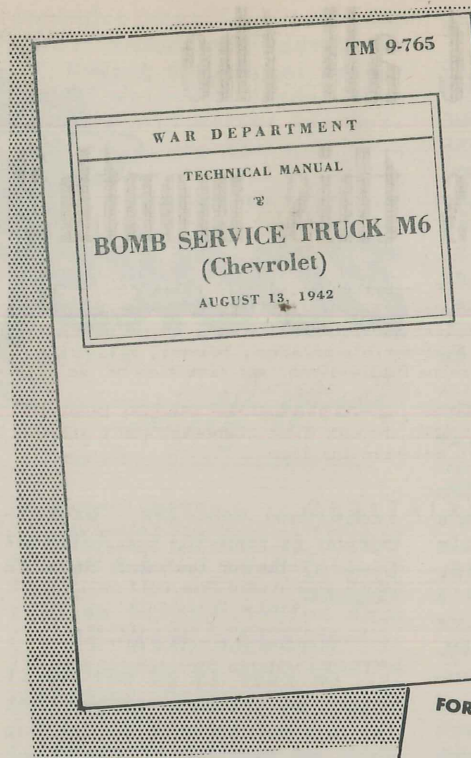
This marvelous little book is going to come out in a new revision every 3 months. When used with the FSMWO index and the OPSI, it will give you a pretty complete picture of what's in print. Now, if the Publications experts could only melt these 3 indexes into ONE, and arrange that one alphabetically by subjects, the beer would be on us.

#### WHICH TM?

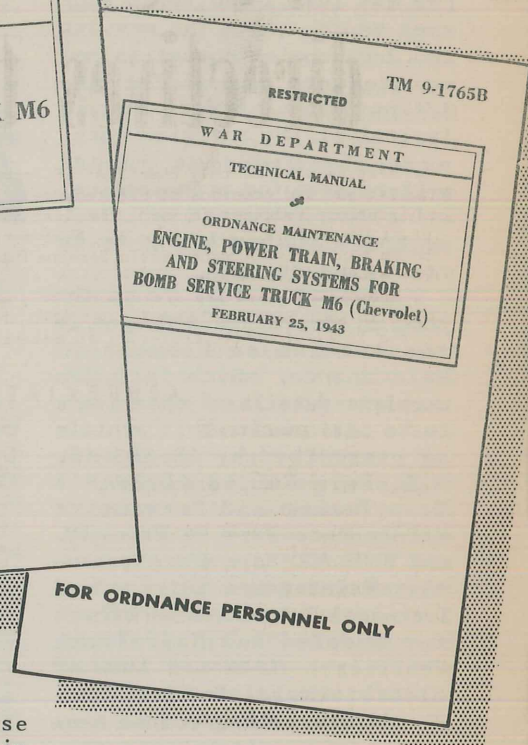
If you've been accustomed to the old-style TM 10-series manufacturers' maintenance manuals, better take a good look at these covers.

Ordnance prepares two types of manuals for each vehicle:

TM 9-765 illustrates the type issued to using organizations. It includes vehicle operation and 1st and 2nd



TM 9-765 for using organizations. TM 9-1765B for Ordnance mechanics.



echelon maintenance. These manuals are always numbered in the 9-700 or 9-800 series.

TM 9-1765B is typical of the manuals issued to Ordnance mechanics. It covers 3rd and 4th-echelon maintenance on specific assemblies which unit mechanics of companies, battalions, or regiments are not

authorized to tear apart, and supplements TM 9-765 (Ordnance mechanics need both). These manuals almost always have similar numbers to the Organizational Maintenance Manual for the same vehicle, but are in the 9-1700 or 9-1800 series.

## HERE'S ONE *BREAKDOWN* WE ENCOURAGE

● ARMY MOTORS' newly authorized distribution calls for this breakdown by organizations:

3 copies to a detached COMPANY\*

10 copies to a detached BATTALION\*

30 copies to a detached REGIMENT\*

\*Or equivalent unit

**HELP KEEP IT THAT WAY!**



# Did you get all the directives this month?

Here is your monthly checklist of recent official directives concerning the 1st and 2nd echelons of maintenance. Because ARMY MOTORS is moving its publication deadlines forward, the list is short this month, containing Adjutant General publications only. Next month's magazine, however, will bring you up to date on Ordnance Field Service Publications, and from then on, we'll be operating on schedule.

