SERVICE MANUAL



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Introduction

The Jiger Twin Six is an amphibious All Terrain Vehicle that rolls on six B.F. Goodrich low pressure tires,

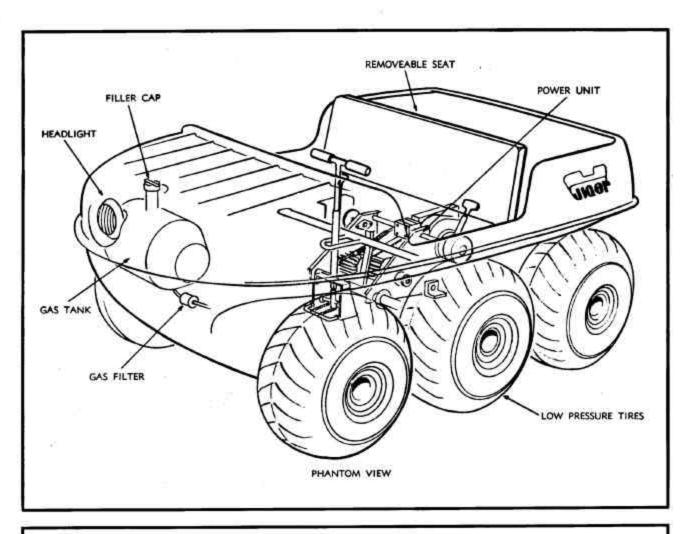
Power is supplied by a 12.5 2-cycle Hirth engine driving two Marshallmatic hydrostatic transmissions each rated at 6 hp.

The vehicle is controlled by a tee-bar column that can be operated by either of the two occupants of the vehicle. Pushing the tee-bar forward causes the vehicle to move forward; pulling the tee-bar back puts it into neutral and then into reverse. A primary feature of the hydrostatic transmission is that it offers highly effective dynamic braking; no additional braking system is required.

Steering is accomplished by operating the tee-bar in the same manner as the handlebars of a bicycle. The degree of turning is proportional to the movement of the tee-bar and it is possible to turn the vehicle around in its own length.

Engine speed is controlled by a thumboperated lever mounted at the top of the tee-bar. To obtain the best performance, the engine speed must be matched to the position of the tee-bar; mastering this technique requires only a few minutes' practice.

All hydrostatic transmissions make unfamiliar noises. Even if the noise seems excessive, particularly when driving and manoeuvering, this does not indicate that anything is wrong with the vehicle.



Total weight 455 lb. Climbing capability 30° with Carrying capacity 400 lb. Tires Six -12 balloon Seating capacity Two adults with gear Length 78 inches Engine Hirth 12. Width 52 inches 2-cycle, a recoil sta	— 0° : — 39 inches h maximum load 12 x 20 tubeless
Carrying capacity 400 lb. Seating capacity Two adults with gear Length 78 inches Engine Hirth 12. Width 52 inches 2-cycle, a recoil sta	12 x 20 tubeless
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Length 78 inches Engine Hirth 12. Width 52 inches 2-cycle, a Height 34 inches recoil sta	
Width 52 inches 2-cycle, a Height 34 inches recoil sta	2.5 hp., 246 cc,
Height 34 inches recoil sta	aircooled with
Wheelbase 44 inches Transmission Twin 6 h	tarter hp Marshallmati atic with reverse
Speed on land 15 to 20 mph— forward or reverse Drive Six whee	eel chain drive
Speed in water 2 mph— Steering T-bar cor	ontrol
forward or reverse Suspension High flot	otation tires

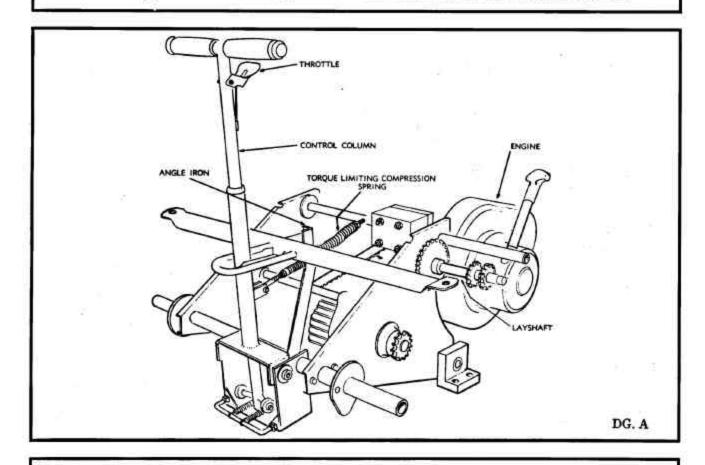
General description

The body of the vehicle is molded entirely from glass reinforced plastic. The upper and lower sections of the hull are fabricated individually and joined to form a single structure. The front foot tray and back shelf are also molded from glass reinforced plastics and all are removable.

The mechanism consists of three primary assemblies — engine and accessories; hydrostatic

transmissions and steering linkages; drive com-

The engine, transmissions and steering mechanism are integrated into a power pack (DG, A) that can be removed from the vehicle as a single unit. The frame of the power pack incorporates two side plates. They are joined by an upper and a lower crossbar to which the engine is attached and by a third crossbar which carries the main bracketry for the steering mechanism.



