

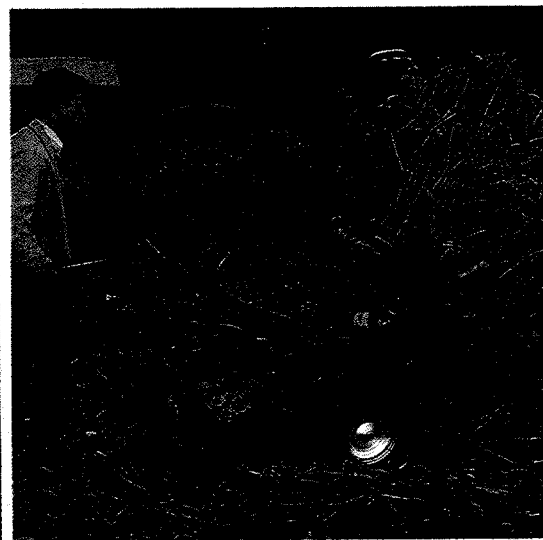
TROY-BILT® ROTO TILLER-POWER COMPOSTER

OWNER'S MANUAL

FOUR-SPEED HORSE MODEL

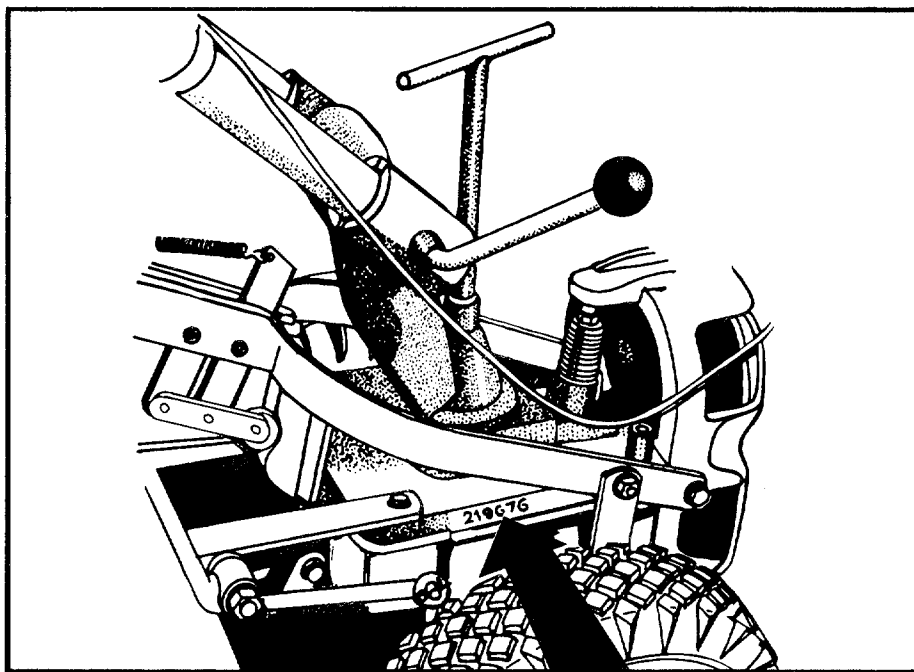
An easy-to-follow guide to assembly, operation, use and maintenance of your tiller and its engine. Be sure to read ALL safety and operating instructions carefully and completely!

3rd Edition



HOW TO FIND YOUR TILLER'S SERIAL NUMBER

If you have a problem with your tiller or you need parts, we will need to know your Tiller Serial Number when you write or call. The arrow in the drawing below points to the right side of the transmission case, where the number will be stamped in the metal.



Write your Tiller Serial Number here for handy reference:

The Date of Delivery: _____

VERY IMPORTANT

For safety's sake, do not attempt to operate your tiller or engine until it is completely assembled as explained in Section 1 of this manual ... and until you have read and fully understand the safety and operating information presented in Sections 2, 3 and 4.

WARNING TO ALL CALIFORNIA TILLER OPERATORS

Under California Law, you are not permitted to operate an internal combustion engine using hydrocarbon fuels on any forest-covered, brush-covered or grass covered land, or land covered with grain, hay or other flammable agricultural crop, without an engine spark arrestor in continuous working order. The engine that runs your tiller, like most garden or lawn equipment, is an internal combustion engine that burns gasoline (a hydrocarbon fuel); therefore it must be equipped with a spark arrestor muffler in proper working order. The spark arrestor must be attached to the engine exhaust system in such a manner that flames or heat from the system will not ignite flammable material. Failure of the operator to comply with this regulation is a misdemeanor under California law.

OWNER'S MANUAL

TROY-BILT® ROTO TILLER-POWER COMPOSTER Four-Speed HORSE Model



THIRD
EDITION

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WELCOME TO THE TROY-BILT FAMILY

Welcome to "power gardening the **Troy-Bilt Tiller** way." Your new **Horse Model Tiller** is not just another piece of machinery. It is a useful, productive gardening tool that, with proper care, should last for many generations.

Your Troy-Bilt Tiller was designed to easily chop up, shred and bury all sorts of vegetation and organic matter in the garden in addition to preparing seedbeds and cultivating. With optional attachments, it can also be used for furrowing and hilling, as well as light earth-moving and snow removal chores.

The Troy-Bilt Tiller's design, with powered wheels ahead of the separately geared bolo tines in the rear, gives it an outstanding combination of tilling and shredding capabilities that allows you to enrich your soil far beyond your abilities to do so by hand. The soil enrichment is gained by tilling in and burying in the soil all kinds of available organic materials including leaves, mulches, crop residues, sod, green manure cover crops and even standing cornstalks! By using this method, you will soon experience better yields than ever before. This is said to be the greatest single benefit of power gardening, "the different, better, and so much more enjoyable Troy-Bilt way."

We have tried our best to build your tiller as strong and trouble-free as we know how. This, of course, is to our mutual benefit. We have fewer service problems and you have a truly reliable tiller.

OFF TO A SAFE START

Please remember that although your Horse Model Tiller is a basically simple machine to operate and to handle, there are certain things which you must know before operating your tiller, and certain precautions which you should follow. For these reasons, please don't attempt to start your engine or operate your tiller without first reading the Sections in this manual about Easy Assembly, Safety, Getting To Know Your Tiller and Its Engine, and Using Your Tiller. REMEMBER... Practice Safety At All Times!

ABOUT MAINTENANCE...

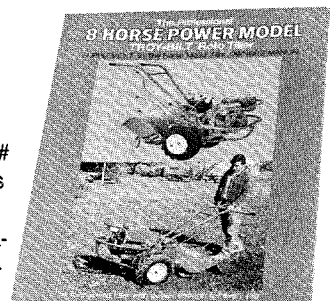
You can insure long-lasting and proper performance from your tiller and engine far beyond your expectations by always remembering to perform the scheduled maintenance services presented in Section 5 of this manual.

By treating your tiller and the engine with good care in the manner described in those pages, your efforts will be returned many times over in the form of a more satisfying and easier operating machine, and with much more bountiful gardening results.



ATTENTION 8HP ENGINE OWNERS!

If your tiller is equipped with an 8HP Briggs and Stratton Engine, then be sure to read the green-covered, 8HP Owner's Manual Supplement (Code # SER-74) that came with this manual. The supplement provides important information on preparing and operating your 8HP engine.



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Here, in this 216-page Owner's Manual, you should find the answer to most any question about operating and servicing your tiller, or about gardening in general.

But, if you can't find the answer here — or if you need further help — just drop us a line or call us (518-235-6010). We're anxious to help you ... anytime!

Here's what to do if you have a question or problem:

1. Check your Owner's Manual ...

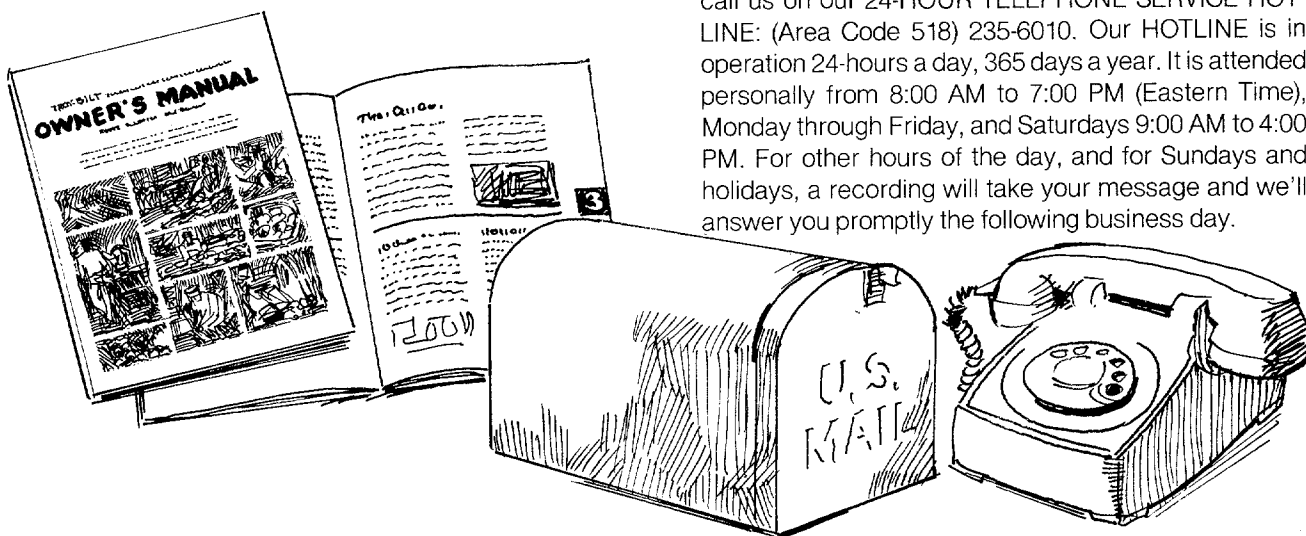
Chances are, you'll find the information you're seeking right here at your fingertips...in easy-to-understand illustrations and instructions. First look at the INDEX in the back of the manual to find the listing that covers the subject you're concerned with. Then, turn to the pages listed to see if the solution is given there or on other pages in that general category. Possibly your search will lead you to another section of the manual where you will find a solution.

2. Drop us a line or call us ...

If you can't find the answer here, then please write or call our Customer Service Department here at the tiller factory. When you do, one of our friendly, helpful tiller experts will gladly help you out — no matter how big or small you think the problem or question is.

A first-class letter from anywhere in the country will reach us within a few days (and often less). When your letter arrives, we will quickly attend to it and either call or write you with our answer.

If you don't care to write, or if it's urgent, then please call us on our 24-HOUR TELEPHONE SERVICE HOTLINE: (Area Code 518) 235-6010. Our HOTLINE is in operation 24-hours a day, 365 days a year. It is attended personally from 8:00 AM to 7:00 PM (Eastern Time), Monday through Friday, and Saturdays 9:00 AM to 4:00 PM. For other hours of the day, and for Sundays and holidays, a recording will take your message and we'll answer you promptly the following business day.



If you need to order a part for your tiller . . .

If you need to order a tiller part, please use the Part Number found in the *Master Parts Catalog* (which was also inside the plastic envelope with this manual). When you've located the part you want, use the *Parts Price List* and *Order Form*. The price list will tell you what the part costs and will give a one or two word description of the part. Then, simply fill the *Parts Order Form* out, enclose it (along with your payment) in the convenient envelope provided, and drop it in the mail-box. Upon receipt, we'll process your order just as quickly as possible.

Of course, if you have any questions about what part you might need, then please don't hesitate to write or call us before placing your order.



If you need engine service . . .

If engine service or repair is needed, contact your local Authorized Engine Service dealer (listed in the "Yellow Pages" of your phone book under "Engines, Gasoline" or "Gasoline Engines"). If you have trouble obtaining service or parts locally, please let us know.

We're here to serve you . . .

The whole idea behind Troy-Bilt Factory Service is to get parts, attachments and service advice out to you just as quickly as possible; also, to answer any questions you may have about tilling or gardening, by phone or by letter, depending upon what is needed.

Nothing is more important to all of us here at the tiller factory than making sure that every Troy-Bilt Owner is completely satisfied 100-percent of the time. You're always entitled to first-rate service. Please be assured that we will do our very best to see that you get it at all times. Thank You.



Dean Leith, Jr.
Dean Leith, Jr.,
Sales Manager

IMPORTANT!

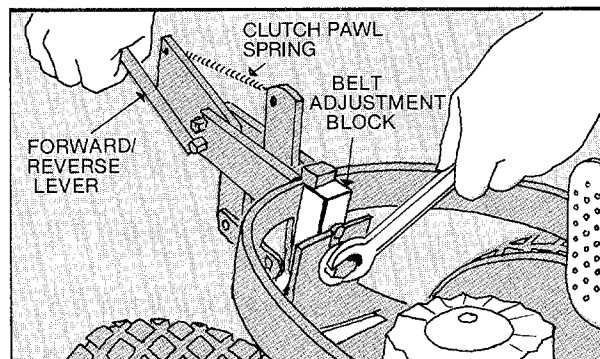
Before trying to run your Troy-Bilt Tiller for the first time, please make sure that you have taken the following steps:

1. Studied photographs locating controls and compared the photos with the actual controls on your tiller.
2. Have added the correct amount of #30 motor oil to the engine crankcase.
3. Have familiarized yourself with all of the engine controls.
4. Have worked the tiller controls without the engine running and understand what each does.
5. Have read the Safety Precautions in Section 2.

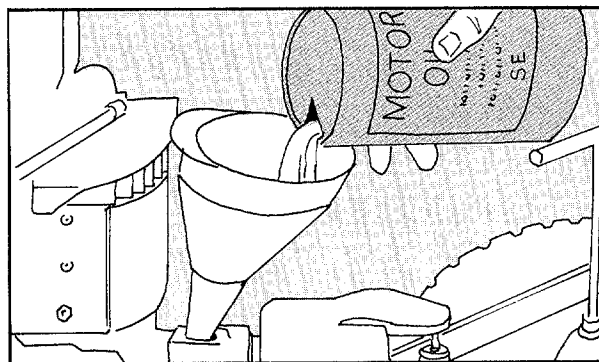
AN IMPORTANT MESSAGE REGARDING YOUR NEW TILLER

WITHIN THE FIRST FEW HOURS OF NEW TILLER OPERATION, YOU WILL HAVE TO:

1. ADJUST THE DRIVE BELT — After the first hour or two of use you may notice that your tiller runs well when the tines are out of the soil, but it slows down when the tines are in the soil, even though the engine continues to run with full power. This is a sign of a loose belt and it can be easily corrected by simply lowering the yellow-painted belt adjustment block. Complete instructions on how to do this are found in Section 5 of this Owner's Manual, "To Adjust Belt Tension."

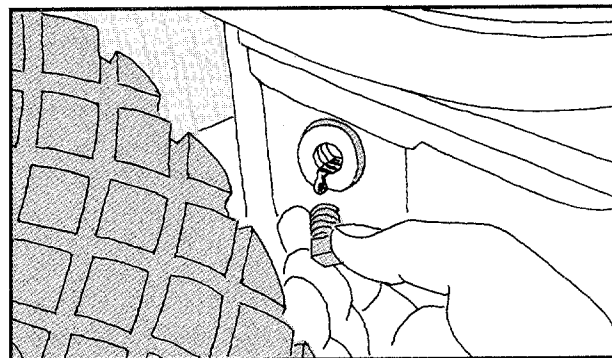


2. CHANGE THE MOTOR OIL — After the first 2 hours of operation of a new 6HP Tecumseh engine, or after the first 5 hours of operation of a new 7HP Kohler or an 8HP Briggs and Stratton engine, you must change the motor oil. Replace it with fresh motor oil classified for SF or SE service, as explained in Section 5, "Adding or Changing Engine Oil." Also see the instructions in the engine manufacturer's Owner's Manual that came with your tiller.

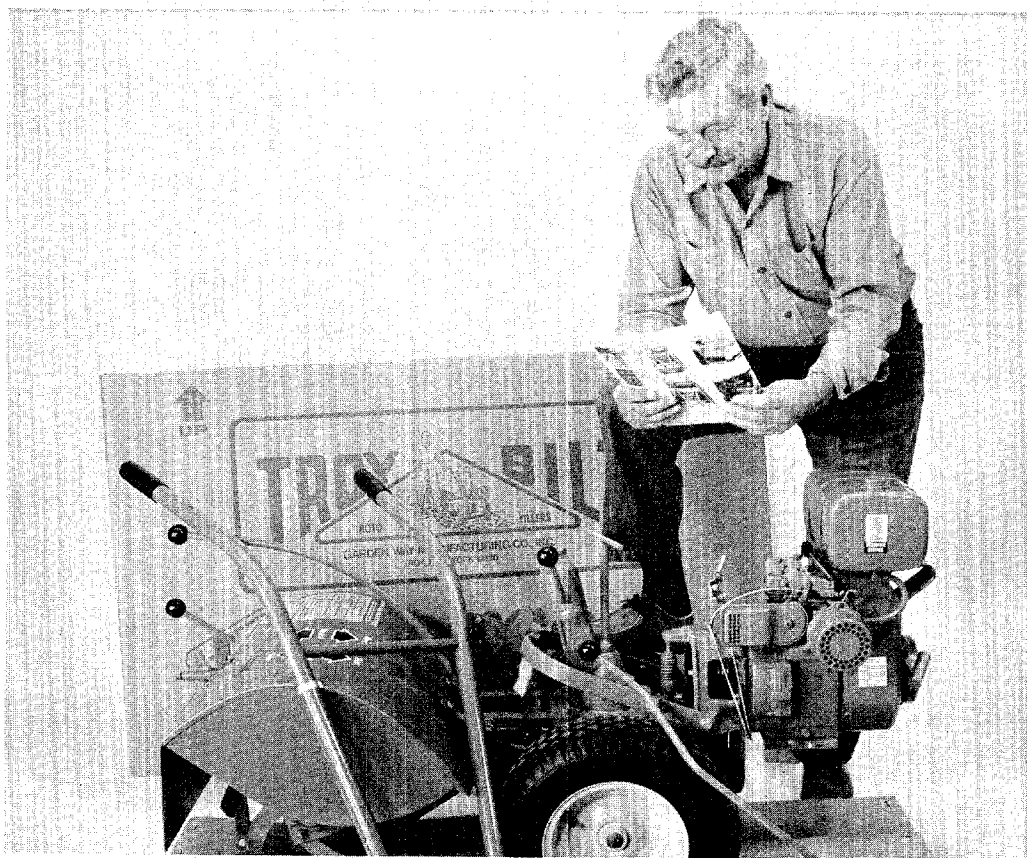


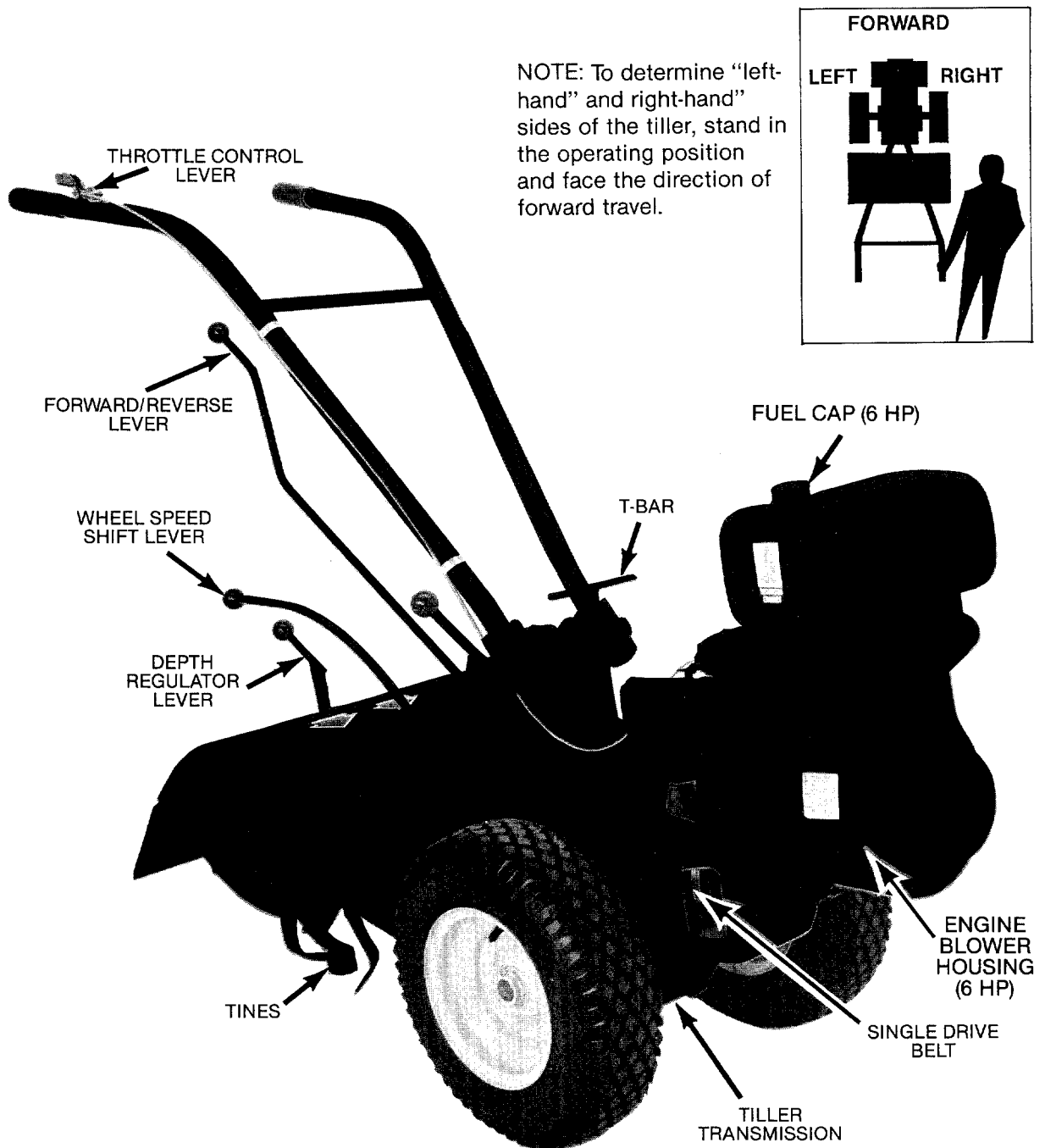
3. INSPECT TRANSMISSION FOR OIL LEAKS —

After the first 2 hours of operation, look over the entire transmission for evidence of an oil leak. Then, check the gear oil level by removing the Oil Level Plug. Make sure the gear oil begins to seep out the oil level hole. For detailed instructions see Section 5, "Check For Tiller Oil Leaks."



EASY ASSEMBLY





THE HORSE MODEL **TROY-BILT** **ROTO TILLER-POWER COMPOSTER**

SECTION 1: Easy Assembly

Here, in simple-to-follow steps is all you need to know about EASY ASSEMBLY of your new tiller.

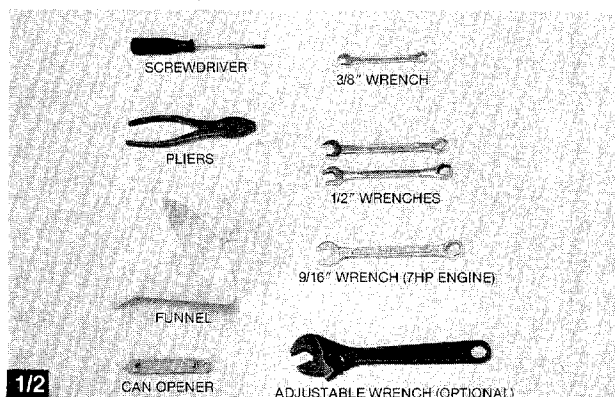
Since your tiller arrived 95% assembled, you'll only need about 45 minutes (average time) to finish setting it up. Of course, if you have an electric start model it will take a bit longer, due to the necessity of preparing your battery for use.

Briefly, here are the simple steps that we recommend you follow for fast, safe, and complete tiller and engine preparation:

- STEP 1** Removal from Shipping Container
- STEP 2** Checking Transmission Gear Oil Level
- STEP 3** Adding Motor Oil to the Engine
- STEP 4** Attaching the Forward/Reverse Lever
- STEP 5** Attaching the Throttle Cable
- STEP 6** For Electric Start Engines Only:
Preparing the Electric Start System

HELPFUL HINTS TO EASY ASSEMBLY

- Gather together the simple tools you'll need (see Photo 1/2) before you start.
- Read each assembly step through, once, before beginning the actual procedure.
- When you complete a step, check it off on the special listing on Page 19. This is important, as it may help to prevent missing a step — especially if your work is interrupted.



STEP 1: REMOVAL FROM SHIPPING CONTAINER

A. UNPACKING AND CHECKING CONTENTS

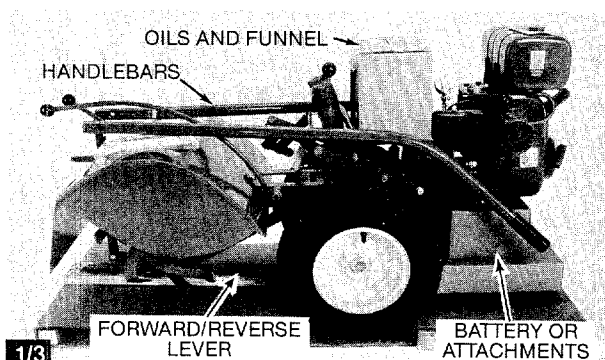
You have already removed the top and sides of the tiller's cardboard container, as well as the special shrink-fit protective plastic wrapping. Now, before attempting to remove the tiller from its container base, please remove the following items noted in Photos 1/3 and 1/4:

FOR ALL TILLERS...

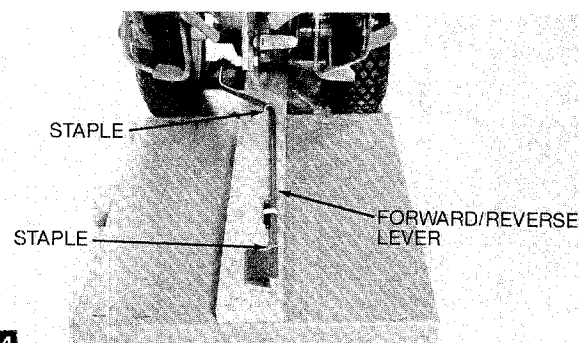
- The handlebars.
- The cardboard box containing two quarts of motor oil and a plastic funnel.
- The Forward/Reverse Lever (with clutch pawl spring taped to one end). This lever is stapled to the container base underneath the tiller, as shown in Photo 1/4. To remove it, *very gently* tilt the tiller forward until the engine is resting on the cardboard base. Then use a screwdriver to carefully pry the staples out of the board.
- Any specially ordered smaller attachments such as the hiller/furrower, tire chains, or tines will be located under the engine—if room permits. Otherwise, they will be shipped in separate cartons that accompany your tiller... as will the larger, dozer/snow blade and bumper attachments (if ordered).

FOR ELECTRIC START TILLERS ONLY...

- The cardboard box containing your battery.
- The plastic bag of electric start parts that is stapled to the literature envelope that contained this manual.



Here is a typical packing arrangement.



The Forward/Reverse Lever (with clutch pawl spring taped to it) is stapled to the board underneath the tiller.

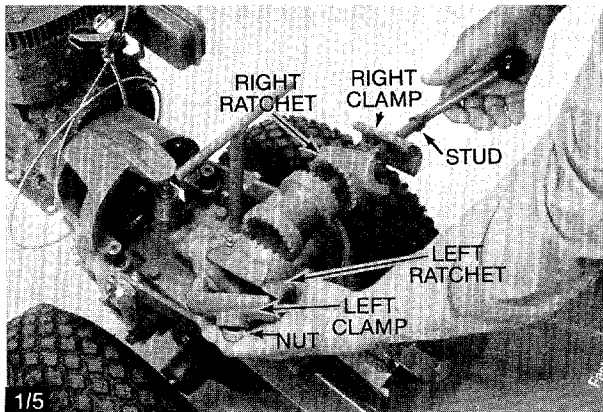
B. REMOVING THE TILLER FROM THE CONTAINER BASE

To remove the tiller, you simply attach the handlebars and then use them as a lever to roll the tiller off the

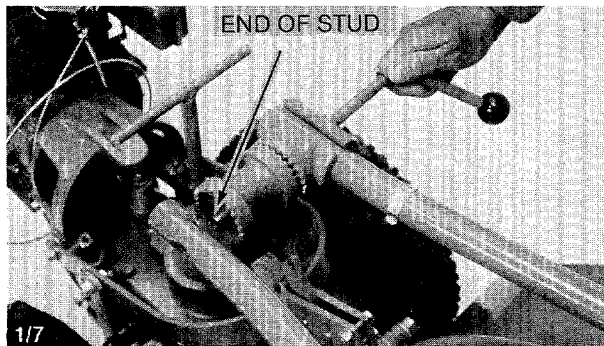
base. The procedure for attaching the handlebars and removing the tiller follows.

(CAUTION: For safety's sake, please don't try to lift the tiller off of the base — it weighs over 260 lbs!)

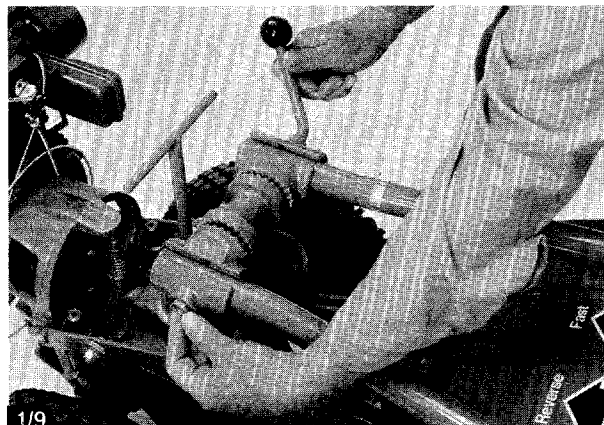
Attaching the handlebars



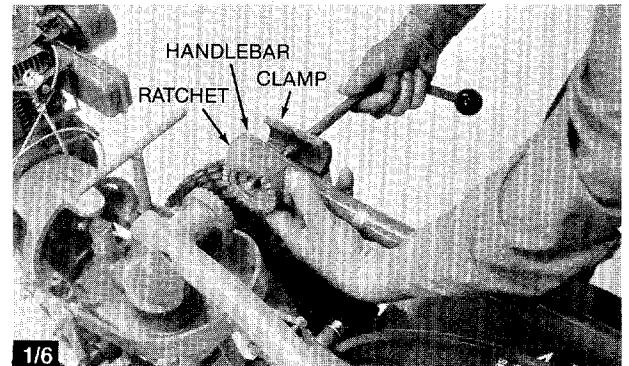
(1) Unwind and remove the handlebar height adjustment stud from the handlebar base, followed by the left and right side ratchets and clamps. Keep the left and right side ratchets and clamps separated from each other.



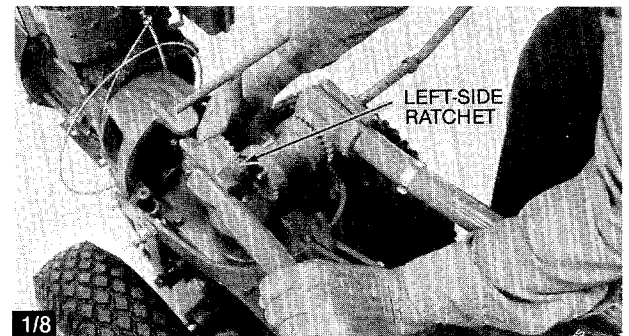
(3) Align the stud with the hole in the handlebar base and push it through the base until the threaded end just comes through the other side.



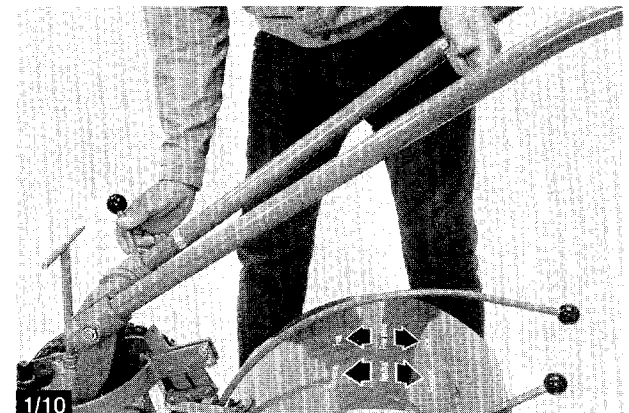
(5) Push the stud through the ratchet and handlebar, then gently wind it up against the nut on the outside clamp.



(2) Lay the handlebars down on the tiller so that the crossbar rests on the Wheel Speed Shift Lever. Now, on the right side handlebar, fit the ratchet (with the teeth facing the handlebar base) against the inside of the handlebar and place the clamp on the outside. Next, push the height adjustment stud through the clamp, handlebar and ratchet.



(4) Force the left side handlebar away from the handlebar base and install the remaining ratchet. Make sure that the teeth on the base and the ratchet are meshed.



(6) Set your handlebars to a comfortable height by unwinding the adjustment stud slightly and lifting the handlebars up. Finally, tighten the stud by winding it in until snug.

Removing the tiller



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(7) Raise the handlebars up until the tines are clear of the container base. Now, *in one steady motion*, pull the handlebars back and to one side, until one wheel rolls up and out of the hole in the base. If necessary, place one foot on the base to keep it from sliding along with the tiller. NOTE: If the wheels won't turn, move the Wheel Speed Shift Lever (shown in photo) a short distance up or down to take the wheels out of gear.



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(8) Keeping a firm grip on the handlebars, continue to roll the tiller backwards until it is free from the base.

IF, BY CHANCE, YOUR TILLER ARRIVES WITH FREIGHT DAMAGE OR MISSING PARTS...

IF YOU NOTICE ANY DAMAGE either at the time of delivery, or later during assembly, here's what to do! Make sure that you put it in writing within 15 days that you intend to file a claim. Tell the driver, or phone the truck terminal that you intend to file a written claim with them. They will advise you how to proceed from there so that you'll get complete satisfaction with any claim you may have. But, if you have any problem with this

procedure, please let us know so that we can lend a hand. The letter confirming your order also had additional information describing exactly what to do in case of damage.

IF YOU THINK SOMETHING IS MISSING — notify the freight company just the same as above. But, if you have any questions about anything that we can be helpful with, please call or write to us here at the factory.

STEP 2: CHECK THE TRANSMISSION GEAR OIL LEVEL

Before leaving the factory, your tiller's transmission was filled with the proper amount (approximately 6½ pints) of SAE 140 Gear Oil. We do, however, want you to check the oil level before operating your tiller the first time to be absolutely sure the level is still correct. It only takes a few minutes to make this important check.

Please note that you can use the SAE 140 gear oil at all times, unless you use your tiller in temperatures below 32°F. Then, it is best to switch to an SAE 90 gear oil as it will flow easier at the colder temperatures. Otherwise, the gear oil never needs to be changed, unless you know or suspect that it has become contaminated with dirt, sand or metal particles.

IMPORTANT SERVICE INFORMATION

Operating the tiller when the transmission is low on oil can cause a rapid buildup of excess heat that will damage gears, worms, and bearings. To prevent transmission damage:

- After the first two hours of new tiller operation, check the gear oil level and inspect the transmission for any gear oil leaks — see Section 5, Page 114.
- Check the gear oil level at every 30 hours of tiller operation, or at least twice a season.
- Never use motor oil or automotive transmission oil in the transmission...they are too light and will leak badly. Always use heavier gear oil (SAE 140 or 90 viscosity).

TO CHECK THE GEAR OIL LEVEL...

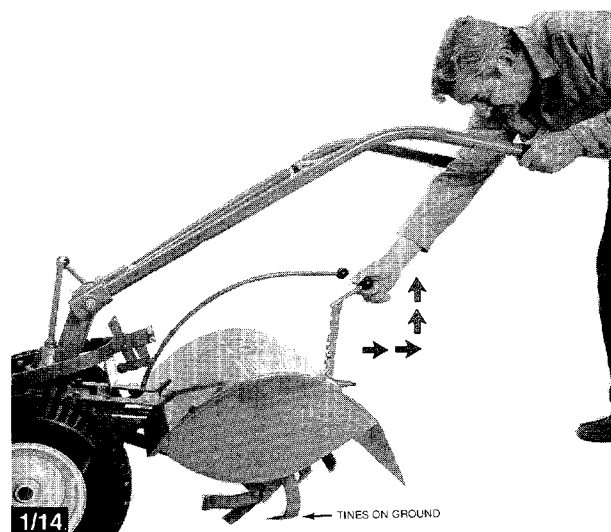
(1) Start with the tiller on level ground. Then, pull the Depth Regulator Lever back and then up until the tines are on the ground — see Photo 1/14.

(2) Using a ¾" wrench, remove the oil level check plug from the left side of the transmission case (just above the wheel axle), as shown in Photo 1/15. If the oil level is correct, oil should start to flow out of the hole when the plug is removed. If it does, securely replace the plug. The level is correct, and your check is finished.

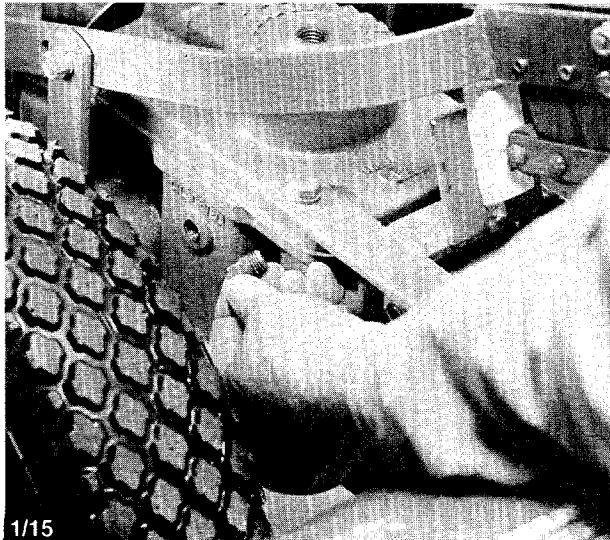
If, however, oil DOES NOT flow out of the hole, then the transmission is low on oil, and you should check it further as explained in No. 3, below. **CAUTION:** Serious damage will result to your transmission if it is allowed to run without an adequate supply of gear oil.

(3) To check the level further, the tiller must be tilted slightly on its side so that the oil will flow toward the check hole. Do this by either moving the tiller to an uneven spot of ground, or by running the right-hand wheel up on a small board. If oil flows out of the hole while at this slight incline, then only a small amount of gear oil will be needed to bring the level up to the correct height (see "To Add Gear Oil" on Page 13).

If gear oil DOES NOT seep out of the hole when the tiller is tilted slightly as explained above, then you may be dangerously low on oil — see "To Add Gear Oil" on Page 13. If your tiller arrived with oil dangerously low, or if you need further advice, we'd appreciate hearing from you.

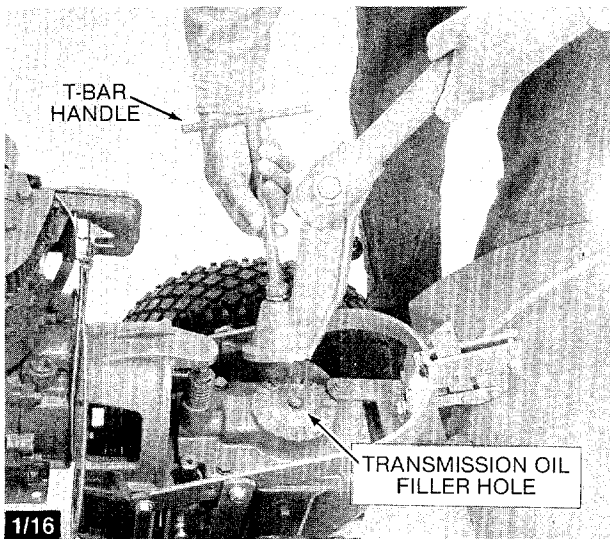


Pull lever up to lower tine end.



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Remove oil level check plug.

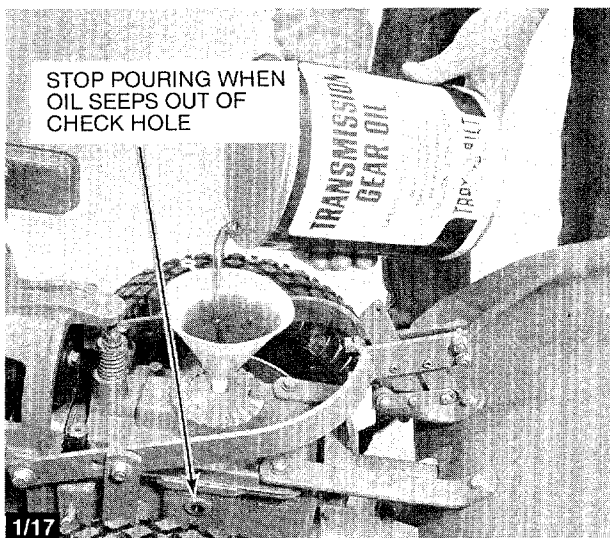


T-BAR
HANDLE

TRANSMISSION OIL
FILLER HOLE

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Add oil through top filler hole.



STOP POURING WHEN
OIL SEEPS OUT OF
CHECK HOLE

TRANSMISSION
GEAR OIL

1/17

Add gear oil if necessary.

TO ADD GEAR OIL...

Use only SAE 140 gear oil (the grade that came inside your transmission) or SAE 90 gear oil. Gear oil should be available at well-stocked automotive service stations or supply stores. If not, take a clean container to a farm supply store, or to a tractor, truck or heavy equipment sales and service garage. They'll usually sell you the amount you need. Never use multi-viscosity gear oil, motor oil, or automotive transmission oil in your transmission. An empty transmission will need about 6½ pints (8 pints = 1 gallon).

(1) Begin with the tiller on level ground. Then, pull the Depth Regulator Lever back and then up until the tines are on the ground—see Photo 1/14. This position will allow the gear oil to flow down the transmission tube to the tiller drive gears and bearings.

(2) If you haven't done so already, then remove the oil level check plug from the left side of the transmission case, as shown in Photo 1/15.

(3) Unthread the T-bar handle by twisting it to the left and remove the handlebar base and T-bar, as shown in Photo 1/16. Set these parts on a clean surface so they won't pick up any dirt that could enter the transmission when they're replaced. With the base removed, you can see the oil fill hole in the top cover of the transmission.

(4) Using a clean funnel, slowly pour the gear oil into the fill hole, as shown in Photo 1/17. Stop pouring when the oil JUST BEGINS to flow out of the oil level hole on the side of the transmission. At this point, the oil is up to the proper level and you should securely replace the oil level plug. DON'T OVERFILL.



STEP 3: **ADDING MOTOR OIL TO THE ENGINE**

The engine on your new tiller is completely drained of oil. Therefore, before operating the tiller, you must add the correct amount of fresh, good quality motor oil to the engine crankcase. The two quarts of SF classified, #30 viscosity oil that we supplied with your tiller more than fulfills this requirement.

We recommend that you use straight #30 viscosity motor oil in temperatures above 32°F. For colder temperatures, please refer to the oil recommendations that are specified in the engine manufacturer's Owner's Manual which you received with your tiller.

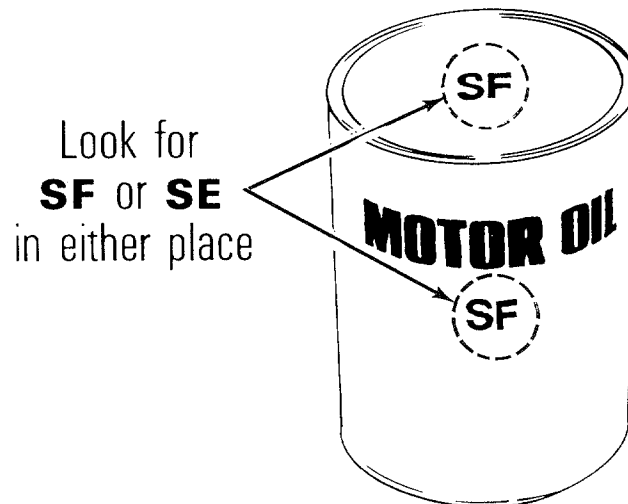
The Tecumseh and Kohler Engines each have a different oil capacity, so please see the oil filling instructions that follow for your particular engine. If you have an 8HP Briggs & Stratton Engine, please refer to your green-covered, 8HP Owner's Manual Supplement for filling instructions.

IMPORTANT SERVICE INFORMATION

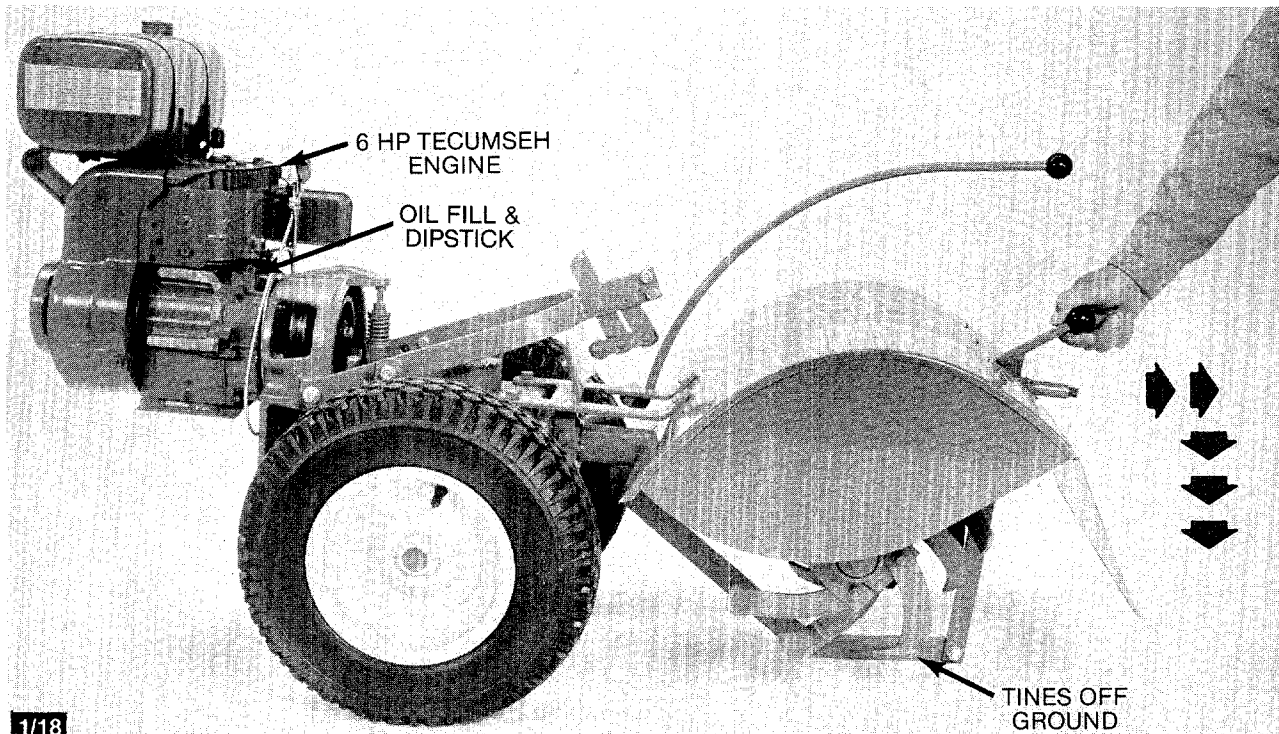
- Read your Tecumseh, Kohler or Briggs & Stratton Engine Owner's Guide thoroughly for complete instructions and warranty information.
- Change the engine oil after the first two hours (Tecumseh) and after five hours (Kohler or Briggs & Stratton) of new tiller operation. Then, change oil every ten hours, or sooner if tilling in dusty, dry conditions (see Section 5, Page 101).
- Check and service the air cleaner frequently. See Section 5, Page 103 for detailed information about air cleaner service, as well as other important engine maintenance information.

CHOOSING THE RIGHT MOTOR OIL

For future oil changes, always select an oil that has the letters SF or SE printed on the top of the can or on the label. There may be other letter combinations (such as SC or SD) also on the can, but as long as SF or SE appears, then you know it is the proper classification for your engine. Oils with these service designations contain detergents and other additives for greatest engine protection against high temperatures, oxidation, rust, corrosion and dirt buildup. Do not use non-detergent oil in your tiller's engine.



ADDING OIL TO 6HP TECUMSEH ENGINES...



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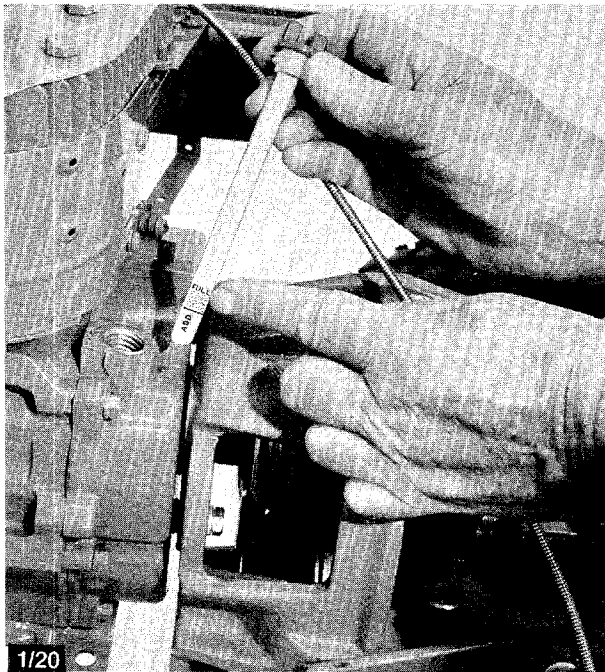
(1) Start with the tiller on level ground. Then move the Depth Regulator back and then down until it engages the top notch (the tines will be off the floor). This places the 6HP engine at the correct

slope for measuring the amount of oil in the crankcase. Always slope the engine at this angle (while on level ground) when measuring the oil level.



1/19

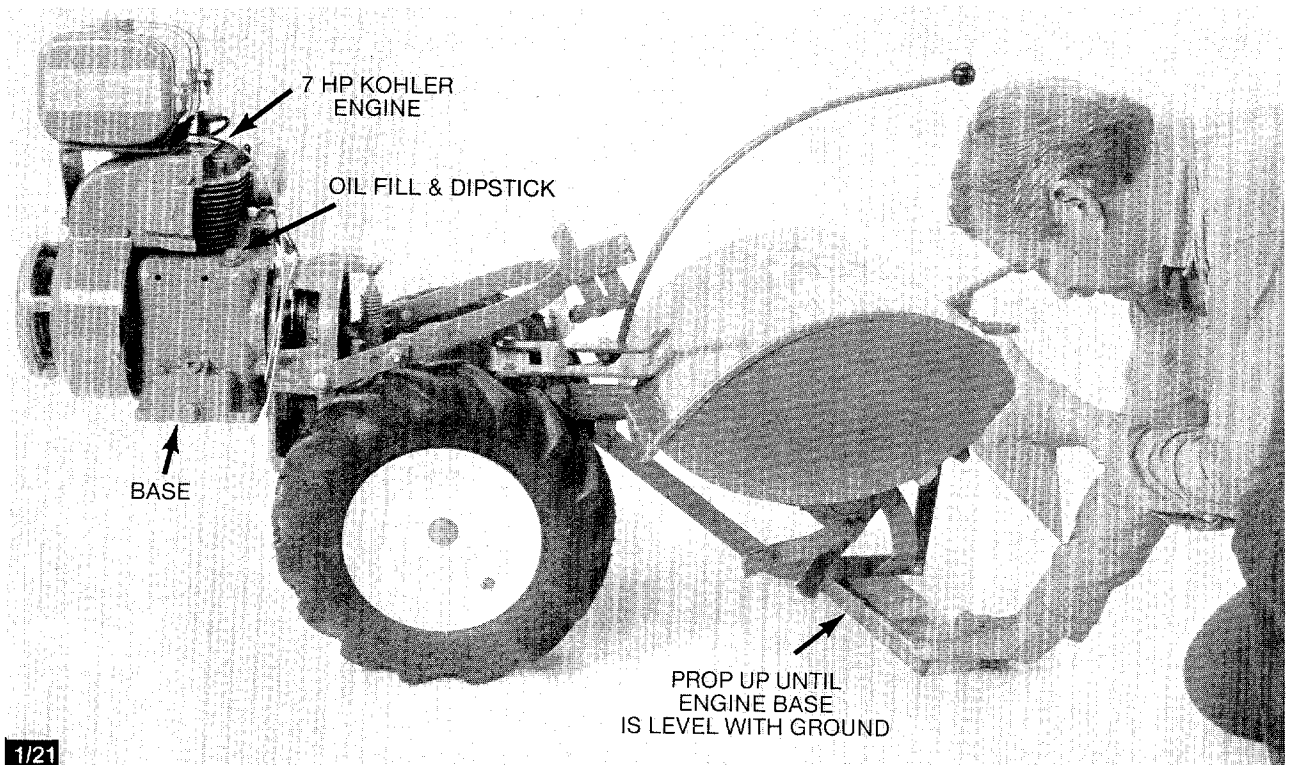
(2) Unscrew and remove the dipstick from the engine. Using a clean funnel, pour the #30 weight oil into the crankcase until the oil level reaches the "Full" mark on the dipstick (see Photo 1/20). DO NOT OVERFILL! It should take about 24½ ounces (1 quart = 32 ounces) to fill a new engine. After filling, securely replace the dipstick. **CAUTION:** Before removing dipstick, always clean around dipstick area to prevent dirt from falling into engine.



1/20

(3) When measuring the oil level for the 6HP engine, thread the dipstick all the way in, wait a few moments, then remove. **Check oil level frequently and maintain level at the "Full" mark.** Securely replace dipstick before operating engine.

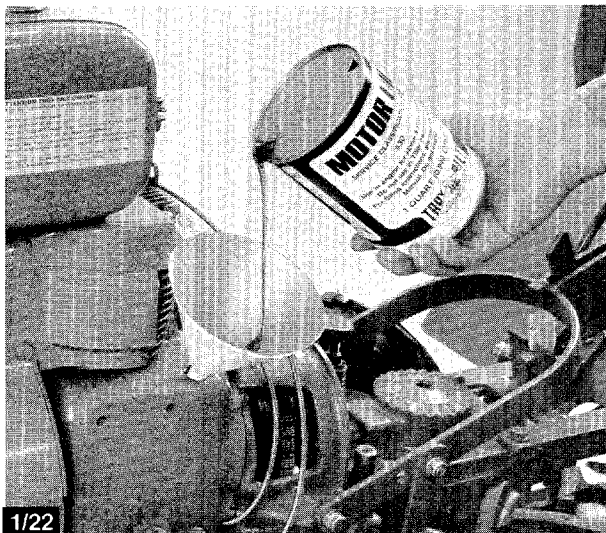
ADDING OIL TO 7HP KOHLER ENGINES...



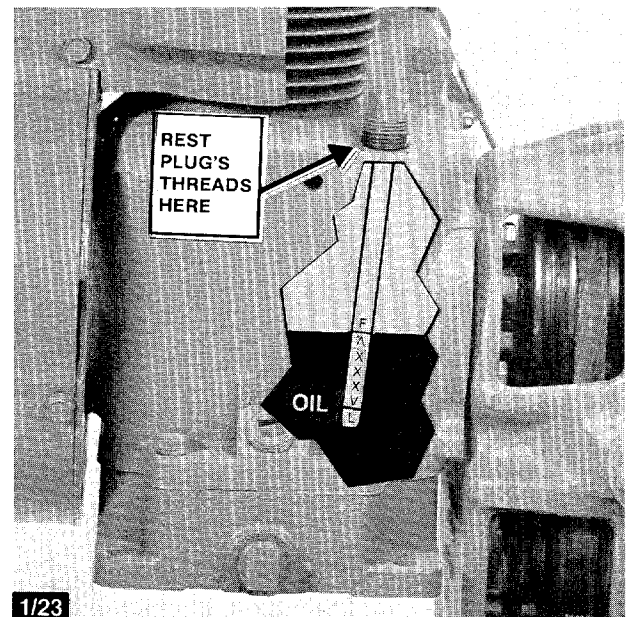
1/21

(1) Start with the tiller on level ground. Then level the engine base by placing something under the tines or the tiller's drag bar. The engine base must

be leveled in this manner in order to correctly measure the amount of oil in the crankcase.



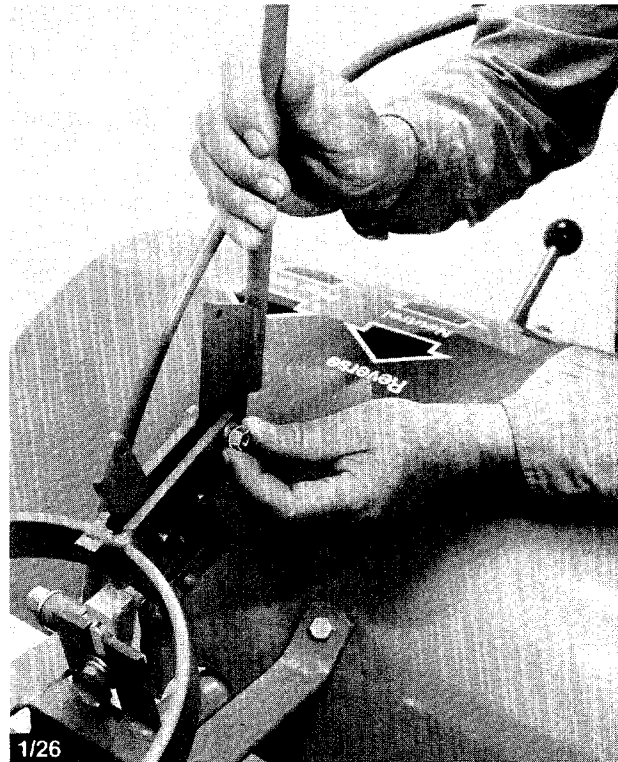
(2) With a $\frac{9}{16}$ " wrench, unscrew and remove the dipstick from the engine. Using a clean funnel, pour the #30 weight oil into the crankcase until the oil level reaches the "Full" mark on the dipstick (see Photo 1/23). **DO NOT OVERFILL!** It should take about $2\frac{1}{2}$ pints (1 quart = 2 pints) to fill a new engine. After filling, securely replace the dipstick. **CAUTION: Before removing dipstick, always clean around dipstick area to prevent dirt from falling into engine.**



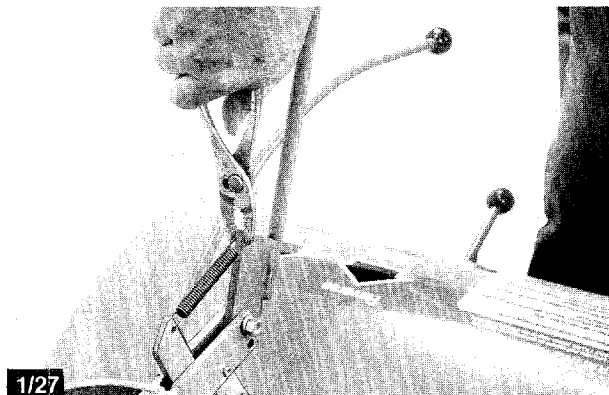
(3) When measuring the oil level for the 7HP engine, **DO NOT** thread the dipstick inward. Instead, rest the threads of the plug on top of the hole. After waiting a few moments, remove the dipstick. **Check oil level frequently and maintain level at the "Full" mark.** Securely replace dipstick before operating engine.

STEP 4: ATTACHING THE FORWARD/REVERSE LEVER

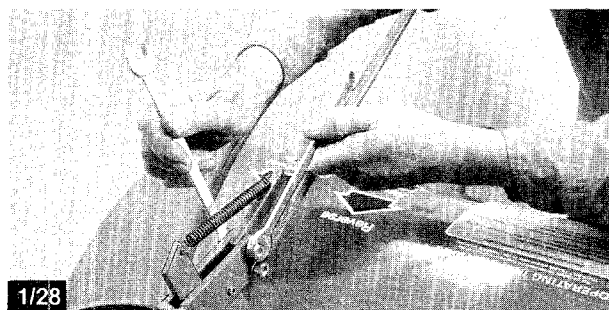
The next step is to take the Forward/Reverse Lever and attach it to the clutch yoke assembly. First, remove the clutch pawl spring that is taped to the end of the lever. Then, proceed as follows:



(1) Remove the two bolts from the end of the clutch yoke and insert the flat plate of the lever in between the parallel pieces of the yoke. Install a bolt through the top holes in the plate and yoke and add the lockwasher and nut — leaving them loose, for now.



(2) Lift the lever up and attach the spring through the small holes in the roller assembly vertical link and in the lever hole. Now, while the spring is relaxed, pinch the ends of the spring flat against the link and the plate, if they are open too wide.



(3) Pull the lever down and install the second bolt, lockwasher and nut. Using two 1/2" or adjustable wrenches, tighten the nuts enough to flatten the lockwashers. When fastened securely, the lever should be tight enough so that it doesn't wobble up and down or to the left or right.

YOU CAN REPLACE YOUR HANDLEBARS NOW...

With your transmission and engine properly lubricated and with the Forward/Reverse Lever attached, you can now replace the handlebars on your tiller. To do so, simply place the handlebar base on top of the transmission cover and thread the T-bar handle all the way in until tight.

SPECIAL NOTE TO OWNER'S OF ELECTRIC START TILLERS

Before replacing your handlebars, you should first activate and install your battery, as explained on Pages 19-24. After you have the battery hooked-up, you can then replace the handlebars and attach the throttle cable, as explained next. **CAUTION:** Always avoid touching the T-bar against the positive (+) terminal of the battery. Doing so can cause a dangerous spark to occur.

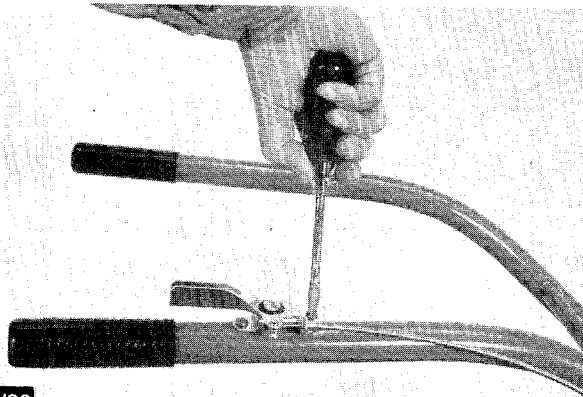


STEP 5: ATTACHING THE THROTTLE CABLE

Your throttle control cable and lever is attached to the engine and has been factory adjusted for proper carburetor control operation. All you need to do is unwrap the cable from around the engine and attach it to the right-side handlebar, as shown below.

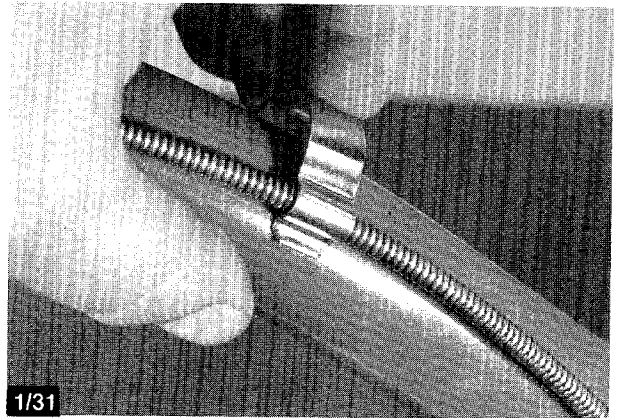
NOTE: If you ordered a Bumper/Guard attachment

with your tiller, you should install it now before attaching the throttle cable. Instructions for installing the bumper are contained in the bumper carton. After you install the bumper, be very certain that you attach the throttle cable, as explained below.



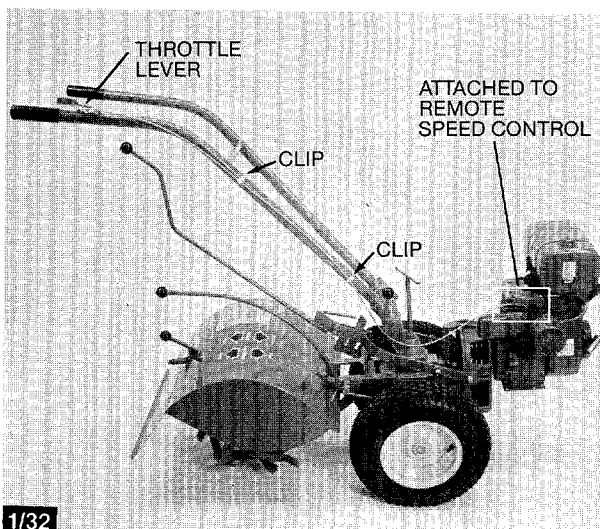
1/30

(1) Carefully unwind the throttle cable from around the engine and lay it along the right handlebar. Then remove the two screws from the handlebar and use them to securely attach the throttle control lever. Please be careful not to kink the cable when you are uncoiling or attaching it. NOTE: If you have an electric starting tiller, please see Photo 1/33 for special throttle cable routing instructions.



1/31

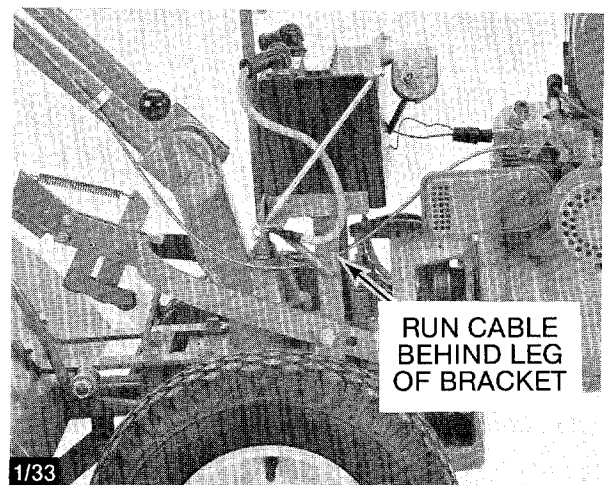
(2) To hold the cable in place, pry one clip off the handlebar grip, lay the cable under the small raised portion of the clip and push the clip back into place. Repeat with the second clip. See Photo 1/32 for suggested locations of the clips. Please note that the clips are not designed to fit all the way around the handlebar.



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(4) On all engines — route the cable down the right handlebar and directly across to the engine. Note that there is some slack in the cable between the handlebars and the engine. This slack permits you to swing the handlebars to either side without putting stress on the throttle cable at the engine connection.

SPECIAL CAUTION FOR ALL ELECTRIC START TILLERS



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On electric start tillers, make sure that the throttle cable doesn't touch any part of the battery or its mounting bolt. DO NOT RUN the cable across the top of the battery — it could short out and damage the battery, as well as melt the throttle cable. As shown above, the cable should be routed behind the right leg of the battery bracket.

IMPORTANT! GET TO KNOW YOUR TILLER AND ENGINE

If you have carefully followed the Easy Assembly Steps (see checklist below), then your tiller should be fully assembled now and you can go on to Section 2. Please!...before trying to start the engine or operate your tiller, be very certain that you:

1. Study the photographs in Section 3 locating the tiller controls and compare the photos with the actual controls on your tiller.
2. Work the tiller controls without the engine running until you understand what each does.
3. Read the Safety Precautions in Section 2.
4. Familiarize yourself with all of the engine controls — see Section 3 and the engine manufacturer's Owner's Guide. Do not add gasoline to your fuel tank until you have thoroughly read that information.

EASY ASSEMBLY CHECKLIST

Check When Completed

- | | | |
|---------------|---|--------------------------|
| STEP 1 | Attach handlebars and remove tiller and assembly parts from shipping container. | <input type="checkbox"/> |
| STEP 2 | Check the level of the transmission gear oil. | <input type="checkbox"/> |
| STEP 3 | Add #30 weight motor oil to engine. | <input type="checkbox"/> |
| STEP 4 | Attach Forward/Reverse Lever and reinstall handlebars. | <input type="checkbox"/> |
| STEP 5 | Attach throttle cable. | <input type="checkbox"/> |
| STEP 6 | For electric start engine only — service and hook-up battery. | <input type="checkbox"/> |

STEP 6: PREPARING THE ELECTRIC START SYSTEM FOR USE

Your electric starting Troy-Bilt Tiller (Photos 1/34 and 1/35) provides you with the convenience of key-switch starting of your engine — much like an automobile. A simple turn of the key starts and stops the engine, and when the key is removed there is some additional security against unauthorized use of your tiller (especially by children).

The following pages describe how to hook-up the battery to the 6HP electric start tiller. If you have an 8HP Briggs & Stratton electric start engine you can also use this information, but you must also read the special information pertaining to your electrical system that appears in your green-covered, 8HP Owner's Manual Supplement.

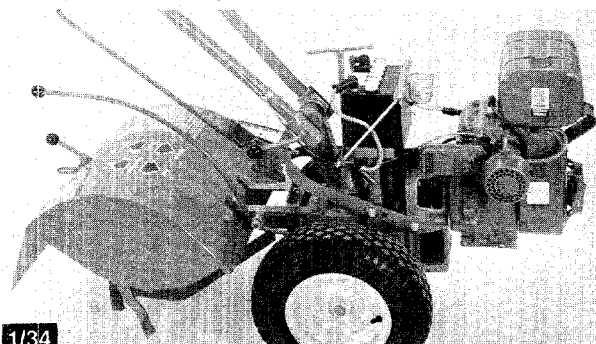
SAFETY NOTE — We suggest that you always remove the key when you are done tilling for the day, and that you keep both keys in a secure, but easily found place.

The electric starting engine on your tiller is equipped with a powerful starter motor that is activated by a 12-volt battery (30 amperes and 54 plates). The battery is automatically recharged during tilling — see Sketch 1/36.

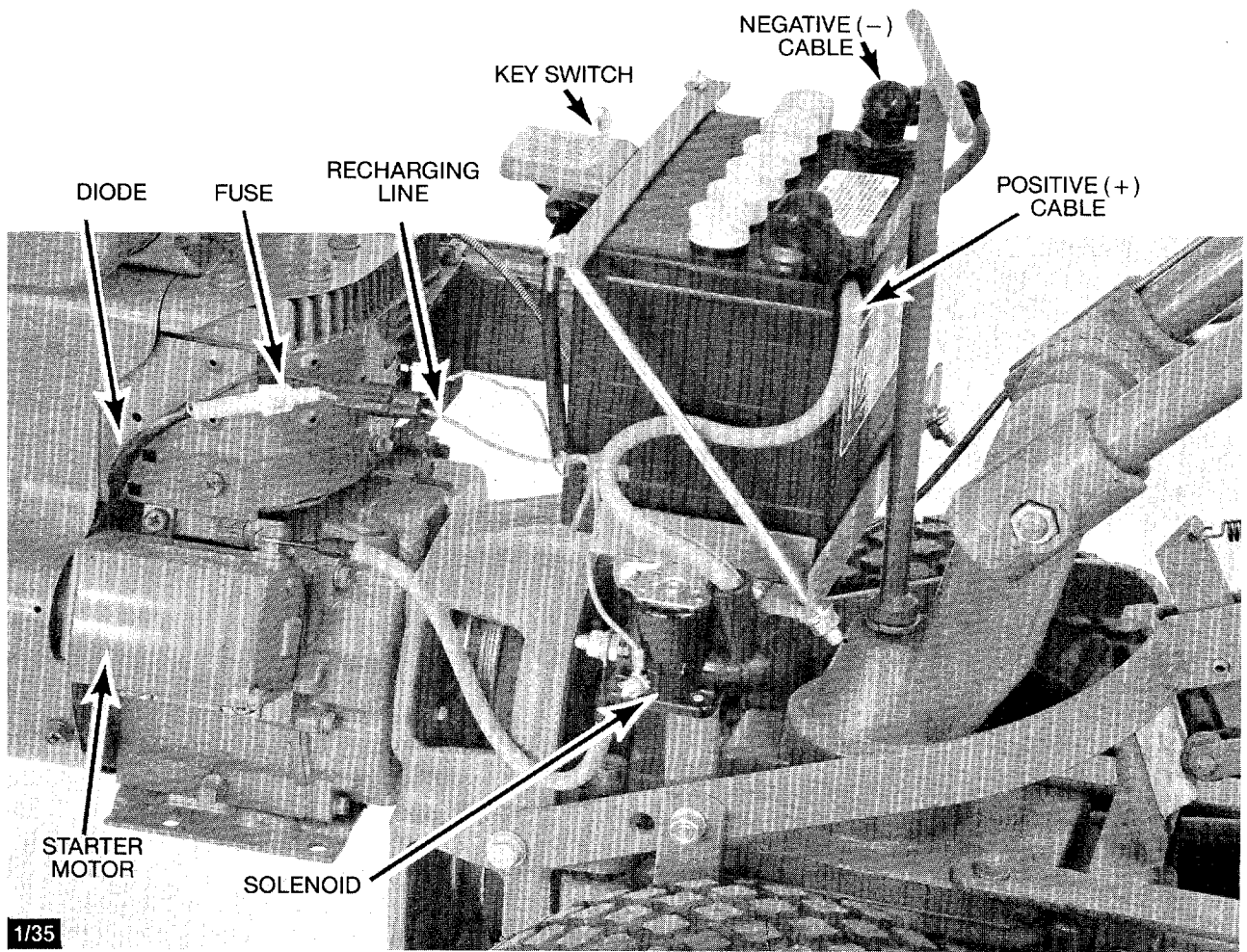
Please note that you can also start your engine with the recoil starter rope, if necessary. Before doing so, however, you should first read Pages 191 through 194 in Section 6, which describes how to solve most electric starting problems, and also explains how to protect your electrical system from damage if you have a dead battery or if one or both battery cables is disconnected.

Except for the key starting feature, operation of your tiller and engine is the same as described in Section 3 of this manual.

CAUTION: "How to Start and Stop" information is in Section 3 of the manual. Do not add gasoline or attempt to start engine until you have read Section 3.



6HP Tecumseh Electric Start engine viewed from right side of tiller.



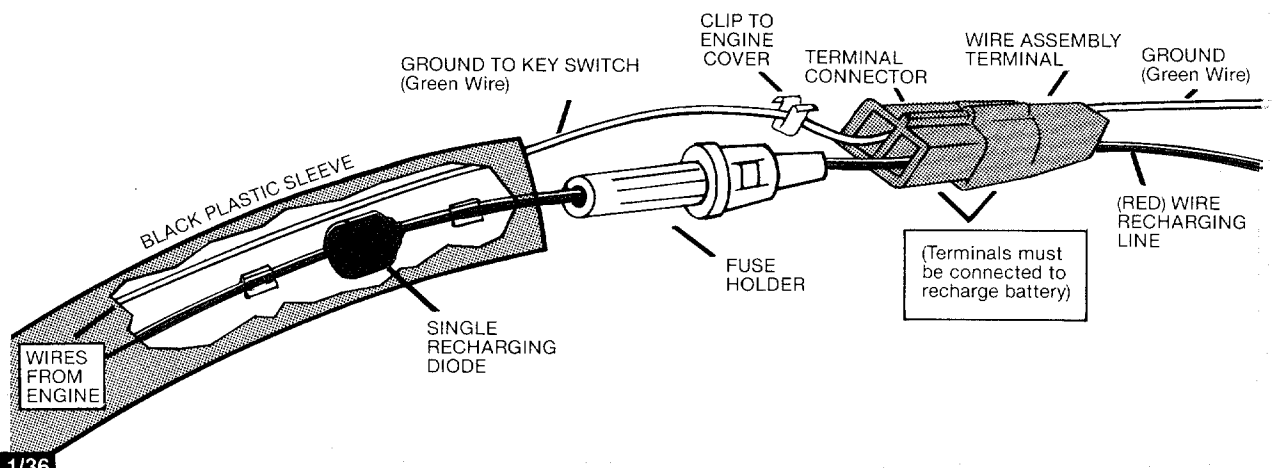
1/35

View of completely assembled electric start system.

A. GATHER TOGETHER THE ELECTRIC START PARTS

Most of the electric start system has already been assembled for you at the factory. The few remaining parts that you will need now are shown in Photo 1/37 and described below:

- A Troy-Bilt lead-acid battery, 12 volts, 30 amperes.
- A battery cable used to connect the negative (–) post of the battery with the grounding point on the battery bracket.

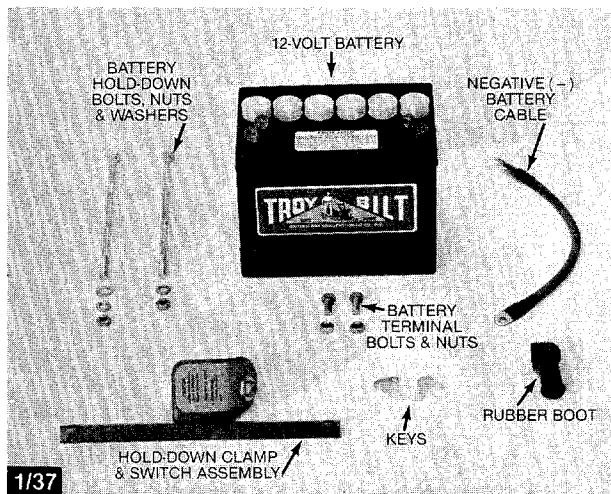


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To recharge the battery automatically, a small current from the engine flows through the diode

and fuse to the solenoid terminal, and into the battery via the battery's positive cable.

- Two, 9" long, carriage bolts for the battery hold-down clamp and the necessary washers and nuts.
- Two battery terminal bolts (3/4" long) and nuts.
- A battery hold-down clamp and key switch assembly (with two keys).
- An insulated rubber boot for the negative (–) post of the battery.



These are the unassembled parts that you'll need. These parts (except for the battery) were packed in the plastic bag that was stapled to your literature envelope.

B. ACTIVATING THE BATTERY

Your battery was shipped to you "dry." To ready it for use, each cell must be filled to the proper level with electrolyte (battery grade acid, which is sulfuric acid with a specific gravity of 1.265 for your battery).

The warning below (and on your battery), is required to warn you about the battery's use after you have added the acid to it:

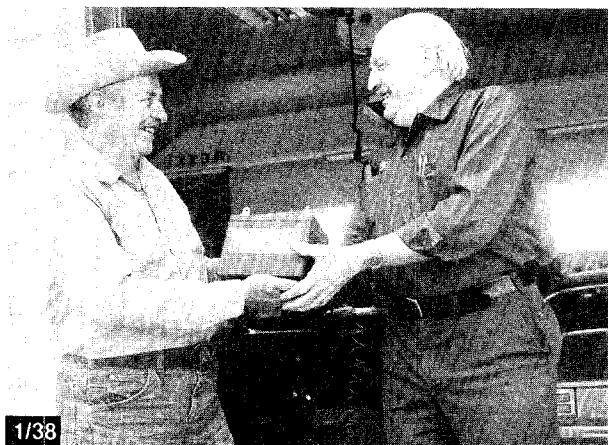
POISON/DANGER CAUSES SEVERE BURNS

Contains sulfuric acid. Avoid contact with skin, eyes or clothing. Antidote: EXTERNAL - Flush with water. INTERNAL - Drink large quantities water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately. Eyes-Flush with water for 15 minutes and get prompt medical attention. BATTERIES PRODUCE EXPLOSIVE GASES. KEEP SPARKS, FLAME, CIGARETTES AWAY. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries. KEEP OUT OF REACH OF CHILDREN.

SPECIAL WARNING - Batteries produce explosive gases. Keep cigarettes, pipes, cigars, flame and sparks away from the battery. Never bring a gasoline can near the battery terminals, a spark caused by touching the positive terminal and other metal could cause an explosion of the battery or gasoline. When working on connections of the battery, follow instructions closely and don't touch the positive battery post and any other surrounding metal with tools, jewelry, or any other metal object, because a short circuit could occur. Your tiller has been provided with insulated rubber boots that fit over the two posts on the battery and on the positive cable connection of the solenoid. To help prevent the possibility of a spark or short circuit from occurring, always keep these boots in their proper place.

Activating a battery with battery acid can be dangerous work and is best left up to those persons who have the necessary training and equipment to do it safely. Please do not attempt to do it yourself unless you are fully experienced in battery service work. The easiest (and safest) way to have your battery serviced is to take it to a reliable automobile service station, auto-electric shop, battery store, or truck or farm equipment service shop. There, a qualified serviceman can have your battery properly activated in a short time. He will also have the necessary testing equipment to check the battery's condition after activation.

Have him fill all six cells of your battery with fresh battery grade acid (specific gravity of 1.265). No water or other liquid should be added during this initial activation of the battery (later, you may add distilled water to replace water that has "boiled off"). Each cell should be filled until the acid just covers the level indicator ledge, as shown in Sketch 1/39. After filling, wait 30 minutes and recheck the level in each cell. Add more acid, if needed. The battery should take slightly less than 1-3/4 quarts (56 ounces) of electrolyte.

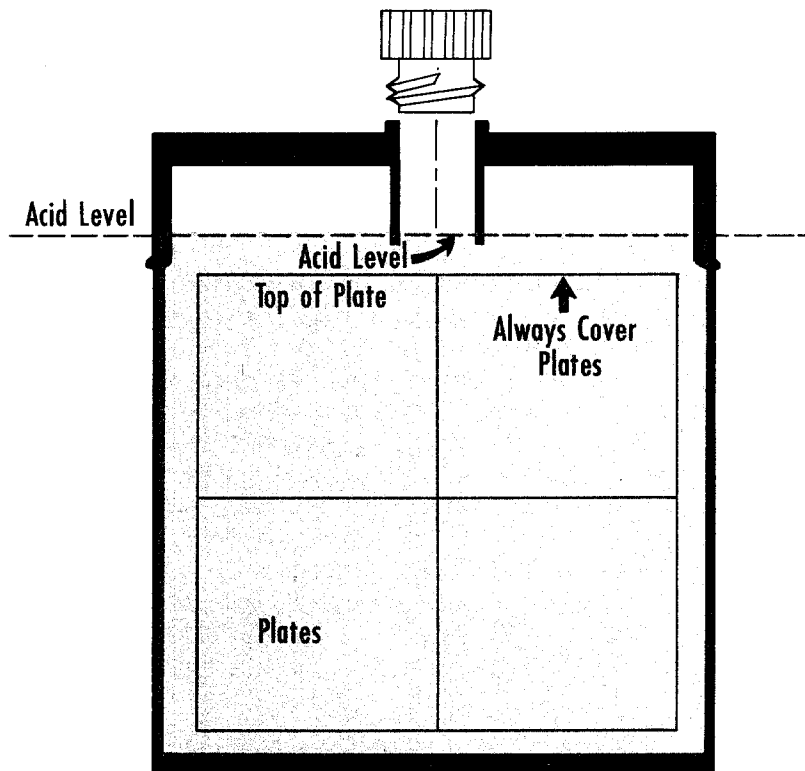


For ease and safety, have your local mechanic activate your new battery.

Finally, have him check the acid temperature and the state of charge. The acid temperature must be at least 80° Fahrenheit. The state of charge must be good (specific gravity must be at least 1.250).

NOTE: It is very unlikely that your battery will need a "startup" charge. However, if it is necessary, then have a qualified service station or battery store charge it at 4 to 6 AMPERES until the electrolyte temperature is at least 80° Fahrenheit and the specific gravity reading is at least 1.250. The acid temperature must never exceed 125° Fahrenheit while charging. Do not exceed a 6 Amperes charging rate — it could permanently damage your battery.

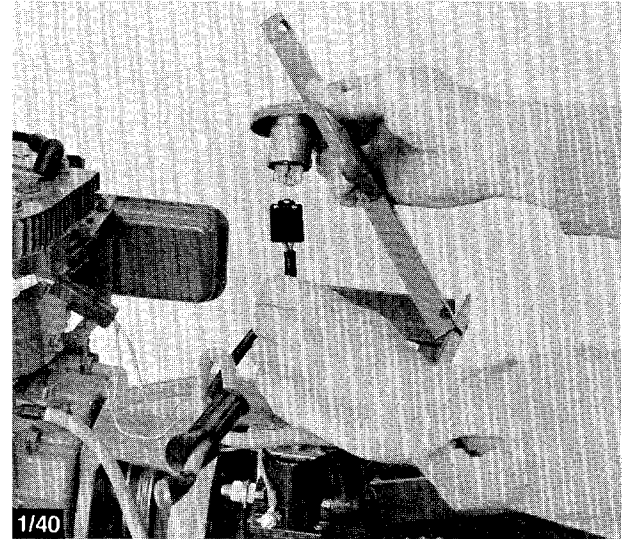
CAUTION: Never attempt to "jump" the tiller battery with your car's battery or charging system. Doing so could result in serious personal injury or property damage from such causes as battery explosion, battery acid, or electric burns. It might also ruin the tiller's electronic and ignition components.



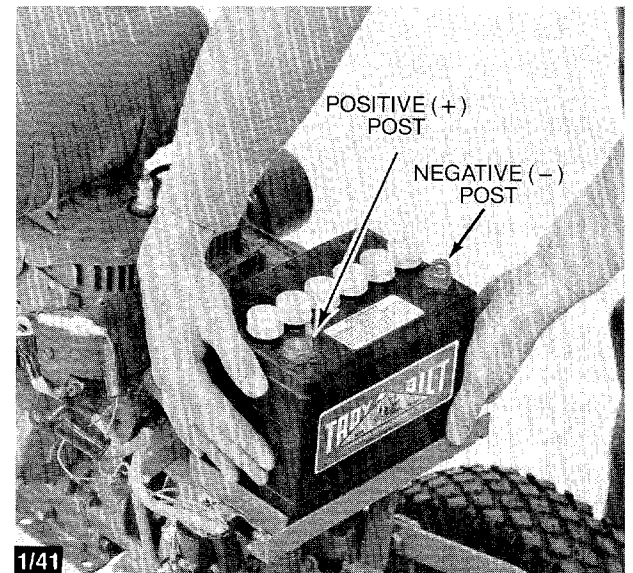
1/39 FILL BATTERY TO BOTTOM OF ACID FILL HOLES OF EACH CELL
Always keep plates covered with acid.

C. INSTALLING AND WIRING THE BATTERY

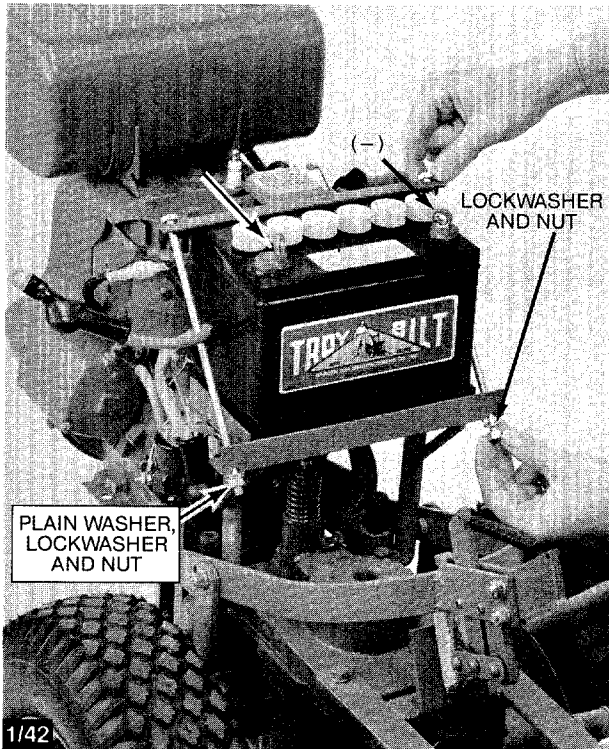
Once your battery is activated, it's simple to hook it up to the electrical system, as shown in the photos that follow. Before beginning, remove rings, metal watch bands, and other jewelry.