These directives are distributed to your CO through the Adjutant General Depot in your Service Command. Get them through those channels; don't write to the Tank-Automotive Center or to Holabird for them.

## ABBREVIATIONS

\*AR - Army Regulations  
C - Change  
\*FM - Field Manual  
°FSMWO - Field Service Modification Work Order  
°OFBS - Ordnance Field Service Bulletin  
°OFSC - Ordnance Field Service Circular  
°OPSI - Ordnance Publications for Supply, Index

°OSPE - Organizational Spare Parts and Equipment, SNL  
°SNL - Standard Nomenclature List  
°SPC - Service Parts Catalog, SNL  
°TB - Ordnance Field Service Technical Bulletin  
\*TC - Training Circular  
\*TM - Technical Manual  
\*WDC - War Department Circular  
\*AGO Distribution  
°OFS Distribution

## GUN CARRIAGES

CARRIAGE, MOTOR, 3-INCH GUN, M10A1  
TM 9-731G

## TANKS

TANK, MEDIUM, M4 SERIES  
FM 17-67 Crew Drill and Service of the Piece.

## TRUCKS

TRUCK, AMPHIBIAN (general)  
AR 55-470, C1, Transportation by water of explosives, inflammables, and chemical materials.  
TRUCK, BOMB SERVICE, M1 (DIAMOND T)  
TC 79 (1943), Reversion of TM 9-762.

## TRACTORS

TRACTOR, 6x6, MINNEAPOLIS MOLINE (Model GTX)  
TM 10-1409, Maintenance Manual.

## TRAILERS

TRAILER, 4-WHEEL, MODEL T-15  
TM 10-1429, Maintenance manual and parts price list.  
TRAILER, 6-TON, 2-WHEEL HOBBS  
TM 10-1409, Maintenance manual and parts list.  
TRAILER, TANK TRANSPORTER (Model CPT 45 SP)  
TM 10-1242, Combined maintenance manual and parts list.  
TRAILER, 2-WHEEL VAN BODY  
TM 10-2116, Maintenance manual and parts list.

## MAINTENANCE

AR 850-15, C3, Military Motor Vehicles (forms, records and reports).  
TM 9-2800, Standard Military Motor Vehicles.  
TC 68 (1943), Approved lists of Universal gear lubricants, greases, and engine lubricating oil.

## STORAGE SHIPMENT AND ISSUE

TM 38-220, Stock control manual for posts, camps and stations.  
TM 9-2800, Standard Military Motor Vehicles.  
AR 35-6520, C1, Property accountability and responsibility.  
AR 35-6560, C1, Receipt, shipment, and issue of property.  
AR 850-15, C3, Military Motor Vehicles (forms, records and reports).

## TRAINING

MTP 9-11, Ordnance Dept. Mobilization Training Program for Ordnance Bomb Disposal Co.  
MTP 10-2, QM Mobilization Training Programs for QM Replacements at QM Replacement Training Centers.  
MTP 10-3, Unit Training Programs for QM Units of the Army Service Forces.  
MTP 11-2, Signal Corps Mobilization Training for Enlisted Replacements at Signal Corps Replacement Training Centers.  
MTP 11-4, Signal Corps Unit Training Programs for Signal Corps Units.  
MTP 14-3, Unit Training Program for

Finance Dept., Dets.  
MTP 19-1, Military Police Mobilization Training Programs for Military Police Units.  
MTP 19-2, Military Police Mobilization Training Program for Replacements at Military Police Replacement Training Centers.  
MTP 55-3, Unit Training Program for Transportation Corps Port Battalions and Companies.  
MTP 55-4, Transportation Corps Mobilization Training Program for Headquarters and HQ Co. Regulating Station.  
MTP 55-5, Transportation Corps Mobilization Training Program for Port Headquarters and HQ Co.  
MTP 3-2, Chemical Warfare Training Program for Chemical Warfare Service Units, Individual Training.  
MTP 3-4, Chemical Warfare Unit Training Program for Chemical Warfare Service Units.  
MTP 5-2, Engineer Mobilization Training Program for Engineer Replacements at Engineer Replacement Training Centers.  
MTP 8-6, Training Program for Revised ROTC Training Program for Medical Army Specialized Training Units.  
MTP 3-5, Chemical Warfare Mobilization Training Programs for Enlisted Replacements at Chemical Warfare Replacement Training Centers.  
AR 310-200, Military Publications, allowance and distribution.  
TC 85 (1943), List of sound training films, film strips, and film bulletins - additions to FM 21-7, 1943.  
TC 78 (1943), List of Publications, Additions to FM 21-6.  
TC 73 (1943), List of sound training films, film strips, and film bulletins, additions to FM 21-7.