Serial Numbers

A plate attached to the dash carries the serial number of the vehicle. It is in three parts denoting the year and month of construction, and the individual number of the vehicle. The complete number must be quoted in all correspondence relating to the vehicle.

Engine and Accessories

The Hirth 12.5 2-cycle aircooled engine is a proven unit that is virtually trouble-free. Twin carburetors are fitted and the air is filtered by an air cleaner. A choke is mounted on the side of body above the starter handle.

The exhaust system is connected by a flexible pipe and appropriate clamps to a muffler mounted horizontally at the rear of the vehicle. A see-through fuel tank is located at the front of the vehicle and secured by two straps. A gasoline vent line extends from the carburetor to the fuel tank.

The engine generator provides 12 volts, 40 watts. A key switch on the dashboard is marked OFF - ON - LIGHT. The headlight is the only electrically-powered accessory.

Hydrostatic transmissions and steering linkages

Each of the two hydrostatic transmissions consists of a variable displacement pump, a fixed displacement motor and a fluid flow control. The transmissions are in matched pairs (RH and LH) rigidly interconnected but mounted so that they are free to rotate about the pump-motor axis.

The engine is connected by a central drive belt to a pulley located between the two hydrostatic transmissions.

The hydrostatic transmissions generate heat particularly when traversing rough terrain. To dissipate heat, a heat exchanger is mounted along-

side the engine. A fan attached to a layshaft driven from the engine crankshaft pulls cool air through the heat exchanger.

A pump with an integral reservoir and filter pumps oil through the heat exchanger, then through the two hydrostatic transmissions and back to the reservoir. The tee-bar control column consists of an inner tube that passes through an outer tube. The lower part of the outer tube is welded to a bracket that swivels about two stripper bolts.

A rod fitted with tensioner springs connects the rear of the tee-bar outer tube to the transmissions and acts as a torque limiting device. It prevents too much torque being applied to the output shafts by the transmissions.

The projecting lower end of the inner steering column is connected to a steering cross through a universal joint. The steering cross is connected at each end to two control rods that extend rearward and are connected to the transmissions.

An overtravel spring is connected around the lower extremity of the steering cross. The function of the spring is to allow the vehicle to be steered by rotating the column when it is in the full forward position.

Transmission Cooling System

The transmission cooling system consists of a main base frame, pump with integral reservoir and filter, heat exchanger, layshaft and fan assembly, hoses and fittings.

Oil is pumped from the reservoir to the heat exchanger, then to the outside, or motor, ends of the transmissions and returns from the centre of each transmission, passing through the filter in the reservoir and then into the reservoir bowl.

The pump body contains a flow control and relief valve to compensate for high engine speeds and low oil temperature. In winter, the oil flow will be low due to the thickness of the oil. As the oil warms up, the flow increases, so the system is self-regulating. The relief valve is set at 50 psi.

Drive components (DG. B)

Six axles are used in the vehicle — three at each side. Each axle runs at its outer end in a 'press fit' bearing. The bearing is mounted inside a housing attached to the body sides by four studs.

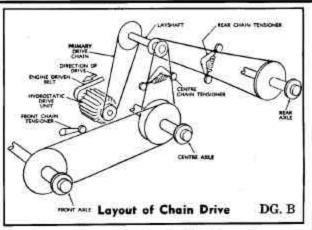
Each pair of axles meets at the centre line of the vehicle and is connected by a coupler tube running inside the inner ends. They meet at a pillow block which secures them to the bottom of the body. Each axle has a loose distance piece in it to keep the free floating coupler centred.

All three pairs of axles are coupled and mounted in the same manner.

The output shafts of the hydrostatic transmissions are connected by a system of chains and sprockets to the axles. The drive system is by No. 35 chains of \(^3/8\)-in. pitch.

A 16-tooth sprocket mounted on the output shaft of each hydrostatic transmission is connected to a 30-tooth sprocket on a layshaft. Two 14-tooth sprockets are mounted on the layshaft. One is connected to a 60-tooth sprocket on the rear axle; the other is connected to a 60-tooth sprocket on the centre axle.

Chains connect a 40-tooth sprocket on the centre axle to an identical sprocket on the front axle.



The entire system is duplicated on the opposite side of the vehicle and all chains are tensioned by 12-tooth idler sprockets.

The hub of each sprocket has fingers that permit it to be clamped onto the axle. An eccentric clamp tightened by a screw is used to clamp each sprocket in place. To ensure that the sprocket hubs transmit torque to the axles without slippage, the appropriate sections of the axles are sand-blasted and pinned.

Each wheel is attached to three fixed studs at the end of the axle by self-locking nuts.

Control system — Principles and method of operation

Each transmission incorporates a variable displacement pump. Variable pump displacement can be made on either side of neutral, so the motor can be made to revolve in either direction.

A shaft projects from the bottom of each transmission and is connected to an aluminum control arm. Attached to the control arm is a swivel jointed link connected to the steering cross at the bottom of the tee-bar.

The tee-bar is connected by a rod to a collar which fits to an angle-iron bolted to the transmission tie bars.

Moving the tee-bar forward moves the angleiron forward and rotates the transmissions about their centre. This has precisely the same effect as would moving the control arms beneath the transmissions. This increases the pump displacement to provide a faster forward speed.