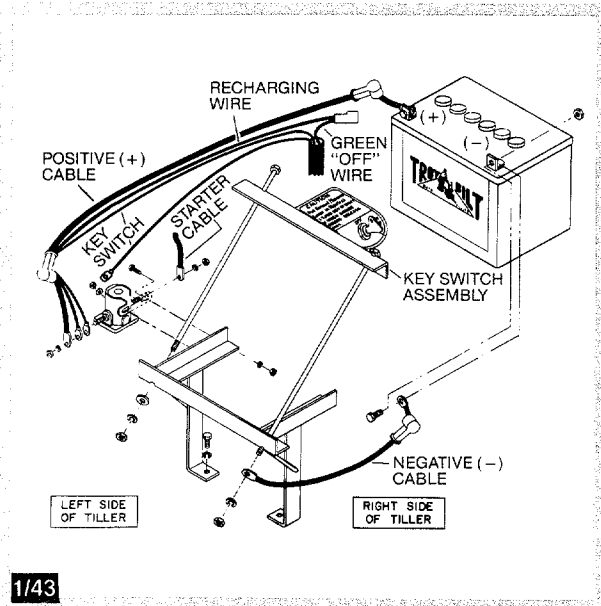
(1) Take the battery clamp and key switch assembly (shown in Photo 1/37) and securely plug in the receptacle that has three wires (two red and one green) leading out of it. If the key is in the switch, turn it to the "OFF" position and *remove the key* from the switch. Now gently set the clamp assembly aside, without putting undue stress on its wires.



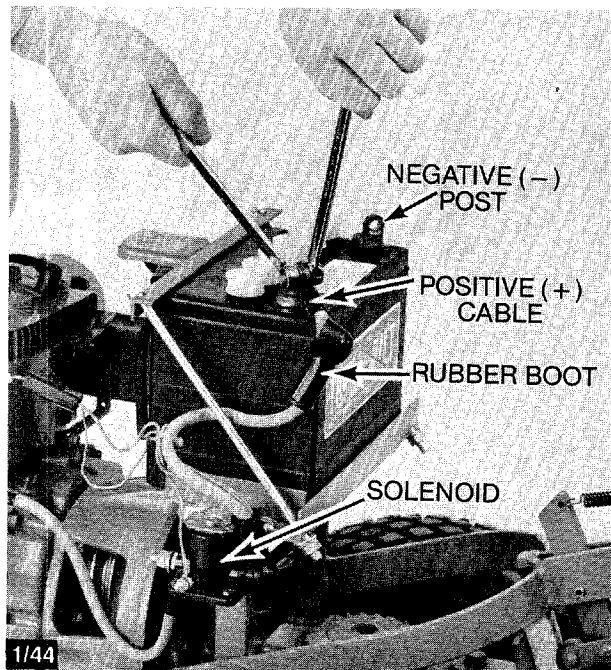
(2) Place the battery on the bracket with the *posts* facing toward the *rear* of the tiller. The positive (+) post must be on the left hand side of the tiller as you face forward from the handlebars. CAUTION: If battery is installed in reverse, damage can result to the battery, diode and electrical system.



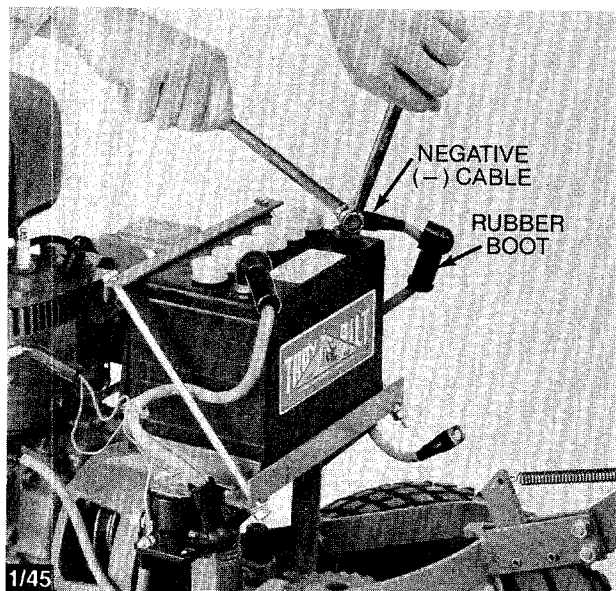
(3) Loosely bolt on the battery hold-down clamp that you assembled in Step 1. To do this, center the clamp along the front edge of the battery and put the 9" carriage bolts through the holes in the clamp and the bracket. On the left hand bolt, thread on a plain washer, lockwasher and nut — *finger tight*. On the right hand bolt, thread on the lockwasher and nut, again *finger tight* (also see Sketch 1/43).



Bracket, clamp and solenoid hardware locations as viewed from right rear of tiller.



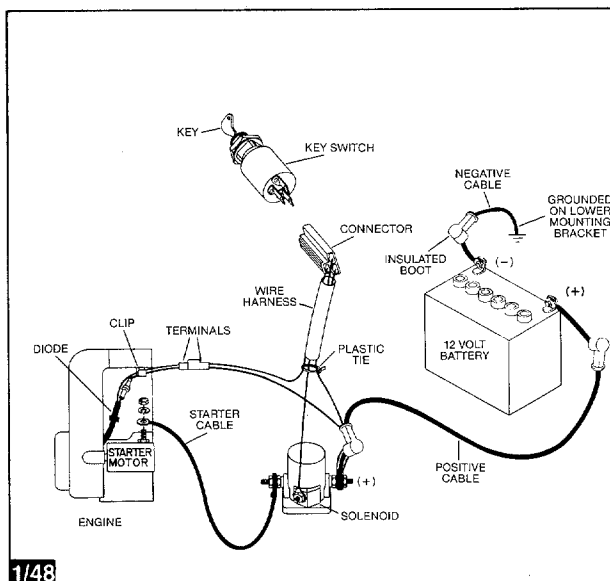
(4) Connect the POSITIVE (+) to the POSITIVE BATTERY POST (+). The positive cable is the one already connected to the starter solenoid. Place the cable terminal on the side of the post nearest to the battery caps and use two 1/2" wrenches to tighten the bolt and nut. Fit the insulated rubber boot snugly over the top of the battery post.



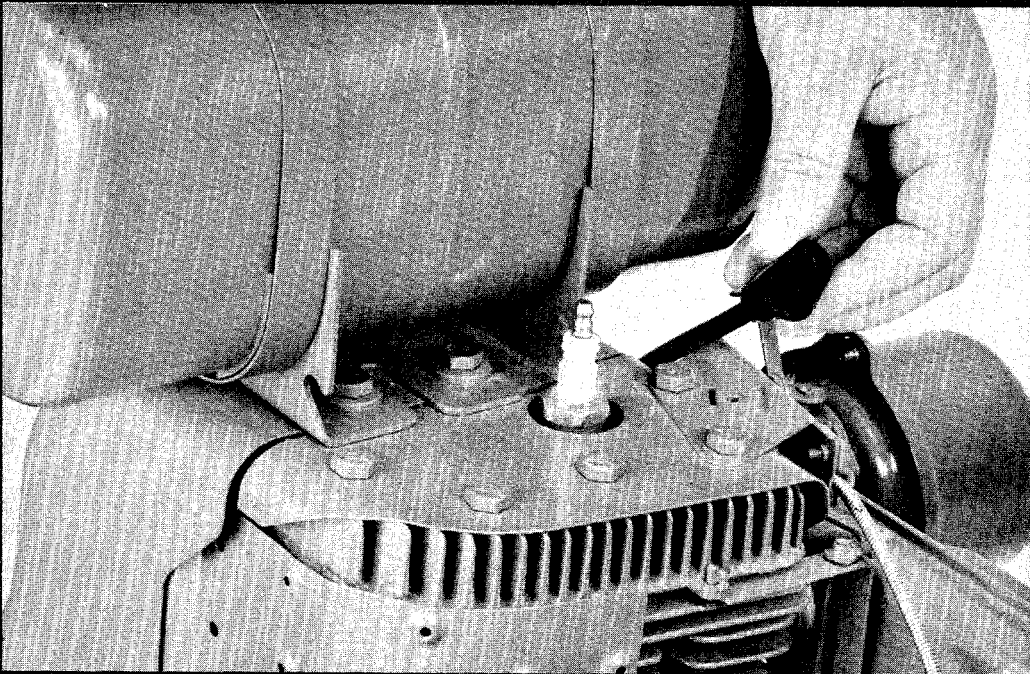
(5) Connect the NEGATIVE CABLE (-) to the NEGATIVE BATTERY POST (-). Take the cable that came in the hardware package and slide the insulated rubber boot onto the cable. Connect one end to the NEGATIVE POST (-) of the BATTERY. Tighten with your wrenches. Fit the rubber boot snugly over the top of the battery post.



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SECTION 2: **Safety Precautions**

All power equipment has to be powerful enough to do its job in the garden. Such power, however, can hurt you if you forget or disregard "common sense" safety practices in normal operation.

Please remember to follow the rules for safe operation listed below and on the next two pages. Each is simply a matter of common sense, based upon knowledge of and familiarity with operating controls of the tiller and the engine.

BASIC SAFETY RULES

Know your tiller and its engine. Please don't operate your Horse Model Troy-Bilt Tiller without first reading the pages in Section 3 — Getting To Know Your Tiller And Its Engine; and Section 4 — Using Your Tiller.

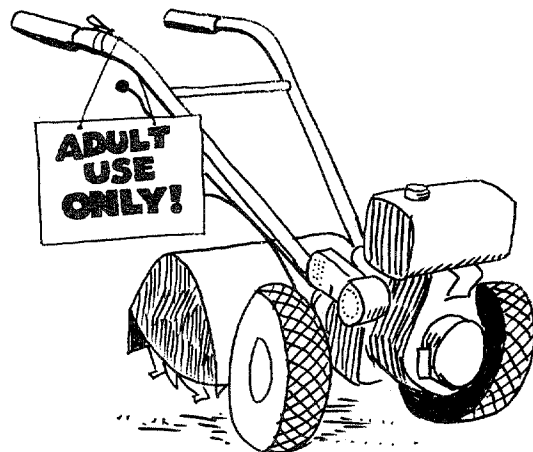


1. Study instructions and photos first: Be sure you know what each tiller and engine control does before you begin.

2. Practice operating controls and running tiller (*with tines out of the ground*) before you start to till.

3. Don't wear loose clothing. It might get caught in moving parts of the tiller or its engine such as the tines, drive belt, pulleys, tires or shift linkages.

4. Keep hands and feet away from the tiller tines, belt, pulleys, and wheels while the engine is running.



5. Never allow children to use or play with the tiller. Keep children away from the area of operation.

6. If you lend your tiller to someone else, be sure to instruct him on proper use of the tiller, including safety precautions, before letting him operate it.

7. Don't till near underground electric cables, pipes, or hoses.

8. Make sure that you wear good, sturdy shoes. Never till in bare feet, sandals or sneakers.

9. Stop engine whenever you leave the tiller unattended. Place the Forward/Reverse Lever in Neutral and disconnect the spark plug wire to prevent accidental starting.

RULES FOR OPERATING AND ADJUSTING THE TILLER

1. Shut off the engine and wait for all moving tiller and engine parts to stop before cleaning the tines or tiller, or before making adjustments or repairs. Disconnect spark plug wire and keep wire away from plug to prevent accidental starting.

Place the Forward/Reverse Lever in Neutral.

2. Keep hands and feet away from revolving tines, the drive belt, pulleys, turning wheels or shafts.

3. Always keep the flap on the tiller cover down when your tiller is in operation, except when furrowing and hilling.



For The Operator

4. Don't use Reverse in Fast Wheel Speed unless you are sure you can handle it. Also, make sure the area behind you is clear of solid obstructions before backing the tiller up.

5. Do not engage powered tines in the ground when the Wheel Speed Shift Lever is in FREE WHEEL. You may not be able to hold it back, and the tiller will travel rapidly away from you.

6. Don't try to till on a hill or slope that is too steep for safety.

7. When heading up or down a steep hill or slope, don't shift wheel speed gears. If you accidentally put the Wheel Speed Lever in Free Wheel, your tiller could roll out of control. (If you must shift on a hill, reduce the engine speed to slow speed, then turn carefully across the hill before you shift gears).

8. Don't try to remove debris or untangle vegetation while the tines are in motion. First try running the tiller in reverse for a few feet (with the tines out of the ground). The tines will usually clear themselves of debris when you go forward again. If that doesn't work, shut off the engine and disconnect the spark plug wire before cleaning the tines.

9. Please remember: You can ALWAYS STOP tiller motion by moving the Forward/Reverse Lever into Neutral.



10. For safety's sake, remove the tines when snowplowing. Revolving tines could be dangerous on slippery sidewalks or driveways. (Removing the tines also aids in banking snow as their absence allows the rear of the tiller to be set down further and the blade to be raised higher off the ground.)

11. Keep all bolts, screws and nuts properly tightened to be sure equipment is in safe working condition. Follow maintenance instructions provided on pages 99-128 of this manual.

12. Maintain 10 to 20 PSI (pounds per square inch) of air pressure in each tire. DO NOT EXCEED 20 PSI. Avoid High Inflation pressures which can cause serious personal injury.

SAFETY RULES FOR OPERATING THE ENGINE

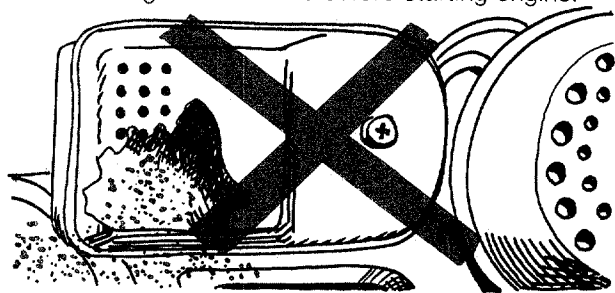
1. Always make sure that the Forward/Reverse Lever is in Neutral before starting the engine.

2. Gasoline is highly flammable and should be used and stored with extreme caution.

- Keep away from open flame, sparks, and do not smoke while filling the fuel tank.
- Do not fill gasoline tank when engine is running or while engine is still hot. Fill fuel tank outdoors, never in an enclosed area.



- Use a funnel or spout to prevent spilling. Wipe off any spilled gasoline and move tiller away from gasoline fumes before starting engine.



- Hot or corroded and rusted out mufflers can cause gasoline explosions or brush fires by allowing hot carbons to escape. Allow muffler to completely cool down before filling fuel tank. Replace deteriorated mufflers immediately.

2

Engine safety rules (cont'd.)

- Do not overfill fuel tank. Fill to within ½-inch of top to prevent spillage and to allow for fuel expansion. Install caps on fuel tank and gasoline container before starting engine.
- Store gasoline in a cool, well ventilated place, safely away from any spark or flame producing equipment. Store only in an approved container and safely out of reach of children.
- Do not store tiller with gasoline in the tank inside a building where fumes may reach an open flame or spark. Always allow engine to cool before storing in any enclosure.
- When adding gasoline to electric start engine fuel tanks, avoid contacting any portion of the battery or its cables with your gasoline can. If a spark should occur, it could cause an explosion.

3. POISON/DANGER — Causes Severe Burns —

Your battery contains sulfuric acid — avoid contact with skin, eyes or clothing. Antidote: EXTERNAL — Flush immediately with lots of water. INTERNAL — Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately. Eyes — Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries. **KEEP OUT OF REACH OF CHILDREN.**

4. Do not run the engine in an enclosed area. Exhaust gases contain carbon monoxide, an odorless and deadly poison.

5. After running the engine, don't touch the muffler or surrounding area until it has cooled down.

6. Don't put hands, tools, or any object near or inside the flywheel or its covering (blower housing) while the engine is running.

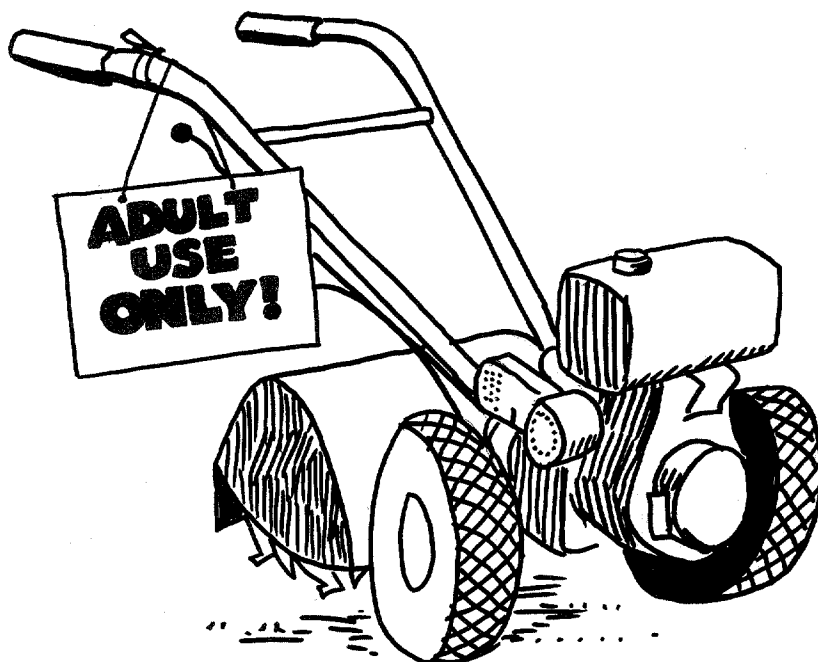
7. Keep the throttle cable on electric start tillers away from the battery and its cables.

8. To prevent accidental engine starting, disconnect the spark plug wire and keep the wire away from the spark plug and fuel tank.

9. Keep engine free from accumulation of grass, leaves, or excessive grease. An accumulation of these materials may result in a fire.

10. Make sure engine bolts, fuel lines and connections are tight and in good condition.

11. Do not tamper with the governor setting to increase engine speed. Overspeeding is extremely hazardous.



GETTING TO KNOW YOUR TILLER AND ITS ENGINE

3



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CONTROLS AND OPERATION OF 6 HP TECUMSEH ENGINES	46-53
CONTROLS AND OPERATION OF 7 HP KOHLER ENGINE	54-61
OPERATING THE TILLER	61-63
TURNING YOUR TILLER AROUND	64

SECTION 3: Getting To Know Your Tiller and Its Engine

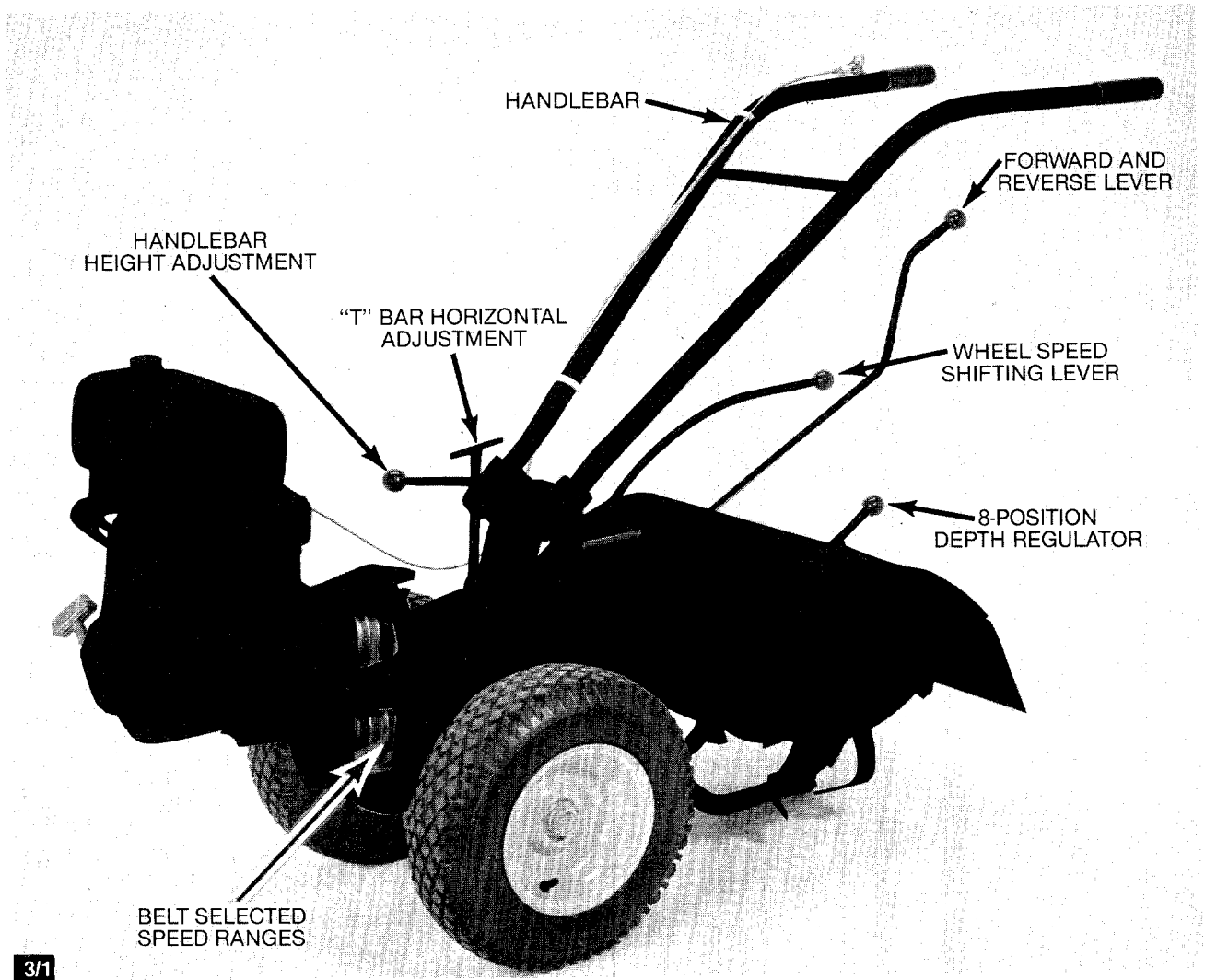
INTRODUCTION

If you have never used a four-speed **Troy-Bilt Horse** Model Tiller, then you are in for a very pleasant surprise. A combination of simple controls (see Photo 3/1), perfect machine balance, rear-mounted Bolo Tines, and power-driven wheels make the Troy-Bilt Tiller incredibly easy to operate and handle.

In the following pages, you'll learn all about the simple tiller and engine controls that affect tiller operation. Practice using these controls — *with the engine*

off — until you become completely familiar with their location and function. And, be very certain that you read and understand the Rules For Safe Operation, found on Pages 25 through 28 (Section 2).

Most important of all, please take your time! These minutes spent now in familiarizing yourself with the proper operation of the tiller and engine controls will greatly add to your understanding and full enjoyment of your new Troy-Bilt Tiller.



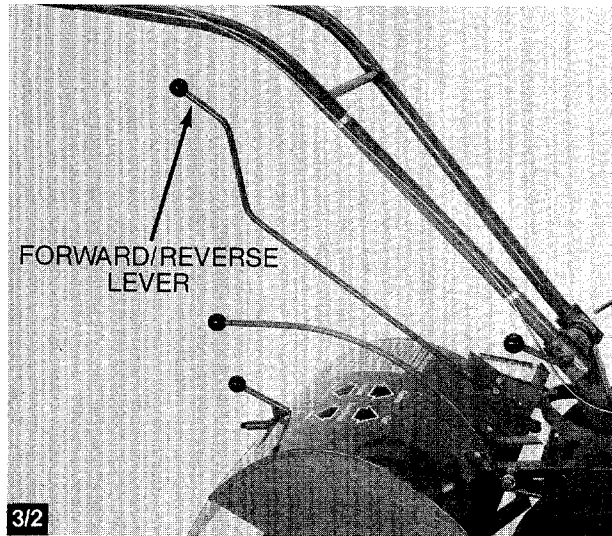
IMPORTANT

If you have any questions about using any of the controls, please don't hesitate to write or call us. We'll be glad to help you... anytime!

TILLER CONTROLS

The Forward/Reverse Lever

This lever (see Photo 3/2) provides forward and reverse motion for the tiller. It is also the most effective control to stop all tiller motion (except engine motion) when you wish to do so in a hurry – or for just general pauses in tilling.



When the lever is engaged in Forward, engine power is delivered to the transmission by the drive belt located between the engine and transmission pulleys. In Reverse, the belt goes slack, and engine power is transferred to the transmission by the rubber reverse disc located on the back of the engine pulley. In the Neutral position, the engine will continue to run, but no power will be delivered to the wheels or tines. (Also see "Basic Theory Of Operation" on Pages 42-43.)

Please note that whenever you place the lever in either Forward or Reverse (while the engine is running), the tines will revolve. Whether or not the wheels will also turn depends upon the position of the Wheel Speed Shift Lever (described on Pages 33-34).

ATTENTION PLEASE...

Always have the Forward/Reverse Lever in Neutral and the Wheel Speed Shift Lever engaged with a wheel gear when starting the engine.

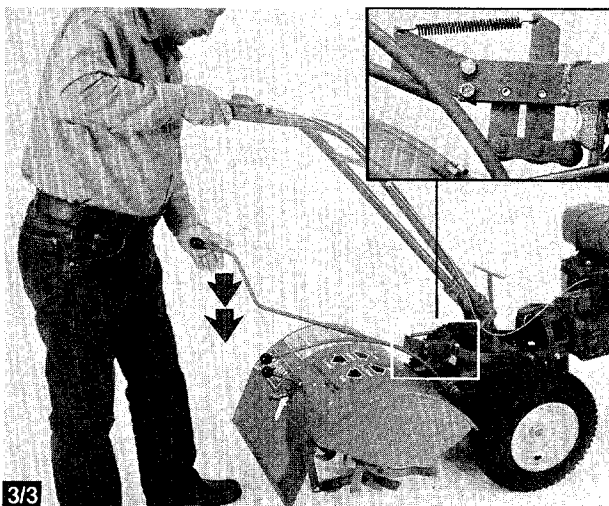
When the lever is pushed all the way down for FORWARD, it will stay in Forward until you tap or lift it up to release it.

If you lift the lever all the way up and raise the tines off the ground by raising the handlebars, the tiller will move in REVERSE as long as you hold the lever up. When you let go of the lever, it will automatically return to the NEUTRAL position, stopping all tiller motion. This is a safety feature for your protection.

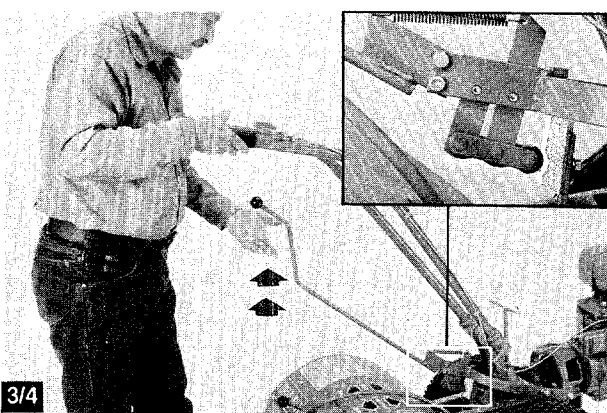
Please remember that reverse should never be used for tilling the soil. Its value is in providing your tiller with extra maneuverability when you are in tight quarters, or when turning around room is limited. Also, it's a handy way of clearing tines if they should get tangled up with vines or other organic matter.

The following photos show you how to move the lever into the Forward, Reverse and Neutral positions. Also shown in the photos are the various positions that the clutch roller takes on the yellow-colored Belt Adjustment Block when you shift the lever. As you practice moving the lever, take note of the position that your clutch roller takes on its adjustment block.

FOR FORWARD MOTION...



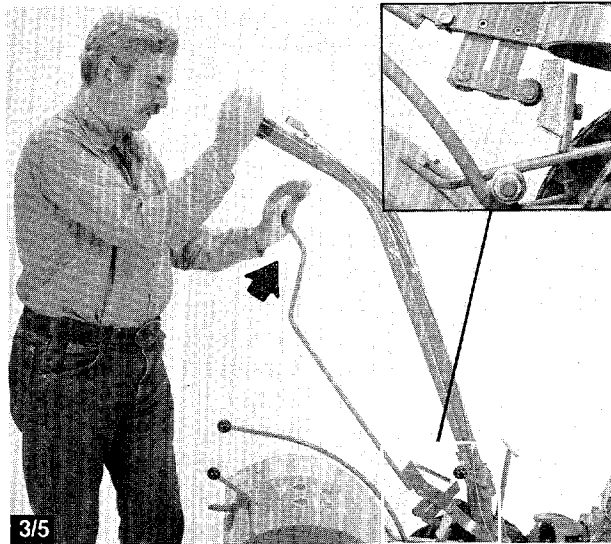
(1) TO GO FORWARD: Push the lever all the way DOWN until the clutch roller (shown in inset) engages underneath the belt adjustment block.



(2) TO STOP FORWARD MOTION: Tap or lift the lever UP and LET GO. This returns the clutch roller to the Neutral position on the belt adjustment block. In Neutral, the roller will rest either in or above the indentation on the block, depending upon drive belt length and future adjustments for tension.

3

FOR REVERSE MOTION ...



(1) TO GO IN REVERSE: Raise the handlebars to get the tines off the ground, and LIFT and hold the lever UP. As shown in the inset, the roller doesn't move very far from Neutral to Reverse. Before using Reverse, you should slow down the engine speed by moving the throttle lever on the handlebar to a slower engine speed setting.



(2) TO STOP REVERSE MOTION: LET GO of the lever. Releasing the lever will automatically return the lever and clutch roller to the Neutral position (see inset of Photo 3/4).

ATTENTION PLEASE... Before shifting from forward to reverse, or vice versa, always return the lever to Neutral position and allow the tines to stop turning completely. This neutral "stop" will prevent possible damage to the drive belt, the reverse disc, or the transmission gears and shafts.

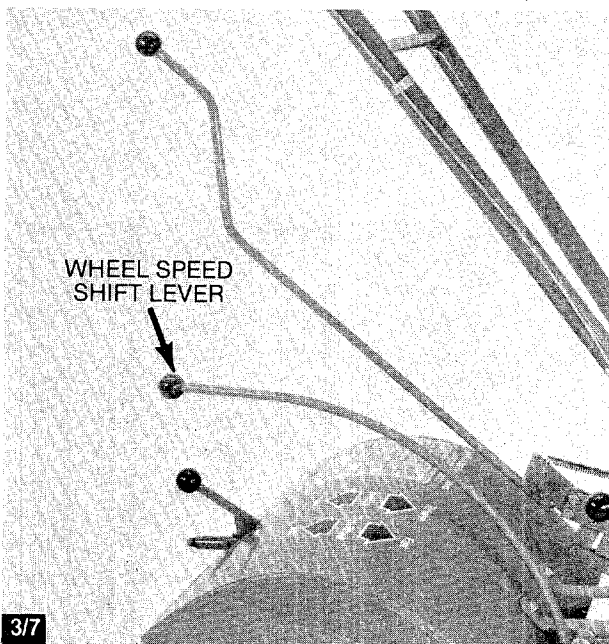
FORWARD/REVERSE LEVER SAFETY PRECAUTIONS

1. Always have the Forward/Reverse Lever in Neutral and the Wheel Speed Shift Lever engaged with a wheel gear when starting the engine.
2. To stop tiller and tine motion anytime, place the lever in the Neutral position.
3. The lever should automatically return to Neutral when you let go of it from the Reverse position. If it fails to do so, you should push the lever down into Neutral. Then see Section 5 (Page 120) for instructions on how to test and adjust this control.
4. If the tiller moves in Reverse even though you do not hold the lever up in the Reverse position, the tiller is badly out of adjustment. This is a dangerous situation and should be corrected immediately as explained on Pages 120-122 of Section 5.
5. Until you are completely familiar with Reverse operation, it is best to use Reverse only in Slow Wheel Speed, and with the engine throttle set to run at a slower speed. Many people never shift into Reverse while in Fast Wheel Speed. This is a good rule to follow, at least until you're sure you can handle the tiller when it is reversing at the faster wheel speeds.
6. Make sure the area behind you is clear of solid obstacles before operating the tiller in Reverse.
7. To insure proper operation of the lever at all times, be sure to follow the scheduled maintenance services presented in Section 5.

The Wheel Speed Shift Lever

This lever (see Photo 3/7) provides engine power to the wheels, allowing you to choose either Slow Wheel Speed (low gear), or Fast Wheel Speed (high gear). It also has a "free wheel" position, in which the wheel gears are not engaged and you can freely move the tiller about without running the engine.

When you shift the lever up or down it moves a sliding clutch inside the transmission to the right or left to engage the Fast or Slow speed wheel gears. No power is provided to the wheels unless this sliding clutch and one wheel gear are engaged, and the Forward/Reverse Lever is moved into either forward or reverse position.



3/7 Wheel Speed Shift Lever provides engine power to the wheels.

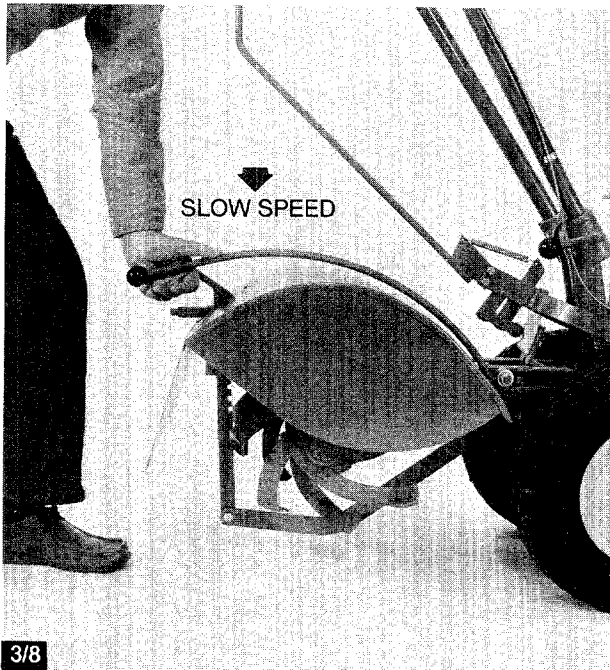
Please remember that whenever the Forward/Reverse Lever is put in forward or reverse, not only do the tines turn, but the wheel gears inside the transmission are also turning. Therefore, always make your wheel speed selection **BEFORE** you shift the Forward/Reverse Lever out of Neutral. This will prevent damage to the transmission which could occur if you try to engage the sliding clutch with one of the wheel gears while they are being turned under power.

Also, please don't use the Wheel Speed Shift Lever to stop tiller motion. When the wheels are turning, the gear and clutch are "locked" and it is very difficult to move the lever out of gear. Instead, always use the Forward/Reverse Lever to stop tiller motion.

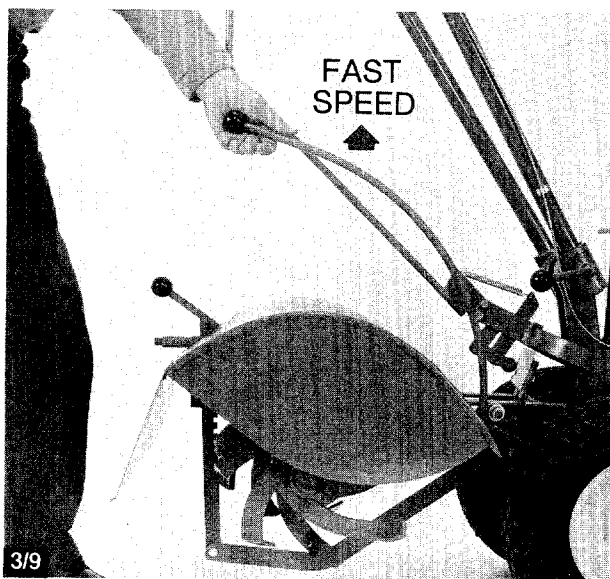
NOTE: On Pages 35-39, we'll discuss how you use the Wheel Speed Shift Lever and the single drive belt on your tiller to obtain four different forward speeds. For now, though, let's just practice shifting this control, as explained next.

TO OPERATE WHEEL SPEED SHIFT LEVER...

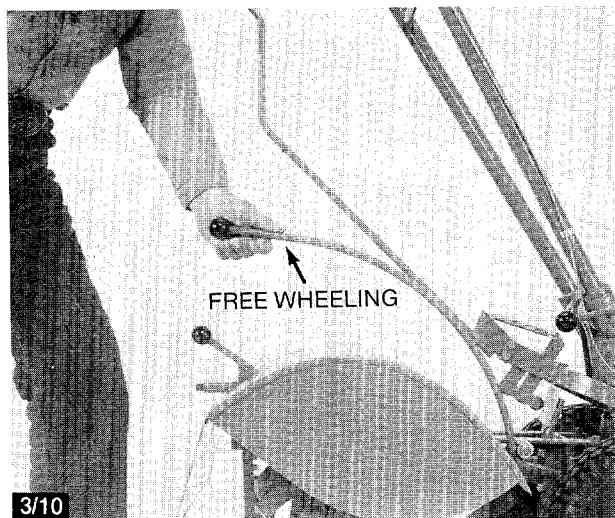
(Always make sure the Forward/Reverse lever is in Neutral before making wheel speed selection).



3/8 **FOR SLOW WHEEL SPEED** — Shift the lever all the way **DOWN**. As you do, maintain gentle pressure on the lever while you roll the tiller back and forth a few inches. When the lever goes into gear, you will no longer be able to roll the tiller.



3/9 **FOR FAST WHEEL SPEED** — Lift the lever all the way **UP**. Again, maintain gentle pressure on the lever while you roll the tiller back and forth a few inches until the lever goes into gear.



FOR FREE WHEELING — Simply place the lever *in between* the Slow and Fast wheel gear positions. When you're in Free Wheel, there should be no "clicking noise" when you roll the tiller. If there is, just shift the lever a little more either up or down.

HERE'S AN ALTERNATE SHIFTING METHOD

Here's a handy shifting procedure to use if you should be stopped in deep garden soil and find it difficult to roll the tiller back and forth in order to engage a wheel gear. First make sure the engine is stopped and that the Forward/Reverse Lever is in Neutral. Then, tilt the tiller forward by lifting up on the handlebars, as you simultaneously apply pressure on the lever towards the gear you select. As you rotate the tiller upward on its wheel shaft, the clutch should "fall" into the gear you choose. It works a very high percentage of the time.



WHEEL SPEED SHIFT LEVER SAFETY PRECAUTIONS

1. Before starting the engine, always make sure that the Wheel Speed Shift Lever is engaged in either Slow or Fast Wheel Speed. This is a safety precaution to make sure you don't accidentally have the tines in the soil and the Forward/Reverse Lever in Forward when starting the engine. If you did this, the tines would rapidly propel the tiller forward because the tiller was in Free Wheel and the wheels would not hold the tiller back. Do not put REVOLVING TINES in the soil, when Wheel Speed Shift Lever is in FREE WHEEL.
2. Do not use this lever to stop tiller motion. Always use the Forward/Reverse Lever to stop tiller and tine motion.
3. To insure proper operation of the lever at all times, be sure to follow the scheduled maintenance services presented in Section 5.

You Have A Choice Of Four Tilling Speeds

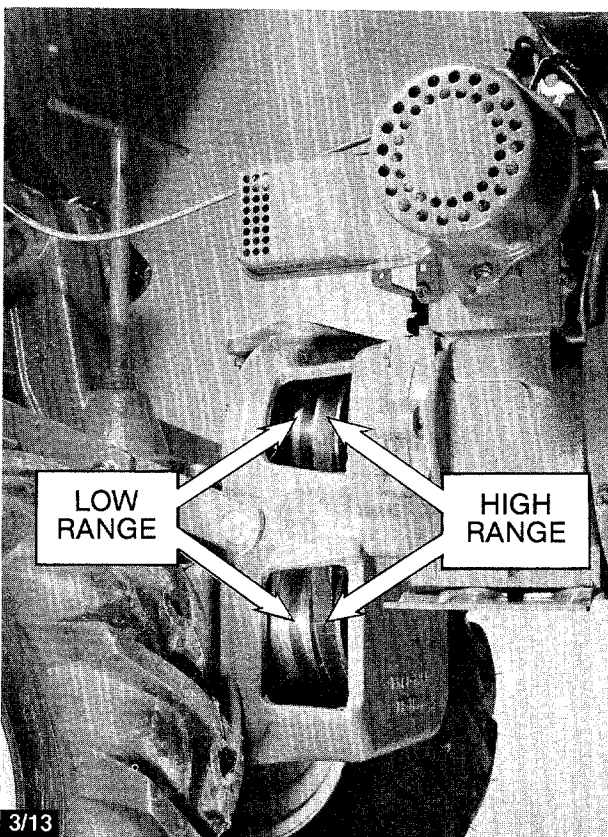
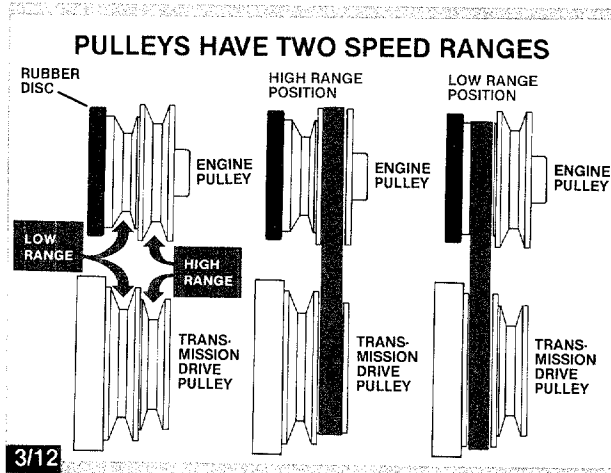
On Pages 31-34, we discussed how the Forward/Reverse Lever activates the drive belt to provide forward motion of the tiller, and how the Wheel Speed Shift Lever delivers engine power to the wheels. Now, we're going to show you how you can easily choose any of four different *forward* tiller speeds by simply moving the drive belt back and forth on the engine and transmission pulleys and shifting gears.

NOTE: In Section 4 of this manual we'll discuss which speeds to use for different tilling applications. For now, though, let's just concentrate on how you select the different speeds.

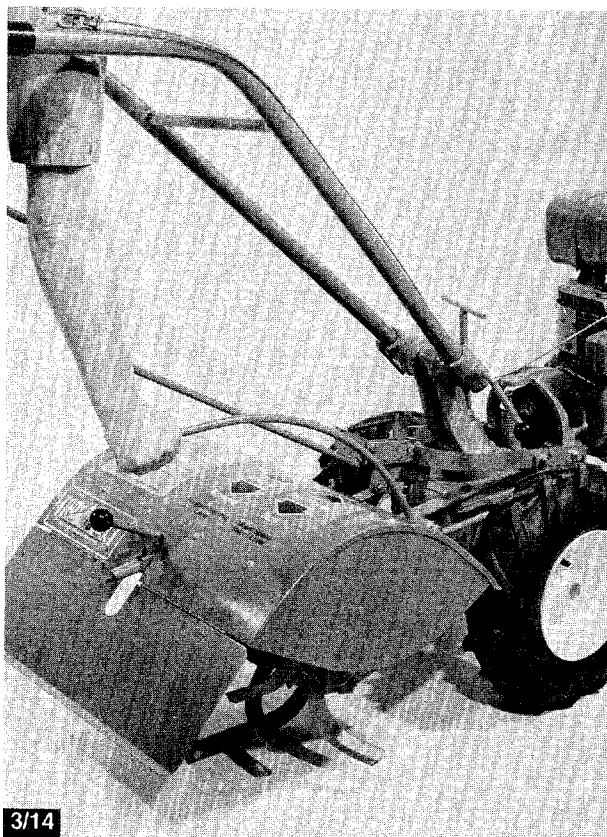
FOUR WHEEL SPEEDS

As shown in Sketch 3/12, the engine and transmission pulleys each have a low range groove and a high range groove. You get the four different forward speeds by placing the belt in the LOW RANGE or HIGH RANGE position of the pulleys (see Photo 3/13) and then by

shifting the gears with the Wheel Speed Shift Lever (Photo 3/14) to FAST or SLOW. If you'll look at your tiller now, you'll notice that it was sent from the factory with the belt in the LOW RANGE position.



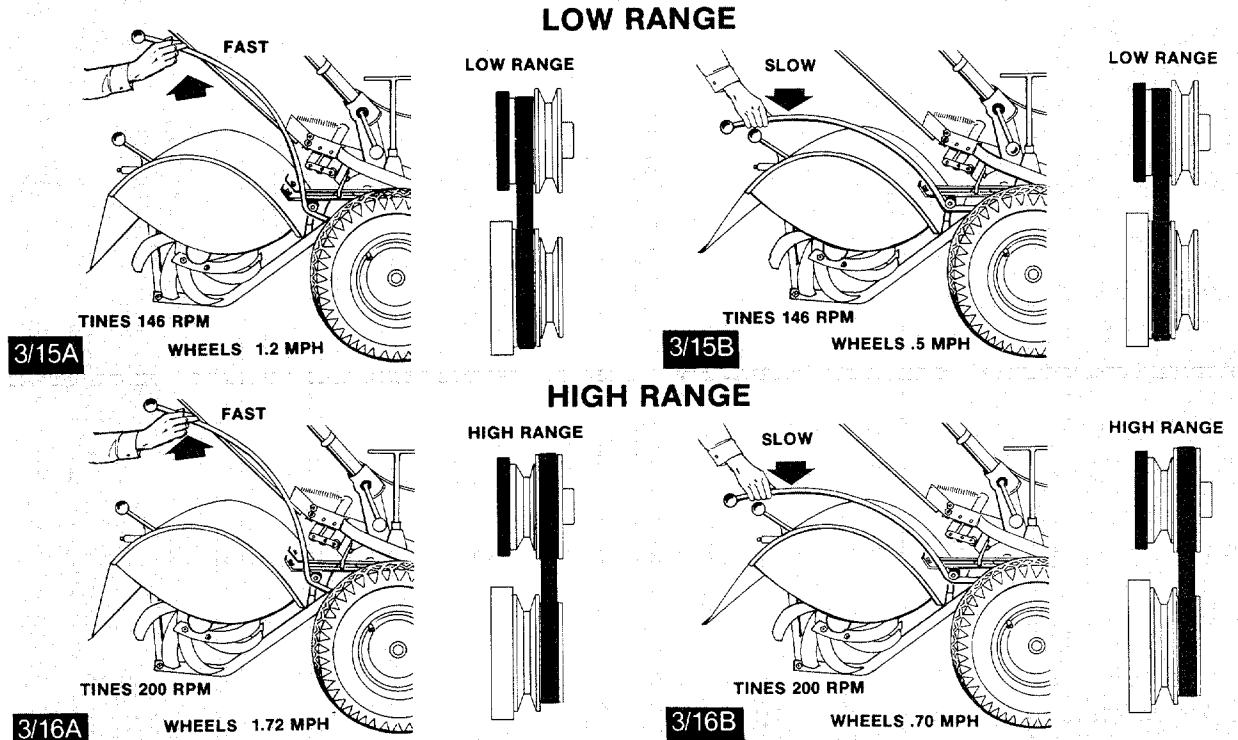
Belt positions on four-speed Horse Model tiller.



Select wheel gear with Wheel Speed Shift Lever.

Shifting gears with the belt in LOW RANGE gives you two wheel speeds (.5 and 1.2 MPH). Then, moving the belt to the HIGH RANGE position and shifting the lever

into SLOW or FAST provides two other wheel speeds (.7 and 1.72 MPH) — see Sketches 3/15A & B, and 3/16A & B. It's as simple as that!



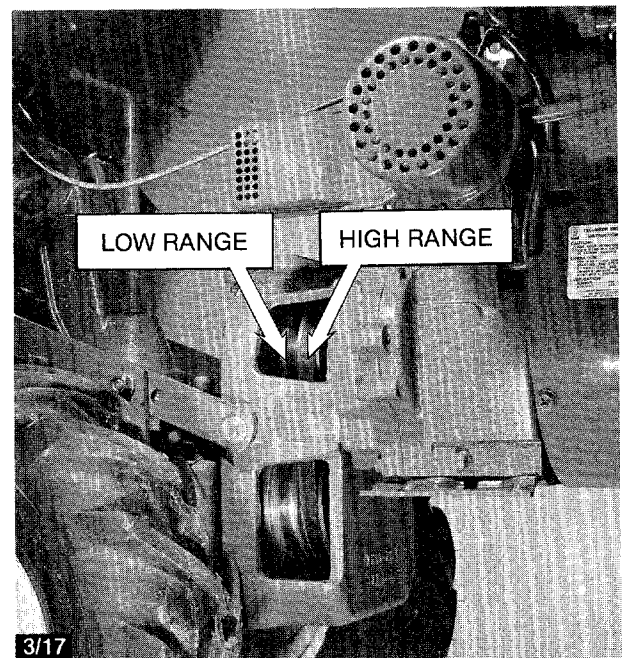
FOUR SPEED TILLER — By using LOW and HIGH ranges of the pulleys, and shifting the Wheel Speed Shift Lever to FAST or SLOW, you achieve four different forward speeds for all tilling conditions.

TWO TINE SPEEDS

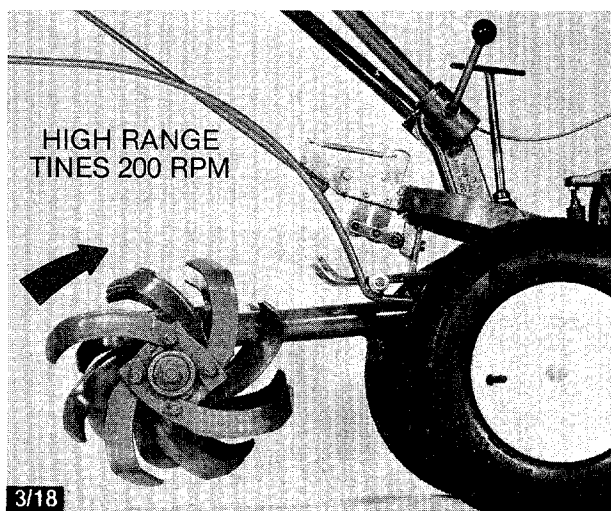
Along with the four forward speeds, you also have two tine speeds. Engine speed and the position you select for the belt (High or Low range) combine to determine the tine speed.

The engine speed determines how fast the engine pulley turns. When the Forward/Reverse Lever is in Forward, the belt turns with the engine pulley and turns the transmission drive pulley, which rotates the main drive shaft and finally the tiller shaft in the rear.

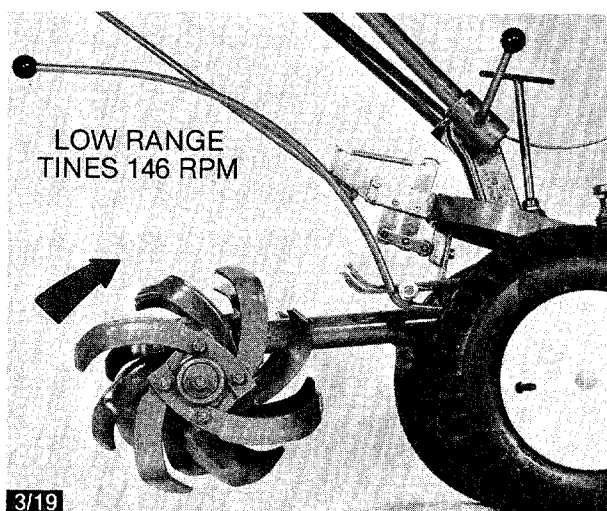
So, putting the belt in HIGH RANGE (Photo 3/17) results in a tine speed of 200 RPM (revolutions per minute) — also see Photo 3/18. In LOW RANGE, the tines revolve at 146 RPM — see Photo 3/19. Both tine speeds are based upon an engine speed of 3,000 RPM, which is about as high an engine speed as you'd want to go. Sketch 3/20 shows how the engine powers the wheels and the tines to go forward. NOTE: In reverse, the wheels and tines are powered by the reverse disc and not the belt. Therefore, you only have two reverse speeds (Fast and Slow), as selected by the Wheel Speed Lever.



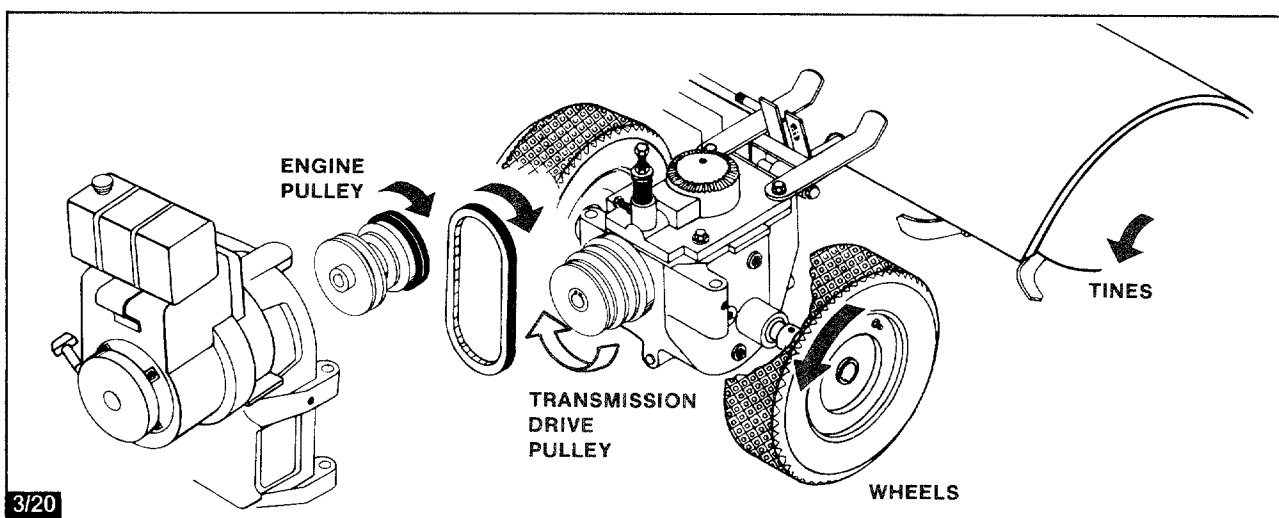
3/17 In High Range, the belt is closest to the engine.



Tine speed is determined by the position of the belt and the engine throttle speed.



Your tiller is shipped to you with the belt in LOW RANGE position.



When first operating your tiller, we recommend that you keep the belt in LOW RANGE, and the Wheel Speed Shift Lever in SLOW WHEEL speed position. Later, when you are more familiar with tiller operation, you can move the belt to the HIGH RANGE position. Thank you.

Belt Position	Wheel Speed Shift Lever Position	Wheel* Speed	Tine* Speed
LOW RANGE	SLOW	.5 MPH	146 RPM
LOW RANGE	FAST	1.2 MPH	146 RPM
HIGH RANGE	SLOW	.7 MPH	200 RPM
HIGH RANGE	FAST	1.72 MPH	200 RPM

*At engine speed of 3000 RPM

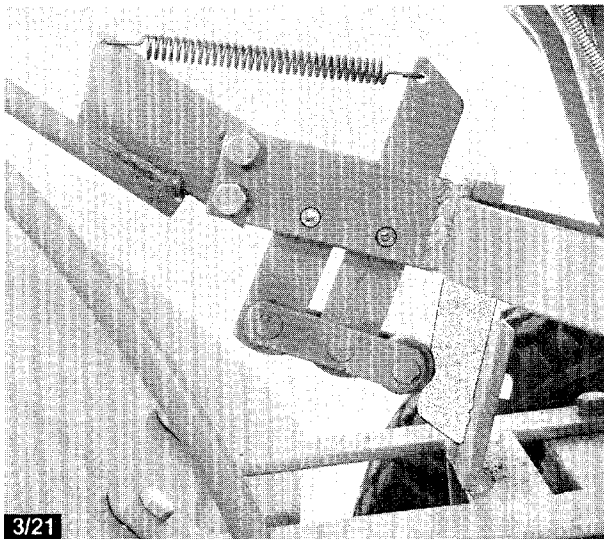
IMPORTANT

- After the first hour or two of new tiller operation, the tension on the drive belt will probably have to be tightened a little by loosening the yellow-colored adjustment block and moving it down. It's a simple job, taking only 5 minutes or less. See Section 5, Page 105, for complete belt adjustment details.
- Keep the shifting mechanisms for the Forward/Reverse Lever and the Wheel Speed Shift Lever well-lubricated at all times. See Section 5, Pages 110-111, for detailed lubrication instructions.

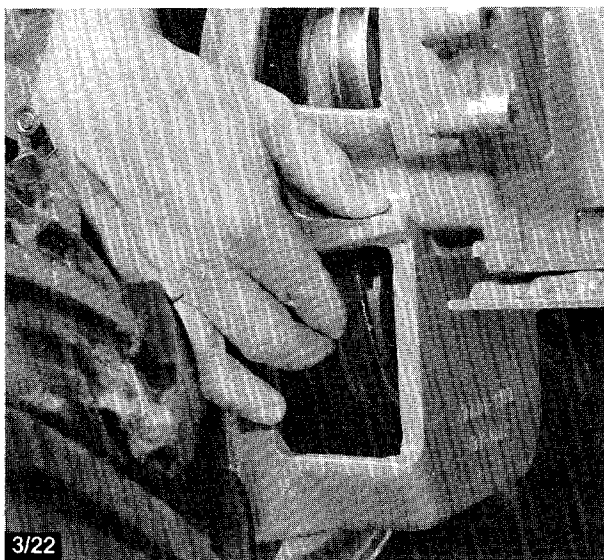
How To Move The Belt From Low Range To High Range

Moving the belt from one speed range to another is really easy to do, even though you may feel “all thumbs” this first time through. However, after you have done it two or three times, it’ll seem like a breeze. Just follow the simple steps shown here:

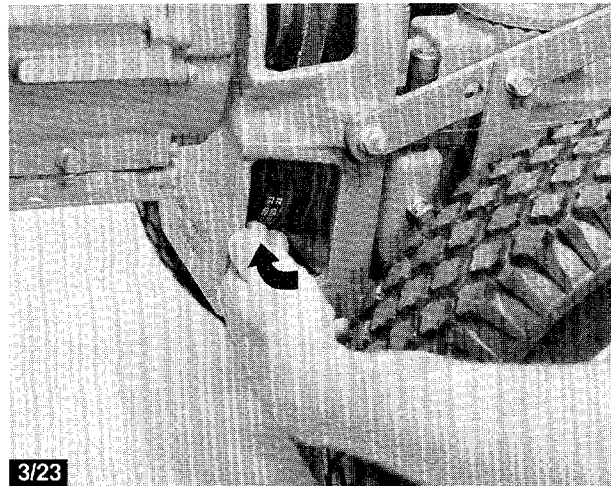
CAUTION: Turn off the engine and remove the spark plug cable from the spark plug. If the muffler is hot, wait until the muffler cools down before moving belt.



(1) Shift the Forward/Reverse Lever into Neutral. In Neutral, the roller will be resting in or above the indentation of the yellow-colored belt adjustment block, as shown above.



(2) Stand on the left side of tiller. (Remember that left and right sides are determined by standing in the operator’s position and facing the direction of forward travel.) Now, reach around the engine mount and push in with your finger at the midpoint on the right side of the belt as shown above. This will give you slack in the belt.



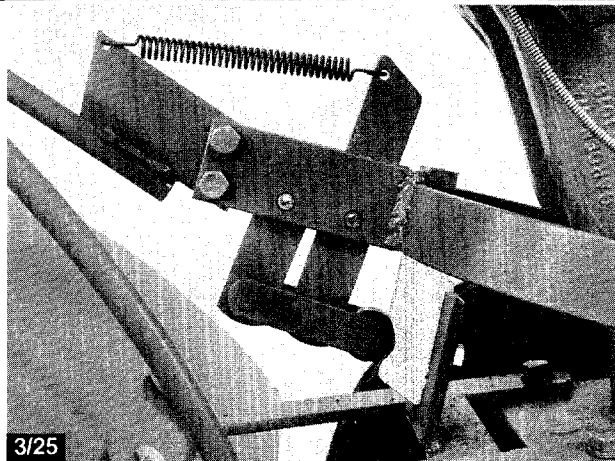
(3) With your right hand still giving slack to the belt, use your left hand to move the belt on the transmission drive pulley (lower pulley) out of the bottom of the groove and into the next groove (closest to the engine). Do this first on the left side as shown above and then on the right side.



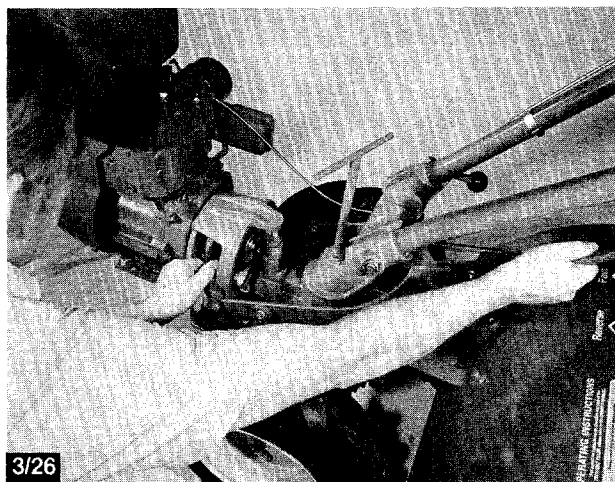
(4) While on the left side of the tiller, move the belt out of the groove on the top pulley and seat it partially in the groove closest to the engine, as shown above. Now, leave the belt partially in the groove and move around to the right side of the tiller. Reach through the motor mount and finish seating the belt in the groove. If you need more room to get it over the pulley, pull the Forward/Reverse Lever up toward Reverse to bring the pulleys closer together and give you more slack.

Changing From High Range To Low Range

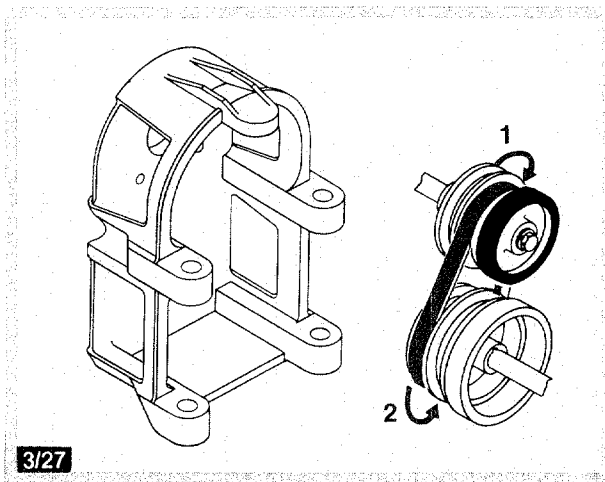
CAUTION: Turn off the engine and remove the spark plug cable from the spark plug. If the muffler is hot, wait until the muffler cools down before moving belt.



(1) Shift the Forward/Reverse Lever into Neutral. In Neutral, the roller will be resting in or above the indentation of the yellow-colored belt adjustment block, as shown at left.



(2) Stand on left side of tiller. Hold the Forward/Reverse Lever up in Reverse with one hand while you move the belt on the engine pulley (top pulley) over the pulley and into the next groove (furthest away from the engine). Do this first on the left side and then on the right side until the belt is seated in the groove as shown in the sketch.

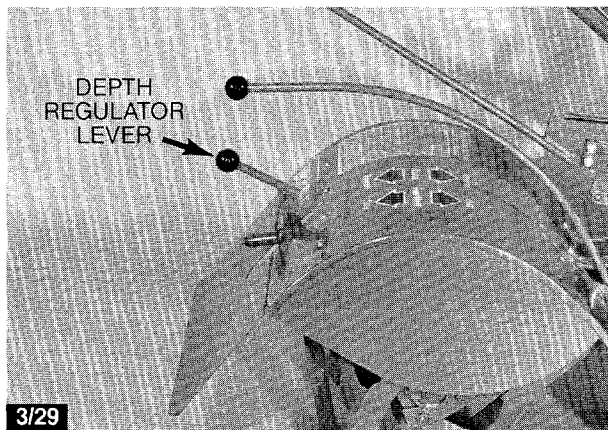


(3) Next, you will have to seat the belt in the lower pulley as you hold the lever up toward Reverse. Move the belt out of the lower pulley groove and into the next groove. Just make sure that the belt is seated in the upper and lower pulley grooves that line up.

3

Depth Regulator Lever

This handy lever (Photo 3/29) controls depth of tilling from shallow cultivating depth down to full tilling depth (8" deep, or more). It also has a "travel" setting, which places the tines completely out of the soil.



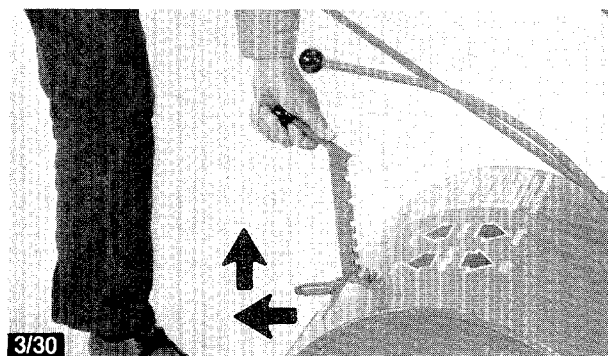
The Depth Regulator Lever.

When you pull back on this lever, notches in the adjustment bar clear a pin and allow it to be moved up or down into any of eight positions — even when the tiller is in motion. Pulling the lever back and up lowers the tines deeper into the soil. Moving the lever back and down raises the tines further out of the ground.

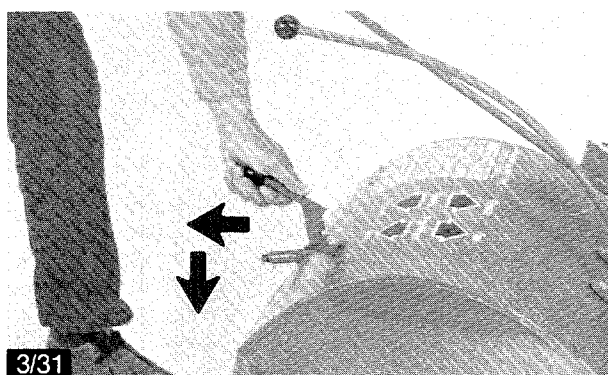
When starting the engine, the Depth Regulator should be kept in the travel position (lever pushed all the way down) so that the tines are clear of the ground — for safety. This position is also most convenient for moving the tiller to and from your garden site, when you don't want the revolving tines to touch your lawn or driveway.

For tilling in unbroken sod or soil, you normally begin on the second notch from the top. After your soil is well tilled, you can increase the tilling depth by raising the lever to the remaining six notches. You'll find out more about using the Depth Regulator when you read the gardening information in Section 4 of this manual.

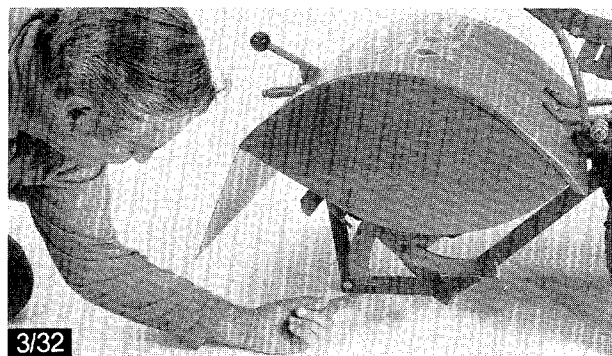
TO OPERATE THE DEPTH REGULATOR...



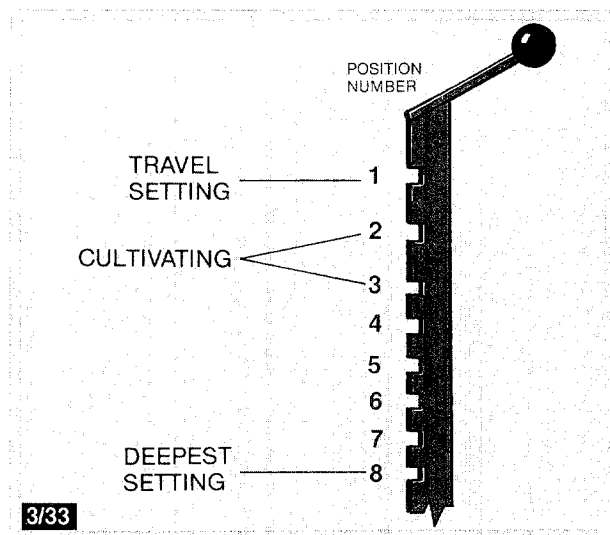
TO TILL DEEPER — Pull the lever back and then up. The bar will lock at any of eight positions you select.



FOR MORE SHALLOW TILLING — Pull the lever back and then push down. In unbroken ground, you usually start with the second notch from the top.



FOR TRAVEL POSITION — Move the lever all the way down. This raises the tines off the ground.



The Handlebars

The handlebars are used to guide your machine through the garden, to turn the tiller at the end of each row, and also to lift the tines out of the ground when you need to do so.

Normally, the handlebars should be approximately waist-high when the tiller is digging deeply. However, you may want to set the handlebars at a lower level whenever you are using the Dozer/Snow Blade. It is easier to control the height and to lift the blade off the ground with the handlebars in a lower position — but be sure this position doesn't interfere with the Forward/Reverse Lever. As shown in Photos 3/34 and 3/35, handlebar height adjustments are easily accomplished by using the Height Adjustment Control.

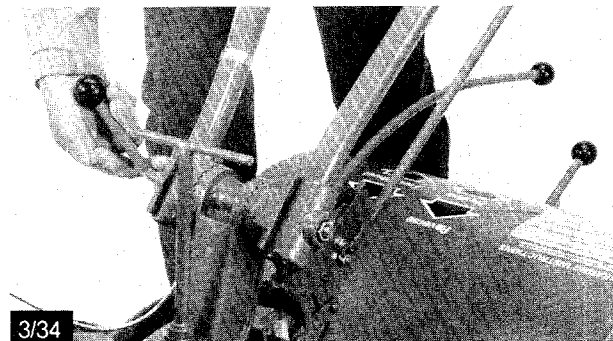
For special situations, your handlebars can also be adjusted to the left or right side of the tiller by using the T-bar Adjustment (see Photos 3/36 and 3/37). Swinging the handlebars to one side usually isn't necessary because you can normally walk on either side of the

tiller and control its movement with just one hand. However, if you are working up close to fruit trees or thorny bushes, and two hands are needed to control the tiller (such as tilling in unworked soil with large hidden stones) then moving the handlebars to one side could be beneficial to you.

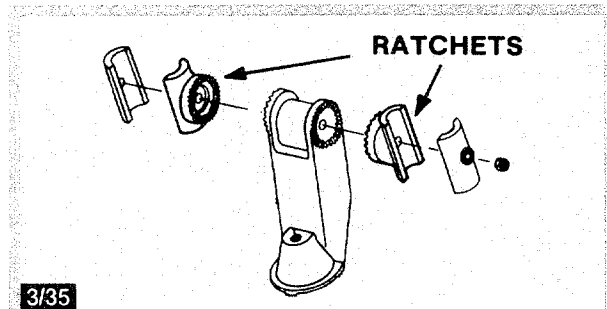
CAUTION: Never operate your tiller on the side of a hill or slope if the handlebars are swung out to one side.

IMPORTANT: When using the handlebars to tilt the tiller over on its "nose" for inspection or service, watch to make sure you let the engine down gently. Letting the engine down hard could dent the engine cover enough to cause severe damage to the engine flywheel — a costly repair! Also, always be sure that the engine is completely stopped before tilting it forward on its cover.

TO ADJUST HANDLEBARS UP OR DOWN:

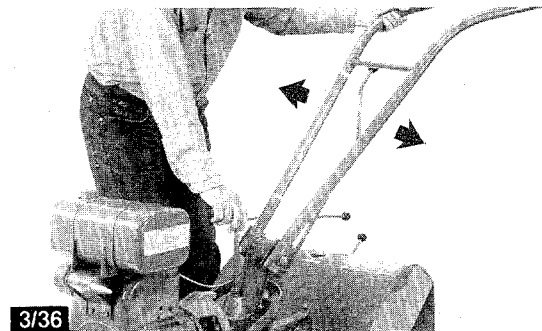


Simply wind out the adjustment lever enough so that the handlebars can be moved up or down to the position just right for you.

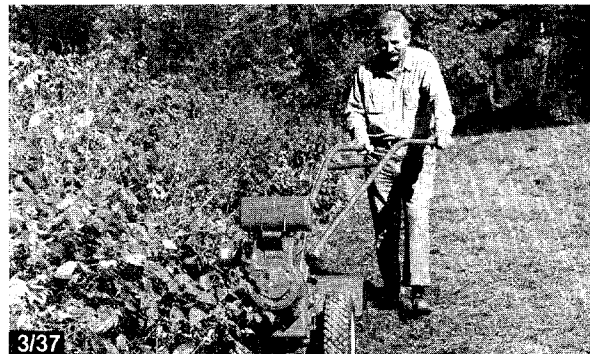


If you have difficulty finding that "just right" height position, in-between positions can be obtained by switching the inside ratchets, as shown above. With the ratchets switched, the height adjustment will be a few inches higher or lower than normal.

TO ADJUST HANDLEBARS FROM SIDE TO SIDE:



The T-bar Adjustment allows you to move the handlebars to the left or right side (when going to the left side, be careful not to overstretch the throttle cable!). Simply unthread the T-bar enough to turn the handlebar base.



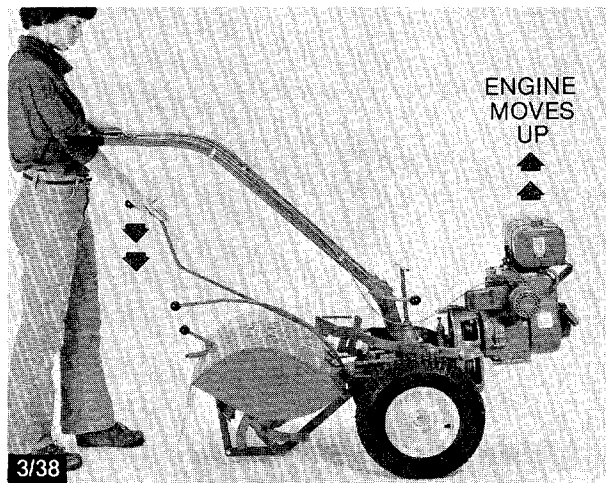
To save your hands from being scratched by thorny bushes while tilling close to them (when "one-hand" tilling isn't possible) just swing the handlebars to one side.

Basic Theory Of Operation

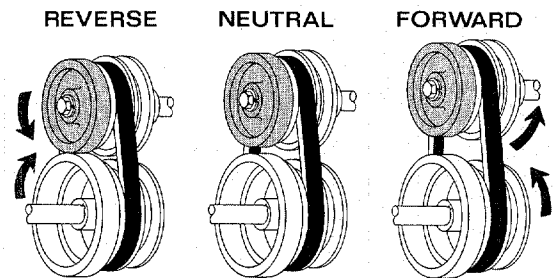
To understand how the engine's power is delivered to the wheels and tines, let's follow the sequence of events that occur when you use the Forward/Reverse Lever and the Wheel Speed Shift Lever.

The engine is bolted to a cast-iron engine mount which is free to move up and down. This up and down motion is controlled by the Forward/Reverse Lever. When the lever is pushed down (into Forward), it raises the engine and mount, and tightens the drive belt between the engine pulley and the transmission pulley — see Photo 3/38 and Sketch 3/39.

When the belt is tightened, it turns the *main drive shaft* (see Sketch 3/40) in a clockwise direction, as viewed from the engine end of the tiller. This is forward. Reverse motion will be covered later.



When engine moves up, the belt is tightened on the pulleys.

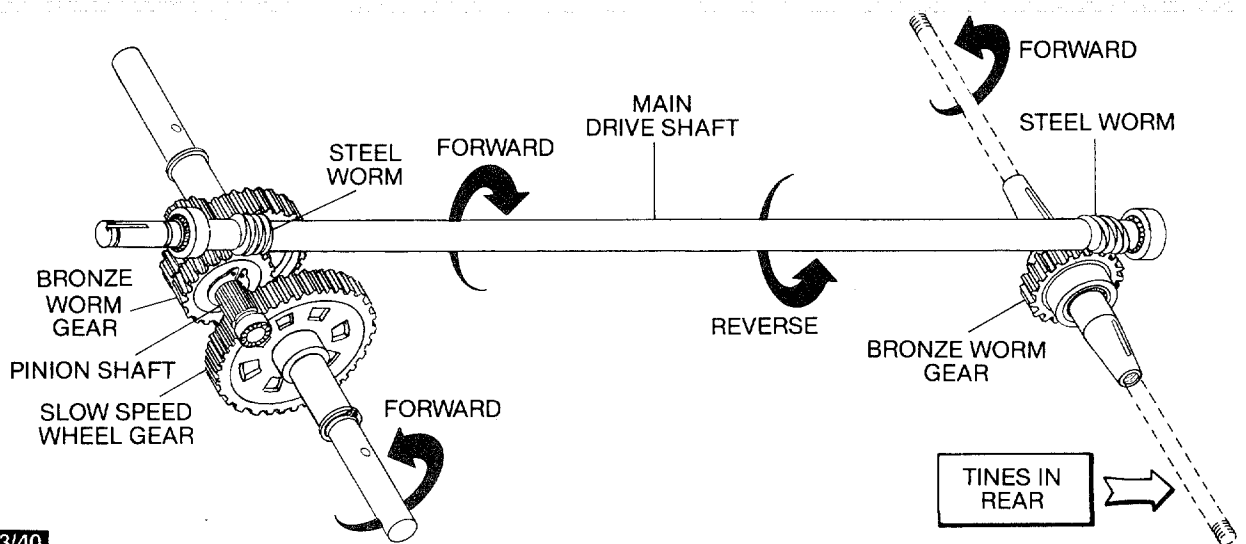


3/39

Upper (engine) pulley moves up or down via Forward/Reverse Lever.

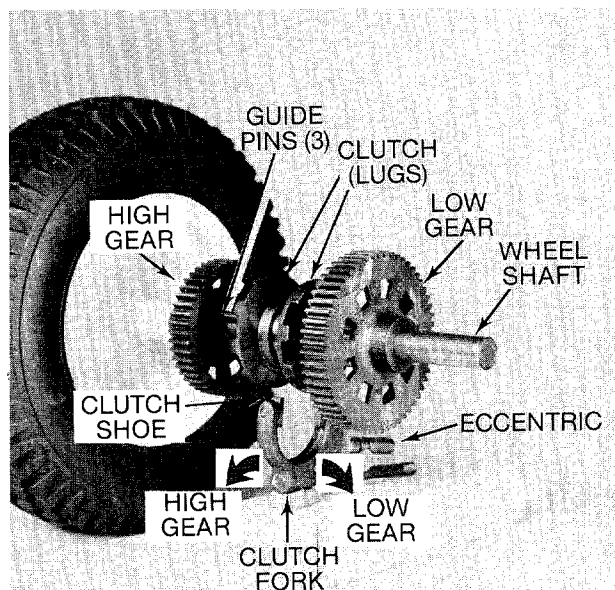
Still looking at Sketch 3/40, you'll note that on the drive shaft are two *steel worms*, one in front for the wheels and one in the rear for the tines. They both mesh with *bronze worm gears*. Thus, whenever the drive shaft rotates, the bronze gears turn. The tines will always turn when the drive shaft rotates, because the tiller bronze worm gear and the tiller shaft are "locked" together by a key (not shown).

The operation of the wheels differs, and it starts with the front steel worm on the drive shaft and the front bronze worm gear. The front bronze worm gear is keyed to the *pinion shaft* and that shaft has high and low speed pinion gears. These pinion gears are constantly meshed with two *cast iron wheel gears*: the larger, Slow speed gear and the Fast speed gear shown in the background. When the drive shaft turns, all these various gears also turn. However, that doesn't automatically cause the wheel shaft (axle) to turn, because the Slow and Fast speed wheel gears are free to spin around the wheel shaft.



3/40

That is, they're free to spin until you move the Wheel Speed Shift Lever into either Fast or Slow wheel speed. The Wheel Speed Shift Lever is linked (via an eccentric shaft and clutch shifting assembly) to a "dog" clutch located on the wheel shaft between the Fast speed and Slow speed gears — see Photo 3/41. The clutch has lugs (or "dogs") that fit in the slots on each of the gears.



3/41

View of clutch assembly. Note that distances between parts have been exaggerated for better clarity.

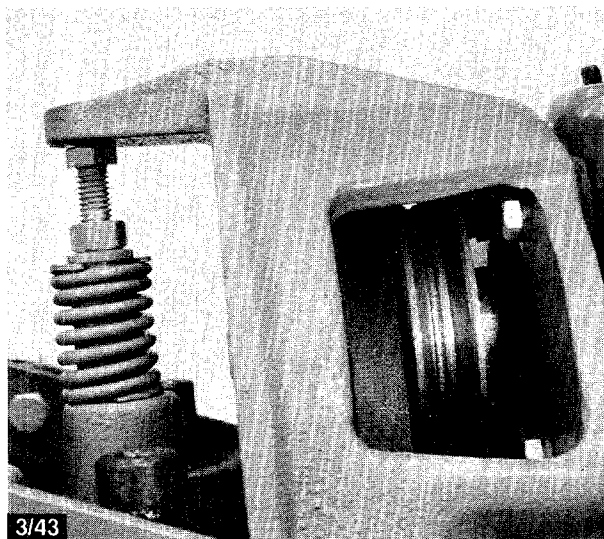
This clutch is keyed to the wheel shaft via a Hi-Pro Key, although it is free to slide left and right on the shaft. It is the Wheel Speed Shift Lever and its linkage that moves the clutch from side to side to engage a wheel gear. So, once the clutch engages one of the wheel gears, the powered gear turns the clutch and the clutch turns the wheel shaft via the Hi-Pro Key. The wheel shaft then turns the wheels (which are held in place on the shaft with wheel pins).

Reverse motion is also controlled by the Forward/Reverse Lever. Instead of pushing down on the lever, the operator pulls up, and that moves the engine and its mount downward — see Photo 3/42. At the end of the engine pulley is a rubber reverse disc and that is lowered until it contacts the transmission drive pulley (Sketch 3/39). At this time the drive belt is slack, and the resultant friction between the rubber disc and the transmission pulley causes the drive shaft to be driven in a counterclockwise direction (viewed from the engine end of the tiller). Through the same power transfer components as described earlier for forward motion, everything now operates in the reverse direction.



3/42

When engine moves down, the reverse disc contacts the transmission pulley.



3/43

Engine mount compresses spring when in Reverse.

You will note that as you shift the lever into Reverse, the engine mount comes down to press on the Reverse Adjustment Bolt — See Photo 3/43. This action compresses the Reverse Spring and Plunger Assembly, requiring you to hold the Forward/Reverse Lever up in Reverse. When you let go of the lever, the spring automatically pushes the lever back into neutral position and all tiller motion ceases. The engine and its pulley, of course, will continue to run. But because the belt and the reverse disc are both in neutral position, the transmission drive pulley will not turn the drive shaft.

ENGINE CONTROLS AND OPERATION

General Information—All Engines

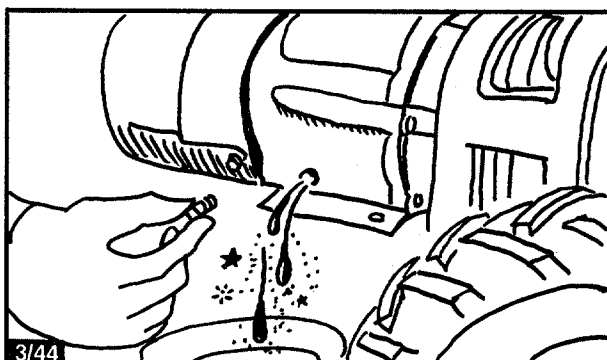
The following pages in this section describe how to operate your 6HP Tecumseh engine (p. 46-53) or 7HP Kohler engine (p. 54-61). In addition, be sure to consult the engine manufacturer's Owner's Guide that came with your tiller. NOTE: If you have an 8HP Briggs & Stratton engine, please refer to your green-covered, 8HP Owner's Manual Supplement for details on operating your engine's controls.

Unlike other engine driven equipment around your home, your tiller will be used under the most adverse operating conditions, often for extended time periods, with continual exposure to harmful dust, dirt and other abrasive small particles. Therefore, the need for regular care and maintenance of your engine is of utmost importance if you want to get the best performance and longest life from your engine. Listed below are three of the most important maintenance steps that you should perform on a regular basis. For other required scheduled maintenance procedures, be sure to read Section 5 of this manual, "Tiller and Engine Maintenance."

1. CHANGE THE OIL OFTEN

Nothing is more important to good performance and long engine life than using fresh, clean motor oil of the proper viscosity. Oil not only serves as a lubricant to minimize wear and power loss from friction, it also acts as a cleaning agent to carry away dirt, carbon and other foreign matter from the engine parts. Unless these impurities are removed from the engine crankcase by changing the oil on a regular basis, they will cause rapid wear to the moving parts of the engine.

Change the engine oil after the first two (Tecumseh) or first five (Kohler or Briggs & Stratton) operating hours. Then, change oil every ten hours, or *even sooner* if tilling in dusty, dry soil. Please note that it is normal for the oil to turn black, but carefully check it for grime, dirt and grit — then, change it whenever needed, no matter how few operating hours you have used it. See Section 5, Page 103, for oil changing instructions.



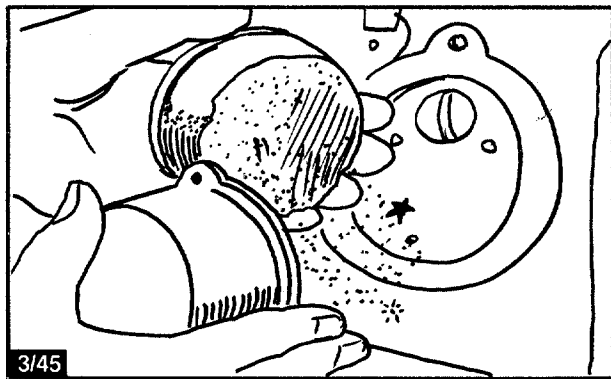
Frequent oil changes will extend engine life.

IMPORTANT: When tilling in extremely dusty conditions inspect the condition of the oil and the air filter very frequently. Every half-hour is none too often!

2. SERVICE THE AIR CLEANER REGULARLY!

Your carburetor mixes air and gasoline to produce a combustible mixture. At normal operating speeds, your engine takes in as much as 8,000 gallons of air through the carburetor for every gallon of gasoline it burns. Since much of this huge volume of air contains dirt and other abrasives that can harm the engine, an air filter has been installed ahead of the carburetor to screen out most of this dirt.

A clean air filter — and tight-fitting, "like new" air filter gaskets — are essential. Dirt coming in through poorly serviced or improperly installed air filters can wear out an engine much sooner than many long hours of tiller use. Also, a clogged air filter can cause hard starting, stalling, or overheating problems. Therefore, always check the air cleaner for cleanliness *each time before* using the tiller. Then, check it at least every two hours during long periods of operation, or even every half hour if conditions are extremely dusty or dirty. If the element requires cleaning, service it as described in Section 5 (Page 104) of this manual. Whenever the element is beyond cleaning or if it is torn, it should be promptly replaced with a new one.

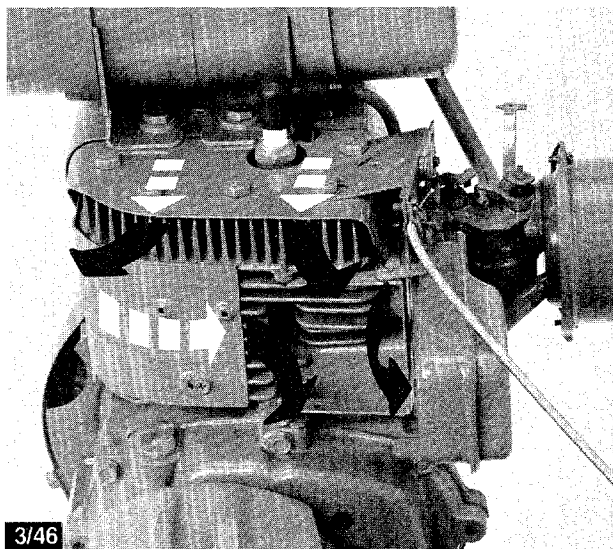


A clean air filter will protect your engine from harmful abrasives.