## ADMINISTRATION

TM 38-220, Stock control manual for posts, camps, and stations.  
FM 17-67, Crew Drill and Service of the Piece, Med. Tank, M4.  
WD AGO form 461, Work sheet for wheeled and half-track vehicles.  
WD AGO form 462, Work sheet for full-track and tank-like wheeled vehicles.  
WD AGO form 463, Work sheet for motorcycles.  
AR 25-220, Claims in favor of U.S. for damage to or loss or destruction of Government property and loss sustained by the Government on account of injury or death to Government personnel.  
AR 310-200, Military publications, allowance and distribution.  
AR 850-15, C4, Military Motor Vehicles (accident claims).  
AR 850-15, C3, Military Motor Vehicles (forms, records, and reports).

## OPERATION

TM 9-2800, Standard Military Motor Vehicles.  
FM 2-30, Cavalry Mechanized Reconnaissance Squadron.  
FM 17-67, Crew Drill and Service of the Piece, Med. Tank, M4.  
AR 850-15, C4, Military Motor Vehicles (accident claims).  
TC 62 (1943), Passage of mine fields.

## RUMORS

(Continued from page 103)

vehicles in combat for five days. It has also been recommended that replacement kits be made available as a supply item and that they be individually boxed in waxed, waterproof packages with proper markings.

\* \* \*

A simple and quickly-applied means of preventing deterioration of spare tires, when carried flat on GMC 6x6 chassis in open storage, has been developed. Rain accumulates in the hollows of such tires near the beads and rots the tires when exposed to all weather conditions for any considerable length of time. Tire covers are made of waterproof paper and it takes only three minutes to make and fit one of these covers on each tire.

Changes in the specifications of hydraulic brake fluid (USA-2-112) are being considered because of the introduction of new type fluids and the coming shortage of castor oil and the use of substitute material.

The Chem Lab at Holabird has submitted a draft of a new specification for ethylene glycol antifreeze reinhibitor to the Office Chief of Ordnance. This specification is based on the use of borax-captax mixture.

The lab will also run comparative tests on certain brand-name cleaners against materials submitted under TAC specification ES 542-a, 398-a and additional tests will be run on standard carburetor-cleaners grouped under TAC specification ES 645, and on brand-name stratified cleaners, and others.

Practical tests are running at Camp Seeley Desert Command, to obtain a basic inhibitor to be used in either an aqueous (water) or a glycol solution, so that a single inhibitor may be used both winter and summer.

We'll give you the results

of this test as soon as they're available.

## DODGE ALINEMENT

(Continued from page 105)

something done about it - like forcing the transfer case forward again to where it belongs. That's a job that calls for a strong chain, a heavy steel bar, a 10- or 12-ton hydraulic jack, and more than a smattering of know-how. Patronize your neighborhood 3rd echelon.

But by checking dimensions as pictured here, you can at least spot the trouble before it puts you on the spot.

## SHOCK ABSORBERS

(Continued from page 118)

The number of springs broken in your outfit depends on you. If you service the shock absorbers faithfully at 1000 and 6000 miles you'll have less springs to replace and hear less griping about bad steering vehicles.

## CONNIE RODD

(Continued from page 102)

## Half-Track Door Stop

If the driver's or assistant driver's door on half-track vehicles is flung open with too much vigor, the slide bolt on the door will puncture the 5-gallon liquid container mounted on the outside of the body shroud.

There's a door stop on the vehicle that's intended to prevent this; but because the door bends slightly when it comes in contact with the stop, it's still possible for the slide bolt to damage the container.