Pulling the tee-bar backward puts the vehicle into reverse by increasing the pump displacement in the opposite direction.

Under all circumstances, the torque requirements at the wheels tend to move the hydrostatic transmissions back to neutral. If an operator removes his hands from the tee-bar, it will move backward towards the neutral position with only slight restraint from positioning leaf springs inside a horseshoe-shaped fitting welded to the seat crossbars. So the tee-bar must be held manually in the required position at all times, the vehicle cannot be made to "coast."

Torque limiting compression springs are mounted on the rod which connects the tee-bar control column with the collar fitting on the angle iron (DG. A). The tension on the spring can be adjusted by a nut and washers at the rear end of the rod. The purpose of the spring is to prevent too much movement being applied to the control arms of the transmissions in any particular situation. The transmission can move backward against the spring, permitting maximum output to be maintained at all times and allowing the wheels to determine the degree of torque to apply.

When the tee-bar is in the normal full forward position, the angle iron contacts the rear extremity of one leg of the horizontal horseshoeshaped component. This indicates that the normal full forward position has been reached and that the vehicle is operating at the highest obtainable gear ratio.

If still more drawbar pull is required, e.g. to climb a steep hill, the tee-bar can be pushed to an extreme forward position by compressing the spring. In this position, it would normally not be possible to steer the vehicle. However, the lower end of the steering cross is fitted in a longitudinal slot and is normally held at the forward end of the slot by the overtravel spring. When the tee-bar is in the extreme forward position, any turning motion applied to the tee-bar extends the spring and causes the lower end of the steering cross to slide back in the slot. Thus full control is provided at all times; the vehicle can be steered irrespective of the longitudinal position of the tee-bar.

Summary of driving technique

To drive slowly, push the tee-bar slightly forward of neutral.

To drive fast, push the tee-bar forward until it hits the top. To provide maximum power on reaching a steep hill, push the tee-bar to the extreme forward position, compressing the spring.

Assembly and disassembly - General

The assembly and disassembly of the vehicle is relatively simple provided that all operations are performed in the sequence and manner specified in this manual. In all instances, assembly is the reverse of disassembly.

There are five phases of servicing and maintenance which require particular attention:

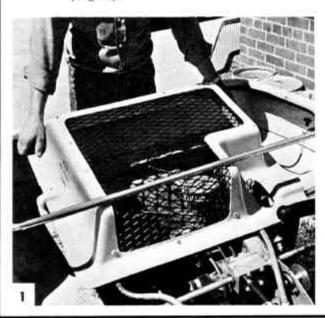
(1) Hydrostatic transmissions, which are rela-

tively simple mechanisms but may be unfamiliar.

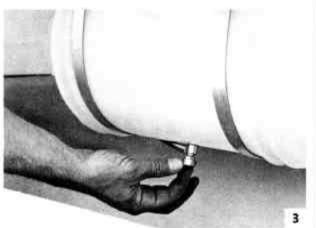
- (2) The control system, which is unique.
- (3) Alignment of chains,
- (4) Adjustment of throttles and throttle cables, and adjustment of carburetors.
- (5) Maintenance of correct tire sizes.

Dismantling - Preparation

- (a) Remove seat by releasing three snap fasteners.
- (b) Remove back shelf by removing wing nuts (Fig. 1).
- (c) Remove sub-floor by removing wing nuts (Fig. 2).
- (d) Shut off gasoline tap beneath fuel tank (Fig. 3).







Dismantling control column

- (a) Disconnect throttle cable at carburetors and withdraw through throttle lever.
- (b) Unfasten bolt and clamp at the bottom of

the tee-bar.

- (c) Release detent in the universal joint.
- (d) Raise tee-bar inner component.

Setting up control system

(a) Set tee-bar in neutral.

NOTE

To find neutral, turn the tee-bar right or left as far as it will go then move it forward and backward. When moving the tee-bar forward it becomes progressively harder to move. The closer it is to neutral, the easier it is to turn left or right. When the tee-bar is in the correct neutral position, with tee parallel to the axles of the vehicle, the tee-bar will be slightly back from the vertical position.



- (b) Compress torque limiting rear spring until the length of the spring is 4½-in. (see Fig. 4).
- (c) Adjust tee-bar so that there is a 1%-in, gap between rear of the column and front of the crossbrace.

- (d) Move tee-bar forward until full pump displacement has been attained and it is impossible to move the control rods connecting the steering cross to the transmissions.
- (e) Check that the angle iron is in contact with the stop on the horseshoe fitting. If there is still movement in the control rods, the stop must be shortened. If there is a gap, a bolt should be brazed in place to provide the correct stop position.

NOTE

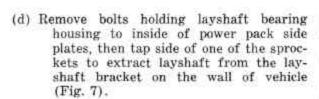
If there is a noticeable gap, the transmissions will rotate forward (clockwise when viewed from the R.H. side of the machine) thereby reducing the maximum spring compression.

Removing power pack

- (a) Remove ground wire from engine by loosening 1/4-in. hex-head bolt (Fig. 5).
- (b) Remove wiring harness from engine by removing three screws from terminal block.



(c) Loosen clamps and detach flexible pipe connecting engine to muffler (Fig. 6).