3. KEEP THE ENGINE COOLING FINS FREE FROM DIRT AND DEBRIS!

Small air-cooled engines such as those used in most gardening equipment, including your tiller, generate a large amount of heat during operation. This heat has to be drawn off from the engine; otherwise the engine could be seriously damaged.

A combination of air cooling and oil lubricating systems control engine heat. Vanes on the engine flywheel blow air through cooling fins on the engine to keep engine parts cooled to safe operating limits (see Photo 3/46). Various engine shrouds and covers are

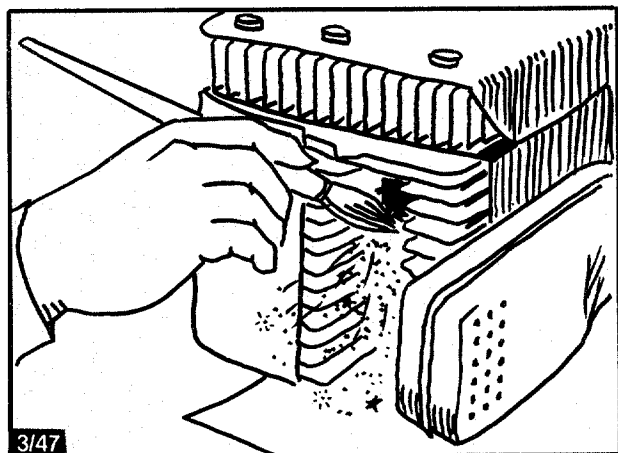


Cooling air flows underneath covers (white arrows) and carries heat away from engine (red arrows).

designed to aid in control of this air flow. At the same time, a system of oil passages throughout the engine lubricates engine parts and avoids a buildup of excessive heat due to friction between moving parts.

Using the correct type of clean oil and *regular cleaning* of dirt and debris from the engine's cooling fins (see Sketch 3/47) will give you better, more efficient performance and longer engine life.

IMPORTANT: Please don't remove the engine shroud or any covers in an attempt to "give it more air for cooling." The cooling fins, shroud and covers are carefully designed to direct the greatest volume of air over all points of the engine to avoid uneven heating. Removing any of these coverings would change the air flow and cause damaging "hot spots" to develop.



Check and clean engine cooling fins each day.

HOW TO PRESERVE ENGINE LIFE

When operating your tiller, please don't run your engine at full throttle all of the time. Instead, try to judge when the engine is providing the proper amount of power — not too little, but not too much. Matching engine power to the work is easier on the engine and on the tiller. The sound of your engine operating will be your best guide.

When you are through with the tiller and are ready to put it away for the day, let it run at low idle speed for two or three minutes without any load on the engine. In fact, let it run at low speed during brief pauses when you're not actually tilling: while you're picking up rocks, preparing to start a new row, or just hesitating for a moment. This practice of giving your engine a "rest" period, will improve fuel economy and will add years to the life of your engine.

When putting the engine away, after it has cooled down, it is a good practice to pull the starter rope slowly until you feel engine compression resisting your pull. This means that both valves in the engine are closed. Leaving the valves closed when the engine is not being used can help to prevent the entrance of moisture into your engine.

Of course, proper care and maintenance of your engine at regular intervals is the best investment you can make to assure longest possible life and trouble-free service. Your engine manufacturer's Owner's Guide and Section 5 of this manual (see Pages 99-128) contain detailed engine care and maintenance instructions — please read and follow that information carefully.

ABOUT ENGINE SERVICE...

If you should ever need engine service, you can locate an Authorized Engine Service Dealer in the "Yellow Pages" of the telephone book under: Engines — Small, or Engines — Gasoline. If you have any difficulty in finding an authorized dealer or in obtaining (or understanding) warranty service, please get in touch with our Customer Service Department here at the tiller factory.

IMPORTANT — Your engine is covered by the engine manufacturer's limited warranty for one full year after the date you received your tiller. During this time, any repair work should be performed by the engine repair dealer who is authorized by the manufacturer to repair the specific make of engine you have. For further details on the engine manufacturer's limited warranty, please see the engine Owner's Guide that came with your tiller.

CAUTION! DO NOT START YOUR ENGINE BEFORE READING:

1. The engine manufacturer's Owner's Guide that came with your tiller.
2. Pages 25 through 28 of this manual, "Rules For Safe Operation."
3. The pages in this section that deal with the controls and operation of your particular model engine.

Controls And Operation Of 6 HP Tecumseh Engines

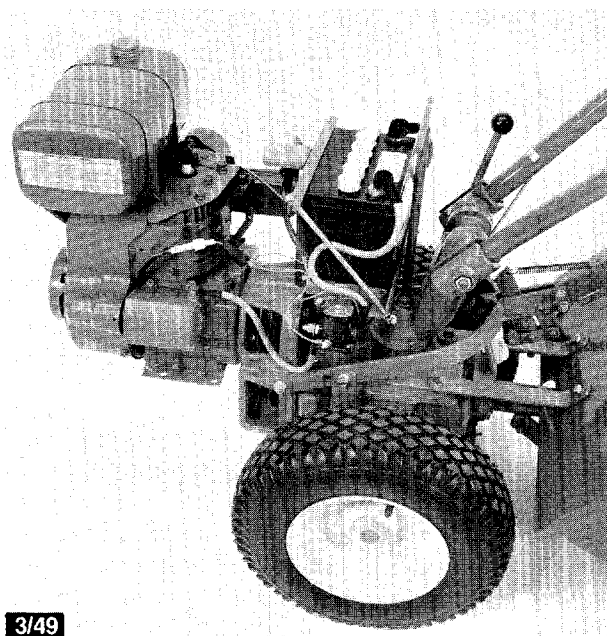
If you have a 6 HP Tecumseh engine (shown in Photos 3/48 and 3/49) on your Horse Model tiller, then please carefully read the following information about its controls and operation before attempting to start it. Also, be sure to consult the Tecumseh Owner's Guide that came with your new tiller.

Please note that your engine is a cast-iron, four-cycle, air-cooled, gasoline powered engine. **DO NOT MIX OIL WITH YOUR GASOLINE.** For complete engine specifications, please see Page 207, in Section 7 of this manual.



3/48

6 HP Tecumseh recoil-start engine.



3/49

6 HP Tecumseh electric-start engine.

RECORDING YOUR ENGINE MODEL AND SERIAL NUMBER

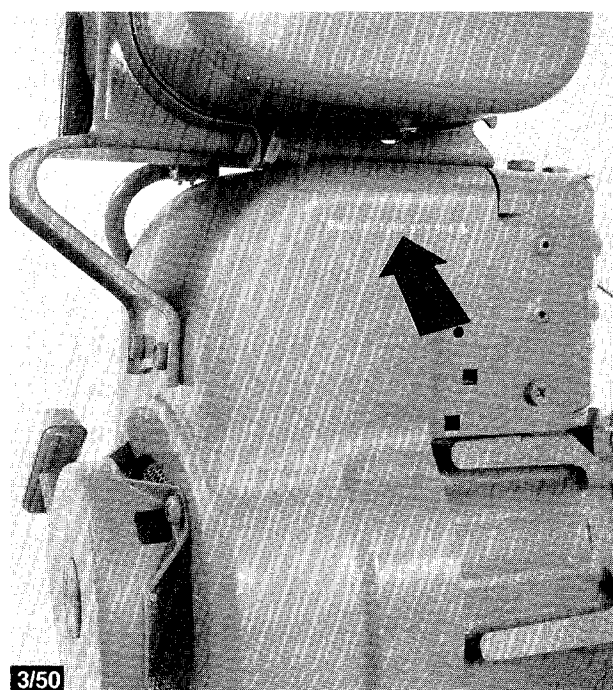
If you ever need engine service or parts, your Authorized Tecumseh Engine Service Dealer will need to know your engine's model type and serial number. As shown in Photo 3/50, this information has been stamped into the left side of the blower housing, on the opposite side of the air cleaner and muffler. To record this information, simply fill in the blank spaces below:

MODEL NUMBER

HH 60— — — — —

SERIAL NUMBER

SER— — — — —



3/50

Engine numbers are stamped in metal.

ENGINE THROTTLE LEVER (6 HP)

The engine throttle lever on your right handlebar (Photo 3/51) provides you with convenient remote control operation of engine speeds. It also has a STOP position which allows you to shut off the 6 HP engine from the operator's position.

If you push the lever all the way to your right (Photo 3/51), it will engage the engine shut-off switch, automatically stopping the engine. Photo 3/52 shows how the control arm at the end of the throttle cable touches a grounding wire at the engine shut-off switch, stopping engine operation. This shut-off position on the throttle lever is another control (besides the Forward/Reverse Lever) that can be used to stop all tiller motion.

If you open the throttle lever by moving it to your left (Photo 3/53) you obtain the full range of engine speeds from idle (lever opened just slightly from the shut-off position) to full engine speed (lever all the way to the left).

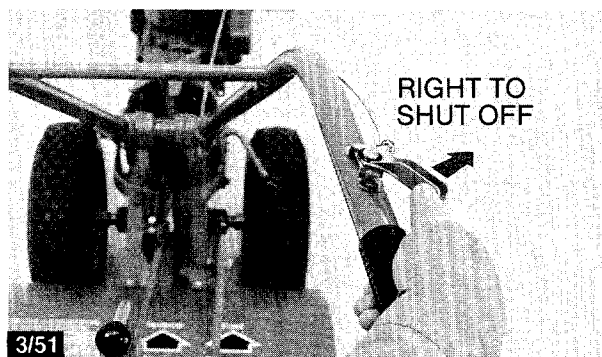
When starting a cold engine, you should normally place the throttle lever at a slow running setting (a little less than the halfway position between shut-off and full speed). This throttle lever position provides a sufficient flow of gasoline to the carburetor to start the engine — see Photo 3/54. Of course, starting a cold engine also requires the use of the manual choke (discussed next), which provides the engine with a richer fuel-to-air mixture.

While the engine is warming up, you should keep the throttle lever at this slow running position. (Avoid racing the engine, which could cause damage to the engine parts until they are thoroughly lubricated.)

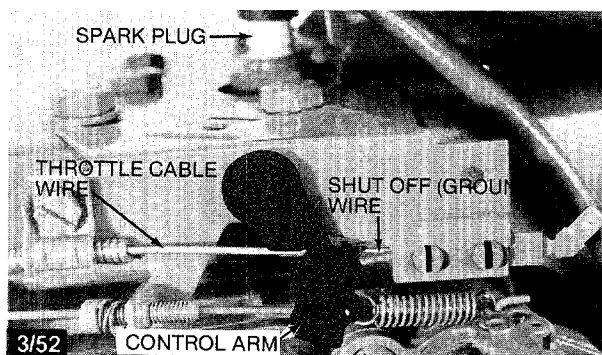
When restarting a warm engine, the throttle lever should also be placed at a slow running setting, but use of the manual choke will probably not be required.

When you open the throttle lever further to the left, it speeds up engine operation and increases tire rotation and wheel speeds. These faster speeds will be necessary when breaking new ground or tilling under heavy crop residues, but remember to use only as fast a throttle setting as is needed to do the job.

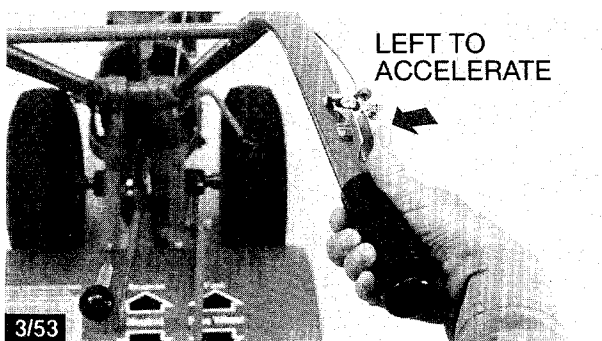
Your throttle cable was attached to the engine at the factory and should be properly adjusted at this time. As you practice using the throttle lever, note the positions that the throttle control (at the engine end) takes when you move the lever from shut-off to full power (Photo 3/54). If the control does not move to these positions when you move the throttle lever on the handlebar, then please refer to Section 6, Page 183, for proper adjustment. There, you'll also find useful information about periodic throttle cable maintenance.



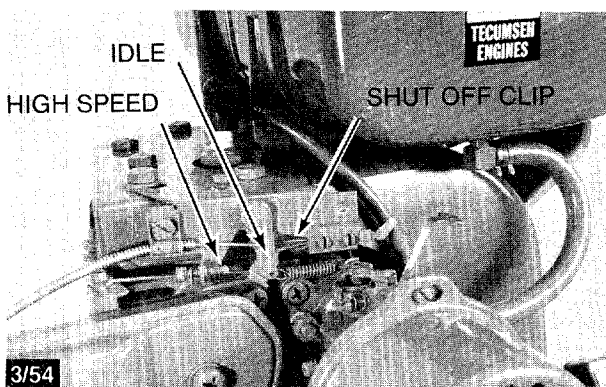
Push right for engine shut-off — 6 HP.



Shut-off position at speed control assembly bracket — 6 HP.



Push left to increase engine speed — 6 HP.



Throttle control positions at speed control assembly bracket of 6 HP engine.

CHOKE (6 HP)

The manual choke on your 6 HP recoil or electric starting engine is located on the carburetor, directly below the front portion of the air cleaner cover (Photo 3/55). If you look closely, you'll notice the word **CHOKE** printed on the arrow-shaped tip of the lever.

When the choke is pushed all the way in (toward the engine) for **FULL CHOKE**, it cuts off most of the air supply to the carburetor to provide the rich fuel mixture required for starting the engine—see Photo 3/55. You should normally set the choke at this **FULL CHOKE** position when starting a cold engine.

Once the engine has started, move the choke to the **HALF CHOKE** position (Photo 3/56). Leave the choke in this position until the engine is warm enough to start till-

ing (depending on outside temperatures, the warm-up time may vary between 45 seconds to as long as three minutes). When the engine is warm, return the choke all the way to the right, to the **NO CHOKE** position (Photo 3/57).

When restarting an already warm engine, you will probably not have to use the choke at all. However, if the engine falters when starting, then try setting the choke at **HALF CHOKE** until the engine runs smoothly and then return it to the **NO CHOKE** position.

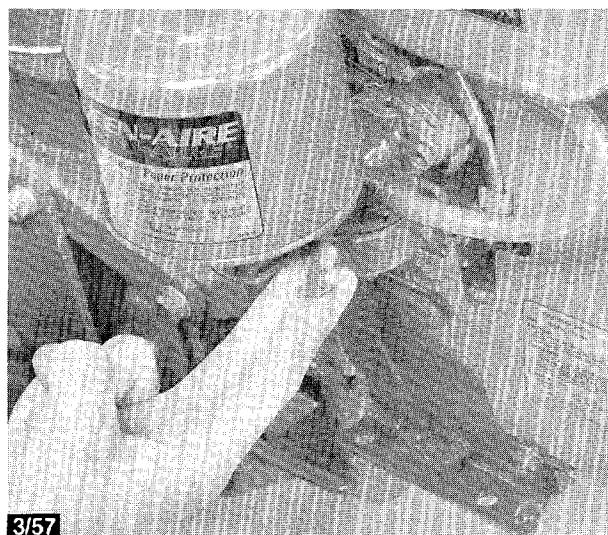
Please make sure that you don't operate the tiller under a load without first seeing to it that the choke is in the **NO CHOKE** position. Failure to do so can quickly build up deposits that are harmful to your engine.



3/55 When starting cold engine, place choke in **FULL CHOKE** position.



3/56 When warming engine, place choke in **HALF CHOKE** position.



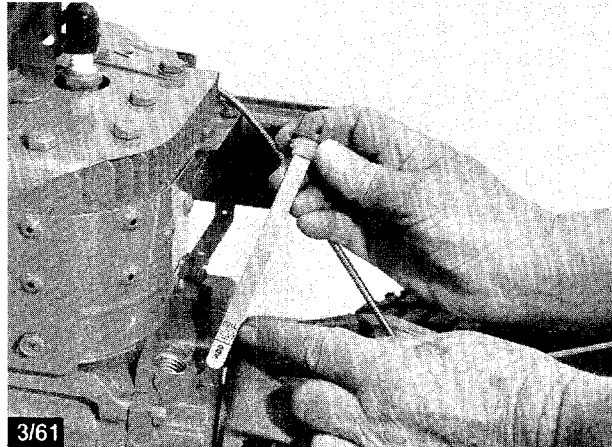
3/57 When engine is warm, return choke to **NO CHOKE** position.

ENGINE OIL (6 HP)

Check the engine oil level each day by measuring it with the dipstick (Photo 3/61). Make sure the level is kept up to, or close to, the "Full" mark (see Section 1, Page 15, for procedure for adding oil to the crankcase). Always make sure that you use the proper grade of oil in your engine. SF or SE must be printed on the top of the can, or on the label.

With a new engine, change the oil after the first 2 operating hours (about one tankful of fuel). Thereafter, change the oil every 10 hours, or even sooner if tilling in dusty, dry soil (see Section 5, Page 102, for details on oil changes).

If you use your tiller during winter, where the temperature dips below 32 °F., you should drain your #30 weight oil and switch to a lighter weight oil (see oil chart in your engine manufacturer's Owner's Guide).



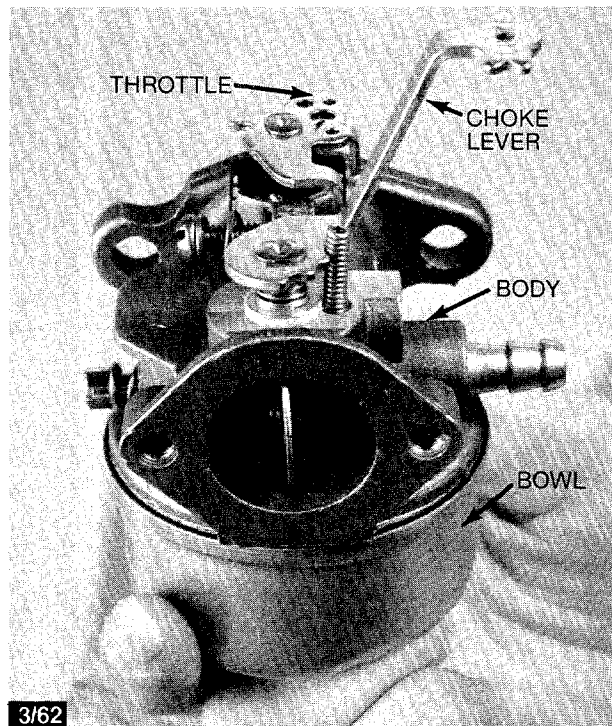
Check oil level with tiller on level floor and Depth Regulator Lever set at first (top) notch (tines off floor). Thread dipstick all the way in, then remove. Replace dipstick securely. Check oil level before each use, and every 2 hours during continuous use.

CARBURETOR (6 HP)

The carburetor (shown in Photo 3/62) supplies a combustible mixture of vaporized gasoline and air to the engine's combustion chamber. The carburetor includes the throttle, choke, body and fuel bowl. There are also three adjustment screws:

1. The Power Adjustment Screw that regulates the fuel-to-air mixture for high speed or power.
2. The Idle Speed Adjustment Screw that mechanically increases or decreases engine idle speed.
3. The Idle Adjustment Needle that affects the idle fuel mixture only.

Do not make unnecessary adjustments to the carburetor. Normally, the factory settings will provide you with the correct fuel-to-air mixture and idle speed for average operating conditions. However, in some cases, minor adjustments may be required to compensate for differences in fuel, altitude and temperature. Your Tecumseh Owner's Guide and Section 6 of this manual (Pages 186-187), provides you with detailed carburetor adjustment procedures, if they are really necessary.



Carburetor for 6 HP engine.

AIR CLEANER (6 HP)

The dual element air cleaner assembly on your 6HP engine filters dirt out of the air being delivered to the engine (see Photo 3/63). It should be checked for cleanliness every time the tiller is used. Dirt coming in through an improperly installed or poorly serviced air cleaner can quickly cause damage to the engine parts. A dirty, clogged air cleaner can also cause hard starting, stalling or overheating of the engine.

When tilling, you should check the air cleaner at least every two hours during continuous operation, or even every half hour if conditions are extremely dusty. If dirty, clean it as explained in Section 5.

Never operate the engine without the complete air cleaner in place.

GOVERNOR (6 HP)

Your 6 HP engine has a built-in mechanical governor which limits engine RPM (Revolutions Per Minute) so that its speed does not exceed limits which could harm the engine. The governor (see external governor lever in Photo 3/63) also allows the engine to adjust its power according to varying loads.

The governor mechanism was carefully set at the engine factory and it shouldn't require any adjustments for years — as long as the external levers and wires are not bent. If adjustments are ever necessary, they should be made only by an Authorized Tecumseh Service Dealer, who has the proper equipment and experience to do so.

CAUTION: Do not tamper with the governor to increase the governed speed. Doing so can cause personal injury, as well as serious damage to the engine.

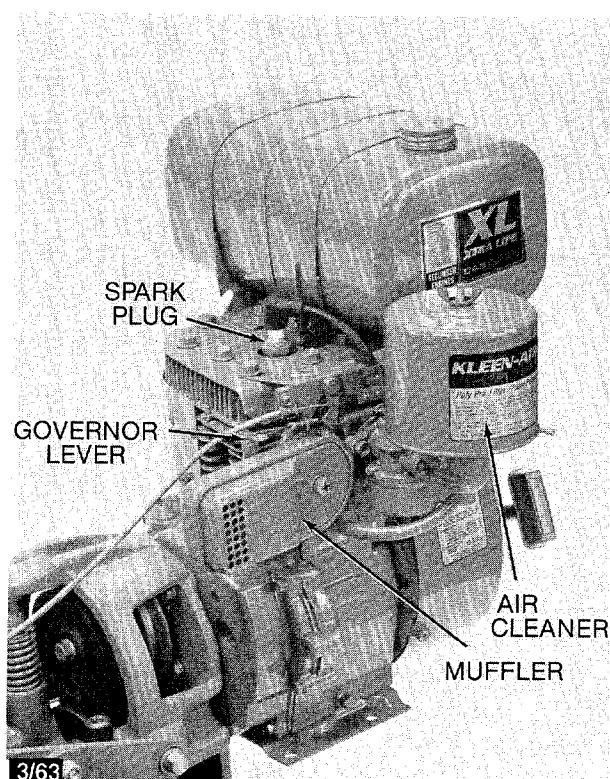
SPARK PLUG (6 HP)

The spark plug (shown in Photo 3/63) provides the spark to the engine to ignite the fuel mixture in the combustion chamber. It is essential to proper engine operation to have a plug that is in good condition. Although a plug can usually be cleaned and reused, they are so inexpensive that we recommend a new one be installed at the beginning of each year, or at least every 50 hours of use (see Page 125 in Section 5).

MUFFLER (6 HP)

The muffler (shown in Photo 3/63) quiets the noise level coming from the engine exhaust. During the first hour of new engine operation the paint on your muffler may melt, resulting in a burning smell. This is not harmful to the muffler and the smell should go away after the first few hours of engine operation. Please be careful never to touch the muffler while it is hot. The temperature of the muffler and nearby areas may exceed 150°F! Keep hands and face away from muffler!

CAUTION: Always wait until the engine and muffler are COOL before refueling the engine. Accidental spilling of gasoline on a hot engine or muffler can cause a fire or gasoline explosion. A corroded or broken muffler is much more likely to cause a spark or smoldering particle that could cause such a fire or explosion. Replace corroded mufflers whenever there is a hole in the muffler.



Some important parts on the 6 HP engine.

IMPORTANT: TO PREVENT ACCIDENTAL STARTING when working on the engine or tiller, always remove high tension cable from spark plug and place it where it cannot contact spark plug or fuel tank area. This is also a good rule to follow whenever you leave the tiller unattended for any length of time. Be careful not to touch the wire while the engine is running!

GASOLINE (6 HP)

Fresh, UNLEADED automotive gasoline is recommended for your 6HP Tecumseh Engine. (Leaded "Regular" grade gasoline is an acceptable substitute).

The use of unleaded gasoline will significantly reduce carbon buildup in your engine's combustion chamber. Less carbon buildup substantially increases the life of your engine and can greatly extend carbon cleanup intervals (normally recommended every 100 hours). A carbon cleanup simply means removing the engine head and cleaning off the carbon. Of course, leaded regular grade may be used, but it won't keep your engine as clean as will unleaded gas.

The fuel tank has a screen to keep dirt out of your carburetor and has a 1 1/2 gallon capacity. **DO NOT MIX GASOLINE WITH OIL.** When adding gasoline, carefully follow the safety precautions listed to the right.

Gum and varnish accumulate in stale gasoline that has been standing for long periods (30 days or more) and can foul spark plugs and clog fuel lines, carburetors, floats and screens in the fuel system. Furthermore, stale gasoline does not vaporize properly for efficient engine performance.

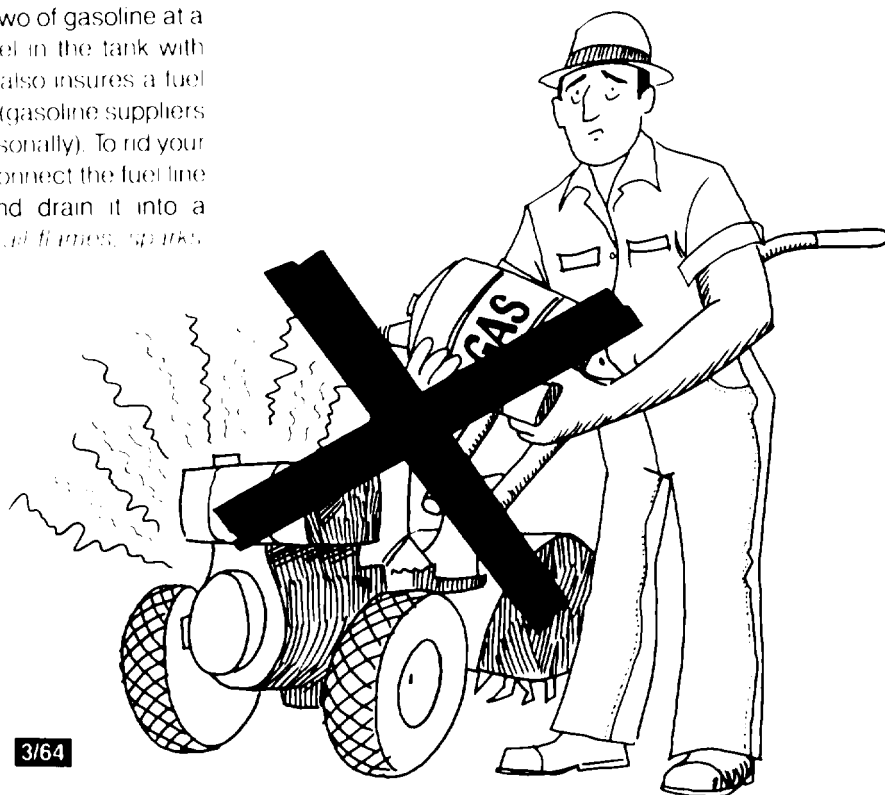
Also, when weather conditions are unfavorable, water can condense on the inner walls of gasoline containers. The water eventually finds its way to the engine's fuel supply. Of course, water in the fuel is a fairly common cause for engine starting failures or for rough-running engines -- conditions often mistaken for carburetor adjustment troubles.

One way of avoiding gummy deposits or water accumulation in fuel is to buy a gallon or two of gasoline at a time and continually replace the fuel in the tank with clean, fresh gasoline. This practice also insures a fuel with volatility tailored for the season (gasoline suppliers usually change the fuel "blend" seasonally). To rid your fuel tank of watery or stale fuel, disconnect the fuel line where it enters the carburetor and drain it into a container. *keeping it away from all flames, sparks, cigarettes, or hot engine parts!*

NOTE: For further information regarding "off-season" storage of your tiller and engine, please see Pages 126 to 128 in Section 5.

SAFETY PRECAUTIONS WHEN ADDING GASOLINE

Gasoline is highly flammable. Keep away from open flame, sparks, and do not smoke while filling the fuel tank. Never fill tank while engine is running or while engine is still hot. Use a funnel or spout to prevent spilling and don't fill any closer than one-half inch from the filling neck of tank. After filling, wipe up spills of fuel and move tiller away from filling area before restarting engine. Never fill fuel tank indoors. When adding gasoline to electric start engines, avoid contacting any portion of the battery or its cables with your gas can. If a spark should occur, it could cause an explosion. Store gasoline in a cool, well ventilated place, safely away from any spark or flame producing equipment. Store only in an approved container and safely out of reach of children. Do not store tiller with gasoline in the tank inside a building where fumes may reach an open flame or spark. Always allow engine to cool before storing in any enclosure.



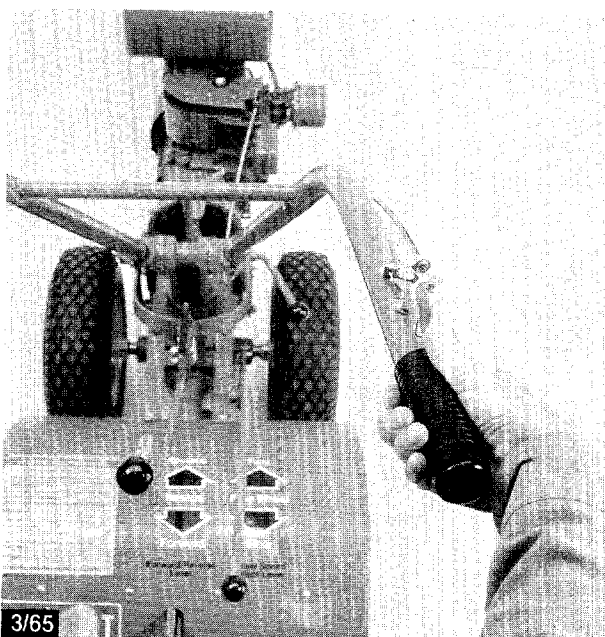
Starting The 6 HP Tecumseh Engine

CAUTION: Do not run engine in an enclosed or poorly vented area. Exhaust gases contain carbon monoxide, an odorless and deadly poison!

If you have followed all of the instructions up to here, then you're ready to start the engine for the first time. First make sure that you have gasoline in the fuel tank and that the spark plug wire is attached to the spark plug. Also, remember to always check the oil level each day, as well as the cleanliness of the air filter. Then, follow these starting steps.

NOTE: At this time, practice starting and stopping the engine only. Please don't try to drive the tiller until you see the step-by-step operating instructions on Pages 61-64 of this manual.

- 1.** Place the Forward/Reverse Lever in NEUTRAL. In Neutral, the clutch roller will be in or above the indentation of the yellow-colored belt adjustment block.
- 2.** Engage the wheels by pushing the Wheel Speed Shift Lever DOWN for Slow Wheel Speed. Roll tiller back and forth a few inches to fully engage lever. When the wheels are in gear, they will no longer turn when you try to roll the tiller.
- 3.** Move the Depth Regulator Lever all the way DOWN, so that the tines are clear of the ground.
- 4.** Move the Throttle Lever to the left, to a Slow Running setting (Photo 3/65).
- 5.** Set the choke lever at FULL CHOKE (for a cold engine). See Photo 3/66.



Position lever slightly less than halfway between shut-off and full speed.

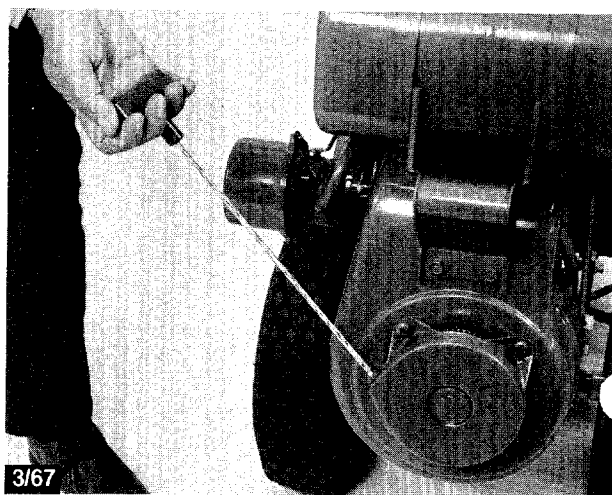


Push lever toward engine for FULL CHOKE position — 6 HP.

6. RECOIL START MODEL — Grasp the starter handle and slowly pull the cord until you feel resistance (Photo 3/67). Then pull the cord out rapidly ... but let it back in slowly. You may have to try this several times until the engine catches. (Be sure there is nothing behind you when you pull the cord.)

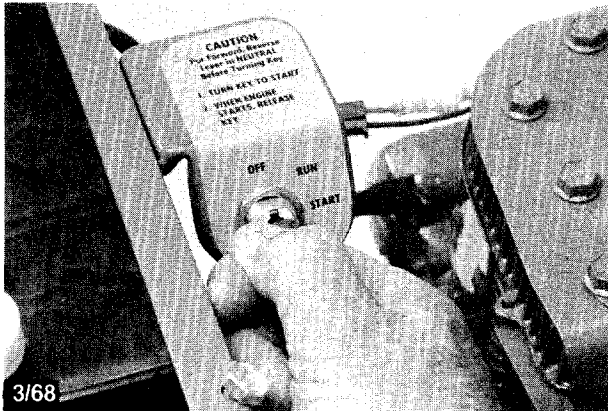
ELECTRIC START MODEL — Insert your key all the way in the slot and turn it to START (Photo 3/68). Hold it at Start no more than 10 seconds. You may have to try this several times before the engine catches. (Allow the engine to come to a complete halt before each restart attempt.) When the engine starts, release the key ... it will automatically return to RUN. (You can also start the electric model with the recoil start rope, but only after you follow the steps described in "In Case Of A Dead Battery" in Section 6, Page 194).

NOTE: If the starter motor fails to turn over when you turn the key to "START", please see Pages 191-193 in Section 6.



Pull cord out rapidly ... let it rewind slowly — 6 HP.

Stopping The 6 HP Engine



Turn key to START position.

7. As soon as the engine fires and is running, keep the throttle lever at a slow run position and move the choke lever to HALF CHOKE (Photo 3/69). Then, as the engine warms, move the choke to the CHOKE OFF position. (After the engine has been operating ten minutes or more, it probably won't be necessary to choke the engine at all to restart it.)

- If the engine falters while warming up, move choke to HALF CHOKE until engine runs smoothly and then to NO CHOKE position.
- If engine fires, but fails to start, move choke to NO CHOKE position and repeat instructions 4 and 6 until engine starts.

If engine again fires, but fails to start, repeat instructions 4, 5 and 6 until engine starts.



Use Half Choke until engine warms, then move to CHOKE OFF — 6 HP.

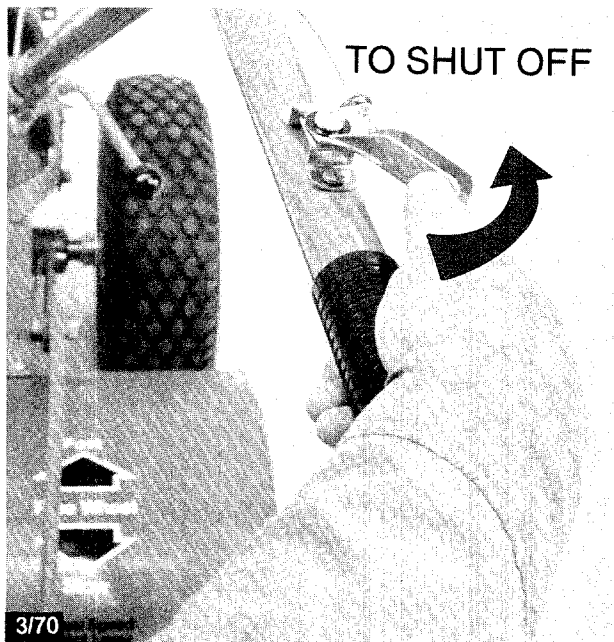
1. To stop tiller motion anytime, place the Forward/Reverse Lever in NEUTRAL.

2. MANUAL START MODEL — Push the Throttle Lever all the way to the right (Photo 3/70). If your engine doesn't shut off automatically, push the choke lever in toward the engine to FULL CHOKE to stop the engine. Then see "Throttle Cable Hookup and Adjustments" in Section 6, Pages 183-185, to correct the problem. Important: Only stop the engine with the choke in emergencies, since repeated use of it can be harmful to your engine.

ELECTRIC START MODEL — You can shut off the engine two ways: with the throttle lever or with the key switch.

a. Push the Throttle Lever all the way to the right, as explained in Step 2, above. Then turn the key to OFF and remove the key for safekeeping.

b. Or, turn the key to OFF. (Remove the key for safekeeping. We suggest you keep the spare key in an easily found place, but secure from children, who shouldn't be allowed to use the engine). If the key switch won't stop the engine when you turn it to "OFF", please see Page 193 in Section 6.



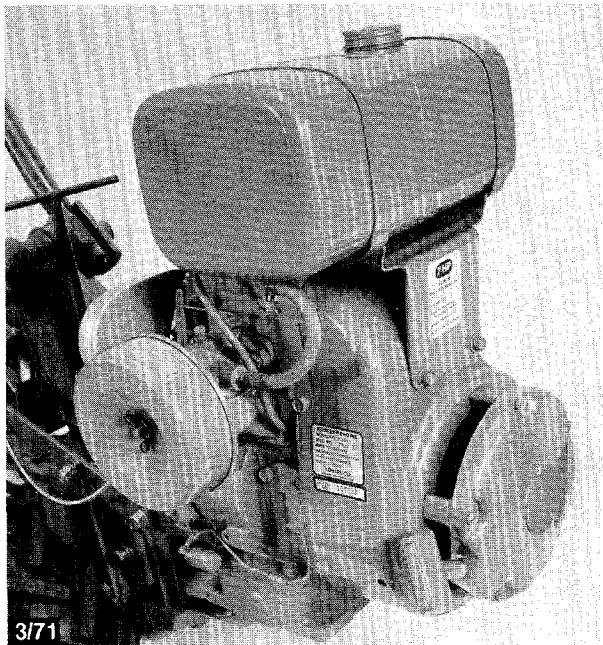
Move lever to right to stop 6 HP engine.

PLEASE SEE PAGES 61 TO 64 OF THIS MANUAL FOR COMPLETE DETAILS ON HOW TO OPERATE YOUR TROY-BILT HORSE MODEL TILLER!

Controls And Operation Of The 7 HP Kohler Engine

If your tiller is equipped with the 7 HP Kohler engine (Photo 3/71), then please carefully read the following information about its controls and operation before attempting to start it. Also, be sure to consult the Kohler Owner's Guide that came with your new tiller.

Please note that your engine is a cast-iron, four-cycle, air-cooled, gasoline powered engine. **DO NOT MIX OIL WITH YOUR GASOLINE.** For complete engine specifications, please see Page 207, in Section 7 of this manual.

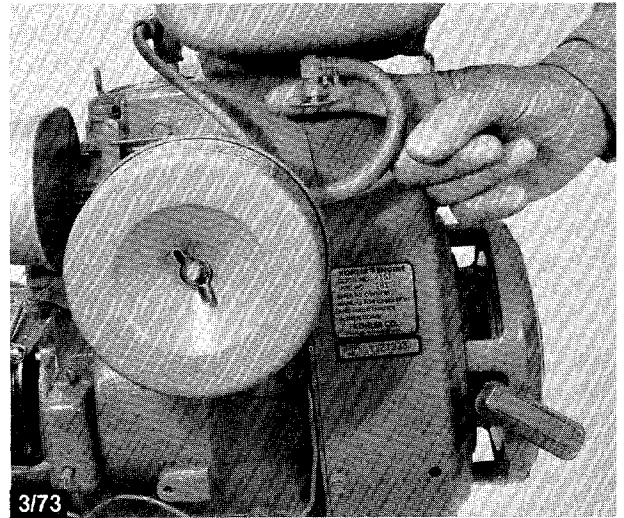


7 HP Kohler recoil-start engine.

FUEL VALVE (7 HP)

Your Kohler engine has a special fuel valve (Photo 3/73) that allows you to shut off the fuel supply to the carburetor when you are done tilling for the day. This prevents seepage of gasoline into the engine, which is especially important to avoid when you are going to store the tiller for a long period of time (also see "Off-Season Storage Instructions" in Section 5 of this manual). It also gives you some additional protection against unauthorized use of your tiller...at least by anyone not familiar with this special feature.

To shut off the fuel supply, turn the valve to the right until it is snug. Before starting the engine, *always* make sure that you open the valve all the way to the left.



Always open fuel valve when starting engine.

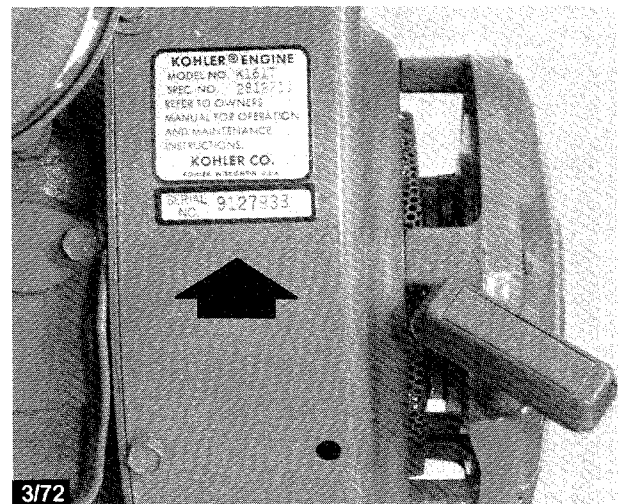
RECORDING YOUR ENGINE MODEL AND SERIAL NUMBER

If you ever need engine service or parts, your Authorized Kohler Engine Service Dealer will need to know your engine's model type and serial number. As shown in Photo 3/72, this information has been stamped into the name plate label on the right side of the blower housing, in front of the air cleaner. For a handy record of this information, simply fill in the blank spaces below:

MODEL NUMBER: _ _ _ _ _

SPECIFICATION NUMBER: _ _ _ _ _

SERIAL NUMBER: _ _ _ _ _



Engine numbers are stamped on name plate.

ENGINE THROTTLE LEVER (7 HP)

The engine throttle lever on your right handlebar (Photo 3/74) provides you with convenient remote control operation of engine speeds.

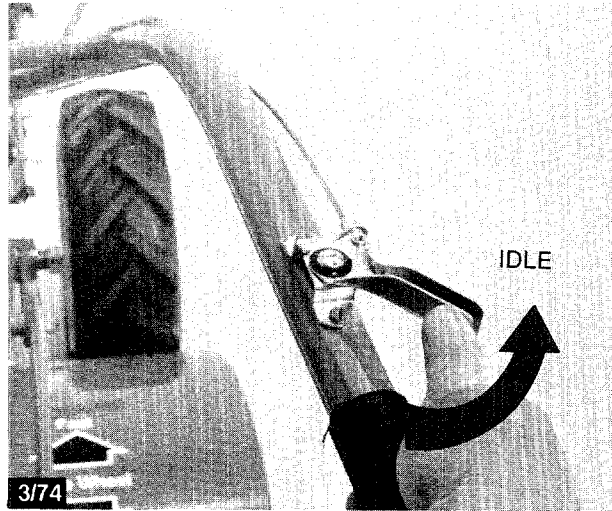
When the lever is pushed all the way to the right (Photo 3/74) it sets the engine speed at a very slow idle setting. By pushing the lever slowly to the left (Photo 3/75) you obtain the full range of faster engine speeds. As you practice using the lever, you'll note that the full range from low speed to high speed is covered with very little movement.

When starting the engine (both "cold" and "warm" engines) the throttle lever should be opened just a "crack" from the idle setting. When you open the lever this very small distance to the left, the carburetor throttle control on the engine will move slightly — see Photo 3/76. As soon as you see this carburetor control move, stop opening the throttle lever. (If you open the throttle lever too far, it will probably flood the engine, making starting difficult.) Of course, starting the engine also requires the use of the manual choke (discussed next) which provides the engine with a richer fuel-to-air mixture.

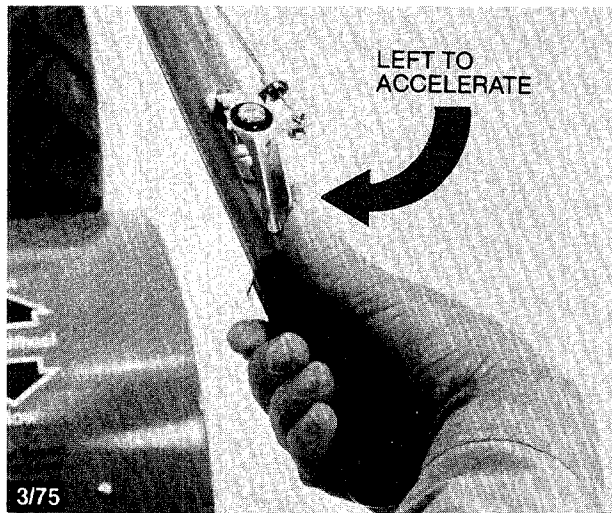
While the engine is warming up, you should keep the throttle lever at this "start" position. Avoid racing the engine, which could cause damage to the engine parts until they are thoroughly lubricated.

When you open the throttle lever further to the left, it speeds up engine operation and increases tire and wheel speeds. These faster speeds may be necessary when breaking new ground or tilling under heavy crop residues, but use only as fast a throttle setting as is needed to do the job. As a matter of fact, because the Kohler engine has great "lugging" power — even at low engine speeds — use of higher engine speeds is rarely required.

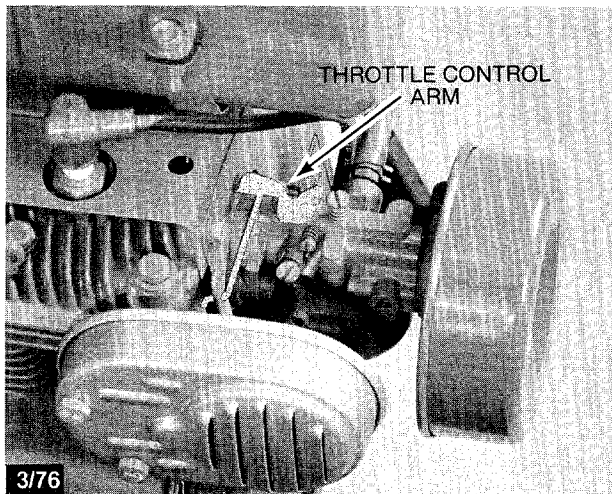
Your throttle cable was attached to the engine at the factory and should be properly adjusted at this time. For throttle cable maintenance and do-it-yourself replacement instructions, please refer to Page 183.



Push lever to right for idle slow speed — 7 HP.



Push lever to left to increase engine speed — 7 HP.



Observe movement of throttle control arm on 7 HP engine.

CHOKE (7 HP)

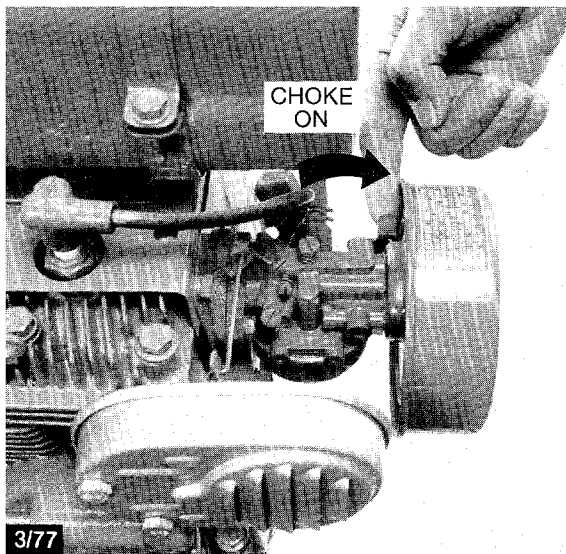
The manual choke on your 7 HP engine is located on the carburetor, directly behind the air cleaner (Photo 3/77). If you look closely, you should see the word "ON" stamped into the choke lever.

When the choke lever is pulled all the way out (toward the air cleaner) for CHOKE ON, it cuts off most of the air supply to the carburetor to provide the rich mixture required for starting the engine — see Photos 3/77 and 3/78. You should normally move the lever to this CHOKE ON position when starting a "cold" engine.

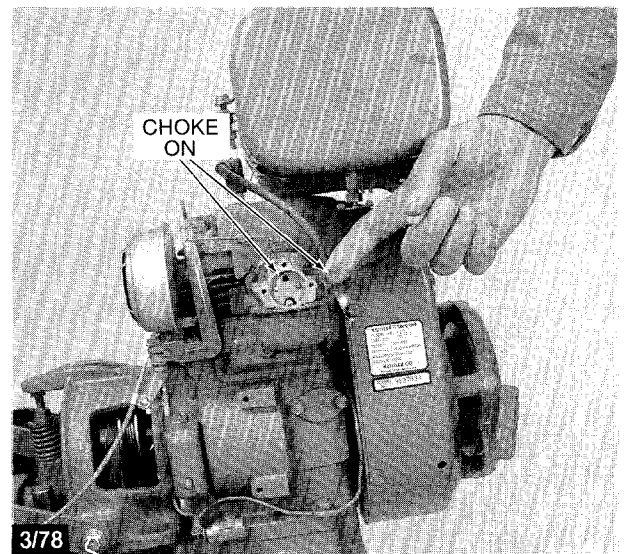
Once the engine has started, gradually return the choke to the CHOKE OFF position (Photos 3/79 and 3/80).

Please make sure that you don't operate the tiller under a load without seeing to it that the choke lever is in the CHOKE OFF position. Failure to do so can quickly build up deposits that are harmful to your engine.

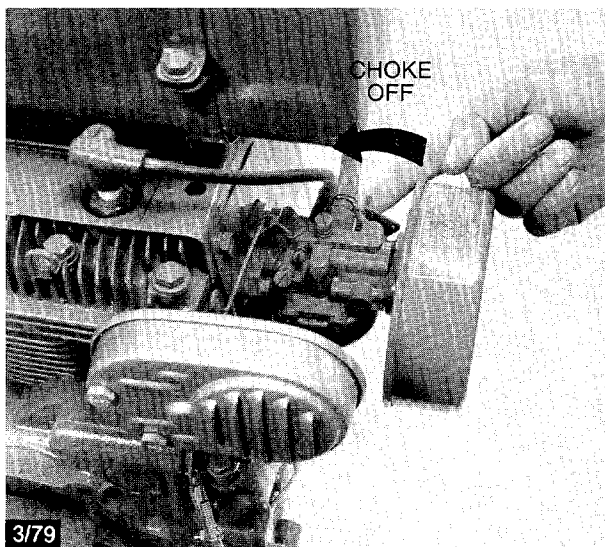
When restarting a warm engine, you may not have to use the choke at all. However, if the engine falters when starting, then try setting the choke at HALF CHOKE until the engine starts. Then gradually return the lever to the CHOKE OFF position.



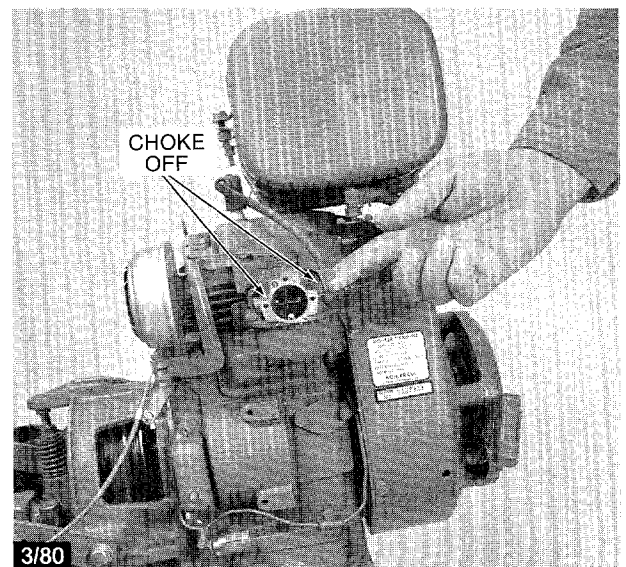
Move choke lever toward air cleaner for CHOKE ON position — 7 HP.



View of choke plate at CHOKE ON position (air cleaner removed for clarity).



Move choke lever toward engine for CHOKE OFF position — 7 HP.

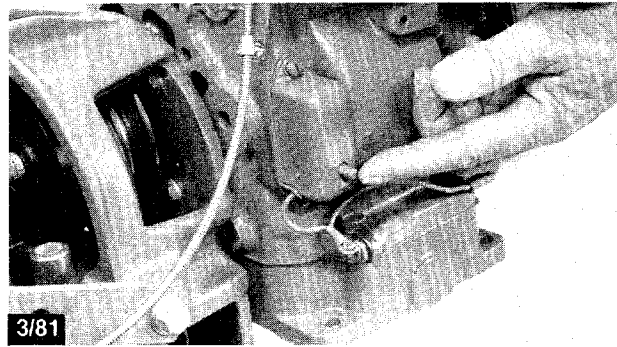


View of choke plate at CHOKE OFF position.

ENGINE STOP BUTTON (7 HP)

When you wish to shut off your 7 HP engine, first slow down the engine speed by moving the throttle lever on the handlebar all the way to the right. Then, push the stop button in and **HOLD IT IN** until the engine stops (Photo 3/81). You may have to hold the button in for several seconds to completely shut off the ignition.

CAUTION: If your tiller is equipped with the optional Bumper Attachment, you should reach **UP UNDER** the brace of the bumper when pushing the stop button in. Doing so will prevent you from accidentally touching the engine's hot muffler.



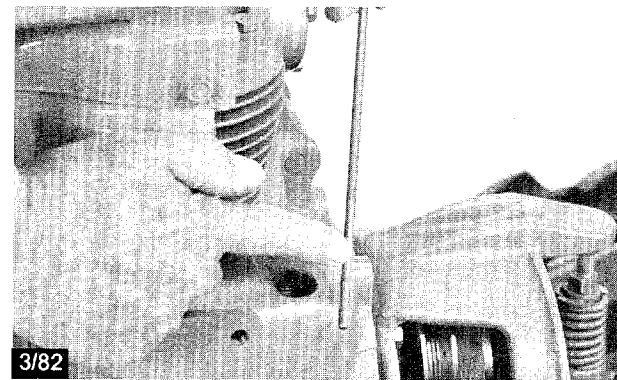
3/81

To stop 7 HP engine, **PUSH IN** and **HOLD** stop button.

ENGINE OIL (7 HP)

It's the smart owner who checks the engine oil level prior to each day's operation (and at least every 2 hours during continuous use) by measuring it with the dipstick (Photo 3/82). Doing so can prevent a ruined engine due to a lack of engine oil. When checking, make sure the level is kept up to, or close to, the "Full" mark (see Section 1, Pages 14-15, for procedure for adding oil to the crankcase). Always make sure you use the proper grade of oil in your engine. SE must be printed on the top of the can, or on the label.

With a new engine, change the oil after the first 5 operating hours. Thereafter, change the oil every 10 hours, or even sooner if tilling in dusty, dry soil (see Section 5, Page 103, for oil changing instructions).



3/82

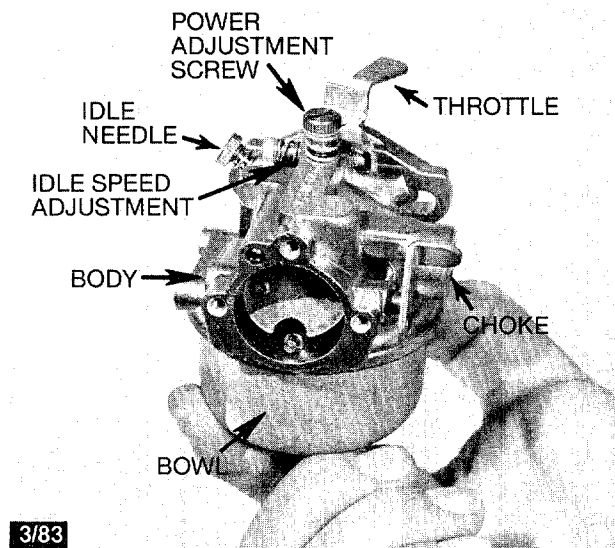
Check oil level with tiller on level spot and with engine base level (prop up tines to level engine). Rest dipstick's threads on top of hole when measuring — do not thread in.

CARBURETOR (7 HP)

The carburetor (see Photo 3/83) provides the engine's combustion chamber with the proper air/fuel ratio for a wide range of operating conditions. The carburetor includes the throttle, body, choke and fuel bowl. There are also three adjustment screws:

1. The Main Fuel Adjustment Needle which regulates the air/fuel ratio for high speed or power.
2. The Idle Speed Adjustment that mechanically increases or decreases engine idle speed.
3. The Idle Fuel Adjustment Needle that affects the idle fuel mixture only.

Your carburetor's settings were adjusted at the engine factory and they should be correct for average operating conditions — do not make any unnecessary adjustments. However, minor adjustments may be required to compensate for differences in fuel, altitude and temperature. If you think your carburetor requires some adjustment, please see your Kohler Owner's Guide and Section 6 of this manual (Pages 186-187) for easy-to-do instructions.



3/83

7 HP Kohler engine carburetor

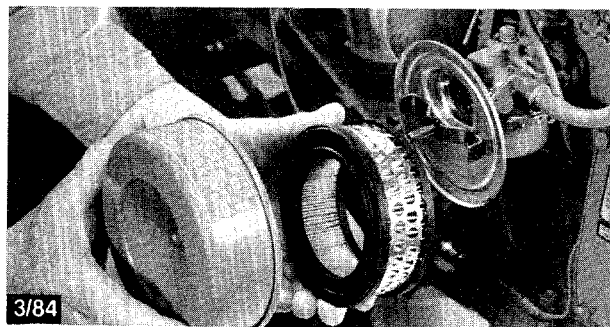
AIR CLEANER (7 HP)

The dry element air cleaner on your Kohler engine prevents dirt and other air-borne contaminants from getting into the carburetor and engine (see Photo 3/84). It should be checked for cleanliness each time before the engine is started. Dirt coming in through an improperly installed or poorly serviced air cleaner can quickly cause damage to the engine parts. A clogged air cleaner can also cause engine starting and running problems.

When tilling, you should examine the air cleaner at least every two hours, or even every half hour if conditions are extremely dusty. See Section 5, Page 104, for easy air cleaner servicing instructions.

Never operate the engine without the complete air cleaner installed.

NOTE: An optional precleaner is available for use with your air cleaner. See your Kohler engine pamphlet for further details.



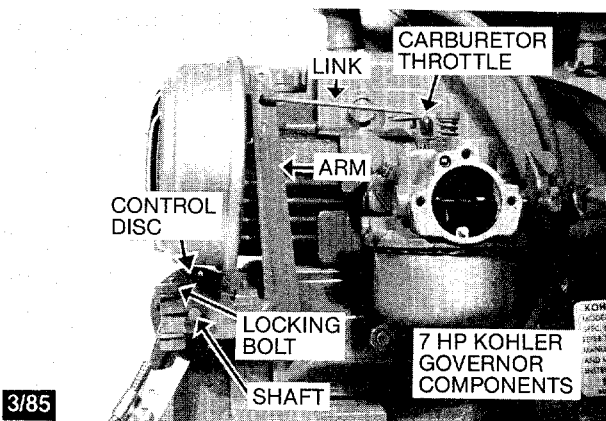
Check and clean the air cleaner often.

GOVERNOR (7 HP)

Your 7 HP Kohler engine has a mechanical governor (see Photo 3/85) that prevents the engine from exceeding safe operating limits. It also adjusts engine speeds according to varying load conditions.

The governor setting was carefully set at the engine factory and shouldn't require any adjustments. Please see your Kohler Owner's Guide for further details regarding the governor.

CAUTION: Never tamper with the governor setting to gain more power. Doing so can cause personal injury, as well as serious damage to the engine.

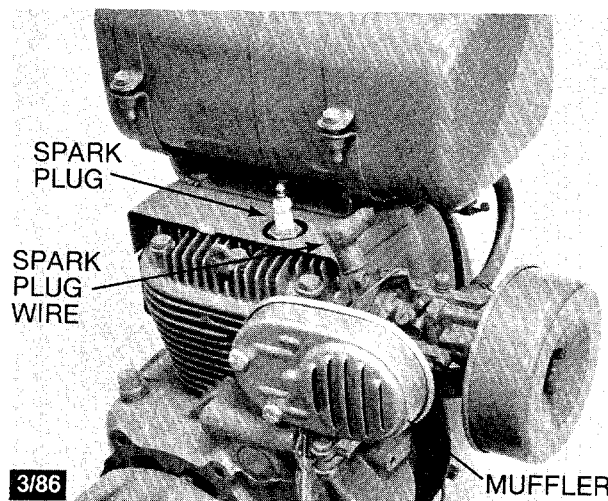


External governor linkage on 7 HP Kohler engine.

SPARK PLUG (7 HP)

To obtain full performance from your engine, the spark plug (Photo 3/86) must be in good condition. Although a plug can usually be cleaned and reused, they are so inexpensive that we recommend a new one be installed at the beginning of each year, or at least every 50 hours of use (see Page 125 in Section 5).

IMPORTANT: TO PREVENT ACCIDENTAL STARTING when working on the engine or tiller, always remove high tension cable from spark plug and place it where it cannot contact spark plug or fuel tank area. You should also disconnect the spark plug wire whenever you leave the tiller unattended. Be careful not to touch the wire while engine is running!



Disconnect spark plug wire to prevent accidental starting.

MUFFLER (7 HP)

The muffler (shown in Photo 3/86) reduces the noise level of the engine exhaust. Please be careful never to touch the muffler while it is hot. The temperature of the muffler and nearby areas may exceed 150°F. Keep hands and face away from muffler!

CAUTION: Always wait until the engine and muffler are COOL before refueling the engine. Accidental spilling of gasoline on a hot engine or muffler can cause a fire or gasoline explosion. A corroded or broken muffler is much more likely to cause a spark or smoldering particle that could cause such a fire or explosion. Replace corroded mufflers whenever there is a hole in the muffler.

GASOLINE (7 HP)

Fresh, UNLEADED gasoline with a pump sticker octane rating of 87 or higher (in the U.S.A.), is recommended for your 7HP Kohler Engine. In Canada and other countries using the research method it should be 90 octane minimum.

The use of unleaded gasoline will significantly reduce carbon buildup in your engine's combustion chamber. Less carbon buildup substantially increases the life of your engine and can greatly extend carbon cleanup intervals (normally recommended every 100 hours). A carbon cleanup simply means removing the engine head and cleaning off the carbon. Of course, if you can't get unleaded gas, then leaded regular grade is an acceptable substitute, but it won't keep your engine as clean as will unleaded gas.

The fuel tank has a screen to keep dirt out of your carburetor and has a 1½ gallon capacity. **DO NOT MIX GASOLINE WITH OIL.** When adding gasoline, carefully follow the safety precautions listed to the right.

Avoid using gasoline that has been standing for long periods. Stale gasoline develops gum that will foul spark plugs and clog fuel lines, carburetors, floats and screens in the fuel system. Also, it does not vaporize properly for efficient engine performance.

Under unfavorable weather conditions, water can condense on the inner walls of gasoline containers. The water eventually finds its way to the engine's fuel supply. Of course, water in the fuel is a fairly common cause for engine starting problems or for rough-running engines — conditions often mistaken for carburetor adjustment troubles.

One way of avoiding stale fuel or water accumulation is to buy a gallon or two of gasoline at a time and continually replace the fuel in the tank with clean, fresh gasoline. This practice also insures a fuel with volatility tailored for the season (gasoline suppliers seasonally change volatility "blend").

To rid your fuel tank of watery or stale fuel, disconnect the fuel line where it enters the carburetor and

drain it into a container — *keeping it away from all flames, sparks, cigarettes, or hot engine parts!*

NOTE: For further information regarding "Off-Season" storage of your tiller and engine, please see Pages 126 to 128 in Section 5.

SAFETY PRECAUTIONS WHEN ADDING GASOLINE

Gasoline is highly flammable. Keep away from open flame, sparks, and do not smoke while filling the fuel tank. Never fill tank while engine is running or while engine is still hot. Use a funnel or spout to prevent spilling and don't fill any closer than one-half inch from the filling neck of tank. After filling, wipe up spills of fuel and move tiller away from filling area before restarting engine. Never fill tank indoors. Store gasoline in a cool, well ventilated place, safely away from any spark or flame producing equipment. Store only in an approved container and safely out of reach of children. Do not store tiller with gasoline in the tank inside a building where fumes may reach an open flame or spark. Always allow engine to cool before storing in any enclosure.



Starting The 7 HP Kohler Engine

CAUTION: Do not run engine in an enclosed or poorly vented area. Exhaust gases contain carbon monoxide, an odorless and deadly poison!

If you have followed all of the instructions up to here, then you're ready to start the engine for the first time. First make sure that you have gasoline in the fuel tank and that the spark plug wire is attached to the spark plug. Also, remember to always check the oil level each day, as well as the cleanliness of the air filter. Then, follow these starting steps.

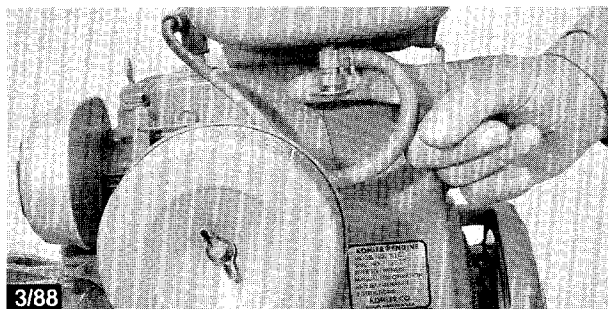
NOTE: At this time, practice starting and stopping the engine only. Please don't try to drive the tiller until you see the step-by-step operating instructions on Pages 61-64 of this manual.

1. Place the Forward/Reverse Lever in NEUTRAL. In Neutral, the clutch roller will be in or above the indentation of the yellow-painted belt adjustment block.

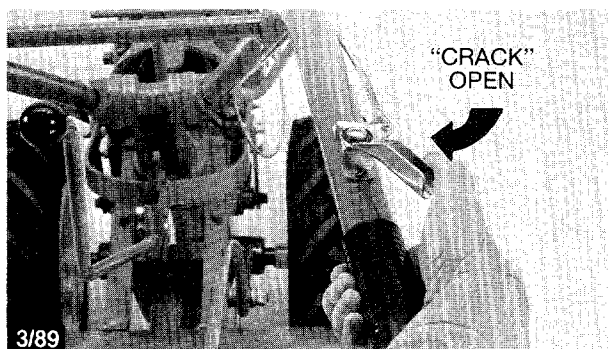
2. Engage the wheels by pushing the Wheel Speed Shift Lever DOWN for Slow Wheel Speed. Roll tiller back and forth a few inches to fully engage lever. When the wheels are in gear, they will no longer turn when you try to roll the tiller.

3. Move the Depth Regulator Lever all the way DOWN, so that the tines are clear of the ground.

4. Open the fuel valve under the gas tank by turning it to the left (Photo 3/88)



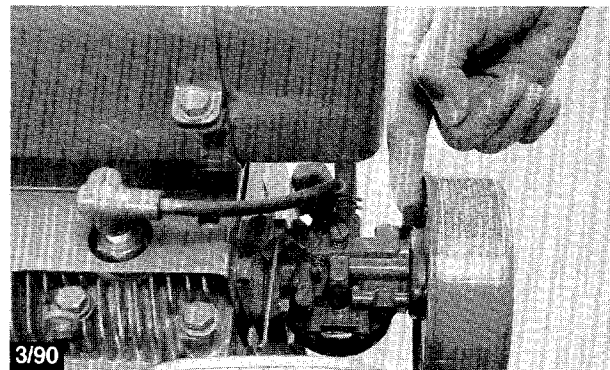
Turn valve to left to open fuel line on 7 HP engine.



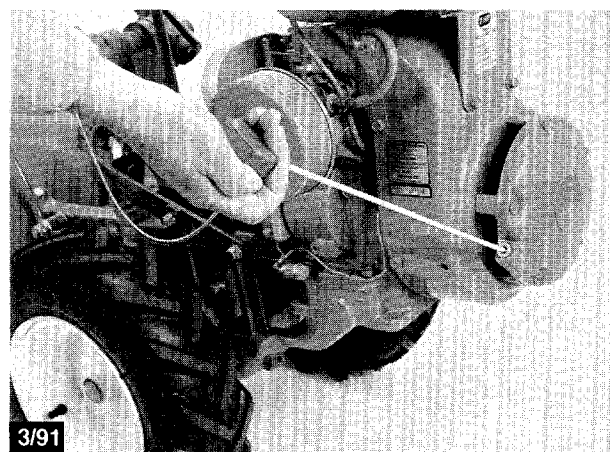
Open throttle a very small amount to the left — 7 HP.

5. Crack open the throttle lever on the handlebar a very small amount — see Photo 3/89. (Avoid flooding the engine with fuel).

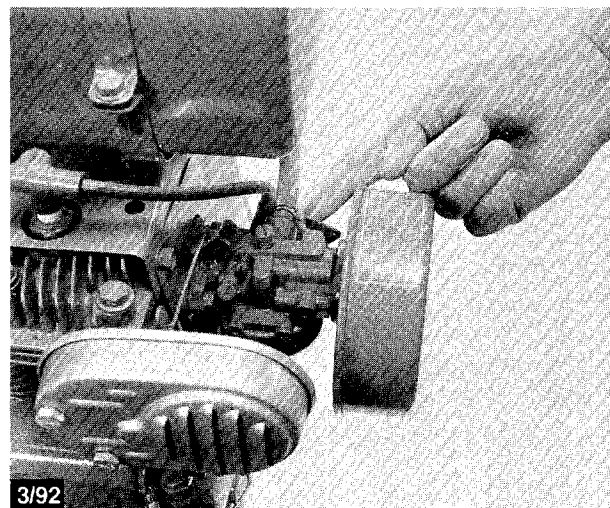
6. Move the choke lever to the CHOKE ON position (toward the air cleaner), shown in Photo 3/90.



Move lever toward air cleaner for CHOKE ON — 7 HP.



Pull cord out rapidly ... let it rewind slowly — 7 HP.



Move lever toward engine for CHOKE OFF — 7 HP.

7. Grasp the starter handle and slowly pull the cord until you feel resistance (Photo 3/91). Then pull the cord out rapidly . . . but let it back in slowly. You may have to try this several times until the engine catches. (Be sure there is nothing behind you when you pull the cord).

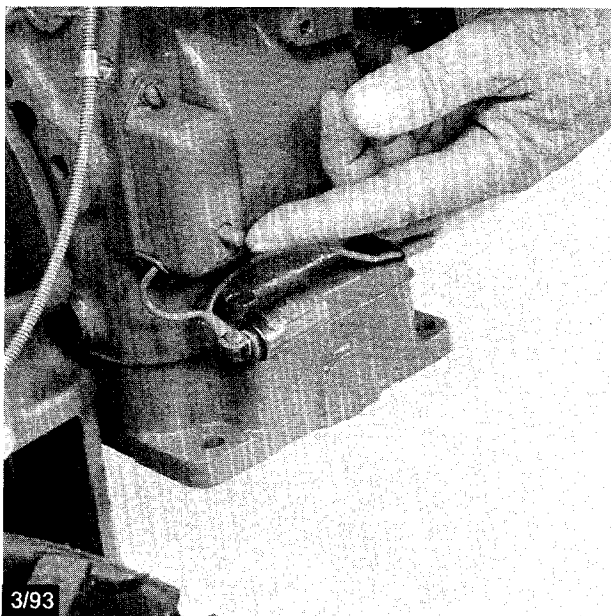
8. After the engine is running, gradually return the choke lever to the CHOKE OFF position (Photo 3/92). Allow engine to warm up before increasing the throttle lever speed. (After the engine has been operating for ten minutes or more, it probably won't be necessary to choke the engine at all to restart it.)

Stopping The 7 HP Engine

1. To stop tiller motion anytime, place the Forward/Reverse Lever in NEUTRAL.

2. Slow down the engine speed by moving the throttle lever all the way to the right. Then, push the stop button IN and HOLD IT IN until the engine stops (Photo 3/93). Allow a few seconds for the engine to stop running.

NOTE: If engine continues running when stop button is pushed in, move the choke lever to the CHOKE ON position and open the throttle lever all the way to the left. This will cause the engine to stall. Only stop the engine with the choke in emergencies, since repeated use of it can be harmful to your engine.



3/93
Push stop button IN and HOLD IT IN to stop 7 HP engine.

OPERATING THE TILLER

Now that you're familiar with the controls and operation of your tiller and engine, we suggest that you practice using your tiller with the tines out of the ground (in "travel" position) until you feel completely comfortable operating it in forward and reverse, and turning it around. During these practice "runs", make sure that you keep the drive belt in the LOW RANGE position on the pulley grooves. In LOW RANGE, the belt will be in the grooves that are furthest away from the engine.

Once you have acquainted yourself with these basic operating procedures, you should go on to Section 4 of this manual, which gives complete details on how to use your tiller in the garden and around your home.

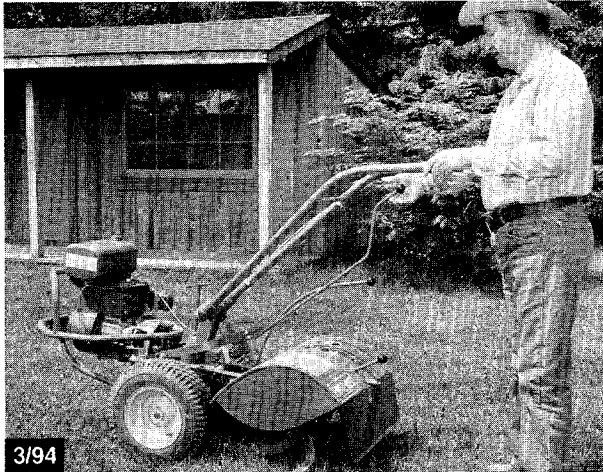
Before trying to run your tiller this first time, please make sure that you have taken the following steps:

- 1.** Studied photographs locating controls and compared the photos with the actual controls on your tiller. See Pages 31 to 41.
- 2.** Have added #30 viscosity motor oil, rated SF or SE, to the engine crankcase. See Pages 14-16.
- 3.** Have familiarized yourself with all of the engine controls. See Pages 46 to 53, or Pages 54 to 61 in this manual, or Pages 15-20 in the green-covered, 8HP Owner's Manual Supplement (for 8HP engines only).
- 4.** Have worked the tiller controls without the engine running and understand what each does.
- 5.** Have read the Safety Precautions. See Pages 26 to 28.

To Operate Your Tiller...

The instructions printed on your tiller hood are a summary of the steps to follow to operate your tiller.

(Please be sure to read the complete "turning around" instructions on Page 64, before starting your tiller.)



(1) Place the Forward/Reverse Lever in NEUTRAL. In neutral, the clutch roller on the lever will be located in or above the indentation of the yellow-painted belt adjustment block.



(2) Push the Wheel Speed Shift Lever DOWN into the Slow Wheel Speed position. As you push down on the lever, roll the tiller back and forth a few inches to help get the lever into gear. When the gear is engaged, you will no longer be able to roll the tiller.

CAUTION: DO NOT put the tines in soil if the Wheel Speed Shift Lever is in FREE WHEEL. The wheels will not perform their function of holding the tiller back, and if the tines are in the soil, they'll propel the tiller very rapidly. Always put the Wheel Speed Shift Lever in Low or High Speed position before engaging tines in the soil.



(3) Move the Depth Regulator Lever all the way DOWN so the tines are off the ground. This places the tines in the "travel" position.



(4) Place the drive belt in the Low or High Range pulley grooves. When first practicing with your tiller, we suggest that you have it in the Low Range grooves (those furthest from the engine).

ATTENTION OWNERS OF 8HP BRIGGS & STRATTON ENGINES — For information on how to START and STOP your 8HP engine, please refer to Pages 15-20 in your green-covered, 8HP Owner's Manual Supplement (SER-74).



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(5) Start the engine. See Pages 52-53 or 60-61 for starting instructions for your own engine. After starting, allow engine to warm up. When engine is warm, advance the Throttle Lever slowly to the left until the engine speed is a little beyond "fast idle." At this time, the engine (upper) pulley will be turning, but the wheels and tines will be motionless.



3/99

(6) TO GO FORWARD: Push the Forward/Reverse Lever DOWN into Forward position and release the lever. The tiller will start moving along the ground by its powered wheels. The tines will also be turning. **TO STOP FORWARD MOTION:** Tap or lift the Forward/Reverse Lever UP, and LET GO. With the lever in Neutral, both the wheels and the tines will stop turning.



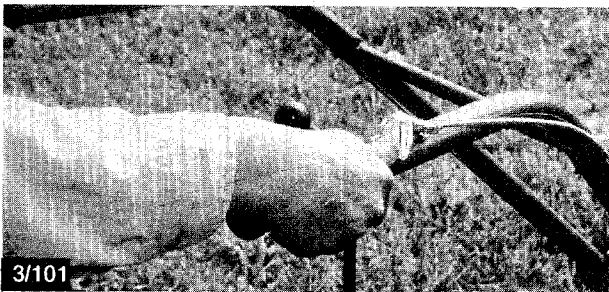
3/100

(7) TO GO IN REVERSE: LIFT the handlebars to raise the tines off the ground, then LIFT and HOLD the Forward/Reverse Lever all the way up. The tiller and tines will go in reverse as long as you hold the lever all the way up.

CAUTION: Make sure the area behind you is clear of any obstacles before moving in reverse! Do not reverse in Fast Wheel Speed until you are sure you can handle the tiller at this faster speed. Always slow down the engine speed with the throttle lever before shifting into reverse.

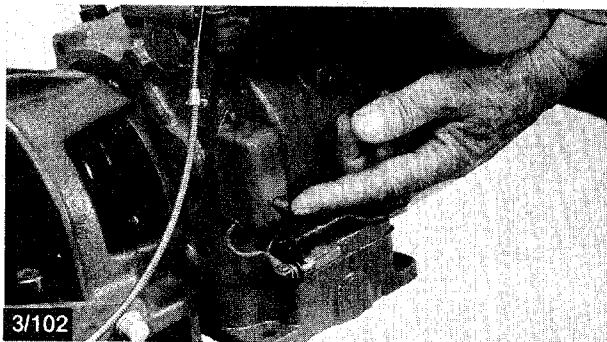
TO STOP REVERSE MOTION: LET GO of the lever. This will return the lever to the Neutral position, stopping all wheel and tine motion.

TO STOP THE ENGINE



3/101

TECUMSEH ENGINES — After placing the Forward/Reverse Lever in Neutral, push the Throttle Lever to the right to the idle position. Let the engine idle for a minute or two. Then push the Throttle Lever all the way to the right until the throttle control engages the shut-off switch. With the electric starting engine, you should then turn the key to OFF.



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KOHLER ENGINE — After placing the Forward/Reverse Lever in Neutral, push the Throttle Lever all the way to the right to the idle position. Let the engine idle for a minute or two. Then push the button IN and HOLD IT IN until the engine stops.

3

Turning Your Tiller Around

As you can see in the sequence of photos that follow, turning your tiller around is simple and very easy. All you really need to do is get used to finding the balance point between the weight of the engine up front and the weight of the tines in the rear, and then let the power driven wheels do the work as you just guide the tiller around. Practice it a few times and you'll have it down pat. Here's how to do it:



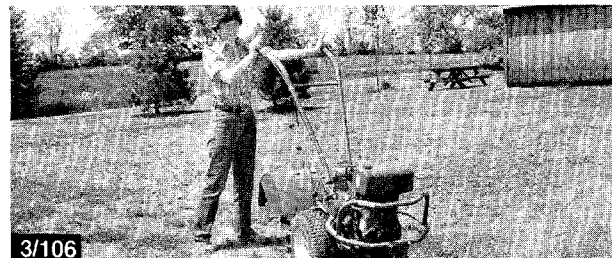
(1) As you approach the end of a row, slow the engine down with the Throttle Lever. Until you're fully used to turning your tiller around, it'll be easier for you if it's going at this slower speed.



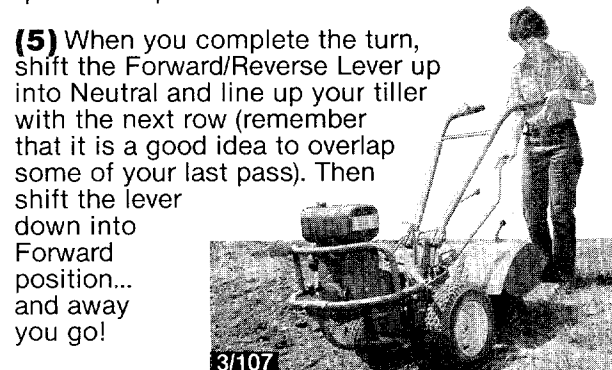
(2) At the end of the row, lift up gently on the handlebars to raise the tines just out of the ground. Then, tap or lift the Forward/Reverse Lever UP into Neutral. (With just a little practice you'll be able to eliminate this stop and shift altogether, and will be able to start the turn in one fluid motion).



(3) To make the turn, keep the handlebars raised up so that the tines are out of the ground and then shift the Forward/Reverse Lever DOWN into Forward. As the wheels start to turn, simply push the handlebars to the left (or right) to swing the tiller around. It will take very little effort since the powered wheels do most of the work.



(4) Remember... tilt the tiller forward, swing the handlebars in the direction you want to turn, and allow the power driven wheels to do most of the work. As you turn, the outside wheel will provide most of the traction while the inside wheel will just spin in one place.



TO TURN AROUND IN CLOSE QUARTERS...



(6) Use reverse if you have to turn around in a limited space. Before shifting into Reverse, reduce the engine speed by moving the throttle lever on the handlebars towards the idle position. Then, raise the handlebars until the tines are out of the ground (balancing tiller weight), and shift the Forward/Reverse Lever UP into Reverse (to stop reverse motion simply let go of the lever). Briefly backing up this way and completing your turn will allow you to turn around in as little as a three-foot radius.

IMPORTANT: Be sure to read Section 4 of this manual for complete details on using your tiller in the garden and around the home.

USING YOUR TILLER



4

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SECTION 4: Using Your Tiller

INTRODUCTION

Your **Troy-Bilt** Roto Tiller-Power Composter with tines in the rear and power driven wheels, is actually two machines in one. First of all, it is a superior rotary tiller for preparing the soil and for cultivating. Secondly, it is an extremely efficient compost chopper-shredder that will easily chop up and mix into the soil organic matter of all kinds — tall weeds, crop residues, sod, fall leaves, green manures and cover crops — even standing cornstalks!

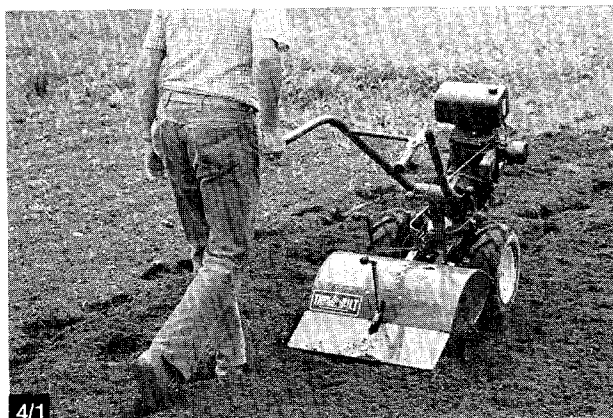
The fact that the Troy-Bilt Tiller has tines in the rear and separately powered wheels is the secret to its success. The large wheels are at the perfect balance point between the engine up front and the tines in the rear. Engine power is supplied directly to the wheels so that they move the tiller forward deliberately, evenly and gradually. Since the wheels take care of moving the tiller forward, the tines are free to revolve at a much faster, separately driven speed ($13\frac{1}{2}$ times faster

than the wheels in Low Gear; $5\frac{1}{2}$ times faster in High Gear). With the tines revolving this much faster than the wheels, they can easily chop up, shred and bury organic material in one simple step.

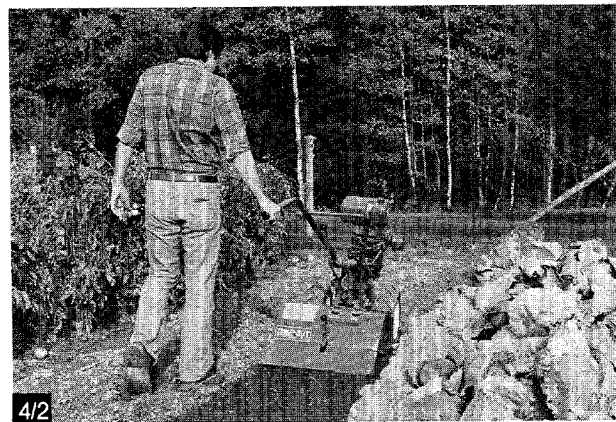
The tine safety hood further helps in soil preparation as sod, soil and vegetation are thrown up against it by the revolving tines. The hood traps this matter momentarily and allows the tines to further break it up and put it back in the garden.

As a compost chopper-shredder, your tiller chops up and shreds vegetation in its path, and in successive passes buries this material in the ground where it decomposes and releases the nutrients to your garden. This unique combination of tilling and shredding capability allows you to enrich the soil far beyond your ability to do so by hand.

Your Troy-Bilt Tiller is a complete gardening machine that will help make gardening and other outdoor chores easier and more fun to do throughout the year.



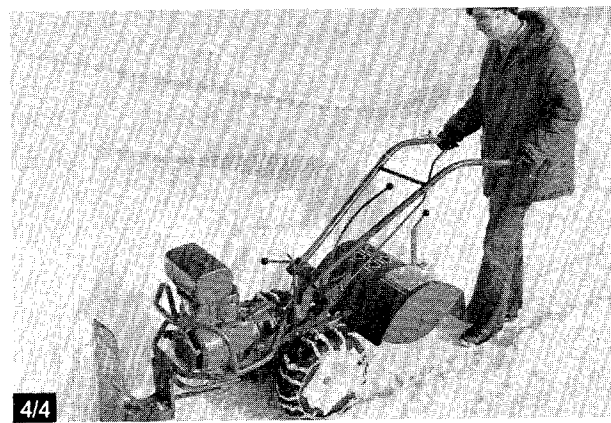
SPRING — Use your Troy-Bilt Tiller to prepare a perfectly smooth seed bed.



SUMMER — Cultivating between rows is fast and simple.



FALL — Tilling under organic matter will enrich your soil and greatly increase yields.



WINTER — Use the optional Dozer/Snow Blade to clear away snow.

Operating Tips

Let the tiller do the work

When you are operating your tiller, relax and let the wheels pull the machine along while the tines do the digging. Walk alongside the tiller on the side that is not yet finished (to avoid making footprints in the freshly tilled soil) and lightly, but securely grip the handlebars with one hand — Photo 4/5.

Try to avoid the temptation to lean on the handlebars. Doing so takes the weight off of the wheels, reduces traction, and causes the tines to attempt to propel the tiller forward instead of just digging. Sometimes, a slight downward pressure on the handlebars will help get the tiller through a particularly tough section of sod or unbroken ground, but in most cases this won't be necessary at all.



4/5

A firm grip but loose arm is all that's needed to guide the tiller along.

How to match wheel and tine speeds to particular jobs

Your new four-speed model Troy-Bilt Tiller offers a speed for every tilling task and situation in the garden, while you get maximum tilling results for each task.

In general, many folks will find that placing the belt in the High Range position and putting the Wheel Speed Shift Lever in Slow Wheel Speed will perform most tilling chores very well, except those under very hard and tough conditions. For example, if you try to work too fast in tilling tough sod or previously unworked land, you won't get the job done adequately. So, you'll have to throttle back the engine speed a little. If you find that in doing so, you aren't getting enough engine power, then moving the belt back to Low Range and tilling in Slow Gear will provide you with more power at the slower speed you want.