A TB is being prepared which directs you to modify the door stop. No parts are required, so you can do this at once. Remove the door stop angle (A215472) for the driver's door, and the door stop angle (A215471) for the assistant driver's door and

## Hold it!

If you order REFINISHING PRIMER by the Federal Stock Numbers we gave you back in February, you'll get Lacquer Thinner instead. So please accept our apologies - and give these *right* numbers from now on:

REFINISHING PRIMER

52-P-20472	1 gal.
52-P-20473	5 gal.

weld a piece of cold rolled steel, 1/4" thick to each door stop angle. This 1/4" of steel on the door stop will keep the door from opening far enough to do any damage to the container.

## Salvaging Distributor Caps

A crack going from the center tower to any of the outside towers on a distributor head cap makes a path for a shorting spark. This is a common type of cap failure and in the past has meant throwing out many caps. Take as large a drill as the clearance between the towers will allow and drill a hole over the crack and through the cap, or to the depth of the crack, if the crack doesn't extend through the thickness of the cap. This will have the effect of cutting the crack in two. A plug made from some non-conducting material, like cork, rubber, sealing wax, etc., may be used to fill the hole.

ARMY MOTORS IS EAGER TO FOLLOW YOU WHEREVER YOU GO. BUT FIRST, YOU'VE GOT TO TELL US WHERE YOU'VE GONE. PLEASE REMEMBER...

NOTIFY US PROMPTLY OF CHANGE OF ADDRESS

...AND INCLUDE BOTH YOUR OLD AND NEW ADDRESS WHEN YOU WRITE.

# NEWS FLASHES

The items on this page include latest news, revisions, and corrections verified after the publication deadline.

There won't be any more Ordnance Field Service Circulars (OFSC). Those already published will remain in force till the end of the year, but no more will be issued.

\* \* \*

If you haven't reworked the carburetor air-cleaner-tubes (GPW 9637) on your old-model Ford quarter-tons, as directed in TB 803-2, dated 6 April 1943, you're lucky. Now there's a new TB coming out which will tell you not to do the work after all.

\* \* \*

Gasoline field ranges are supposed to have preventive maintenance too. W.D. Cir. 143 (22 June 1943) says using organizations are responsible for cleaning, minor repairs, and replacement of worn or damaged parts. If major units, cabinets, or fire units can't be repaired in this way, they should be swapped for new ones at the Quartermaster supply unit, which in turn will send them to a designated Ordnance outfit for repair. QM will also stock repair parts and expendable supplies for the field range.

\* \* \*

Have your medium M3 and M4 series tanks, equipped with Continental R975 engines, recently developed that smooth-as-Mabel's-cheek performance? You can attribute it to the new cam authorized in TB 700-52, or to the new valve timing specification in TB 1750D-2 and magneto timing in 1750D-3, which the Ordnance shops are following to time the engines. The new timing specs are one of the reasons for elimination of engine surge, valve spring failures, and greatly improved engine performance.

\* \* \*

Local purchase of automotive parts and supplies is now forbidden except in an emergency, and then it may be done only by Ordnance depots or Ordnance Service Command supply points. Tools supplied by Ordnance are not to be purchased locally except to fill deficiencies for a task force about to move into its theater of operations. For details, see W.D. Cir. 144 (23 June 1943).

\* \* \*

On page 60 of the May ARMY MOTORS, Half-Mast recommended Grease General Purpose No. 1 for lubricating universal joints. He should have added "for temperatures above 32°F, and No. 0 for use between 0°F and 32°F".

\* \* \*

The new TB 700-70, covering replacement of the hub-sprocket capscrew on Medium Tanks of the M4 series (and similar vehicles) contains an error. The old capscrew that you remove should be numbered A222801, and *not* A222081, as the bulletin incorrectly states. The parts number for the new self-locking bolt is given correctly in the TB.

\* \* \*

Parts interchangeability for Autocar, White, and Diamond T half-track vehicles is published in the "Piece Mark Conversion List," SNL G-102, Sec. 26, which has just appeared in a new revision dated 4 February 1943. This book tells what piece mark numbers are applied to any given part by 1) the Ordnance Department, 2) the parts manufacturer, and 3) each vehicle manufacturer. It does not give Item Stock Numbers, complete nomenclature, or pictures, and therefore will generally have to be used in connection with other parts of the SNL.

\* \* \*

If you have any ideas of putting some gum solvents in engine oil to dissolve sludge and carbon, DON'T. Oil now used by the Army already has such an additive in it. Actually, if you put in something you think is better, both additives may fail - because the chemicals in them may go to work on each other instead of dissolving the sludge. (TB 850-10, 26 June 1943).

