M4A3 Medium Tank, "General Sherman"

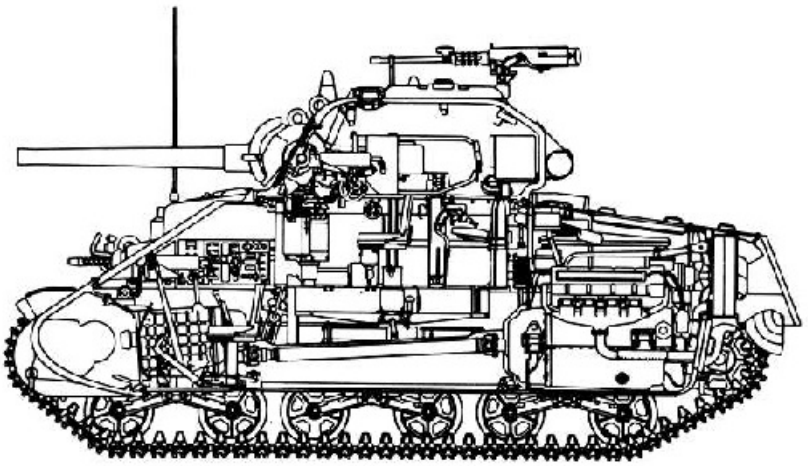
Originally taken from the outstanding but unfortunately extinct website
http://afvinteriors.hobbyvista.com/

Picture 1:

Probably the most popular and well-known of the American tanks to see service in WWII was the M4 Medium Tank, known also as the "General Sherman", or just plain "Sherman". There are seemingly endless varieties of the Sherman, each type named differently depending on the engine that was used, as well as other details. In these pages we will explore primarily the type that was known as the US tanker's favorite Sherman, the M4A3. And although we will be spending most of our time exploring the M4A3, the illustrations in these pages will also be useful for understanding many of the interior components of the other types, including variants like recovery vehicles, self-propelled howitzers, and even flame-thrower versions.

We currently have three sections to our interior exploration of the Sherman tank. This first part will cover the driver's and hull gunner's positions, as well as the engine setup, while the second will look into the fighting compartment and turret. The third and final section will take you into both the upgraded 76mm gun M4A3, as well as the 105mm howitzer support tank. These web pages are an expanded and edited version of a single page that was originally published in AFV INTERIORS back in 1997. This particular image is one of a series of shots taken by the US Army in 1943 to publicize the M4A3 and the Armor Force.

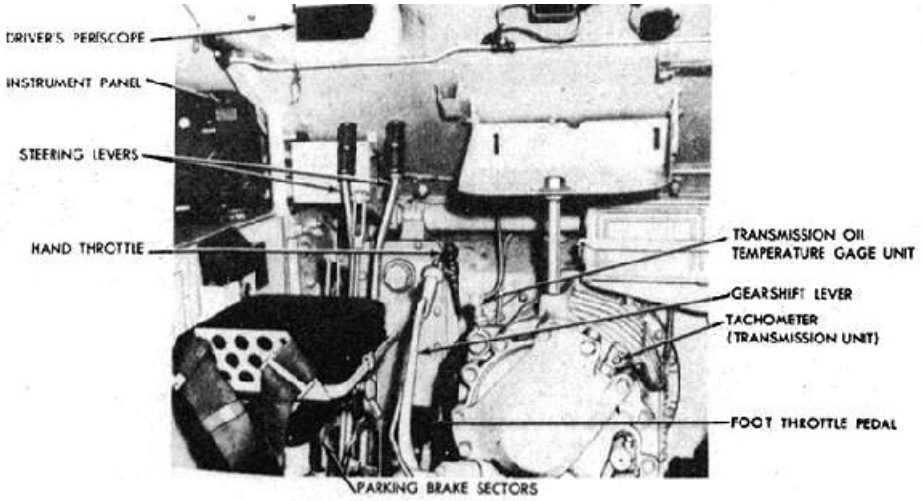
Picture 2:



The production of the M4A3 Medium Tank (known as the "Sherman IV" in British service) by the Ford Motor Company ran from mid 1942 through September of 1943, totaling around 1700 vehicles manufactured. At that time, production was started on an updated version of the M4A3 at Grand Blanc, and this improved M4A3 included a new commander's cupola, a loader's hatch on the roof, an improved 47 degree inclined front transmission cover, and "wet storage" bins for the main ammunition. The total output of this improved version was yet another 3071 Sherman tanks. This particular drawing shows a cross section of an early M4A3, illustrating the five-man crew layout of driver and assistant driver in the bow, the three-man turret crew in the high profile turret, and a Ford GAA gasoline engine in the rear.

The M4 was originally designed to be powered by the tall Continental R-975 series of radial engines, and the driveshaft that traveled from the rear-mounted engine up to the front transmission ended up dictated the overall height of the turret, as the turret floor had to clear the driveshaft. A couple of different engine configurations were tried inside the basic Sherman hull, partially due to the lack of sufficient numbers of Continental radials for all the Sherman tanks that were being constructed at the time. All these Shermans were then officially designated with different model numbers, and the vehicles that were powered by the compact Ford engine were named M4A3 Medium Tanks. Not only was the Ford-designed and built engine more compact than the previous radials, but the driveshaft left the engine compartment much lower on the firewall, leaving a considerable distance between the shaft and turret floor, as you can see in the sketch

here. Radio sets were mounted up in the turret bustle as the British had, and for unit commander's tanks an additional command set could be mounted on the right sponson, next to the hull machine gunner. The crew consisted of a driver and assistant driver/hull machine gunner in the bow, and gunner, commander and loader up in the turret. In typical American fashion, the gunner sat on the right side of the turret with the commander behind him, the loader occupied the left side of the turret.



Picture 3:

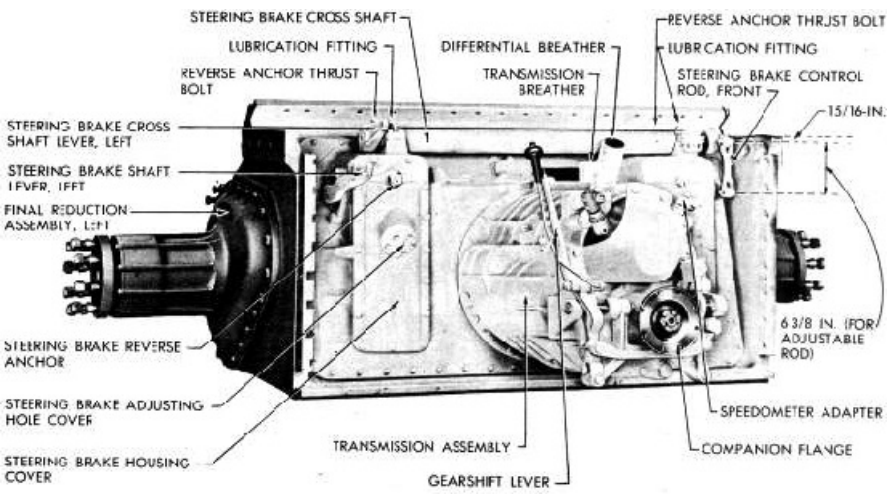
This is a TM image showing the view looking forward to the driver's area in the front hull. The transmission is to our lower right and the driver's seat is to the left. The seat back has been removed for a clearer view of the driving controls and the driver's wide seat belt can be seen hanging down from the back of the seat. These were not generally used in combat, but most of the TM images show them installed. Steering was via a controlled differential using the conventional steering levers you see in front of, and to either side of the seat. The long gearshift lever can also be seen to the right of the seat with a push button for shifting into reverse on top of the handle knob. The large shelf on the front plate above the transmission was for storing a protective driver's hood, which could be attached to the hatch above the driver so that he could drive head-out of his hatch when not in combat and still remain relatively dry.

As I alluded to earlier, the M4A3 Sherman underwent numerous changes during its production run, one of which was the elimination of the direct viewing slots for driver and assistant driver on the front glacis plate. This view shows one of the later versions of glacis, indicating that the viewing slot has been eliminated and replaced with a periscope mounted in front of the hatch above his seat. There was also a periscope in his hatch, so in effect, the driver had two periscopes available. Also visible in this TM photo is the main instrument panel, sitting up on the left sponson. Forward of the gearshift lever is a hand throttle (basically used as an idle adjustment), and a machine gun ammo feed box is above and to the right of the transmission, over by the hull gunner's seat. This was the feed box for the assistant driver's hull MG, mounted in front of his seat.

Back on the driver's side of the tank again, the main accelerator pedal is barely visible as a black rectangle down on the floor between the lower shaft of the gearshift and the transmission housing. The clutch pedal that is mounted to the left of the accelerator is lost to view.

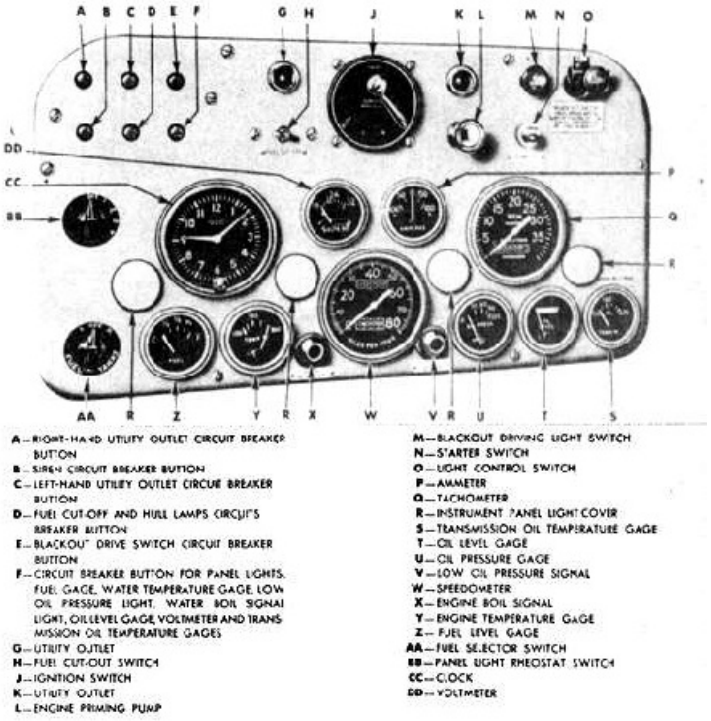
Picture 4:

The combination of transmission and controlled differential steering components could be removed from the front of the Sherman by unbolting the front armor plate and disconnecting the mechanicals from the inside of the tank. We have a number of images in another web page in AFV INTERIORS, Sherman Factory Images, that show these transmission/steering units removed from the tank. This TM picture identifies many of the primary components for you, including the gearshift lever on the left side of the transmission housing and the connecting links that applied the brakes to the controlled differential steering units at the front of the casing.