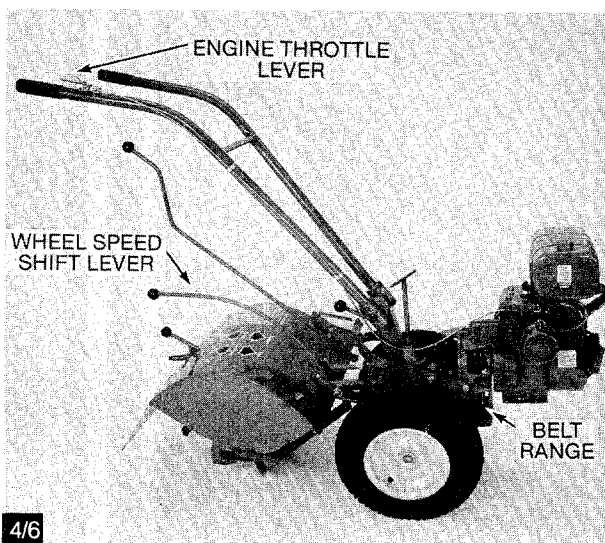
On the other hand, High Belt Range and Fast Wheel Speed offer some people the perfect combination of wheel and tine speeds to prepare seedbeds in well-tilled soil and cultivate at speeds fast enough to get the job done quickly — at a lower engine throttle setting. These faster wheel and tine speeds not only save wear and tear on your engine, they also permit you to dig shallower, without as much lifting up of the handlebars.

With a little experimenting, you will soon be able to find the proper tilling depth, engine throttle setting, and wheel and tine speeds that are just right for the piece of soil you are working on (see Photo 4/6). What this means is:

1. You advance the throttle lever on the handlebars to keep the engine running at a sufficient power level to do the job.
2. You have the depth regulator set in a notch which is not so deep that it causes the engine to labor or causes the tiller to jump.
3. You have the tines turning over fast enough to really break up the soil with a minimum number of passes.

When your tiller is working properly, you can hear that the engine is not laboring very hard and see that the tines are breaking up the soil into small, thoroughly tilled bits. At the proper match of wheel and tine speeds, you will get the job done quickly, and achieve results which are better and more satisfying.

To help guide you in your selections of wheel and tine speeds, please refer to the chart that follows. As you can see, there are many tasks and speeds that, with the combined use of the engine throttle, belt ranges and wheel gear shifting, permit you to tailor your tiller's action to your needs.



4/6

Throttle and belt/pulley range determine tine speeds.

4

Wheel Gear and Belt Range Choices

Please note that the following belt range and gear shift choices are based on suggestions received from gardeners who are very experienced in the use of the four different speeds available on your tiller. Before you use the High Belt Range and Fast Wheel Gear combination, please remember that it will propel your tiller along at a fairly fast pace, especially if you have the engine throttle set to run at a fast speed. When first using this

High Belt Range/Fast Wheel Gear combination, reduce the engine throttle speed setting until you are used to the tiller moving at this faster pace. At the same time, remember that if you use Reverse when the Wheel Speed Lever is in Fast Gear, the tiller will be reversing towards you at this faster speed. Again, reduce the engine throttle speed to a slower setting before shifting into Reverse.

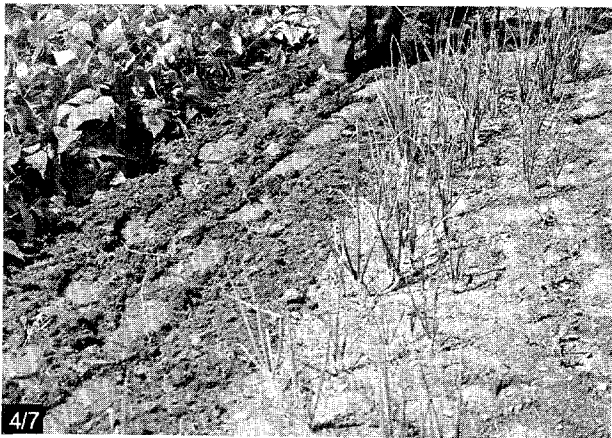
SLOW GEAR, LOW RANGE	SLOW GEAR, HIGH RANGE	FAST GEAR, LOW RANGE	FAST GEAR, HIGH RANGE
Till in sod Till hard clay Till in corn stalks Till in cover crops Prepare very deep seedbed Till in stony soil Till in residues and organic matter Mix in fertilizers and manures	Till in sod Till hard clay Till in corn stalks (in most cases, much faster) Till in cover crops (faster, better job in most soils) Prepare seedbeds (in most soils better and faster) Till in stony soils Make raised beds Mix in fertilizer Prepare seedbed for tilling very fast Pull hillier in hard clay soil Mix fertilizer and manure Till in residues and organic matter (As good or better in all but very hard, tough conditions)	Prepare last time over seedbed for planting vegetables and cover crop Cover seed in wide row or plot planting. (In some soil, handlebars must be held up to keep from going too deep) Hill and furrow very well Raise beds easily Cultivate. In some soils you may have to hold up on handlebars to avoid going too deep. Handy in keeping large areas tilled and prepared for a season to improve soil Till in some organic matter in good soil Mix in lime Cultivating between raised beds with hillier/furrower.	Prepare seedbeds for planting cover crops Mixing in lime Cover seeds with less holding up on handlebars (faster than low range) Cultivate (excellent, saves engine because you don't have to run it wide open, nor hold up handlebars — with rare exception — because it travels faster and stays on top) Keep large areas tilled and ready through summer (saves a lot of time) Till in some organic matter. Moving tiller from one place to another Cultivating between raised beds with hillier/furrower. (Does many jobs better and faster)

(NOTE: See Pages 88-91 for suggested tiller speeds when using Dozer/Snow Blade)

Avoid making footprints

When making your final passes in a garden section, always try to walk alongside the tiller on the side that is not yet finished — see Photos 4/7 and 4/8. You can easily guide your tiller with one hand, leaving no footprints in the path that you have just tilled.

Eliminating footprints contributes much more than just good appearance to your garden. It aids in preventing soil erosion and avoids “planting” unwanted weed seeds and plants right back in your newly tilled ground. It also leaves your soil nice and loose, so that vegetable roots can penetrate it easily.



Don't leave footprints in your newly tilled soil.



To prevent footprints, walk on unfinished side, guiding tiller with one hand.

Soil and moisture conditions

Extreme soil and moisture conditions can affect your tiller's performance. It is best not to work the soil when it is too soggy or wet. Doing so will make too many clumps that won't break up as well as they would if you had waited for a few dry days. If time will permit, always wait a day or so after heavy rains for the ground to dry — Photo 4/9.

However, if you have low, wet sections in your garden, you can often speed up the drying time by just breaking up the top layer of soil the first time through. Then go over it again after a couple days. Wait and repeat the process again a few days later. Once the soil is dry enough to work at maximum depth, you can prepare your final seedbed. If you have perennial wet areas, the optional Furrower attachment can be used for digging drainage ditches (see Page 86), or you might want to try raised bed gardening with the Hiller/Furrower attachment (Page 87).

In very hard, dry soil, you should start tilling at a very shallow depth, only an inch or two deep the first time. In each succeeding pass, you can go down a few more inches, gradually working down to the depth you want (watering your garden a few days prior to tilling will make the going much easier).



Whenever possible, let soil dry to a crumbly texture before tilling.

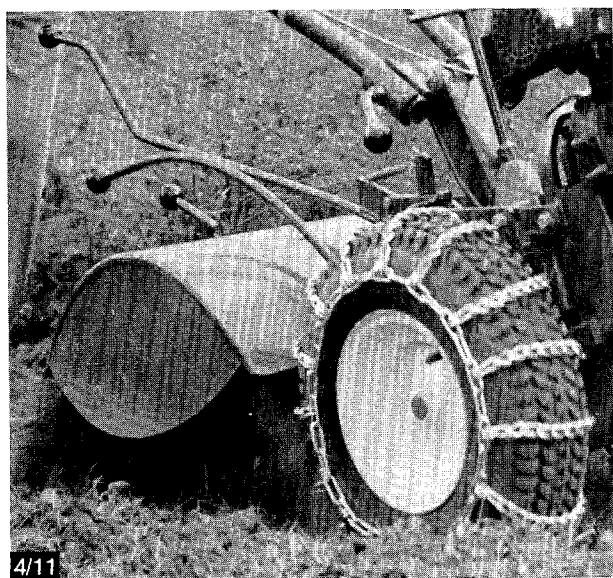
Traction

Some owners may have a problem with traction in wet clay soil, tall or heavy vegetation, or with extremely loose, light sandy soil (where spinning wheels may tend to get buried). Then too, a combination of soil and slope conditions can sometimes cause traction problems.

In these situations, Bar Tread Tires (Photo 4/10) or Troy-Bilt Chains (Photo 4/11) should provide the solution. For more details regarding these two items, please see Pages 96 and 97. NOTE: If you use the Dozer/Snow Blade, we recommend the use of tire chains or Bar Tread Tires for better and safer traction.



Bar Tread Tires can make the difference in loose soil



Chains add traction in tall vegetation.

Clearing debris from tines

Occasionally, dried-out grass, stringy stalks, or tough vines may become tangled in the tines. If this happens, lift the tines just out of the soil and run your tiller in reverse for a few feet — Photo 4/12. This reversing action of the tines should unwind most of the debris.

With experience you will find that it is not necessary to remove all of the crop residue that might get wound around the tines during tilling. But, of course, you can't allow it to accumulate so much that it chokes off the action of the tines. Before it does this, try reversing the tiller as explained above. Then, if necessary, stop the machine and engine and remove the tangled material by hand. A small pocket knife or linoleum knife will help you to cut away the material.

CAUTION: For safety's sake, stop the engine and disconnect the spark plug wire before trying to clean out the tines by hand.

Normally, you can avoid most tangling problems by setting the depth regulator deep enough to get maximum "chopping" action as the tines chop the material against the ground, and by tilling under crop residues or cover crops while they are still green, moist and tender.



Operating tiller in reverse will usually untangle debris.

Tilling in the garden

Seedbed preparation

Preparing the soil for planting is the most important single step in gardening. In a well-prepared seedbed, the soil should be as loose and fine as possible, tilled to a depth of 6 to 8 inches, or more (Photo 4/13).



4/13 The final seedbed should be tilled 6 to 8 inches deep.

If you are preparing a new garden site, or expanding an old one, then you'll most likely have to bust up sod or hard ground that hasn't been touched for several months or even years. This won't prove overly difficult for your Troy-Bilt Tiller, but you must be patient and take it easy.

In most cases, weeds or grasses growing on the plot can be tilled right under. However, if the material is very tall (over 18"), dry or wiry, you may have to cut it down first with a powerful, heavy-duty rotary mower or with a hand scythe — Photo 4/14. After cutting, till as soon as possible to take advantage of any moisture left

in the ground. If you cut the material with a scythe, it may still be too long to be able to till under easily (the rotary mower will usually cut it into smaller sections). In this case, you should rake away the cut material and use it for mulch or compost.

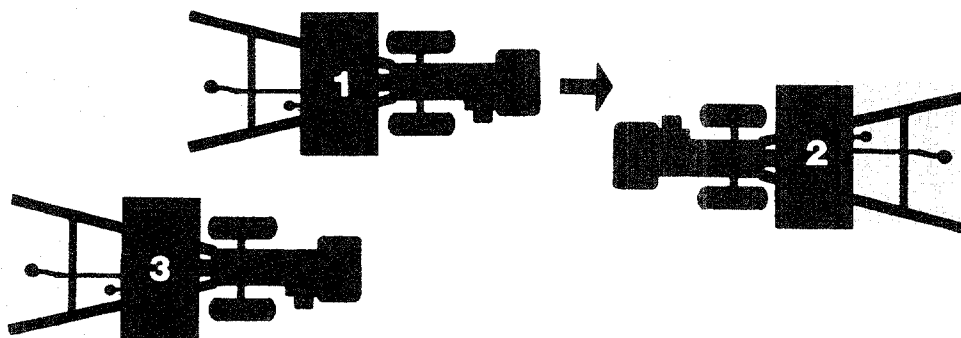
Once you have marked off your garden plot, remember to avoid trying to till too deeply the first time through. As shown in Sketch 4/15, use an overlapping pattern, with the tines set as deeply as you can without making the engine labor too hard or causing the tiller to



4/14 It's best to cut or mow extra tall growth before attempting to turn it under.

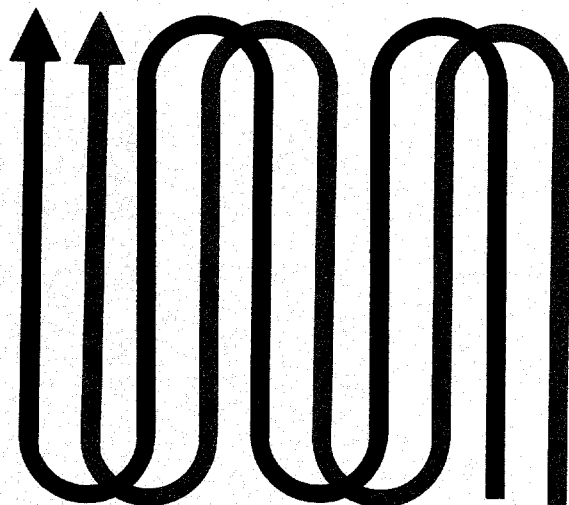
CAUTION: The standard, non-commercial rotary lawnmower used by most homeowners for lawn cutting is not recommended for field cutting use. You should only use a commercial type mower that can easily handle this extra heavy cutting, and that can be raised high enough above the ground so that the blade safely clears any hidden rocks or other debris that might be in the path of the mower (before mowing, always thoroughly inspect for, and remove, all foreign objects in the area of operation).

4



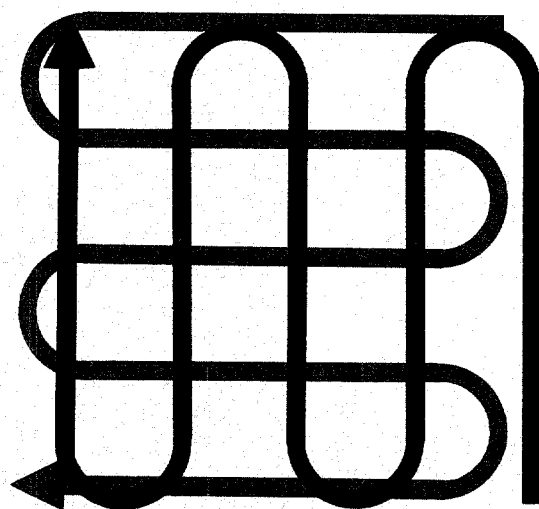
4/15

Depending on soil condition, overlap $\frac{1}{2}$ the tiller width, or even $\frac{1}{4}$ the width, on each pass.



4/16

Tilling pattern for previously worked soil.



4/17

Tilling pattern for unplowed ground.

“jump”. (In most soils, it’s best to start out at the second or third notch of the depth regulator to break through the upper surfaces of the soil. On your succeeding passes, you can then set the depth regulator at a lower setting.) At any time, if you have difficulty getting down really deep, let the newly worked soil set for a day or two. When you return to it, the tilling will go easier.

When preparing soil for planting, start out with the Slow Wheel Speed and either Low or High Range belt positions. After reaching the depth you want, wait a few days and then go over it again with the tiller set in Low Belt Range and Fast Wheel Speed. This final pass through at the higher wheel speeds will leave you with a beautiful, finely textured seedbed.

Please see Sketches 4/16 and 4/17 for recommended tilling patterns for both previously worked soil and for unplowed ground. By going up and down rows and overlapping one-half the tiller’s width each time, you will be sure to bust up all the soil with the minimum amount of effort. And, by making a second pass in a direction crosswise to your previous passes (especially in unplowed ground), you will really pulverize the entire garden area.

If you don’t have enough width in your garden to till lengthwise and then crosswise, then overlap the second, third, and fourth passes half a tiller width over each previously tilled path, then overlap one-fourth a tiller width on successive passes back over the freshly tilled ground. This overlapping method will assure you of thoroughly breaking up the ground.

If you have plans to expand your garden for next season, then the best time to bust up sod is in the fall. Doing so will allow the sod or tough surface growth to be completely broken down by the time spring rolls around. (Sod busting can be done right up to December in most areas of the country, as long as the ground isn’t frozen.) If there is still some growing season left, then you should plant a cover crop (such as annual rye grass), which will protect the soil over the winter. If your soil needs lime or other special treatment (have it tested), fall is also the best time for it. Add the proper amount and till it into the upper 6 inches of soil (Photo 4/18).

Of course, when making your final passes through a seedbed, remember to walk beside the machine in the unfinished soil, guiding it with one hand so you will avoid footprints. And don’t be afraid to till the soil often. When preparing it for planting, it should be as fine, textured as possible.



4/18

Use your tiller to mix lime or other nutrients into the soil.



4/19

Clay soil can be improved by adding plenty of organic matter before planting. Let clay soil dry before tilling.



4/20

In rocky soil, use slower wheel and tine speeds. Get rid of stones that are larger than baseballs; let the smaller ones stay.



4/21

Sandy soil is easy to prepare and can be worked almost anytime. Adding organic matter to sandy soil will aid its ability to hold moisture and prevent erosion.

4

How to till on sloping ground or hillsides

When gardening on sloping or hilly ground, you have a choice of three tilling patterns: vertically up and down, laterally across, or terracing. Each method re-

quires some special operating techniques and consideration, so please read the following information carefully.

Tilling vertically on slopes

If you garden on a slope, your Troy-Bilt Tiller can be the greatest benefit to you if you are able to plant vertical rows up and down the slope — Photo 4/22. It is better to run the machine up and down a slope rather than across it; otherwise, it will have a tendency to creep sideways. Also, tilling vertically on a slope will permit you to use the entire area for your seedbed, as well as provide enough room between rows so that you can cultivate between them during the growing season.

Surprisingly, growing a garden vertically on a slope does not have to involve much of a soil erosion problem, as long as you put in enough organic material to improve the moisture holding ability of your soil, and if you avoid packing down the soil with footprints. If there is not plenty of organic material, then either mulch

between rows, or start a program of soil building with organic matter right away. The more organic material you are able to till into a slope, the more likely you are to be able to prevent hard-packed soil conditions that can lead to soil erosion.

It is a good idea to drive the tiller up the hill when you make your first pass. As you do, lift up slightly on the handlebars to prevent the tines from digging in too deeply and to keep the engine's slope from reaching an extreme angle (see "Uphill Tilling Note", on Page 75). When going back down the slope, overlap your first pass by about half the width of the tiller. For best results, use High Belt Range and Slow Wheel Speed — do not use Fast Wheel Speed as it may be too fast for safety!



Tilling vertically on a slope allows you to walk alongside the tiller guiding it with one hand.



The powered wheels will pull the tiller up the hill and will also hold the tiller back while you go downhill to prevent the tiller from going too fast.

CAUTION: When heading up or down a steep hill, don't shift the Wheel Speed Shift Lever. If you should accidentally put the lever in Free Wheeling, your tiller will roll out of control. If for some reason you must shift on a hill, reduce the engine speed to a slow idle, then carefully turn across the hill before you shift wheel gears.



For safety's sake, never shift wheel speed gears if the tiller is heading up or down a slope.

Uphill tilling note

When you are tilling at the deepest setting of the depth regulator and going up a steep hill, you seriously increase the incline of the engine. As you know, the engine's operation depends on its ability to splash oil on all its moving parts to properly lubricate itself and to prevent overheating from friction. Since going uphill causes the oil to slant away from its normal position, it is *absolutely necessary* that you keep the oil level up close to the "FULL" mark on the dipstick at all times. The engine's oil dipper will not be able to reach the oil unless the level is kept close to the "Full" mark. To prevent serious damage to your engine due to oil starvation, be sure to check the oil level at least every $\frac{1}{2}$ -hour during uphill tilling operations.

To help minimize the engine's incline while tilling uphill, lift up gently on the handlebars (this also keeps the tines from digging in too deeply). And, it is helpful if you can level out the engine base momentarily between long passes uphill.

NOTE: When tilling *across* a slope or *downhill*, you should also make sure that your engine oil level is up close to "Full" at all times.

Tilling laterally across slopes

Whenever a slope is extremely steep or too short for vertical tilling, you may decide that you simply must till across the slope laterally. If you are faced with this situation, we strongly recommend that you first consider terracing, as explained below. However, if terracing isn't practical for you, then you can till laterally across a slope, in the following manner.

First, make sure that the slope is not too steep to till safely at all. Then, begin at the top of the slope and overlap one-half of each tilled path, always keeping the uphill wheel in the soft, newly tilled soil. Doing so will help you keep the tiller more stable across a relatively steep slope. When tilling, keep both hands on the handlebars and use the Low Belt Range and Slow Wheel Speed. Never shift the Wheel Speed Shift Lever if the tiller heading up or down a slope — see Caution on Page 74.

Hillside terracing

Whenever a slope is much steeper than, say, 5 to 7 degrees, it is probably best to dig terraces — Photo 4/25. In as few as four or five easy passes, your Troy-Bilt Tiller can carve out a terrace flat and wide enough for planting.

Make your terraces about 2 to 3 feet wide. This means you'll be able to prepare a wide enough seedbed for one or two rows of plants and till under crop residues and cover crops, but there will probably not be enough room for cultivating with your tiller.

(Cont'd.)

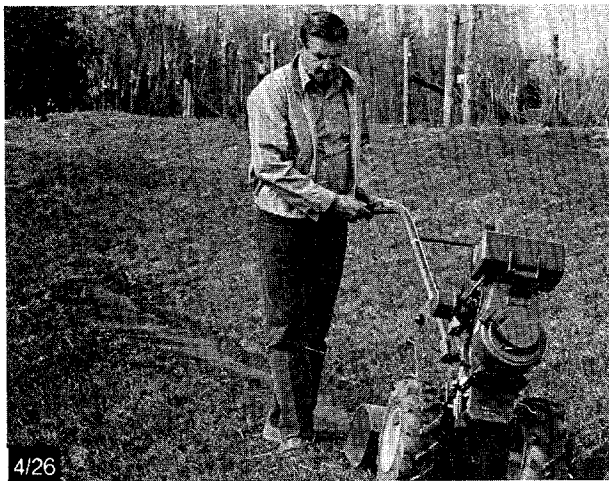


Terracing can solve the problem of gardening on steep slopes.

Hillside terracing (cont'd.)

Although your tiller could make a terrace wide enough for cultivating too, it would involve digging as much as a foot into the uphill side of the terrace and you would end up trying to grow vegetables in the poor subsoil there. Thus, it is best to maintain 2 to 3-foot terraces by hand while plants are growing, and only use your tiller for preparing the seedbed and for tilling under soil-improving organic matter.

First, make sure that the slope is not too steep to till safely at all. Then, make your first pass at the top of the hill and work down — Photo 4/26. Each succeeding lower terrace is started by walking below the terrace you are preparing. This puts you at a level where you can control the tiller. Make sure that you don't till the last 12 inches or more of the downhill outside edge of



Start terracing at the top of the slope and work down. Terraces 2 to 3-feet wide are ideal.

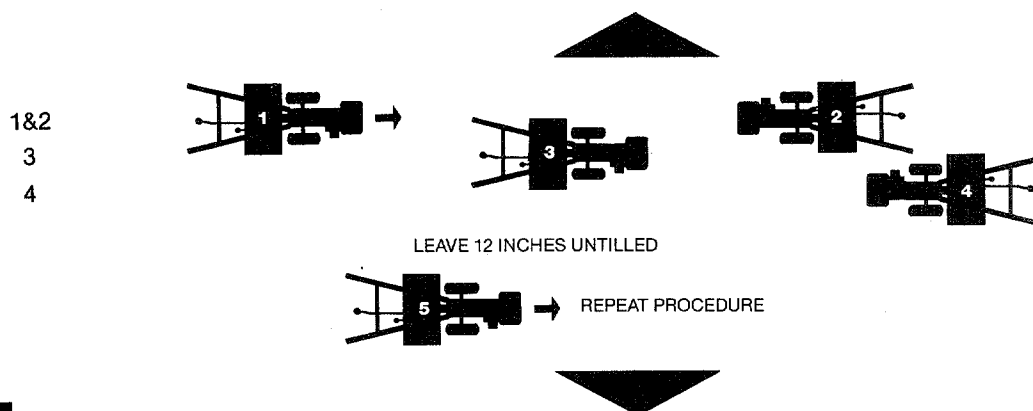


Leave the outside edge (12" or more) unbroken to prevent erosion.

each terrace. Keeping the soil unbroken beneath the outside edge will help to prevent terraces from breaking apart and washing downhill. It will also give you room to walk between the terraces when you need to do so (Photo 4/27).

The Troy-Bilt Furrower attachment can help you to start the cut in the uphill side of each terrace, but it isn't necessary to use one. If you do, remove the furrower after the first couple of passes, then till across the slope several more times.

When cutting terraces, use the Low Belt Range and Slow Wheel Speed. Never shift the Wheel Speed Shift Lever if the tiller is heading up or down a slope — see Caution on Page 74.



4/28

MAKING TERRACES IN 4 or 5 PASSES. Here's how to make your terraces across a hillside. **(1)** Till across the inside edge of the terrace, then turn around and retill the same ground **(2)**. Now, move downhill about 10 inches and make your third pass **(3)**, overlapping one-half a tiller's width. When you complete the third pass, turn around and go back again, overlapping one-half a tiller's width **(4)**. If necessary, make another pass to thoroughly mix up the soil. Remember to leave the last 12 inches or more of the outside edge untilled.

Cultivating your garden

Regular cultivation during the growing season is important to your garden. Cultivating not only eliminates weeds, it also creates something called a "dust mulch." This is a thin layer of soil that forms on top of the ground and stops some of the soil moisture from evaporating. You should begin to cultivate with your tiller as soon as your seedlings appear above ground; then cultivate as often as once a week (Photo 4/29).

Shallow cultivation is very important! The tines should be adjusted to till to a depth of just 1½ to 2 inches so they won't injure your plants' roots, which grow close to the soil surface (Photo 4/30). Cultivating should be done in Fast Wheel Speed, with the belt in either Low or High Range position. If you notice the tines are digging too deeply, then you may have to lift

up on the handlebars slightly (running your tiller in High Belt Range will usually prevent the tines from going too deep).

Since your tiller's tines are completely enclosed by the steel hood, it is possible to cultivate up close to your plants without throwing dirt on them. And don't be afraid to cultivate quite close to mature plants like cabbage or broccoli, and right next to tall growth like corn — *as long as you don't go deeper than 2 inches!*

The day following a rain shower is an excellent time to do some cultivating, as long as the plants are dry. You don't want to work in your garden when plants are wet since diseases, blights and rusts can easily be spread if you touch wet plants with your hands, clothes, or the tiller itself.



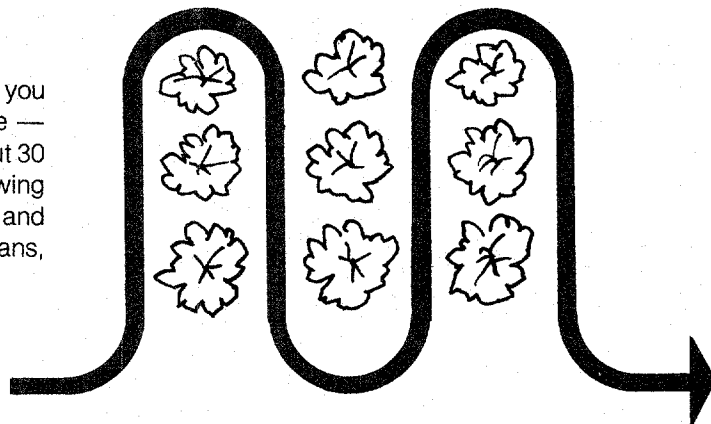
4/29 Cultivating with one hand avoids footprints which can replant weed seeds and spoil the new "dust mulch."



4/30 Avoid deep cultivation that can sever shallow plant roots. Set your depth regulator to till at a depth of 1½ to 2 inches.

4

If you plan your garden carefully in the spring, you can leave enough room between rows to cultivate — see Sketch 4/31. As a general rule, leave rows about 30 to 36 inches apart on crops that take up less growing room above ground (onions, celery, carrots, etc.) and up to 48 inches apart on bushier crops such as beans, tomatoes and peas.



4/31

How to enrich your soil

The secret of gardening success has always been chopping up and mixing into your soil all of the organic matter you can get — see Photo 4/32. Nature has been recycling and adding organic matter (any tissue living or once alive) to the soil for millions of years. The natural cycle is completed when plants tap soil nutrients and grow out of the soil, then flourish, die and return to the earth's surface to decompose with the help of earthworms and other soil life. As they decompose, they release nutrients back into the soil to form a fresh supply of transplant food.

Many gardeners overlook these simple natural cycles that have been taking place around them all the time. Although chemical fertilizers can release enormous quantities of nutrients at one time, they don't add to the soil's ability to avoid compaction and retain moisture.

On the other hand, fully decomposed organic matter acts as a natural fertilizer, helps make valuable humus, and actually creates rich new top soil. It also aids the soil by retaining moisture, making soil more friable (crumbly), and by improving air circulation.

The most common sources of organic matter for home gardeners are leaves, old hay, weed-free manures, compost, grass clippings, crop residues and green manure cover crops. Other good sources of organic material are kitchen scraps, sawdust, woodchips, straw, seaweed and even shells.



4/32

You can improve your soil dramatically by adding organic matter to it on a regular basis.

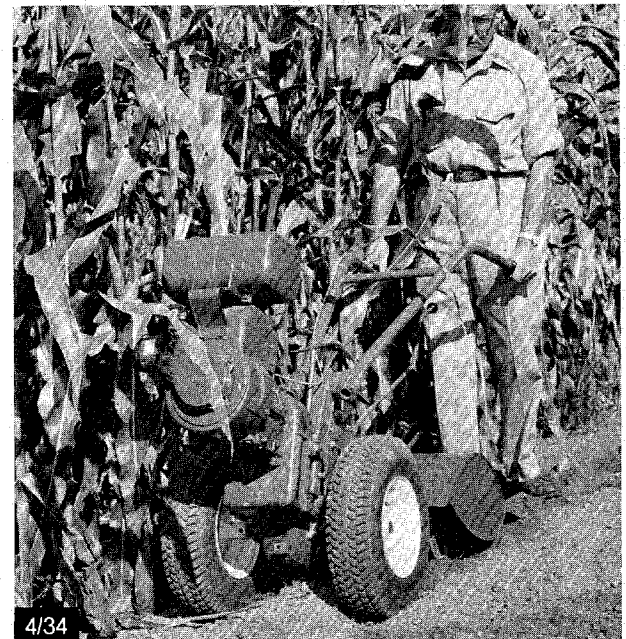
How to till under standing cornstalks

As soon as your corn has been harvested, the stalks should be turned into the soil while they are still green. Don't wait until the stalks are dried out, they are tougher to handle and the roots pull out more easily. **YOU DON'T WANT TO PULL THE ROOTS OUT BY HAND, OR CUT THE STALKS, BEFORE TILLING.** It is the action of the stalk (held in place by its root structure), being chopped against the soil that makes it so easy for your tiller to cut it down and chop it up, partially burying much of the cornstalk material in the first pass.

Knocking down cornstalks and tilling them under is not difficult once you understand three basic principles. First, the stalks should go in between the left wheel and the transmission case, as shown in Photo 4/35. (The right wheel will not work because the stalks might interfere with the carburetor, air cleaner, or throttle linkage.) Second, each pass should overlap one-half a tiller width over the ground tilled on the previous pass. And third, till just as deeply as you did when preparing the ground for planting. This usually means that the depth regulator is pulled all the way UP to the deepest setting possible, depending upon the condition of the soil. Generally, Low or High Belt Range and Slow Wheel Speed will be best for tilling under cornstalks. However,

SPECIAL TROY-BILT

some folks will even be able to use Low Range and Fast Wheel Speed, depending upon the size of the stalks and the condition of the soil.



4/34

(1) Make the first pass alongside the first row with the **RIGHT** wheel up close to, but not touching any cornstalk. The purpose of this pass is to loosen up the soil in preparation for the next pass.

A garden with plenty of decaying organic matter has so many things going for it that it can't help but be bountiful. Thousands of Troy-Bilt Tiller owners are now having tremendous results because they grow or spread huge quantities of organic material over their gardens and chop and till it under in one easy operation. Surrounded by earthworms and all the other forms of life which digest and break down these materials, "compost" and new humus is manufactured so much faster. This is "power composting," a task that can only be accomplished effectively with a rear-end tiller like your Horse Model Troy-Bilt.

Tilling under crop residues

It is absolutely essential that a garden be fed something if it is to be bountiful year after year in the same location. You must replenish the plant nutrients — primarily nitrogen, phosphorus and potassium — that you took away from the soil in the form of harvested fruits

and vegetables. The first place to begin is with the crop residues (Photo 4/33).

Turn under crop residues as soon as they finish bearing. The sooner this is done, the better. Tender, green matter not only tills in easier, but provides that much more good food to the earthworms and other



After harvest, tilling under crop residues adds nutrients to the soil.

GARDENING TECHNIQUE

Allow the tilled-in cornstalks to lay in the ground undisturbed for a week to give the active soil life a chance to start decomposition and digestion of the stalks. Then, till in the residue as deeply as possible. This will probably take only one overlapping pass through the garden. Four or five days after this final tilling, you can sow a cover crop, such as annual rye grass.



(2) The second pass will be over the row with the stalks in between the LEFT wheel and the transmission case. It will also overlap the first pass by one-half a tiller width. Using this overlapping method permits the tiller to apply maximum power to the cornstalks. This pass will just knock down the stalks and cut some of them up into one or two-foot lengths, partially burying them.



(3) On the third pass, you will be going back over the stalks that are lying down, but this time from the opposite direction. This will bury much of the residue 3 or 4 inches under the soil.

4

Cont'd

Tilling under crop residues (cont'd.)

beneficial forms of soil life. It also prevents the crop residues from becoming a home and feast for all kinds of insect pests and disease organisms.

Another advantage to tilling under crop residues early is that you may still have time to plant another crop in the same garden section. (Many cool-weather crops taste best when they mature during the cool, autumn weather.) If you don't want to grow more vegetables, then you should sow a green manure cover crop (see Pages 80-82) to get even more organic matter in your soil, and to protect the ground over the winter. For most crops, you should wait one or two weeks after turning them under to allow decomposition to begin; then plant your new crop after preparing a new seedbed for it. You can, however, often plant sooner if you add some fertilizer to the soil immediately after tilling under the crop residues.

When turning under crop residues, you should till as deeply as you can, mixing them into the upper 8 inches of the soil. Set the depth regulator at the lowest digging depth you can (depending upon the condition of the soil) and overlap each succeeding pass by $\frac{1}{2}$ or $\frac{1}{4}$ the

tiller's width. We recommend using High Belt Range and Slow Wheel Speed. If you find the tines aren't working effectively in High Belt Range, then try tilling in Low Range. As you'll discover, tilling under crop residues is easy with your Troy-Bilt tiller. You can even bury standing cornstalks, as explained in the special instructions starting on Page 78.

Green manure cover crops

"Green Manuring" is an excellent way to make sure your garden gets enough organic matter, and an outstanding technique for eliminating weeds, diseases and pests that live in the soil. Green manures are sometimes called "cover crops" or "catch crops." You simply grow a crop of clover, alfalfa, buckwheat, peas, beans, rye grass, grain, kale or millet on an idle piece of land, and then later till it into the soil, thus adding far more nutrients than you have taken out — see Photos 4/41 through 4/46.

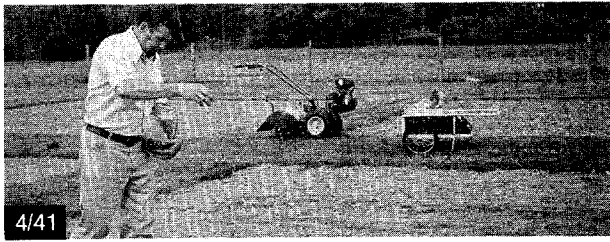
By growing green manures, you increase the soil's



(4) The fourth pass will be back down between rows, overlapping one-half the No. 3 pass.

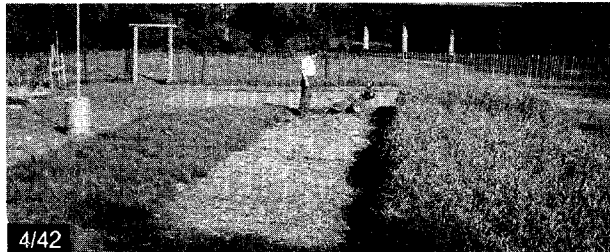


(5) The fifth pass will be alongside the second row of cornstalks, with the right wheel up close to, but not touching the stalks.



4/41

Sow a green manure cover crop after tilling in crop residues and preparing a fine seedbed.



4/42

This annual rye will help prevent soil erosion. In the spring, it will be dead and partially decomposed, making it easy to till under.



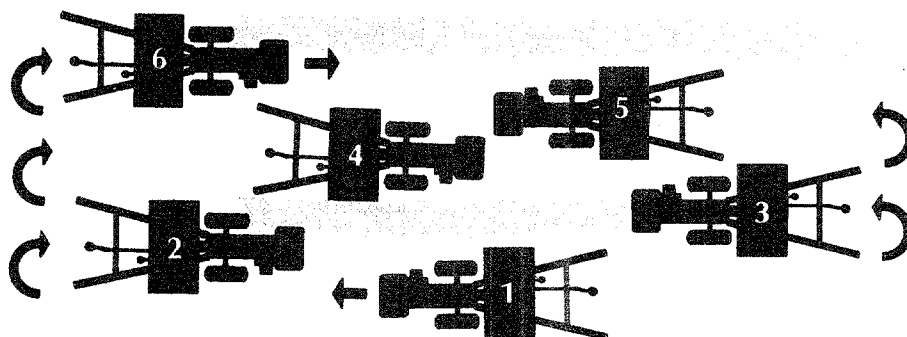
4/43

Till under cover crops from ten days to two weeks before planting a new crop.



4/39

(6) On the sixth pass, you will start to knock down the second row of stalks, carefully guiding the stalks between the left wheel and the transmission case. Repeat the process until the last row of stalks is down, chopped and tilled under in the opposite direction from which it was knocked down.



4/40

The numbered tillers represent the six passes shown in the photos.

4

Green manure cover crops (cont'd.)

humus content and build up the available supply of top soil plant nutrients. When growing, green manures draw nutrients from the soil. But after they die, the used nutrients are returned to the earth in excess if the crop is chopped and mixed directly into the soil — especially if it is turned under while still mature, green and tender.

Green manures will sharply reduce the amount of commercial fertilizers and soil conditioners you have to buy and use. In addition, they prevent soil erosion from rains and winds; help smother weeds; keep the soil warmer in winter, cooler in summer; retrieve replacement minerals from the deep subsoil; and of course, improve the soil structure and fertility.

Once you see the improvement that comes from planting cover crops, you will never want to permit the bare spots of your garden to waste valuable growing time again. You can sow cover crops in the spring, summer or fall — anytime you have a month or two of growing season left, and a section of your garden that is idle.

As a general rule, most cover crops should be turned under anywhere from ten days to two weeks before the following crop is planted in order to give them a chance to decompose and begin releasing their nutrients to the soil. It is also best to till them under before letting them go to seed. When tilling, use Slow Wheel Speed and Low or High Belt Range, whichever works best for you. Mix the residue thoroughly into the upper six to seven inches of the soil.

Common kinds of cover crops

There is a large variety of good cover crops and it would be best to consult your local county agent as to which crop would most benefit your particular soil. Here are some of the most common types: annual and winter ryes, buckwheat, oats, kale, cowpeas, clover, soybeans, lespedeza, alfalfa, lupine, vetch, millet and barley.



Tilling under Sudan grass stuble.



Knee-high cover crop of buckwheat tilled into the soil adds large amounts of valuable organic matter.



Thoroughly chop up and till under cover crops, using Low or High Belt Range and Slow Wheel Speed.

Other soil-enriching ideas



4/47

MULCH — If you use an organic mulch during the growing season, it can be tilled under with your crop residues at the end of the growing season. Popular mulches include hay, old straw, grass clippings, and other dense organic materials. Till this matter under to a depth of 4 to 6 inches.



4/48

LEAVES — Leaves are an excellent (and free) natural fertilizer that will do wonders for your soil's fertility and texture. In the fall, spread 6 to 8 inches of leaves on the ground and till them under. If there is enough growing season left, you can till once again after a few days, and then sow a cover crop on top of them.



4/49

SHEET COMPOSTING — All manner of organic material including weed-free manure and mulches, leaves, straw, hay, grass clippings, etc., can be "sheet composted" directly into the soil. Just spread it around and till it under — it's a lot quicker than the lengthy compost-pile process.



4/50

TRENCH COMPOSTING — Trench composting is easy with the optional Troy-Bilt Furrower. Just dig a trench, put in all manner of organic matter and biodegradable household garbage and cover it up with soil. The earthworms and microbial life in the soil will consume it faster than you might imagine.

SHEET COMPOSTING NOTE: When sheet composting, don't overdo it when you add organic materials that decay very slowly, such as sawdust, pine needles, or old, tough plants. They may remain undecomposed in the soil for a long time, even when nitrogen fertilizer is added along with them. Also, don't use any plant material that was severely diseased, and never use anything which has been sprayed with herbicides.

SPECIAL TROY-BILT GARDENING TECHNIQUE

Try wide-row planting

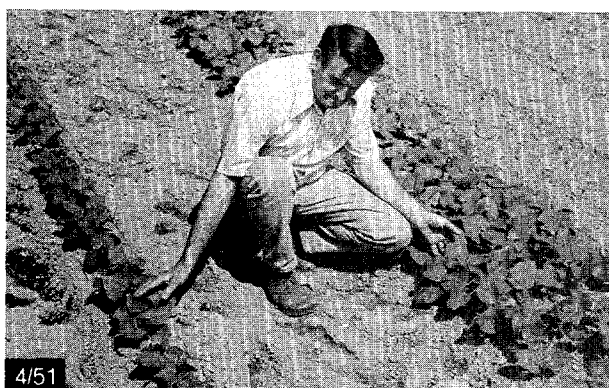
Wide-row planting is a highly productive gardening technique that is worth trying. As the name implies, it involves broadcasting seed in bands anywhere from 10 inches to 2 or more feet wide, rather than in the traditional single-file rows.

The greatest advantage to this gardening method is that you have more plants per area in your garden, which results in much higher yields from the same amount of space (see Photo 4/51). Typically, you can grow anywhere from 3 to 4 (or more) times more produce in the same space normally set aside for a single row. In addition, when you plant crops in wide rows, you automatically shade the ground. Shading prevents most weeds from growing and also holds moisture in the ground. Wide rows also protect the soil from temperature fluctuations and makes harvesting easy, since you can sit and pick so much produce from one spot.

It's simple to plant and grow wide-row crops. First

prepare a loose, smooth, fertile seedbed and mark off your row with strings — Photo 4/52. Hand broadcast the seeds over the raked area as if you were seeding a lawn; remember to plant vegetable seeds a little thinner than grass seed. Cover them with soil from outside the row, tamping it down firmly with a hoe. If you're planting larger seeds such as peas or lima beans in wide rows, you can run your tiller over them, planting about 2 or 3 inches deep. If you use your tiller for planting, sow your seeds a little thicker as some of them won't get deep enough to germinate. After tilling, firm the soil.

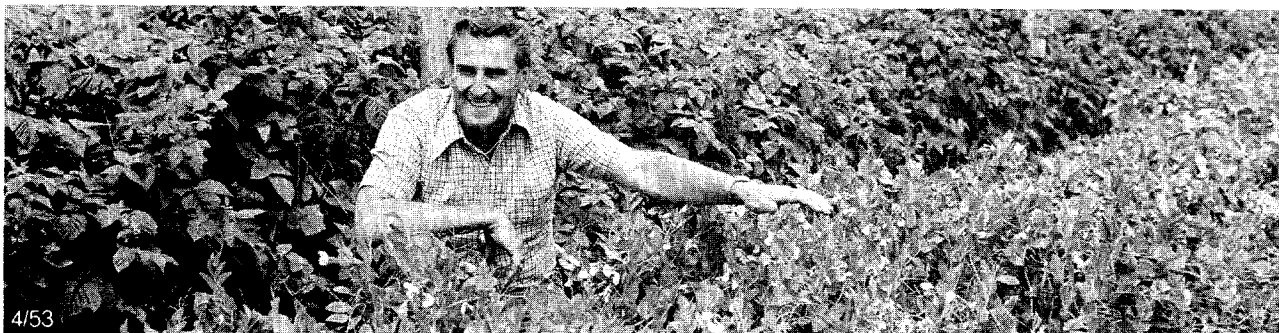
Plant the larger-seeded crops, such as beans or peas, with a little care so you won't have to thin later on. For small-seeded crops, such as lettuce and carrots, you can easily thin as soon as they come up by lightly dragging a steel garden rake across the row about 1/4-inch deep. You will also disturb and kill many tiny weed seeds that have begun to sprout near the soil surface.



Wide-row planting on the right compared to single row on the left.



After preparing seedbed, mark off row area as wide as you want, even up to 4-feet across.



Wide-row planting really works, as evidenced by this lush growth of peas.

HERE'S ANOTHER SPACE SAVING METHOD: Planting in double (or even triple) rows is another space saving idea that many Troy-Bilt Tiller owners use. Beans, for example, can be planted in two rows spaced 6 to 8 inches apart. On either side of the double row, leave enough room for side-growth and later cultivating with your tiller. It is still necessary to thin seedlings according to the seed company's directions on the packet.

OPTIONS & ATTACHMENTS

There are a number of options and attachments that are available for your Horse Model Tiller. They include the Hiller/Furrower, Dozer/Snow Blade, Bumper/Guard, Tines, Bar Tread Tires and Tire Chains. When ordering any of these accessories be sure to use the Master Parts Catalog and the Parts Order Form that came with this Owner's Manual. Please don't hesitate to write or call us if you have any questions.

The Hiller/Furrower attachment

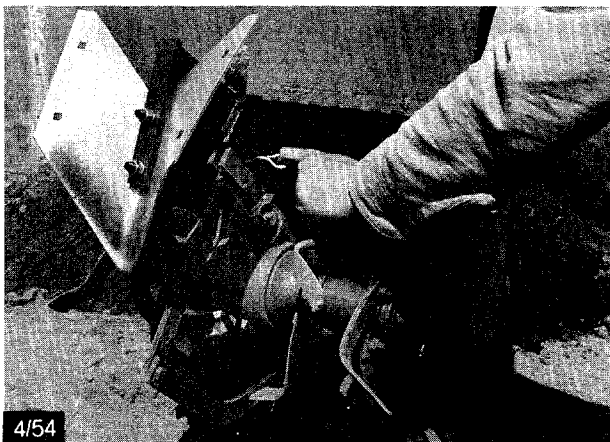
The Hiller/Furrower is our most popular attachment because it has so many uses both in and out of the garden (Photos 4/54 through 4/60). Featuring "instant on-off" versatility, the attachment can be switched from a furrower to a hiller, and back again, in just seconds — and without tools.

The furrower can easily be adjusted with the depth regulator to only scratch the surface for making rows to plant peas, beans, and other seeds set close to the surface. Lower the furrower (as deep as 8 inches) and quickly dig trenches for transplants like tomatoes, celery, peppers, cabbages, asparagus, melons and strawberries. You can also dig ditches for drainage or irrigation projects, for laying underground pipes, and for trench composting.

With the hiller wings attached, it can be used to cover and kill weeds, for sidedressing plants, for covering potatoes or seeds planted in a furrow, and for making raised bed gardens. The hiller wings handle rows from 30 to 40 inches apart.

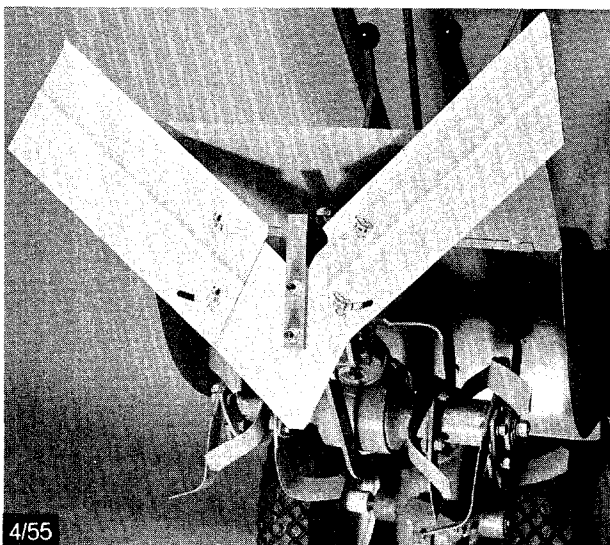
Using the Hiller/Furrower

When either furrowing or hilling, always do so in soil that was recently thoroughly tilled since hard, chunky soil will usually interfere with proper performance of the hiller/furrower. Also leave the tines on when furrowing or hilling. The tines loosen and throw the dirt toward the attachment, making both jobs much easier. Always guide the hiller/furrower with two hands, walking directly behind the tiller (footprints in the furrow will not do that much harm). To help regulate the hilling and furrowing depth, you can lift or push down slightly on the handlebars, as necessary.



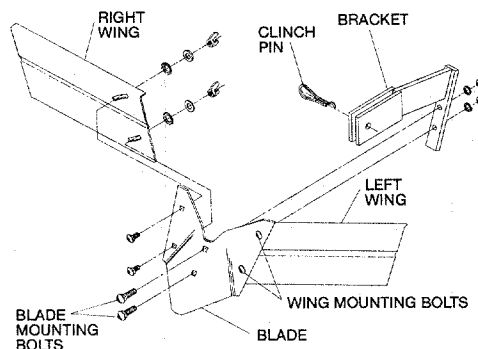
4/54

The furrower mounts to your tiller in seconds with just one clinch pin. Just remove pin to detach blade.



4/55

Hiller wings are attached with wing nuts and can be quickly adjusted or removed.



4/56

HILLER/FURROWER—Part #1317
(Viewed from front of tiller)

Complete attachment and its parts bolt together simply.

4

Helpful furrower tips

1. For a deep furrow, set the depth regulator all the way up to the last notch so it will be out of the way. In general, you should use faster wheel and tine speeds (and slow engine speed down), but you will have to experiment with various speeds for best results.
2. For a shallow furrow, set the depth regulator in whichever notch you need for desired soil penetration. Faster wheel and tine speeds will work best here, but control in a straight line may be more difficult. Again, experiment with the different speeds.
3. Always furrow going downhill. The furrower digs in too deeply going uphill.
4. If there is buildup of soil or debris on the furrower, just lift the handlebars briefly and the debris usually falls off.
5. By aiming for a flag you've placed at the end of the row, or even stretching a string as a guide 4-inches from one of the wheels, you should be able to get a nice straight furrow.



When planting potatoes, make a furrow 6 to 8 inches deep and spread out the potato sections along the row. Then attach the wings and cover them over lightly. Later, you can hill them as needed.



The hiller/furrower "weeds" as it hills between these young corn plants. Other tall plants can also be sturdiest against wind and rain.

Helpful hiller tips

1. Use generally higher speed ranges and throttle settings for hilling. This will help overcome the added "drag" of the soil against the hiller wings. You may spin your wheels if you go too slowly.
2. Hiller wings are adjustable for hilling rows 30 to 40 inches apart and for heights up to 8 inches. Use a low wing position for sturdiest smaller plants, and for weeding by burying weeds with loose dirt. Use high wing position for sturdiest up bigger plants, hilling potatoes, or making raised beds.
3. Use the depth regulator to help control height. Use a relatively shallow setting for sturdiest up corn or weedkilling within the rows. Use a deep setting for raised bed gardening in wet areas.



The furrower can make drainage or irrigation ditches easily. Can also be used to dig other trenches for laying cable, trench composting, etc.



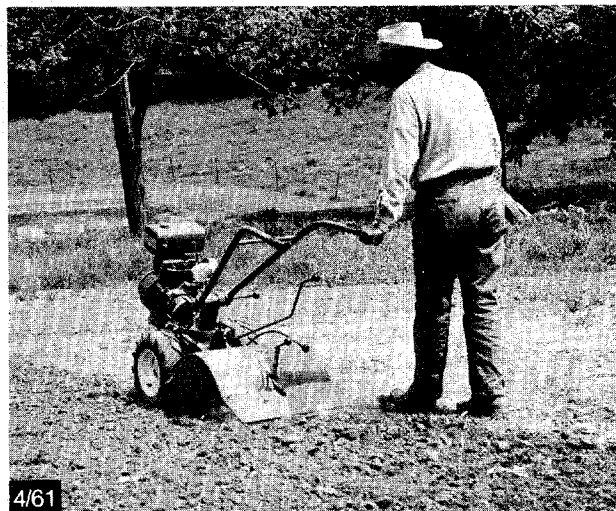
Hold the handlebars with both hands when using the hiller/furrower.

SPECIAL TROY-BILT GARDENING TECHNIQUE

How to make raised beds for planting

It's easy to make raised beds with the hiller/furrower attachment. Most crops can't grow in wet soil or heavy clay conditions because they can't get the air or nutrients they need for growth. Raised beds can solve this problem. In addition, raised beds provide a good irrigation system, discourage soil compaction (from walking near the plants), give your soil earlier and greater exposure to the sun, increase the amount of topsoil around the crops, and provide looser soil conditions for root crops to grow in. You can even try wide row planting on raised beds. Rows can be anywhere from 30 inches to 3 feet apart, and 8 to 10 inches high.

EASY STEPS TO RAISED BEDS



(1) Till under sod or crop residues and work soil into a deep, smooth, loose seedbed.



(2) Place row-marker stakes at proper intervals; attach hiller/furrower and make your rows.



(3) Hold the handlebars with both hands and use faster tiller and engine speeds.



(4) After planting seeds in ridges, rake loose soil over top and firm soil according to seed directions.



(5) Use furrower to make irrigation trench at ends of rows.

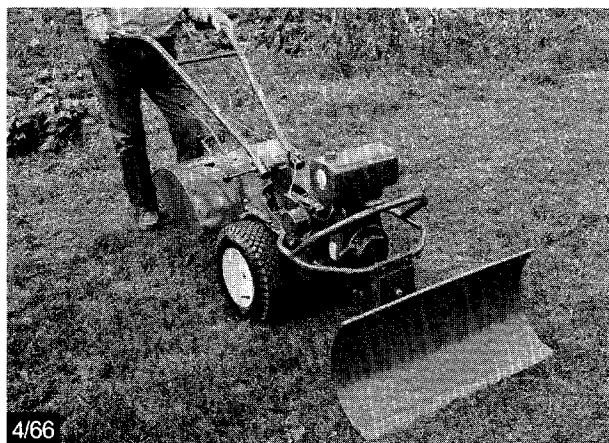
4

The Dozer/Snow Blade attachment

The dozer/snow blade is a versatile “homestead helper” that makes your tiller a truly year-round yard and garden machine — Photos 4/66 through 4/73. And, as an extra bonus, the attachment bracket for the blade also serves as a solid, protective bumper.

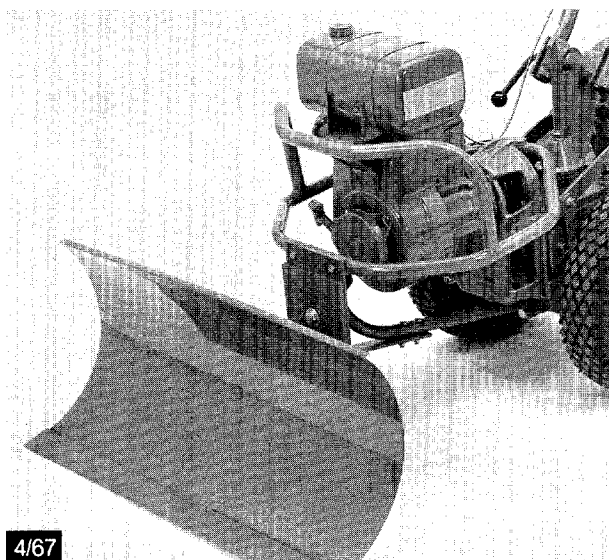
In the winter, the blade will move a foot or more of light snow or 6-8 inches of heavy, wet snow from your driveway, sidewalks or outbuilding paths.

During the summertime, it can be used for moving sand, gravel, loose dirt, grain, sawdust, fodder, mulches and manures. Some folks have even used it for digging a base for a swimming pool and even the pool itself! It is an ideal tool for medium-duty landscaping, and for backfilling trenches — especially in tight quarters where larger equipment won't fit. Summer or winter, it lets you use Troy-Bilt Tiller power instead of hand-power.



4/66

It's easy to relax when you have the Dozer blade to do the heavy work for you.



4/67

The Dozer/Snow Blade attachment includes the Bumper/Guard.

Built to be ever-so-useful

Handling is solid and sure thanks to the driving power of the large wheels. The operator can control just how much dirt or snow the dozer moves by simply lifting or pressing down on the handlebars. You get lots of “pushing power” for the tiller's size because of the tiller's geared down transmission and four forward speeds. Having this choice of wheel speeds is especially handy because it helps you get the greatest force or speed advantage, depending on whether the work is light or heavy. Of course, the tiller and blade is not a bulldozer meant to cut into unbroken soil or push very heavy loads... but it's a great investment at this very reasonable price!



4/68

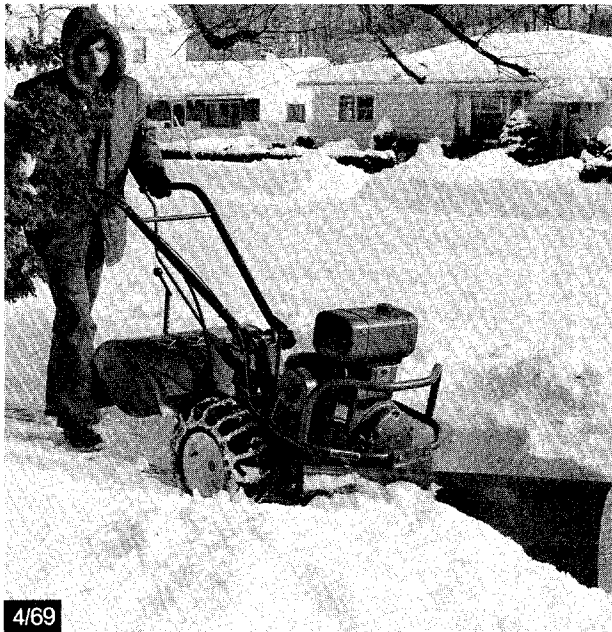
Enlarging a pile of loose soil.

You can set the blade at any one of five positions: straight ahead or at either of two angles on the right or left so you can do special jobs faster and better. With this flexibility, you can move snow to either side of the walk, or backfill in one pass. Changing the blade angle in seconds is simply a matter of removing a pin and changing blade positions.

It takes just a few minutes to remove the blade (just remove two bolts and the positioning pin). The Wrap-around Bumper/Guard stays in place at all times to protect your tiller and engine from accidental bumps against doors, fences, trees, etc., (see Pages 92-93 for more information on the Bumper/Guard attachment).

Just like your Troy-Bilt Tiller, the Dozer/Snow Blade is built to last a lifetime. The 41-lb., 32" x 15" blade is made of tough steel, braced with 1/4-inch bar stock. Its Bumper/Guard attaching bracket is made of one-inch, high-strength, steel tubing. All tubing is welded for added strength and then finished with our own special Troy-Bilt red paint.

Assembly is quick and easy with the simple, step-by-step instructions sent along with the unit. And, there's no need for special tools or skills.



4/69

Clearing a sidewalk of snow.



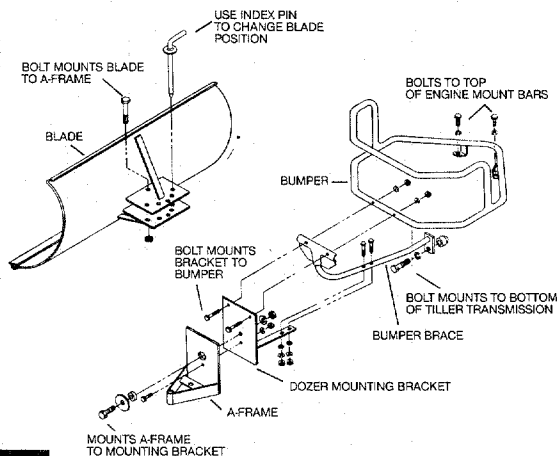
4/70

Angle blade to one side to put soil where you want it.



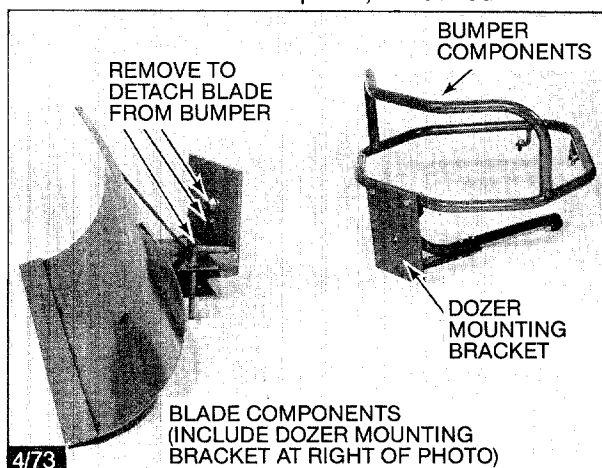
4/71

Dirt grading and landscaping is easy.



4/72

Blade easily detaches from the Bumper by removing two bolts and the index pin. It then leaves the useful Bumper and mounting bracket on the tiller. The latter can be left in place, if desired.



4/73

Dozer/Snow Blade components.

Adjusting handlebars for easy usage

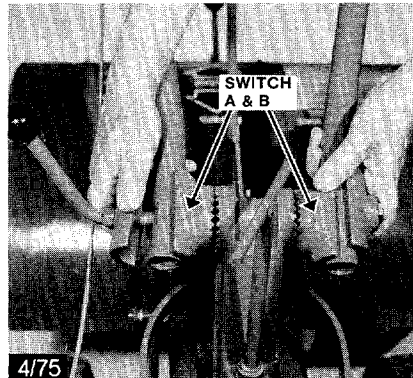
When plowing or dozing, adjust the handlebars lower (slightly less than waist high) to give yourself more leverage to raise the blade for banking, clearing obstacles and backing up.

If you lower the handlebars and find the crossbar interferes with your shifting into Reverse (Photo 4/74), switch the inside ratchet as shown in Photo 4/75. That

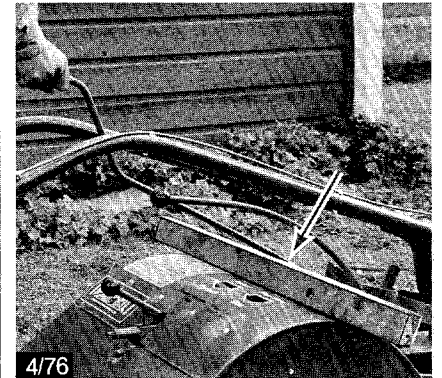
should give you a few more inches of clearance. If even more clearance is needed, you can bend the Forward/Reverse Lever a little by placing a 2 x 4 board across the hood and pushing down on the lever — Photo 4/76. This will give you extra clearance and won't hurt the lever or its performance.



4/74
If lever hits handlebar cross-piece, switch ratchets as shown in Photo 4/75.



4/75
Switch the left and right inside ratchets for added clearance.



4/76
If necessary, bend Forward/Reverse Lever for added clearance.

Dirt dozing suggestions

Your Dozer Blade is handy for lots of dirt moving jobs. Used in combination with the Hiller/Furrower and tines, you can make culverts, fill ditches, make a trench to bury cable, and do light grading, to name a few applications. Again, you'll get the most work from your Troy-Bilt Tiller and Dozer Blade if you use these hints... and then carefully experiment.

First, the blade should be used for moving loose dirt... it can't dig into unbroken soil or hard packed piles like a big bulldozer. Thoroughly loosen soil with the tines (before you take them off for safety) or break up hard packed piles with hand tools.

Next, the soil (or mulch, or manure) is best moved when it's nearly dry. If it's very wet, it can stick to the

blade, and the moisture's extra weight means you move less per pass. Also, when nearly dry, you can spread the material more evenly — it doesn't clump up.

Don't try to take too big a bite from a pile at once. Angle the blade away from the pile and start at one edge. Then, spread the load evenly, with the blade straight ahead. In this manner, when you "cut away" at a pile, the pile breaks itself up for you.

As for backfilling, that depends on how much you've dug up. Sometimes one or two passes will do it, with the blade angled toward the trench. Experimentation will help you find the best way.

SAFETY NOTE: Always remove the tines when using the Dozer/Snow Blade. The tines always revolve when the tiller is moving, and the blade's weight tends to keep the tines up high where they are exposed. This is especially dangerous when operating in slippery conditions such as snow or ice. It only takes a few minutes to remove the tines for safety's sake. Leave the tine holders on, however. Their weight helps maintain tiller balance. To remove tines, see Pages 146-157 in Section 6.

Also, leave the depth regulator on the tiller to protect the bottom of the tiller housing from damage.



4/77
Tine removal is not only safer, it permits you to raise the front higher, and the blade banks easier.

Snowplowing suggestions

Your Dozer/Snow Blade can move a remarkable amount of snow in a short time when you know how. Here are two snowplowing techniques we've developed that speed things up with a minimum of reverse maneuvering and blade angle changing. Use the accompanying patterns as a guide and adapt them to your needs.

In deep snow, it is best to remove a top layer several inches thick in the first passes before attempting to remove all the snow. You might even start near the end of the drive in deeper snow and gradually work yourself back toward the house or garage.

For light snowfalls, make the first pass in the center of the area being plowed, with the blade angled right (Sketch 4/78). The blade can remain in this position, until the last pass, when the blade is angled left as shown. Then you can finish off the job by building up snowbanks at the end of the cleared area by positioning the blade straight ahead.

In moderate snow, begin plowing on the outer edge and work toward the middle (Sketch 4/79). The blade should be angled away from the center for this operation. At the end of the last pass down the center, follow the pattern for light snow (Sketch 4/78). By moving the snow in this fashion, you will be duplicating some work, but deeper snows can be handled much more easily.

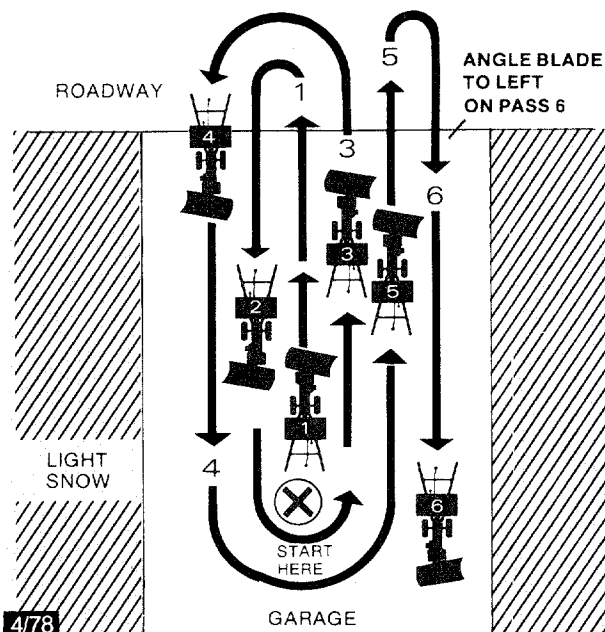
If you bank snow down by the main road, in most towns, you should bank it on the right-hand side of the

driveway. This way, when the town snowplow comes through, it won't push your snowbanks back into the entrance to your driveway (which it would if you had banked snow on the left).

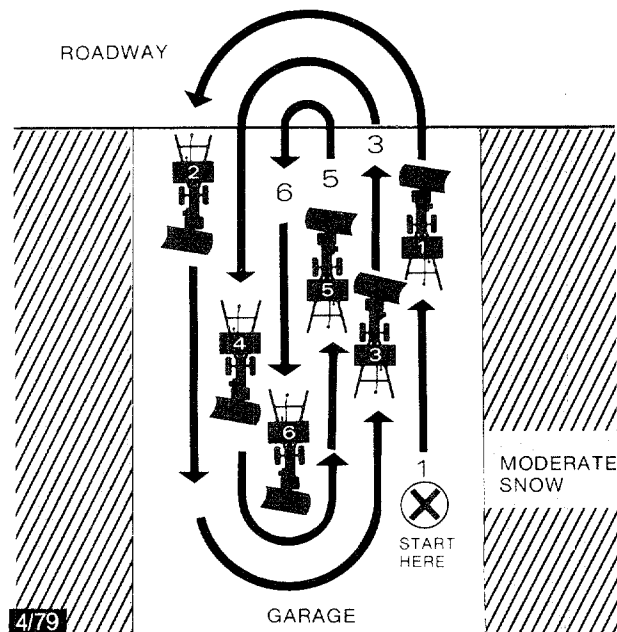
Snowplowing should be done in Fast Wheel Speed so you can "wing" the snow with the blade, and with the engine throttle cut back about 25 percent. Throttling down is very important! The resulting slow down prevents too much build-up of momentum. If your blade strikes an immovable object at high speed (which you're not likely to see under snow), the resulting shock could damage the wheel shaft or gears in your transmission. If you are using High Belt Range and Fast Wheel Speed, we recommend that you throttle back the engine to 60-70% of power.

Snow banking, however, should be done in Slow Wheel Speed for better control and protection of the gears. Again, throttle down the engine speed about 25 percent.

In winter, it is important to remember to change to a lighter engine oil and a lighter, SAE 90 transmission gear oil. (You can use the #90 gear oil year-round). Be sure to give the tiller a few minutes to warm up before you use it in cold weather. Also, don't try to drive the tiller when the wheels are frozen in the ground. Use hot water, for example, to free the wheels before you try to move the tiller under its own power.



Plowing pattern for light snowfalls.



Plowing pattern for moderate snowfalls.

A WORD ABOUT TRACTION

When dozing dirt and especially in snow, the more traction, the better. For standard tread tires, chains will help. Bar tread tires will help in moving dirt, and chains will even help them in wintery, snowplowing jobs.

Bumper/Guard attachment

The heavy-duty Wraparound Bumper/Guard comes as an extra bonus when you buy the complete Dozer/Snow Blade attachment, or it can be ordered separately. Either way, it's a solid investment in tiller protection.

As shown in Photos 4/80 – 4/86, the Bumper will protect the engine against damage from all sorts of blows (we've tested it under the worst conditions to make sure it protects the carburetor and the blower housing — and it does). The wraparound design encloses and protects your carburetor against such mishaps as bumping into trees, fences, posts, garage and barn doorways, stone walls and parked vehicles. The cost of

replacing a carburetor today can be well worth the protection provided by the Bumper.

In addition, the bumper also protects the engine's entire blower housing, including the recoil starter assembly. You don't want to dent in the blower housing because the dented metal could rub or hit the flywheel inside. If you should bend the recoil starter cover, it could interfere with the recoil starting mechanism. Both are costly repairs, and you would also lose valuable tilling time while getting the engine back into working order.

Besides protecting your tiller from bumps and scrapes, the Bumper is also useful as a very handy tie-



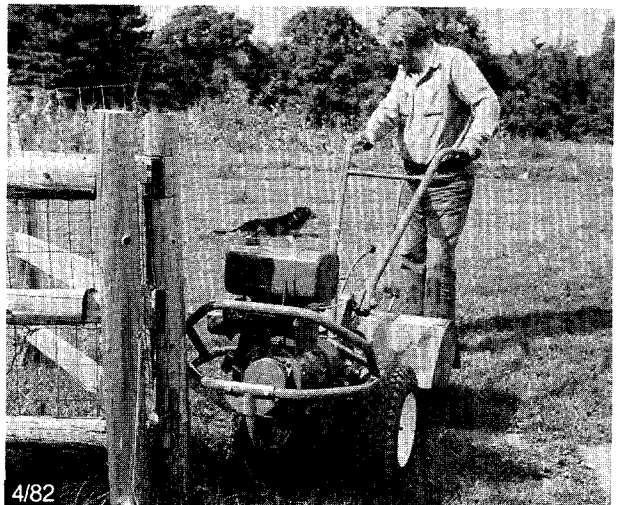
4/80

The multi-purpose wraparound Bumper/Guard.



4/81

Protects carburetor and engine from bumps and scrapes.



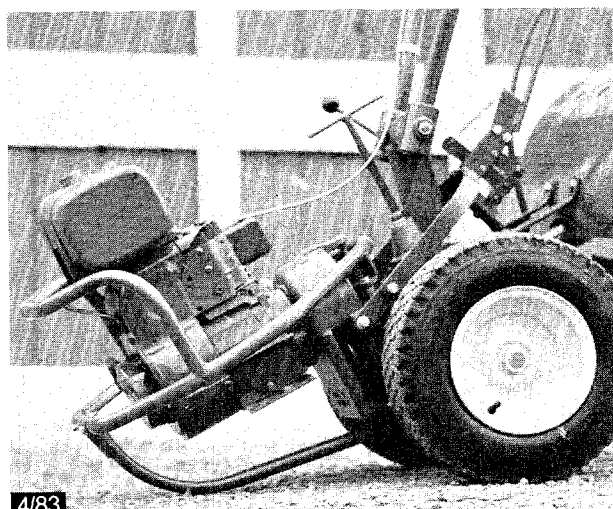
4/82

Prevents serious damage from accidental mishaps.

down in a trailer or pickup truck. And, it's a comfortable, secure hand-hold for pulling or lifting the tiller.

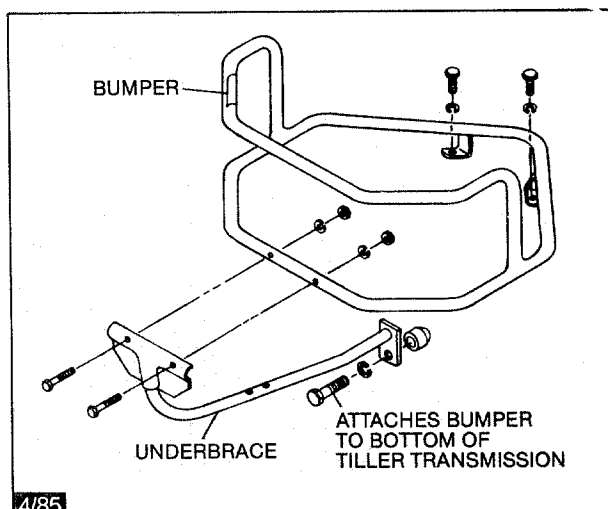
The Bumper is made of one-inch, high-strength, steel tubing, welded for maximum strength. It's finished with Troy-Bilt red paint. The length of the tiller with the Bumper attached is 69 7/8" (tiller length without bumper is 66"). The width of the bumper is 22 1/2" (tiller overall width is 23").

Installing the Bumper is easy with the simple step-by-step instructions provided — no special skills needed. And, if you decide to purchase a Dozer/Snow Blade later, we have a special kit which includes easy-to-follow instructions for attaching the blade.



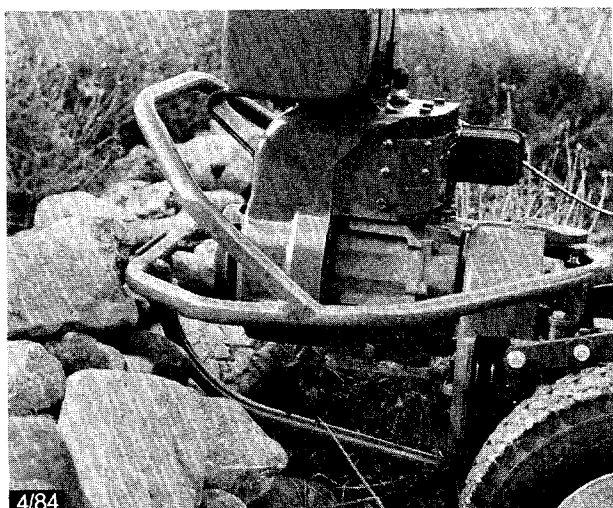
4/83

Bumper protects engine blower housing while tiller is tilted for maintenance.



4/85

Bumper components attach easily to your tiller.



4/84

Safeguards blower housing and recoil starter from front impact.



4/86

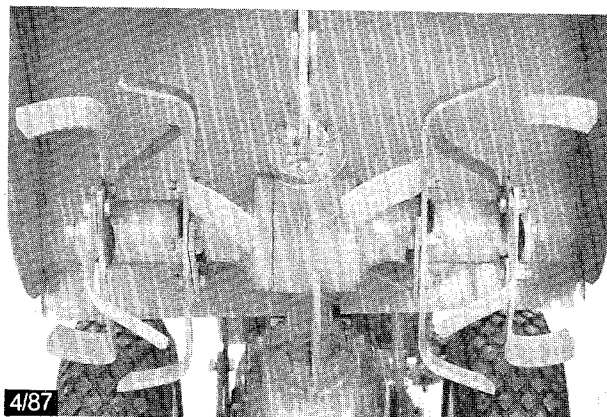
It's easy to add the Dozer/Snow Blade to the Bumper — just add the brackets, the blade, and you're ready to go!

Bolo Tines

Bolo Tines are standard equipment on your Horse Model Tiller (see Photo 4/87). They are truly the best all-purpose tines for all soil conditions and are used for tilling sod, weeds, cover crops, composted material, as well as for seedbed preparation and cultivating. They will till to a depth of 6–8 inches, or more.

With 16 curved tines (4 “gangs” of 4 tines each), there is always one tine on each side slicing into the ground at the same time. This arrangement gives you the widest and most completely tilled soil possible.

Their swept-back “bolo” design have a self-cleaning action that is excellent for tilling under cover crops and working other organic matter into the soil without unbearable tangling. Tines can be replaced individually (see Page 146 in Section 6).



4/87

BOLO TINES — All purpose tines for all soil conditions.

Row Marker

If you like straight, neat, picture-perfect rows in your garden, then you'll enjoy the convenient Row Marker attachment pictured to the right. The Row Marker hooks up quickly and easily to the Troy-Bilt Furrower Attachment and eliminates the need for string, stakes, and measuring tape.

Neat, even rows not only make weeding and picking easier, they also make your whole garden more attractive and allow you to make maximum use of your available space. And, you'll appreciate the straight rows even more if you lay out furrows, dig compost trenches, or make raised beds.

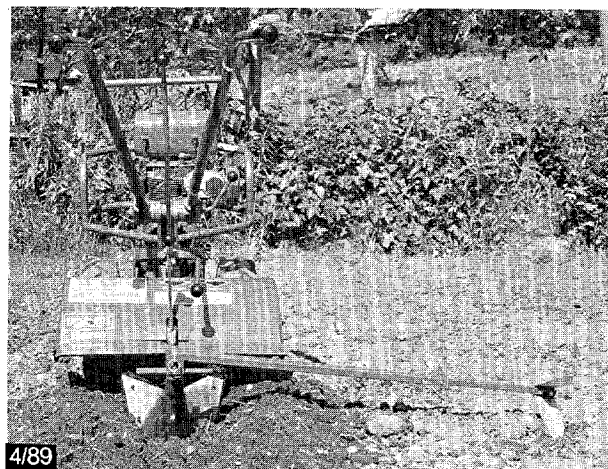
The Row Marker arm extends from 28" to 49¾", allowing you to vary the width between rows according to the crop you're planting. Width adjustment takes only a few seconds and requires no tools. Assembling the Row Marker and mounting it on the Furrower Attachment is easy, too.

A special feature of the Row Marker is its pivot-action arm. When you finish marking off one row and you turn the tiller around to start another, you simply pivot the arm from left to right (or vice-versa).



4/88

Straight, even rows are easy with the Row Marker attachment.



4/89

The Row Marker attaches quickly to the Furrower.

Wheel and tire assemblies

8" standard tires and wheels

All 6 HP Horse Model Tillers come factory equipped with 4:80/4:00 x 8", tubeless standard-tread tires (unless you order the optional Bar Tread tires discussed below). These tires (Photo 4/90), have a diamond or modified diamond shaped tread pattern.

Standard tread tires are excellent for most tilling and cultivating jobs in average soil and crop conditions. However, for soft, muddy ground; tall or heavy vegetation; or for plowing or grading with the Dozer/Snow Blade; chains should be added to improve traction.

Each tire comes mounted on a single piece, white colored steel wheel. The wheel has a self-contained hub section and includes an air valve. Replacement tires and wheels (Part #9142) can only be purchased as a complete tire and wheel assembly from Garden Way Manufacturing Co., Inc. We are unable to supply the steel wheels or the tires separately.

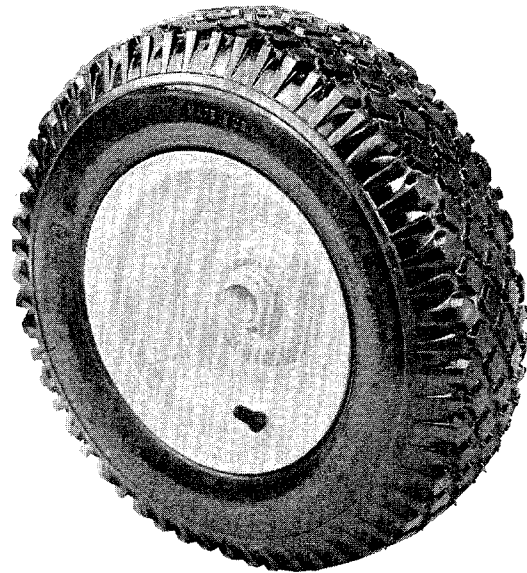
We recommend that you keep 10–20 PSI (pounds per square inch) of air pressure in each tire. Keep both tire pressures nearly equal so that you can till in a straight line. When refilling tires DO NOT EXCEED 20 PSI. Take extra care during the process of filling a tire with air to avoid High Inflation pressures which can cause serious personal injury.

8" bar tread tires and wheels

Bar Tread tires and wheels (Photo 4/91) can be used on all Horse Model Tillers and come factory-equipped on the 7 HP models. These tubeless tires have deep, agricultural style traction grips and are particularly helpful in soft, muddy or sandy soils. They also provide better traction when using the Hiller/Furrower or Dozer/Snow Blade attachments. Chains can be added for even greater gripping power.

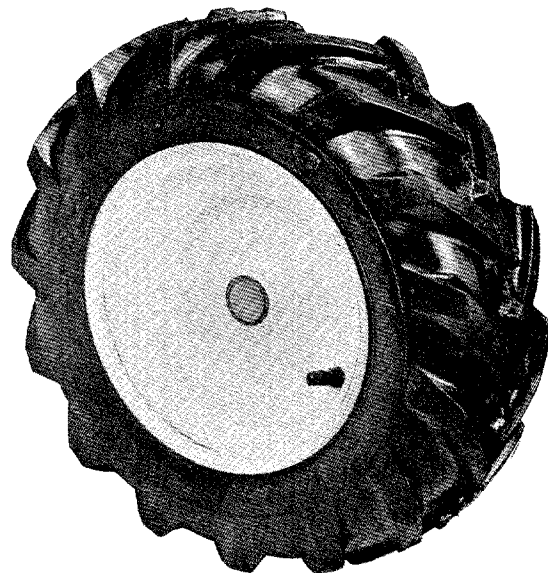
The 4:80/4:00 x 8" Bar Tread tires are mounted on single piece, white colored steel wheels. The wheels have a self-contained hub section and include an air valve. The steel wheels and tires cannot be purchased separately from Garden Way; they must be purchased only as a complete assembly. If ordering a replacement tire, be sure to specify the manufacturer's name (Goodyear, McCreary, etc.) of the tire that you are keeping, as the tiller may not travel in a straight line if the tires are not a matched pair. Also, remember that there are separate part numbers for left (#9143) and right (#9144) side Bar Tread Tires.

We recommend that you keep 10–20 PSI (pounds per square inch) of air pressure in each tire. Keep both tire pressures nearly equal so that you can till in a straight line. When refilling tires DO NOT EXCEED 20 PSI. Take extra care during the process of filling a tire with air to avoid High Inflation pressures which can cause serious personal injury.



4/90

8" wheel with Standard Tread tire.



4/91

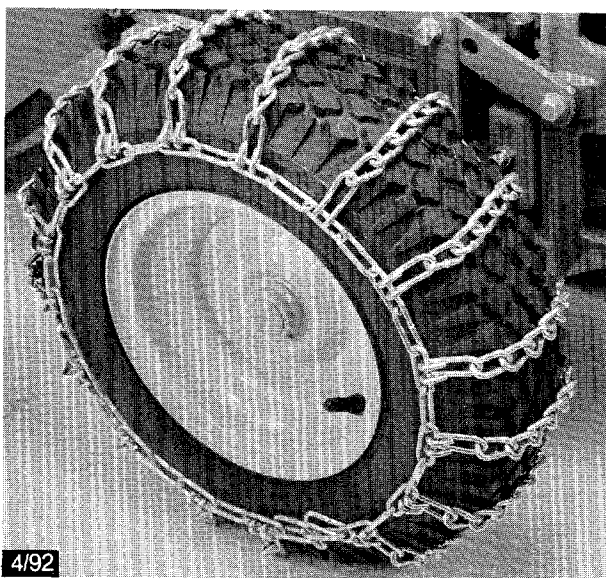
8" wheel with Bar Tread tire. The "V" pattern of the tire lugs should point towards the front (engine end) of the tiller.

Tire Chains

When extra traction is needed because of certain soil conditions or when snowplowing, the use of tire chains on either Standard or Bar Tread tires (see Photos 4/92 and 4/93) can be very helpful. True, Bar Tread tires work well under most conditions, but there are some instances — such as snowplowing on a sloping drive, or furrowing on wet clay — which might better be done by adding chains. Here are some of the jobs you can do better when you put chains on your tires:

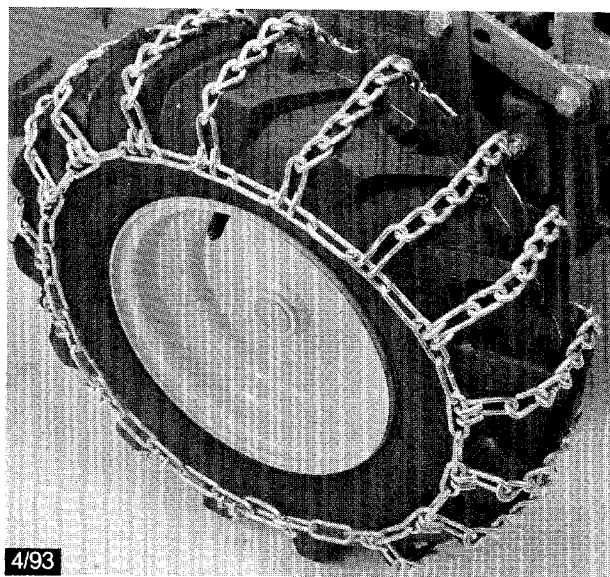
- Tilling in loose, sandy soil when your wheels might tend to bury themselves and spin — especially when deep tilling.

- Snowplowing with the Dozer/Snow Blade (Photo 4/94).
- Tilling in wet clay or muddy ground (if you have to).
- Making drainage ditches with the Furrower, especially in soggy ground.
- Grading with the Dozer Blade when extra traction is needed in loose, sandy soil or on wet ground.
- Tilling in tall weeds, heavy cover crops or very thick vegetation (Photo 4/95).
- Tilling large amounts of mulch, compost or leaves into loose, fertile soil.
- Custom Garden Tilling where you meet a variety of conditions, yet you want the tiller to work as quickly and thoroughly as possible.