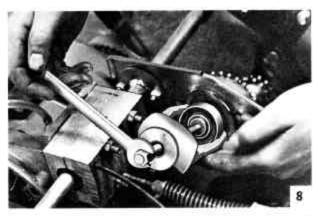




- (e) Remove inner bearing from layshaft, using puller (Fig. 8).
- (f) Remove layshaft.
- (g) Remove layshaft at opposite side of the vehicle in the same manner.

Note

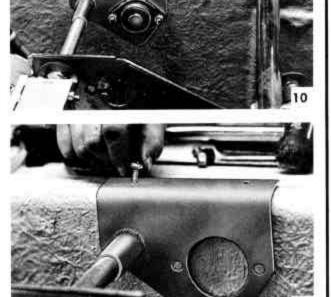
All bolts securing the power pack in position are inserted from the outside of the vehicle. When removing, use a soft-headed hammer, taking care not to damage the ends of the threads.



(h) Partially deflate the centre pair of tires and remove the two lower bolts from each of the brackets holding the layshaft bearings in position (Fig. 9).



- (j) Loosen the two upper bolts (Fig. 10), remove the spherical bearings complete with flanges, then remove the bolts (Fig. 11).
- (k) Remove the bolt at each end of the seat support crossbrace.
- (l) Detach throttle cable from carburetor.



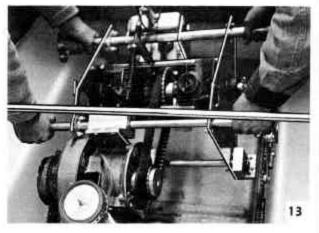
- (m) Remove one handgrip, then remove the seat support crossbrace (Fig. 12).
- (n) Remove the two bolts from each of the brackets on the body side that support the forward crossbar.
- (p) Remove two bolts from each of two blocks that anchor power pack side plates to bottom of vehicle.
- (q) Remove gas lines at carburetor.
- (r) Ensure that the front chain tensioners are not obstructing removal of the power pack. Disconnect the springs and ensure that the chain tensioner arms can be moved around so that they will not catch under the chain when the power pack is lifted out.
- (s) Remove the power pack by lifting it vertically. This is best accomplished by two men one on each side of the machine, gripping the support bars that connect the side plates and lifting the power pack onto the front of the body (Fig. 13).

Note

It is not necessary to remove the rear seat support bar but it is advisable to place a blanket on the front of the vehicle to avoid scratching the fiberglass as the power pack is being removed.

(t) Place power pack on a bench in the same position it would assume when installed in the vehicle.



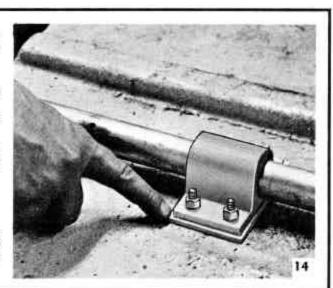


Removing wheels, sprockets and axles

- (a) Remove three nuts holding each wheel to axle.
- (b) Remove wheel.
- (c) Remove from outside body the four nuts holding each axle seal flange.
- (d) Remove connecting links from chains and remove chains.
- (e) Loosen bolt in clamp holding sprocket hub to axle and remove the pin through the axle.
- (f) Withdraw axles from body.

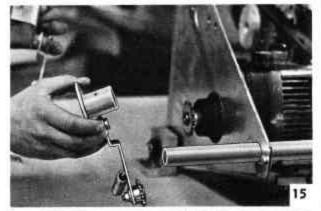
Note

The axles are held in horizontal alignment by the use of pillow block shims (Fig. 14) inserted between the pillow block and the body of the vehicle.



Dismantling power pack

(a) Remove the RH side layshaft bracket and then remove the RH side bracket that supports the front chain tensioner, if necessary prying it off using a screwdriver (Fig. 15).



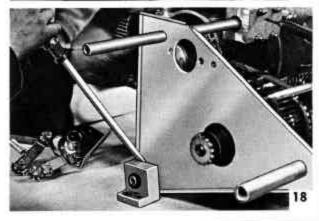
(b) Remove the bolt holding the torque limiting rod (Fig. 16) to ensure that the torque-limiting assembly is free of the tee-bar.



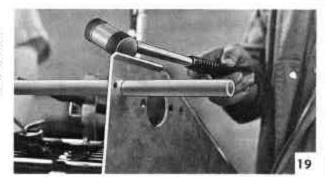
(c) Remove the cotter pins on the steering cross and detach the control arms by tapping the swivel joints gently with a soft-faced hammer (Fig. 17).



(d) Remove the lower mounting block, if necessary, prying off with a screwdriver (Fig. 18).



(e) Remove the RH sideplate by tapping gently in three locations (Fig. 19). Note that the transmissions are then held in the power pack only by the trunnion bearing on the remaining side plate and by the belt.



(f) Detach belt from engine timing pulley and withdraw transmission assembly from remaining sideplate (Fig. 20).



(g) Dismantle the transmission assembly by removing the nuts from one end of each of the four tie rods (Fig. 21).

Note

There is no need to remove the sprockets from the output end of the hydrostatic transmissions in order to change the belt.



The LH transmission (Fig. 22) is stamped adjacent to the control arm shaft counter clockwise (CCW); the RH transmission is stamped clockwise (CW). The direction of rotation is as viewed when looking at the input shaft. It is essential that the transmissions be fitted in their correct relationship to each other.