Connecting rods from the driver's steering levers connected to the steering brake shaft levers, the left lever connected directly to the shaft lever on the driver's side of the tank. The right steering lever connected to the steering brake cross shaft which transferred the rotating movement to the assistant driver's side of the case, where it was connected to the right steering brake control rod, as you see here. The companion flange at the back of the transmission (closest to us) connected to the driveshaft from the engine, and off to the left

of the connection was the typical location for an electrical generator (not seen here). Direct access to the steering brakes was possible through the housing covers, one for the left brake and one for the right.



Picture 5:

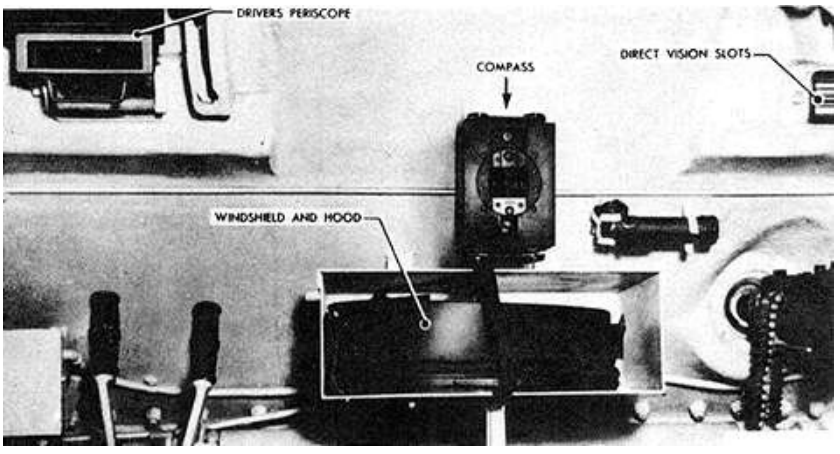
The instrument panel for each Sherman type was different, depending on the engine used. This is the setup for the M4A3 with the Ford engine. Panels were typically dark green or black, and most of the dials had black faces with white printing, as you see here. I believe the ID labels are clear enough for you to read, so I won't bore you with which dials are which.

The starting sequence for the Ford engine was similar to a typical American truck of the same period. The parking brakes were applied if they weren't already and the transmission was shifted into neutral. Next, the hand throttle was pulled out, the clutch pedal was depressed, the ignition (electric power) switch turned on, and the starter switch flipped to start the engine. Once the engine started, the clutch pedal was released and the engine allowed was allowed to warm up to operating temperature, the idle adjusted as necessary with the hand throttle. When the engine was at the recommended operating temperature, the clutch pedal was engaged again, first or second gear selected via the gearshift, and the clutch pedal was slowly released, allowing the tank to begin to roll. Steering was via the hand levers, and shifting was accomplished in the typical manner by depressing the clutch pedal, shifting to the desired gear, and then slowly releasing the clutch again. All gears (except first and reverse) were synchronized, so double clutching was not generally required.

This startup sequence for the Ford GAA engine was much simpler than with the aircraft radials, and the Ford engine was less temperamental and easier to maintain. For those drivers and mechanics already familiar with truck engines when they entered military service (as most of them were), the Ford was merely a larger version of the same ol' thing. This was not true with the radial engines, for they were a whole new ballgame for most young American tank drivers/mechanics.

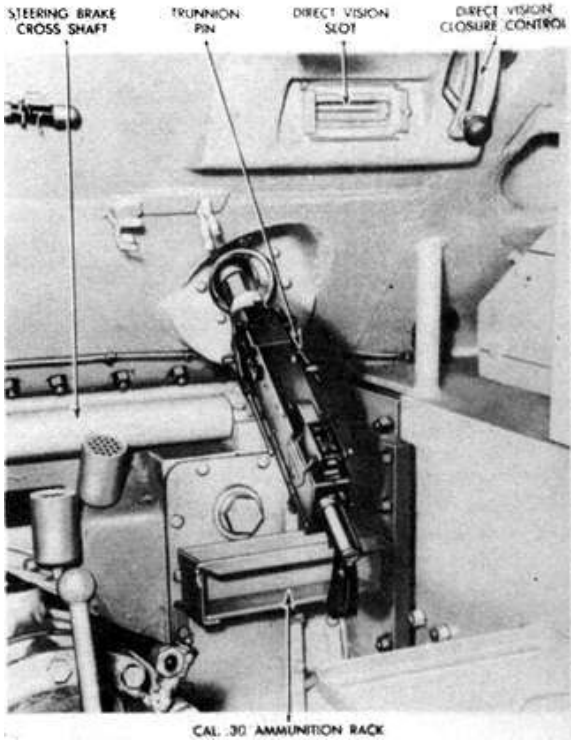
Picture 6:

I included this TM photo to show the earlier direct vision slot version of the driver/assistant driver viewing devices that I mentioned earlier. In this case you can see that the driver's hatch-mounted periscope obscures most of the viewing slot in the front armor. The driver, hull gunner (typically called an assistant driver in these vehicles), commander, and loader each had access to M6 periscopes at their positions. Actually, the driver and assistant driver would later have two at each of their positions, one fixed overhead in front of their hatches to replace the lost vision slits, and another that was mounted in a rotating mount up in their hatches. The gunner had a completely different set of optics--originally he used a M4 periscope, which had an internal M38 or M38A1 telescope for sighting.



In this photo the driver's hood is folded up and stored on the shelf over the transmission. The hood came in a couple of different varieties, but the main idea was to provide some over-head protection when driving head out of his hatch. The hood was constructed of a canvas cover and windshield with wiper assembly, and it attached to the hatch opening with clips around its circumference. There is also a large black directional compass mounted above the shelf. These gyro compasses were originally designed to allow for precision navigation of ships whose bulk of surrounding metal added magnetic deviations and therefore required the use of complicated correction tables for

correct compass bearings. The gyro compass does not rely on magnetism for direction finding, but rather on an internal spinning gyro, and therefore the bulk of the tank's steel armor has no effect on the compass bearing indicator. To the right of the compass is a stowed flashlight and to the right of that are the hull gunner's .30 cal Browning machine gun and ball mount.

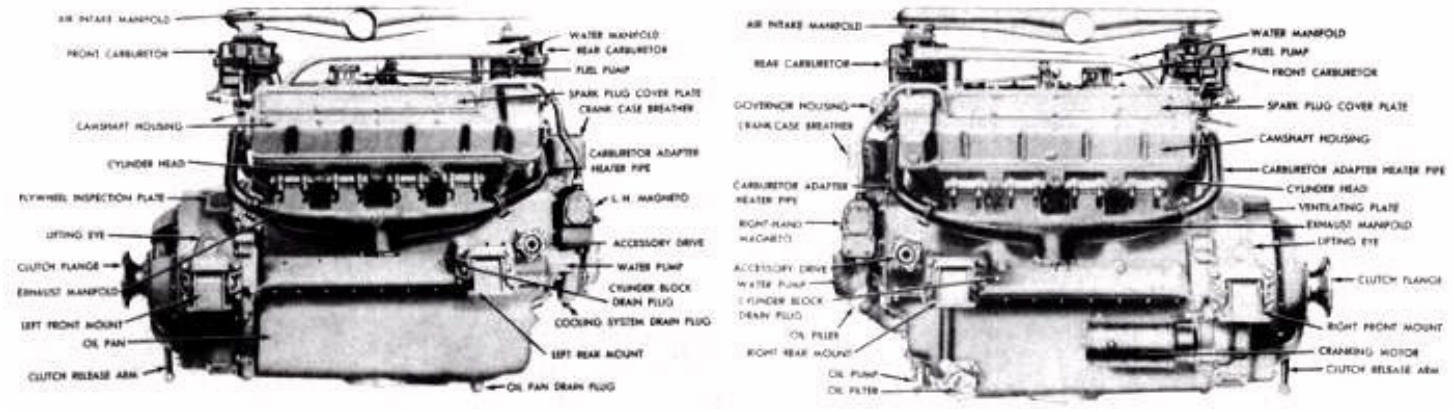


Picture 7

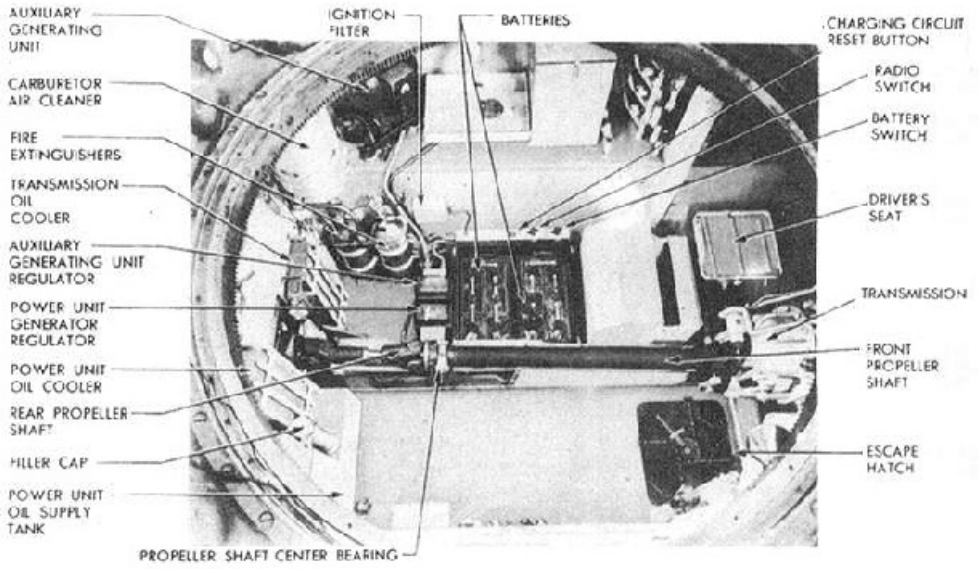
The area in front of the assistant driver to the right of the transmission is visible here, complete with his hull machine gun and the vision slots used in early M4 tanks (this is an M4A1 with cast hull, but the setup here was just about identical in the M4A3). The armored cover handle is to the right of the vision slot. To the far right, and up on the sponson, is a box for storing spare prism blocks, and the shaft with the knob handle at the lower left in the TM illustration is the parking brake handle. This type of parking brake will be removed from the transmission in later vehicles when new brake ratchets are added to the base components of the steering levers).