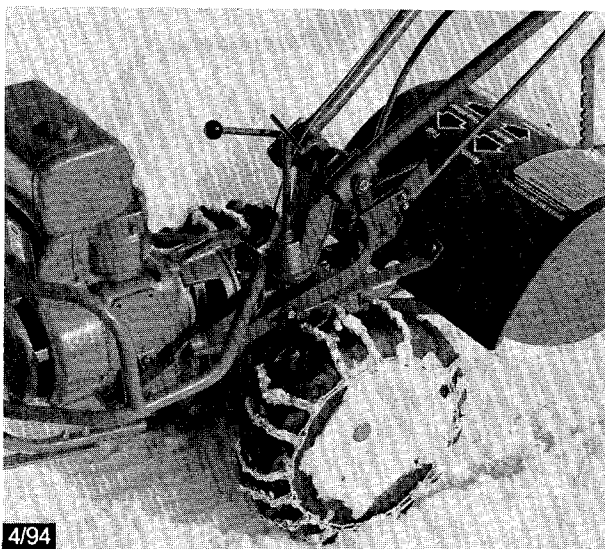
4/92

Standard Tread Tire with Chains.



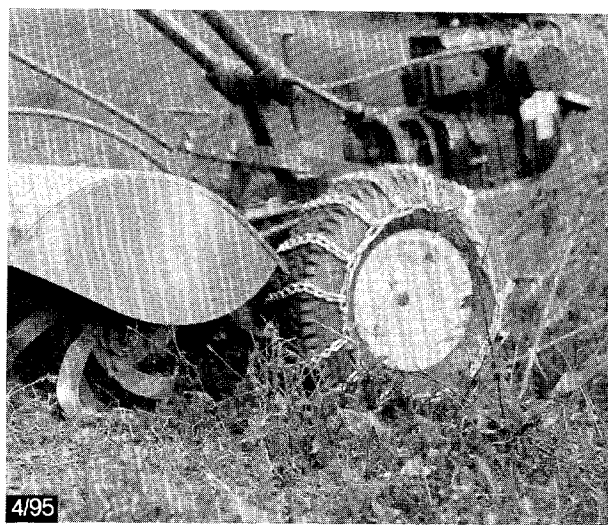
4/93

Bar Tread Tire with Chains



4/94

Chains give added traction on snow or ice.

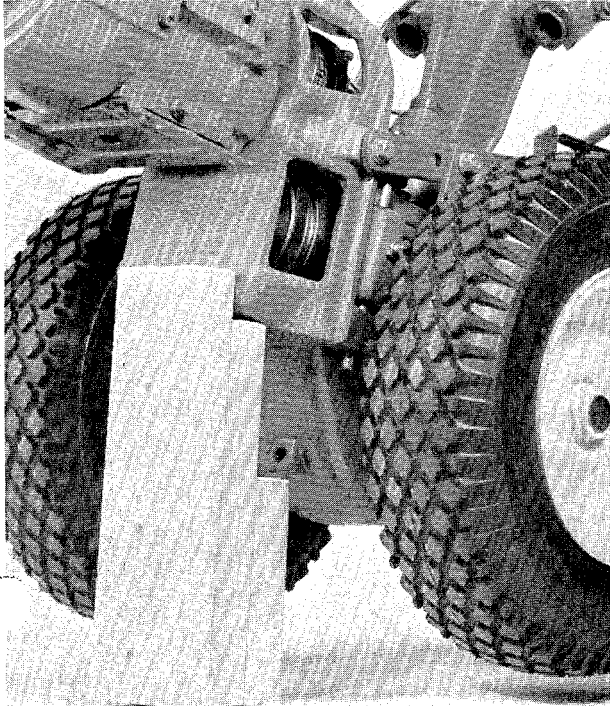


4/95

Added gripping power of chains is helpful in tall vegetation.

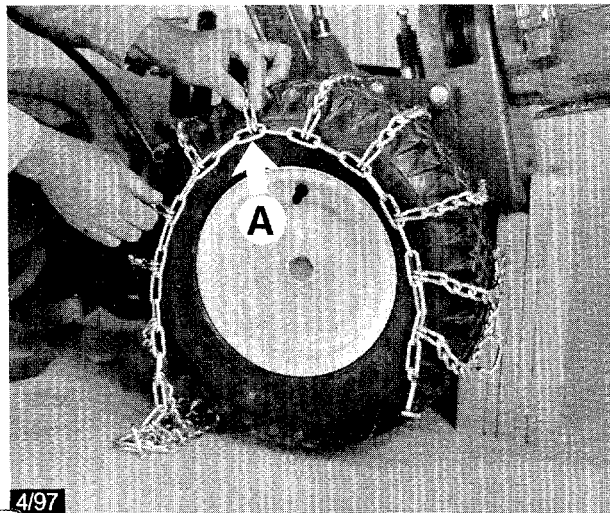
How to install chains

As shown in the following instructions, tire chains are easy to install. The chains can be hooked up tight to the wheel, or loose, whichever you prefer. A snug fit is more secure, but a loose fit gives them a "self-cleaning" action in snow or mud. Your experiences should tell you which type of fit you prefer.



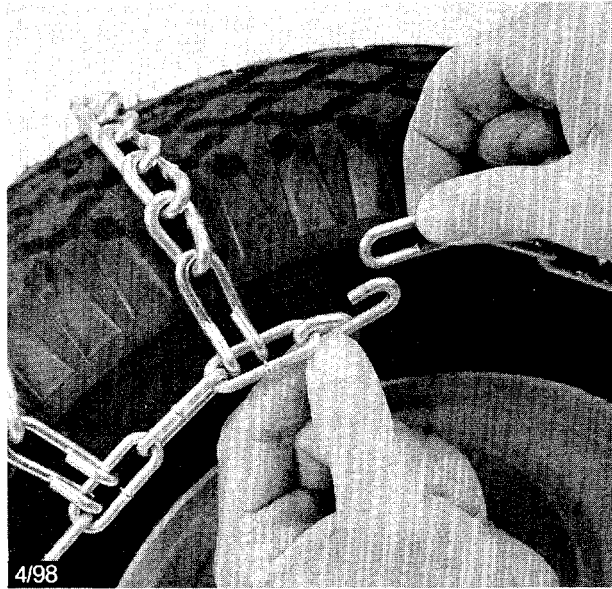
4/96

1 Prop the tiller up under the wheel shaft or transmission with bricks, two-by-fours, or anything sturdy enough to raise the wheel off the ground a few inches.



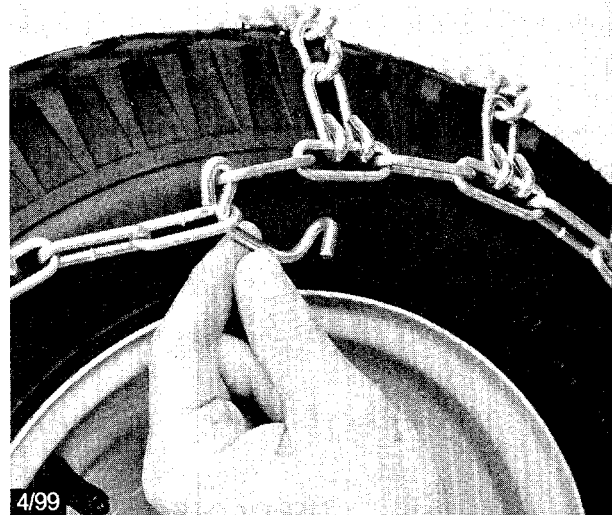
4/97

2 Lay the chain over the wheel, making sure that the curled ends of the outside cross-links curve away from the tire (see "A" in photo).



4/98

3 Put the "U"-shaped fastener loosely through the last chain link on the inside of the wheel (nearest tiller) and rotate the wheel so that the fastener is located at the front of the tiller. Then, hook up the outside, hook-shaped fastener in the same manner. Take up slack in the chains by spacing out the cross-links as evenly as possible around the wheel.



4/99

4 Bend the fastener on the outside of the wheel backward and hook it around the link that is before the one holding the fastener.

NOTE: If you would like a tighter fit, first drive the tiller for five or ten minutes until the chains properly locate themselves on the wheel. Then unhook the fasteners and put them through the second link from the end of the chain. Finally, repeat steps 3 and 4 above.

4

Convenience accessories

TROY-BILT TILLER SADDLEBAG

With a Troy-Bilt Horse Model Saddlebag you can put just about everything you will need in the garden right on your tiller before you leave the shed!

The Horse Saddlebag is a compact but roomy 11" x 12" x 2 1/4" pouch, with sturdy snap fasteners that hug the cross-piece of your handlebars.

Inside are four fitted tool-pockets and a single, large pocket. Made of tough, flexible, waterproof Naugahyde™ in bright Troy-Bilt red, the Saddlebag has welded seams and closes with two positive-action twist clasps.

When you're tilling, the Saddlebag lies flat and secure across the front of the handlebars; never in the way, but always right at hand.

HERE ARE SOME OF THE THINGS THAT WILL FIT CONVENIENTLY INTO THE HORSE SADDLEBAG:

- Everything for planting... seeds, stakes, string, tape measure, row markers, trowel!
- Mid-season maintenance equipment... oil can, wrenches, screwdriver, spare parts!
- General gardening aids... hand cultivator, hoe-file, tomato ties, netting!
- Harvesting helpers... plastic or string bags, pruner, knife, kitchen shears, twine.
- Help-yourselfers... your Troy-Bilt hat or jacket, sandwiches, gloves!
- PLUS... Most important... your Horse Model Owner's Manual!



The Troy-Bilt Horse Saddlebag.



You can carry all this (and more) in your Saddlebag.

TROY-BILT WEATHERPROOF TILLER COVER

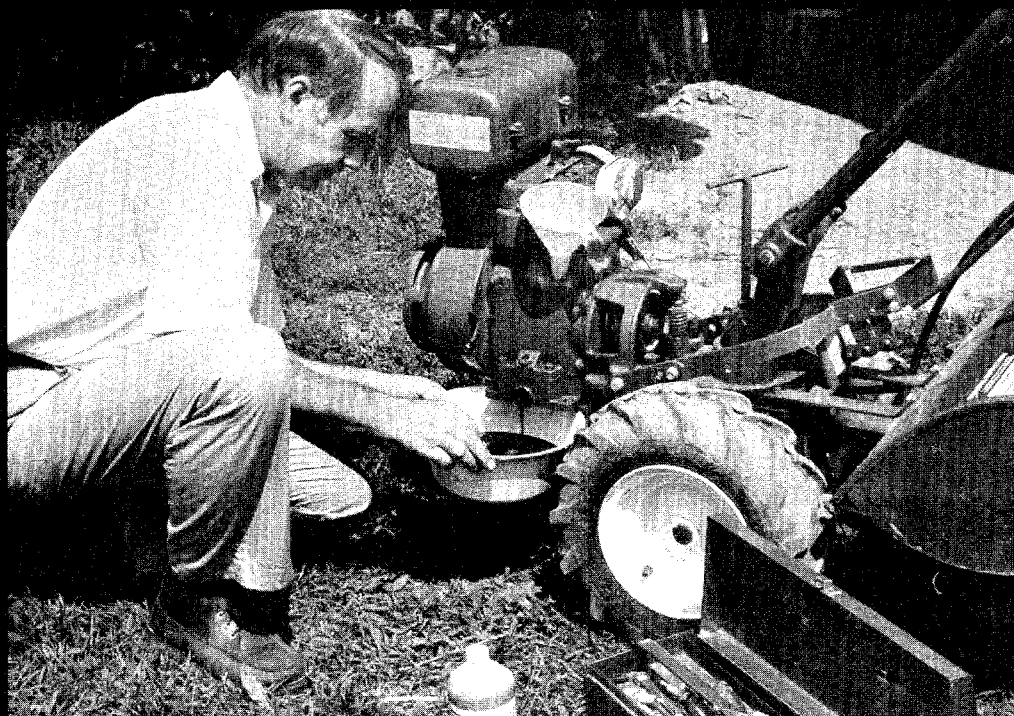
If you have to keep your tiller outdoors, then this custom made, custom fitted all-weather protective cover is for you! Fits neatly over all Horse Models, including the popular Electric Start and those fitted with Bumpers.

Made of tough, heavy-duty 16 oz. vinyl/laminated nylon with di-electrically sealed seams, the cover is flame-resistant, and crack resistant in cold down to 65° below zero. Also resistant to ultra-violet rays, rot and mildew; plus has breather discs to prevent condensation. Completely moisture-proof and wind resistant, the cover also has a special fiberglass insert over the muffler area.

Handy brass grommets around the hem make it easy to secure snugly around your tiller in the garden, on a trailer or in the back of your pickup. In handsome Troy-Bilt red, with our logo printed in white.



Protect your tiller with this weatherproof heavy-duty cover.



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SECTION 5: Tiller and Engine Maintenance

Scheduled Maintenance

Your tiller's mechanical parts and its engine require some regularly scheduled care and preventive maintenance if they are to give you the many years of faithful service that you should expect of them. Fortunately, these maintenance items are easy to do yourself with the help of your *Owner's Manual*, *Master Parts Catalog*, and a few simple tools. In addition, you can always rely on us here at the factory for expert advice and for prompt delivery of any parts you may need (see Pages 4&5).

Remember, you don't have to be a mechanic — or even handy with tools — to accomplish these basic maintenance procedures. However, if for any reason you'd rather not do a particular job yourself, you might ask a mechanically inclined friend or relative to help you out. Or, ask your neighbors if they know a reliable handyman, automobile mechanic or garden equipment repairman who might be interested in working on your tiller. If he's not familiar with the Troy-Bilt Tiller, loan him this *Owner's Manual* and the *Master Parts Catalog*. Then, have him get in touch with us at the factory if he needs any special advice or parts.

Of course, you can also obtain Factory Authorized service at any of our regional factory branches, or from a nearby "key" dealer (please call or write us for an up-to-date listing). These factory-trained tiller mechanics will provide you with prompt, courteous service.



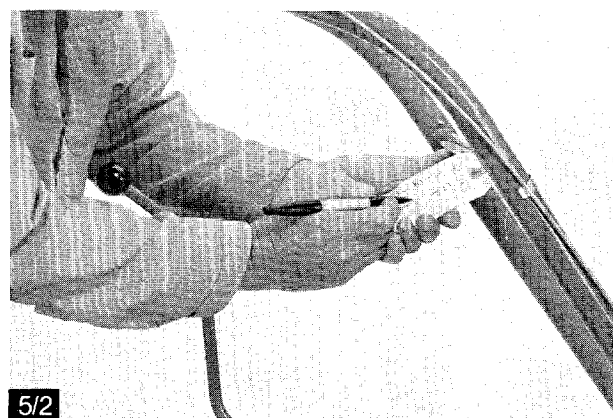
5/1

Regular care and maintenance is easy...and fun. No special skills needed!

Keeping track of hours

You'll note that the chart on Page 102 lists the various recommended maintenance intervals according to Hours of Operation. Keeping track of the hourly use isn't hard to do at all. Many owners simply tie a card to their handlebars and keep a running tally of hours on it. If you don't carry a watch with you in the garden, then you can measure the time fairly accurately by noting how many hours you can till with a tankful of fuel. (On a Tecumseh engine, for example, one tankful usually lasts about three hours). Do some experimenting with your engine. Then, once you have established this ratio, you can record the hours, or tankfuls, on your tally card.

It is very important that these maintenance services be performed regularly at or near the scheduled time as recommended in the chart.



5/2

Tie a tag to your tiller's handlebars to keep track of operating hours.

Non-scheduled maintenance and service

Service and repair work will be kept to a very minimum if you take care of and maintain your tiller and engine according to the recommended maintenance schedule presented in this section. However, the need for some non-scheduled maintenance and repairs will probably be required at some point in time. These special services or repairs are usually indicated by inspection, performance or operation of your tiller and engine.

Non-scheduled services include such things as trouble-shooting the ignition system, repairing oil leaks, and replacing worn or damaged parts. Please see Section 6 for easy, do-it-yourself instructions on how to perform many of these non-scheduled maintenance and repair services.

RECOMMENDED TILLER AND ENGINE MAINTENANCE SERVICES

ENGINE

TILLER

BEFORE EACH USE

- Check engine oil level to make sure oil level is up to "full" mark on dipstick. Also check every 2 hours during continuous use. See Pages 14&15.
- Clean dirt and debris from the cooling fins and air intake screen. See Page 103.
- Check vent hole in fuel tank cap to make sure it is unobstructed by dirt. See Page 105.

- Check the freedom of controls and levers.

EVERY 10 OPERATING HOURS

- Change the engine oil after the first 2 hours (Tecumseh) or first 5 hours (Kohler or Briggs & Stratton) of operation, then every 10 hours thereafter. Check and change it more frequently in dusty, dry conditions. See Page 102 in this manual, or Page 24 in the 8HP Owner's Manual Supplement.

- Check the drive belt for wear and proper tension after the first 2 hours of operation, then every 10 hours thereafter. See Page 105.

- Check the air cleaner for cleanliness before each use, and every 2 hours during continuous operation. See Pages 103-104 for cleaning intervals and instructions. For 8HP engines, see Page 20 in the Owner's Manual Supplement.

- Check bolts, nuts and screws throughout the tiller for tightness after the first 2 hours of operation, then every 10 hours thereafter. See Page 107.

- Check battery acid level. See Page 22. Also see other battery maintenance information on Page 112.

- Remove the tines from the tiller shaft and clean away any debris that may be caught on the tiller shaft or inside the holders. See Page 109.

- Oil and grease tiller after the first 2 hours of operation, then every 10 hours thereafter. See Page 110.

EVERY 20 OPERATING HOURS

- Check engine governor and carburetor linkage for freedom of movement. Make sure linkage is clean and unobstructed. See Page 117.

- Check for transmission oil leaks at oil seals, gaskets, front and rear bearing caps, tiller housing cover, transmission cover, pipe plugs and "O" rings after the first 2 hours of operation, then every 20 hours thereafter. See Page 114.

- Check for oil leaks at oil drain plugs, and at head, side cover, oil pan (Kohler), and breather gaskets. See Page 117.

EVERY 30 OPERATING HOURS

- Check level of transmission gear oil. See Page 118.
- Check tines for damage or excessive wear. See Page 119.
- Check rubber reverse disc for damage or excessive wear. See Page 120.

EVERY 40 OPERATING HOURS

- Check engine screws, bolts and nuts for correct tightness. See Page 123.

- Check tires for equal air pressure. Maintain 10 to 20 PSI (pounds per square inch) in each tire. Do not exceed 20 PSI. See Page 128.

EVERY 50 OPERATING HOURS

- Check the spark plug for carbon deposits or wetness (caused by oil) and for the proper electrode gap. Replace the spark plug every 50 hours, or at least once a season. See Page 125.

- Check for proper amount of end play (forward/backward movement) in main drive shaft. See Page 160.

100 + OPERATING HOURS

Ask for our free tune up instructions (no parts provided) to check or change the breaker points and condenser. Bad points will be burnt, pitted, oxidized, dirty or oily. For complete engine tune-up kit including spark plug, points and condenser, please see your Parts Order Form and Price List.

- On the 6 HP Tecumseh engine equipped with a dual element air cleaner assembly, clean or replace the dry paper element as described on Page 103.

IMPORTANT: For wintertime use and off-season storage instructions, see Page 126 of this section.

Adding or changing engine oil

Please remember to check the engine oil level with the dipstick prior to each day's operation and at least every two hours during continuous use — Photo 5/4. When checking the level, also make sure the oil is clean. Remember that dirty oil can cause engine failure as quickly as the lack of it. Since it is not easy to tell when oil is dirty merely by appearance or feel, you should change the oil on a regular basis according to the hours that the engine has run. The procedure for checking and filling the engine crankcase is described on Pages 14-16.

Change the oil after the first 2 hours (Tecumseh) or 5 hours (Kohler) during the initial break-in period and every 10 hours thereafter. But if extremely dusty or dirty conditions prevail, change the oil more frequently. Always use clean, good quality, SE-classified oil. Please consult the engine manufacturer's owner's guide for recommended oil viscosity (SAE 30, SAE 10W-30, etc.). Remember to change to a lighter weight oil when using the Dozer/Snow Blade in the wintertime.

If you have an 8HP Briggs & Stratton Engine, please see your green-covered, 8HP Owner's Manual Supplement for details on changing engine oil.

Changing engine oil

1. If possible, drain oil soon after engine has reached

operating temperature to assure complete removal of used oil and contaminants. *Stop the engine* before proceeding to the following steps.

2. Place a brick or wood block under the wheel opposite the drain hole you're using — see Photos 5/5 and 5/6.

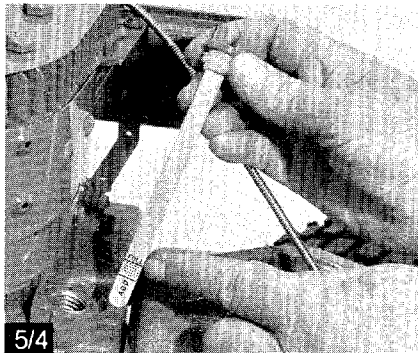
3. Place a pan or bucket under the engine to catch the old oil (approximately one quart). Clean away any dirt or debris from the dipstick location and remove the dipstick to vent the crankcase and speed-up the draining time.

4. Remove the drain plug and patiently wait for the last bit of oil to drain out — which will likely carry the most dirt and sludge out with it. Make sure the engine is tilted toward the drain hole.

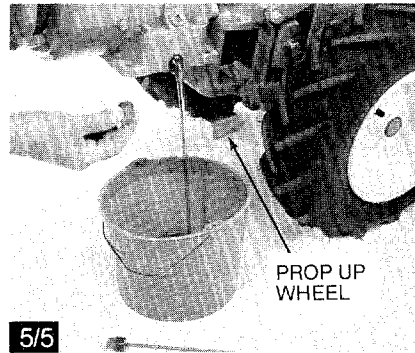
5. Replace the drain plug.

6. Refill the crankcase with fresh oil, and check level with dipstick (see Pages 14-16). Stop filling when level reaches "Full" mark. Because some old oil will cling to the engine's sidewalls, you may not use as much oil as when you filled it the very first time. Replace the dipstick securely.

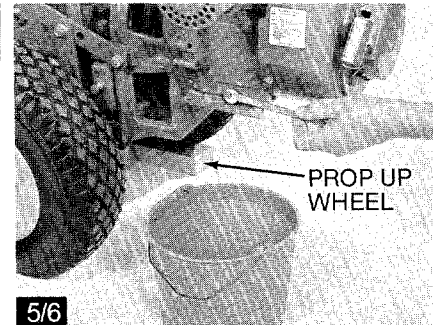
7. If possible, start the engine (outdoors) and let it warm up. Then check the drain plug for any possible oil leak.



5/4 Keep a close watch on your engine's oil level. The dipstick for the 6 HP Tecumseh Engine is shown here.



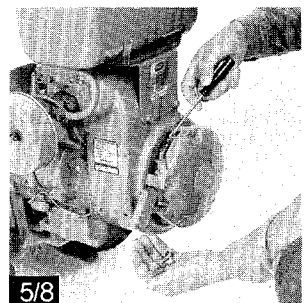
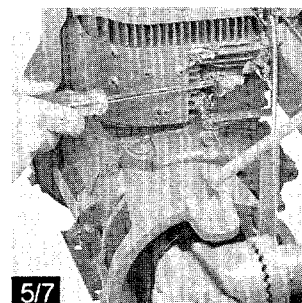
5/5 7 HP KOHLER ENGINE — Drain plug is located on left side of engine. Use 9/16" wrench to remove plug.



5/6 6 HP TECUMSEH ENGINE — Drain plugs are located on both sides of engine. Use only one plug when draining oil. Use 3/8" wrench to remove plug.

Clean cooling system

In order to keep your engine cool, it is important that the cooling fins on the engine be regularly cleaned to remove all grass, chaff and other debris — see Photos 5/7 and 5/8. With the *engine off, and cool*, use a small brush or a screwdriver wrapped in a rag to remove debris from between the cooling fins and from the air intake screen at the front of the engine (make sure the engine is off before reaching into the blower housing area!).



5/7 **5/8** Keep cooling fins and air intake screen clean.

Air Cleaner Service

The air cleaner on your engine filters dirt and other rasives from the air entering the carburetor. It keeps these contaminates from getting into the engine, where they could cause rapid wear of the internal parts. Check the air cleaner for cleanliness before using the tiller each time. Then, check it at least every 2 hours during operation, or even every half hour if conditions

are extremely dusty. Also, be sure that the entire air cleaner assembly is snug and tight.

Follow the instructions below and on Page 104 that apply to your particular engine. If you have an 8HP Briggs & Stratton Engine, please refer to your 8HP Owner's Manual Supplement.

Servicing the 6HP Tecumseh Air Cleaners

If your Tiller Serial Number is 531808 or higher, then your 6HP engine has a dual element style air cleaner, as shown in Photo 5/9A. 6HP-equipped tillers below that number have a single element filter (see Photo 5/10). Please follow the instructions that apply to your style air cleaner only.

Cleaning the 6HP Dual Element Air Cleaner

The dual element air cleaner filters the air twice. The outer polyurethane foam ring is a pre-cleaner that filters the air first. The inner dry paper fiber cartridge filters the air a second time.

At every 10 hours of operation you should clean the foam ring.

At every 100 hours of operation or annually, whichever comes sooner, clean the paper fiber cartridge.

NOTE: Inspect and clean more often in extremely dusty or dirty conditions.

CAUTION: When servicing the air cleaner, take extra precautions that no dirt or other debris enters the carburetor.

To clean the outer foam element:

1. Remove the wing nut and cover (Photo 5/9A).
2. If element is dirty, remove it gently (Photo 5/9B).
3. Wash in a warm water-liquid detergent solution (Photo 5/9C). Rinse in clear water and squeeze (don't twist) until completely dry.
4. Saturate element with clean motor oil (Photo 5/9D). Squeeze (don't twist) to distribute oil and remove excess oil.
5. Clean the topside of the air cleaner base and the inside of the metal cover. Now replace the element, sliding it down until it fits snugly and evenly on the bottom base of the air cleaner.
6. Replace cover and wing nut, tightening securely.

Cleaning the paper cartridge element.

CAUTION: When you remove the cartridge, do so very carefully and only after you wipe and brush the air cleaner cover and surrounding area before-hand. This is when dirt and dust are most likely to

fall into the carburetor air horn and then enter the engine!

1. Refer to Photos 5/9A and 5/9B to remove the air cleaner cover and outer foam element.
2. Remove nut, small cup, and paper element (Photo 5/9E).
3. If the element is just dusty, tap it gently against a flat vertical surface (see Photo 5/9F) rotating element as you tap. Examine filter. If torn or punctured, replace with a new one.

If very dirty, either replace it or clean it in a water and detergent solution. After washing, rinse completely by flushing water from the inside to the outside (Photo 5/9G). Then air dry thoroughly. Air drying may take a day, so plan ahead before cleaning. **DO NOT OIL PAPER ELEMENT.**

4. Replace element, followed by cup and nut. Install nut finger-tight, plus one more full turn. Do not over-tighten. (**NOTE:** When installing NEW filter, always use new NUT supplied with filter.) Finally, reinstall foam element (see Step 5 above) and cover and wing nut.



5/9A Dual Element Air Filter



5/9B Remove foam element.



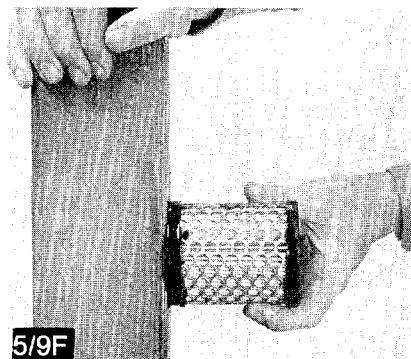
5/9C Wash foam element.



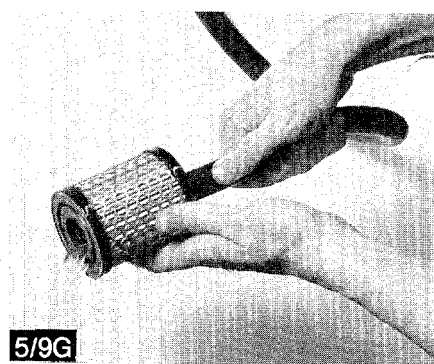
5/9D Add oil to element.



5/9E
Remove 7HP paper element.



5/9F
Tap on vertical surface.



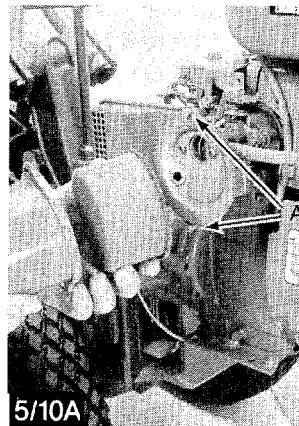
5/9G
Air dry after washing.

Cleaning the 6HP single element air cleaner

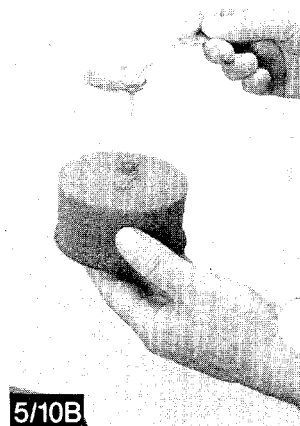
The polyurethane foam element air filter will last almost indefinitely. But, when it can't be cleaned anymore, replace it with a new one. Here's how to clean a dirty element:

- 1.** Loosen the two screws that hold the air cleaner cover in place. Twist cover to left and remove. Take out the air cleaner element — see Photo 5/10A. Check the two Phillips head screws in the back plate ("A" in photo 5/10A) and snug them down if loose.
- 2.** Wash the element by soaking and squeezing it in a detergent and water solution. Rinse the element and squeeze out the cleaning solution, then let it air dry.
- 3.** Before replacing the filter, clean the inside of the cover and the cover base thoroughly.
- 4.** Saturate the element with motor oil and squeeze to distribute the oil — Photo 5/10B. Wipe off any excess with a paper towel or clean cloth.

- 5.** Replace element in cover and reattach cover to base, tightening it securely. The felt pad on the one end of the element should be facing the engine.



5/10A
Check for loose screws.



5/10B
Add oil, then replace.

Servicing the 7HP Kohler air cleaner

Your Kohler engine uses a pleated paper type element. The element can be cleaned as described below, but it should normally be replaced after 50 hours of use, or sooner if dirt does not come off — or if it is torn. Here's how to clean a dirty element:

NOTE: On some 7HP tillers, the optional Bumper/Guard may make it difficult to remove the cover. If so, loosen all five bolts on the bumper and shift the bumper to the right until enough clearance is obtained. Retighten the bolts and remove the cover with the element still inside. After servicing, reinstall cover with element inside it.

- 1.** Remove wing nut fastening the cover to the carburetor and take out the element inside the cover — see Photos 5/11 and 5/12. With the element removed, check the two screws in the back plate ("A" in Photo 5/12) and snug them down if loose.
- 2.** Tap paper element lightly on a flat vertical surface to dislodge loose surface dirt. Rotate the filter as you tap. You can also vacuum clean the element. Do not wash or oil element.

- 3.** Before replacing element, clean the inside of the cover and cover the base thoroughly.

- 4.** Replace element in cover and install wing nut finger tight — do not overtighten.



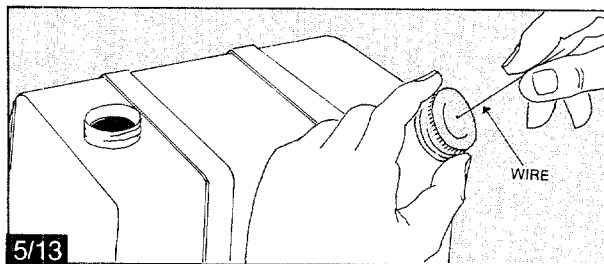
5/11
Remove wing nut (7HP).



5/12
Check screws in plate.

Check vent hole in fuel tank cap

Before each use, check the hole in the top of your fuel tank cap to make sure it isn't clogged with dirt — see Sketch 5/13. Use a thin wire or pin to clean it out, but be careful not to enlarge the hole or poke through the plastic or foil cover on the inside of the cap.



Check vent hole before each use.

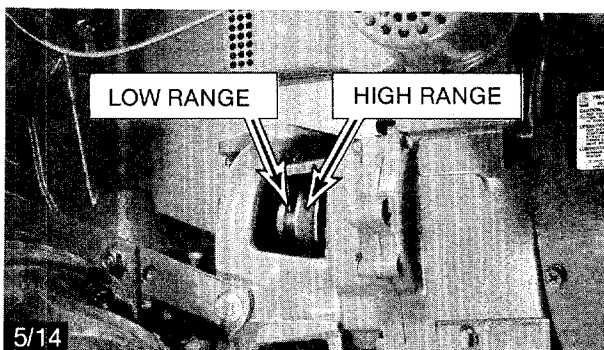
Checking and adjusting drive belt tension

Proper belt adjustment is critical for good tiller performance. The drive belt (Photo 5/14) transfers power from the engine to the transmission in order to drive the wheels and tines forward. If the belt is loose or worn, it can slip on the pulleys and cause disappointing tiller performance.

On a brand-new tiller, the belt will probably have to be adjusted after the first few hours of use. After this initial adjustment, you should check the belt at least every 10 hours for correct tension, and for signs of cracks, fraying and severe wear.

To help extend the belt's life, you should: store the tiller indoors when not in use (and place the Forward/Reverse Lever in Neutral); keep the belt tension properly adjusted; and avoid jamming the Forward/Reverse

Lever in and out of Forward... especially when shifting from Reverse to Forward.



Check drive belt every 10 operating hours.

How to tell when the belt needs tightening or replacing

There are three ways to tell if your belt needs adjustment or replacement:

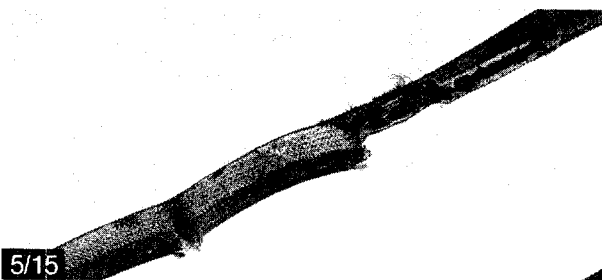
1. Try out your tiller in deep garden soil with the Wheel Speed Lever in Slow Speed and the engine throttle set at a moderately fast speed. If the engine runs smoothly, with no power loss whatsoever, but the tines and wheels slow down or seem to lose power, then the belt is slipping on the pulleys.

Further evidence is if the belt slips even during shallow cultivating, or if you notice the belt slipping in Forward gear, but find tiller operation is normal in Reverse, when the lower (transmission) pulley is being driven by the reverse disc, not the belt. If any of these conditions exist, tighten the belt as explained below.

2. If the drive belt appears badly worn, cracked or frayed, it should be replaced with a new one — Photo 5/15. (If a few strands from the outer belt covering fray and come loose, trim them off with scissors.)

3. If you are in the process of adjusting belt tension and find that previous belt adjustments have left the yellow-colored adjustment block as far down as it will go, and your belt is still too loose to do the proper job, then you definitely need a new belt.

(cont'd.)



A torn or cut belt should be replaced.

IMPORTANT

When the time comes to change your belt, please order Part No. 9245 from the factory. This belt is of a special length and strength, *made especially* for your Troy-Bilt Tiller. At the present time, it is not available from local stores or suppliers. Use of any belt other than Part No. 9245 available from Garden Way Manufacturing Co., Inc., will result in unsatisfactory tiller performance and possible damage to your tiller. For detailed instructions on how to remove and replace the belt, please see Page 141, in Section 6.

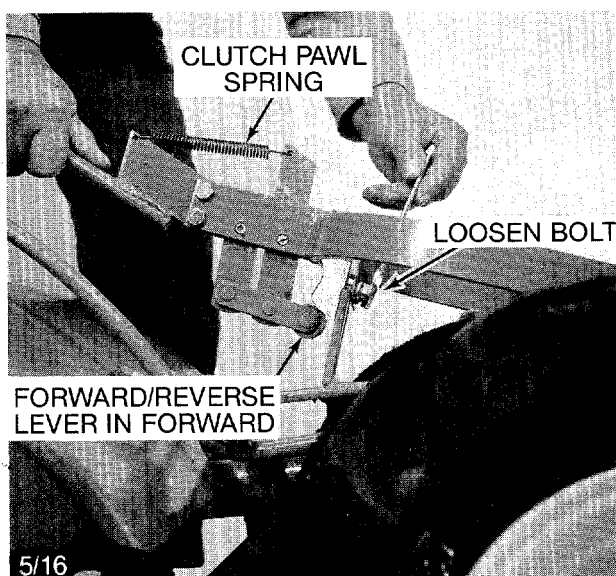
How to adjust belt tension

WARNING: If the engine has been running, wait until the muffler and engine cool down. Also disconnect the spark plug wire to prevent accidental engine start-up.

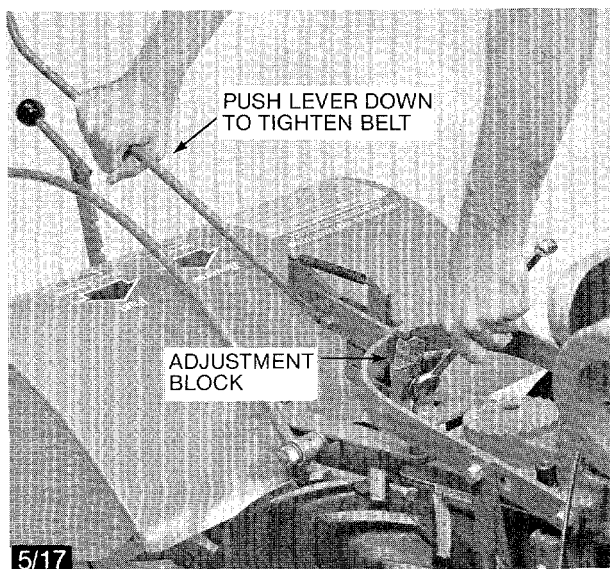
1. Push the Forward/Reverse Lever all the way down until it locks in the Forward position — Photo 5/16. The lever must be in Forward position to test and adjust belt tension.

2. Using a 9/16" or adjustable wrench, loosen — but don't remove — the mounting bolt for the yellow-colored belt adjustment block — Photo 5/16.

NOTE: Removing or swinging your handlebars to one side will give you additional working room.



Loosen bolt to adjust belt tension (handlebars removed for clarity).

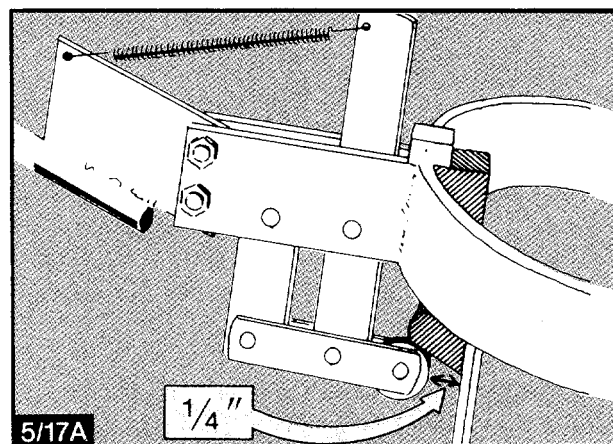


Push down on lever and retighten bolt.

3. Stand alongside the tiller and grasp the Forward/Reverse Lever a few inches below the first bend in the lever, as shown in Photo 5/17. Now, push down on the lever **AS HARD AS YOU CAN**. As you do, the yellow adjustment block will move down, increasing the belt tension. Keeping full downward pressure on the lever, retighten the mounting bolt securely.

4. With the lever still in Forward, measure the distance between the front edge of the roller and the face of the mounting bracket (Sketch 5/17A). If the distance between the two is $\frac{1}{4}$ ", then the belt should be very close to the correct tension and you are all set. If there's **less** than $\frac{1}{4}$ ", then the belt may still be too loose, and it will slip when you test it in the garden. If so, lower the block slightly. If there's much **more** than $\frac{1}{4}$ ", the belt may be too tight, and the lever may "pop" out of gear when you till. If so, raise the block very slightly.

5. Now you should take your tiller out to the garden and try it out. If it performs well when under a load, with no loss of power to the wheels or tines, then the belt is properly adjusted.



Position roller $\frac{1}{4}$ " from face of mounting bracket. A $\frac{1}{4}$ " diameter bolt makes a handy gage.

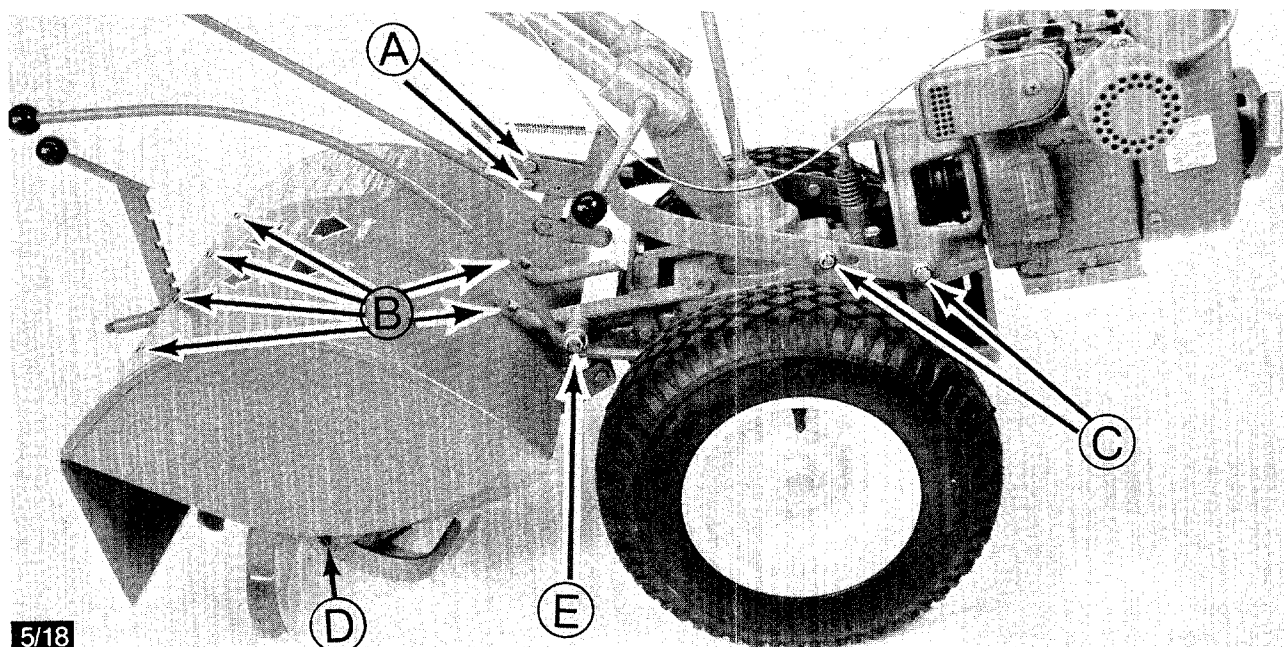
A word about "neutral"

When the Forward/Reverse Lever is in Neutral, the clutch roller does not have to be at any specific position within the indentation or on the face of the yellow colored belt adjustment block. The Neutral position that the roller takes on the block results primarily from the height of the reverse plunger adjustment bolt and the overall length of the drive belt. As successive adjustments are made for belt tension, the Neutral position of the roller will gradually move higher and higher on the block — until the block hits bottom and there is no adjustment room left because the belt has stretched too much.

Tighten bolts and nuts on tiller

At least every 10 operating hours you should check all tiller bolts, nuts and screws and tighten any which may have become loose. Following is a list of some of the more important fasteners that you should especially keep an eye on (see Photos 5/18 through 5/23.)

CAUTION: Make sure engine is off and spark plug wire is disconnected before working on tiller. When tilting tiller forward on its engine for inspection or service, do so gently to avoid denting the engine's blower housing.

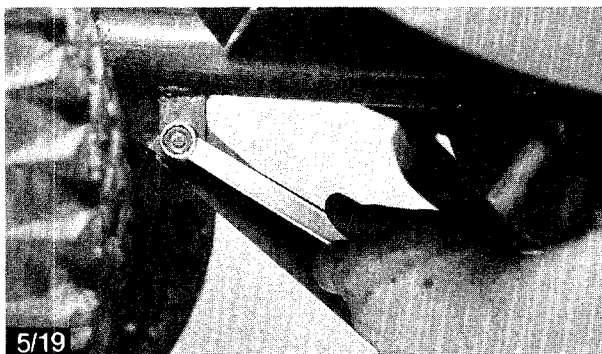


5/18

Check these bolts and nuts every 10 operating hours.

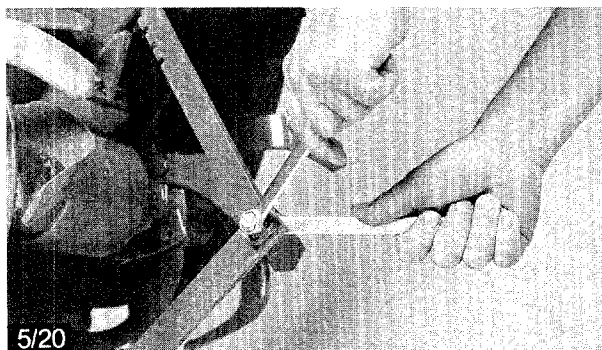
- 1.** Check the two bolts that fasten the Forward/Reverse Lever to your tiller — see "A" in Photo 5/18. Make sure that they hold without any wobble of the lever, but don't overtighten and break the bolts.
- 2.** Check the bolts fastening the drag bar to the tiller and to the depth regulator — see Photos 5/19 and 5/20.
- 3.** Check the bolts and nuts that fasten the front and rear hood brackets — see "B" in Photo 5/18.

(cont'd.)



5/19

Tighten bolt that connects drag bar to transmission tube.



5/20

Tighten bolt at drag bar and depth regulator.

Tighten bolts and nuts, cont'd.

4. Check the two end cap bolts under the rear hood bracket — see Photo 5/21. Also, check the three hex head flange screws for tightness. Look for evidence of oil seepage between the end cap and the transmission tube. For further details regarding an oil leak from the end cap, please see “End Cap” on Page 115.

5. Check the bolts and nuts that connect the linkage to the yoke — see “C” in Photo 5/18.

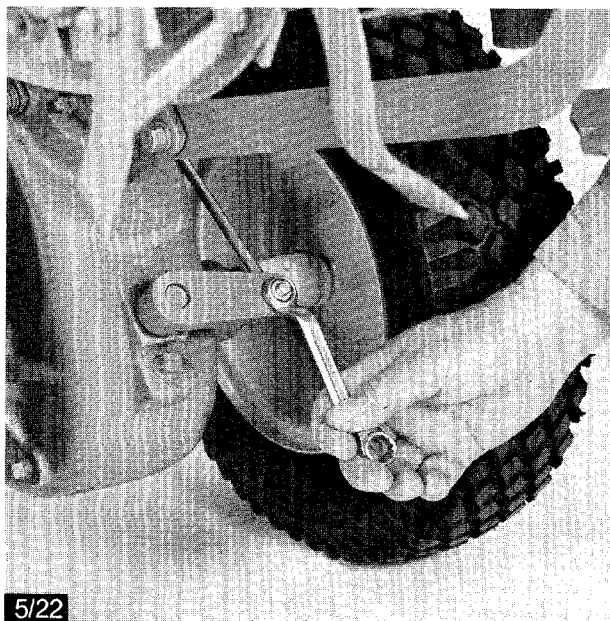
6. Check the locknut that fastens the Wheel Speed Shift Lever linkage to the transmission’s eccentric lever — Photo 5/22. Be careful that you don’t tighten the nut against the eccentric lever. Doing so will interfere with proper shifting of the Wheel Speed Shift Lever.

7. Check the nuts and bolts that fasten the tines — see “D” in Photo 5/18. Make sure they are good and tight.

8. Remove the tine holder on the left side so that you can reach the tiller housing cover and check the five hex head screws holding that cover in place — Photo 5/23. To remove the tine holder, use a 3/4” wrench to remove the bolt holding the tine assembly to the shaft, and tap the tine assembly loose from the shaft (see Photo 5/24 on Page 109). You especially should make certain that those five screws are tight and that the cover is snug and shows no sign of any appreciable oil leak. A small amount of “wetness” with oil at that point on the cover is nothing to get excited about. A genuine loss of oil should receive attention at once (see “Tiller Housing Cover and Tine Shaft” on Page 115).

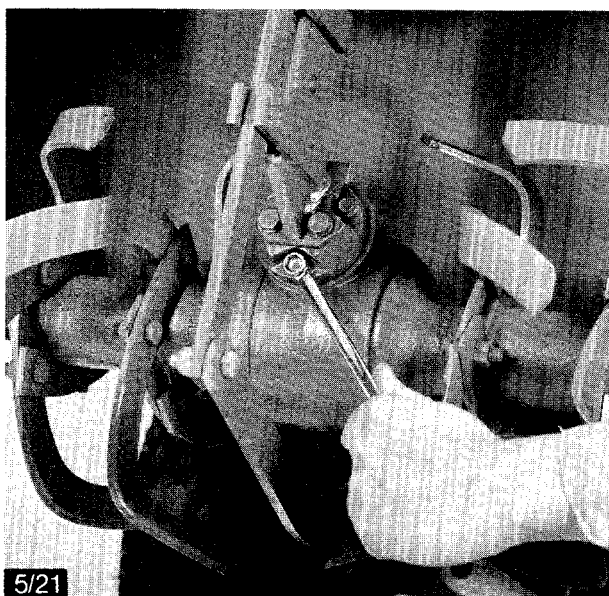
9. Occasionally, check the rubber reverse disc and make sure that the mounting bolt attaching it to the engine pulley is firmly threaded in — see Page 143 in Section 6.

10. The locknut on the Wheel Speed Shift Lever (“E” in Photo 5/18) regulates the freedom of movement of the lever. If the nut is too loose, the lever may drop out of Fast Wheel Speed. If too tight, the lever may be difficult to shift. Tighten or loosen the nut as required.



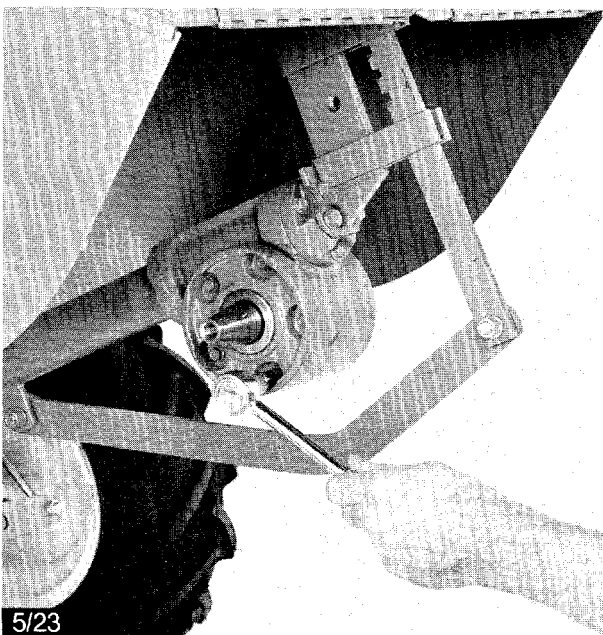
5/22

Make sure locknut securely fastens shifting linkage to transmission eccentric lever.



5/21

Check two hood bracket bolts and three flange screws in end cap.

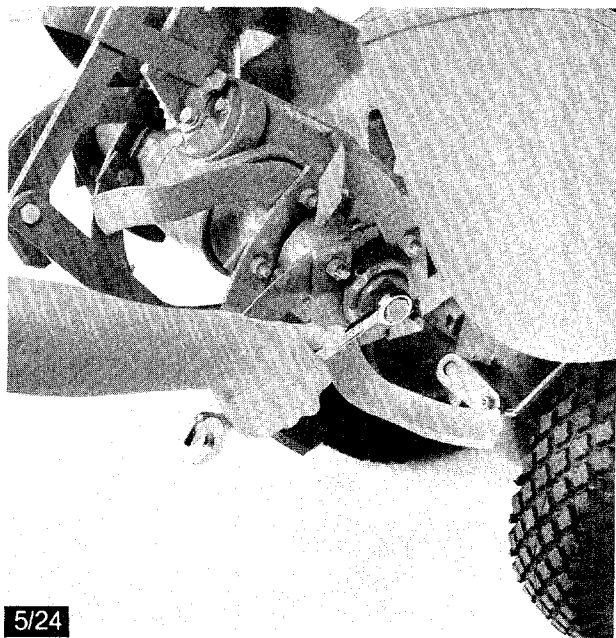


5/23

Check tiller housing cover screws for tightness.

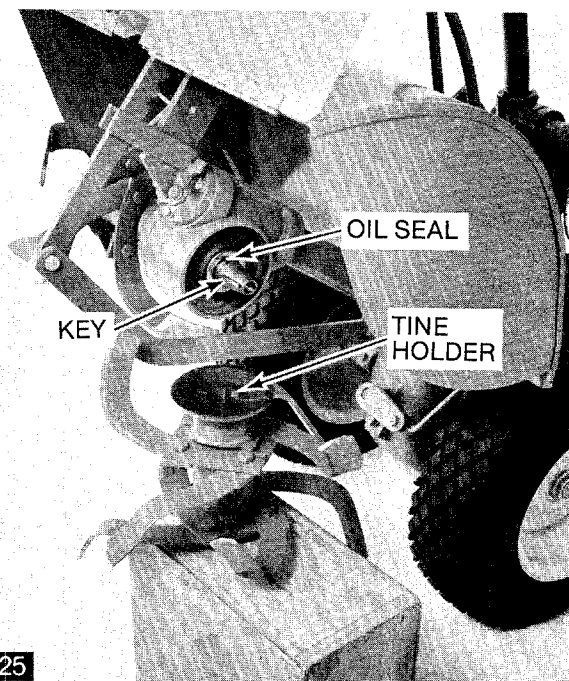
Clean tiller tine shaft

At least every 10 operating hours, it's a good idea to remove the left and right-side bolo tine holders and clean out any dirt, vines or straw that may have accumulated on the shaft or inside the holders. This debris can cause wear to the shaft and the oil seals due to rubbing and friction whenever the shaft turns. See Photos 5/24 through 5/26 for this easy to do maintenance procedure.



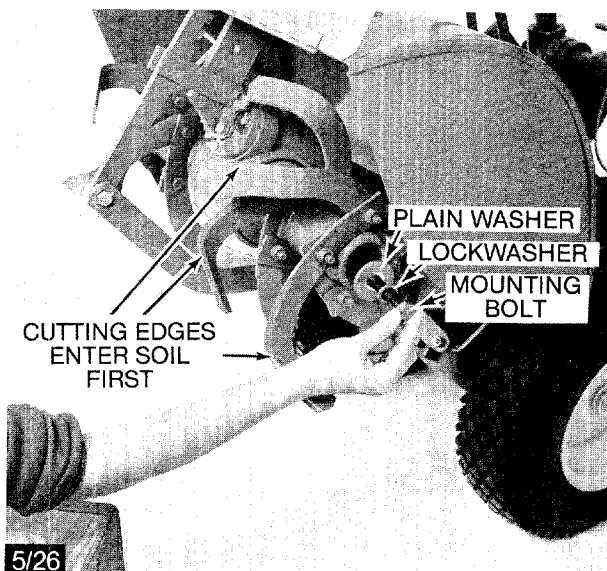
5/24

1. After *disconnecting the spark plug*, and with *all tiller controls in neutral*, gently tip the tiller forward and remove the bolt on the end of the tine holder with a 3/4-inch wrench (push down on right side, pull up on left side). As you remove the bolt, hold the tine holder so it won't fall. If necessary, tap the holder outward with a mallet to free it from the transmission housing. Follow same procedure for right side of tiller. **NOTE:** If you have any difficulty removing the bolt, see additional instructions in Section 6, Page 146.



5/25

2. With holder removed, inspect and clean tiller shaft and inside of tine holder. Make sure the tiller shaft key stays in shaft (look inside holder if it is missing). If you notice a very oily build-up or leak around the oil seal, you should replace the seal as explained on Page 135, Section 6. **NOTE:** Be careful not to scratch or gouge the tiller shaft while cleaning.

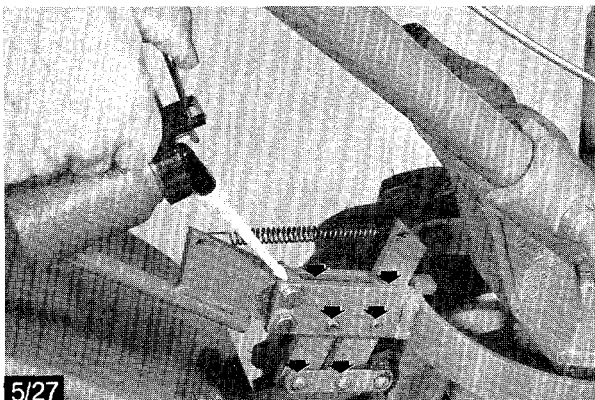


5/26

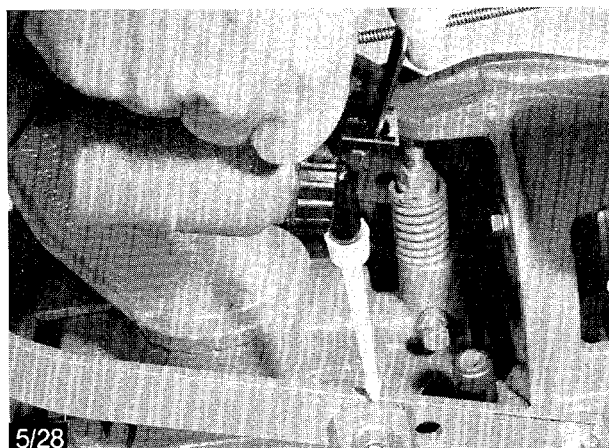
3. When replacing holder, line-up keyway in holder with key in tiller shaft and tap holder into place. If the tines are installed correctly, the cutting edge of the tines will enter the soil first when the tiller moves forward. Replace the bolt and washers and tighten securely.

Tiller lubrication

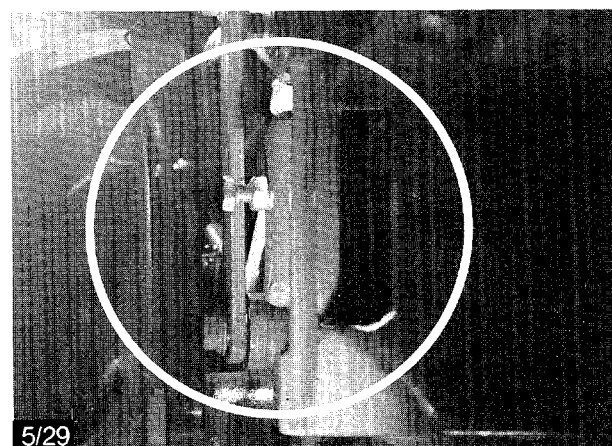
To keep your tiller's mechanisms operating properly and easily for you, you should lubricate all of the moving parts shown in Photos 5/26 through 5/38 at every 10 hours of operation. Use ordinary motor oil where oil is called for. The grease can be any general purpose grease, so long as it does the job of lubrication.



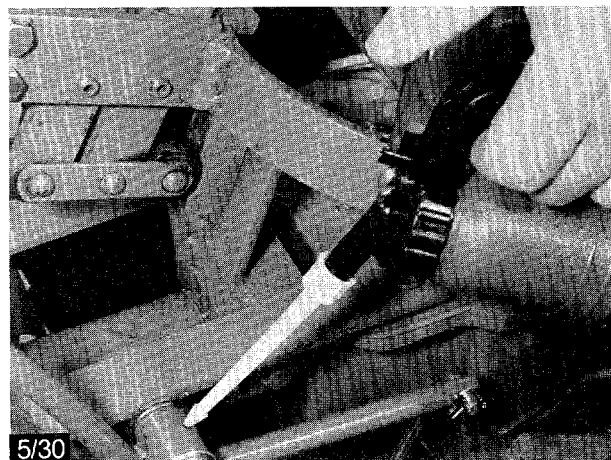
Oil bolts, plate, link, rivets and roll pins on clutch shifting assembly.



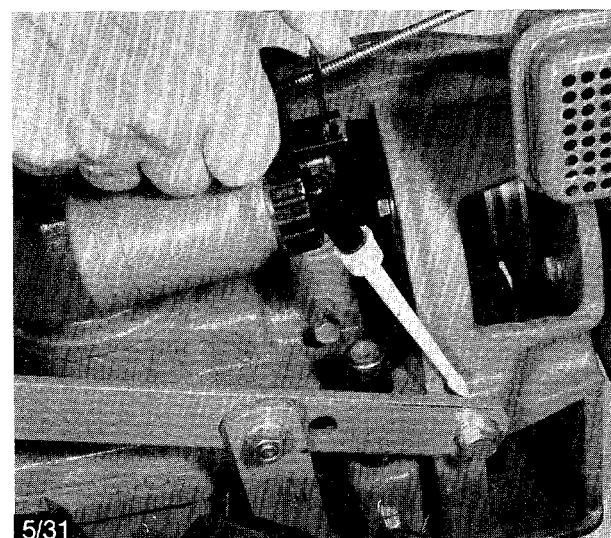
Oil top of vertical links where they connect to yoke.



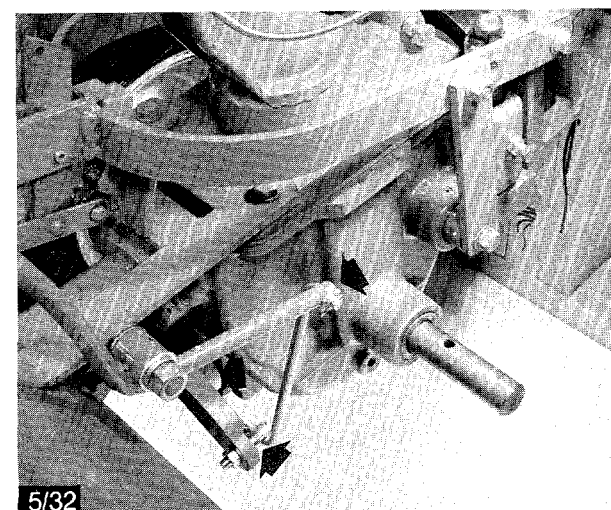
Oil bottom of vertical links where they connect to pinion bearing side plugs.



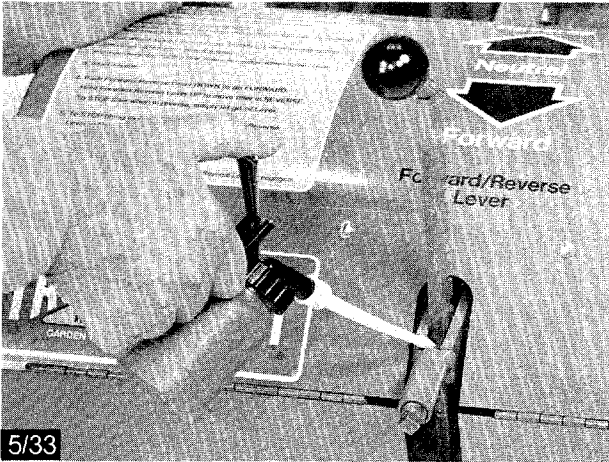
Oil pivot point of Wheel Speed Shift Lever.



Oil ends of yoke and bolts.

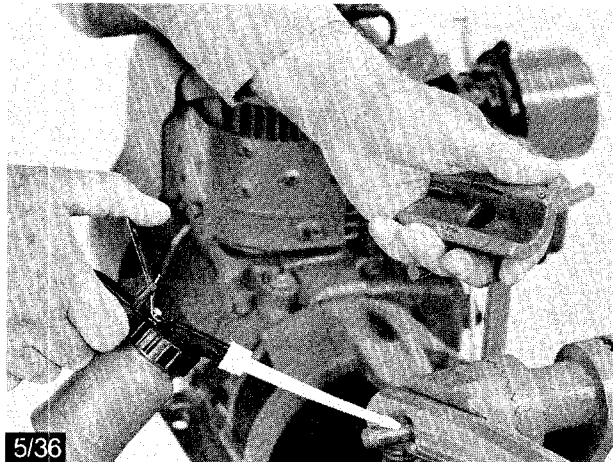


Oil speed shifting linkage and shaft behind eccentric lever (wheel removed for clarity).



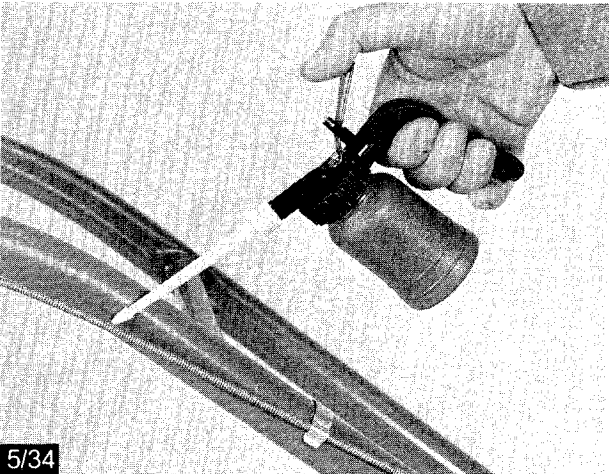
5/33

Oil depth regulator bar, plunger and spring.



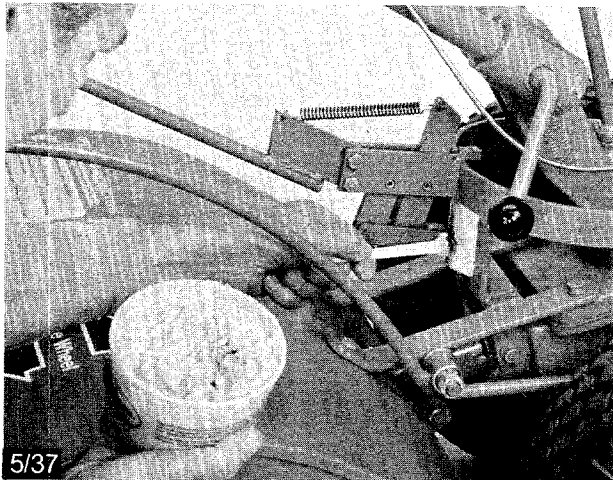
5/36

Oil handlebar height adjustment stud, thread and nut.



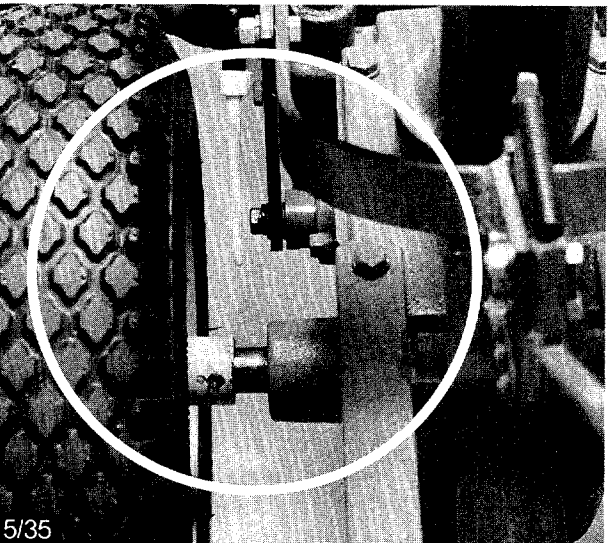
5/34

Lubricate entire length of the throttle cable and its casing with silicone oil spray, graphite, oil or grease.



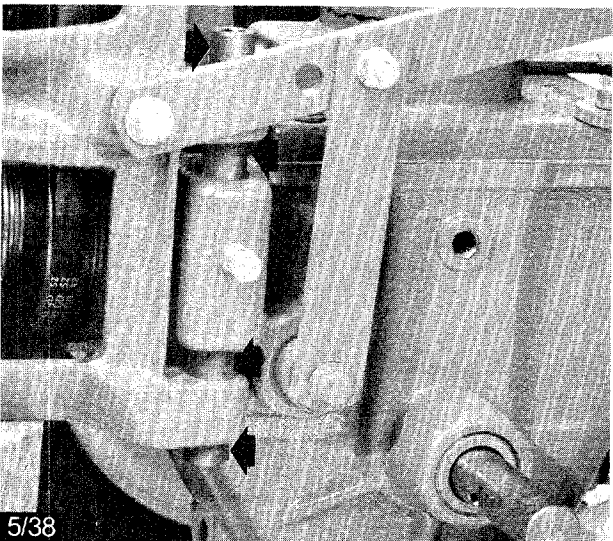
5/37

Apply grease to face of belt adjustment block.



5/35

Oil wheel shaft with occasional squirt of oil.



5/38

Grease engine mounting bars at top, middle and bottom (wheel removed for clarity).

5

Battery care and maintenance

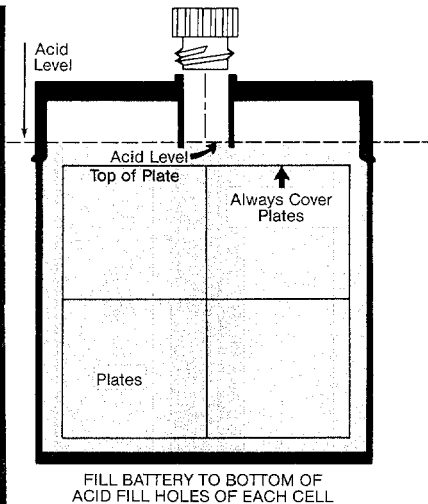
POISON/DANGER — CAUSES SEVERE BURNS

Your battery contains sulfuric acid – avoid contact with skin, eyes or clothing. Antidote: **EXTERNAL** – Flush immediately with lots of water. **INTERNAL** – Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately. Eyes – Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries. **KEEP OUT OF REACH OF CHILDREN.**

ADDITIONAL CAUTIONS

- Do not wear jewelry while working near battery. Any metal jewelry that touches a battery terminal can cause a short circuit, which may cause a spark that can ignite explosive gases.
- Do not place a metal tool or any metal object on top of the battery, because a short circuit could occur. When working on battery connections, don't touch the positive battery post and any surrounding metal with a wrench.
- Never jump the tiller's battery with your car's battery or charging system. This could cause your battery to explode, and would also ruin the electric start system and possibly the engine's ignition system.



1. At every 10 hours of operation, you should check the acid level in each cell of the battery. If the engine is run with a dry battery (or one low in acid), the battery and other electrical system parts can be damaged. Also, a battery that is low in acid won't deliver full starting power, or be able to receive a satisfactory charge during engine operation.

When checking, make sure the battery is level. As shown in Sketch 5/39, the electrolyte level should be maintained up to the bottom of the acid filler tubes. If the level is low, add distilled or demineralized water. After adding water, run the engine for about 20 minutes to help recharge and recirculate the electrolyte.

2. If the battery terminals become corroded with acid oxidation (a white material), they can be cleaned with a baking soda and water solution. Sprinkle baking soda on the terminals making sure that the filler caps are on securely (tape over any vent holes in the caps with masking tape). Add water. If the solution starts to fizz, you know that battery acid is present. Flush off solution with clean water and repeat applications until terminals are clean. **WARNING:** The white oxidation is acid. Avoid getting it on your skin or in your eyes. See "Poison/Danger" caution above. This solution can also damage your tiller's paint finish — remove battery before cleaning.

3. The battery posts and cable terminals should be cleaned to a bright, shiny condition with sandpaper or steel wool. After cleaning, apply petroleum jelly or a silicone grease to prevent new corrosion. Be sure to replace the insulated rubber boots on the battery posts when the service work is complete.

4. Check to be sure battery cables are tight at both ends of the cables.

5. Check specific gravity periodically. If the specific gravity is less than 1.250, recharging is required. Gas stations will check specific gravity for you and should be able to recharge the battery whenever it's necessary (see battery charging information on Page 22, of Section 1). You can also recharge your battery by running the engine, as explained in Step 6 below.

6. If battery will not be used for several months, it should be removed and stored, fully charged in a cool, dry place. Place the battery on a board (not on metal or concrete) during storage. Temperatures ranging from 10°F to 45°F are best, as long as your battery retains its state of charge. You can even store the battery outdoors (in a safe place), but if the state of charge is very low when temperatures below freezing occur, you could damage the battery. On the other hand, never store a battery indoors in a warm place for extended periods.

If it is convenient for you to check the battery's condition every 3 or 4 weeks during storage, you could hook the battery back up to the tiller's electric start system and run the engine (outdoors) for 45 to 60 minutes at intermediate speed. If the engine is started easily with the battery, and the battery acid level in each cell is up to the correct level, then that is reasonable evidence that the battery's condition is okay.

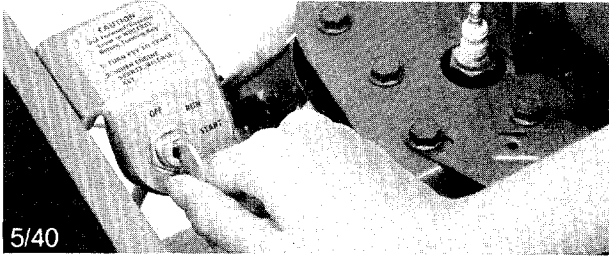
7. If you have a problem starting or stopping your electric start engine with the key switch, refer to "Troubleshooting the Electric Start System" on Pages 191-194 in Section 6.

8. For information on operating the engine with a dead battery, or one or both battery cables disconnected, please see instructions, "In Case of a Dead Battery" on Page 194 in Section 6.

How to remove and reinstall the battery

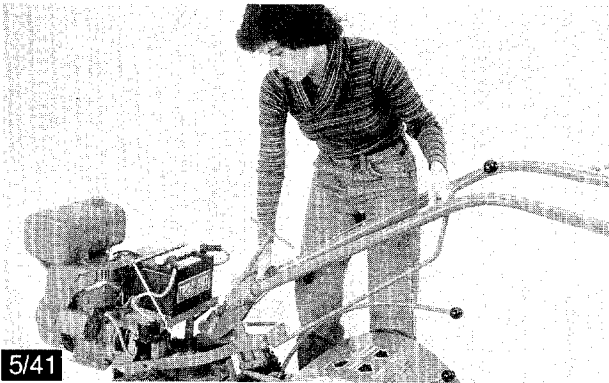
Here are simple steps to take whenever you want to remove the battery from your tiller for servicing or storage:

REMOVAL STEPS:



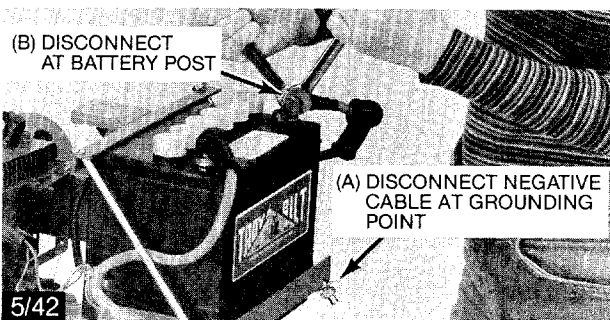
5/40

1. Turn the key to the "OFF" position and remove the key from the switch.



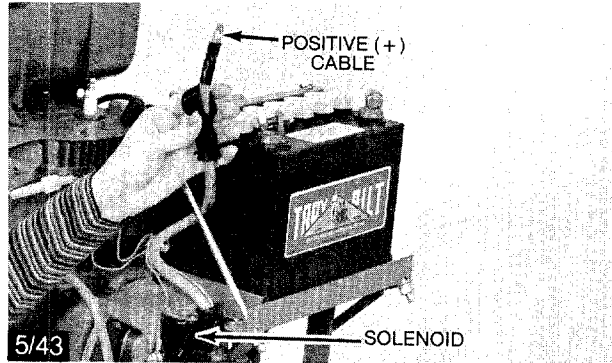
5/41

2. Remove the T-bar and handlebars from the tiller and set them aside, being careful not to overstretch or kink the throttle cable. Place the T-bar on a clean surface so it won't pick up any dirt that could enter the transmission when you replace it later. Removing the handlebars is a safety precaution so you won't accidentally touch the positive battery post and the T-bar with a wrench, which could cause a spark to occur.



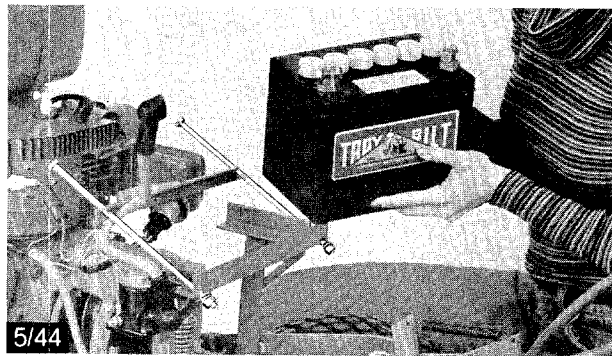
5/42

3. Disconnect the **NEGATIVE CABLE (-)** from the grounding point at the bottom of the battery hold-down bolt ("A" in photo) and bend it safely away from the battery and the tiller. Replace the lockwasher and nut on the end of the bolt for safekeeping. Next, disconnect the other end of the negative cable from the battery post (as shown at "B" in photo above) and *completely* remove the cable.



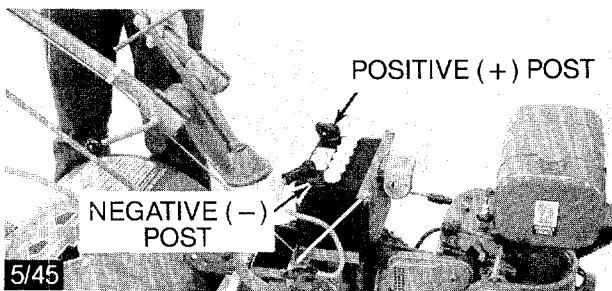
5/43

4. Disconnect the **POSITIVE CABLE (+)** from the battery post on the left side of the tiller and bend it away from the battery and the tiller. Leave the other end attached to the solenoid. Place the rubber boot over the terminal end of the cable.



5/44

5. Loosen the hold-down bolt on the right side (Negative (-) side) of the battery enough to move the battery clamp away so that the battery can be removed easily. If necessary, also loosen the hold-down bolt on the left side.



5/45

Battery installed correctly on tiller.

INSTALLATION STEPS:

6. When it comes time to replace the battery, be sure that you install the **POSITIVE CABLE (+)** first and the **NEGATIVE CABLE (-)** last. Detailed instructions for replacing the battery are found in Section 1, Pages 22-24. Before installing, make sure that the key is removed from the switch and that the T-bar and handlebars are removed from the tiller. Be especially careful that you place the battery on the tiller with the *posts facing toward the rear* (tine end) of the tiller. The positive (+) post must be on the left hand side (solenoid side) of the tiller as you face forward from the handlebars (Photo 5/45).

Check for tiller oil leaks

After the first 2 hours of operation of your new tiller, look over the entire transmission for signs of an oil leak. Thereafter, check at least every 20 operating hours.

Even though your tiller may show no outward sign of an oil leak (any dirty, oily accumulation on the transmission, or on the floor beneath the tiller), it's still a good idea to check for leaks regularly. In doing so, you may discover a minor leak that can be corrected early, or that can be watched closely to be sure it doesn't have a chance to develop into a serious one. (Often, you can put off making repairs to a minor leak until after the gardening season is over... as long as you maintain the oil level in the transmission at its correct level!).

On the other hand, if you discover a leak which is bad enough to drip oil it should be corrected right away. This kind of leak always gets worse and could lead to a major loss of oil.

Before starting your check, clean off and dry any area on which you find oil or dark dirt that is wet with oil.

Then, operate your tiller and watch for fresh oil seepage to locate the leak, if there is one.

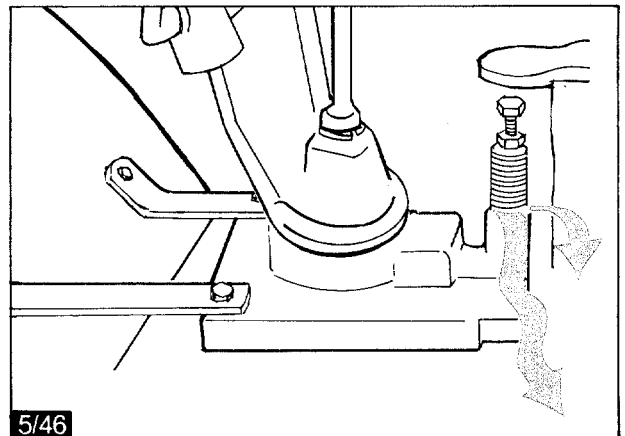
IMPORTANT: A rapid build-up of excessive heat will damage internal transmission parts such as gears, worms, or bearings. Such a build-up can result from running the tiller with the transmission oil below the required level. Check the gear oil level at least every 30 operating hours, or sooner if an oil leak is present — See "Adding or Changing Transmission Gear Oil," on Page 118. Never put motor oil or automotive transmission oil in the transmission — they are too light. Always use heavier gear oil: SAE 140 or SAE 90 viscosity.

CAUTION:

Before inspecting the tiller, make sure that the controls are in neutral, the engine is off, and that the spark plug wire is disconnected.

1. REVERSE SPRING AND PLUNGER ASSEMBLY —

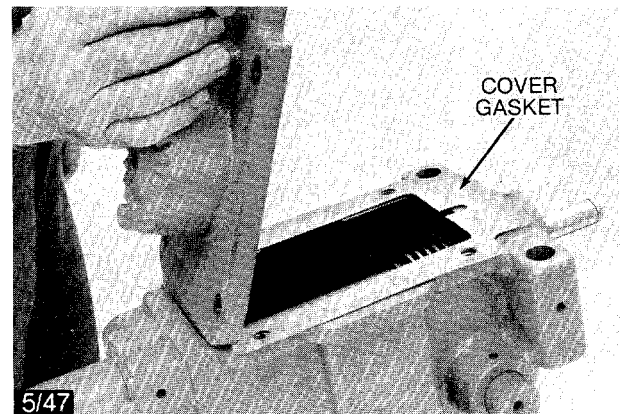
Any oil leak at this location (see Sketch 5/46) is nothing to be alarmed about. This area actually acts as an oil relief point to permit oil to escape if hot days and hard tilling cause the oil to heat up and build up some pressure inside the case. Also, oil will sometimes leak out of this location when the tiller is tipped forward on its engine cover while being serviced. Again, this is nothing to worry about — as long as the transmission is not overfilled with oil!



Don't be concerned about small amounts of oil seepage from bottom of plunger assembly.

2. TRANSMISSION COVER —

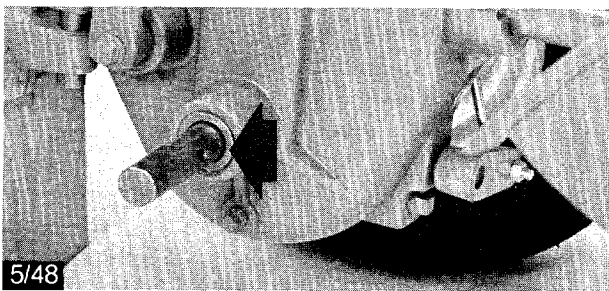
Beneath the cover there is a gasket (Part No. 1123) that seals the metal surfaces between the cover and the transmission case — Photo 5/47. A little seepage here is nothing to worry about and can usually be corrected by evenly snugging down the four screws that hold the cover in place (don't overtighten... it could damage the gasket!). However, if a leak is serious, or if the gasket leaks badly even when the cover is tightly bolted, then you should call our Customer Service Department for further advice.



Snug down four cover bolts if leakage occurs.

3. WHEEL SHAFT OIL SEALS —

The wheel shaft oil seals (Part No. 9601) prevent oil leaks between the wheel shaft and the transmission case — Photo 5/48. Like all oil seals, they may eventually wear out and become damaged and have to be replaced. A little oily wetness around the seal is nothing to be alarmed about. However, if the seal actually drips oil, then it should be replaced right away. (On a new tiller, the seal may leak until the tiller has been operating for 10 or 15 hours, during which time the seal will have an opportunity to “lap” in). See Section 6, Page 132 for wheel shaft oil seal replacement instructions.



Wheel removed to show location of wheel shaft oil seal.

4. END CAP —

To check the end cap for oil leaks, gently tilt the tiller forward on its engine cover — Photo 5/49. Now, run your finger around the edge of the cap where it joins the transmission housing. A little seepage or wetness is nothing to be concerned about, but if there's a heavy accumulation of oil, or if it drips oil while sitting overnight, then you should check the following:

A. Three, hex head, self-locking screws hold the end cap to the tiller housing and if loose, could cause an oil leak. You should remove the screws and apply a *non-hardening* gasket sealant (check with your local mechanic or auto store) to the threads and tighten them securely. If the screws come loose again after



Look for oil leak where end cap joins tiller housing.

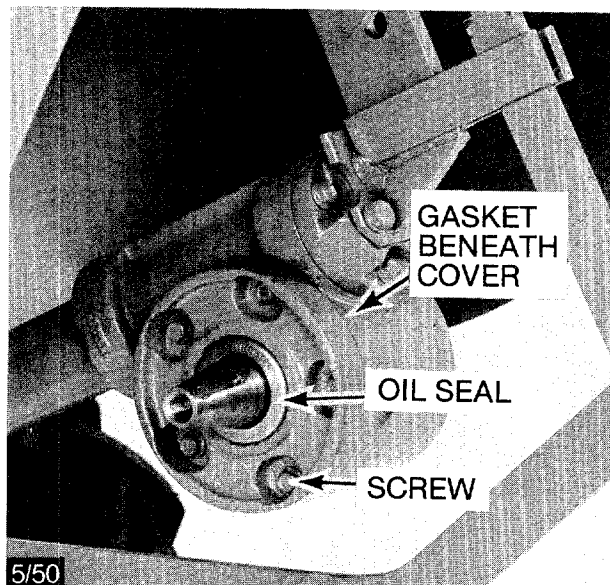
tilling in the garden, the problem may be a loose drive shaft that is pounding against the cap. Please see Page 160 in Section 6 for details on shimming a loose drive shaft.

B. If the cap and screws are tight, but you still have a leak, then the gasket (Part No. 1124) beneath the cap should be replaced. See Page 161 for details on replacing the gasket.

5. TILLER HOUSING COVER & TINE SHAFT —

To examine these areas, remove the bolo tine gangs as shown in Photo 5/24 on Page 109. On the left side of the housing (Photo 5/50) an oil leak could be from the tiller shaft oil seal (Part No. 9602), from loose or unsealed screws in the housing cover, from a leaky gasket (Part No. 1129) beneath the cover, or from a poor fitting cover. If you're not sure where the leak is coming from, wipe off the parts and run the tiller for a short while (without tines installed). If the seal is leaking, it can be replaced by following the directions on Page 135 of this manual. If the screws are loose, you should coat them with non-hardening gasket sealant and replace them securely. If oil continues to leak after tightening the screws, you may have to replace a worn gasket, or the cover itself (rarely). To replace a gasket or cover, please see Page 139 in Section 6.

On the right side of the housing any oil leak would have to be from the tiller shaft oil seal located there. Again, see Page 135 for seal replacement instructions.

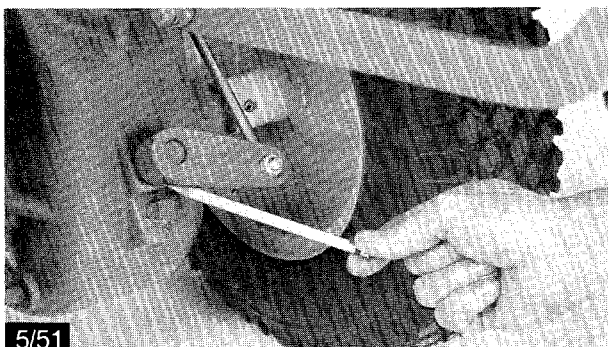


Oil leak at tiller housing may be due to loose screws, damaged seal, defective gasket, or poor-fitting cover.

Check for tiller oil leaks, cont'd.

6. ECCENTRIC LEVER —

While you still have the tiller tilted forward on its engine, this is a good time to check out the eccentric lever which is located at the back of the transmission case — Photo 5/51. Again, a little seepage here is nothing to be alarmed about. However, if oil is dripping out between the lever and the transmission case, then you should call or write us for instructions on correcting this problem. NOTE: Don't forget to squirt a little lubricating oil here occasionally to keep the lever working freely.