The centre pulley between the two transmissions should be a slide fit on the transmissions. Under no circumstances should the pulley be hammered onto the transmission input shaft, nor should the sprocket be hammered on or off the output shaft of the transmission.

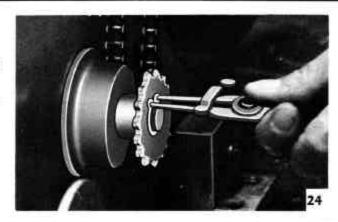
- (h) Separate the transmissions.
- (j) Remove nut, then remove transmission control arms, using bearing puller (Fig. 22)







- (k) Remove circlip, then withdraw sprocket and spacer (Fig. 24).
- Remove four bolts holding engine to aluminum mounting plate and detach engine.



Removing engine

To remove the engine:

- (a) Remove flexible muffler pipe.
- (b) Disconnect throttle cable.
- (c) Disconnect choke cable.
- (d) Disconnect electrical wiring.
- (e) Disconnect gasoline supply line.
- (f) Disconnect vapour vent line.

- (g) Remove belt that drives the oil cooling fan layshaft.
- (h) Remove four bolts which secure the engine to the vertical aluminum plate mounted to the top and bottom mounting blocks.
- (j) Remove the engine, detaching the engine drive belt.

Replacing drive belt or hydrostatic transmission

- (a) Disconnect oil cooling system hoses at transmissions by unscrewing hex connections at the end of each hose.
- (b) Unbolt the transmission torque limiting rod from the tee-bar assembly.
- (c) Remove connecting link in RH chain between the hydrostatic transmission and the layshaft, then remove chain.
- (d) Remove control rods from the steering cross.
- (e) Remove bolts holding the self-aligning layshaft bearing to the R.H. sideplate.
- (f) Remove bolts holding the R.H. sideplate to the upper and front tubular cross members.
- (g) Remove the R.H. L-shaped block securing the bottom cross-member to the bottom of the body.

Removing and installing engine drive pulley

To remove the engine drive pulley, a special pronged tool available from JIGER dealers must be used. The pulley is secured to the crankshaft by a taper fit; there is no keyway. To replace the pulley, place it over the shaft and apply a moderate blow with a soft-faced hammer.

Replacing flexible pipe between engine & muffler
To replace the pipe between the engine and
muffler:

- (h) Remove the remaining two bolts holding the sideplate to the cross-member.
- (j) Tap the R.H. sideplate with a soft faced hammer to move it away from the transmissions toward the side of the body.
- (k) Remove the central drive belt from the engine drive pulley.
- Slide the entire transmission assembly toward the R.H. side of the body and remove from the machine.
- (m) Remove the tie rod nuts on the R.H. transmission and then remove the transmission.
- (n) Replace the transmission or drive belt, ensuring that the drive belt is threaded over the tie rods in the correct manner relative to the torque limiting assembly.
- (p) Reassemble all components in the reverse sequence to that in which they were disassembled.
- (a) Loosen clamps.
- (b) Slide flexible pipe along the muffler inlet pipe.
- (c) Pull the free end of the flexible pipe away from the exhaust pipe.
- (d) Install new pipe by reversing the procedure, ensuring that the clamps are positioned so that they grip both the flexible tube and the pipe.

Replacing throttle cable

If the throttle cable breaks it is not necessary to replace the black outer protective guide cable. Thread a new inner core through the outer guide cable from the throttle lever on the tee-bar, through the top engine mounting block to the carburetor. See carburetor adjustment instructions for method of securing the cable at the carburetor.

Engine maintenance

See engine manufacturer's manual,

Carburetor maintenance

See carburetor manufacturer's manual.

Adjusting carburetor

The throttle adjustment

 (a) Loosen the two screws on the connecting rod between throttle arms,

(b) Adjust idling screws, which are set at an angle, so that each throttle butterfly is open the same amount. Do this as accurately as possible by removing air cleaner and looking down into carburetors.

(c) Re-tighten screws on connecting rod being careful to maintain butterflies in their 'set' positions.

(d) Connect throttle cable to loop at front of

connecting rod.

(e) Adjust idling by turning both idling screws an equal amount. Important—Do not set idle speed too slow. A fairly fast idle speed is required to maintain proper running at all temperatures, and also makes driving easier.

Carburetor jets adjustment:

- (a) Close the two jets marked L (Low Speed) and H (High Speed) on each carburetor.
- (b) Open each jet one turn.
- (c) Then if necessary adjust High Speed jet according to how the vehicle performs when being driven under load.

NOTE

Final adjustments from the initial setting of the carburetor cannot usefully be made with the engine idling. If the mixture is too lean there will be a lack of power when the vehicle is driven. If operation with too lean a mixture is continued, lubrication will be inadequate and the overheating which will result may cause scoring of

the cylinder walls. Extreme overheating will cause the engine to seize. The mixture can be assumed to be correct when the engine performs satisfactorily under maximum load. It is better to run too rich than too lean.

Choke adjustment

The choke outer cable must be clamped so that the choke will operate only between the full on and full off positions.

Carburetor gaskets

If it appears difficult to maintain the correct mixture ratio, make a careful examination of the gaskets on the entire carburetor intake system between the engine cylinder and the mating parts which are bolted together. Any air leaks in this area will cause a weakening of the mixture.