In this case the rack for the .30 cal ammo box is below the gun, not mounted above the transmission. The hull ball mount for the .30cal Browning M1919A4 machine gun had no direct sight, proper aiming relied on the gunner's view through his vision block/periscope of the fall of tracers that were mixed in with the ball rounds. The Browning MG could be removed and mounted on a tripod base (also stowed in or on the vehicle), and then used outside the AFV if necessary. Over 4,700 rounds of .30 cal belted ammo was carried for both the bow and coaxial MGs. The small cans attached to tubes that are visible near the transmission are breather tubes (ventilators) for the transmission and the right final drive case. There is also one of these on the left of the transmission, on the left final drive.

Picture 8:



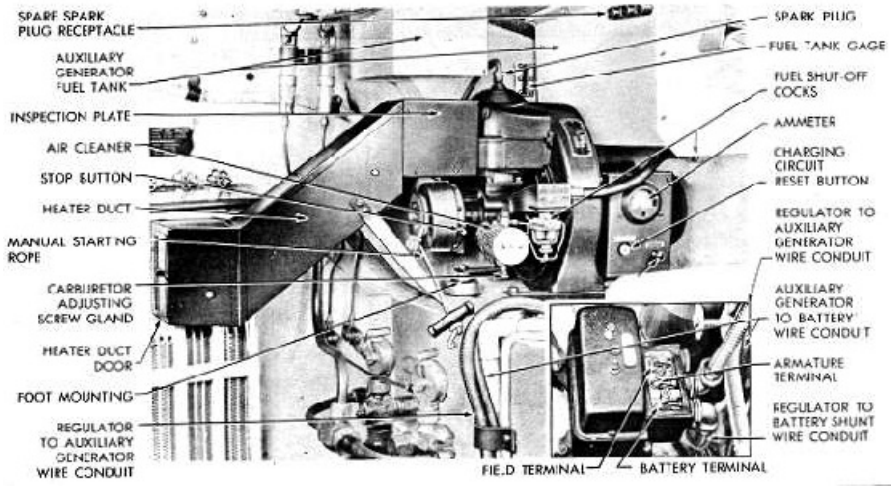
The Ford GAA engine used in the M4A3 was an 8-cylinder, liquid-cooled gasoline engine. It was derived from a prototype V-12 aircraft engine design and developed about 500hp, a big improvement over the Continental radial R-975's 400hp which had been used in most other Sherman tanks. The Ford engine featured a number of innovative design features, including many aluminum castings to save weight and separate bolt-together sub-assemblies to ease engine service. The GAA engine was the preferred engine type of most US tankers, and if enough of the power plants had been available the US Army would have had all their Shermans fitted with them. Inside the M4A3 Sherman, the Ford GAA was bolted to a Syncromesh transmission via a long driveshaft, the Syncromesh incorporated a locking system that prevented 3rd, 4th and 5th gears from engaging until the engine and drive were synchronized. The transmission had five forward and one reverse gears and top speed for the M4A3 fitted with the GAA was governed to 26mph on roads. Cruising range with full gas tanks (160gal of 80 octane) was roughly 130 road miles.



Picture 9:

This is the view looking down into the hull with the turret removed (notice the 69in turret ring). This was the general hull layout for most of the mid and late M4 versions with their 75mm main gun and dry ammo storage. In this photo the stern is to our left. Visible in this left side of the photo (at the 8 o'clock position) is the upright grating of the engine oil cooler, mounted on the firewall between the fighting compartment and engine. Above that is the drive shaft and the transmission oil cooler, pressurized lines transferred oil between the transmission and cooler. Next to the transmission cooler are two fixed 10lb carbon dioxide fire extinguisher bottles (red) for the automatic fire suppression system (a necessity for gasoline engines). Just visible above the cylinders is the left rear air cleaner (the other one is in the other rear corner), and forward of that on the left sponson is the 30v auxiliary electrical generator (black). In early vehicles the carburetor air filters were mounted outside the vehicle on the rear plate, but it was quickly realized that cleaner air could be found in the fighting compartment and the twin air cleaners were moved inside. This required some minor rearrangements at the firewall, with the aux. generator, for instance, placed further forward on the track sponson.

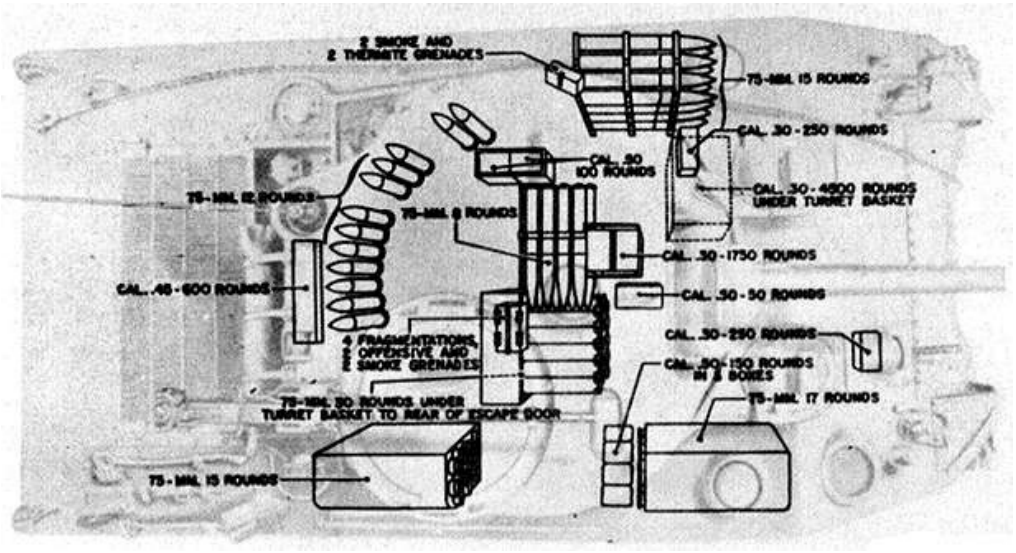
Further forward along the same sponson is a flat rack for 5gal water cans, and then you see a tool storage bin with hinged lid. Further forward on the sponson, and partially obscured by a roof support, is the left ammo bin for 75mm main ammo rounds. In the center of the picture are two 12v batteries that are normally hidden under the turret basket floor, and to the far right is the folded seatback of the driver's seat. The driveshaft is black in this picture, and to the lower right of the photo is the floor escape hatch located behind the assistant driver's seat. Most of the interior of M4 Sherman hulls were painted gloss white, including the floor, but the gloss gradually faded to a dull white and was quickly dirtied up.



Picture 10:

In most Sherman tanks an auxiliary motor/generator set was mounted on the rear end of the left track sponson, back by the firewall. This particular image shows the generator set used in mid and late production tanks. The electrical generator was used to recharge the batteries and it could also run most of the electrical components onboard when the main engine and its attached main electrical generator were shut off. The auxiliary motor/generator set consisted of a small gasoline engine that turned the 220v electric generator, and in this TM image you can see the fuel tank for the small engine mounted above the set. An exhaust pipe leads from the side of the single cylinder out through the firewall, where it passes back into the engine compartment and then out of the tank. A sheet metal heater duct was constructed around the exhaust pipe to protect tankers from burns, but it also acted as a crew compartment heater.

Also visible in the picture are the tops of two CO2 cylinders that were used for engine fire suppression. The carbon dioxide was piped into the engine compartment through the firewall, and to start the flow of chemical you could either pull the handles up by the driver's position, or the externally mounted handles on the rear engine deck. It was a two shot system, if the fire was not extinguished with the pull of the first handle you could use the second bottle by pulling the second handle. To the left of the extinguisher cylinders is the top of the transmission oil cooler radiator, and above them are three of the four fuel shut off valves for the engine. There were four fuel tanks, two horizontal ones located above the track sponsons, and two vertical ones mounted on the forward corners of the engine compartment.



Picture 11:

This is the ammunition storage layout for a mid-production M4A3 (bow to the right), including the ammo stored up in the turret. Two armored dry storage lockers for 15 and 17 rounds of 75mm are located on the right sponson shelf, and an open rack for another 15 rounds is to the left of the driver (this was sometimes a box bin). Another 8 rounds are stored under the gun on the turret floor, 30 more rounds under the floor next to the escape hatch, and 12 more ready rounds sit in racks around the rear floor of the turret basket (for a total of 97 rounds). Storage for .30 cal ammo is scattered here and there around the vehicle while .45cal magazines for a Thompson SMG are stowed in the rear bustle of the turret.

This completes Part 1 of our exploration of the M4A3 Sherman Tank. Part 2 will examine further the fighting compartment and the turret while Part 3 takes you inside the 76mm gun and 105mm howitzer versions of the M4A3.

Picture 12:

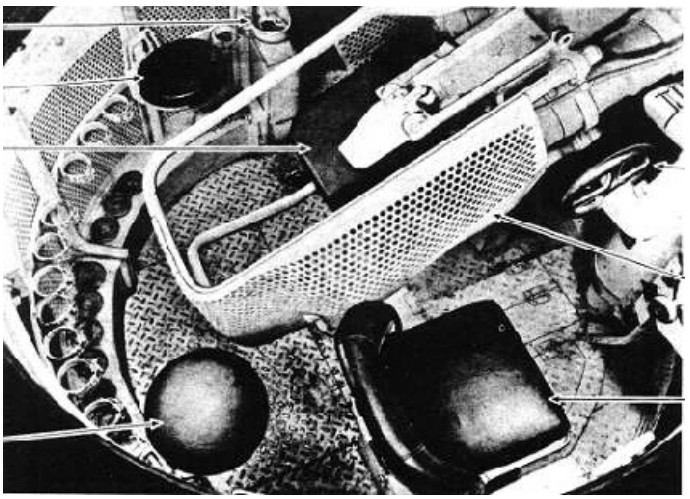
This image is part of a series of photographs taken by the US Army during a publicity shoot. It shows both the general appearance of the 75mm ammunition for the M3 Gun and the prescribed uniform for an M4A3 crew, circa 1944. The rounds are both AP (black projectile) and HE (green), and the brass cartridge cases are also clearly visible. The tankers are wearing their special tank crew crash-helmet with goggles, as well as the tanker's short windcheater jacket over their baggy one-piece overalls. The chevron ranking patches are worn on both sleeves, the soldier on the ground having two, denoting Corporal, 5th Grade, and the tanker up on the hull having three, denoting Sergeant, 4th Grade.