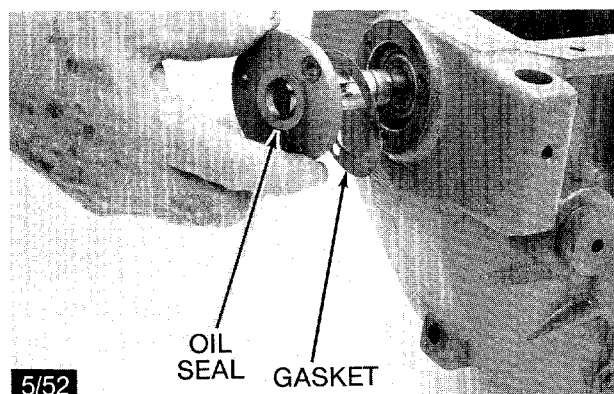


Look for oil leak between eccentric lever and case.

7. FRONT OIL SEAL ON TRANSMISSION —

At the very front of the transmission, behind the lower (transmission) drive pulley, there is an oil seal (Part No. 9600) that seals the area between the main drive shaft and the transmission housing — see Photo 5/52. This seal fits inside the front bearing cap and isn't visible unless you remove the engine and the lower pulley. If you suspect a leak in the front end of your transmission, check it out carefully before you go to a lot of trouble and work.

First, check to make sure the oil is not coming out of the hole for the reverse spring and plunger (Sketch 5/46) and running down the front when you tilt the tiller up. If you see an oil "path" from the plunger area to the



Remove engine and lower pulley to replace front oil seal and bearing cap gasket.

front of the transmission, then this may be the source of the leaking oil. Another possibility is that gear oil may be leaking past the transmission cover gasket (Photo 5/47) when you tilt the tiller forward for servicing or when turning it around. If you suspect this, feel around the front of the transmission cover (with engine off!) for excessive oil. If it is wet with oil there, don't worry about the oil seal in the front bearing cap.

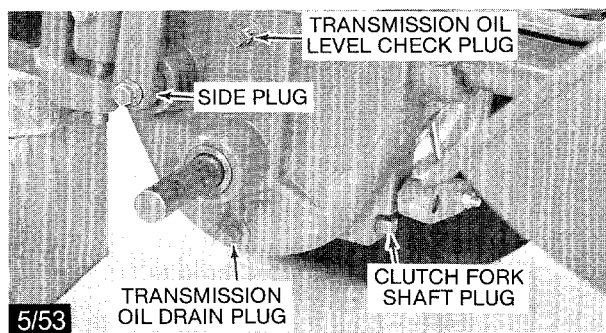
If these two areas are not the source of the leak then you will have to remove the engine and the lower pulley (see Page 162 for engine removal instructions). With the engine removed, check the oil seal located at the power take off (PTO) shaft of the engine (Photo 5/57). If this seal is leaking, the oil will also appear to be coming from the front of the transmission. If this is the case, have an authorized engine service dealer replace it for you.

Finally, inspect the front bearing cap on the transmission and the oil seal inside the cap. If oil is leaking from around the edge of the cap, you should remove the three cap screws and replace the gasket beneath the cap. At the same time, you should replace the oil seal, even if it isn't leaking (it may be damaged during cap removal). If the seal itself is leaking, then you should also replace the gasket at the same time as you replace the seal. See Page 145 for seal and gasket replacement instructions.

8. SIDE PLUG AND PIPE PLUGS —

Photo 5/53 shows the location of the Pinion Bearing Retaining Plug (side plug) and three pipe plugs. If an oil leak occurs at one of the side plugs (there's one on both sides of the tiller) it is usually a result of a damaged or misfitting "O" ring (Part No. 9604) on the plug. Write or call us for further instructions on making this simple repair.

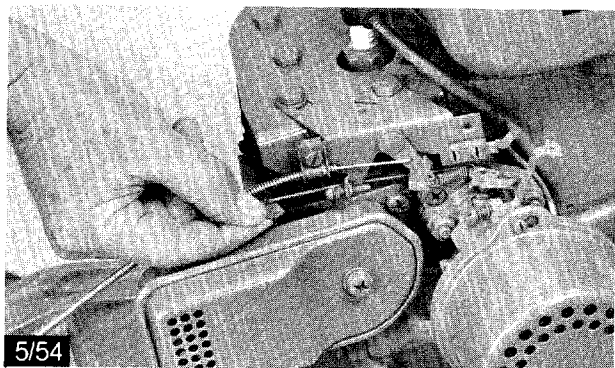
If a pipe plug is leaking, it usually just needs to be snugged down a bit. If that doesn't work, then try applying some *non-hardening* gasket sealant to the threads (if you remove either of the two lower plugs the gear oil will flow out — have a clean bucket or pan ready to catch it in).



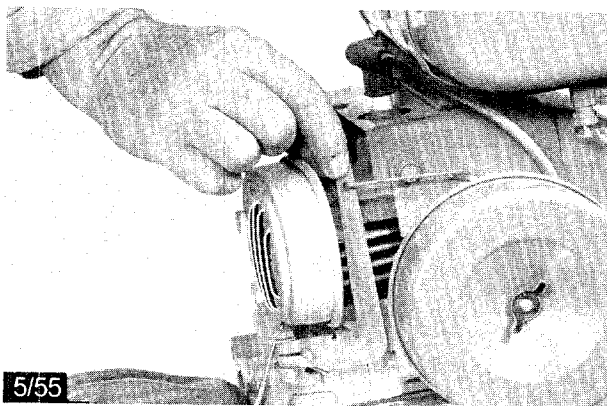
Location of "O" ring on pinion bearing (side) plug and three pipe plugs (wheel removed for clarity).

Check engine governor and carburetor linkage

At least every 20 operating hours you should look over all of the throttle and governor linkages to make sure that they are free to move easily — see Photos 5/54 and 5/55. Use a small brush to clean away any dirt



5/54
6 HP Tecumseh Engines — Keep governor and carburetor linkages clean.



5/55
7 HP Kohler Engine — Make sure governor and carburetor linkages are clean and unobstructed.

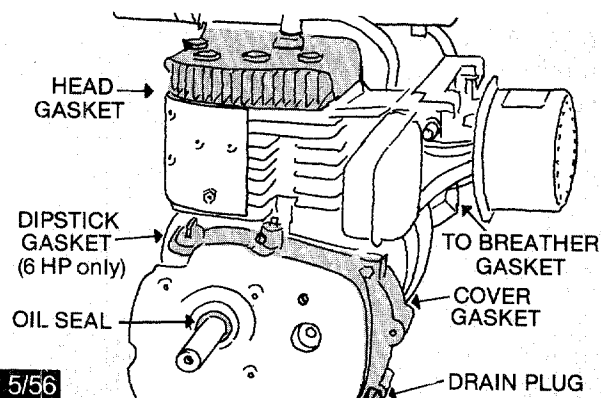
Check engine for external oil leaks

Make it a habit to examine the external surfaces of your engine at least every 20 hours for any evidence of an oil leak. An oil leak will usually attract dirt and be quite noticeable. Sketch 5/56 shows the most common areas where leaks might develop.

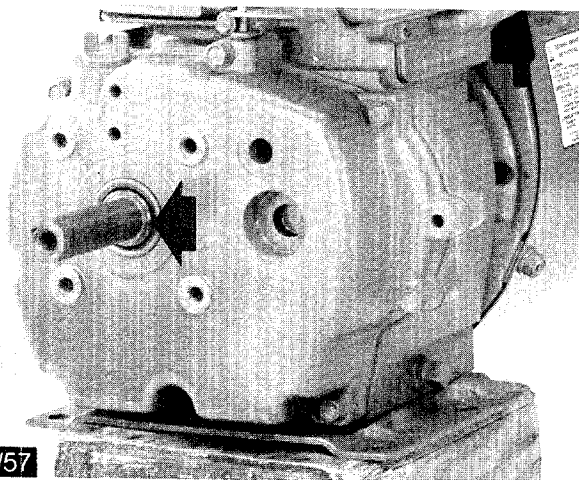
A small loss of oil shouldn't overly concern you, but a heavy leak should receive immediate attention. If you suspect an oil leak, wipe off the engine before trying to pinpoint the source of the leak. Usually, the leak will only occur while the engine is in operation.

Sometimes, a leak from a gasket location can be cured by merely tightening a screw that has loosened due to vibration (see "Checking Engine Screws, Bolts and Nuts" on Page 123). If the leak continues, however, then the gasket will probably have to be replaced. If the leak appears to be from an oil seal (Photo 5/57) then the engine will have to be removed in order to replace the seal (see "Engine Removal" instructions on Page 162). Seal and gasket replacements are best left up to Authorized Engine Service Dealers, even on engines that are out of warranty.

Of course, you must be very sure that you don't overfill the engine with too much oil. Doing so will result in oil dripping or blowing out of the engine through the air filter and muffler, often accompanied by smoke. When adding oil to your engine, carefully follow the filling instructions on Pages 14-16, in Section 1 of this manual. NOTE: Also see "6 HP Engine Crankcase Breather Service," in Section 6, Page 190, and "Engine Troubleshooting" in Section 7, Page 203.



5/56
Oil leaks can occur at drain plugs, and at head, side cover, oil pan (Kohler) and breather gaskets.



5/57
Arrow points to oil seal on 6 HP engine.

Checking or changing transmission gear oil

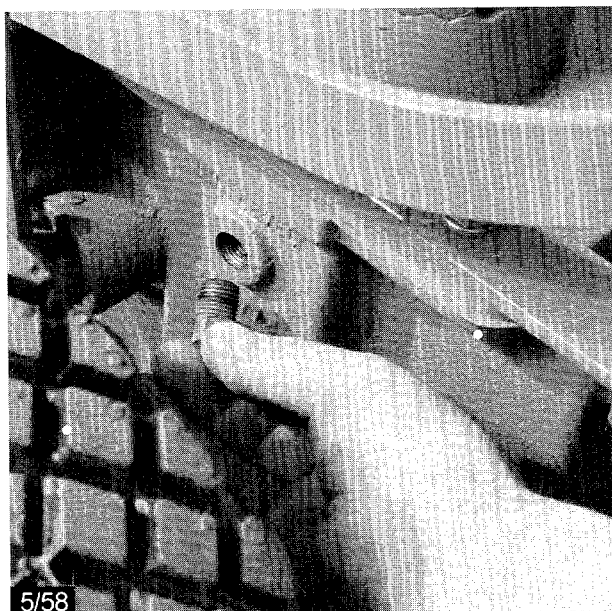
The transmission gear oil rarely needs to be changed. Do so only if you are going to be using the Dozer/Snow Blade in below freezing temperatures (where you should use SAE #90 gear oil), or if you know it has become contaminated with dirt, sand or metal particles.

If you have difficulty finding gear oil at a well-stocked automotive service station or supply store, take a *clean* gallon container to a farm supply store, or a tractor, truck or heavy equipment sales and service garage.

CHECKING GEAR OIL LEVEL

At least every 30 hours of operation you should check the gear oil level. Serious damage can be caused to your transmission if it is allowed to run for even a short time without an adequate supply of gear oil. You can check the oil level easily as follows:

1. Begin with the tiller on level ground.
2. Pull the Depth Regulator Lever back and then up until the tines are on the ground.
3. Using a 3/8" wrench, remove the oil level check plug from the left side of the transmission case — see Photo 5/58. Have a cloth ready to wipe up any oil spillage. If the gear oil level is correct, oil should start to flow out of the hole when the plug is removed. If it does, securely replace the plug.
4. If the oil level is low, add fresh oil through the oil filler hole until it just starts to flow out of the oil level hole. The procedure for filling the transmission with gear oil is described and illustrated in Section 1, Page 12.



5/58

To check gear oil level, remove plug located three inches above left side wheel shaft.

They'll sell you the 6-1/2 pints required.

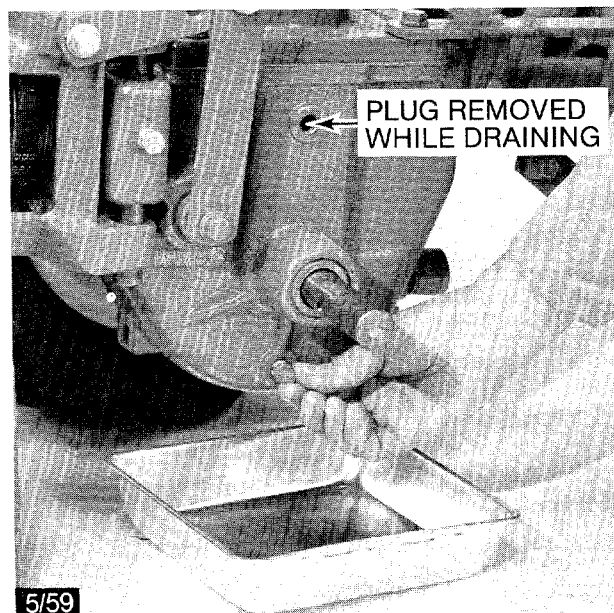
NOTE: The #90 weight gear oil can be used year-round.

IMPORTANT — Never put motor oil or automotive transmission oil in the transmission — they are too light. Always use heavier gear oil (SAE 140 or SAE 90 viscosity).

DRAINING GEAR OIL

1. Place a shallow pan beneath the oil drain plug — see Photo 5/59. If you plan on reusing the gear oil, make sure the pan is clean. You will be draining out about 3-1/2 quarts of oil. NOTE: In Photo 5/59 we removed the wheel for clarity. You do not have to remove the wheel to drain the oil.
2. Using a 3/8" wrench, remove the oil level check plug (Photo 5/58). This will help vent the transmission to speed up the draining time. Then, remove the oil drain plug (3/8" wrench) as shown in Photo 5/59. It will take a while for the oil to drain out, so be patient. After about 2 quarts have drained, gently tilt the tiller forward on its blower housing so the oil will also drain out of the transmission tube and tiller housing area.
3. When the old oil has drained out, clean the two plugs and replace them securely. It's a good idea to apply some *non-hardening* gasket sealant to the threads of the drain plug before replacing it. If the old oil is clean, you should cover the container until you are ready to use it.

IMPORTANT: Be sure to refill the transmission case before operating your tiller again!



5/59

Remove lower plug and drain gear oil into clean pan.

Inspecting the tines

To enjoy maximum use and performance from your tiller, your tines must be in good condition. At least every 30 operating hours you should check your tines for damage or wear, using the following information as a guide. Please note that tine wear greatly depends on the use you give your tiller and the soil conditions. Sandy, stony soil will cause a great deal of tine wear, while some clay soils will have hardly any effect on tines after many hours of use.

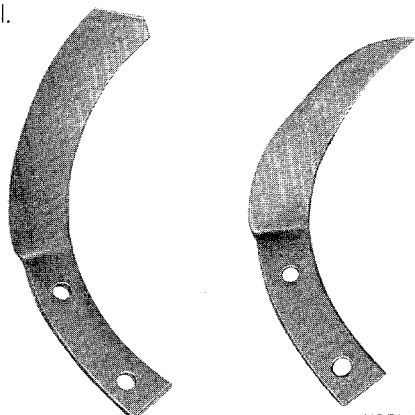
CHECKING BOLO TINES

Your Bolo Tines will wear with use, and a badly worn tine will dig shallower and scoop a lot less dirt than a new one. Most important, worn tines cannot chop and shred organic matter as effectively nor bury it as deeply as good ones can. As a result, your tiller can't give you the same fast and thorough tilling results it did when brand new.

As tines wear, they become shorter, narrower, and more pointed — see Photo 5/60. When this happens, the depth at which they till and the amount of earth turned are greatly reduced. Worn tines may dig only 3" to 5" deep even though you adjust the depth regulator to the maximum depth. In comparison, new bolos will dig a full 6" to 8" deep! Loss of tilling depth is a sure sign that your tines need replacing.

Also, as tines wear shorter, they will end up leaving an increasingly wider gap in the middle of the tilled row. A wider gap makes for needless extra work when you overlap your rows during tilling. A new set of Bolo Tines will usually have a 3" gap between the tips of the innermost tines. Gradually this gap will widen through use and wear. It's time to replace your tines when this gap widens to 5" or more — Photo 5/61.

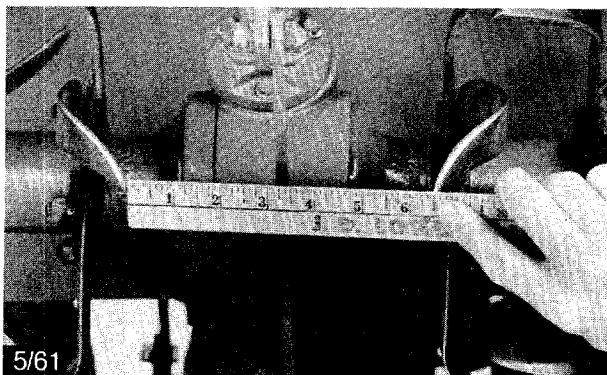
Bolo Tines can be replaced individually or in complete "gangs" of four tines each. When ordering tines, carefully note the tine arrangement shown in your *Master Parts Catalog*. Easy, do-it-yourself tine replacement instructions can be found in Section 6, Page 146, of this manual.



5/60 NEW TINE

WORN TINE

A worn Bolo Tine will merely scratch the soil surface.



5/61

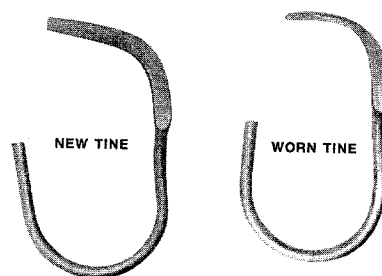
Replace your worn-down Bolo Tines when the gap widens to 5-inches or more.

CULTIVATING TINES AND POINTED PICK TINES

When the knife-like edge of a Cultivating Tine becomes worn, it will lose its capacity to scoop up and turn over the earth. If a tine becomes as worn as the one shown in Photo 5/62, it should be replaced. Cultivating Tine removal and replacement instructions begin on Page 153 of this manual.

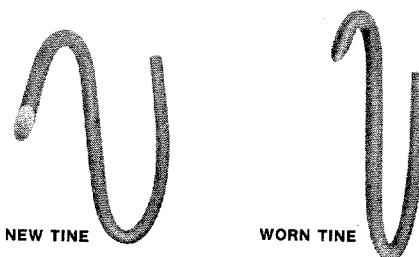
When Pointed Pick Tines become worn, their heads will wear to a point — see Photo 5/63. They will also wear to a shorter length. A worn-down pick tine will lose a good deal of its digging capacity and tilling depth. See Page 157 for removal and replacement instructions.

IMPORTANT: Cultivating Tines and Pick Tines are no longer available in complete sets. However, individual tines, studs, holders and hardware may still be available on a limited basis.



5/62

Replace a Cultivating Tine if it's worn this much.



5/63

NEW TINE

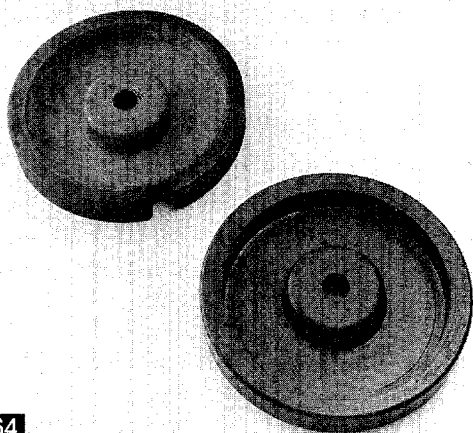
WORN TINE

Don't let your Pointed Pick Tines wear as short as the one at right.

Checking the reverse disc and reverse operation

REVERSE DISC INSPECTION

Your reverse disc is made of a steel disc with a special long-lasting rubber compound bonded to the rim. At least every 30 operating hours you should make a visual inspection of the disc. If a large chunk of rubber is missing (see Photo 5/64), then the disc should be replaced right away. Small nicks and gouges usually are nothing to worry about, but you should keep an eye on them to be sure they don't get worse. If your disc ever needs replacing, see the easy, do-it-yourself instructions on Page 143 of this manual.

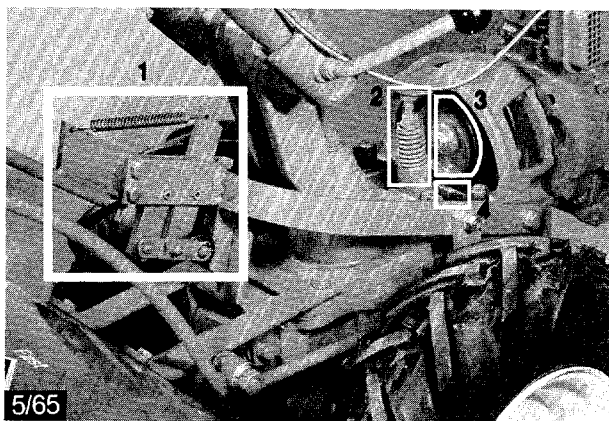


5/64

If a chunk of rubber ever breaks away from your reverse disc, replace the disc immediately.

TESTING REVERSE OPERATION

To operate your tiller in reverse, you know that you must lift and hold the Forward/Reverse Lever in an upward position. When you do, this brings into play primarily four components that control the tiller's reverse action. As shown in Photo 5/65, they are (1) the Forward/Reverse assembly, (2) the Reverse Spring and Plunger assembly, (3) the Reverse Disc, and (4) the Transmission Drive Pulley.

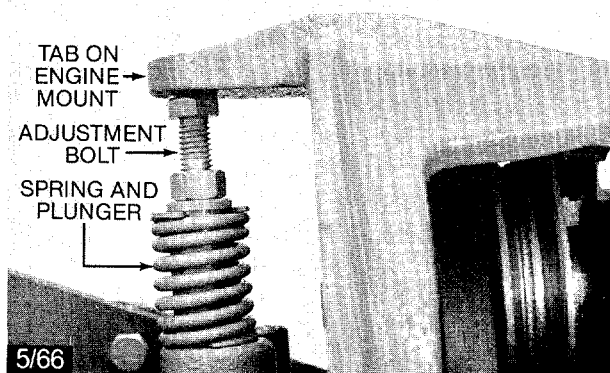


5/65

All of these parts affect reverse operation.

You'll note that whenever you shift the Forward/Reverse Lever up into Reverse, the engine and its mount comes down to press on the Reverse Adjustment Bolt — see Photo 5/66. This action compresses the Reverse Spring and Plunger Assembly, requiring you to hold the lever up in Reverse. When you let go of the lever, the spring automatically pushes the lever back into Neutral. The Spring and Plunger Assembly is designed to prevent the reverse disc from making contact with the transmission pulley until you decide to shift into Reverse. The lowering engine mount compresses the spring enough to "pop" the lever back into Neutral when it is released. When the lever is in Neutral, the tab on the engine mount should be resting squarely on top of the plunger bolt, or close enough to it so that you can hardly see daylight between them — see Photo 5/66.

The plunger bolt can be adjusted to various heights to correct a number of reverse operating problems, as explained below.



5/66

Engine mount tab rests on plunger bolt.

Watch action of reverse disc and pulley

1. Shift the Forward/Reverse Lever into Neutral and disconnect the spark plug wire. Now, pull the engine starter rope, briefly (Photo 5/67). As you do, the reverse disc should turn, but the lower pulley should not. When the Forward/Reverse Lever is in Neutral position, the Rubber Reverse Disc should be located above the flat surface of the transmission pulley (see Photo 5/68) — thus preventing the reverse disc from driving the pulley. If the disc is closer than $\frac{3}{16}$ ", or if the disc DOES turn the lower pulley when the lever is in Neutral, then the plunger bolt should be adjusted upward, as explained below ("How To Adjust Your Reverse Action"). This adjustment will also correct the problem of a tiller that goes into Reverse by itself.

2. Now, while the spark plug wire is still disconnected, reach under the handlebar and pull the Forward/Reverse Lever up into Reverse — Photo 5/69. As you do, the reverse disc should be lowered until it comes into

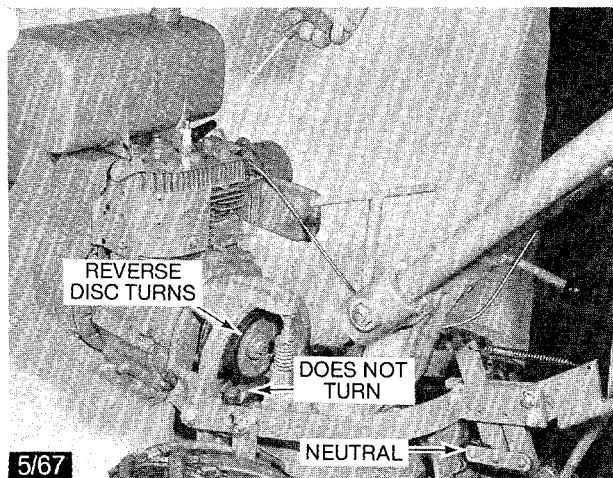
contact with the lower pulley. Now, while still holding the lever up in reverse, use your other hand to briefly pull the starter rope. This time, the reverse disc and the lower pulley should *both turn*. If the reverse disc does not turn the lower pulley, or if you find it takes too much pressure to hold the lever up in reverse, then turn the plunger bolt downward. When adjusted correctly, the Forward/Reverse Lever should “pop” out of Reverse when the lever is released, but it should not require exceptional strength to hold it in Reverse.

Please remember that whenever your tiller is in Reverse the lever should return to Neutral when you let go! If it doesn't, raise the adjustment bolt until it does return to Neutral.

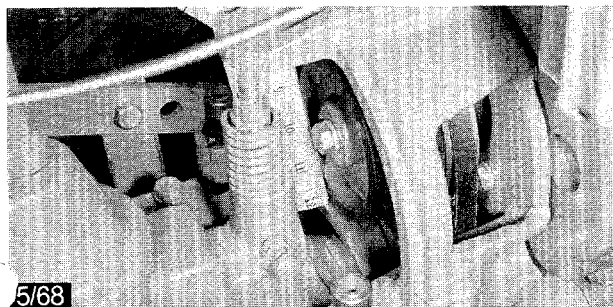
If adjusting the plunger bolt does not result in a properly functioning Reverse, please check these additional points:

1. Make sure that the linkages for the Forward/Reverse Lever are lubricated with oil.
2. Make sure that the engine mount bars and the belt adjustment block are greased.

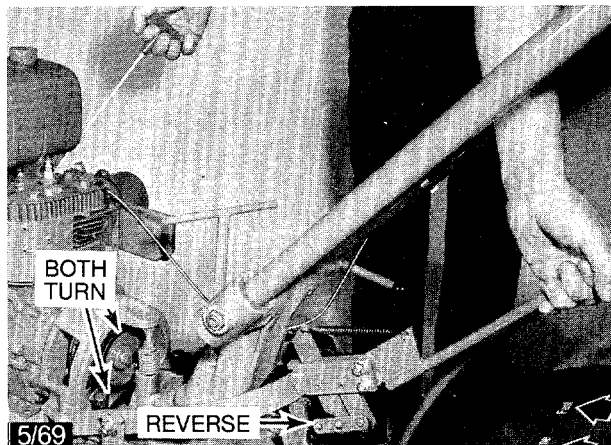
If these checks have not determined a cause for your improper reverse action, please call or write our Customer Service Department for further advice.



With Forward/Reverse Lever in Neutral, reverse disc should not contact lower pulley.



In Neutral, reverse disc should be at least 3/16" above lower pulley.



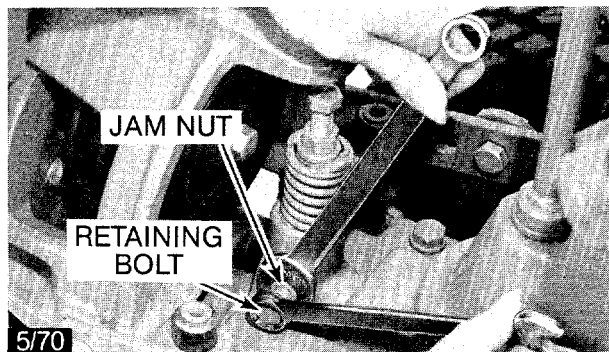
With the lever in Reverse, lower pulley should be turned by reverse disc.

How to adjust your reverse action

To make an adjustment (either up or down) to the neutral plunger bolt:

1. With the *spark plug wire removed from the spark plug*, place the Forward/Reverse Lever in Forward position.
2. While standing on the left side of the tiller, place a 1/2" wrench on the plunger retaining bolt and another 1/2" wrench on the jam nut next to it — see Photo 5/70. Now, hold the bolt steady while you loosen the jam nut by turning it counterclockwise. Unthread the jam nut until it touches the head of the retaining bolt.
3. Using your 1/2" wrench, turn the retaining bolt (shown in Photo 5/70) to the right, until it is tight against the plunger inside the spring. It must be good and tight to prevent the plunger from turning when you go to the next step, but be careful not to overtighten and break the bolt.
4. Using two 9/16" wrenches, loosen the self-locking jam nut on the plunger adjustment bolt — see Photo 5/71. Unthread the jam nut 3 or 4 turns upward.

(cont'd.)



Use two 1/2" wrenches, one on jam nut and one on plunger retaining bolt.

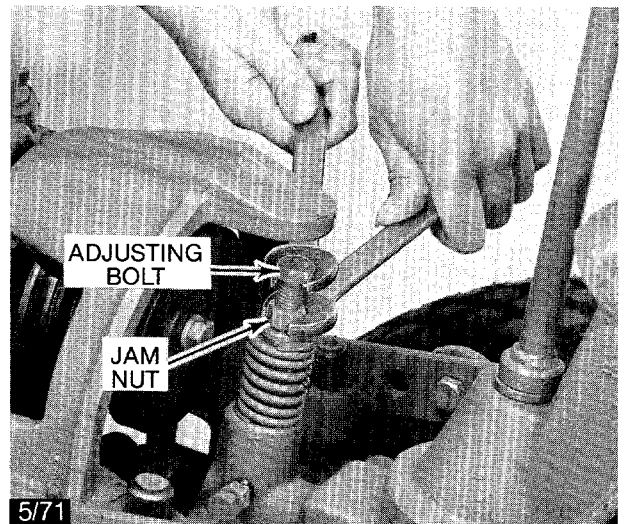
How to adjust your reverse action, cont'd.

5. Return the Forward/Reverse Lever to Neutral. In Neutral, the tab on the motor mount should be resting on top of the plunger bolt (see Photo 5/66), and the Rubber Reverse Disc should be at least $\frac{3}{16}$ " above the flat surface of the transmission drive pulley, as shown in Photo 5/68. If the disc is closer than that, thread the adjustment bolt up. To move the bolt upward, turn the bolt counterclockwise (while standing on the left side of tiller).

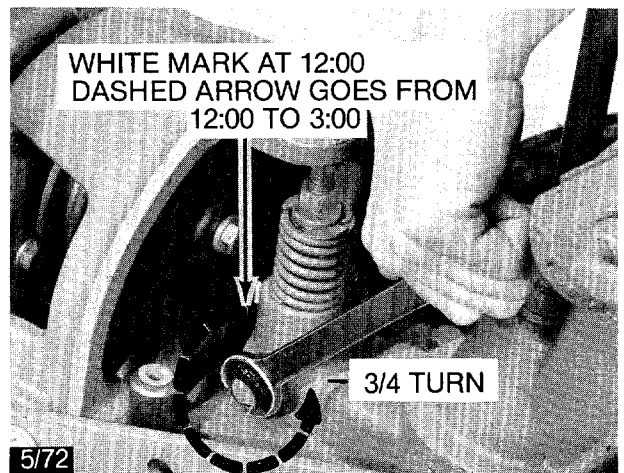
6. Check to make sure the Reverse Disc is the correct height and then use two $\frac{9}{16}$ " wrenches, one to hold the bolt steady in position, while you securely tighten the locking jam nut with the second wrench — see Photo 5/71.

7. Place a chalk or pencil mark at the top edge of plunger retaining bolt and use your $\frac{1}{2}$ " wrench to back the bolt off a full $\frac{3}{4}$ turn to the left — see Photo 5/72. *Do not exceed this $\frac{3}{4}$ turn, as you could cause the bolt to disengage itself with the locking groove in the side of the plunger.* Now, hold the bolt steady with one wrench, while you use your second wrench to tighten the jam nut securely against the side of the plunger housing.

8. Once you have repositioned the Rubber Reverse Disc at least $\frac{3}{16}$ " above the lower pulley, test the action of Reverse as explained in "Watch Action Of Reverse Disc and Pulley" (Photos 5/67 and 5/69), on Page 120.



Loosen the jam nut on the plunger adjustment bolt before raising or lowering bolt.



Back off plunger retaining bolt a $\frac{3}{4}$ turn, then tighten jam nut securely against cast iron housing.

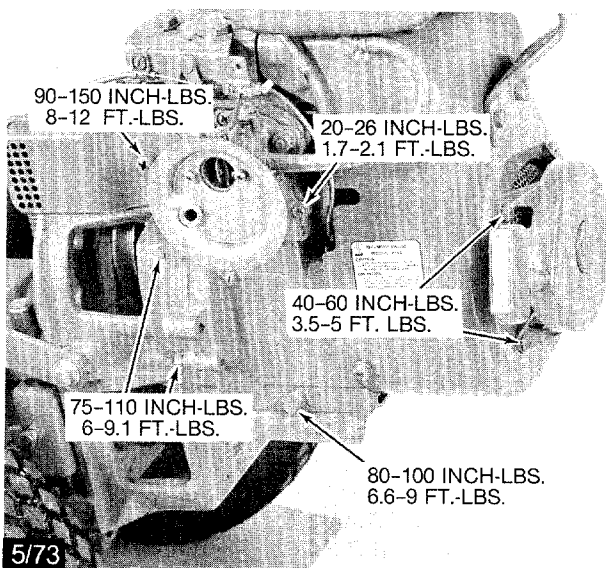
IMPORTANT

Please remember that whenever your tiller is in operation in Reverse, the Forward/Reverse Lever should return to Neutral when you let go! If it doesn't, raise the adjustment bolt until it does return to Neutral. **CAUTION:** When testing your reverse action with the engine running, make sure that you do so only with the Wheel Speed Shift Lever in SLOW position, and with the engine throttle set to run at a Slow Speed.

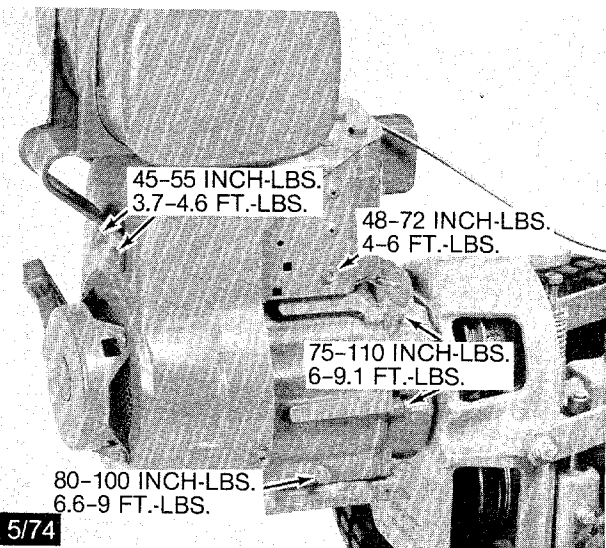
Check engine screws, bolts and nuts

At each 40 hours of operation, you should visually check for any loose screws and bolts on your engine. Some bolts and nuts should be tightened to specific torque tolerances, as indicated in illustrations 5/73 through 5/81. If a tolerance for a bolt or screw is not given in the illustrations, then you should tighten them until snug.

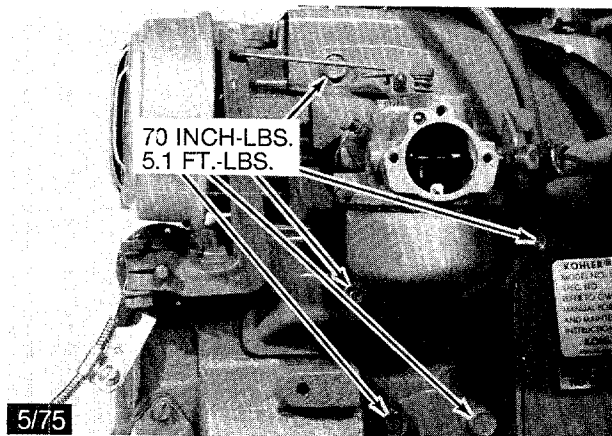
In order to apply the correct torque to those fasteners specified, you will need to use a torque wrench (shown in Photos 5/79 and 5/80) that fits your sockets and extensions. If you don't already have a torque wrench around your home, perhaps you can borrow one from a friend or neighbor.



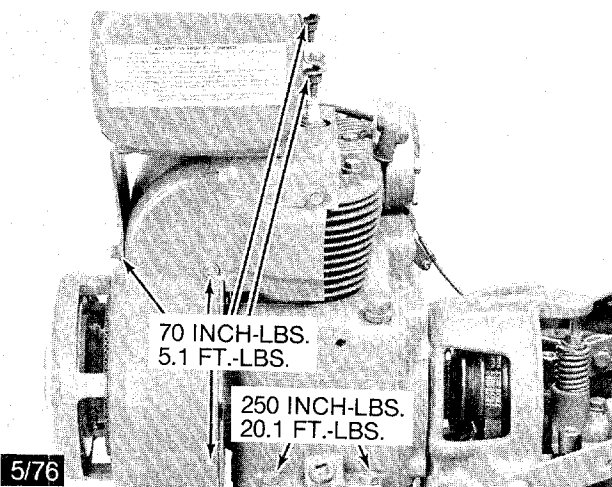
6 HP Tecumseh Engine — Recommended tightening torque for fasteners on right side of engine. Air cleaner removed for clarity.



6 HP Tecumseh Engine — Recommended tightening torque for fasteners on front and left side.



7 HP Kohler Engine — Recommended tightening torque for fasteners on right side of engine. Air cleaner removed for clarity.



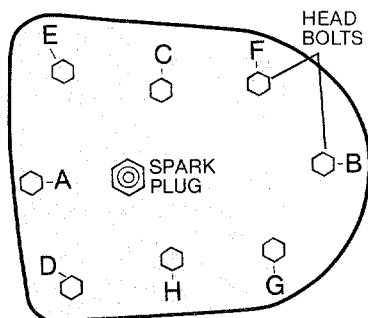
7 HP Kohler Engine — Recommended tightening torque for fasteners on left side.

6 HP TECUMSEH HEAD BOLT TIGHTENING

If the engine head bolts need tightening (for example, if the head has been removed or if a new gasket is installed) carefully follow the sequence shown in Sketch 5/77 and Photo 5/78. (At least once a year you should check for proper tightness of the two head bolts located nearest to the muffler.) First, thread in the bolts labeled A, B, C, D, E, and F. Now tighten and torque them (with a torque wrench, as shown in Photo 5/79) to 160-200 inch-lbs. (13-16 foot-lbs.) in the same sequence. Make sure D (also shown in Photo 5/78) is properly tightened down because it's covered after you install the fuel tank bracket. Install fuel tank bracket with head bolts G and H to the same torque specifications. Also recheck torque of bolts A, B, C, H, F, E and G. Finally, as shown in Photo 5/78, put the two small bolts in the holes on the bottom of the tank bracket.

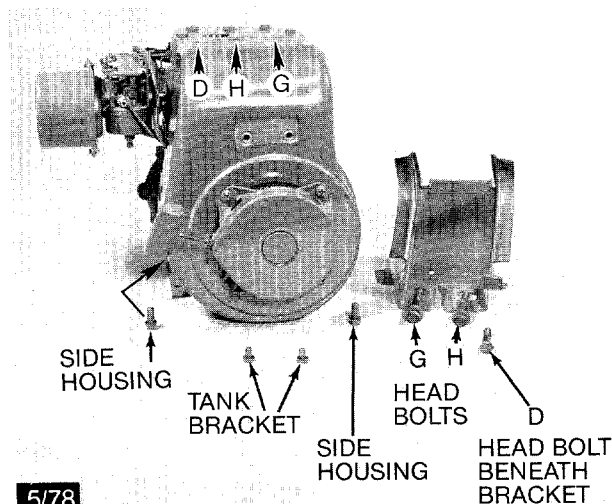
(cont'd.)

Check engine screws, bolts and nuts, cont'd.



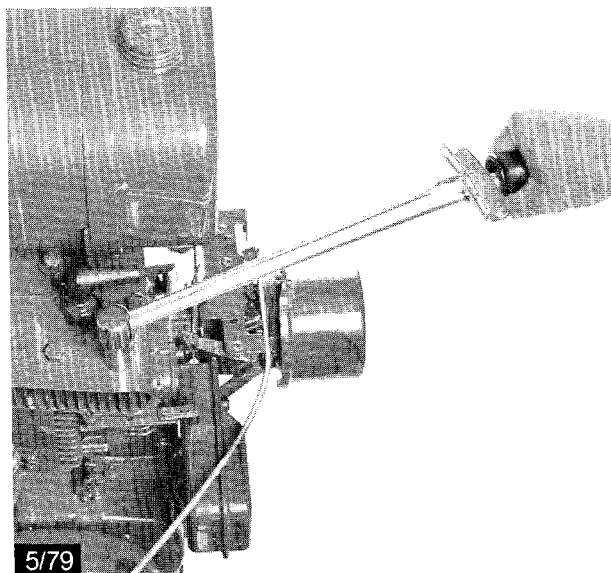
5/77

6 HP Tecumseh engine head bolt tightening sequence.



5/78

Two head bolts (G & H in photo) are used to fasten down the fuel tank bracket. Therefore, head bolt D has to be tightened before the bracket is installed. See Sketch 5/77 for tightening sequence.



5/79

Use torque wrench to tighten head bolts — 6 HP Tecumseh engine.

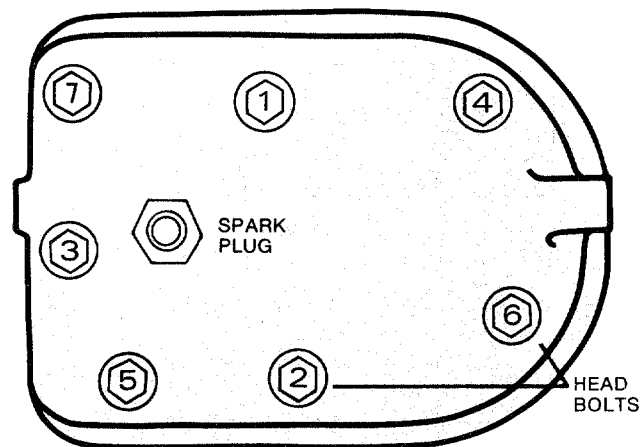
7 HP KOHLER HEAD BOLT TIGHTENING

To tighten the head bolts of the 7 HP Kohler engine (Photo 5/80), simply follow the sequence shown in Sketch 5/81. First, partially tighten the bolts as numbered 1 through 7. Then, go back over the same sequence, tightening them to 180-240 inch-lbs. (15-20 foot-lbs.). NOTE: At least once a year you should check for proper tightness of the two head bolts located nearest to the muffler.



5/80

Using torque wrench to tighten head bolts on 7 HP Kohler engine.



5/81

7 HP Kohler engine head bolt tightening sequence.

Servicing the spark plug

The spark plug should be inspected and cleaned or replaced every 50 hours of use, or once a year. Before removing the spark plug, clean the area around the plug to prevent dirt from falling into the engine. To remove the plug (make sure it isn't hot!), slip off the rubber boot that covers the plug. Then, use a plug wrench (available at most hardware or automotive stores) or a spark plug socket and carefully unscrew the plug — Photo 5/82.

Carefully note the condition of the plug when you remove it. If your engine has been operating poorly it could be due to a plug that is in poor condition or that is gapped incorrectly ("gapping" is making an adjustment of the distance between the two electrodes at the bottom of the plug). If a plug shows only moderate wear of the electrodes and has a light coating of gray or tan, it can probably be cleaned and reused (see the engine manufacturer's Owner's Guide for cleaning instructions). However, if you have used the plug for a full season, or if it is badly fouled or in poor condition — then we recommend you replace the plug with a new one. *This will assure you of best results.*

INSPECTING THE SPARK PLUG

1. Use a round wire feeler gauge to check the gap between the electrodes (do this with brand new plugs, too!) — see Photo 5/83. A gap that is too narrow can cause the engine to idle roughly; too wide a gap can cause the engine to misfire. You can bend the curved electrode to the gauge setting you want. When adjusted correctly, the gauge should just slide between the two electrodes with a slight feeling of resistance.
2. A plug showing a light coating of gray or tan deposits and slight electrode wear indicates normal

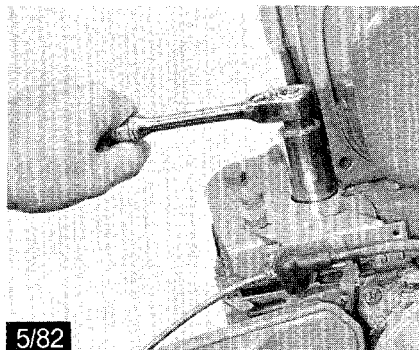
engine operation.

3. A white, blistered coating on the electrodes — or burned electrodes — indicates engine overheating. Check for clogged cooling fins and for correct fuel-air mixture (carburetor may be set too lean).
4. A black, powdery coating indicates carbon fouling and can be caused by an overrich fuel-air mixture, a clogged air cleaner, use of high-test gasoline or excessive idling.
5. If a plug has a wet, oil deposit, it may indicate a clogged air filter, too high an idle setting, or worn piston rings (worn rings will usually be indicated by excessive oil consumption and a smoking muffler).
6. Red, yellow, white or brown coatings are caused by fuel additives. If coating is thick, it can cause engine misfire. Make sure you use recommended grade of gasoline and that muffler is in good condition.

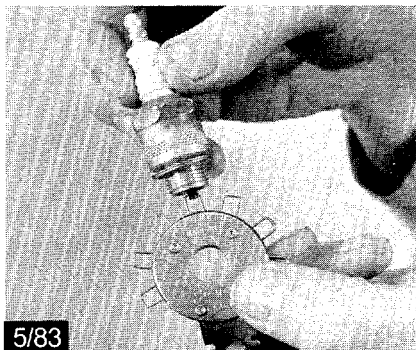
REPLACING THE SPARK PLUG

The table below shows the recommended brand and model spark plug to use in your particular engine. A good quality, equivalent spark plug can be substituted, as long as it matches the plug supplied with your new engine.

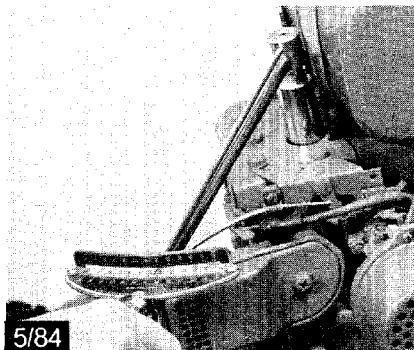
When replacing the plug, apply a light coating of graphite grease on the threads and tighten it by hand as far as it will go. Then, use a torque wrench to tighten it securely — see Photo 5/84. If you don't have a torque wrench, then tighten the plug firmly by hand. Then, use your plug wrench to gently give it an extra quarter turn. *Don't overtighten!* Doing so could strip the threads in the cylinder head, requiring a costly repair. Replace the rubber boot on the plug, making sure it fits snugly.



5/82 Make sure engine is cool before removing plug.



5/83 Use wire feeler gauge to check electrode gap.



5/84 Using a torque wrench to tighten spark plug.

SPARK PLUG GUIDE

ENGINE	BRAND & MODEL	GAP SETTING	TORQUE SETTING
HP Briggs & Stratton	Champion J8	.030"	15 ft. lb./180 in. lb.
7 HP Kohler	Champion J8	.025"	22 ft. lb./260 in. lb.
6 HP Tecumseh	Champion J8	.030"	15 ft. lb./180 in. lb.

Wintertime use and off-season storage

Here are our special recommendations for winterizing and storing your tiller during the off-season, and for operating it during cold weather (to remove snow with the dozer blade, for example).

Wintertime use

If you plan on using the tiller during the winter for snowplowing or other work — where the temperature gets below 32°F — you should drain your #30 weight motor oil and switch to a lighter weight oil. See Photo 5/85. Consult your engine manual for the specific weight motor oil recommended by the engine manufacturer at lower temperatures, and Page 103 in this manual for engine oil changing instructions. You should also switch from #140 weight to #90 weight gear oil in the tiller transmission if you will be operating your tiller in below freezing temperatures (Photo 5/86). The #90 weight gear oil can be used in both summer or winter. See Page 118 for detailed transmission oil changing instructions.

In cold weather, always take 5 or 10 minutes to warm the engine up (do not run the engine in an enclosed space). This will warm up the oil so that it flows adequately for proper lubrication to the engine parts. Also, as you warm up the engine, leave the Wheel Speed Shift Lever in Free Wheeling position and put the Forward/Reverse Lever in Forward position for 5 minutes or more. This will rotate the tine shaft and warm up the tiller transmission oil. *Of course, before doing this*, make sure that the tines have been removed and that the Depth Regulator Lever is pushed all the way down to the travel setting (top notch on lever engaged).



If you plan to use your tiller in temperatures below 32°F., it is best to change to a lighter weight oil (see your engine manual for their recommendations).



If you'll be snowplowing in below freezing temperatures, switch to #90 weight gear oil in the transmission.

FOR SAFETY'S SAKE

Always remove the tines from your tiller before snowplowing. Revolving tines are dangerous on slippery sidewalks or driveways.

If the wheels ever get frozen in ice, don't try to drive the tiller out under its own power — melt the ice around the wheels first by using hot water.

Off-season storage

If you are putting your tiller "to bed for the winter," or for any period of a month or more, here are some simple steps you should take to protect your tiller and engine from deterioration. These steps will also ease restoring your tiller to service in the spring. NOTE: For more information regarding your engine, you can also refer to the engine manufacturer's Owner's Guide that came with your tiller.

PROTECTING THE ENGINE...

1. Your Gasoline

The best way to prevent the gasoline in your tank from getting stale and gummy during storage is to add a gasoline stabilizer product call STABIL® to a full tank of gasoline. See Photo 5/87.

An eight ounce can of STABIL will cost only a few dollars and can usually be obtained from your local small engine, lawnmower, or snowmobile dealer, and at a nearby boat marina.

Just add the amount recommended on the label, then run the engine for five minutes so that the stabilized gas works its way into the carburetor. To help you determine the amount of stabilizer to use, both the 6 HP Tecumseh and 7 HP Kohler engines have 1-1/2

allons (6 qts.) gas tank capacities. If you have a Kohler engine, be sure to leave the fuel valve open during the winter so that fresh fuel can come down from the fuel tank as fuel evaporates in the carburetor.

Check the fuel tank occasionally during storage to make sure you haven't lost any fuel due to evaporation. If the tank is below full, top it off with fresh gasoline (to within 1/2 inch of top). CAUTION: Do not store tiller with gasoline in the tank inside a building where fumes may reach an open flame or spark!

In the spring, you just start your engine up and consume the STABIL®, too.

If you have difficulty finding STABIL®, then you should follow the storage instructions for your engine as explained in the engine manufacturer's Owner's Guide that came with your tiller.



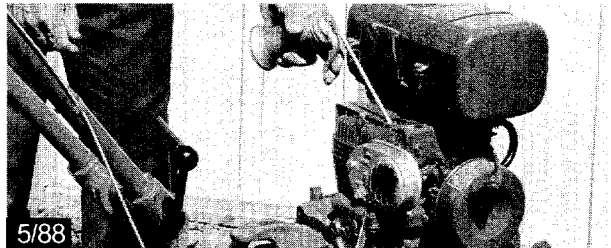
To prevent gum and varnish from fouling your fuel system during storage, fill fuel tank with recommended mix of gasoline and Stabil®.

2. Your Engine Oil

We recommend that you change your engine oil in the spring (before you use the tiller). Waiting until then will remove any moisture which may collect in the crankcase over the winter. See Page 103 in this manual for engine oil changing instructions.

3. Your Engine's Cylinder

To protect the piston and cylinder wall of your engine from corrosion during off-season storage, remove the spark plug and squirt about a tablespoon of clean engine oil into the spark plug hole (see Photo 5/88).



Squirt or pour motor oil into spark plug hole.

Then, crank the engine slowly by pulling the starter rope once or twice to distribute the oil evenly. Clean the spark plug with a soft cloth and replace it, but don't reconnect the spark plug wire until you're ready to use your tiller after storage. See Page 125 for spark plug removal and replacement instructions.

Now, slowly pull the starter until you feel compression; then let it rewind. At this point, the valves are seated and rust can't form in the cylinder or the valve seats.

4. Your Air Cleaner

Before storing your tiller away, make sure that you clean the air cleaner (Photo 5/89). Consult Page 104 in this manual for complete details on servicing your particular air cleaner.



Each make of engine has a different type of air cleaner. See Page 104 for exact instructions.

PROTECTING THE TILLER...

1. Electric Starting Models

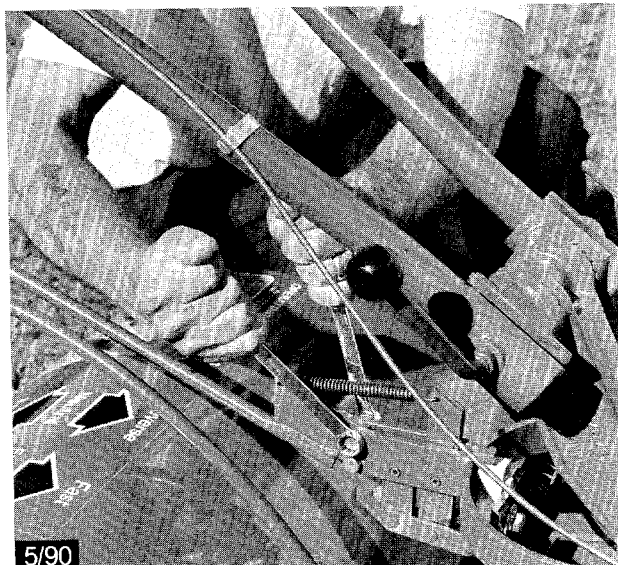
Since a weak battery may freeze and rupture during cold weather, be sure yours is charged and in good condition. If it won't be used for any length of time, it should be removed from the tiller and stored in a cool, dry place. For detailed instructions on battery care and maintenance, please see Page 112.

(cont'd.)

Protecting the tiller, cont'd.

2. Lubricate Moving Parts

Now is a good time to clean your tiller thoroughly and lubricate all moving parts (see Photo 5/90). After cleaning, use an oil rag to spread a light film of oil over any areas that could corrode.

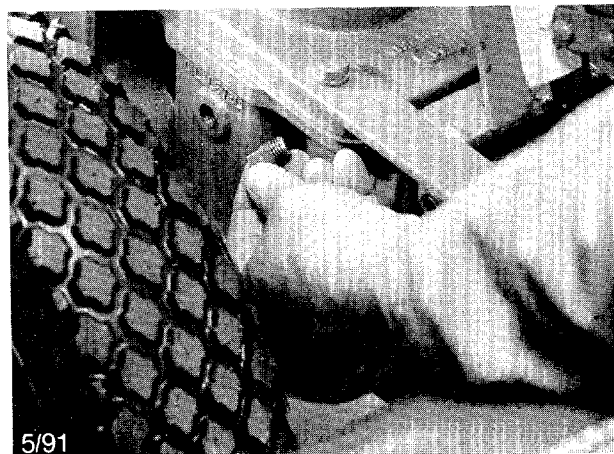


Clean tiller thoroughly. Lubricate moving parts and tighten loose nuts and bolts.

3. Check Transmission Oil

The tiller transmission oil level should be checked and filled if necessary (see Page 118). Make sure it's up to the level of the check plug on the left side of the

transmission (Photo 5/91) and no higher. If you do need to add oil, it may be due to a leak around a seal or cover. Double-check these areas carefully (see Page 114) and fix it now before there's any serious damage from a major oil loss.



Make sure the gear oil level in the transmission is up to the level of the oil plug (located 3-inches above the left wheel shaft).

4. General Inspection

Inspect all moving parts, tightening any loose nuts and bolts (see Page 107 and Page 123). Check the drive belt (Page 105), the reverse disc (Page 120) and the tines (Page 119). If you find any wear or damage remember that the off-season is the best possible time to order replacement parts and to do your repairs.

GETTING YOUR TILLER READY FOR SPRING

If you faithfully followed the off-season storage tips above, then light maintenance should be all that is required to restore your tiller to service.

1. Change Engine Oil.

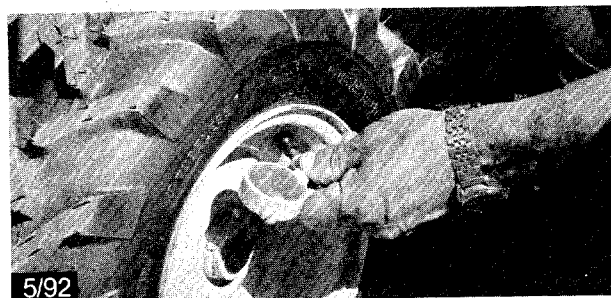
Unless you changed the engine oil after the last use of the tiller, it should be drained and refilled to the "Full" mark on the dipstick with fresh, #30 SE motor oil. See oil changing instructions on Page 103. Also, make sure that the air cleaner is clean and that the spark plug is new, or in good condition.

2. Replace Battery.

If you have an electric-start tiller, be sure the battery connections are tight and the negative (—) terminal is connected to ground (see replacement instructions on Page 113).

3. Check Tire Pressures.

We recommend that you keep 10–20 PSI (pounds per square inch) of air pressure in each tire. Keep both tire pressures nearly equal so that you can till in a straight line. When refilling tires, DO NOT EXCEED 20 PSI. Take extra care during the process of filling a tire with air to avoid High Inflation pressures which can cause serious personal injury.



Check air pressure in tires. Each should be inflated at 10 to 20 P.S.I.

DO-IT-YOURSELF REPAIRS & ADJUSTMENTS



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SECTION 6: **Do-It-Yourself Repairs and Adjustments**

As was mentioned at the beginning of Section 5, most service and repair work will be kept to a minimum if you faithfully perform the preventive maintenance procedures presented there.

But, no matter how well we design and build our tiller — or you try to take care of it — eventually some sort of repair or adjustment is likely to be necessary. When (and if) you run into a problem... don't panic! In most cases, you will be able to do the fixing up all by yourself, or perhaps with a little help from a friend or neighbor.

That's why we've included this special "how to" section on minor repairs and adjustments to your tiller and engine, as well as a detailed "Troubleshooting Guide" in Section 7. If a problem crops up, the first thing you should do is refer to the Troubleshooting Guide. It may refer you to the simple, step-by-step instructions in this section, or it may advise you to contact our Customer Service Department for additional guidance. Your service representative will then help diagnose — *without obligation* — what maintenance or repair work needs to be done. If it's a repair that you can do yourself, he will try to provide any extra instruc-



"Doing-It-Yourself" not only saves you time and money...you also know that the job has been done "right".

DO-IT-YOURSELF TIPS AND HINTS

- 1.** During disassembly, carefully lay out each part in the *exact* order it is removed. Even if the part is to be discarded, temporarily keep it in sequence. By following this practice, you can then reassemble new or old parts in reverse order and know that you are doing so correctly. In some cases, you may also want to place a note or tag with a part, describing its use or placement.
- 2.** As you remove parts, clean them thoroughly and inspect for any wear or damage. If in doubt about the serviceability of a part, please contact our Customer Service Department. To order new parts, see your *Master Parts Catalog* for part numbers and descriptions.
- 3.** When doing repair work, be sure to read the instructions thoroughly before beginning the actual procedure. This will help you to gain an overall view of the job and will also allow you to gather together any parts or tools you'll need.

4. Try to schedule your work to be free of breaks or interruptions. If your work is interrupted, place a check mark in the manual next to the step you have just completed. Then, you can later pick up your work at the exact place you left off.

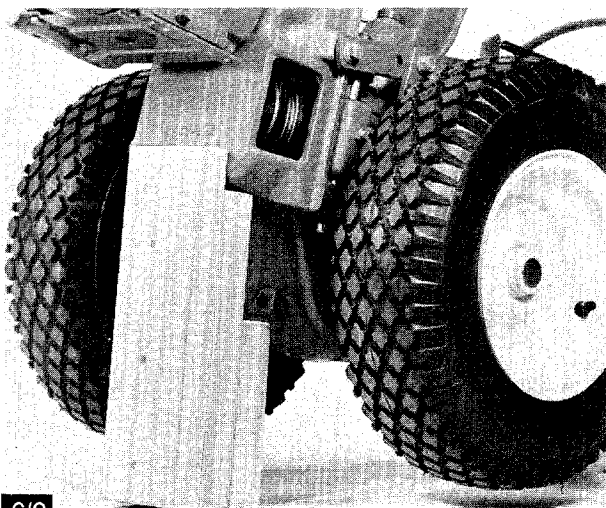
5. Practice safety at all times! Prevent accidents by only using tools that are in good condition. When grinding or striking metal parts, or when working with snap rings, always protect your eyes by wearing industrial safety glasses. Always be guided by what might happen if your hand or tool slips during work. Wear gloves or cover sharp objects wherever possible. Use cleaning solvents (*never gasoline!*) only according to recognized safety practices. Keep your floor and work area clean and uncluttered. When working on the tiller or engine, always stop the engine and disconnect the spark plug wire to prevent accidental startup.

6. In order to perform numerous service tasks, you will need something strong enough to put under the transmission to hold the wheels up off the ground an inch or two. We have found that making a block out of three short lengths of 2" x 4" pieces of wood is a very handy item for such maintenance — see Photo 6/2.

tions that you might need. And, of course, *please be sure to call or write us any time you have a problem with your tiller or engine.* We're as close as your telephone or mailbox!

It is important to remember that your tiller's engine is warranted by the manufacturer for one year from the date of delivery. During this time, any repair work on the engine must be performed by an authorized engine service dealer. If anyone else, including yourself, repairs or alters the engine, the one year warranty is voided. Of course, some specialized engine work should always only be done by a qualified service person who has the training and special tools necessary for such work. Again, please feel free to consult your Troy-Bilt service representative here at the factory for further advice.

To build your block, simply nail 7", 11½" and 13" boards together in step-like fashion. In this way, you can prop up different parts of the tiller, using the same block.



6/2

One method of raising wheels off the ground.

Removing and Replacing Wheels

To remove and replace a wheel from your tiller, follow the simple step-by-step procedure below. (In the accompanying photos, we removed the engine and other tiller parts for clarity. It isn't necessary for you to do so.)

TOOLS YOU'LL NEED — Hammer; 1/4" dia. steel rod or a 16-penny (16d) nail with blunted point or a 3/16" tapered or 1/4" untapered drift pin; penetrating oil; grease.

1. Prop up the transmission until the wheels are off the ground.

2. Using the steel rod, nail or drift pin, drive the roll pin down through the wheel hub — see Photo 6/3. (Caution: Wear safety goggles when driving the roll pin in or out.) To keep the wheel from turning as you work, place the Wheel Speed Shift Lever in either Fast or Slow gear.

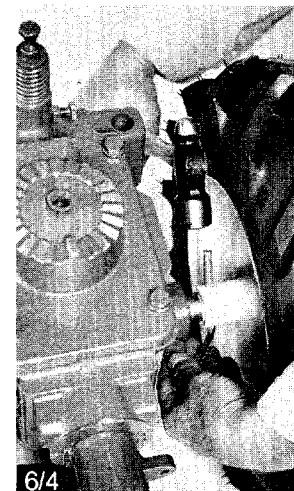
3. With the roll pin removed, the wheel should slide easily off the shaft. If necessary, squirt some penetrating oil around the shaft and wheel hub and tap the rubber tire to set up vibrations which will help to distribute the oil. Be patient and allow enough time for the oil to soak in.

4. Before replacing the wheel, apply some grease to the wheel shaft. Then, replace the wheel and tap in the roll pin flush with the wheel hub. Use your steel rod, nail, drift pin or a socket head (Allen) wrench to help you align the holes while you drive in the roll pin — see Photo 6/4. NOTE: If the roll pin appears to fit loosely in the shaft, you'd best replace it with a new one right away (Part No. 9322). In an emergency, you can usually hold a loose roll pin in place by securing it with an inexpensive adjustable clamp such as those on automobile engine hoses.



6/3

Drive out roll pin.



6/4

Tap pin in flush.

6

Replacing a Wheel Shaft Oil Seal

If a wheel shaft oil seal (Part No. 9601) is leaking, you can replace it easily by following these simple step-by-step instructions. (Please note that the accompanying

photos show the engine and other tiller parts removed for clarity — it's not necessary that you do so).

TOOLS YOU'LL NEED

- Two medium screwdrivers
- 3/8" wrench or adjustable wrench
- Hammer
- Penetrating oil
- Grease
- Fine metal file or #400 grit paper or cloth
- A 4½" x 4½" sheet of thin, flexible plastic similar to photo album page protector sheets
- A 6" length of 1" (inner dia.) Standard black pipe. Available at hardware or plumbing stores

- Large flat washer, with a 1-1/16" inner dia.*
- Non-hardening gasket sealant (such as Permatex or Plasgon brands)**
- Shallow pan to catch oil drips

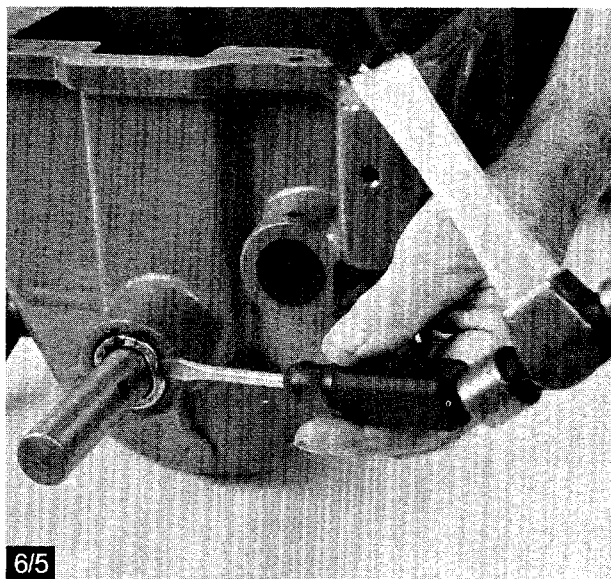
*If not available locally, order special Seal Installation Washer Set (Part No. 1344)

**If not available locally (check auto and hardware stores) order Seal and Gasket Replacement Kit (Part No.1309)

Seal removal steps

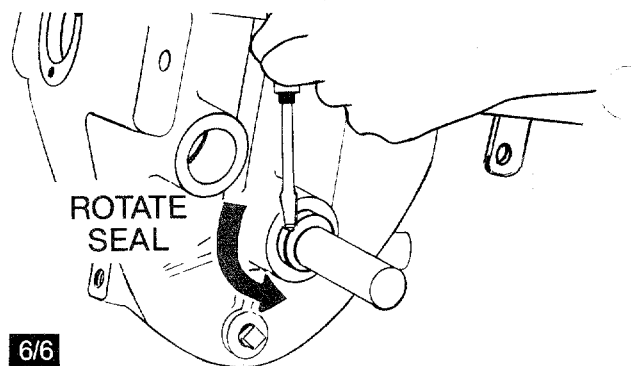
STEP 1. Remove the wheel next to the damaged seal as explained on Page 131. With the wheel removed, check the wheel shaft by trying to "wiggle" it up and down, and then from side to side. If the shaft moves more than 1/4" when you do this, it may signal a more serious problem involving the wheel shaft or its bushings, and you should call your Customer Service Representative at the Tiller Factory for further advice.

STEP 2. Place a pan below the seal to catch any oil drips. Next, drive the tip of a screwdriver into the seal at a slight angle, as shown in Photo 6/5. After puncturing the seal on one side, drive a *second* screwdriver into the opposite side. Be very careful not to hit the shaft or the inside of the transmission case bore as you puncture the seal!



Puncture one side of seal, then the other.

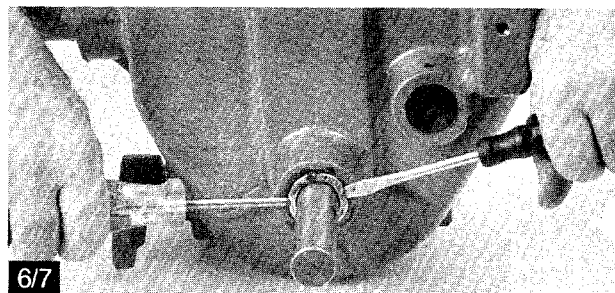
STEP 3. Tap down on one screwdriver and force the seal to rotate around the shaft, as shown in Sketch 6/6. This will help break any grip the gasket sealant has formed between the seal and the transmission bore, making seal removal easier.



6/6

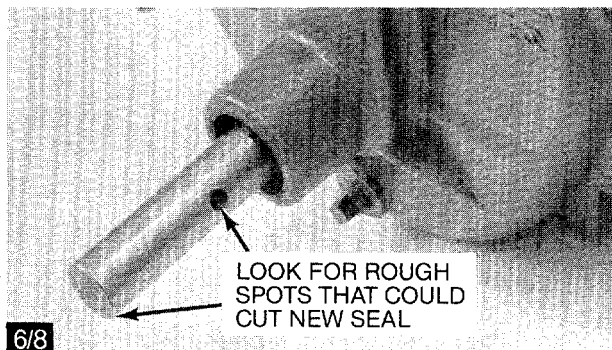
Rotate seal in bore to loosen it.

STEP 4. With both screwdrivers firmly embedded, pry the seal outward by pressing the blades against the transmission case — see Photo 6/7. If necessary, pierce the seal in other places in order to obtain better leverage. NOTE: Before discarding the seal, check that there aren't any wheel shaft shims (they look like thin, metal washers) stuck to the back of it. If you find any, replace them on the wheel shaft.



Pry oil seal out of casting bore.

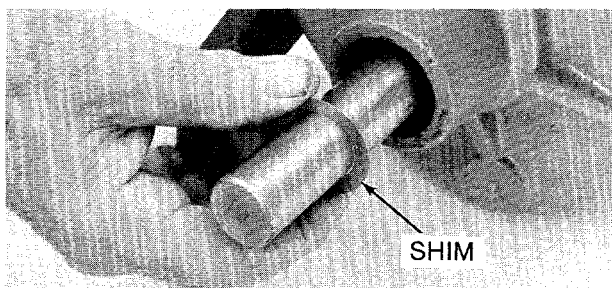
STEP 5. With the seal removed, use a clean cloth to *thoroughly* clean the surfaces of the wheel shaft and the transmission bore. (Remember — the cleaner the shaft and bore, the better the seal will fit.) Now, closely examine the end of the shaft and the area around the roll pin holes for any rough or sharp edges that could cut the new seal when it is installed — see Photo 6/8. If necessary, use a fine file or #400 grit paper or cloth to lightly smooth off any rough spots, being careful to avoid the area on the shaft where the oil seal will fit. Clean away any metal particles.



Smooth off any rough or sharp edges.

Seal replacement steps

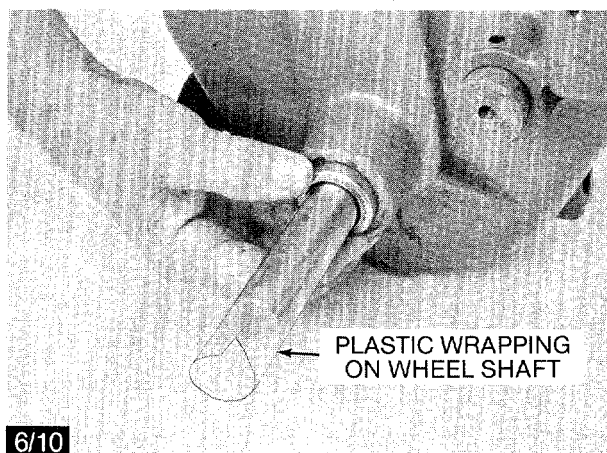
STEP 1. Look into the transmission bore and make sure there is at least one wheel shaft shim (Part No. 1166) located there. The shim protects the oil seal from being scraped by the snap ring inside the bore — see Photo 6/9.



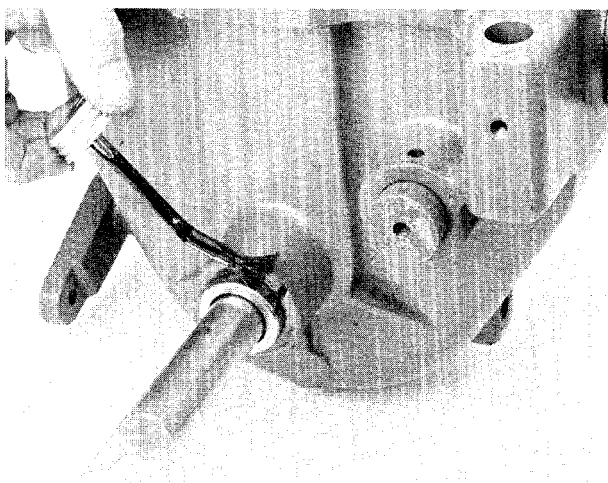
Shim protects oil seal from internal cuts.

STEP 2. Use the thin, flexible plastic to protect the seal from cuts when you slide it over the shaft. If you can't find the plastic, use a sheet of letter paper stationery or at least cover the end of the shaft and the roll pin hole with transparent tape. As shown in Photo 6/10, roll the plastic or paper into a tube and insert it halfway through the seal. Slide the tube and seal over the shaft and up to the bore opening. **IMPORTANT:** Under the lip on one side of the seal you'll see a thin spring. The side with the spring showing goes in the bore first.

STEP 3. Coat the outer edge of the seal with *non-hardening* gasket sealant, as shown in Photo 6/11. The sealant helps to prevent oil leaks between the seal and the bore. After coating the seal, remove the protective wrapping from the shaft.



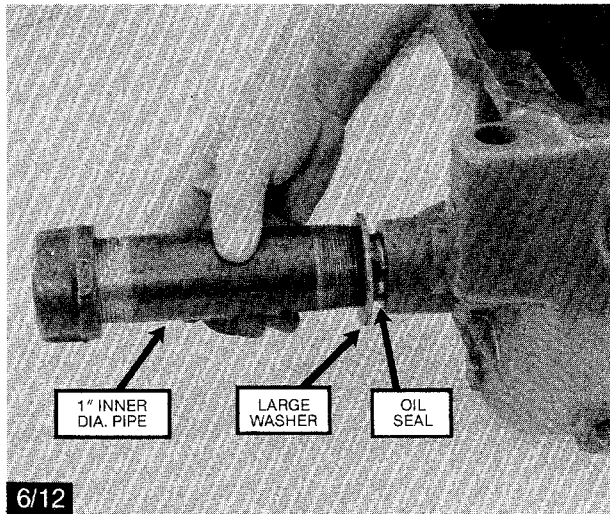
Spring side of seal goes in first.



Apply sealant to outer edge of seal.

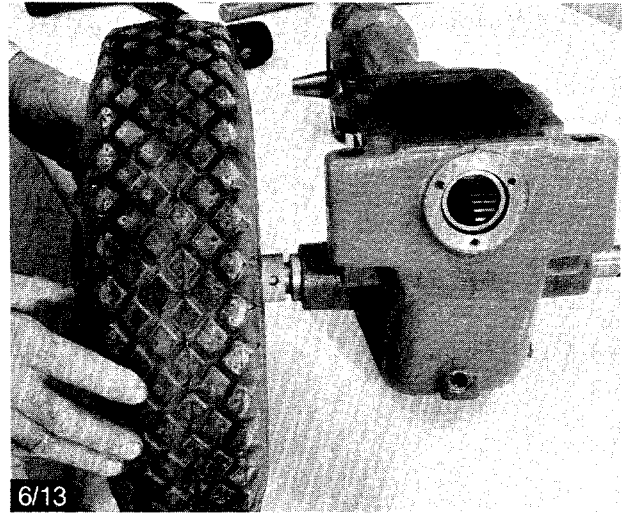
STEP 4. The best way to seat the seal in the bore is to use a thick, flat 1" washer (with a 1-1/16" inner dia.), and a 6" length of 1" (inner dia.) Standard Black pipe, as shown in Photo 6/12.

When you tap the pipe with a hammer, the washer will apply equal force around the face of the seal. This will prevent it from going into the bore at an angle or caving in at the center. Now, gently tap the seal in until it is *almost* flush with the transmission bore. The little edge you leave protruding will make it easier to remove the seal at a later date, if necessary. Please be sure that the seal enters the bore straight and without bending. If it goes in crooked, it will most likely tear and leak badly.



Use 1" washer between pipe and oil seal.

STEP 5. With the seal in place, apply some grease to the shaft and replace the wheel (see Page 131). Check the level of the transmission gear oil and top it off if the level is below the oil level plug (see "Adding or Changing Transmission Gear Oil" on Page 118).



You can also use tiller wheel to seat oil seal.

SPECIAL NOTE: In an emergency, and if you're careful, you can also use the tiller wheel to seat the seal — see Photo 6/13. Just slide the hub of the wheel up against the oil seal and gently tap the seal into place — a handy trick that a Troy-Bilt Owner showed us!

SERVICE NOTE: A properly installed oil seal should give you long and trouble-free service. Please don't be overly concerned if a newly installed seal leaks. It may take several hours of tiller operation for the seal to become completely effective.

Replacing Tiller Shaft Oil Seals

As discussed in "Check for Tiller Oil Leaks," (Step No. 5, Page 115), an oil leak from the area of the tiller housing could be due to a damaged oil seal, a loose tiller housing cover, loose cover mounting screws (or screws which had no sealant put on their threads), or a faulty gasket. The following instructions show you how to take care of any of these problems in simple, step-by-step sequence.

To replace the tiller shaft oil seals, you will have to remove the hood and tines from your tiller. First, remove the hood as described on Page 140. Then, see "Re-

moving and Replacing Bolo Tines and Their Holders," on Page 146. After removing the tines, be sure to remove the 3/16" x 1" tine holder keys from both sides of the shaft.

If you keep the tiller tipped forward on the engine during seal removal and replacement, any oil leakage will be kept to a minimum (have a shallow pan available to catch any drips). If you find this doesn't work well for you, then you should drain out the gear oil as explained on Page 118.

TOOLS YOU'LL NEED

- Flat blade screwdriver
- Soft mallet and steel hammer
- 3/8" socket wrench-6 pt. for hex head screws
- Fine metal file or #400 grit paper or cloth
- Large, flat washer, with a 1-3/8" inner diameter*
- A 4-1/2" x 4-1/2" sheet of thin, flexible plastic similar to photo album page protector sheets
- 4" to 6" length of Standard black pipe, having a

1-1/4" inner diameter. Available at hardware or plumbing stores.

- Non-hardening gasket sealant (such as Permatex or Plasgon brands)**

*If not available locally, order special Seal Installation Washer Set (Part No. 1344).

**If not available locally (check auto and hardware stores) order Seal and Gasket Replacement Kit (Part No. 1309).

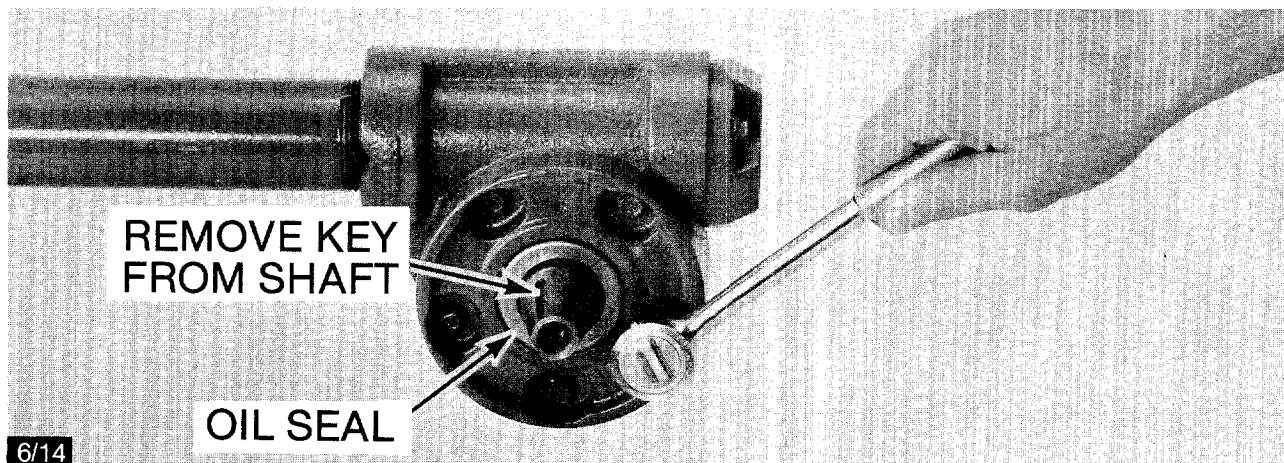
Removing the left-hand tiller shaft oil seal

If you have determined that the tiller shaft oil seal on the left-hand side is leaking, the easiest way to replace it is to first remove the tiller housing cover. The seal will remain in the cover and can be removed and replaced more easily than by trying to pry it out of the cover while the cover is installed. (Instructions for removing the right-hand seal are given further on.) Follow these easy steps:

STEP 1. To remove the tiller housing cover, first remove the five socket head or hex head mounting screws — see Photo 6/14. **NOTE:** Before removing the

screws, check whether any of them are loose, particularly the two on top. If any screws are loose, it could be the cause of oil seepage from the screw holes, or from between the cover and the housing.

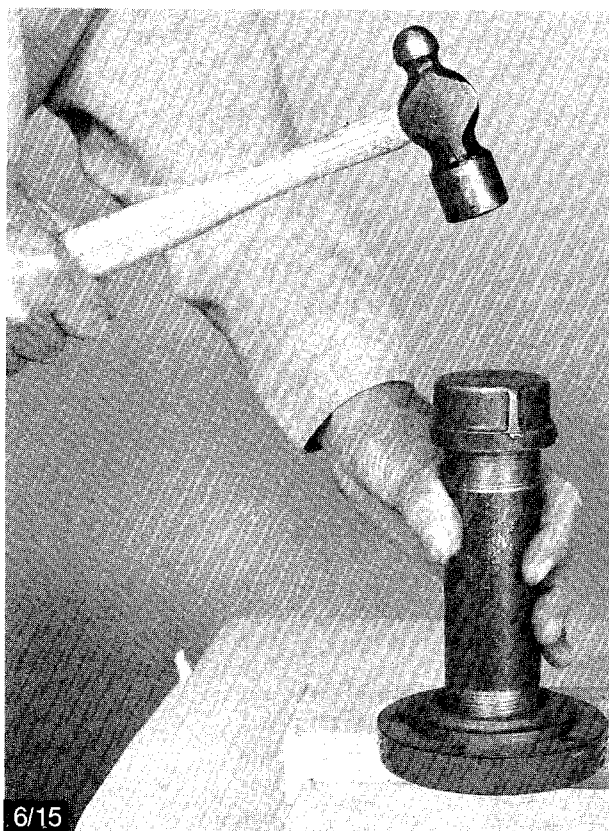
When the screws are removed, try to remove the cover with your fingers. Note how snugly it fits and whether or not there is any movement from side to side. The cover should be a tight, snug fit. If you have to tap it off lightly with a hammer, or find it difficult to pry off with your fingers, the cover probably fits properly. (If it's loose-fitting, please call or write us for further advice.) Now, remove the cover and carefully peel off the paper gasket(s) on the cover or on the housing. Wipe away any dirt or debris from these two surfaces.



Remove tiller housing cover screws.

STEP 2. With the cover off, you should carefully tap the seal out of the cover from the inside outward. The easiest method is to use a 6-inch length of 1-1/4" (inner dia.) pipe to drive the seal out. Do this by placing the cover *upside down* between two blocks of wood — see Photo 6/15. Tap it gently out, being very careful not to scratch the internal side of the cover, or the steel bearing cup (race) inside the cover. With the seal removed, inspect the bearing cup for any deep scratches or gouges (let us know if any are present).

It is possible to remove the seal in this manner without doing it any harm (if it was a good seal in the first place). But, it is best to use a new seal each time. Don't reinstall the left-hand seal until after you have removed the right-hand seal, if that is to be replaced as well (you will use the housing cover to center your tiller shaft if you are going to replace the right-hand seal). Otherwise, install a new seal in the left-hand side by following the replacement instructions beginning on Page 138.



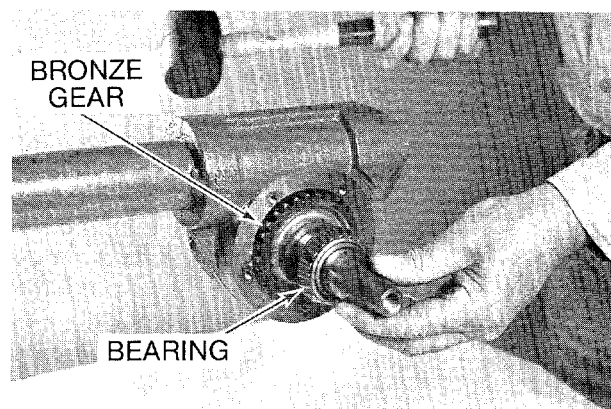
6/15 Carefully tap oil seal out of housing cover.

Removing the right-hand tiller shaft oil seal

To remove the right-hand oil seal, you will have to first remove the tiller housing cover from the left side, as explained on Page 135. After removing the cover, follow these simple steps:

STEP 1. Using a *soft* mallet, tap the right side of the tiller shaft inward hard enough to drive the shaft, bronze gear and bearings toward the large hole on the left — see Photo 6/16. Lift up the shaft on the left side to align the bronze gear with the hole as you hit the shaft. Once the bronze gear is free of the drive shaft's steel worm, lift the gear assembly out and put it aside on a clean surface. (See Service Note below).

When replacing the shaft and gear cluster, it doesn't matter which end you put in first. But, you may want to reverse the direction of wear (to even it out) by putting the opposite side in first. Mark one side accordingly, if you wish to do this.

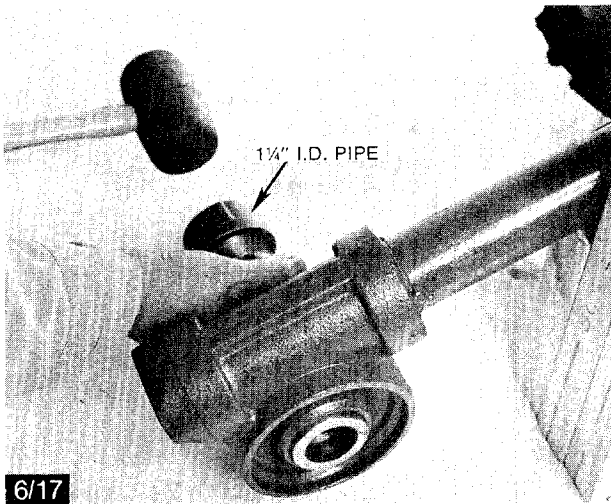


6/16

Lift and align bronze gear with opening.

SERVICE NOTE — If you have difficulty tapping the shaft and gear cluster out, the steel worm on the drive shaft is probably blocking your way. Simply pull up on the left side of the tiller shaft, while you simultaneously press down (hard) on the right side. This action should deform the right-side oil seal enough to provide the added clearance you need to remove the tiller gear cluster.