The gaskets in the carburetor system are as follows:

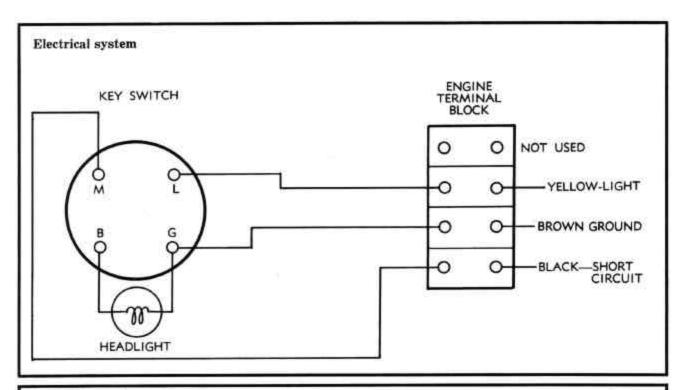
- (1) Engine cylinder wall to phenolic block-
- (2) Phenolic block to manifold extension asbestos steel.
- (3) Manifold extension to manifold—No. 220 0-ring (1\%-in, x 1\%-in, x 1\%-in, thk).
- (4) Manifold to carburetors 1/32-in. thk cardboard—one for each carburetor.
- (5) Carburetors to choke slide and choke slide to air cleaner baseplate—1/16-in. thk cardboard.

NOTE

To ensure that there will be no air leaks, it is recommended that gaskets 1, 2 and 3 be replaced with new ones when reassembling.

Air filter maintenance

The air filter should be checked after every 4-24 hours of operating depending on the circumstances under which the vehicle is used, and changed whenever necessary. Place a light bulb inside the filter and examine from the outside. If no light is visible through the paper elements of the filter it is plugged and should be replaced.



Spark plug maintenance

Examine spark plug approximately every 25 hours of operation and set the spark gap to .016-in. or .018-in. The colour of the plug should be a light chocolate brown. If the plug is black in the region of the spark gap, this is an indica-

tion that the mixture is too rich. If the entire end of the plug that is normally inside the engine is a very light brown, this is an indication that the mixture is too lean. Badly burned plug points also indicate that the mixture is too lean.

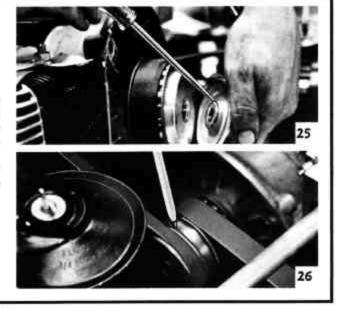
Starter cord

If the starter cord is pulled out too far, it may not recoil. Jerk the cord gently and release it several times in succession. If it still does not recoil, tap the starter housing lightly. If neither of these procedures is successful, it will be necessary to dismantle the starter and housing assembly. See engine manual for the correct method.

Pulley assembly

The vee-belt pulley (Fig. 25) on the engine crankshaft is held in position by the machined boss (Fig. 26) which fits into the end of the primary drive pulley. Both pulleys are held to the crankshaft by a hex-head bolt with lockwasher.

Important—Do not install the vee-belt pulley backwards or the bolt will crush the side of the pulley against the primary drive pulley.



Tensioning primary drive belt

Alignment and tension of the primary drive belt is important. If it is too tight, or out of alignment, there will be a loss of power and belt life will be short. If it is too slack, it may jump the teeth on the pulleys.

To adjust and tension the drive belt:

Estimate the degree of misalignment by checking visually or by laying a straightedge along the side of the pulleys.

- (a) Loosen all engine mounting block bolts.
- (b) Slide the engine sideways along the rods

NOTE

A belt tensioning device that can be procured from any automotive parts dealer is useful in this operation. Full instructions are provided with the device. Press the tensioner tip into the belt at a point approximately midway between the two pulleys (Fig. 27). Check the deflection compared with a straightedge placed between the pulleys. The height of the straightedge must be deducted from the reading on the tensioning device.

until the alignment is correct.

(c) Tighten the bolts.

- (d) Check belt tension by pressing the top of the belt, midway between the engine and the hydrostatic transmissions, with a force of 7 lb. This should deflect the belt by 3/16 inches.
 - If belt is too tight or too slack, adjust tension by inserting special shims between the engine mounting plate and the top crossbar block.



Tensioning transmission cooling system drive belts

- (a) Loosen the single nut holding the pump bracket to the main base frame and move the bracket rearward.
- (b) Loosen the nut holding the bracket carrying the layshaft on which the fan is mounted and move it rearward until the engine-to-layshaft belt is correctly tensioned.
- (c) Tighten the nut securing the layshaft bracket to the main base frame.
- (d) Slide the bracket holding the pump assembly forward until the drive belt from the layshaft carrying the fan to the oil pump is correctly tensioned.
- (e) Tighten the nut holding this bracket to the base frame.

NOTE

A belt tensioning device that can be procured from any automotive parts dealer is useful in this operation. See above.

NOTE

It is not necessary to have these two belts very tight. The power requirement of the fan and pump is small and therefore the belts are adequate to drive these components with moderate tension.