On the left shoulder of a couple of the crew is the three-color triangular insignia patch worn by most of the Armored Divisions' tankers. The three colors used on the patch (red, yellow and blue) represent the three components of the armored division, Cavalry, Field Artillery, and Infantry. Superimposed black symbols in the center of the three colors include the tank track for mobility and armor protection, the cannon for fire power, and a bolt of lightning to signify shock action. Each patch has an Arabic numeral at the top, which designates the divisional number. The basic triangular design and the three colors were taken from the original insignia of the WWI Tank Corps, and the superimposed symbols came from the old 7th Cavalry Brigade (Mechanized), one of the first US units formed into an armored division at the start of WWII.

Notice the belt of .30cal MG ammo draped over the front of the turret mantlet, the belt itself being made of canvas. A Browning M2HB .50cal MG is mounted on the turret roof in front of the commander's hatch. The original images are labeled "10th Tank Battalion, 5th Armored Division", which was known as the Victory Division, originally activated on the 1st of October, 1941, at Fort Knox, Kentucky and landing on Utah Beach on the 22nd of July, 1944.

Mid production M4A3 tanks used cast homogeneous steel turret armor while the hulls were rolled and cast homogeneous steel, all welded together. The front hull thickness was 2.0in while the sides and rear were 1.5in. The turret gun shield averaged out to around 3.5in, the rotor shield was 2.0in, the turret front was 3.0in, and the sides and rear were 2.0in. The floor armor varied from an inch at the front to 1/2 inch thickness at the rear.

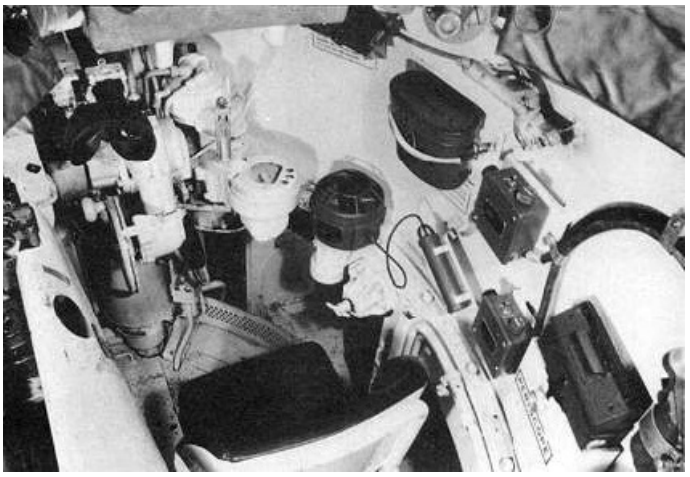
Picture 13:



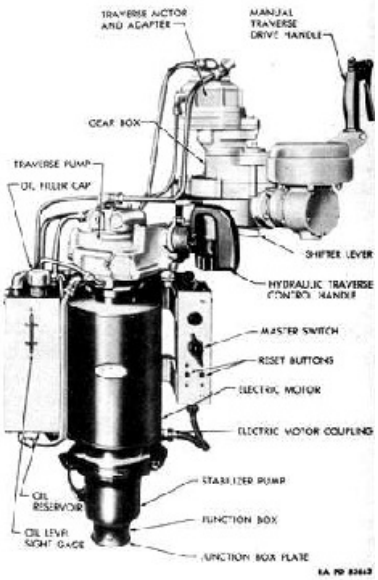
This is a good overall view of the turret basket, the image from one of the operator's manuals, showing the general layout of the turret interior including the recoil guard of the main gun and the stowage racks for ready rounds located at the back of the turret floor. The gunner's manual elevating hand wheel is visible to the right of the gun breech, forward of the gunner's seat. The commander's lower seat is at the lower left, and the loader's seat located on the left side of the turret is seen at the top of the picture. The arrow above the loader's seat is pointing to an empty fire extinguisher floor bracket. Visible over the gun breech is the folded ejector cam.

The turret basket was screened around most of its perimeter except for a section in front of the gunner and at the rear. The screen was a safely precaution that was designed to keep the turret crew from accidentally catching their feet or legs on parts of the hull as the turret rotated. The screen was removable in sections and should there be an obstruction to the driver/assistant driver's over-head and emergency belly hatches, the screens could be kicked out and they could crawl into the turret for escape out the roof hatches. Of course, the turret members could also escape out the driver's hatches, if egress out their roof hatches was impossible. Quite frankly, if your damaged tank was being raked by enemy fire, you would probably rather escape out the belly hatch, as long as there was time to get forward and drop out onto the ground under the tank.

Picture 14:



We are inside a late model M4A3 turret now, looking down to the right side of the main gun, toward the gunner's position. His seat (with black cushions) is at the bottom of the picture, and the turret traverse lock is to the right, along the turret ring. Forward along the turret ring from the lock is the round black housing of the azimuth indicator, and in front of the indicator are the components of the Oilgear Hydraulic turret traverse system. The system allowed a 360 degree traverse of the turret in less than 15 seconds, which was very fast for a medium tank in WWII. Directly forward of the gunner is the head pad for the M55 sighting telescope. The gunner's M4 periscope in the roof of the turret was also used for sighting and contained a M38A1 telescope, but due to the way it was mechanically coupled to the gun, the sight often worked itself out of gun alignment. Below the sight can be seen the manual elevating wheel for the 75mm gun (+25 to -10 degrees elevation). To the far left in the photo is seen the gun recoil shield.



Stowage along the turret wall next to the gunner include (beginning at the lower right in the photo) a spare periscope (black), two radio connection boxes, cylindrical battery case for lighting the azimuth indicator, and a binocular case (brown or black).

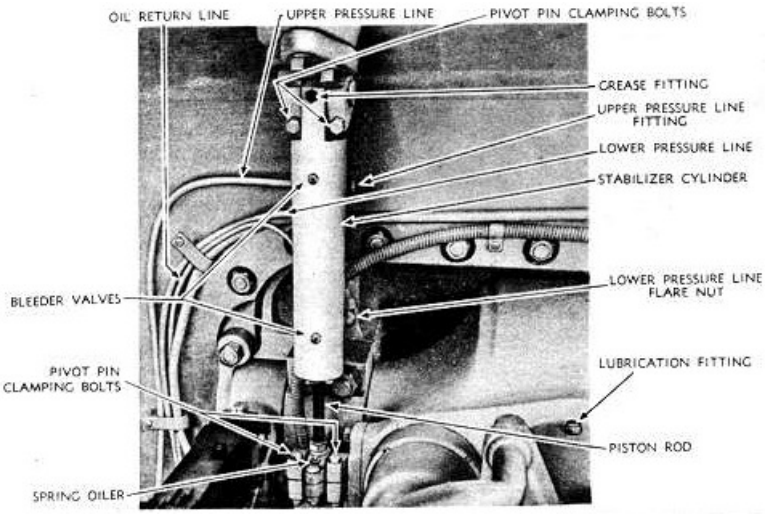
Picture 15:

This illustration shows detail of the most common turret traverse mechanism used inside the M4A3 Sherman, the Oilgear Hydraulic System. There were two other powered traverse mechanisms used in fewer numbers-- one was a similar hydraulic setup that was produced by Logansport, and the other an electric motor type manufactured by Westinghouse which used an additional turret motor generator set linked to the driveshaft near the transmission. But as I said, the most common, and probably the best of the three powered traverse systems was the Oilgear Hydraulic type.

In the upper right corner of the picture is the manual traverse hand crank with the turret brake release lever. The release lever disengaged the internal brake so the turret could be traversed, and in order to do this the palm switch had to be squeezed with your hand before you could manually hand crank the turret around. Behind the hand traverse is a mechanism with some hydraulic tubes attached

at the top-- this is the constant displacement hydraulic motor with its associated gearbox. Just below the gearbox is a black hand control in the shape of an inverted U-- this is the powered traverse control handle. If you gripped this handle and turned it to the left, the turret would traverse in that direction. The amount you turned the handle determined the speed of the traverse.

The large black cylinder at the bottom of the picture is the heavy-duty electric motor used to charge the hydraulic system's pump, which is mounted on the top of the motor. To the electric motor's left is the hydraulic oil reservoir and to the right of the motor are the turret switch controls. If you were sitting in the gunner's seat inside the turret, these traverse controls would be at chest height, but the electric motor is so large that the bottom of the motor rests on the turret basket floor. Although not drawn in this sketch, just to the left of the motor on the floor were the two electric foot buttons that fired the 75mm gun and coaxial MG. Next to these was a mechanical backup foot pedal that fired the 75mm if there were electrical problems with the primary firing system.