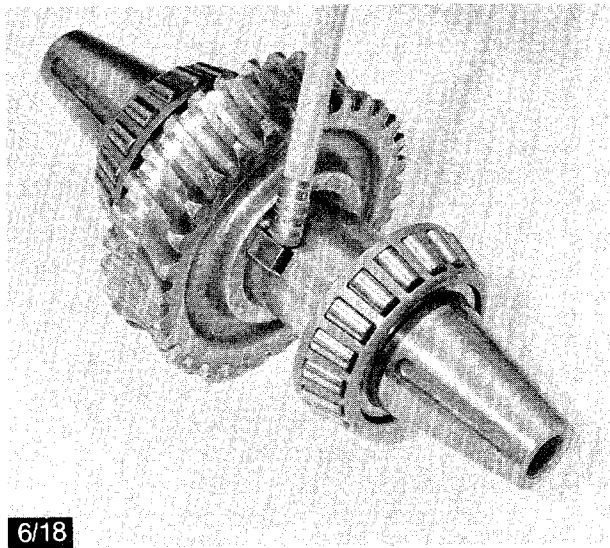
STEP 2. To remove the oil seal, place the 1-1/4" pipe carefully inside the housing against the seal and tap it out — see Photo 6/17. As you do, be careful not to scratch the steel bearing cup (race) surrounding the seal. With the seal out, inspect the bearing cup inside the housing for any deep scratches or gouges. (Let us know if any are present).



6/17

Place pipe inside housing to drive seal out.

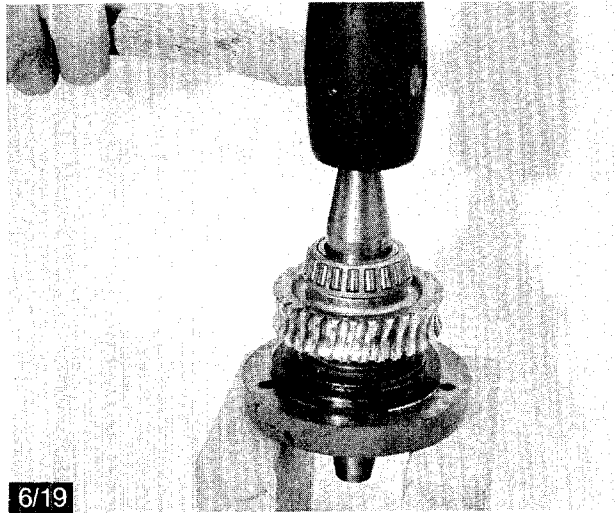
STEP 3. Look carefully at the bronze gear and the key in the keyway — Photo 6/18. If the key is exposed more on one side of the bronze gear than the other, you will have to center the gear over the key, as explained in Step 4.



6/18

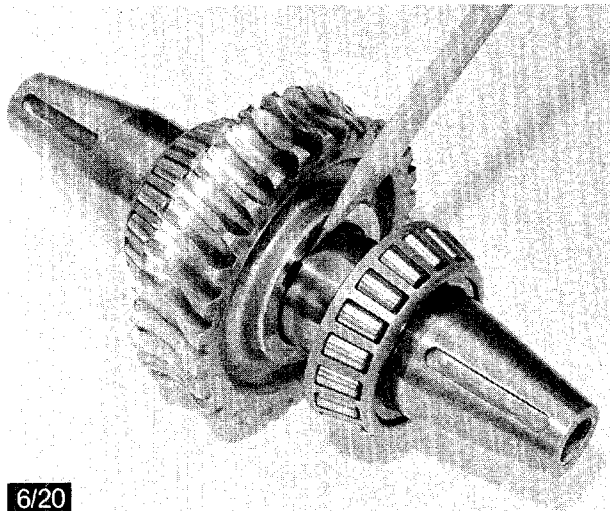
Check position of key that drives bronze gear.

STEP 4. To center the bronze gear over the key, first place the cover *upside* down between two blocks of wood — see Photo 6/19. Make sure there is enough distance below the cover to drive the shaft down. Now, place the shaft in the cover (the oil seal should not be in the cover) and tap the shaft down with a mallet until it stops moving. Turn the shaft over and repeat this action. This will cause the bronze gear to align itself in the center of the tiller shaft. When correct, the key should not protrude out of the gear keyway any further on one side than it does on the other — see Photo 6/20.



6/19

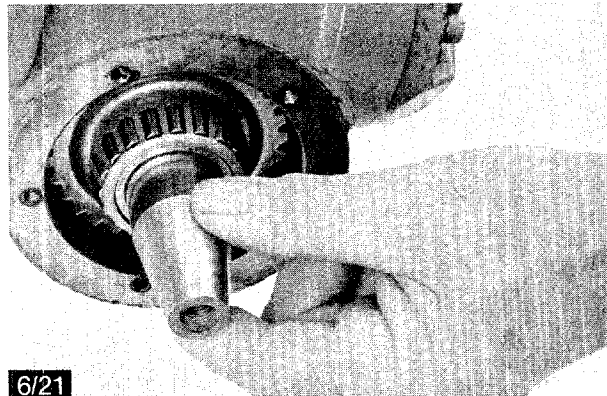
Place shaft in housing cover and hit with mallet.



6/20

Bronze gear should be evenly centered over key.

STEP 5. Wipe off any dirt or debris from the bearing cup inside the right-hand tiller housing and then replace the tiller shaft assembly as shown in Photo 6/21.



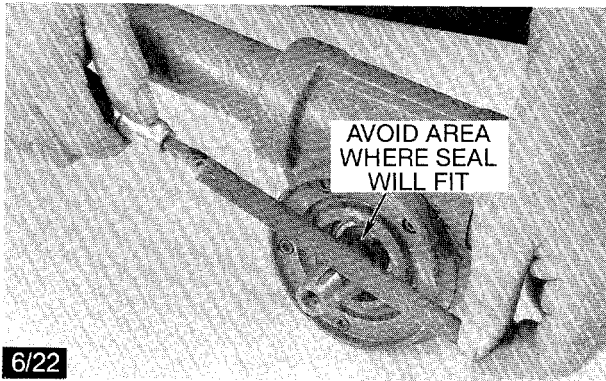
6/21

Replace tiller shaft assembly in tiller housing.

Replacing the tiller shaft oil seals

Before replacing the left or right side oil seals, carefully inspect the keyways in the tiller shaft to make sure there are no burrs or sharp edges that could cut the new seal. File the keyways lightly, if necessary, being very careful to avoid filing the area where the seal will fit — Photo 6/22. Then, clean off any dirt or metal particles from the shaft.

If you are replacing the seal on the right side, replace the left-side housing cover and its seal first. You will need the cover installed in order to align the right-side seal with the shaft.



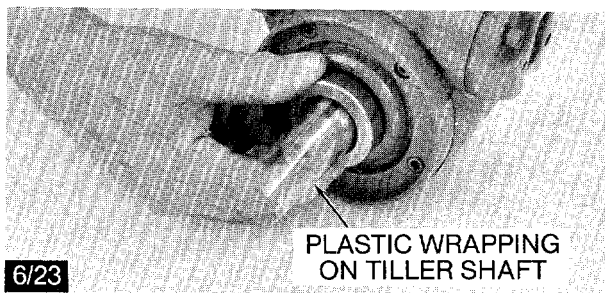
6/22

File keyway area only.

Installing the left-side tiller shaft oil seal

STEP 1. Before installing the new seal, replace the housing cover as explained on Page 139.

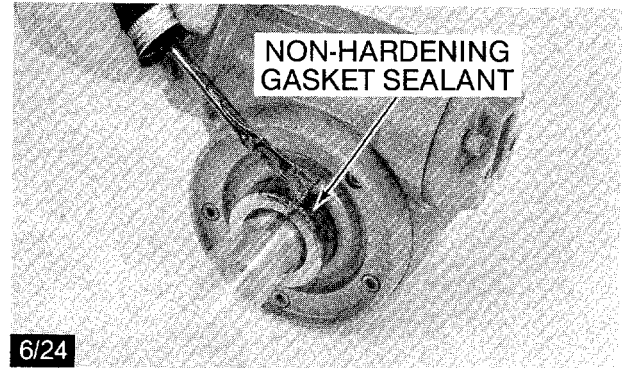
STEP 2. To protect the oil seal from being cut as you slide it past the keyway, roll your sheet of thin, flexible plastic (or even letter paper stationery) into a tube and insert this halfway through the seal. Then, slide both together over the shaft until the seal is up to the housing bore — see Photo 6/23. Make sure that the side of the seal with the name and number stamped on it is facing away from the housing.



6/23

Seal name and number face outward.

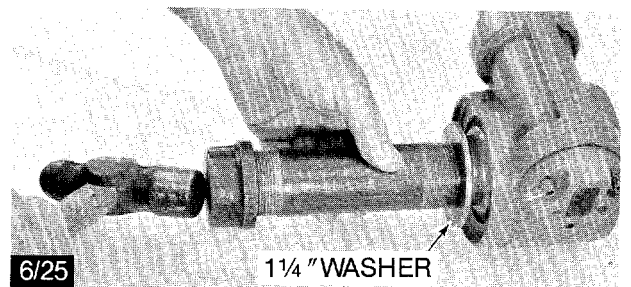
STEP 3. Apply a coating of *non-hardening* gasket sealant around the outside edge of the seal — see Photo 6/24. The sealant will help to prevent oil leaks from between the seal and the bore. After coating the seal, remove the protective wrapping.



6/24

Apply non-hardening gasket sealant.

STEP 4. The best way to seat the oil seal is to use a thick flat washer (with a 1-3/8" inner dia.), and a 4" to 6" length of 1-1/4" (inner dia.) Standard Black pipe, as shown in Photo 6/25. Using the washer ahead of the pipe will prevent the pipe from centering on the seal and caving it inward. If you don't have a pipe and washer, you can try tapping the seal in with two hammers — one on each side of the seal — although this method isn't as safe as using the pipe and washer combination. Drive the seal in until it is nearly flush with the casting.

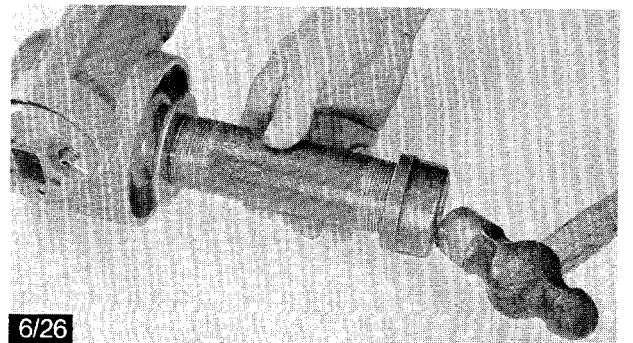


6/25

Use 1-1/4" washer between pipe and seal.

Installing the right-side tiller shaft oil seal

Before replacing the right-side seal, the seal and housing cover should already be installed on the left side. Then, simply follow the instructions for installing the left-side tiller shaft oil seal (Steps 2 through 4). Photo 6/26 shows the right side oil seal being installed.



6/26

Installing right side oil seal.

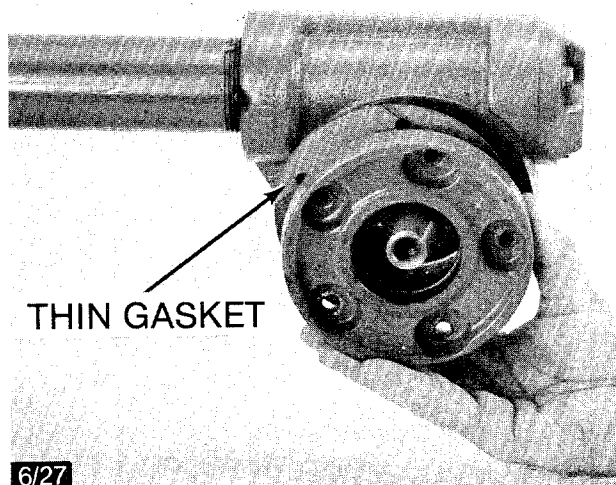
Replacing the Tiller Housing Cover

If you removed the tiller housing cover (Part No. 1023) to replace an oil seal or gasket — or to do any other repair work — here are easy instructions on how to replace it correctly (these steps can also be used if you are installing a completely new cover).

STEP 1. If you haven't done so already, then you must first remove the housing cover and the oil seal inside it, as explained on Page 135, "Removing the Left-Hand Tiller Shaft Oil Seal," Steps 1 and 2.

STEP 2. The tiller housing cover is designed to fit snugly with the tiller housing. Check the fit now by tapping the cover back into place, after first removing any old gaskets or other debris from the cover and the tiller housing. Without installing any screws, note how snugly it fits and whether or not there is any movement. Please call us if you can wiggle the cover from side to side, or if you can rotate it. (Usually, if you have to tap the cover off with a hammer, then the fit is good.) Remove the cover after making this check.

STEP 3. Place a new thin gasket (.010", Part No. 1129-1) on the housing cover and replace the cover — see Photo 6/27. Tap the cover on securely and then install two cover mounting screws in *holes opposite each other*. Tighten the screws securely and then tap around the cover again. Retighten the screws.



6/27

Install thin gasket and replace cover with two screws.

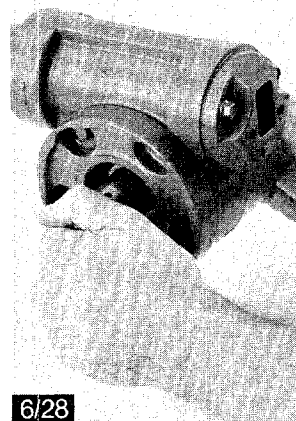
STEP 4. With the cover and screws down tight, you should be able to tell whether the tiller shaft is fitted correctly (the fit of the shaft is determined by the quantity and thickness of gaskets between the housing cover). When fitted correctly, there should be virtually no side-to-side play in the tiller shaft from left to right. But, the cover should not be so tight that there is absolutely no give in the shaft, or it will bind up on the bearings.

First, push in and pull out the tiller shaft: you should feel virtually no movement. Now, grab each end of the shaft in your hands and try to turn the shaft forward and backward — see Photo 6/28. You should feel a little bit of backlash (a tiny bit of movement that stops suddenly). We often refer to this movement as a "click." If these two conditions are met, then the housing cover and the thin gasket have created the correct fit.

Lack of any side play in the tiller shaft indicates the cover is in too close to the tiller housing. Remove the cover and add to the gasket thickness using two of the thinner gaskets (total gasket thickness of .020"), or one thicker (.030") gasket, or even one thin and one thick gasket (.040" total thickness). One of these combinations should give you the right amount of total thickness to relieve the pressure on the bearings. Of course, each time you change the gasket thickness, be sure to install the cover with the two screws before testing for play. NOTE: One "30" is better than three "10's."

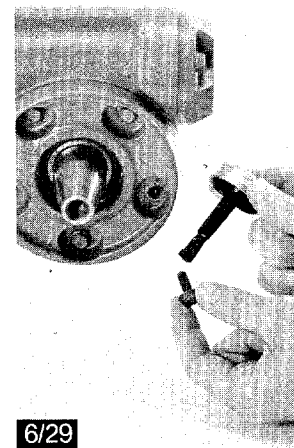
If there is excessive play in the shaft (with the single, thin (.010") gasket in place and the cover securely tightened with two screws), then please call our Customer Service Department for further advice. (You may need a new tiller shaft key, or a special shim between the bearing and the bronze worm gear.)

STEP 5. When you've determined the proper gasket combination, put some *non-hardening* gasket sealant on the threads of the remaining three mounting screws and tighten them down snugly — Photo 6/29. Then, remove the first two screws, put sealant on them and tighten them down. Tap around the cover with your mallet and retighten the screws once again. Now you should replace the oil seal in the housing cover (see Page 138).



6/28

Test play in shaft.



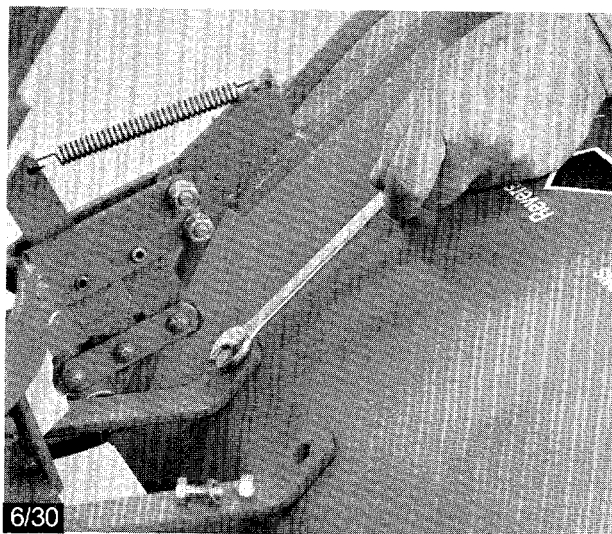
6/29

Apply sealant to screws.

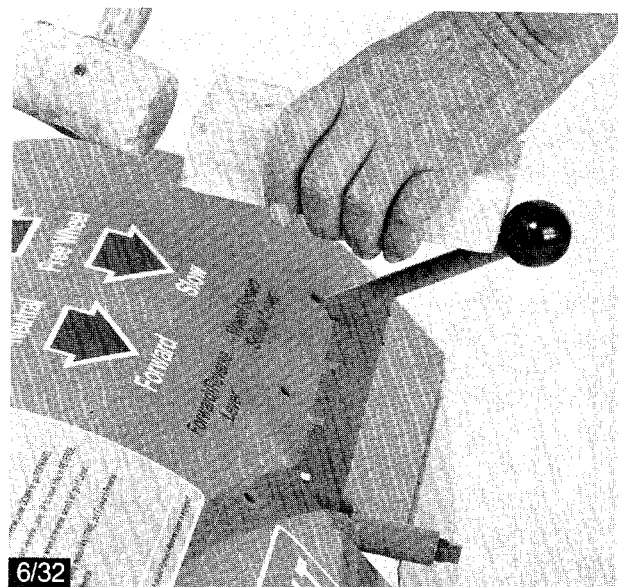
Removing the Tiller Hood

If you ever need to remove the tiller hood to service the tines or tiller shaft area, here is a quick and easy method to follow:

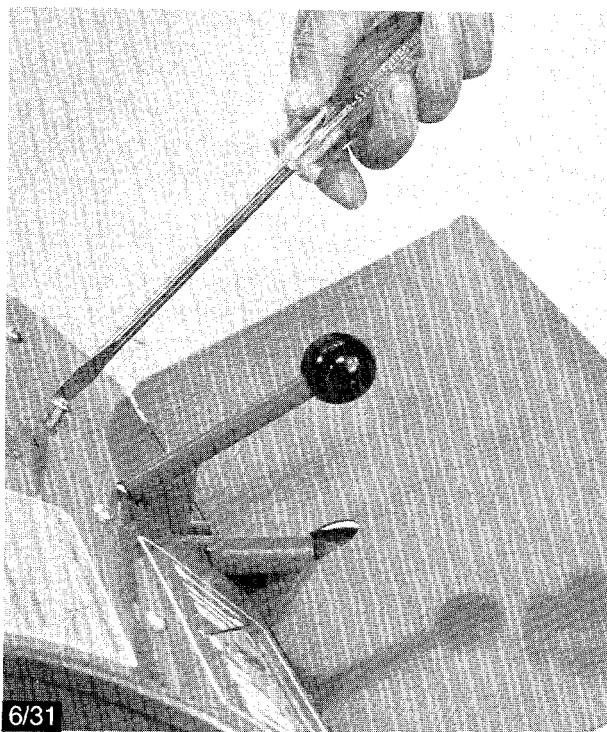
TOOLS NEEDED: Two 1/2" wrenches, one 7/16" wrench, screwdriver, soft mallet, wooden block.



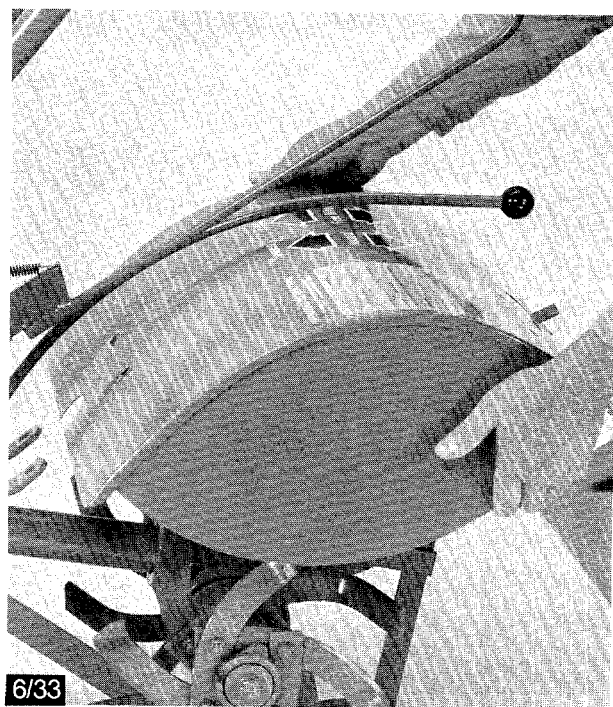
1. Gently tilt your tiller up on its engine, taking care to place something beneath the engine cover to protect it from damage. Then, use two 1/2" wrenches to remove the two front hood bracket bolts, lockwashers and nuts. If the bolts are frozen, saturate them with penetrating oil, and let the oil soak in.



3. Take a small board and drive the knob off the handle of the depth regulator (with the tiller lowered back down to its normal position). Don't lose the metal tolerance ring that fits inside the knob.



2. Using a screwdriver and 7/16" wrench, remove the four screws, lockwashers and nuts that fasten the hood to the top of the rear mounting bracket.

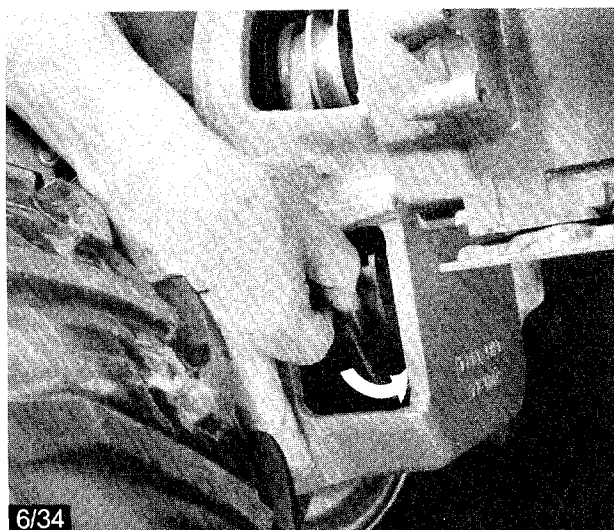


4. With the fasteners removed, lift the hood up and off. When replacing the hood, simply follow the above procedure in reverse. Make sure you securely tighten all of the fasteners.

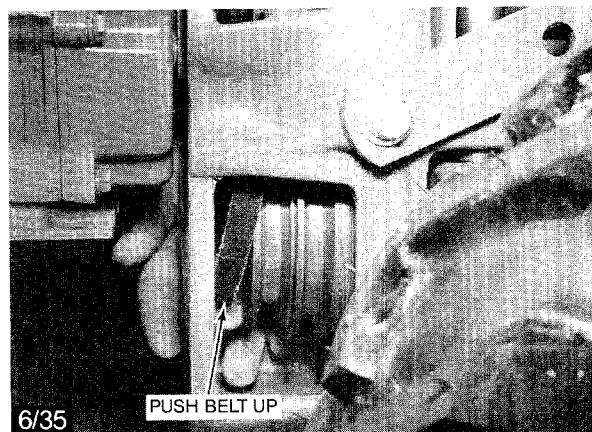
Replacing the Drive Belt

If an inspection or adjustment to your drive belt (see Page 105, "Checking and Adjusting Drive Belt Tension") has determined that you need to replace your belt — or if you need to remove the belt for other service work — here's a simple, step-by-step procedure to follow. If you need to order a new belt, please specify Troy-Bilt Part No. 9245. This belt is made specially for your tiller and is *only available* from Garden Way Mfg. Co., Inc.

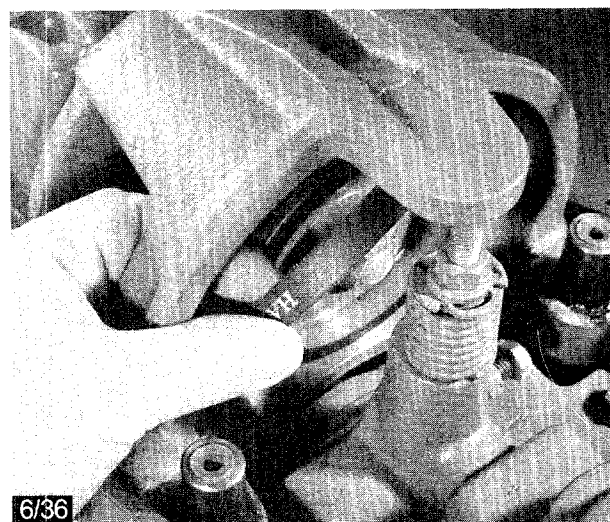
Belt Removal Steps



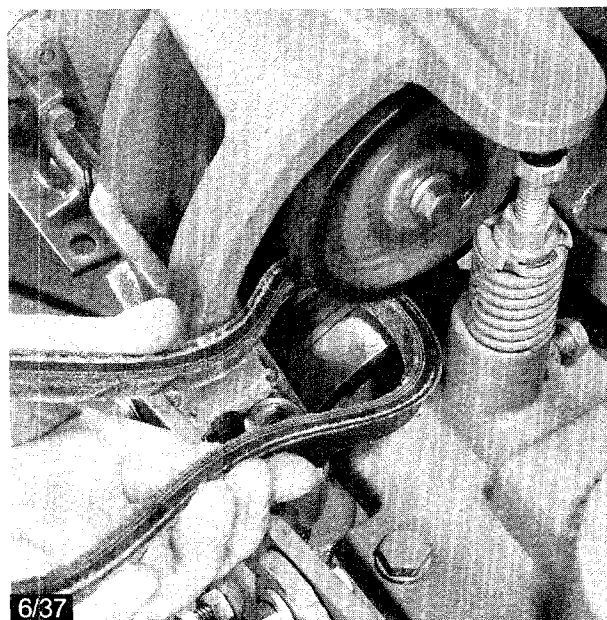
1. Shift Forward/Reverse Lever into Neutral. While on right side of tiller, reach over engine mount with your left hand and push belt toward you with fingers to give you slack. Now reach through the bottom opening on the right side (as shown above), and move the belt on the lower pulley down and away from the pulley, moving it toward the engine. Once it is off of the pulley, push the belt over to the left of center.



2. With the belt fully off the lower pulley, push the belt upward with your finger. This will provide more slack to remove it from the upper (engine) pulley.



3. Working on the left side, lift the belt up and over the rubber reverse disc, moving it down in front of the disc.

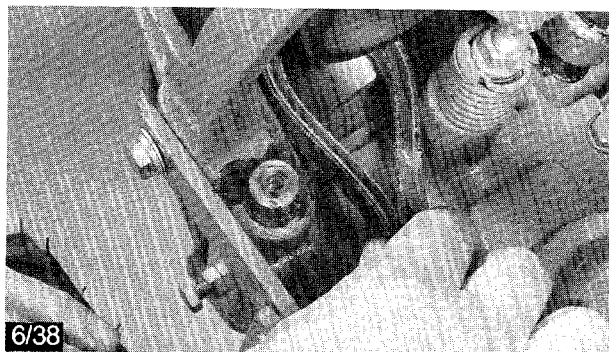


4. Shift the Forward/Reverse Lever down into Forward. Now, raise the lower end of the belt out from behind the bottom pulley and pull the belt out the front, left side.

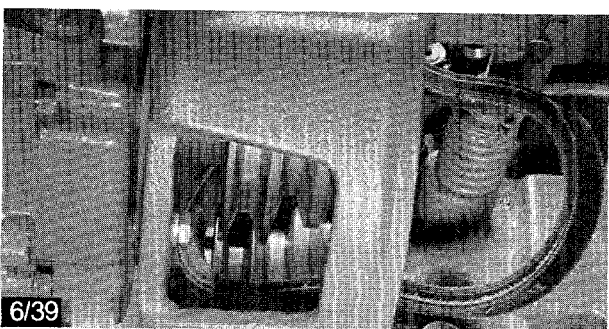
(cont'd.)

Belt Replacement Steps

(Make sure your engine and muffler are cool and the spark plug wire is disconnected before beginning.)



6/38
1. Shift the Forward/Reverse Lever down into Forward. Then, take a new belt and squeeze it between your finger and your thumb. Insert the belt between the two pulleys.



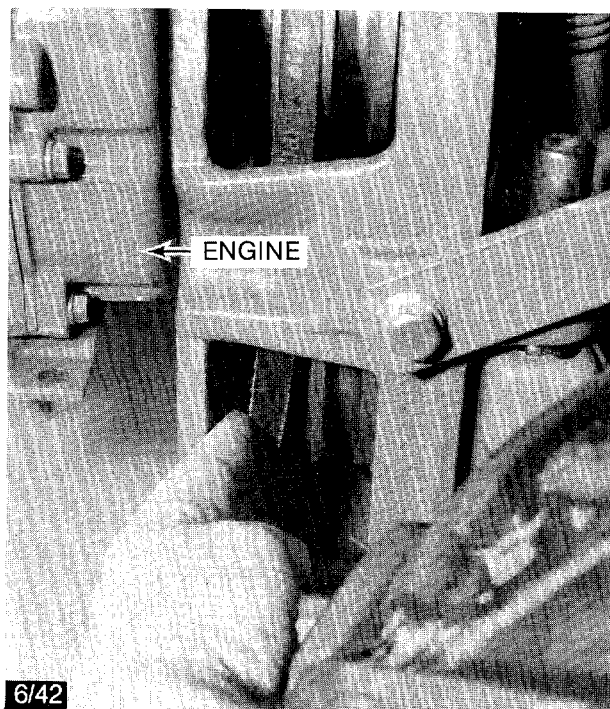
6/39
2. Push the belt all the way back between the two pulleys so that it's almost ready to go over and down under the lower pulley.



6/40
3. Work the belt down behind the lower pulley — but not in the groove yet. At the same time, work the top of the belt UP and over the rubber reverse disc, as shown here. Now it's simply a matter of seating the belt in the coinciding upper and lower pulleys according to the speed range you choose (with the Forward/Reverse Lever in Neutral). We'll show you the *High Range* choice in the next two steps.



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4. Working on the left side, seat the belt completely into the groove of the top pulley, using the groove closest to the engine. Then, simply reach around the engine mount with your right hand and use one finger to push the belt into the corresponding groove of the lower pulley. If you find it difficult to move the belt into (or out of) a groove, place the Forward/Reverse Lever in Neutral, or hold it up in Reverse. This will bring the pulleys closer together to give you extra slack.



6/42
5. Finally, move the belt into the pulley groove on the left side of the transmission pulley. Now, adjust the belt tension as described in the "Belt Adjustment" instructions on Page 106.

Replacing the Rubber Reverse Disc

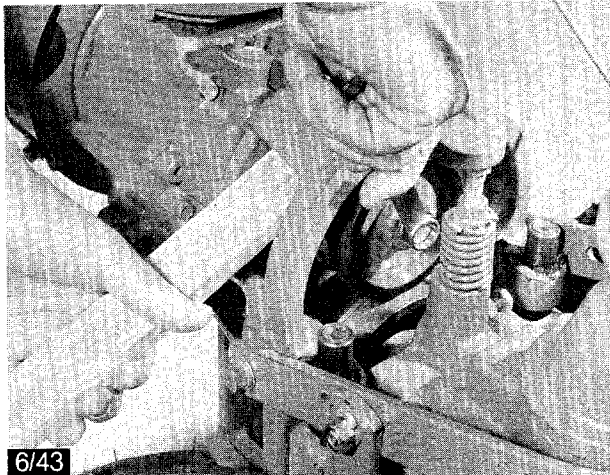
Here are easy steps to follow if you need to remove and replace your rubber reverse disc (Part No. 1485). Please note that if your tiller is equipped with a Bumper Attachment, you'll have to remove the bumper first in order to give yourself enough working room.

CAUTION: If the engine has been running, wait until the muffler and engine cool down. Also, disconnect the spark plug wire to prevent accidental engine start-up.

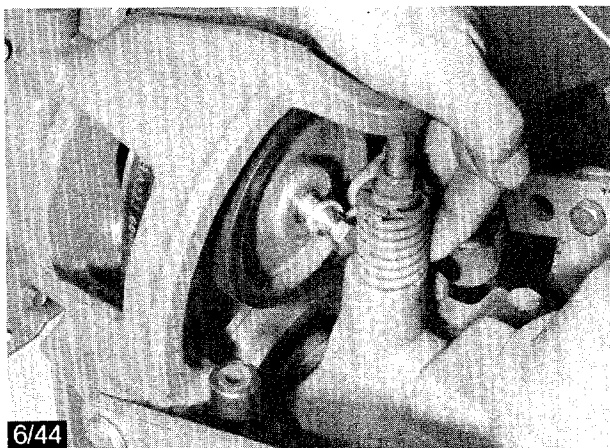
TOOLS YOU'LL NEED

- Soft Mallet
- 9/16" Wrench (open and closed end)
- Large Screwdriver (flat blade)
- Short length of strong stick; 5/16" thick, about 1-3/4" wide, and about 12"-14" long.

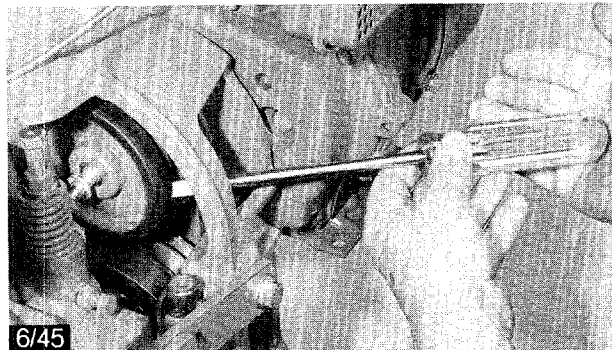
Removal Steps



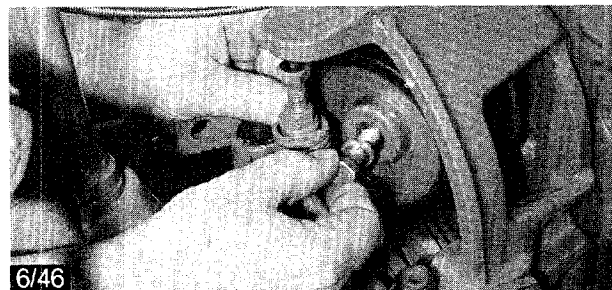
1. Wedge the stick under the left side of the engine mount between the engine pulley and the mount, as shown above. Make sure the stick is on the portion of the pulley without the belt. Pull up on the stick hard enough to hold the pulley from turning, while you use the 9/16" wrench to push down (counterclockwise) on the disc's mounting bolt. Pulling up *hard* on the stick and pushing down on the wrench should break the bolt loose.



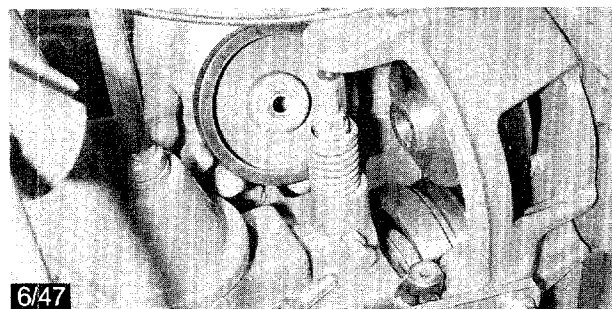
2. Unthread the bolt all the way out until it touches the reverse spring and plunger assembly. Do not try to remove the bolt completely at this time.



3. Put the screwdriver behind the rubber reverse disc where the disc and the cast iron pulley meet. Using your hand, tap the screwdriver to move the disc away from the pulley (on both sides, if necessary). It should come loose easily.

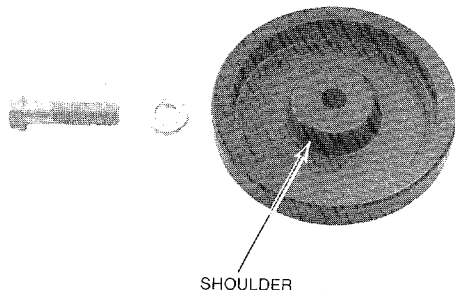


4. Slide the rubber reverse disc outward until it contacts the head of the mounting bolt. Then, turn the reverse disc in your direction (facing a little to the right) as shown above. Remove the mounting bolt and its lockwasher.



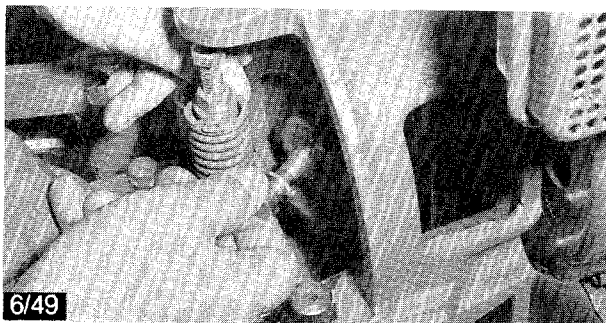
5. With the bolt and lockwasher removed, simply remove the reverse disc as shown above.

Reverse Disc Replacement Steps



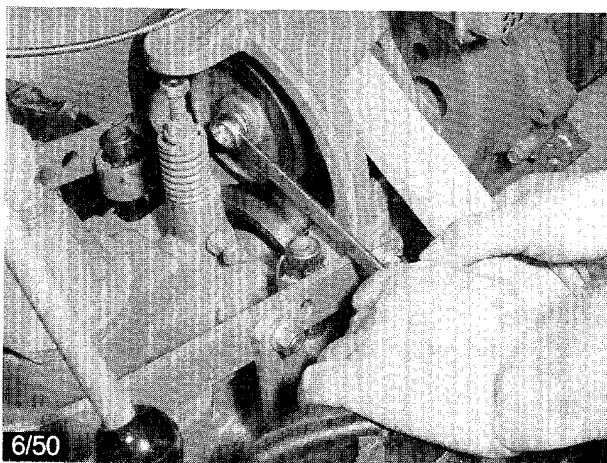
6/48

1. When replacing the reverse disc, the shoulder (shown above) must face toward the rear (operator's position) of the tiller.



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2. With the Forward/Reverse Lever in Neutral, put the reverse disc in front of the engine pulley and angle it as shown above. Put the lockwasher on the bolt and push the bolt through the hole in the reverse disc. Once the bolt is through the disc, put the disc on the hub of the engine pulley (keep the bolt with the disc). Now thread the bolt into the hole as far as you can.



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3. Now, working from the right side of your tiller, put the stick in between the empty groove on the pulley and the engine mount (don't put the stick on the reverse disc). Pull up hard on the stick and tighten the mounting bolt with a 9/16" wrench. With the reverse disc installed, you should now check the adjustment of the disc by following the directions described in "Testing Reverse Operation" on Page 120.

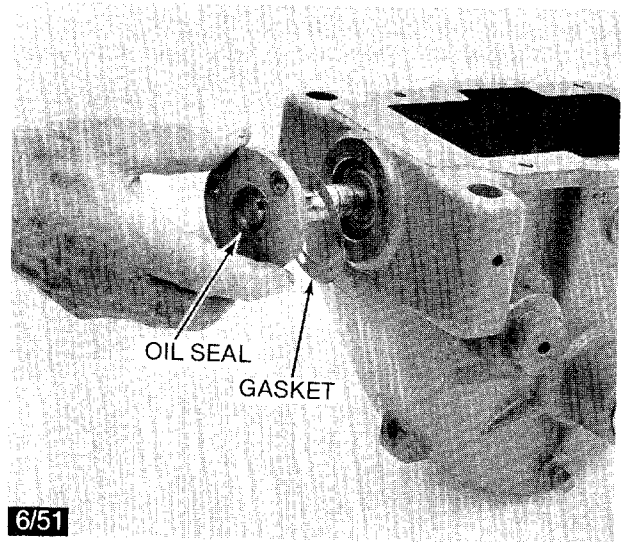
Replacing the Front Oil Seal on the Transmission

Here are easy to follow instructions on how to replace the oil seal (Part No. 9600) and the bearing cap gasket (Part No. 1124) on the front of the transmission. As mentioned in "Check for Tiller Oil Leaks" (see Page 116, Step 7), it's a good idea to first make certain that the oil isn't coming from another source before going to the trouble of replacing this seal and gasket.

Before removing the oil seal, you must remove the engine (see engine removal instructions, Page 162) and the lower drive shaft pulley (see transmission removal instructions, Pages 174-175.) To prevent gear oil from leaking out when you remove the bearing cap, simply pull the depth regulator lever all the way up so that the transmission slopes to the rear. NOTE: The following photos show the transmission completely disassembled from the tiller . . . it isn't necessary for you to do so.

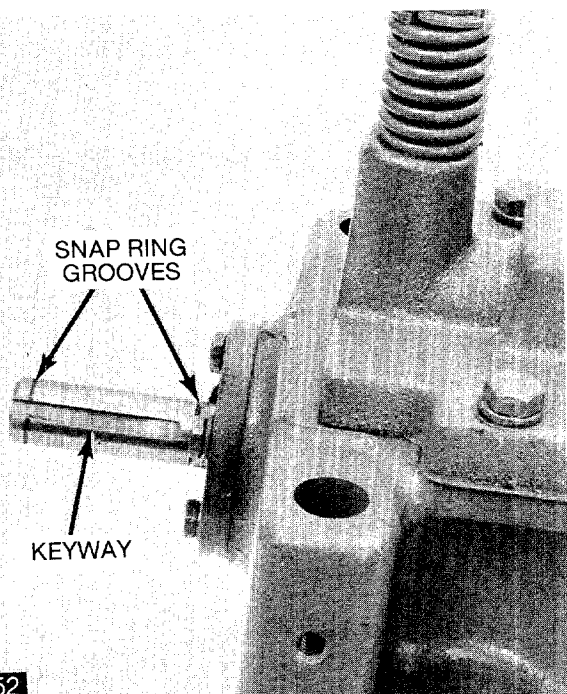
TOOLS YOU'LL NEED

- Soft Mallet
- 7/16" Wrench
- Fine Metal File or #400 Grit Paper or Cloth
- A 4-1/2" x 4-1/2" sheet of thin, flexible plastic similar to photo album page protector sheets
- Non-hardening gasket sealant (such as Permatex or Plasgon brands). If sealant is not available at local hardware or auto stores, order Seal and Gasket Replacement Kit (Part No. 1309).



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1. With the transmission pulley, pulley shim, two snap rings and the pulley key already removed from the shaft, use a 7/16" wrench to remove the three screws and lockwashers from the front bearing cap. Remove the cap and gasket as shown above. With the cap off, pry or push out the oil seal in the center of the cap, being careful not to scratch or gouge the inner edge of the cap.



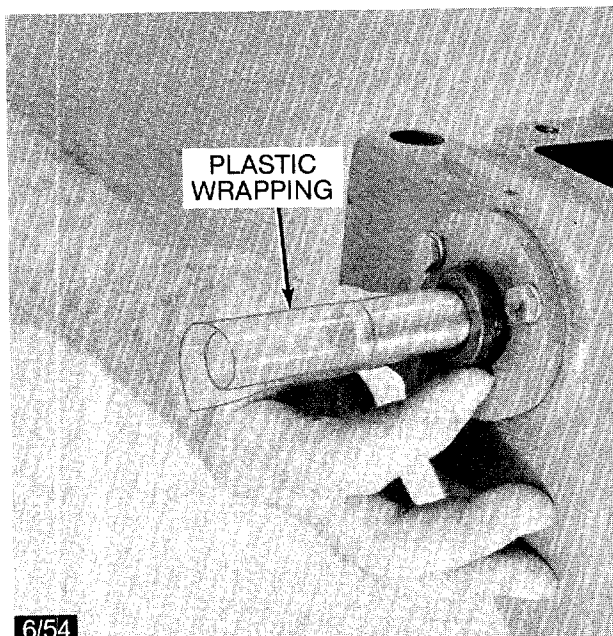
6/52

2. Before installing the new seal, make sure that the keyway and the snap ring grooves on the shaft don't have any burrs or sharp edges that will cut the seal. Use a fine file or fine emery paper to gently smooth off any rough spots or rust, but don't polish the area where the seal will fit on the shaft! Next, clean off any oil or debris on the back of the cap and the front of the transmission housing (where the gasket goes).



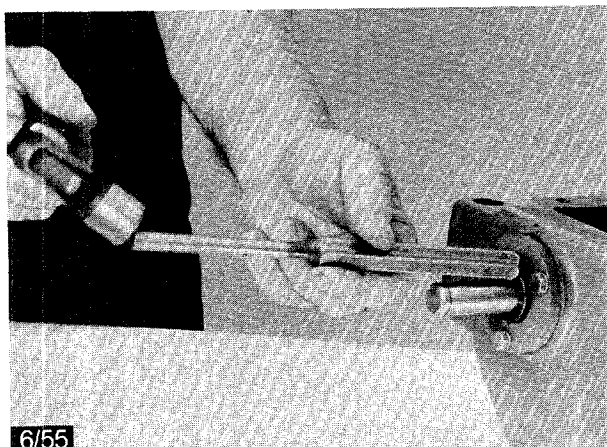
6/53

3. Install the new gasket on the front bearing cap (with the holes in the gasket aligned with the holes in the cap) and tap the cap into place with a soft mallet, being careful not to hit your fingers! Install the lockwashers on the mounting screws, coat the screw threads with *non-hardening* gasket sealant, and securely replace the screws in the cap.



6/54

4. To further protect the seal from being cut during installation, first wrap the shaft tightly with the sheet of thin, flexible plastic. If plastic isn't available, use some letter paper stationery or transparent tape to cover the keyway and the snap ring grooves. Then, lightly oil the shaft and wrapping and slide the oil seal (*the side with the spring in it goes on first*) over the shaft and up to the bore in the bearing cap. Now remove the plastic, paper or tape.



6/55

5. Apply a coating of *non-hardening* gasket sealant around the outside edge of the seal. The sealant will help to prevent oil leaks from developing between the seal and the bearing cap. Now, use a blunt tool (such as the flat end of a drift pin) to install the seal evenly and flush inside the cap.

NOTE: Before you replace the lower pulley and engine, this is a perfect time to check for forward/backward play or movement of your drive shaft. To do so, please see "Checking and Adjusting Drive Shaft End Play" on Page 160.

How to Remove and Install Bolo Tines

- Removing and Replacing Bolo Tines and Holders Pages 146-147.
- Removing Bolo Tine Gangs Pages 147-148.
- Assembling and Installing Bolo Tine Gangs 149-152.

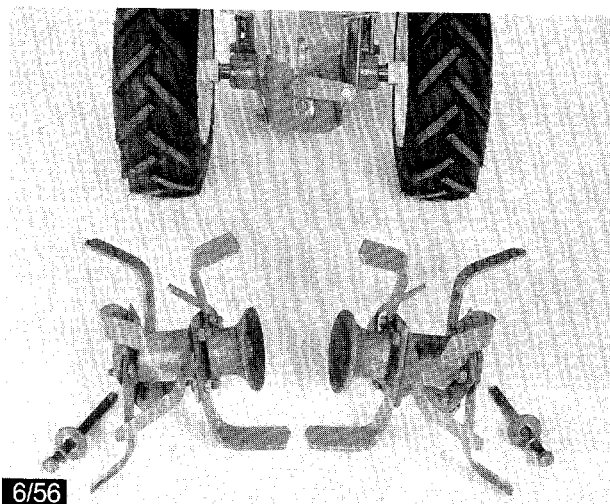
Removing and Replacing Bolo Tines and Holders

Here are simple steps to follow if you want to remove and replace the Bolo Tines *and* their holders, as shown in Photo 6/56. You should use this procedure whenever you wish to install Cultivating or Pick Tines, or if you merely want to remove the tine and holder assemblies in order to inspect or service the tiller shaft area. Although you may be a little cramped for space, you should be able to remove the tines without having to take off the tiller hood (for hood removal instructions, see Page 140).

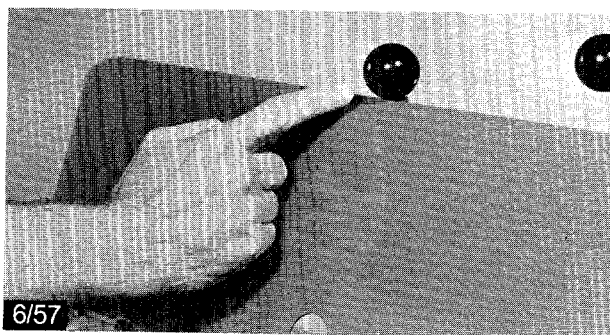
TOOLS YOU'LL NEED

- Soft Mallet
- 3/4" Wrench
- General purpose grease

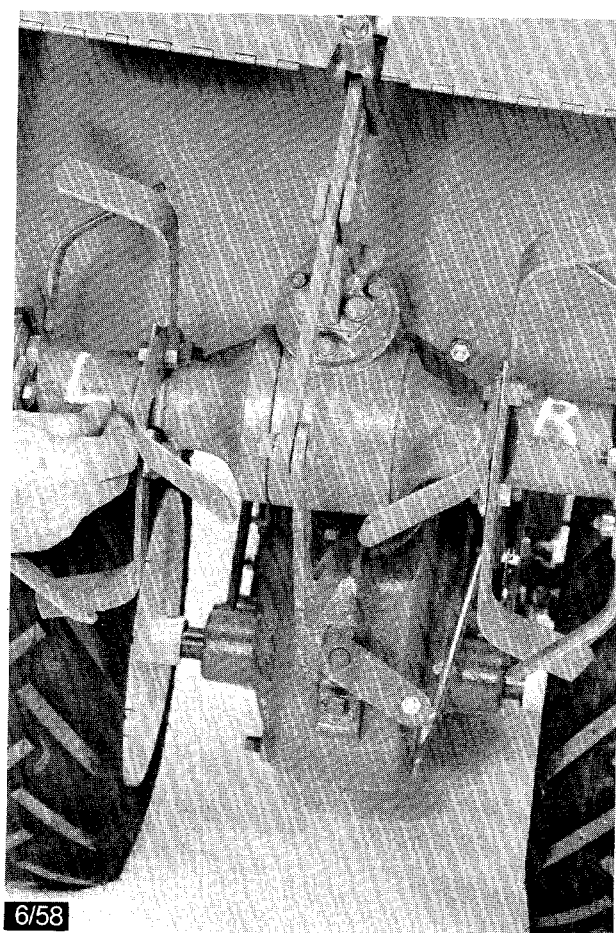
CAUTION: Please do not start this job until you've disconnected the spark plug wire from the spark plug and moved the wire away from the engine and fuel tank area.



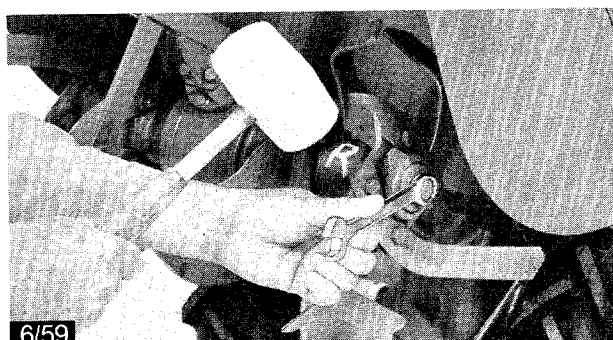
Bolo Tines and holders removed as complete assemblies.



1. First, put the Wheel Speed Lever in Fast or Slow Wheel Speed and place the Forward/Reverse Lever in Neutral. Then, pull your Depth Adjustment Bar all the way up, lift the hood flap, then lower the bar so the knob "catches" the flap, as shown above. This will hold the flap while you're working. Finally, *gently* tilt the tiller forward on its engine blower housing (carefully so as not to dent it).

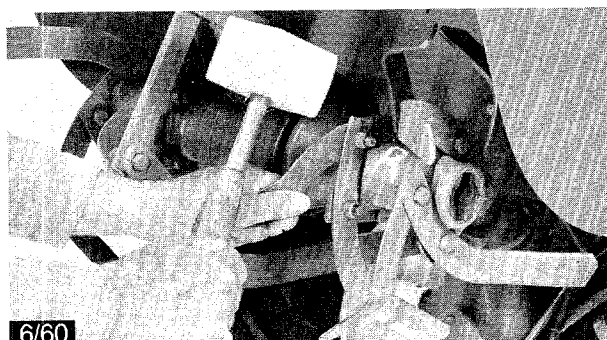


2. Before removing the left or right side tines and holders, it's a good idea to mark them with a "Left" and "Right" as shown above. In this way, you'll be sure to replace them correctly later on (so that the cutting edges of the tines will enter the ground first when the tiller moves forward). Use chalk, a marking pen, or a piece of tape to mark your holders.



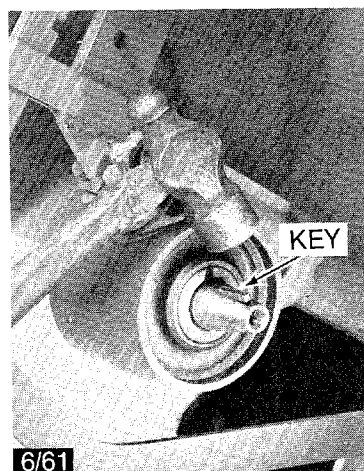
6/59

3. Using a 3/4" or adjustable wrench, remove the bolt, lockwasher and plain washer that retains the holder on the tiller shaft. On the right side, you push **DOWN** on the wrench; push **UP** on the left side bolt. If the bolt is difficult to remove, hold the closed-end of the wrench on the bolt and give the wrench a sharp tap with a *soft mallet*, as shown above.



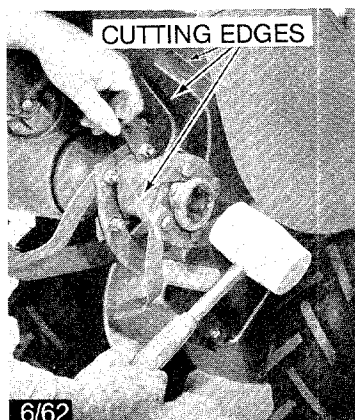
6/60

4. After removing the bolt and washers, use your soft mallet to tap the tines and holder off of the tiller shaft. As you do, hold the tines with one hand so they won't drop on the floor. With the holder removed, clean away any dirt, grass or other debris from around the tiller shaft and from inside the holder.



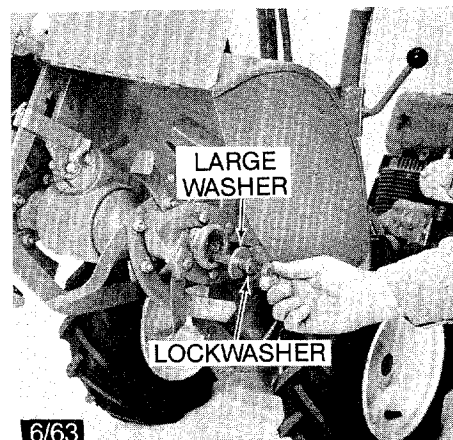
6/61

5. Check to make sure that the 1" x 3/16" metal key is still in the tiller shaft. If it isn't there, then check the keyway in the tine holder. Replace the key in the shaft by *gently* tapping it into place with a steel hammer (be careful not to damage the edges of the key).



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6. When replacing the tine holder assemblies, remember that the tines must be installed so that their *sharp edges* will enter the ground first when the tiller moves forward. Now, carefully line up the keyway in the tine holder with the key in the tiller shaft and tap the holder into place with the soft mallet, as shown above.



6/63

7. Put the lockwasher on the mounting bolt, followed by the large plain washer. Now place a light coating of grease on the threaded portion of the bolt (do not put grease on the unthreaded section) and thread the bolt in as far as you can by hand. Finally, take your wrench and tighten the bolt securely. **NOTE:** When tightening the bolt, do not use a mallet or pipe to exert extra tightening pressure — it will strip the threads! If you have a torque wrench, tighten to 35 ft. lbs.

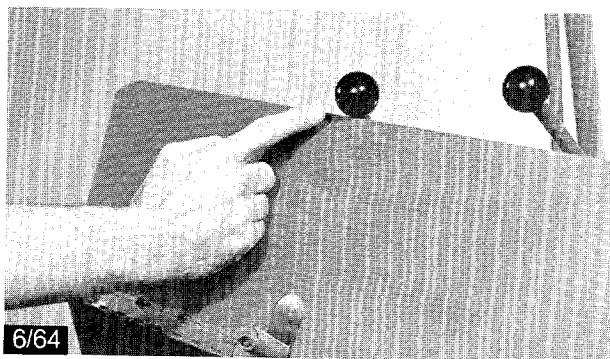
Removing Bolo Tine Gangs

Your Bolo Tines consist of 16 tines assembled into 4 "gangs" of 4 tines each. Each tine gang fits around tine holders that are mounted to the left and right sides of the tiller shaft — see Photo 6/65 on next page. To remove one or more of the tine gangs, but not the tine holders, please follow the step-by-step instructions below. This gang removal procedure should be used if you are going to use your Dozer/Snow Blade (when the tines should be removed for safety, but the holders should be left on for necessary weight), or if you need to replace any or all of the tines with new ones.

TOOLS YOU'LL NEED

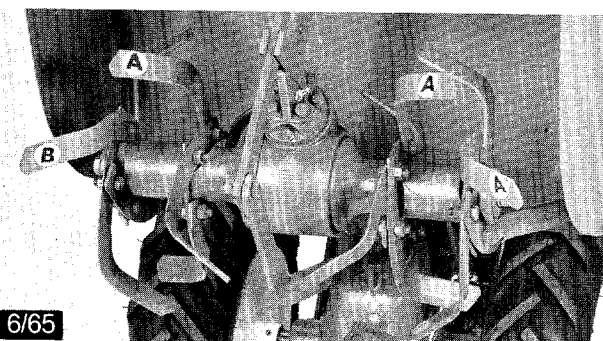
- Two 9/16" Wrenches
- Soft Mallet
- Penetrating Oil (maybe)

CAUTION: Before working near the tines, disconnect the spark plug wire from the spark plug and move it away from the engine and fuel tank area.



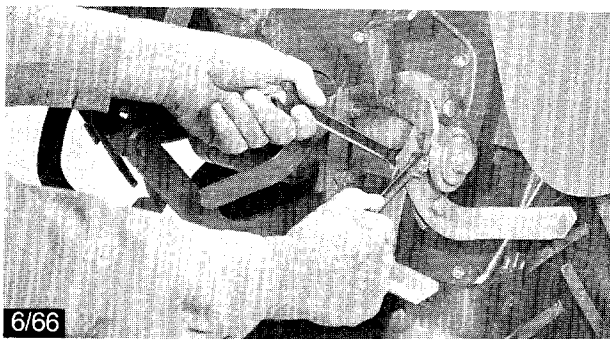
6/64

1. First, put the Wheel Speed Lever in Fast or Slow Wheel Speed and place the Forward/Reverse Lever in Neutral. Then, pull your Depth Adjustment Bar all the way up, lift the hood flap, then lower the bar so the knob “catches the flap”, as shown above. This will hold the flap while you’re working. Finally, *gently* tilt the tiller forward on its engine blower housing (carefully so as not to dent it).



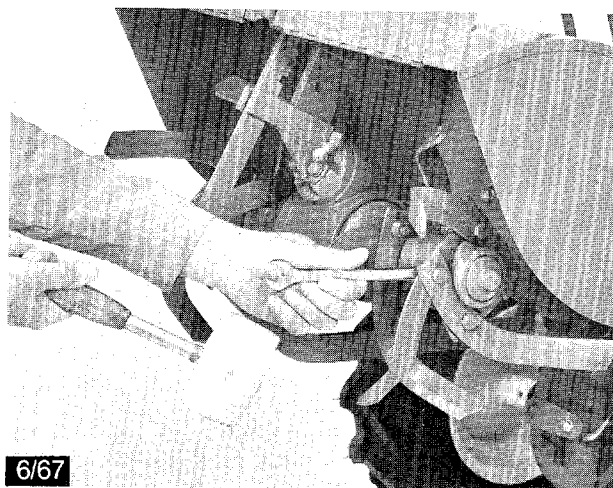
6/65

2. Each tine gang consists of two left hand and two right hand tines assembled in a particular pattern. Three of the gangs are assembled in what we call an “A” pattern; the remaining gang is a “B” pattern. Before you take the gangs off, you should mark one tine in each gang with an “A” or “B”, as shown in the photo above (use chalk, tape or a marking pen). This is very important as it will help you later when you replace these tines, or if you have to assemble new tines into gangs (you can use the old gangs as a guide).



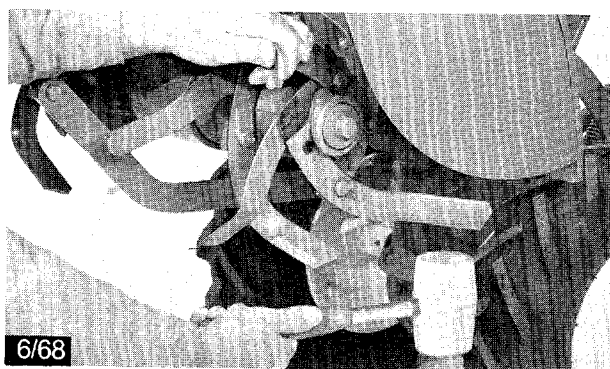
6/66

3. Using two 9/16” wrenches, remove one bolt from a tine gang. Always start with a bolt on the gang nearest the *outside* of the hood. If a nut is stubborn, first use a little penetrating oil on it, or try another nut on the gang (also see Step 3A). When using penetrating oil, saturate the bolt and nut and let the oil soak in. Be patient.



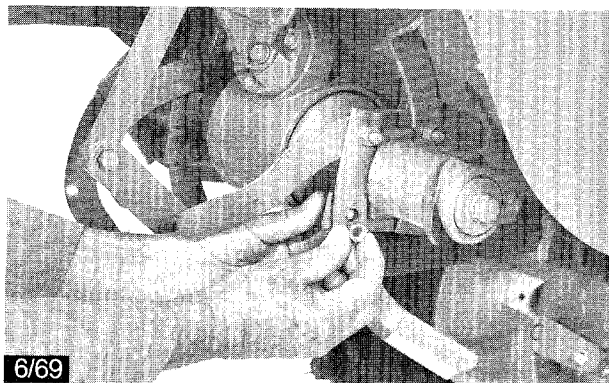
6/67

3A. If necessary, place the closed-end of the wrench on the nut (not the bolt head) and tap the wrench handle with a *soft mallet*.



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4. When the bolt, lockwasher (if any) and nut are removed, use a soft mallet to tap the loose tine in a direction that will open up the gang. You shouldn’t have to bother loosening the other bolts on the gang. Once opened up, the gang usually can be removed easily.



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5. Repeat Steps 3 and 4 on the remaining gangs of tines. The photo above shows an “A” gang being removed from the inside position on the tine holder. If you are going to replace these same tine gangs on your tiller, then simply follow the installation instructions that begin on Page 151. If you are assembling *new* tines into gangs, then follow the assembly and installation instructions that begin on Page 149.

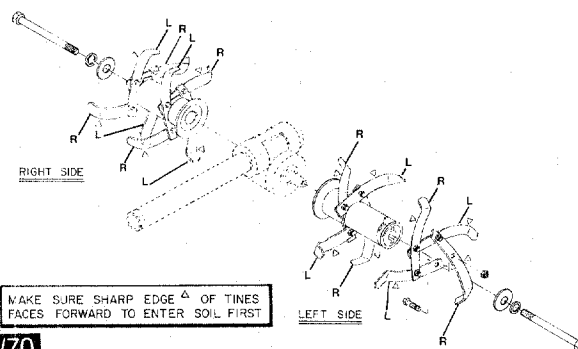
Assembling and Installing Bolo Tine Gangs

As shown in Sketch 6/70, a complete set of Bolo Tines consists of 2 holders, 16 tines (8 left-hand and 8 right-hand), 16 each of bolts and nuts for the tines, 2 tine holder mounting bolts, and 2 sets each of plain washers and lockwashers for the mounting bolts. NOTE: Replacement tine gangs will come to you with a lockwasher and free-running nut for each tine bolt, instead of a bolt and locknut. It's easier for you to assemble the tines with this lockwasher and nut combination.

Before starting, you must first remove your old tine gangs — but not the holders — as explained in the tine gang removal instructions beginning on Page 147.

TOOLS YOU'LL NEED

- Two 9/16" wrenches
- A large, flat blade screwdriver
- A fine metal file (maybe)



6/70

Complete tine assembly as seen from left front of tiller.

CAUTION: Before beginning work, disconnect the spark plug wire from the spark plug and move it away from the engine and fuel tank area.

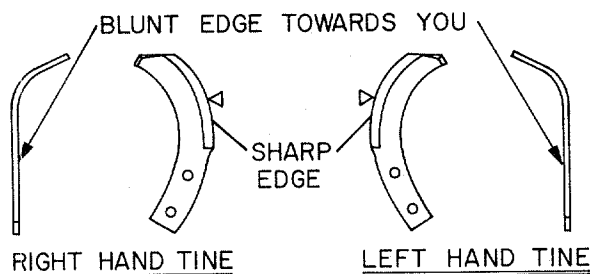
Assembling bolo tines into gangs

To assemble tines properly, please look at the difference between a left-hand and a right-hand Bolo Tine, as shown in Sketch 6/71. Hold each tine with the blunt (non-cutting) edge facing you. If the tine bends to the left it's a left-hand tine; if it bends to the right, it's a right-hand tine. Also, tines are generally stamped 1270L (or 70L) for left-hand tines, and 1270R (or 70R) for right-hand tines.

Next, looking at Photo 6/72, you can see that your tiller will use four "gangs" of tines — three "A" gangs and one "B" gang. Each "gang" consists of two left-hand and two right-hand tines assembled in a special pattern.

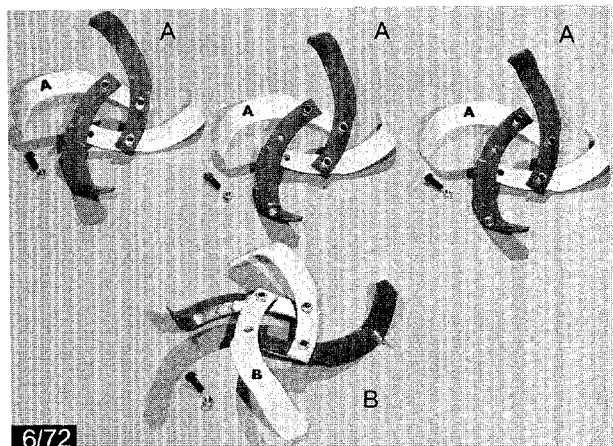
Finally, notice in Photo 6/73 that the empty tine holders are shown with four separate positions marked 1, 2, 3 and 4. Each position is also marked with an "A"

or a "B" to show which type gang of tines goes there. As you'll see in the following instructions, it's easy to assemble and install your tine gangs when you follow this simple "A" and "B" procedure.



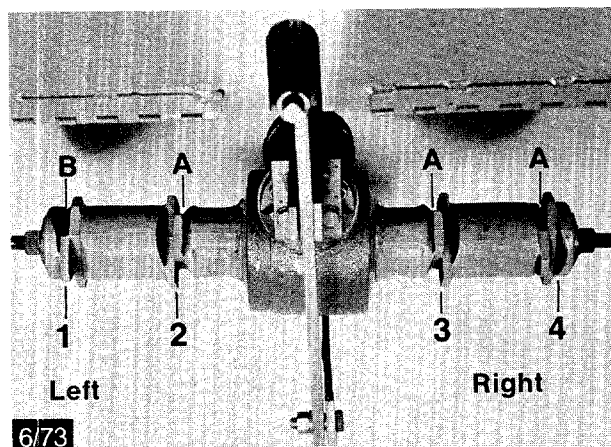
6/71

Note the important difference between tines.



6/72

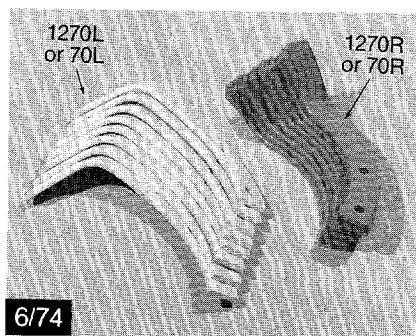
You will be making up three "A" gangs and one "B" gang.



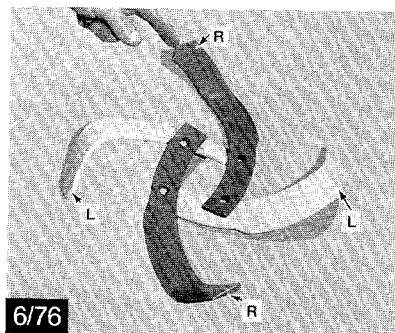
6/73

Empty gang holders are shown with gang positions (viewed from rear of tiller).

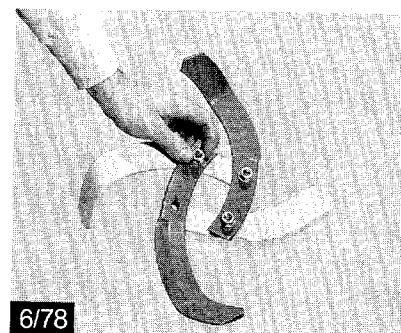
Assembling three "A" gangs



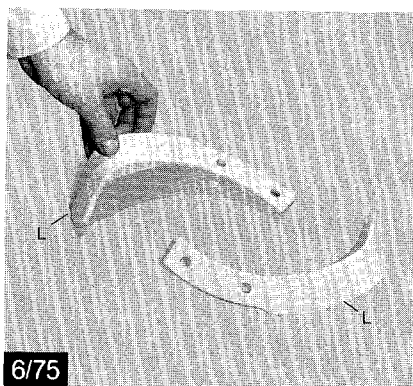
1. Collect the tines, bolts, and nuts together in groups. Place all of the left-hand tines in a stack with their tips facing down. Note that the tines have their tips to your left and their blunt edges towards you. Next, place all of the right-hand tines on the table, so that their tips are farthest away from you and the tips turn up.



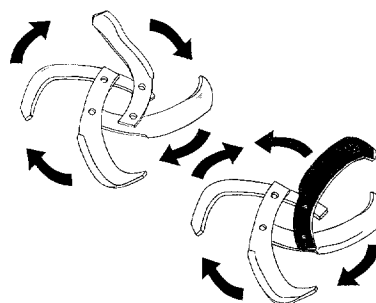
3. Next, as shown above, lay two right-hand tines over them with the tips pointed *up*. As shown in Sketch 6/77, the cutting edges of the tines should now all be facing in the *same* direction (arrows indicate direction of rotation of cutting edges).



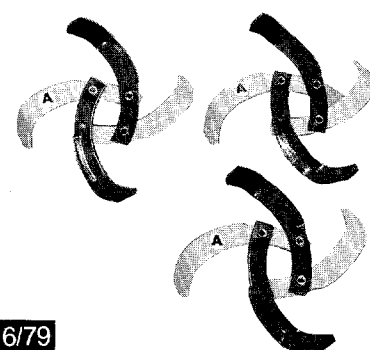
4. Now, put a bolt through three of the holes in the tines. Add the locknut (or lockwasher and nut) but don't tighten them. They must be very loose during later installation on the holders. Don't install the fourth bolt until you install the gang around the holder.



2. Take two left-hand tines and place them in front of you as shown above. Be sure that the tips of the tines are pointed *down* on the table.

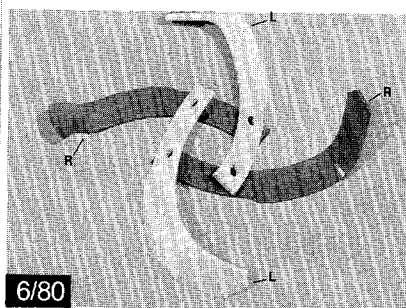


6/77
Tines are facing correctly in sketch at top. In the sketch at bottom, the red-colored tine is heading in the wrong direction. Remember, the *cutting edges* should all be facing in the *same direction*.

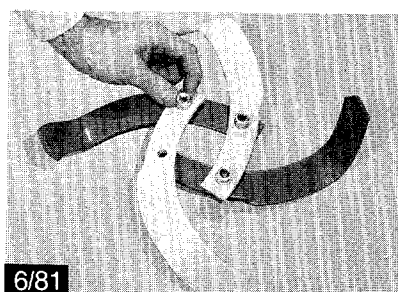


6/79
5. Once you have assembled 4 tines with 3 bolts in what we call a "A" gang, make *two other gangs* just like the first one. When finished, you will have three identical gangs as shown above. Now take a crayon, a marking pen, or a piece of tape and put the letter "A" on the face of one tine in each gang. With three "A" gangs assembled and marked, now make one "B" gang, as explained next.

Assembling one "B" gang



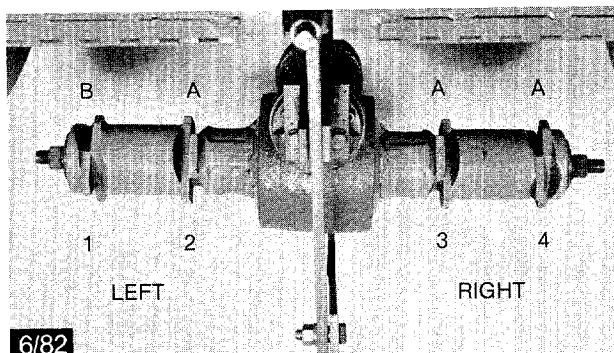
6/80
1. As shown above, first take two right-hand tines and place them *tips up*, horizontally in front of you (dark colored tines in photo). Then, lay two left-hand tines over them, with the tips *facing down*.



6/81
2. With the tines in place (cutting edges of the tines facing in the same direction), loosely install three bolts, as shown above. The fourth bolt assembly doesn't go on until you put the gang around the holder. Now, mark one tine in this gang with a letter "B".

Installing Bolo Tine Gangs

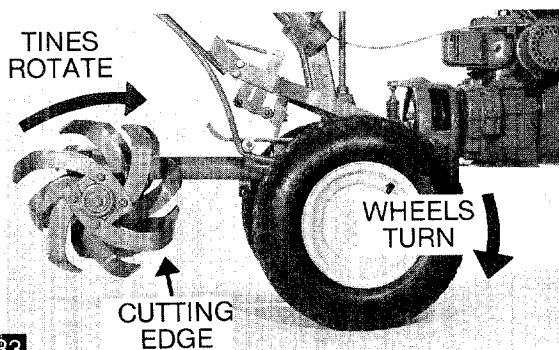
With three "A" gangs and one "B" gang assembled, you're ready to install the gangs on your tiller. Each gang must be installed in the correct location on the tine holders, as shown in Photo 6/82. Also, always



6/82

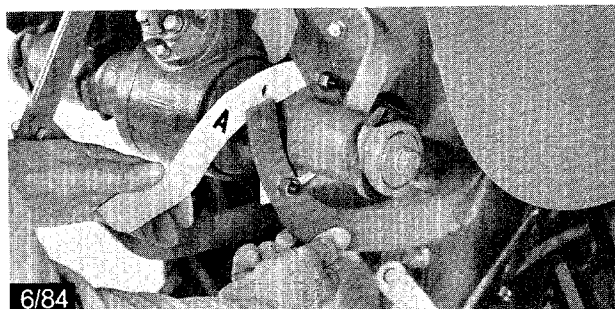
Please be certain that the gangs marked with an "A" are in positions 2, 3 and 4, and the gang marked with a "B" is in position 1 (holders viewed from rear of tiller).

make sure that the cutting edges of the tines will go into the soil first as the tiller moves forward — see Photo 6/83.



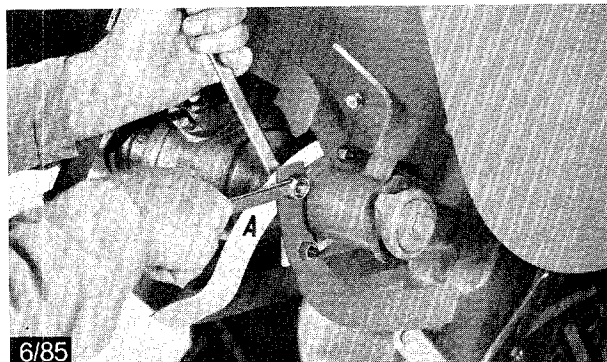
6/83

Make sure that the cutting edges of the tines will enter the soil first when the tiller goes forward. Tines rotate in the same direction as the wheels (hood removed in photo for view of tines).



6/84

1. Take any gang marked with an "A" and wrap it around *position 3* of the tine holder. Rotate the gang until the two inner (left-hand) tines are around one lug and the outer (right-hand) tines are around the other lug. The gang can only go on the holder one way — as long as the tines are installed so that *their sharp edges will enter the soil first when the tiller moves forward.*



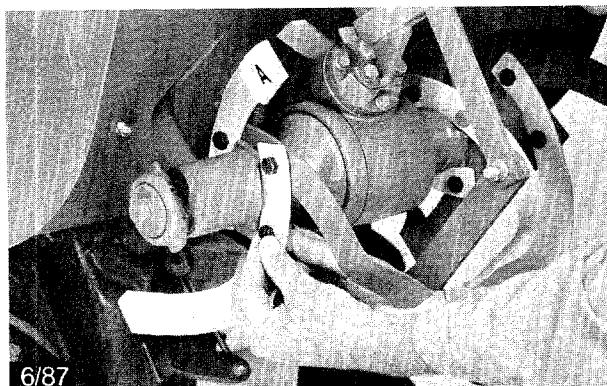
6/85

2. Put a bolt through the two remaining tine holes once you have them aligned. Add a locknut (with new tines use the lockwasher and nut) and tighten all the bolt assemblies with two 9/16" wrenches. NOTE: If you have any problem lining up the holes, please see "Alignment Difficulty" on Page 152.



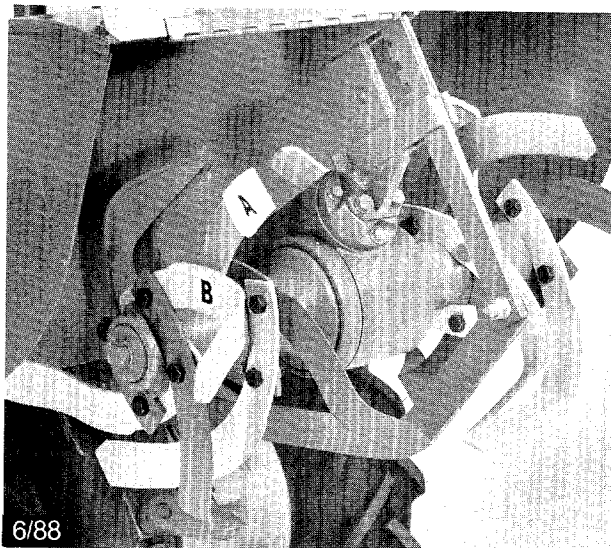
6/86

3. Take another "A" gang and install it in *Position 4* of the tine holder. Add another bolt assembly and tighten all four bolts securely.



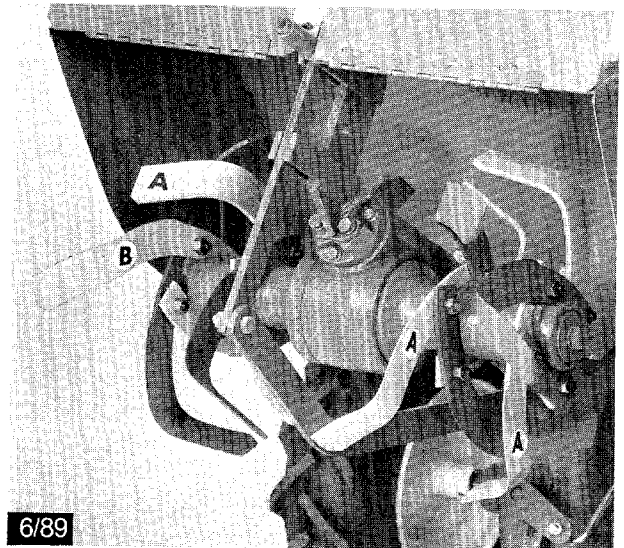
6/87

4. On the left side of the tiller, take the remaining "A" gang and install it in *Position 2*. Again, add a bolt and nut and tighten all four fasteners.



6/88

5. The "B" gang goes on *Position 1* of the tine holder. Install a bolt and nut and tighten securely.



6/89

6. Here's what your complete Bolo Tine assembly should look like. The "A" gangs are at Positions 2, 3, and 4 and the "B" gang is at Position 1. Again, make sure that the sharp edges of the tines will strike the ground first when the tiller moves forward.

Alignment Difficulty

If you have trouble lining up the holes, use a screwdriver placed through the bolt holes to help pry the tines together (Photo 6/90). Or, use a mallet to give the tines a light tap in the proper direction. Also, make sure that the nuts are very loose and pinch the tines together when you have them close to being aligned.



6/90

Pry tines to align holes.



6/91

File rough spots in groove.

Installing and Removing Cultivating Tines

IMPORTANT: Complete sets of cultivating tines are no longer available from Garden Way. However, individual tines, holders, studs and hardware may still be available on a limited basis.

Here are the parts that make up a set of Cultivating Tines (see Photo 6/93):

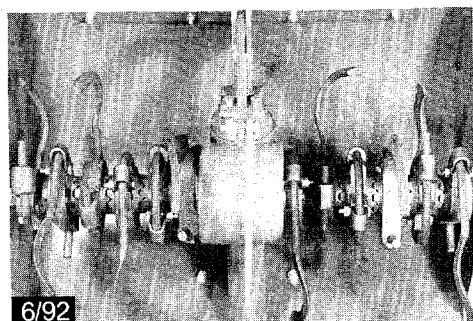
- 6 left-hand tines, 6 right-hand tines
- 1 inside holder, blunt teeth (left side)
- 1 inside holder, pointed teeth (right side)
- 1 outside holder, pointed teeth (left side)
- 1 outside holder, blunt teeth (right side)
- 6 middle holders, (interchangeable)
- 12 clamps, bolts, lockwashers and nuts

2 tine studs, 8" long (not shown)

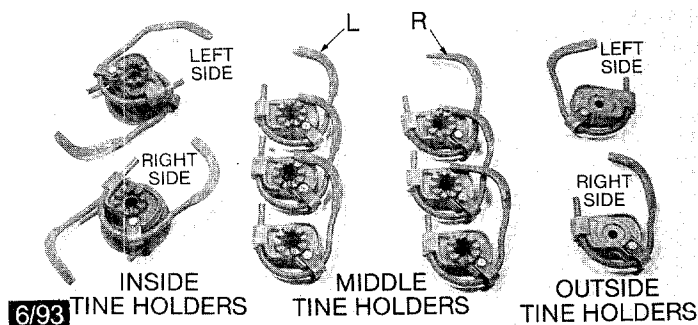
2 nuts and washers for mounting tines on tiller (not shown)

TOOLS YOU'LL NEED

- Soft mallet
- Two 7/16" wrenches
- One 3/4" wrench
- A pair of pliers
- General purpose grease



6/92 Cultivating Tines installed on tiller.

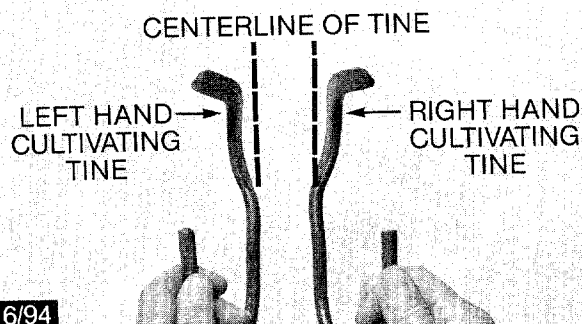


6/93 Cultivating Tines assembled on holders (without studs).

CAUTION: Before installing or removing tines, disconnect the spark plug wire and move it away from the engine and fuel tank area.

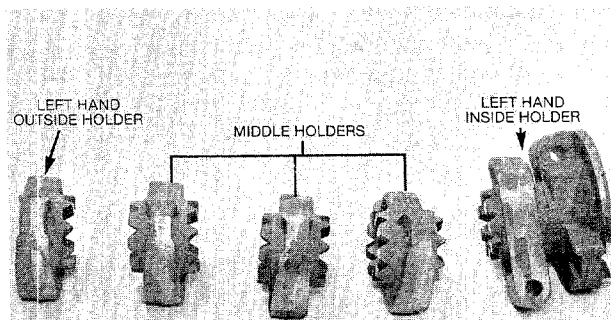
Assembling tines on holders

All tines should be mounted on their holders before installing the tine set on your tiller. When fully assembled, you will have two inside holders (one right-hand and one left-hand tine), three middle holders with left-hand tines, three middle holders with right-hand tines, and a right and left-hand outside holder — see Photo 6/93.

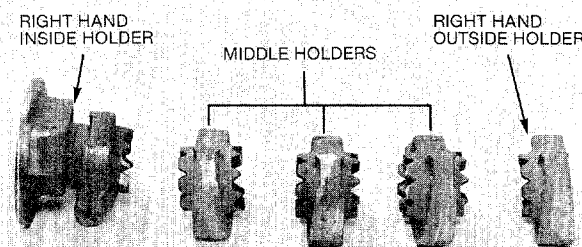


6/94 First bend from line tells.

STEP 1. Divide the twelve tines into two groups of six left and six right-hand tines. To determine whether a tine is a left or a right, hold it by the end of the "U" bend with the *cutting edge of the blade facing away from you* and pointing upward — see Photo 6/94. Notice that the first bend of the blade takes it to your left or right. That first bend away from the center line determines whether it is a left or right-hand tine.

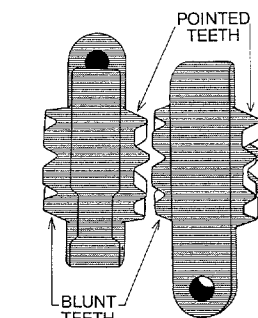


6/95 Tine holders for left side of tiller.

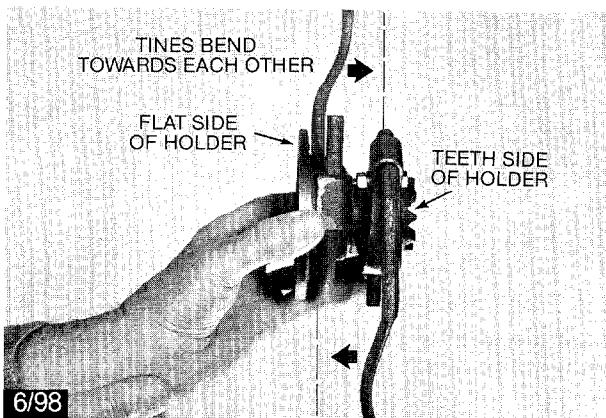


6/96 The right side tine holders are shown above.

STEP 2. Sort the tine holders out, as shown in Photos 6/95 and 6/96. Notice that the middle holders have blunt teeth on one side and pointed teeth on the other side — also see Sketch 6/97. The left-hand inside holder has blunt teeth; the right-hand inside holder has pointed teeth. The left-hand outside holder has pointed teeth; the right-hand outside holder has blunt teeth.



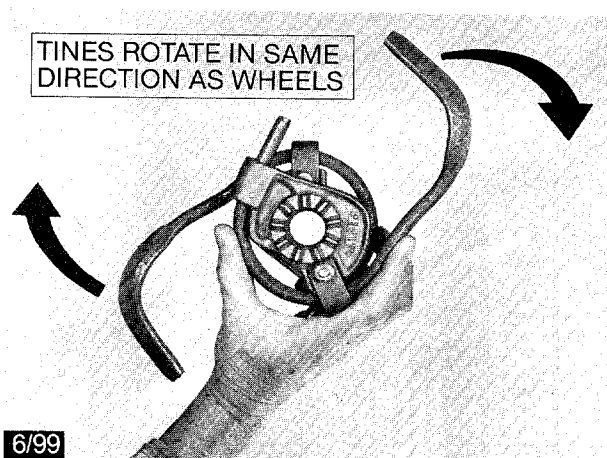
6/97 The middle tine holders are all the same.