Notes on transmission fluids

Only the best quality automatic transmission fluid should be used and it is vital that it be clean. Never use dirty oil, or even apparently clean oil that has been stored in dirty containers. Make sure that all funnels or other transfer devices are kept scrupulously clean.

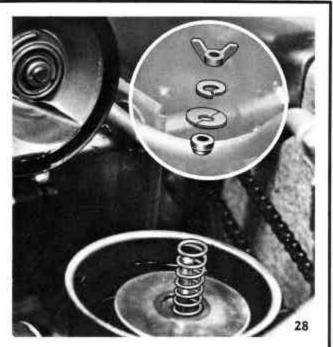
The oil in the reservoir must be kept at the prescribed level, otherwise the severe pitching motion characteristic of the vehicle will cause the pump to suck in air. This will cause aeration of the oil with very noticeable loss in power from the transmission. If the oil in the system becomes aerated very minute bubbles may be noticeable, the fluid will become slightly milky and distinctly opaque. In this case, drain as much oil as possible out of the system by disconnecting hoses and allowing the oil to drain into body troughs and out through body drain holes, then replace with new oil.

Transmission cooling system maintenance

- (a) Remove wingnut, lockwasher, flat slotted and tapered rubber washer.
- (b) Remove lid of reservoir.
- (c) Check that the surface of the oil is ½-in. to ¾-in. from top of reservoir bowl and replenish if necessary.
- (d) Replace lid of reservoir and tapered rubber washer, flat washer, lockwasher, wingnut (Fig. 28).
- (e) Examine all hoses and SAE standard fittings to ensure that they are not being damaged by chafing against metal components in the vehicle.
- (f) Check the entire system for leaks.
- (g) Blow across the heat exchanger fins with an air hose to remove dirt, bugs, leaves and other debris.
- (h) Check tensions of vee-belts.

NOTE

It is essential that there is a slot in the flat steel washer to permit oil to vent under pressure. In some models this slot has been omitted and it must be added.



Replacing transmission cooling system oil

- (a) Remove spark plug.
- (b) Fill reservoir while pulling starter cord continuously.
- (c) When no more oil can be added put the top back onto the reservoir, replace spark plug and run engine at idle speed for 15 seconds only with tee-bar in neutral.
- (d) Remove reservoir top and check oil level. If level is down, fill to correct level and

run engine for a further 15 seconds. Check again. When level remains steady, the system is free of air and the vehicle can be used.

NOTE

Failure to follow the correct procedure when replacing oil in the system will result in either immediate lack of power, or steadily decreasing power from the transmission.

Removing and dismantling transmission cooling system

- (a) Drain the system.
- (b) Remove all hoses.
- (c) Remove the transmission cooling system layshaft bracket by loosening the nut holding it in position and sliding the bracket forward (Fig. 29).
- (d) Remove belt connecting engine pulley to layshaft pulley and belt connecting layshaft pulley to oil pump pulley.
- (e) Remove nut and bolt securing layshaft bracket in position.



(f) Remove entire layshaft bracket, complete with belts (Fig. 30).



- vise by gripbeneath the liding the lay-
 - 32

(g) Secure layshaft bracket in a vise by gripping the central guidepiece beneath the bracket.

(h) Remove the nuts and bolts holding the layshaft bearings in position (Fig. 31) and remove the layshaft, complete with bearings (Fig. 32).

Notes on reassembly of transmission cooling system

- (a) All fittings are straight thread SAE except Pipe Threads on elbow and tee into transmission tops, and special inlet fittings in transmissions.
- (b) SAE fittings seal on 45° tapered face, not on threads, therefore do not need to be excessively tight. If they leak, check for dirt on the mating faces.
- (c) On the special fitting at the reservoir return pipe, the ferrule only has to be
- reseated, so the nut need only only be snug. When replacing this fitting, or using a new ferrule, or replacing an old ferrule over new reservoir bowl pipe, tighten fitting nut finger tight, then turn nut exactly 11/4 turns with wrench.
- (d) All fittings which are pushed into hoses are re-usable. Cut old hose off and push fitting into new hose using a small quantity of oil on the fitting.

Removing reservoir and pump

- (a) Remove pump from its bracket by removing the three nuts, but do not attempt to dismantle the pump.
- (b) Remove special hex bolt holding reservoir to pump body, noting that the ½-in metal strip holding reservoir in position has the two small ears uppermost and over the pump intake.

Note

The pump pulley is fitted to the pump shaft, which is straight and is fitted with a key.

If the 5/16-in NC stud is removed from the centre of the special hex bolt, it should not be overtightened when being re-fitted.

Removing heat exchanger

- (a) Disconnect hoses.
- (b) Remove bolt securing top aluminum angle to body brace.
- (c) Remove two ¼-in. nuts holding aluminum angle down onto heat exchanger.
- (d) Remove aluminum angle, and slide heat exchanger vertically upward until it is free from the rods.

Note

Tie rods are covered with plastic tubing to prevent damage to copper tubing of heat exchanger. Heat exchanger is mounted top and bottom on foam vinyl strip. No part of the heat exchanger can be damaged by contact with adjacent metal parts.

Disassembling transmission cooling fan layshaft

- (a) Hold layshaft in one hand and dismantle with the other, taking care not to lay the assembly down since this might damage the fan blades.
- (b) Remove circlip holding first bearing in place (Fig. 33).
- (c) Use puller to remove self-aligning bearing (Fig. 34).