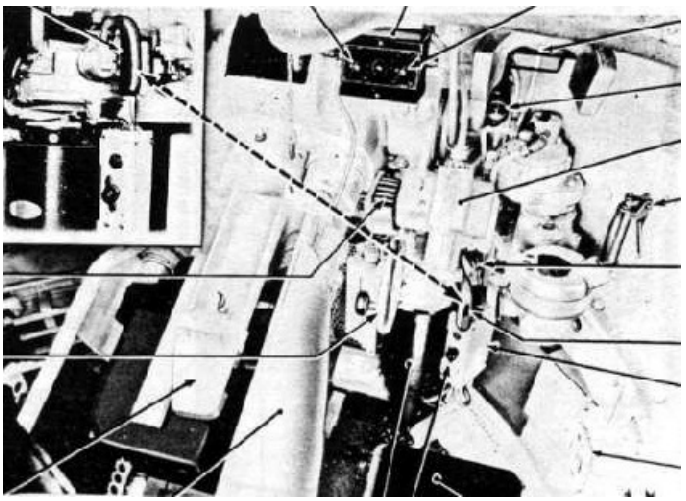
Picture 16:

At the bottom of the large electric motor is a second hydraulic pump, this one would normally be connected by tubing to the Westinghouse gyrostabilizer that was mounted on the left side of the main gun. The gyro system stabilized the gun in the vertical only and the system was mounted on most Sherman and M3 Light Tank types from 1942 on. This second pump on the bottom of the electric motor fed the hydraulic cylinder you see here that was attached to the left side of the gun cradle and also to the turret roof. When the gyro sensed that the tank was rocking up or down, it would rotate a cam that controlled a hydraulic valve allowing hydraulic fluid to flow into one end or the other of this correcting cylinder. The movement of the piston up or down in the cylinder would gently elevate or depress the gun, and if the system was adjusted correctly, the gun would elevate or depress the same amount as the tank was rocking, and the gun would stay on target. These adjustments were critical, and difficult to make.

Many WWII Sherman gunners found the gyro stabilization system to be complicated and failure-prone and disconnected it. In British tanks it was removed before the crews ever saw the tanks. Loaders were also not fond of the system because when it was working and the tank was traveling over rough ground, the breech would constantly be bouncing up and down, making it almost impossible for the loader to punch a round into the moving breech. However, in the hands of an experienced gunner and loader, the stabilizer allowed crews to shoot on the move for the first time, and it certainly was a real advantage over all other country's AFVs of the time, especially the Germans.

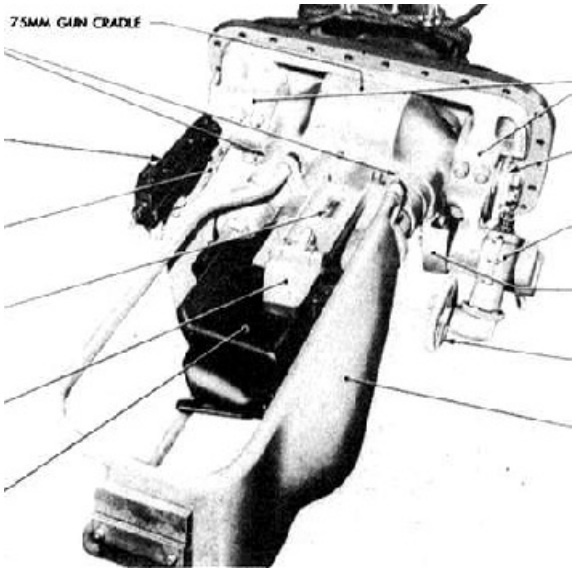
Picture 17:

This is the general area around the gunner in an early M4A3 machine. In order to make the image as large as possible I had to crop out the identifiers. Beginning at the top of the image, the black box with two arrows pointing to the controls on the face is the stabilizer control box, and the control knobs are the recoil adjustment knob on the left and the stiffness adjustment knob on the right. To the right of the control box is the bottom of the gunner's periscopic sight mount with the face pad shown installed that would frame his face while sighting. A small compass is seen to the lower left of the face pad. At the far right is the manual traverse hand crank with the turret traverse brake palm switch on the handle. The elevating gearbox is identified to the left of the traverse hand crank with the elevating shift lever sandwiched between the gearbox and manual traverse crank. Below the shift lever is the turret traverse power control handle, which is magnified in the box to the upper left of the image. Below the handle is an arrow identifying the turret electrical switches and to the left of that is the large turret traverse electric motor, painted black as we saw it in an earlier picture. To the left of the motor is the elevation hand wheel with a palm handle, the wheel attached to the bottom left of the elevating gearbox. Just above the elevating wheel you can see part



of the elevating pinion gear, exposed at the top.

To the left of the gunner's position is the 75mm gun, a recoil shield protecting the gunner from the black breech. Above the breech is a ejector cam that assisted in ejecting spent cartridges after the gun fired. Other items of interest in the picture include the front of the gunner's seat (at the lower edge of the picture, and the turret locking clamp wheel at the lower right.



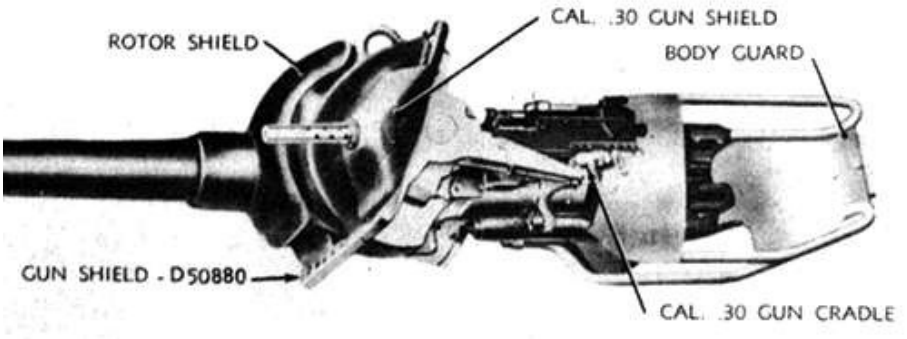
Picture 18:

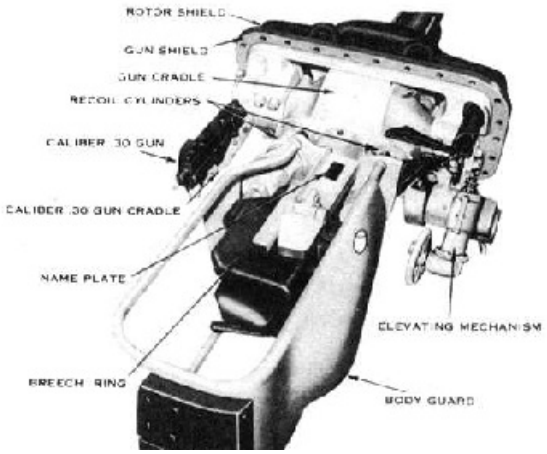
Here is the TM photo of the 75mm gun M3 and mount M34 of the early M4A3 Shermans. Visible to the right is the elevating mechanism and wheel and the 75mm gun cradle. To the left is mounted the coaxial .30 cal MG and the shoulder guard completely surrounds the main gun breech. The M3 75mm gun was of the semiautomatic sliding wedge type, mounted so the breech block slid horizontally. The breech lever is at the bottom of the breech. Most of the gun and cradle attachments were painted the same as the tank interior (white) with the exception of the breech, which was often black or gun metal.

the M3 gun had a total weight of around 893lbs, and the semiautomatic sliding wedge breech was mounted so the breechblock slid horizontally when installed in the Mounts M34 and M34A1. The ammunition was fixed (one-piece), and the primer was of the percussion type; a firing pin in the breechblock was used to set off the primer in the cartridge, which then ignited the powder and fired the projectile. Normally, the firing pin was moved electrically via a solenoid that was mounted behind the pin lever; the solenoid moved the firing pin release lever so it would release the spring-loaded pin to strike the primer cap in the base of the cartridge. But in an emergency, when the electric circuit and solenoid were not functioning, the gunner could also use a foot pedal that was mechanically connecte4d to the same firing pin components in order to fire the weapon.

Picture 19:

This is the side view of the 75mm gun M3 and its mount M34, again used in early M4A3 Shermans. The coaxial .30cal Browning is seen on this side of the main gun, and you will notice that the early recoil shields were made from solid sheet metal. Later on, the shields will be manufactured from perforated sheet stock, which not only reduced the weight slightly but allowed better cooling around the breech. Picture 2 above shows this improved recoil shield.



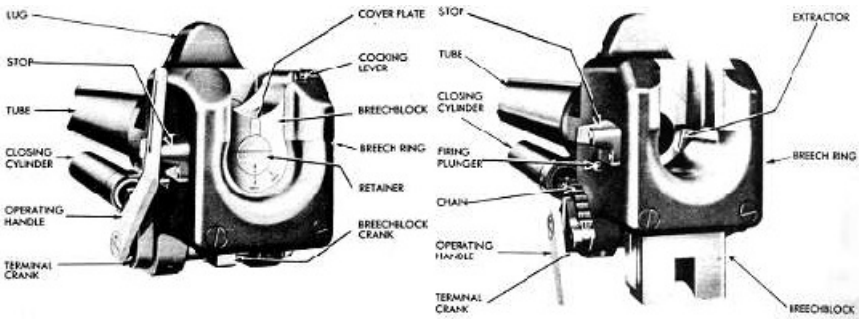


Picture 20:

It didn't take long before the Army realized that the gunner needed a back up system of targeting, as the periscope on the roof was vulnerable. Also, the periscope was aligned to the gun via a connecting rod between the two, and the alignment was easily displaced after firing the gun a number of times. So, gun mounts for mid-production Shermans were modified to hold a T92 sighting telescope on the right side of the gun mount, and this TM photo shows the minor differences built into this new M34A1 gun mount. The telescopic sight then became the primary gun sight, the periscope in the roof only used to initially acquire the target. Notice the use of additional weights attached to the rear of the recoil guard to help balance the barrel-heavy 75mm M3 Gun.

Picture 21:

As I mentioned before, the breech of the 75mm gun was of the semi-automatic sliding block type, with the breech and tube rotated counter-clockwise so the block was horizontally sliding, opening toward the left. The TM image provides some of the breech and breech ring details, including the opening lever and breech opening spring which would end up on the bottom of the breech ring when the weapon was mounted in the M34 and M34A1 Mount.



The M3 75mm gun fired a number of projectile types, ranging from APC to HVAP, HE and HC. The APC traveled at 2,030ft/sec and could penetrate 2.4in (60m) at 1000yds. It was not the best anti-armor tank gun for it's time, and it didn't take long before Sherman tankers were wishing for a more powerful replacement weapon as they watched their well placed shot bouncing off the thick hides of German Panther and Tiger tanks. The comparatively weak main gun, thin armor, and the tank's high profile were to haunt the Sherman throughout its service life. Indeed, the gun and armor would lead to one of the most emotionally fought tank debates in US armor history.