\* \* \*

Dump truck operators had better quit driving their trucks while the hydraulic hoist pump is engaged. A new TB forbids this practice warning that it causes the pump to overheat and expand, thus "freezing" in place. The sad results are likely to be a broken pump shaft, broken gears or case, or a combination of these troubles.

\* \* \*

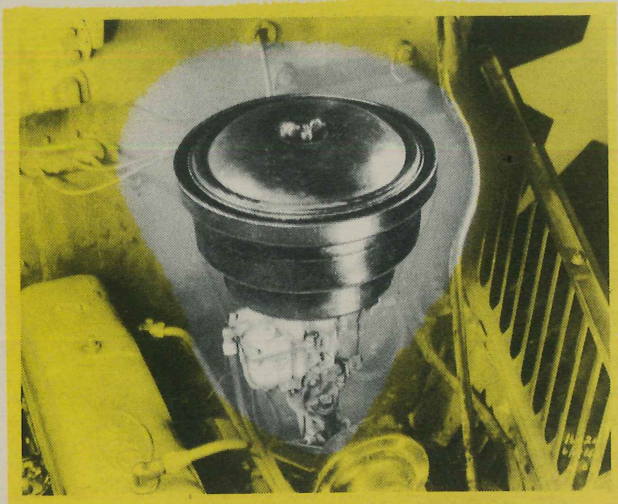
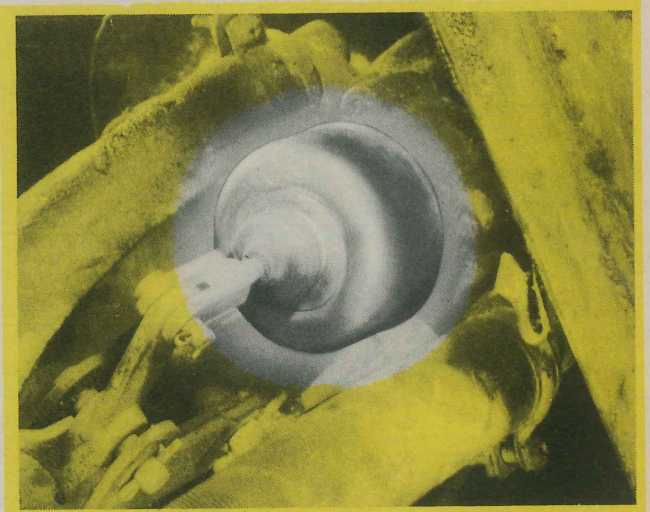
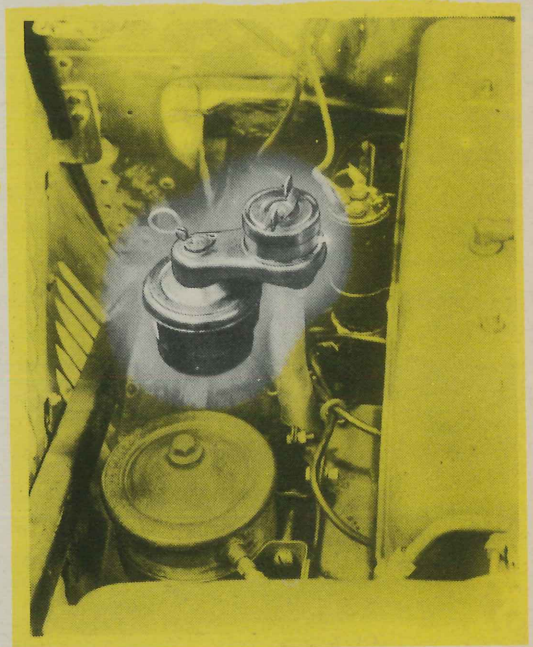
# LOOK AT ALL THREE!

See that your  
Air Cleaners  
are **CLEAN**--  
every day--  
every week--  
every 1,000  
miles.\*

CRANKCASE  
VENTILATING  
SYSTEM  
AIR  
CLEANER

VACUUM  
BRAKE  
AIR  
CLEANER

CARBURETOR  
AIR  
CLEANER



\* As prescribed by the new  
Driver's Trip Ticket and PM  
Service Work Sheets.