(d) Loosen setscrew in hub of larger of the two diecast pulleys (Fig. 35).

Note

When reassembling, ensure that the setscrew and hub on each pulley is on the opposite side of the pulley from the fan.



(e) Hold pulley in one hand and strike the end of the shaft with a soft-faced hammer (Fig. 36). Ensure that the Woodruff key is not mislaid.



- (f) Loosen setscrew in smaller pulley, then hold pulley in one hand and use softfaced hammer in a similar manner to drive shaft out of the pulley.
- (g) Wrap shaft in rag, then grip in vise. Remove keys by tapping one end of each key downward so that the other end protrudes, then use pliers to extract it. Alternatively, tap out using a screw-driver and light hammer. Take care not to burr the keys.

NOTE

In some machines there is a small spacer between the 2-in, pulley and the bearing adjacent to the fan. The spacer can be removed after the keys have been extracted.

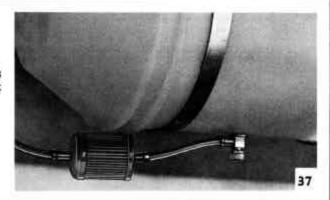
- (h) Remove the bearing adjacent to the fan in the same manner employed to remove the first bearing. Alternatively use a bearing puller.
- Remove the circlip positioned between the bearing and the fan hub.
- (k) Remove the fan from its mounting hub after removing nuts completely.
- (1) Remove the two bolts from the hub.

NOTE

When the fan is replaced, it is essential that the mating faces between the fan and the locating hub be devoid of burrs. It may be necessary to file or ream the central locating hole to ensure that it mates properly with the boss on the fan hub. The fan is designed to fit only one way on the hub.

Fuel filter

A standard automotive-type fuel filter is installed (Fig. 37) and with normal use it will not be necessary to replace it.



Cleaning fuel tank

The pet-cock at the bottom of the tank is fitted with a screen which projects inside the tank and is washed by the motion of the fuel. It is improbable that the screen will ever become completely plugged but if the outlet becomes blocked it will be necessary to remove and clean out the tank.

Procedure

- (a) Turn off the pet-cock.
- (b) Remove gasoline line.
- (c) Remove vapour vent line.
- (d) Unfasten nuts holding the straps that secure the tank.
- (e) Remove the tank.
- (f) Clean out the tank, using gasoline or water.

CAUTION

Do not remove the pet-cock. Reassembly would require the use of a special tool to secure the nut on the inside of the tank.

Tire maintenance

All tires must be inflated to a circumference of 62½ inches (Fig. 38) rather than any specific pressure. They should be checked frequently and maintained at that size. Tire inflation and checking should be carried out with the vehicle blocked up off the ground.

The vehicle is not intended for operation over asphalt or other hard surfaces but if it is so operated and the circumferences of the tires are not uniform they will tend to rotate at different speeds. This will impose severe loads on chains and transmission components. To a lesser degree, the mechanism of the vehicle will be similarly affected when it is travelling over rough terrain.

If the vehicle has a tendency to turn in a particular direction, the most likely cause is that the tires on one side have been inflated to a larger diameter than those on the opposite side.

To repair tires, use ordinary bicycle patches.



Alignment and lubrication of chains

Check chains frequently to ensure that they are kept as clean as possible to reduce wear resulting from any accumulation of sand, grit and other abrasive materials. Whenever there is an excessive buildup of dirt, wash the chains with solvent, then lubricate with light machine oil.

Accurate alignment as well as correct tensioning of all chains is important.

In adjusting the chains, use the layshaft sprockets as a central reference point. Line up the centre chain connecting the layshaft to the centre axle sprocket, then the chain from the centre axle to the front axle, and finally the chain connecting the layshaft to the rear axle. All chains may be checked visually and axial alignment should be kept with 1/2-in.

When the vehicle has been used for about ten hours, the chains may have stretched. Chains fitted with offset or half links may be removed and the connecting link replaced. If there is no offset link in the chain, it may be shortened by breaking, using a chain pin extractor, and reconnecting with or without an offset link. If the length of the chains is not reduced in this manner, they may become so slack that the slackness will not be fully taken up by the chain tensioners.

All chain tensioners and their idler sprockets must be accurately located and maintained in their correct positions so that they do not change the normal path of the chains between sprockets in an axial direction. Sufficient tension must be maintained on the idlers to ensure that the chain does not jump off the sprocket teeth.

Greasing axles

The inner ends of each pair of axles are connected by a coupler tube rotating inside a pillow block at the centre of the floor of the vehicle. The axle assemblies are greased at the factory during assembly and should not require attention for a considerable period of time. Lack of grease may be indicated by squeaks emanating from the pillow block and coupler assembly. To re-lubricate, remove one axle and use MOLY grease.

Drain plugs

Two drain holes are provided, both located at the rear of the vehicle in the upper part of the chain troughs. The plugs are designed so that the tighter the wingnut is turned, the more firmly the plug will be secured.

Fiberglass repairs

Repairs to the fiberglass body can be made in the same manner and using the same materials employed in repairing fiberglass boats. Repair kits with instructions are available at local hardware stores.