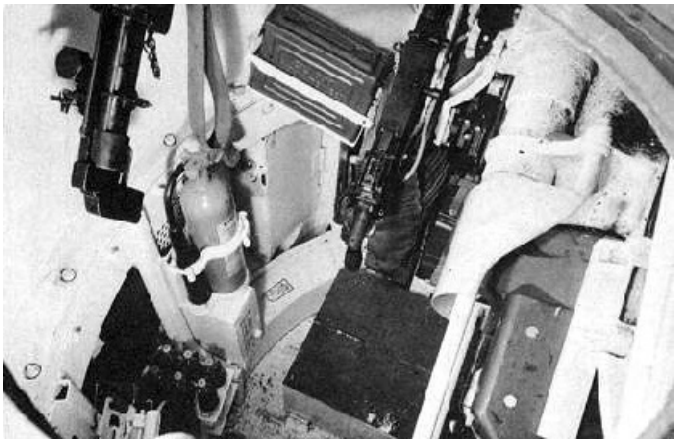
Picture 22:

An excellent US Army photo of the gunner and commander in a Sherman illustrates their relative positions and the location of some of the equipment around them. The elevated 75mm gun is at the lower left, with components of the ejection cam visible on top of the breech. The gunner's forehead is near his sighting periscope, and the connecting alignment linkage from the periscopic sight on the roof and the gun mount can be see at the left edge of the photo. The electrical box on the roof in front of the periscope mount is the control for the lighted graticle in the sight, and the control box off to the left edge of the photo houses the stabilizer controls we mentioned earlier.

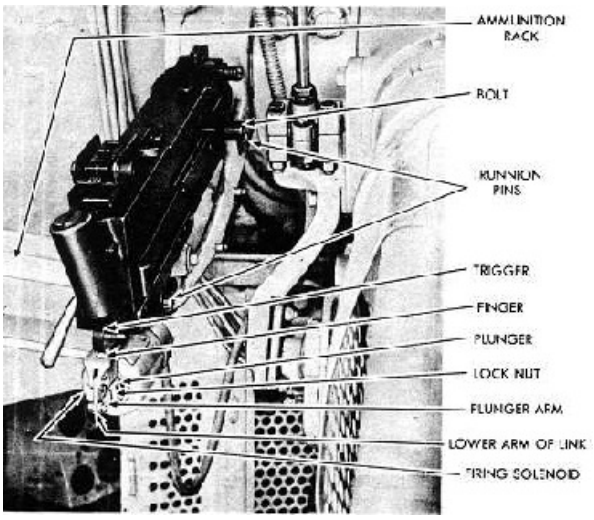
On the turret wall to the right of the gunner is one of the radio connection boxes with a hand microphone hanging off the top. The second connect box is below it, but mostly lost to the shadows. To the left of the radio connection box is a stowed binocular case, but it too is also partially hidden, this time obscured by the gunner's back. Also on the turret wall, but next to the commander, is a stowage box for a spare periscope, this one for the commander's over-head hatch. It is held in place inside the box by the same nut that will hold it in its mount in the turret roof when used. The commander's hatch is directly over-head-- the cover hatch was in two pieces with the periscope mounted in the right side in a fully rotating mount. It was still a fairly restricted view for a tank commander, and the hatch arrangement will be replaced with a vision cupola design by mid 1944.

Picture 23:

This is the left side of the turret, the image also from the Icks Collection at the Patton Museum of Armor and Cavalry at Ft. Knox, Kentucky. The main gun is to the right and the coaxial .30 cal Browning M1919A4 MG and mount is to the left, along with its ammo feed box, which would normally be painted green. Below and to the left in the picture is a red portable fire extinguisher and above that, in the upper left of the photo, is the breech end of a black 2in smoke mortar (of British design) with bomb storage in the bin down on the floor. These close defense and smoke mortars were added to American vehicles after British experience with the Sherman. The dark box on the floor under the coax is additional main round storage, holding eight 75mm ready rounds. The round loader's fold-up seat would be just below the bottom edge of the picture, mounted to the turret ring. This photo and Picture 3 were actually taken inside a M4A2 turret, but stowage and general layout was almost identical.



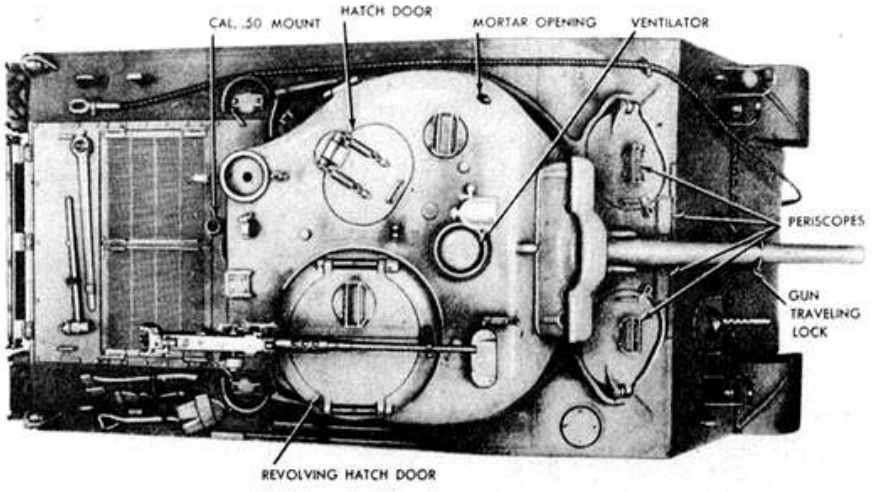
Picture 24:



The coax .30cal MG mount is shown in this TM image, the ammo box mount attached to the left side. These weapons were fired electrically, via a solenoid, and the location of the solenoid and electrical connections are visible in the image. The solenoid merely pushes the slightly revised trigger mechanism when there is electricity in the circuit.

Also visible in this picture is a section of the turret basket screening. There are also some components and linkages of the stabilization system visible. The linkage to the right of the MG is the control link attached to the elevation cylinder above and the gyro stabilizer box below, here hidden by the gun mount and left recoil cylinder.

Picture 25:

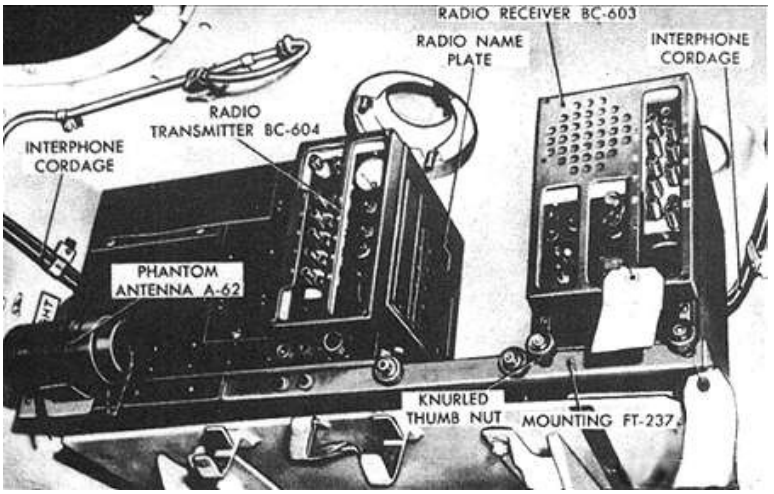


The M4A3 75mm Medium Tank was upgraded mid way through the war with some much needed improvements. The man gun ammo stowage was found to be poorly designed, with ammo stored openly in the turret and in lightly armored boxes on the sponsons. Even with additional protective armor panels welded to the hull at the storage bin locations, the general ammo stowage situation was unsatisfactory. New ammo bins were designed that protected the rounds with water jackets, the bins placed on the floor under the turret. The bins that been on the sponsons were removed, and most of the ready rounds that had been located on the rear turret floor were also removed. In fact, most of the turret floor and the turret basket were also removed, in order to provide access to the new floor bins. In most later WWII M4A3 tanks, all that was left of the turret basket and floor was a small section of floor at the gunner's and commander's feet. This is a TM image of these upgraded 75mm gun M4A3 tanks.

While they were being upgraded or manufactured (if new), some M4A3 vehicles had their 75mm gun replaced with a higher velocity 76mm weapon. These 76mm gun tanks had a different turret, known as the T23 type, which resulted in minor stowage changes inside. We will cover this type in Part 3 of our coverage.

This image shows some of the exterior turret and hull changes made to the later M4A3, this tank being the 75mm gun wet stowage tank, M4A3W, which began rolling off the production lines in February of 1944. First, notice the sloping front glacis armor plate, with no bulges remaining of the early vision slots. The driver's and assistant driver's hatches are now much larger, and are wider from side to side, where in the earlier tanks they were smaller and were longer from front to back. With the previous hatches it was very hard for the crew to quickly bail out in an emergency. This turret is an improved casting, now with hatches for both commander and loader on the roof. The commander's hatch on this particular vehicle is the same rotating two-door type you see on earlier vehicles, with a periscope mount in one door. But many of the later vehicles with wet ammo storage had a new commander's vision cupola that included vision blocks around its perimeter, which considerably improved the commander's view. But supplies of the new vision cupola lagged behind vehicle production and it was only installed as supplies became available. The new loader's hatch is flush mounted on the roof and utilizes two springs to balance its weight.

Picture 26:



The radios typically carried in the bustle of the M4A3 for US troops were generally one of three possible Signal Corps Radios (SCR) sets-- the 538, 528 or 508. All were FM radios with a voice range of 5 to 10 miles under good conditions and consisted of a transmitter (left in the picture) and/or receiver (right), depending on the set, attached by knurled thumb nuts to a shelf unit bolted to the turret wall. The average tank mounted a SCR 538 which had no transmitter and consisted of one BC 603 receiver with a BC 605 interphone amplifier for crew communication. The SCR 528 used the same receiver and included a BC 604 transmitter-- it was found in tanks requiring two-way communication, such as platoon leaders and platoon sergeants. Tank company commanders used the SCR 508 set that included the same transmitter with two receivers, allowing the commander to have one tuned to battalion frequencies and the other to platoon. The set illustrated here is the SCR 528; one of the antenna mounts is on the ceiling directly over the transmitter.

This concludes Part 2 of our coverage of the 75mm gun version of the M4A3 Sherman Tank during WWII. Most of the images used for these pages came from the two TMs for the vehicle (TM9-759, 1944, 1945) and the M3 Gun/M34 Mount (TM9-307, 1944), and the remainder are official US Army images. The next section explores the interior of both the 76mm and 105mm howitzer gunned versions of the M4A3.

Picture 27:

As the mid-production versions of the M4A3 Sherman tank with its safer wet ammo storage were supplied to the troops, some of these new tanks were equipped with a new 76mm gun in place the older 75mm M3 weapon. Still other new M4A3 tanks were modified to mount a 105mm howitzer in place of the gun, to be used as direct infantry support and to destroy the enemy in a way that had not been possible with the 75mm gun.

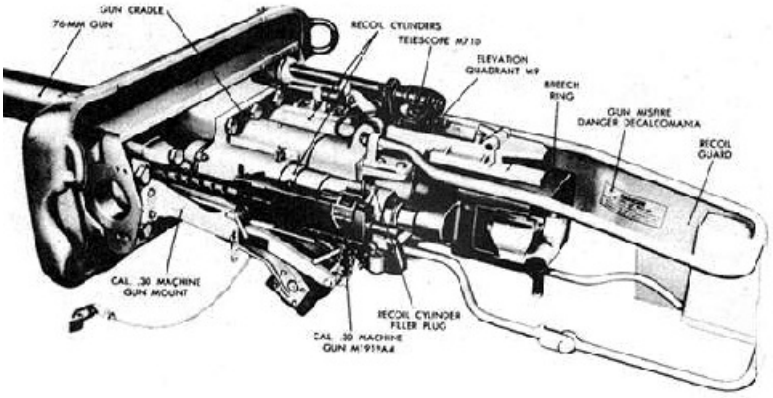
In this third section of our interior tour of the M4A3 we will take a brief look into both of these variants, spending most of our limited time in the turret with the main guns. This is a US National Archives photo of a M4A3(76)W; notice the long barrel with muzzle blast deflector, the new gun mantlet, and the wider tracks. The gunner's telescopic sight opening is seen on the right side of the mantlet (our left) and the coaxial MG opening is on the left (our right).

Picture 28:

As we mentioned earlier, the turret design was altered when the M4A3 was converted for wet ammo storage, both for the original 75mm weapon and the new 76mm. One of the changes in these turrets was the addition of a small flush-fitting loader's hatch as we saw in a previous TM picture. But a few vehicles had a larger hatch unit installed above the loader-- in fact it was the same two-door hatch that had been originally provided for the commander on the early Shermans. These large non-rotating hatches also had a periscope mount in the left-hand door and an anti-aircraft MG mount, as you see here, on the back of the hatch ring.

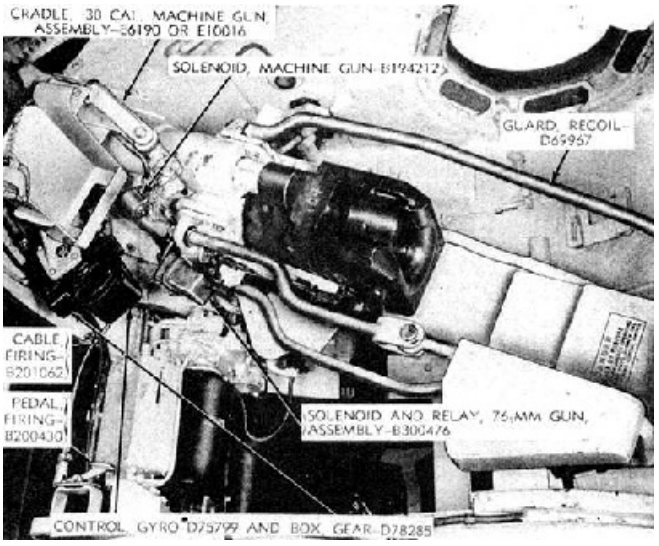
Down inside this M4A3(76)W Sherman we see a Staff Sgt. 3rd Grade leaning on the gun mount, the black breech ring just inches from his face. The left recoil cylinder is behind his left shoulder and directly behind his head is the empty mount for the coax .30cal Browning MG. Recoil cylinders for this weapon were the same type as for the 75mm gun M3, one providing the buffering during recoil and the other a spring to bring the gun back to battery position.

Picture 29:



Because the drive train and driving controls were the same for all the later M4A3 vehicles, you will find few if any changes outside the fighting compartment of the 76mm and 105mm-armed vehicles. But since the weapons were different, and their ammo of different sizes, the turret interior was altered. This is a TM image of the 76mm Gun M1A2 in its M62 Mount, illustrating some of the differences between this and the earlier 75mm setup. One of the few differences between the M3 Gun and the M1A2 76mm Gun was the size of the tube bore, the 76mm tube actually being 76.2mm, or 3in. The main components of the mount, recoil mechanism and breech ring were identical with the 75, so without close inspection you will not be able to tell which gun is installed. Like the 75mm gun, the 76mm weapon was rotated 45 degrees to the left so the breech opening was more convenient for the loader. However, the weight of the longer barrel was significantly greater than the 75mm, so additional weights were added to the rear of the recoil guard to balance the gun on its trunions.

The main difference between the two weapons was the ammo, the 76mm rounds being slightly larger in diameter and much longer. In fact, the initial ammunition used in the 76mm gun tanks were slightly revised rounds that were used in the US 3in Gun M7, the projectiles adapted for the new weapon. The powder charge in the new 76mm cartridge case was adjusted to obtain the same 2600 ft/sec muzzle velocity as the 3in gun. Further development of 76mm ammo as time went by produced new rounds that had even better penetration results.

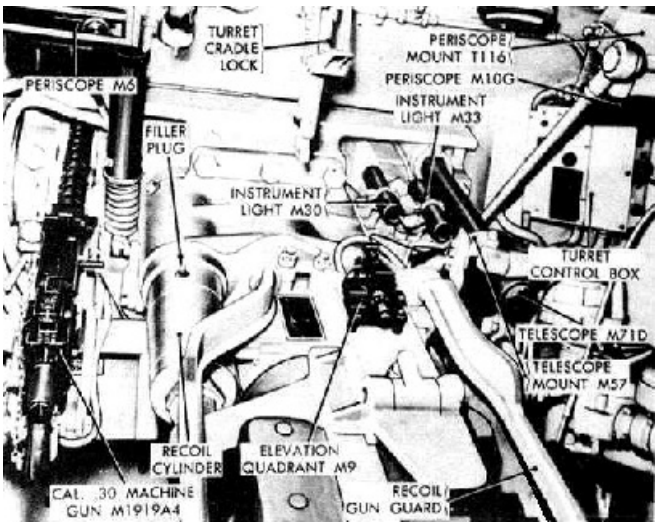


Picture 30:

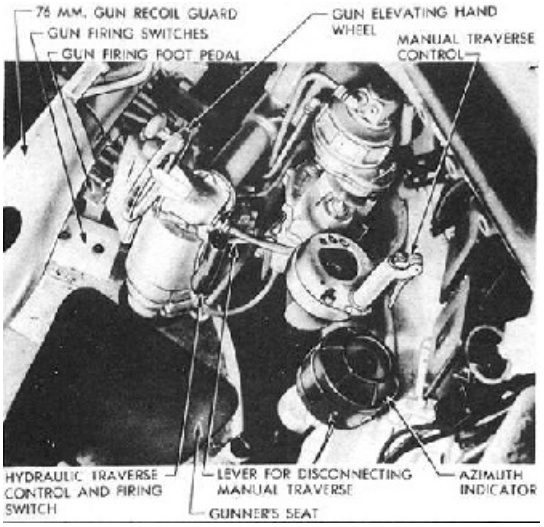
Again, there isn't much different when looking at the left side of the 76mm gun compared to what we have seen of the 75mm. However, the image is better than the one from the manual we used for the 75mm gun tanks, and you can see some of the equipment mounted on the left side and below the bun mount. One of the few differences is that because the recoil of this 76mm was longer, the recoil guards were longer, reaching to the rear of the turret ring. Notice the gyrostabilizer is attached to the side of the mount, and for the first time we see the gunner's backup mechanical firing pedal, used when the electric circuit failed to fire the gun electrically. Like with the upgraded 75mm gun tanks, the M4A376(W) often used the improved commander's cupola with vision blocks, and this tank is no exception. The coax MG is not installed here, but the solenoid is identified and the ammo feed box support is at the far left of the picture.

Picture 31:

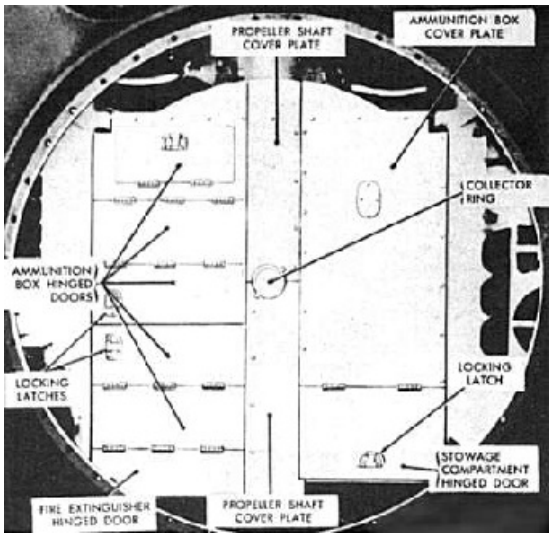
The slightly large recoil cylinders used on the M62 mount for the M1A2 76mm Gun are visible here, but otherwise most of the equipment is the same. Notice that this TM image includes the Elevation Quadrant M9, the quadrant used during indirect fire missions to precisely determine the gun's elevation. Both instrument light cases are installed on the gun mount forward of the quadrant, one holding the batteries for the quadrant light and the second for the gunner's telescopic sight. The internal gunlock is visible on the ceiling; these M4A3 tanks also used an external support crutch for the gun tube attached to the front armor. For the first time we see the loader's roof mounted M6 periscope at the upper left which has been in all the M4A3 turrets, but hasn't been shown in any of our illustrations.



Picture 32:



A slightly different angle of the gunner's station provides some good detail of the same equipment used in the mid-production 75mm gun tanks. A bit of the right turret wall is also visible and contains the two radio connection boxes we saw previously in Part 2. This is the Oilgear powered traverse equipment again, with the manual traverse crank to the right, electric motor for charging the hydraulic system directly in front of the gunner's seat, and hydraulic traverse motor in front of the hand traverse crank. Down below the seat are the firing switches that allow you to alternate between the main gun and coax, as well as the manual firing pedal for the 76. The powered traverse handle is hard to see in the lower center of the picture, but the manual elevation wheel is to the left and clearly seen in this illustration. Just like the later 75mm M4A3 tanks with wet storage, the turret floor and basket were altered to provide access to the main ammo storage on the floor of the tank. Only turret floor under the gunner and commander were retained, the turret floor on the loader's side was removed so he had to walk on top of the ammo box lids while the turret traversed.



Picture 33:

The hull floor under the turret has been smoothed out by adding covers to the water-jacketed ammo bins so the loader can walk the floor as the turret traverses. Unfortunately the turret has been removed for this picture so you do not see the partial floor that remains under the gunner and commander. But the different bins are identified for you here, with the driver's and assistant driver's seats at the top edge of the picture and some of the stowage on the sponsons visible on either side. If the ammo bin doors were opened, you would see the tops of the projectiles, as they sat vertically in tubes surrounded by a combination of water and antifreeze. Only 71 rounds of 76mm ammo could be carried, particularly due to the increased length of the ammo and to the fact that most storage had been confined to these bins and there was only so much room down there for stowage.

So why go to all the trouble of installing a new gun in the Sherman when it only fired a projectile that was 1mm larger in diameter? Well, the typical AP M72 shot used with the 75mm M3 Gun attained a muzzle velocity of 2,030 ft/sec. The typical AP M79 shot, which was used with the M1A2 76mm Gun, achieved a velocity of 2,600 ft/sec. This additional speed provided a penetration difference in homogeneous armor at 30 degree obliquity from 2.4in (60mm), to 4.3in (109mm), a penetration difference of approximately 2 inches. To what was this new penetration performance due? It was mostly due to the additional powder used in the larger shell cartridge, but both the increased length of the barrel and the improved performance of the projectile itself also had some effect. The increased velocity of the round still wasn't enough to penetrate a Panther or Tiger I head on at distance, but the improved performance was directly noticeable to the users, and it temporarily reduced American tankers' complaints about the poor performance of their earlier 75mm M3 weapons.

Picture 34:

Chrysler began manufacturing the new M4A3(76)W tanks at Detroit in March of 1944, and 1400 vehicles were produced by the end of August. Additional wide track versions of this tank were then produced, 2617 of them to be exact, before production was eventually stopped in April 1945. These wide track versions used the horizontal volute spring suspension (HVSS) and the 23in center guide tracks, the tracks most common tracks seen on all Sherman HVSS vehicles. The wider track provided improved floatation on soft ground and helped the Sherman move through areas where they would have bogged down in the past.

This US Army image shows one of these later 76mm gun tanks, with the HVSS installed. Notice the new larger turret used on the M4A3(76)W, with the bigger gun mantlet and improved

commander's cupola hatch and loader's hatch. The new commander's cupola had only one large door, but you can see that it retained the M6 periscope mount. One is also mounted in the loader's hatch, as we saw earlier. In this case, both the driver's and assistant driver's roof hatches are also of the later style, again complete with periscopes. The longer length of the 76mm barrel (compared to the M3 75mm gun) is very apparent here. While some 76mm weapons had a muzzle blast deflector screwed onto the end, you will see in period photos just as many tanks without the deflector installed (as you see here), but with a protective sleeve. Along with the wider tracks and suspension on these tanks came wider track fenders, and in this case sand shields have also been attached.

Picture 35:

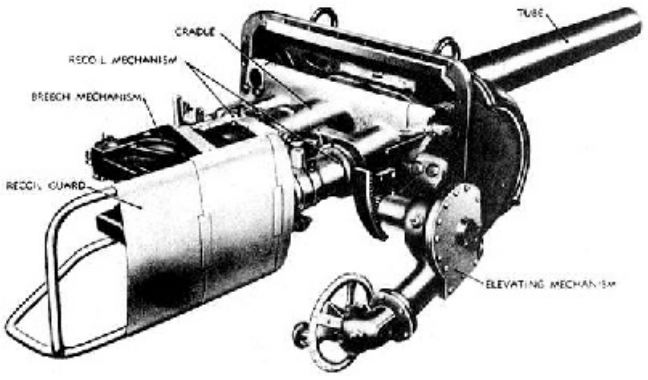
This is a US Army photo of an early M4A3 with the 105mm howitzer. All of the tanks armed with the 105mm howitzer were built by Chrysler at the Detroit Tank Arsenal. Production of the M4A3 with the weapon began in May of 1944, and 500 of the vehicles with the early vertical volute spring suspension were delivered by September of that year. At that time the wide track HVSS was substituted for the older VVSS, and an additional 2539 105mm howitzer tanks were then manufactured, series production concluding in June of 1945. Because the commander's improved vision cupola was not available in quantity at this time, early M4A3 tanks with the 105mm howitzer were built with the original two-door round hatch for the commander.

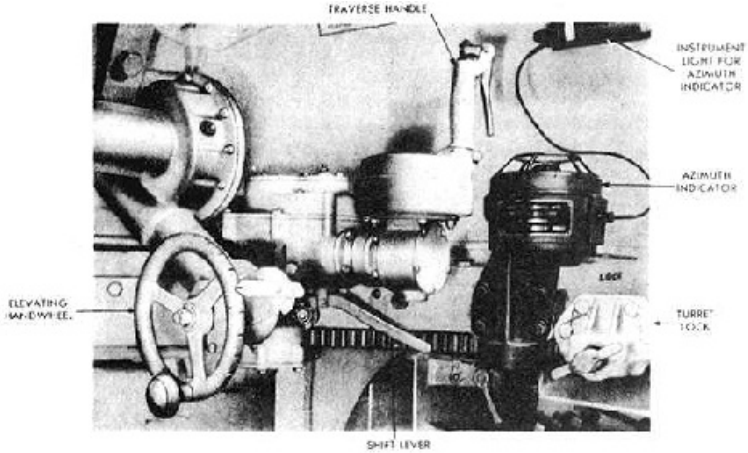
Turret traverse for these vehicles was manual only when they were originally produced because the powered traverse mechanism was deemed unnecessary for a support tank. But after its introduction there was such a protest from the users that powered traverse was added to those vehicles then coming off the factory production lines. Stowage for the 105mm rounds was similar to that for the early Sherman tanks, with co-called "armored" horizontal bins on both sponsons and ready rounds in the turret. But since most of these vehicles appeared in 1944, the one .45cal Thompson SMG allocated for the crew was changed to five new M3 SMGs ("Grease Guns"), one for each crewmember.

Picture 36:

Here is the TM photo of the 105mm Howitzer M4 in its M52 Mount. Elevation in this mount was from +35 to -10 degrees with a manual loading system. Once again the weapon had a horizontally sliding wedge design with the breech ring opening located toward the loader's side of the turret.

As you can see, the elevating mechanism is a fairly simple design, the manual hand wheel attached to a gear box and extension arm directly to a rack and pinion near the right recoil cylinder. A large recoil guard protects the gunner who sits very close to the breech, but you should notice that it does not provide any protection for the loader. Once again the two recoil cylinders flank the gun tube, and the tube itself is short and unadorned with muzzle breaks or other complications.

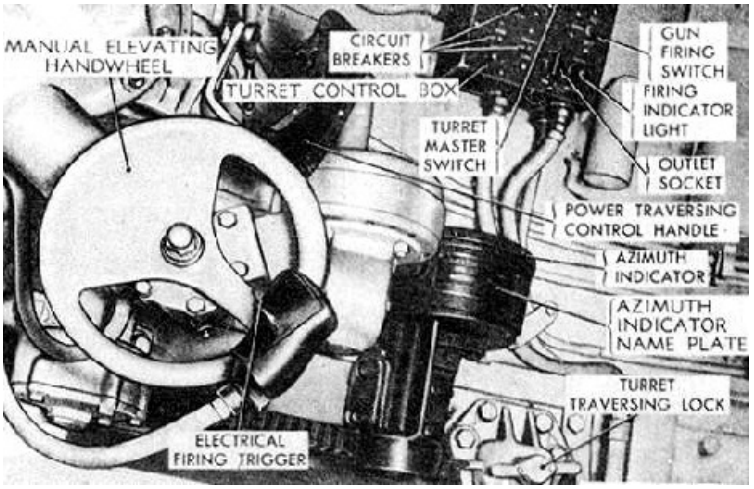




Picture 37:

This is the early traverse system used on the first vehicles delivered to the field, the traverse crank shown attached, via a gearbox, directly to the turret ring gearing. We are looking toward the right front of the turret-- the gunner's seat would be to our lower right. Also visible here are the manual elevating handwheel, the azimuth indicator and the turret lock, all just about in the same place as with the 75mm and 76mm gun tank versions of the Sherman.

Picture 38:



Once the powered electric/hydraulic traverse system was installed, there wasn't nearly as much room at the gunner's position anymore. This view is taken looking to the right side of the turret from under the howitzer. The hand elevation wheel, azimuth indicator, and manual traverse crank are in the same position we have seen them previously. But now there is the addition of a power traversing control handle, the same as used in the other Oilgear-equipped M4A3 tank models. And although it can't be seen in this image, the black electric charging motor and hydraulic turret traverse motor are in their normal positions, forward and to the left of the gunner's legs. Notice that the electrical control box for the howitzer is now mounted on the right side of the turret, above the azimuth indicator, where it is presumably closer at hand.

Picture 39:

Our final picture illustrates a later manufactured vehicle, this one showing all the upgrades we have seen in the other M4A3 Sherman tanks. This tank also has the commander's vision cupola installed, as well as the HVSS and wide fender guards. Notice that even though the howitzer barrel was short, an external gun crutch was provided for use when not in combat. This is a US National Archives picture.

That completes our exploration of the M4A3 Sherman and its 76mm and 105mm gun versions. We are always looking for additional material about these tanks, and if you have something you would like to share with our readers we would be happy to hear from you. All images are either from the original TMs or from official US Army/National Archives sources.

Originally taken from the outstanding but unfortunately extinct website
http://afvinteriors.hobbyvista.com/