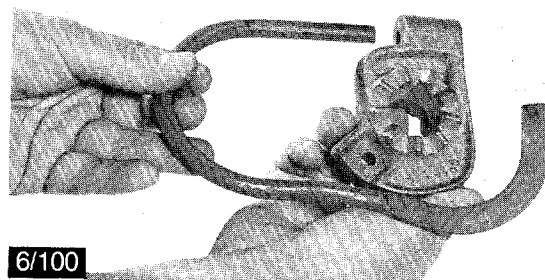
6/98 Tines installed on right side inside holder.

STEP 3. Start assembling with the right-hand inside holder. It will hold two tines and has pointed teeth. Mount a right-hand tine on the flat side of the holder and a left-hand tine on the teeth side of the holder — see Photo 6/98.

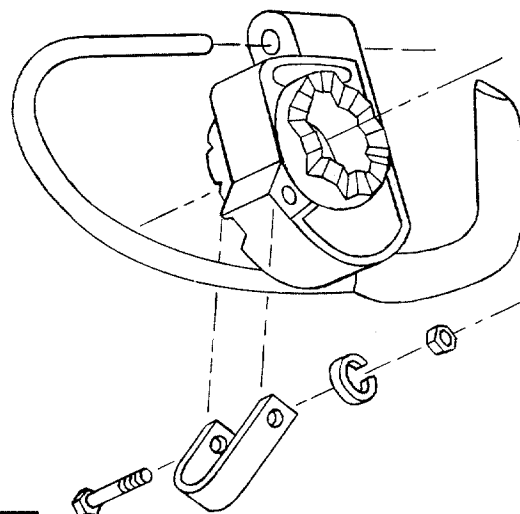
IMPORTANT: Remember that the tines rotate in the same direction as the wheels. When the tiller moves forward, the knife-like edge of the Cultivating Tines goes into the ground first — see Photo 6/99.



6/99 The cutting edge of Cultivating Tines must enter the soil first when the tiller moves forward (hand is holding two middle tine holders).



6/100 Insert blunt end of tine through holder.



6/101 Add tine clip, bolt, lockwasher and nut.

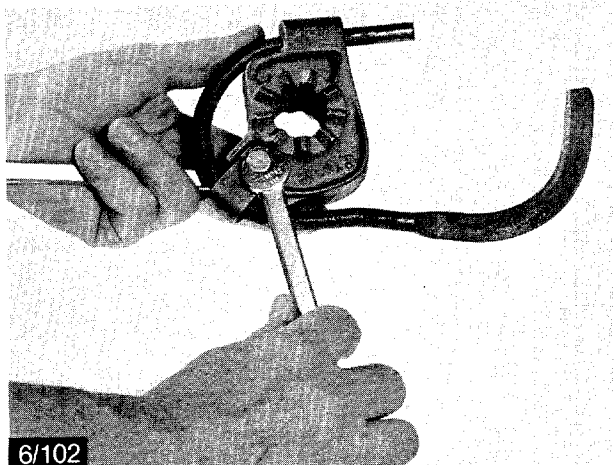
STEP 4. A tine is mounted on the holder by inserting the blunt end of the tine into the holder (Photo 6/100). The tine is then held in place by a “U” clamp (Sketch 6/101) with the bolt going from the outside toward the center of the holder. Add a lockwasher and nut and tighten with two 7/16” wrenches as shown in Photo 6/102. **NOTE:** On the inside tine holders it is not possible to have both bolts facing inward — the bolts will head toward each other.

STEP 5. If the right-hand inside holder has been assembled correctly, the two tines will bend toward each other, as shown in Photo 6/98. Now, assemble the left-hand inside holder with a left-hand tine on the flat side of the holder, and a right-hand tine on the teeth side of the holder. Please note that the innermost tine on the inside holder always bends away from the tiller housing.

STEP 6. Install three left-hand tines and three right-hand tines on the middle tine holders — see Photo 6/93.

STEP 7. Take your left-hand outside holder (with pointed teeth, see Photo 6/95) and install a right-hand tine. Finally, install a left-hand tine on the right-hand outside holder.

STEP 8. All of the tines should now be mounted on their holders as shown in Photo 6/93.



6/102

Tighten until lockwasher is flattened.

Installing Tines and Holders on Tiller

The following steps show you how to install the tines and holders on the right side of the tiller (viewed from operator's position). The installation of tines on the left side is accomplished simply by using the right side as a pattern. (When you are ready to do the left side, start with the left-hand inside holder.)

STEP 1. Fit the right-hand inside holder (the one with pointed teeth) against the tiller housing so that the slot on the inside of the holder fits over the $\frac{3}{16}$ " x 1" metal key in the tine shaft. Then, use a *soft mallet* to tap the holder into place (Photo 6/103). **IMPORTANT:** Be sure that the inside holder is installed so that the cutting edges of the tines will strike the ground first when the tiller moves forward — see Photo 6/99.

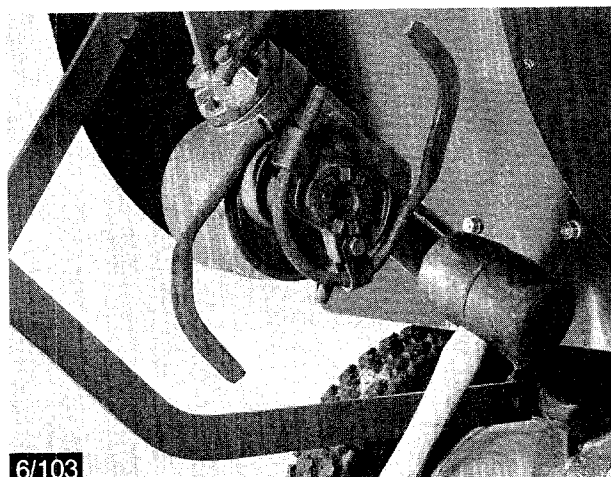
STEP 2. Grease the end of the stud with the most threads and insert it into the end of the tiller shaft. Tighten it firmly with pliers, taking care not to touch the threads on the stud with the pliers (Photo 6/104).

STEP 3. Take a middle holder having a right-hand tine and slide it onto the stud. Note how the blunt teeth (see Sketch 6/97 and Photo 6/93) fit into the spaces between the pointed teeth on the inside holder. The tine will bend away from the inside holder. **NOTE:** It is best to hold this tine in place as you install each successive tine holder.

STEP 4. Take a middle holder having a left-hand tine and install it on the shaft with the blunt teeth side going on first. If these middle holders are correct, their tines will bend toward each other, as shown in Photo 6/105.

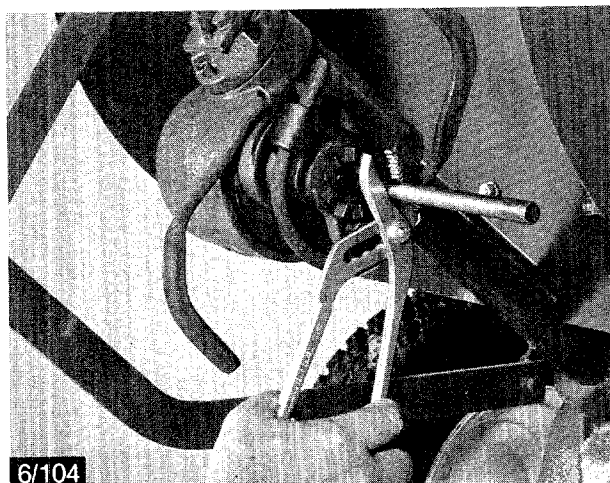
STEP 5. Take a middle holder, having a right-hand tine, and install it with the blunt teeth side going on first. (See Photo 6/105).

STEP 6. The right side outside holder (with a left-hand tine and blunt teeth), goes on last with the blunt teeth side facing the middle holders (flat side out). The tines on the outside holder and the nearest middle holder should be bending toward each other.



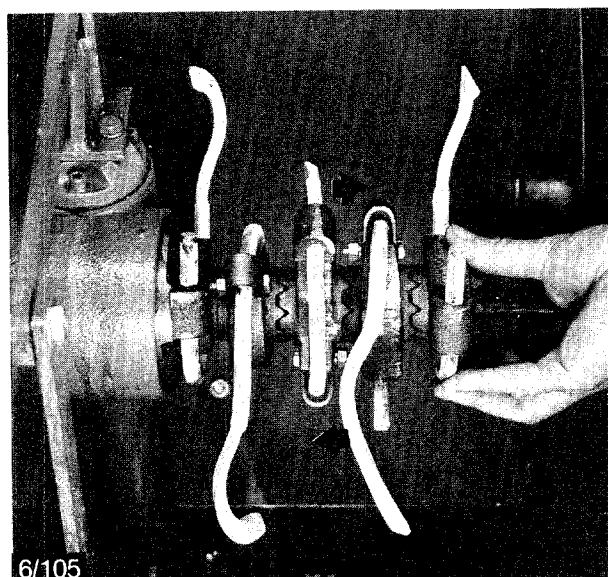
6/103

Use a mallet to tap inside holder into place.



6/104

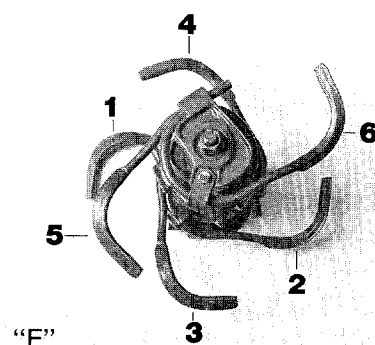
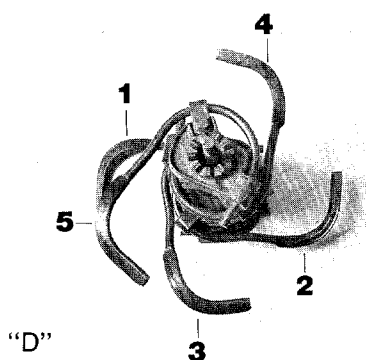
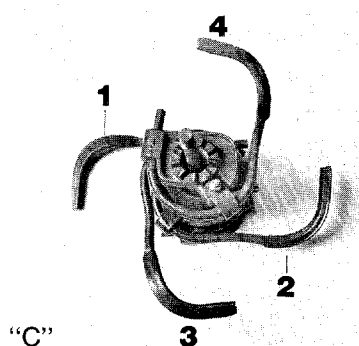
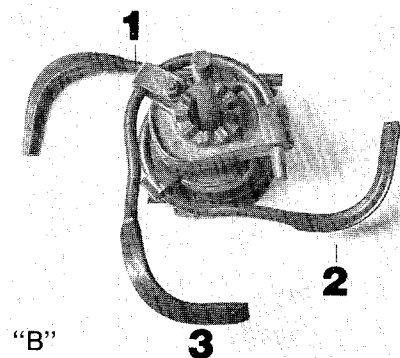
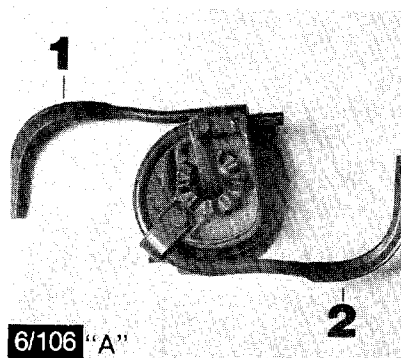
Use pliers to tighten stud in tiller shaft.



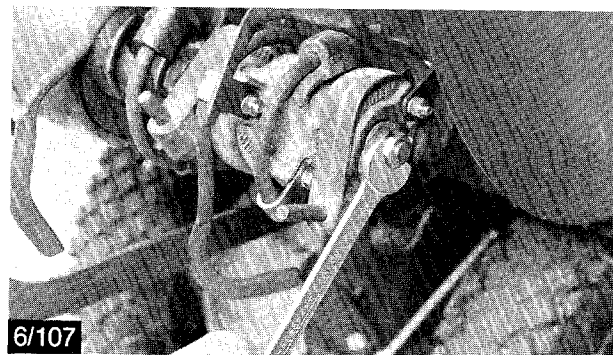
6/105

Inside holder and three middle holders installed.

STEP 7. Now, follow Photo 6/106 (from "A" through "E"), and arrange the tines in a "pin wheel" effect by aligning each successive tine up, as shown by the numbers in the photos. Please note that no two tines on the right side should strike the ground at the same time. Again, make sure that the cutting edges of the tines will enter the ground first when the tiller moves forward.



STEP 8. When the holders are positioned correctly, add the lockwasher and nut to the stud and tighten securely — Photo 6/107.



Tighten nut securely with a 3/4" wrench.

Removing Cultivating Tines

As you remove the tines from each side, keep them in exact left to right order. Then, when all of the tines are removed from the right side, place them on the stud and mark them with a note, "for right side." Do the same with the left side tines. Later, when you want to install the tines again, you'll already have the holders conveniently separated.

STEP 1. Stop the engine and disconnect the spark plug wire so the engine can't possibly start.

STEP 2. Gently tilt the tiller up on its engine, taking care to place something underneath the engine blower housing to protect it from damage.

STEP 3. Take a 3/4" wrench and remove the tine nut, as shown in Photo 6/107. Place the nut and lockwasher in your pocket so you won't lose them.

STEP 4. Now, remove two or three holders from the tine mounting stud. This will give you room to get at an unthreaded portion of the tine stud. (NOTE: As you remove the holders, keep them in left to right order.) Use a pair of pliers (or vise-gripping pliers) to unscrew the stud from the tiller shaft. The remaining tine holders and tines will drop to the ground as you remove the stud. You can use a soft mallet to tap off the inside holder from the tine shaft (be sure to replace the 3/16" x 1" metal key in the shaft if it comes off with the holder.)

Installing and Removing Pointed Pick Tines

IMPORTANT: Complete sets of Pick Tines are no longer available from Garden Way. However, individual tines, holders, studs and hardware may still be available on a limited basis.

A complete set of Pointed Pick Tines consists of twelve tines and the holders and fasteners listed below and shown in Photo 6/109. All of the "S" shaped tines are interchangeable, there are no left or right-hand tines.

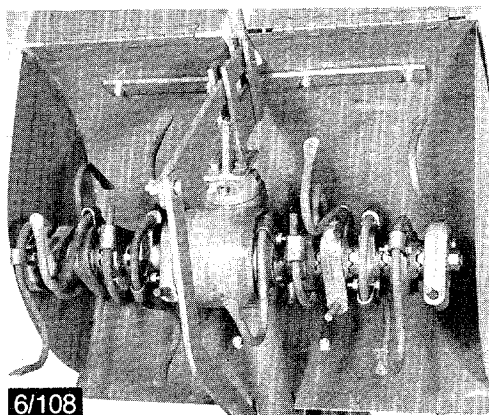
- 12 tines
- 1 inside holder, blunt teeth (left side)
- 1 inside holder, pointed teeth (right side)
- 1 outside holder, pointed teeth (left side)
- 1 outside holder, blunt teeth (right side)
- 6 middle holders (interchangeable)
- 12 clamps, bolts, lockwashers and nuts
- 2 tine studs, 8" long (not illustrated)

2 nuts and washers to mount tines on tiller (not illustrated).

TOOLS YOU'LL NEED

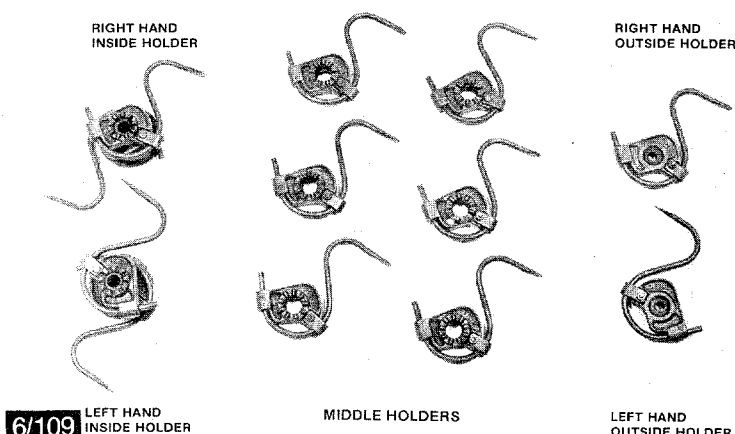
- Soft mallet
- Two 7/16" wrenches
- One 3/4" wrench
- A pair of pliers
- General purpose grease.

CAUTION: Before installing or removing tines, disconnect the spark plug wire and move it away from the engine and fuel tank area.



6/108

Pointed Pick Tines installed on tiller.



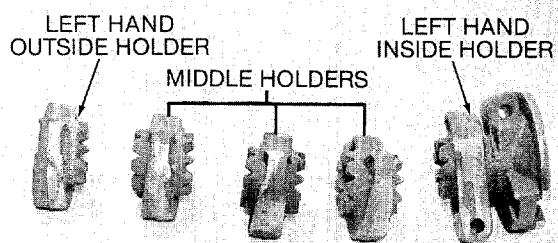
6/109

Assembled set of Pointed Pick Tines and holders.

Assembling Tines on Holders

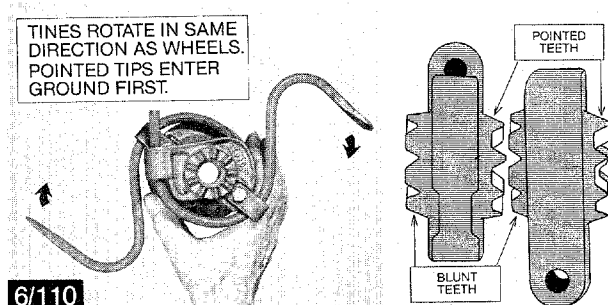
STEP 1. Please remember that the pointed tip (pick end) of the tine always enters the ground first when the tiller moves forward (Photo 6/110).

STEP 2. Sort the tine holders out, as shown in Photos 6/112 and 6/113. Notice that the middle holders have blunt teeth on one side and pointed teeth on the other side — see Sketch 6/111. The left-hand inside holder has blunt teeth; the right-hand inside holder has pointed teeth. The left-hand outside holder has pointed teeth; the right-hand outside holder has blunt teeth.



6/112

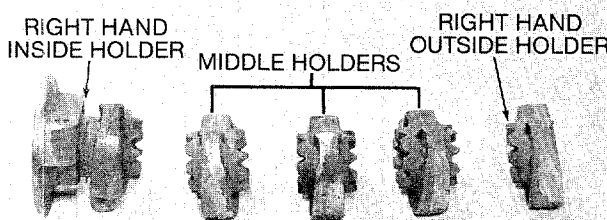
Holders for left side of tiller.



6/110

Pointed tips of tines strike soil first when tiller moves forward.

6/111



6/113

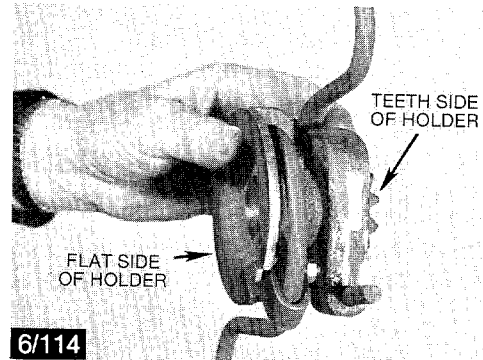
Holders for right side of tiller.

STEP 3. Start assembling with the right-hand inside holder. It will hold two tines and is flat on the inside and has pointed teeth facing outward. Mount a tine on the flat side of the holder and another tine on the teeth side of the holder (Photo 6/114).

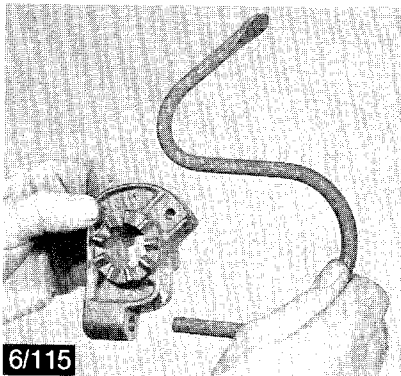
STEP 4. A tine is mounted on the holder by inserting the end opposite the pointed tip in the holder, as shown in Photo 6/115. The tine is held in place by a "U" clamp (Sketch 6/116) with the bolt going from the outside toward the center of the holder. Add a lockwasher and nut and tighten with two 7/16" wrenches, as shown in Photo 6/117. NOTE: On the inside tine holders it isn't possible to have both bolts facing inward — the bolts will head toward each other.

STEP 5. If the inside holder has been assembled correctly, the pointed picks of the two tines will enter the ground first when the tiller moves forward (see Photo 6/110).

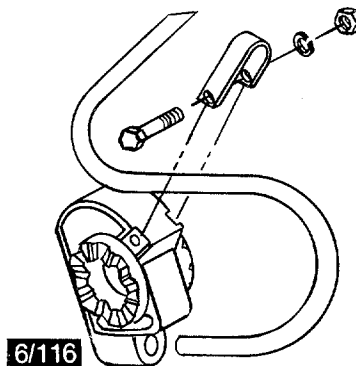
STEP 6. Now, take the left side inside holder and mount two tines on it. Finally, take the middle and outside holders and install a tine in each one. When finished, you should have a completely assembled set as shown in Photo 6/109.



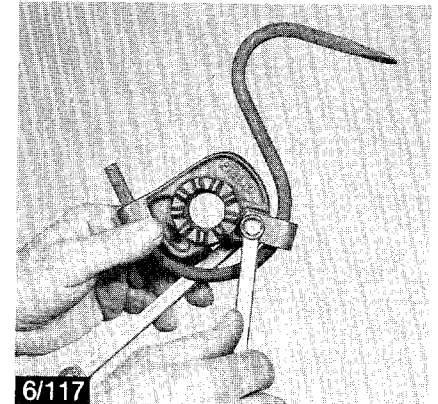
Tines in place on right side inside holder.



Insert blunt end of tine through holder.



Add clamp, bolt, lockwasher and nut.



Tighten with two 7/16" wrenches.

Installing Tines and Holders on Tiller

The following steps show you how to install the tines and holders on the right side of the tiller (viewed from operator's position). The installation of tines on the left side is accomplished simply by using the right side as a pattern. (When you are ready to do the left side, start with the left-hand inside holder.)

STEP 1. Start on the right side of the tiller. Fit the assembled right-hand inside holder against the tiller housing (Photo 6/118) so that the slot on the inside of the holder fits over the 3/16" x 1" metal key in the tiller shaft. The side with the pointed teeth should be facing outward. Tap the holder into place.



Install right-hand inside holder over tiller shaft.

STEP 2. Grease a threaded end of the stud and insert it into the shaft. Tighten firmly with pliers, taking care not to touch the threads on the stud with the pliers (Photo 6/119).

STEP 3. Place three middle tine holders on the stud — blunt teeth side first. Note how the blunt teeth fit into the spaces between the pointed teeth of each successive holder.

STEP 4. Place the right-hand outside holder on the stud, with the blunt teeth side facing the middle holders. The flat side (without teeth) of this holder will be facing outward — see “A” in Photo 6/120.

STEP 5. Now check to be sure that the pointed picks of the tines are all facing so that the *tips will enter the ground first when the tiller moves forward*.

STEP 6. The inside holder is fixed in place, but the three middle and outside holders must be positioned in a staggered or “pin-wheel” style so that no two tines on the right-hand side will touch the ground at the same time (Photo 6/120).

STEP 7. When the holders are positioned, add the lock-washer and nut and tighten securely with a 3/4” wrench (Photo 6/121).

FOR LEFT-HAND SIDE OF TILLER

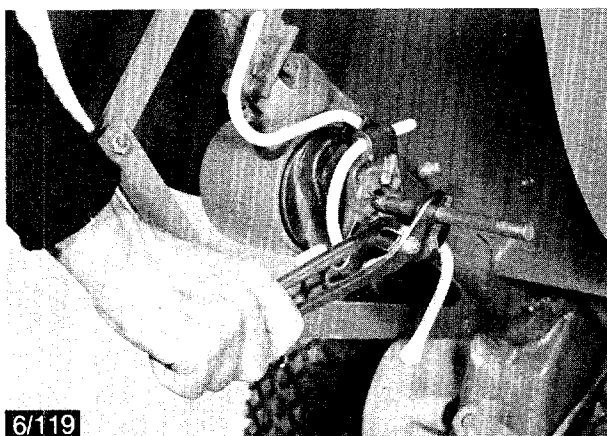
To install the tines and holders on the left-hand side, simply repeat the seven steps outlined above. Please note that the holders on the left side will have blunt teeth facing outward, which will match up with the pointed teeth of each succeeding holder.

Removing Pointed Pick Tines

As you remove the tines from each side, keep them in exact left to right order. Then, when all of the tines are removed from the right side, replace them on the stud and mark them with a note “for right side.” Do the same with the left side tines. Later, when you want to install the tines again, you’ll already have the tines conveniently separated.

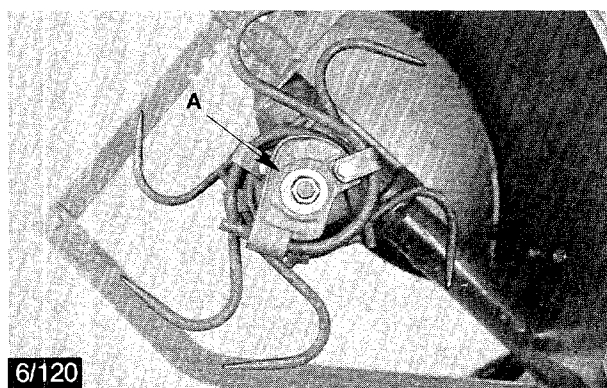
STEP 1. Stop the engine and disconnect the spark plug wire to prevent accidental engine start-up.

STEP 2. Tilt the tiller *gently* forward on its nose, taking care to place something underneath the engine blower housing to protect it from damage.



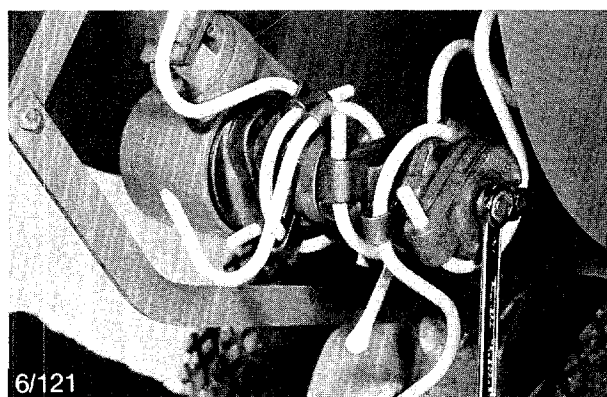
6/119

Install tine stud in tiller shaft.



6/120

Position tines in a “pin-wheel” design.



6/121

Tighten nut securely with a 3/4” wrench.

STEP 3. Using a 3/4” wrench, remove the tine nut and lockwasher, as shown in Photo 6/121. Put the nut and washer in a safe place.

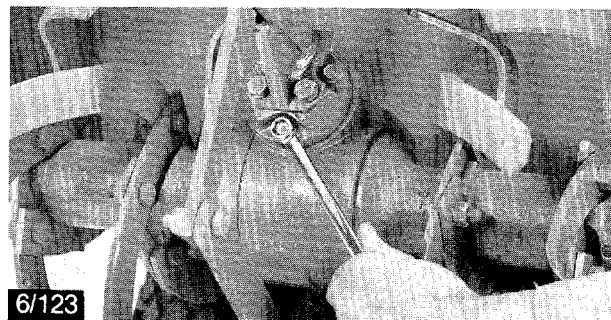
STEP 4. Remove two or three holders from the tine mounting stud. This will give you room to get at an unthreaded portion of the tine stud. Use a pair of pliers (or vise-gripping pliers) to unscrew the stud from the tiller shaft. The remaining tine holders and tines will drop to the ground as you remove the stud. If necessary, you can tap the inside holder off of the tiller shaft (don’t lose the key in the shaft).

Checking and Adjusting Drive Shaft End Play

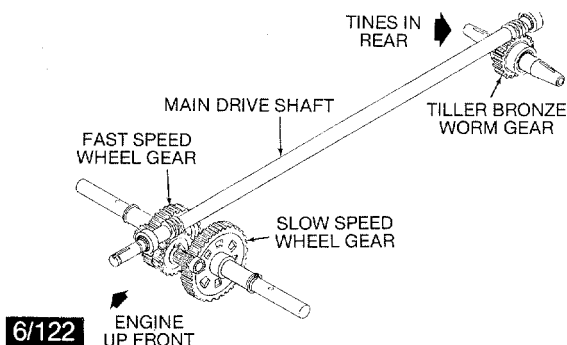
As mentioned in "Theory of Operation" on Page 42, the main drive shaft delivers engine power to the wheel gears and to the tiller bronze worm gear (see Sketch 6/122). In order to work effectively, there should be practically no end play (forward-backward) movement in the drive shaft. Factory specifications call for .002" to .010" (thousandth's of an inch) allowable play. As an example of how little movement this represents, the thickness of a \$1 bill equals only about .004".

This close fit is maintained by shims that are put in from the rear (behind the rear bearing cap) and that are held in place by the bearing cap. If the end cap is allowed to loosen, tiller operation will eventually cause the drive shaft to pound against the end cap until it becomes so loose that transmission gear oil leaks out. Of course, if too much oil runs out, the tiller gears, worms and bearings could be ruined. To guard against such an occurrence, check the three screws in the end cap at least every 10 hours of operation to make sure

they are tight (see Photo 6/123). Loose screws could be due to vibration (or a lack of non-hardening gasket sealant on the screw threads), but if the looseness develops again after you have tightened them, then it is wise to check for excessive drive shaft end play, as explained below. If you discover excessive end play, the shaft will require shimming from the rear.



Three hex head flange screws secure end cap.



Drive shaft delivers engine power to wheel and tine gears.

SHIMS ARE LIKE THIN WASHERS

For those who are unfamiliar with the term "shim", a shim looks like a very thin washer and is used to fill any gap between the end cap and the bearing race to get the proper fit of the drive shaft. The following shims can be obtained from our Parts Department:

PART NO.	DESCRIPTION
1224-1	SHIM .010" thickness
1224-2	SHIM .030" thickness
1224-3	SHIM .005" thickness (thinnest)
1224-4	SHIM .062" thickness (thickest)

NOTE: One "10" is better than two "5's".

Checking for Drive Shaft End Play

It is possible to determine the amount of end play in the drive shaft — without removing the engine — by following the simple steps below.

Before beginning, please remember that although there should be almost no play in the shaft, it cannot be so tight as to cause binding on the bearing in the rear. This would heat up the bearing and eventually do much damage. (NOTE: It is extremely rare to find a factory adjusted drive shaft having too little play in it).

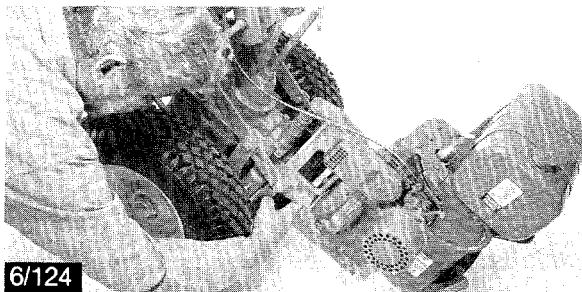
On the other hand, being too loose will cause misalignment that can wear out the worm, worm gear, bearings, and front drive shaft oil seal. It can also loosen the end cap during tilling. What you are looking for is the bearest amount (or "trace") of play.

STEP 1. Disconnect the spark plug wire and move the wire away from the spark plug and the fuel tank area. Place the Forward/Reverse Lever in Neutral. Gently tilt the tiller forward onto the engine's blower housing.

STEP 2. Take a 3/8" wrench and securely tighten the three hex head flange screws in the end cap — see

Photo 6/123. You can't accurately check for end play unless these screws are tight.

STEP 3. Reach into the *lower opening* of the motor mount (Photo 6/124) and locate the end of the drive shaft in the center of the lower (transmission) pulley. You'll feel the end of the shaft protruding about 1/2" from the pulley. Press one finger firmly against the end of the shaft.



Place finger firmly against end of shaft (in center of lower pulley).

STEP 4. With your free hand, grasp the tines and try to rotate them abruptly forward and backward — Photo 6/125. As you do, carefully note the amount of any forward-backward movement at the end of the drive shaft (where your finger is located).

If you feel only the slightest trace of end play (or even none at all), then the drive shaft is adjusted correctly. If, however, you feel very definite forward-backward movement (more than .010", or the thickness of three \$1 bills), then the drive shaft should be shimmed. That is, the shaft should be shimmed until only the slightest trace of end play is felt. In the case of end play that is just beyond the .010" maximum, probably one of the thinnest shims (.005") is all that is required. For more excessive play, you will have to shim accordingly.

How to Shim the Drive Shaft

Once you have determined approximately how much shimming is required, you should order your shims and a new rear bearing cap gasket (Part No. 1124). These items can be ordered separately, or as a convenient drive shaft reshimming kit.

STEP 1. With the engine off and the spark plug wire disconnected, *gently* tilt the tiller forward on the engine's housing cover. The Forward/Reverse Lever should be in Neutral. Clean away any dirt or debris from the end cap area.

STEP 2. Remove the tine safety hood as described on Page 140. With the hood removed, use a 1/2" wrench to remove both mounting bolts that clamp the hood bracket of the depth regulator to the end cap — see Photo 6/126. Lower the depth regulator assembly out of the way.

STEP 3. Using a 3/8" wrench, remove the three hex head flange screws from the end cap (Photo 6/123). As you remove the screws, check to make sure that there is *non-hardening* gasket sealant on the screw's threads. If there isn't, this could be the cause of the end cap screws (and thus the end cap) coming loose.

STEP 4. Tap the end cap lightly with a mallet and pull the cap off — Photo 6/127. If any shims come out with the cap, be sure to replace them inside the housing. Now, remove the old gasket from the cap or the

NOTE: To test for end play when the engine and lower (transmission) pulley are removed, simply grasp the end of the drive shaft firmly and pull it back and forth.



Note end play in shaft as you rock tines back and forth.

TOOLS YOU'LL NEED

- 3/8" wrench
- Soft mallet
- 1/2" wrench
- Non-hardening gasket sealant

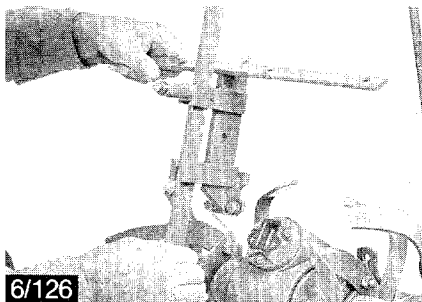
housing and clean off any dirt or debris from these two surfaces.

STEP 5. To shim the excess end play out of the shaft, add the required number of new shims that you estimate will do the trick — without putting undue pressure on the rear bearing.

STEP 6. After adding your shims, install a new gasket on the end cap (do not use gasket sealant) and tap the cap into place (Photo 6/128). Securely replace the three hex head screws, after first applying *non-hardening* gasket sealant to their threads. After tightening the screws, rap the end of the cap firmly with your mallet. Now, tighten the screws again.

STEP 7. Test for end play by again holding the end of the shaft with your finger and rotating the tines with your other hand. If you feel just a "trace" of play (.002" to .010"), then the shaft has been adjusted properly. Otherwise, increase or decrease the shimming thickness as necessary, by repeating Steps 5, 6 and 7.

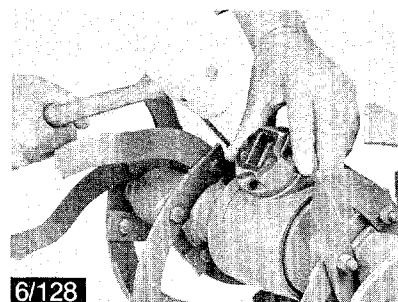
As a final check, test for end play again after you have operated the tiller in the garden for an hour or two.



Remove depth regulator bolts.



Shims adjust "play" in shaft.



Install gasket and tap on end cap.

Engine Removal and Replacement

Removing the engine from your tiller — to repair or replace the engine, or to repair internal tiller transmission parts — is not very complicated at all. Briefly, here are the simple steps that you will have to take (complete instructions follow):

1. Disconnect the throttle cable from the engine.
2. Remove the reverse disc.
3. Remove the drive belt.
4. Detach clutch control yoke and remove engine mounting bars.
5. Lift and remove engine from tiller.

NOTE: If you have an 8HP B & S engine, refer to the green-covered, 8HP Owner's Manual Supplement (or call us) for details regarding the throttle cable, engine shims, or removing and replacing wires on the electric start model.

REMOVING THE ENGINE

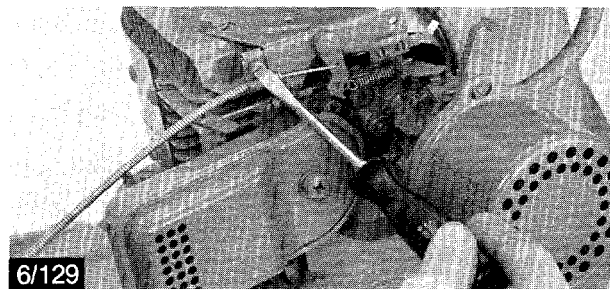
Part One: Remove Throttle Cable

STEP 1. For 6 HP Tecumseh Engines — As shown in Photo 6/129, loosen the throttle cable mounting clip and lift the cable out of the clip. Then, disconnect the throttle wire from the speed control lever at the carburetor, being careful not to bend the tip of the wire out of shape. Remember, it's *extremely difficult* to rebend the shape at the end of the throttle wire, so treat it accordingly. Also, be careful not to kink or bend the throttle cable when it is free. Gently loop the cable backwards and tuck it out of the way.

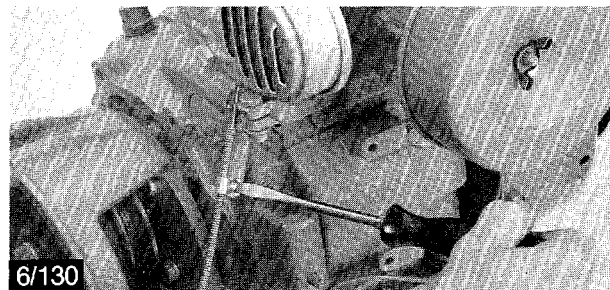
STEP 2. For 7 HP Kohler Engines — As shown in Photo 6/130, loosen and remove the throttle cable mounting clip from the engine control arm. Now, remove the throttle wire from the governor control disc, being *very careful* not to bend the tip of the wire out of shape. With the cable free, gently loop it backwards and tuck it out of the way, being careful not to bend or kink it.

TOOLS YOU'LL NEED

- Flat blade screwdriver
- 9/16" wrench
- Wood stick (about 5/16" thick, 1-3/4" wide and 12" long)
- Two 1/2" wrenches
- 1/2" dia. drift pin, dowel, or steel rod
- Mallet or hammer
- General purpose grease



6 HP engine throttle cable removal.



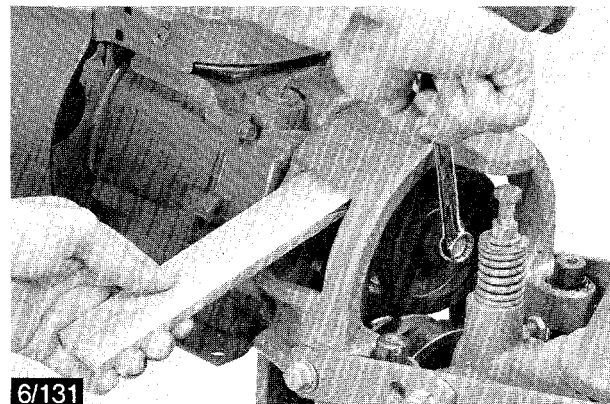
7 HP engine throttle cable removal.

ATTENTION OWNERS OF ELECTRIC START TILLERS: Before proceeding to Part Two, you should first remove the battery and its bracket as explained in the instructions starting on Page 171. After you have completed those steps, return to Part Two, below.

Part Two: Remove the Reverse Disc

CAUTION: To prevent accidental engine start-up, first disconnect the spark plug wire and move the wire away from the plug and the fuel tank area.

STEP 1. As shown in Photo 6/131, wedge a stick under the left side of the motor mount between the engine (upper) pulley and the mount. Make sure the stick is on the portion of the pulley without the belt. Pull up on the stick *hard enough* to hold the pulley from turning, while you use a 9/16" wrench to push down (counterclockwise) on the disc's mounting bolt. Pulling up hard on the stick and pushing down on the wrench should break the bolt loose.



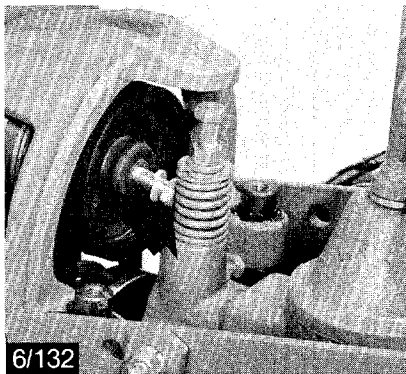
Use stick to keep engine pulley from turning.

STEP 2. Unthread the bolt all the way, until it touches the reverse spring and plunger assembly — see Photo 6/132. Don't try to completely remove the bolt at this time.

STEP 3. Put a screwdriver behind the rubber reverse disc where the disc and the cast iron pulley meet — Photo 6/133. Using your hand, tap the screwdriver to

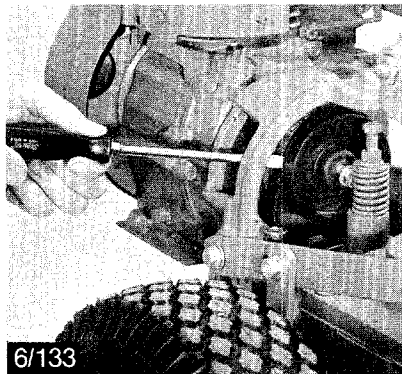
move the disc away from the pulley. It should come loose easily.

STEP 4. Slide the reverse disc outward until it contacts the head of the mounting bolt. Then, turn the disc in your direction (facing a little to the right) as shown in Photo 6/134. Now, remove the mounting bolt and its lockwasher, followed by the reverse disc.



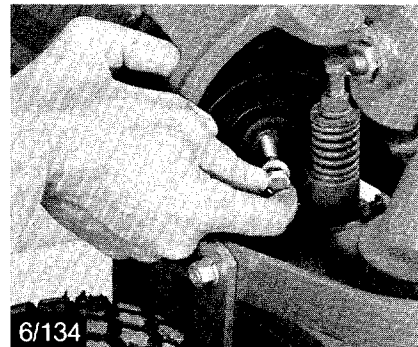
6/132

Unthread bolt as far as you can.



6/133

Separate rubber disc from pulley.



6/134

Remove bolt, lockwasher and disc.

Part Three: Remove the Drive Belt

STEP 1. Shift the Forward/Reverse Lever into Neutral. Now, while on right side of tiller, reach over the engine mount with your left hand and push the belt towards you to give it some slack. With your right hand, reach through the bottom opening on the right side (Photo 6/135), and move the belt on the lower pulley down and away from the pulley, moving it toward the engine. Once it is off the pulley, push the belt over to the left of center.

STEP 2. With the belt fully off the lower pulley, push the belt upward with your finger, as shown in Photo 6/136. This will provide more slack to remove it from the upper pulley.

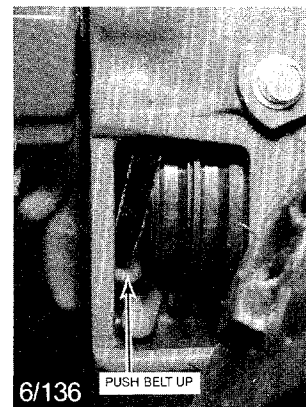
STEP 3. Working on the left side of the tiller, lift the belt up and over the engine pulley, moving it down in front of the pulley — Photo 6/137.

STEP 4. Shift the Forward/Reverse Lever down into Forward. Now, raise the lower end of the belt out from behind the bottom pulley and pull the belt out the front, left side — Photo 6/138.



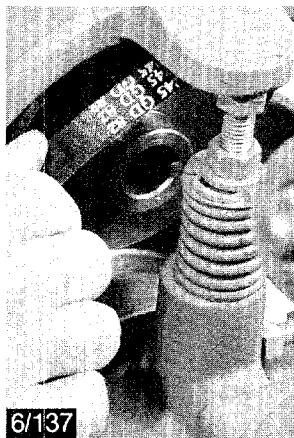
6/135

Move belt toward engine.



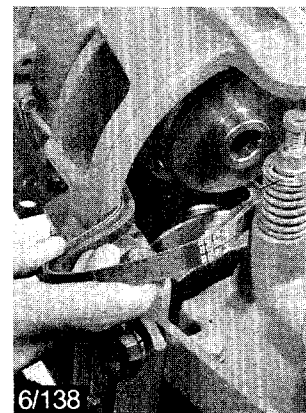
6/136

Push belt up for more slack.



6/137

Lift belt over pulley.

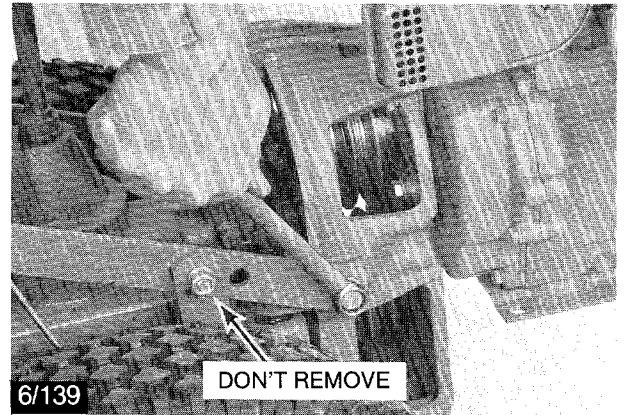


6/138

Remove belt from left side.

Part Four: Detach the Clutch Control Yoke

Using a 9/16" wrench, remove the two bolts (one on each side) that fasten the end of the clutch control yoke to the engine mount — see Photo 6/139. Be careful not to lose the bushing inside the yoke when you remove the bolt and two washers.



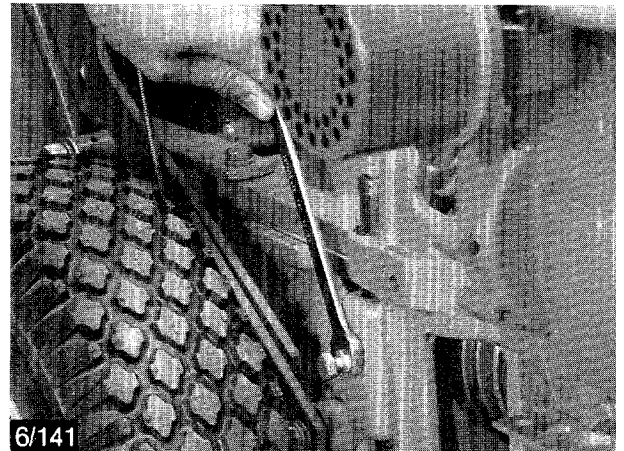
Remove bolt at end of clutch yoke.

Part Five: Remove Engine Mounting Bars

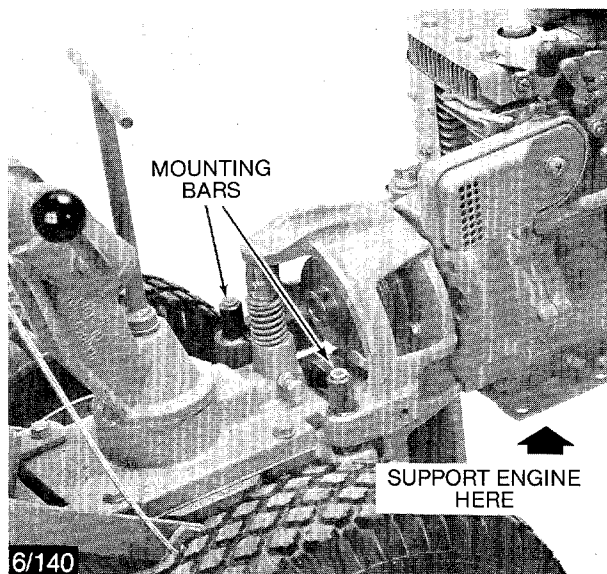
STEP 1. The two engine mounting bars hold the engine in place on the transmission (Photo 6/140). Before removing them, be sure to place a solid support beneath the engine base so it won't fall when the second mounting bar is removed.

STEP 2. There are two bolts (each with a jam nut), on either side of the tiller that lock the mounting bars in place — see Photo 6/141. As shown in the photo, use a 1/2" wrench to loosen the jam nut. Then unscrew the bolt *almost* all the way out.

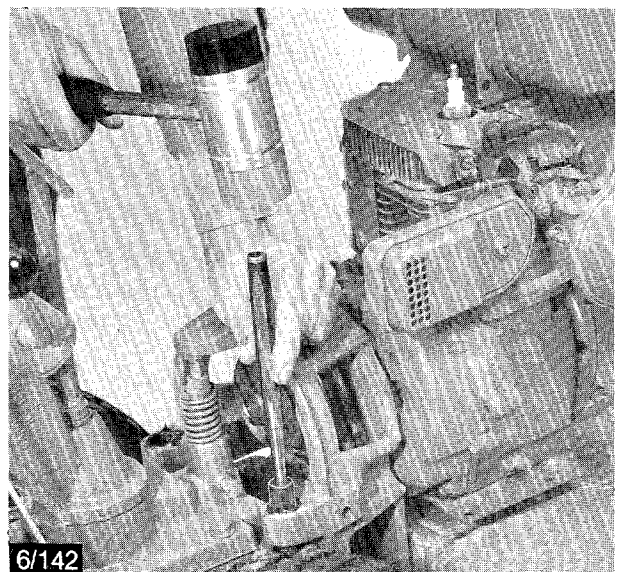
STEP 3. With a solid support placed under the engine, tap each mount bar down to remove the bar from the housing — Photo 6/142. Use a drift pin or steel rod to drive the bars out, being careful not to damage the screw threads in the top of the bars. If necessary, squirt a little oil on the bars so they'll slide out more easily.



Loosen jam nut and unthread (but don't remove) bolt.



Engine mounting bars hold engine in place.

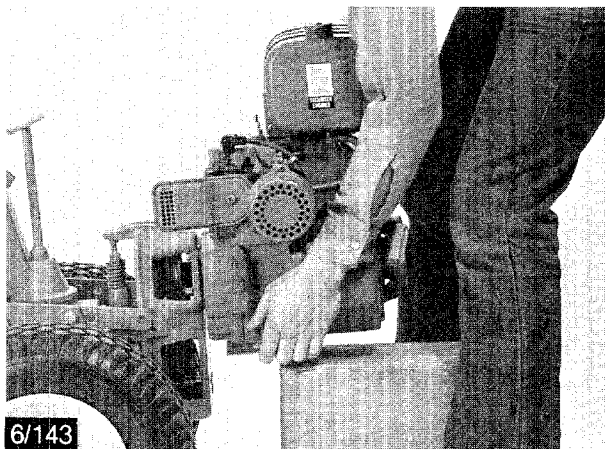


Tap mounting bars down and out.

Part Six: Lift and Remove Engine and Its Mount

STEP 1. Prepare for removal of the engine by having ready a cement block, a sturdy box (about 4-1/2" to 12" high), or a table upon which to place the engine when you remove it. The engine and its mount weighs about 90 lbs., so have someone ready to help you lift it, if necessary.

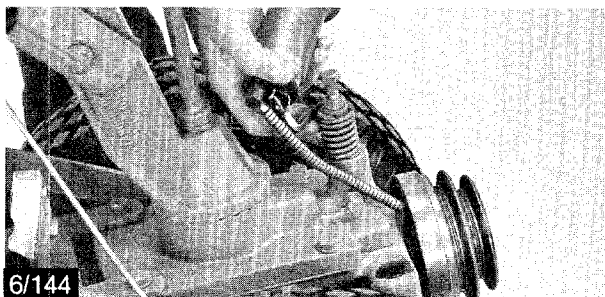
STEP 2. When you lift up the engine (Photo 6/143), don't hold it by the air cleaner or carburetor. You will almost certainly break the carburetor if you do. Instead, pick the engine up with one hand on the steel base and the other hand on the steel bracket that holds the fuel tank. Then, lift the engine and move it towards you, making sure that the engine pulley safely clears the transmission pulley below it.



6/143

Use care when lifting engine.

NOTE: With the engine removed, it's a good idea to squirt a little oil on the transmission shaft in between the transmission pulley and the transmission case (Photo 6/144). This pulley should have a small amount (about 1/16") of lateral "float" on the shaft. If there is no movement, use some penetrating oil to free it up.



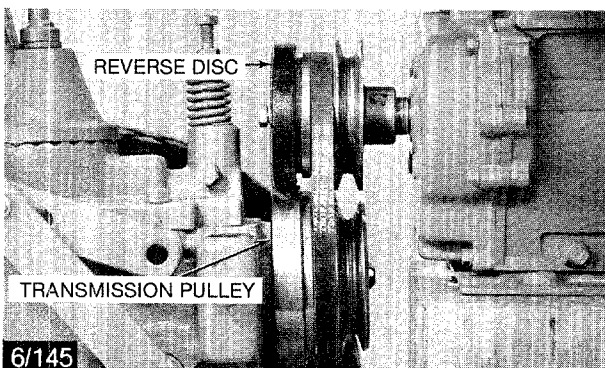
6/144

Make sure pulley has small amount of "float".

Part Seven: Separating the Engine From Its Mount

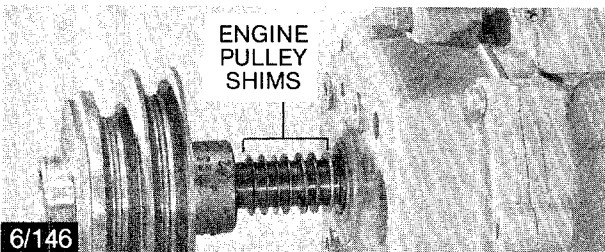
The following steps explain how to separate the engine from its cast iron engine mount. In most cases you won't have to do this procedure. However, if you suspect that the engine oil seal on the power take-off (PTO) shaft is leaking, or if you are going to replace your engine with a new one, then you will have to remove the mount.

Please remember that the location of the engine pulley on the PTO shaft is fairly critical. When the engine is replaced on the tiller, this pulley must align itself with the lower transmission pulley so that the rubber reverse disc is centered (or very close to centered) over the wide rim on the lower pulley — see Photo 6/145. The location that the engine pulley takes on the PTO shaft is determined by the number of shims that are located between the pulley and the back of the engine, as shown in Photo 6/146. Generally speaking, the manner in achieving this alignment is to replace the engine pulley with the same number of shims. Naturally, this may not be the situation if you are switching engines; that is, replacing one engine with another type engine. When replacement engines are supplied from the factory, they are accompanied by additional shims.



6/145

Rubber reverse disc centered over wide rim of lower pulley (motor mount removed for clarity).



6/146

Shims located between engine and pulley.

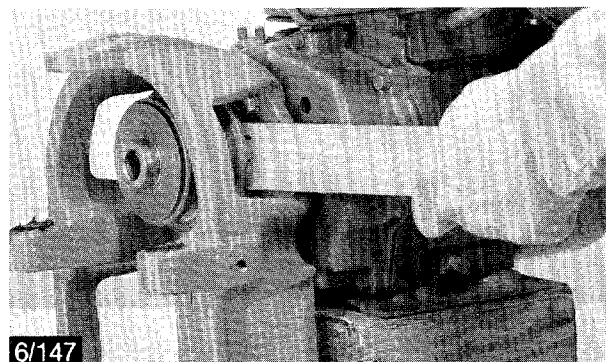
Use the following table as a general guide for shimming whenever you are switching engines:

NEW ENGINE	SHIMS REQUIRED		
	Part No.	Qty.	Description
6 HP Tecumseh	1138-1	4	1/16" thick
	1138-2	2	1/32" thick (thinnest)
7 HP Kohler	1138-1	2	1/16" thick
	1138-2	1	1/32" thick (thinnest)

Then, after you have installed the engine, check the alignment of the reverse disc with the lower pulley (explained further on). If the disc isn't centered over the rim on the pulley, then you will have to remove, or add, shims as necessary.

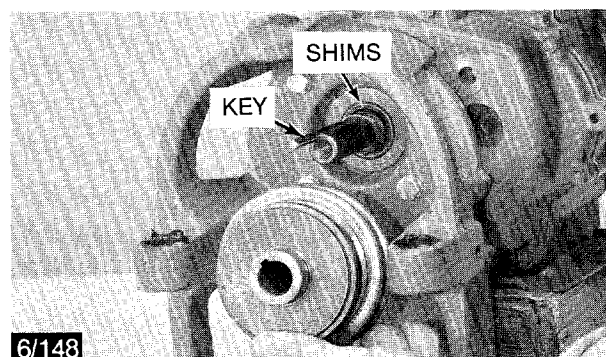
STEP 1. To remove the engine pulley, put a small pry bar or a stiff board behind the pulley and tap it loose — see photo 6/147. Then, remove the pulley as shown in Photo 6/148. Next, remove the key in the PTO shaft, and the engine pulley shims. Be sure to write down the number of shims removed as it will help you return to the original shim distance, if desired.

STEP 2. With the pulley removed, you can now take out the four 5/16" bolts that hold the engine to the mount — Photo 6/149. Before you do this, make sure the engine is properly supported so it won't fall off the mount when the screws are removed.



6/147

Pry pulley off engine crankshaft.



6/148

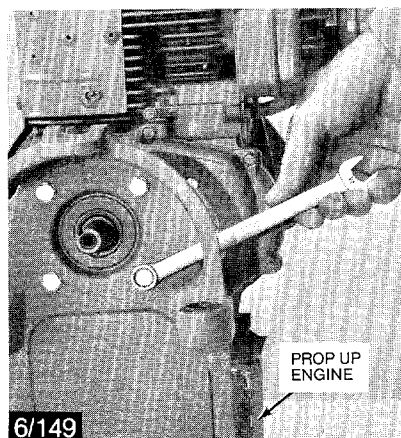
Remove pulley, key and shims.

Installing the Engine on Its Mount

STEP 1. Reinstall the four bolts and lockwashers, as shown in Photo 6/150. When tightening the bolts be *extremely careful* not to over-torque them as it could damage the mounting plate on the engine. To avoid this possibility, use a torque wrench and tighten each bolt to 14-16 ft. lbs. (168-192 in. lbs.). If you don't have — or can't borrow — a torque wrench, you can probably

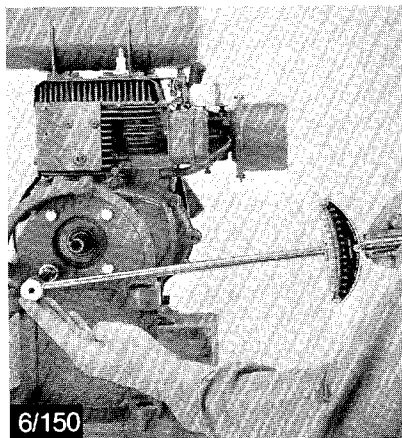
take the engine and mount to a local mechanic and have him do it for you.

STEP 2. Replace the engine pulley shims and the engine pulley on the crankshaft. Then, insert the key in the keyway by tapping it in with a mallet or hammer — Photo 6/151.



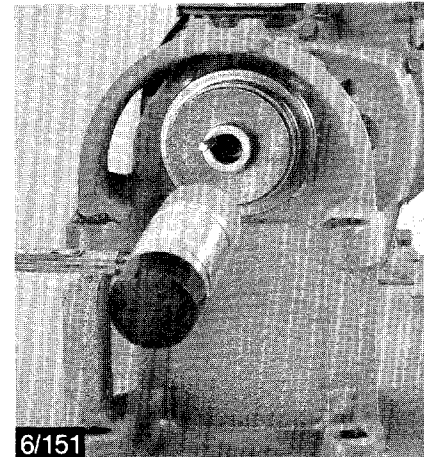
6/149

Remove four bolts from engine mount.



6/150

Use torque wrench when replacing bolts.



6/151

Replace pulley key in PTO shaft.

REPLACING THE ENGINE

Part One: Replacing Engine Mount Bars

STEP 1. Clean off any old grease from the two engine mounting bars and grease them liberally with fresh, general purpose grease. Place them within easy reach of the engine and tiller.

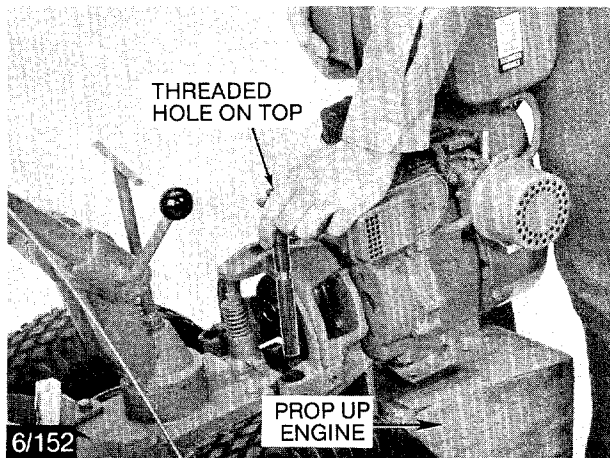
STEP 2. Carefully lift the engine and position the engine mount over the front of the transmission, aligning the holes in the engine mount with those in the transmission casting (Photo 6/152). Then, push one engine mount bar halfway down into the hole, making sure that the end with the threaded hole in it is on top. Now, align the holes on the other side and insert the second bar part way through. This will hold the engine in place for now.

STEP 3. With the two mount bars installed part way in the holes, screw the holding bolt and the jam nut for each mounting bar partially into position. Don't let the end of the bolts protrude into the hole far enough to prevent passage of the mount bars.

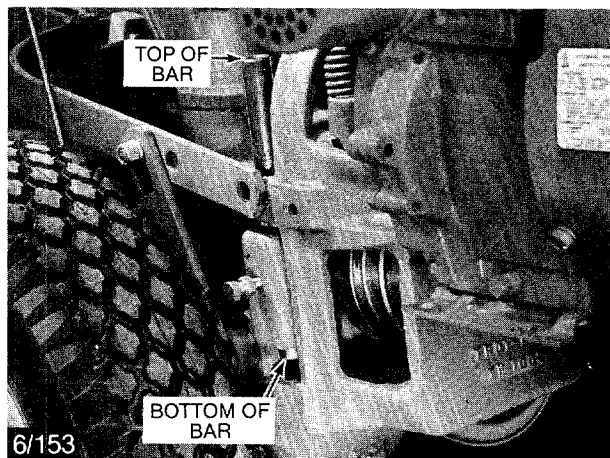
STEP 4. Tap the bars down lightly with a mallet until they have *just penetrated* the lowest hole of the transmission case (not the lowest hole in the engine mount!) — see Photo 6/153. Align the engine mount assembly as you do so. Momentarily, leave the bars right where they are.

STEP 5. On one side of the engine mount, thread in the holding bolt until you feel pressure against the side of the mounting bar. Hold steady pressure on the bar by holding the bolt with a 1/2" wrench and continue to gently tap the bar down until the pressure releases (Photo 6/154). When the pressure releases, you know that the groove in the middle of the bar has reached the end of the bolt. Now, screw the bolt all the way in *finger-tight*, then back off a 1/4 turn. Lock the bar securely in place by holding the bolt with one wrench and using a second wrench to tighten the jam nut against the side of the engine mount (Photo 6/155).

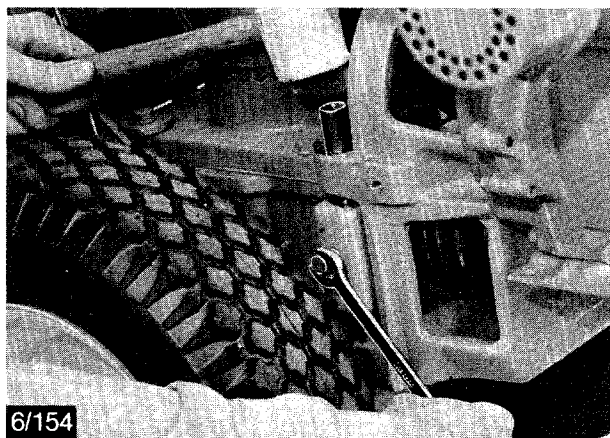
Repeat this process with the bar on the other side.



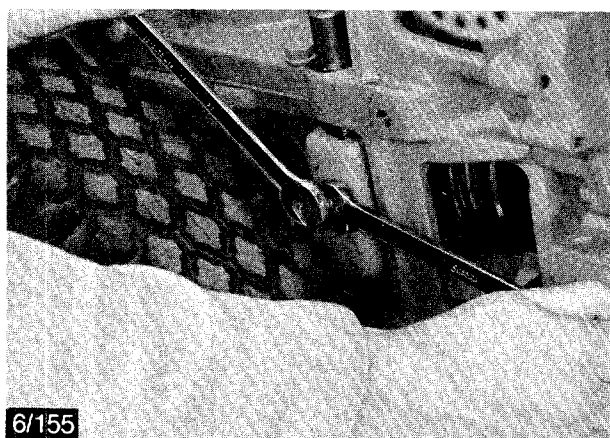
Carefully line up holes in engine mount and transmission case.



Tap bar down until it just penetrates hole in transmission case.



Hold pressure on bolt and tap mount bar down until pressure releases.



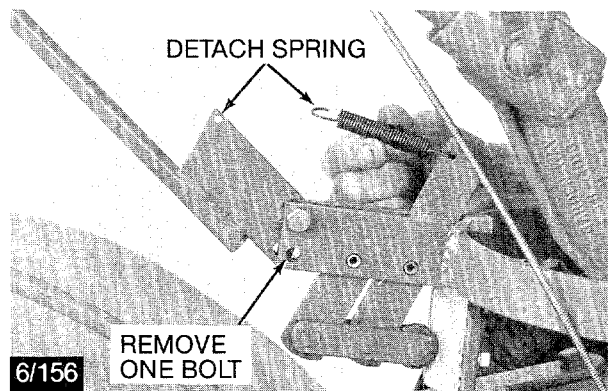
Tighten jam nut securely against side of engine mount.

Part Two: Attach Clutch Control Yoke

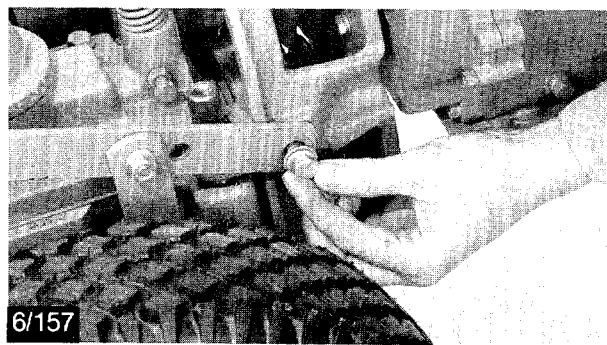
STEP 1. Remove one bolt from the base of the Forward/Reverse Lever and tilt the lever upward. Remove the clutch pawl spring from one hole only — see Photo 6/156. This action will take tension off of the clutch roller assembly and permit you to move the yoke assembly more easily.

STEP 2. Place the lockwasher, plain washer and bushing (in that order) on the bolt that holds the clutch yoke in position. Now align the hole in the yoke with the hole in the engine mount and thread in the bolt assembly (Photo 6/157). As you tighten the bolt (use a 9/16" wrench), the bushing will pop into place. Repeat this step with the bolt on the other end of the yoke.

STEP 3. Reconnect the clutch pawl spring on the Forward/Reverse Lever and replace the bolt you removed. Make sure that both bolts are fastened tightly enough to flatten the lockwashers.



Remove one bolt and detach one end of the spring.



Replace bolt in clutch yoke and engine mount.

Part Three: Replace the Reverse Disc

STEP 1. Make sure that the spark plug wire is disconnected from the spark plug and that the wire is moved away from the plug and the fuel tank area. Then, shift the Forward/Reverse Lever into Neutral.

STEP 2. Put the reverse disc in front of the engine pulley and angle it as shown in Photo 6/158. Make sure that the shoulder on the one side of the disc is facing toward the rear of the tiller. Now, put the lockwasher on the bolt and push the bolt through the hole in the reverse disc. Once the bolt is through the disc, put the disc on the hub of the engine pulley (keep the bolt with the disc). Then thread the bolt into the hole in the pulley as far as you can.

STEP 3. Working on the right side of your tiller, put the stick in between the engine pulley and the engine mount (don't put the stick on the reverse disc). Next, *pull up hard* on the stick and tighten the mounting bolt securely with a 9/16" wrench — see Photo 6/159.

STEP 4. With the reverse disc installed, stand along the right side of the tiller and shift the Forward/Reverse Lever into and out of Reverse. Closely watch the reverse disc to make sure it contacts the wide rim on the lower pulley when you shift into Reverse. When you return the lever to Neutral, make sure the disc is

positioned about 3/16" above the rim of the lower pulley.

STEP 5. Now check to make sure that the reverse disc is positioned correctly over the rim of the lower pulley (Photo 6/160). Before making this test, be sure that the lower transmission pulley is able to float back and forth a *fraction of an inch* when you move it with your hand (with the Forward/Reverse Lever in Neutral). If it doesn't move at all, squirt some penetrating oil on the shaft behind the pulley, as shown in Photo 6/144, on Page 165.

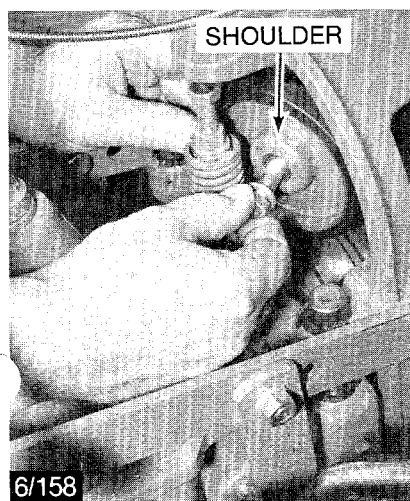
First, move the lower pulley all the way forward toward the engine. Now raise the Forward/Reverse Lever up into Reverse. As you do this, watch the position that the reverse disc takes on the rim of the lower pulley...it should fully contact the rim, without any portion of the rubber hanging over the edge of the rim that is furthest away from the engine. Now, release the lever and move the lower pulley toward the rear of the tiller. Shift the lever into Reverse and note where the disc contacts the rim on the lower pulley. Again, it should seat itself fully on the rim, without any portion hanging over the front edge (closest to engine) of the rim.

If the disc makes full contact with the rim — without

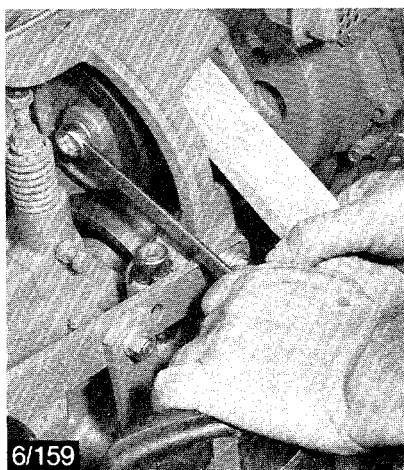
any overhang — then the engine pulley is centered correctly over the transmission pulley. However, if the disc hangs over the front (closest to engine) edge of the rim then the engine pulley must be removed and one or more additional shims must be added behind the pulley. On the other hand, if the disc hangs over the edge furthest away from the rim, then one or more shims behind the engine pulley must be removed. If you add a shim behind the pulley, it will move the pulley toward the operator by the thickness of that shim. If you take out a shim, it will move the pulley toward the engine.

To remove, or add, shims behind the engine pulley you will have to remove the engine pulley from the power take-off shaft as explained on Pages 165-166 (see Step 1). With the pulley removed, you can add, or subtract, shims as needed.

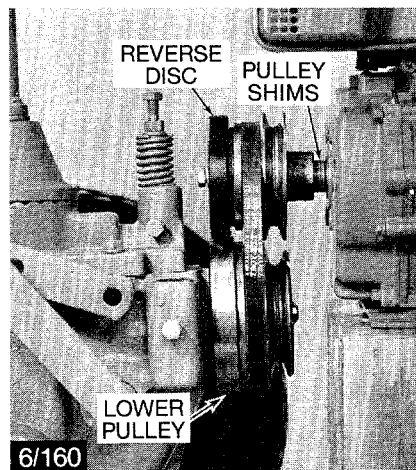
NOTE: On a tiller that has had 25 or more hours of use, if the reverse disc on the upper pulley can't be properly aligned with the lower pulley, it could be that the main drive shaft has become loose. To check and adjust drive shaft end play, please see Page 160.



6/158 Replace disc on engine pulley.



6/159 Use stick to keep pulley from turning.



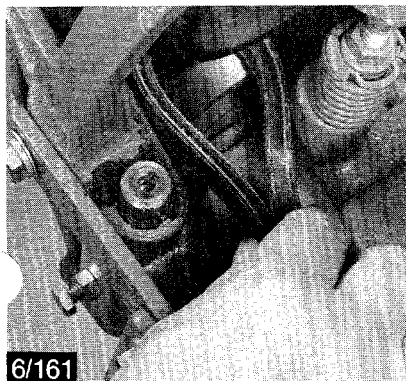
6/160 Reverse disc correctly centered over pulley.

Part Four: Replace the Drive Belt

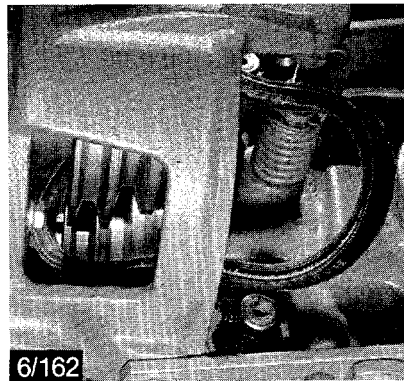
STEP 1. Shift the Forward/Reverse Lever into Forward. Then, take the belt and squeeze it between your finger and your thumb (Photo 6/161). Insert the belt between the two pulleys.

STEP 2. Push the belt all the way back between the two pulleys so that it's almost ready to go over and down under the lower pulley — Photo 6/162.

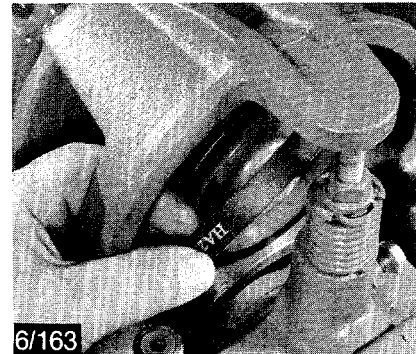
STEP 3. Work the belt down behind the lower pulley — but not in the groove just yet. At the same time, work the top of the belt UP and over the rubber reverse disc, as shown in Photo 6/163. Now, it's simply a matter of seating the belt in the coinciding upper and lower pulleys according to the speed range you choose. When doing so, place the Forward/Reverse Lever in Neutral, or hold it up in Reverse, to give you extra slack in the belt.



6/161 Insert belt between pulleys.



6/162 Push belt toward engine.



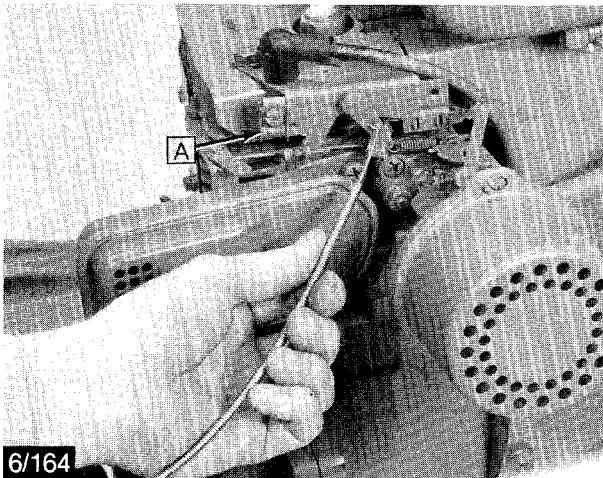
6/163 Work belt up and over reverse disc.

Part Five: Hook Up the Throttle Cable

ATTENTION OWNERS OF ELECTRIC START TILLERS

Before attaching the throttle cable, replace the battery bracket and make your electrical connections. Then replace the battery. See detailed instructions beginning on Page 171.

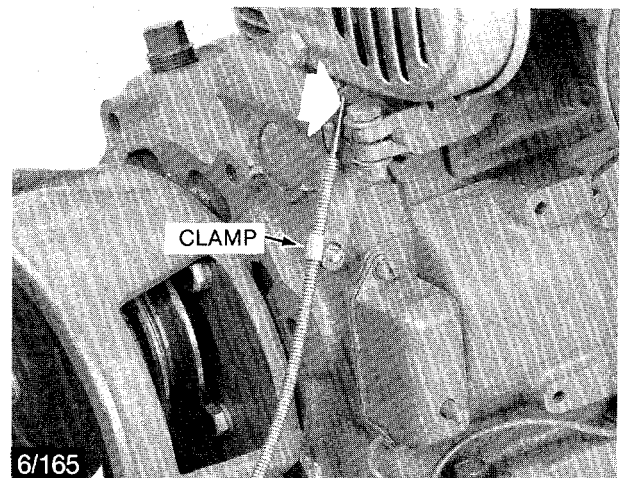
STEP 1. For 6 HP Tecumseh Engines — Route the throttle cable straight down the handlebar and over to the speed control lever. Connect the crimped end of the throttle wire at the remote speed control, as shown in Photo 6/164. Then, place the cable in the clamp ("A" in Photo 6/164) and move the throttle lever on the handlebar all the way to the right. Now, tighten the screw in the clamp. Finally, test the cable for proper throttle and shut off settings, as explained in "Throttle Cable Hookup and Adjustments," beginning on Page 183. CAUTION: With the electric start engines, keep



Connect wire to speed control lever (6 HP).

the throttle cable away from the battery and its bracket. Route the cable behind the right leg of the battery bracket.

STEP 2. For 7 HP Kohler Engines — Route the throttle cable straight down the handlebar and over to the governor control disc, making sure the wire doesn't take an extreme bend. Then connect the wire in the first practical hole of the disc (Photo 6/165). Finally, replace the cable in the clamp and tighten it securely. If the cable slips inside the clamp, you should give the clamp a squeeze with a pair of pliers.



Put crimped end of wire in nearest hole (7 HP).

FINAL CHECKS

1. Make sure that you have the proper amount of #30 SE motor oil in the engine.
2. Try shifting into Forward, then Neutral and Reverse. The lever should hold properly in Forward and should release quickly from Reverse when you let go. See "Testing Reverse Operation" on Page 120.
3. Check reverse disc alignment with the lower pulley after you have run the engine.
4. Check and adjust belt tension, as necessary. See "Belt Adjustment" instructions on Page 105.
5. Make sure that all bolts and screws are tight.

Removing and Replacing the Battery and Its Bracket

If you are removing or replacing an electric start engine on your tiller, follow these simple steps:

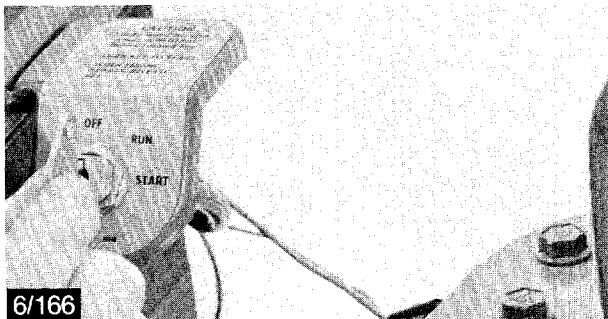
STEP 1. Disconnect the spark plug wire and move the wire away from the spark plug and the fuel tank area. Then place the Forward/Reverse Lever in Neutral. Read battery safety precautions on Page 21 before proceeding.

STEP 2. Turn the key to the "OFF" position and remove the key from the switch (Photo 6/166).

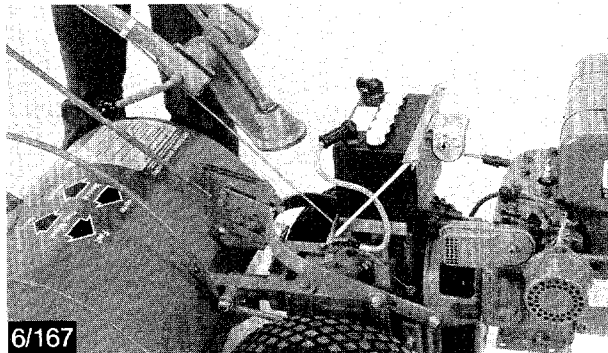
STEP 3. Remove the T-bar and handlebars from the tiller and set them aside, being careful not to kink the throttle cable (Photo 6/167). Place the T-bar on a clean surface so it won't pick up any dirt that could enter the transmission when you replace it.

STEP 4. Using 1/2" wrenches, disconnect the NEGATIVE CABLE (–) from the grounding point at the bottom of the right side hold-down bolt (see "A" in Photo 6/168) and bend it safely away from the battery and the tiller. Replace the lockwasher and nut on the end of the bolt for safekeeping. Next, remove the negative cable from the battery post, as shown at "B" in Photo 6/168. Set the cable aside, safely away from the battery.

STEP 5. Disconnect the POSITIVE CABLE (+) from the left-side battery post (Photo 6/169), and bend it away from the battery and the tiller. Leave the other end of the cable attached to the solenoid. Cover the free end of the cable with the rubber boot.

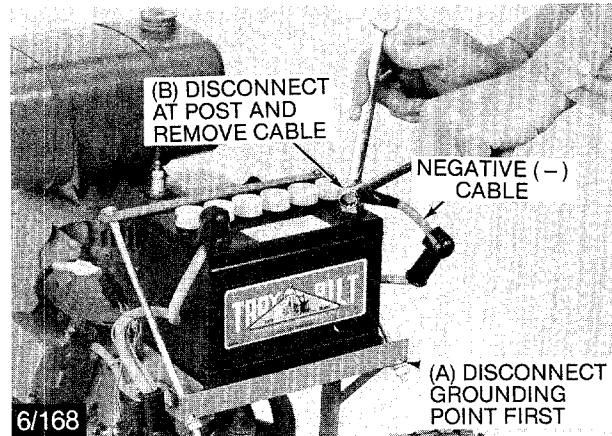


Remove key.

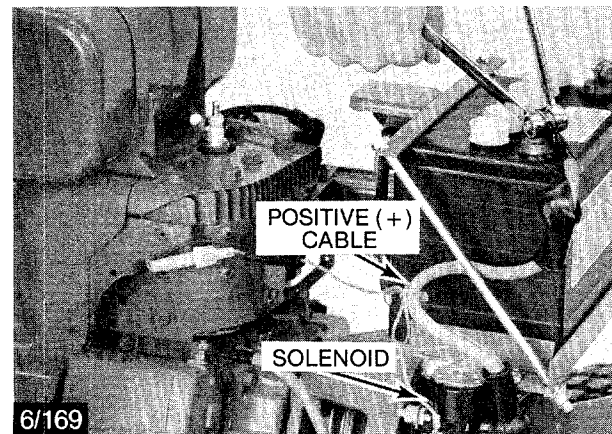


Remove handlebars.

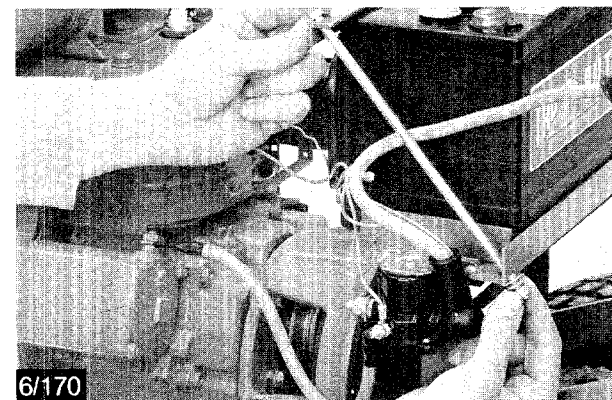
STEP 6. With two 1/2" wrenches, loosen the battery hold-down bolts on both sides of the battery (Photo 6/170) enough to move the battery clamp away so that the battery can be removed (Photo 6/171). Place the battery a safe distance away from the tiller and your tools.



Disconnect negative (–) cable from bottom of hold-down bolt ("A") and then from battery post ("B").



Disconnect positive (+) cable from battery post. Leave other end connected to solenoid.



Loosen (but don't remove) both hold-down bolts.

STEP 7. Disconnect the terminal at the bottom of the key switch, as shown in Photo 6/172.

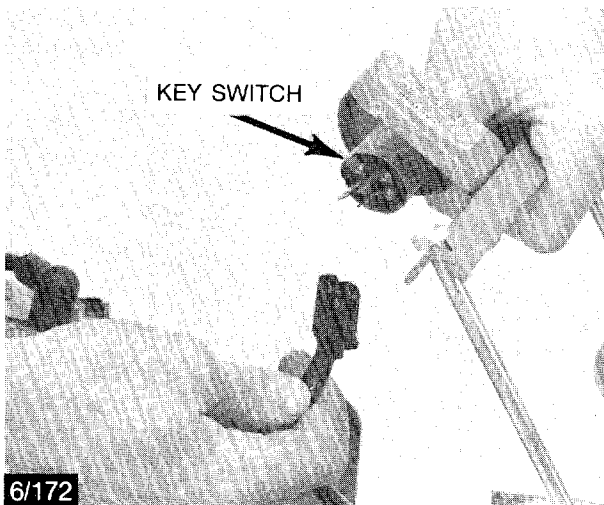
STEP 8. Disconnect the terminals (Photo 6/173), that connect the green ground wire to the key switch, and the diode and fuse to the solenoid.

STEP 9. With a 7/16" wrench, disconnect the red starter cable from the top of the starter motor on the engine — replacing the nut on the post for safekeeping — see Photo 6/174.

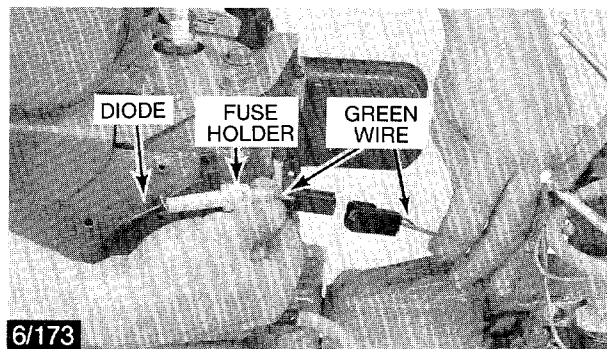
STEP 10. Using a 9/16" socket and a socket extension, remove the two bolts from the bottom of the battery bracket (Photo 6/175) and remove the battery bracket (cables and all) from the tiller — see Photo 6/176. Replace the two bolts in the top of the transmission cover for safekeeping. **CAUTION:** Be careful not to let any wires or metal touch the battery terminals while putting the bracket assembly safely aside.



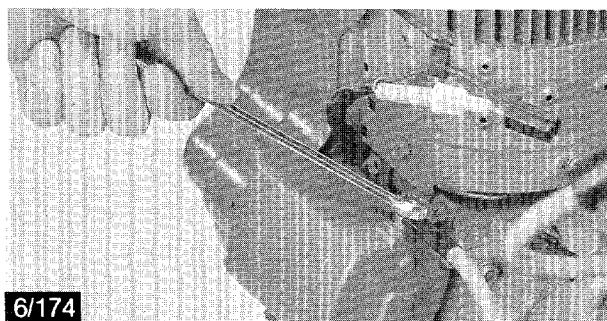
Remove battery from tiller.



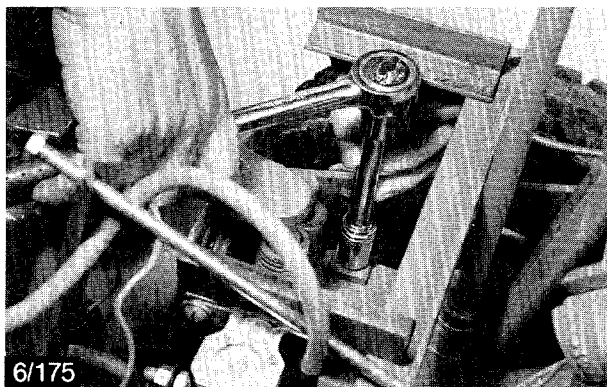
Disconnect terminal from key switch.



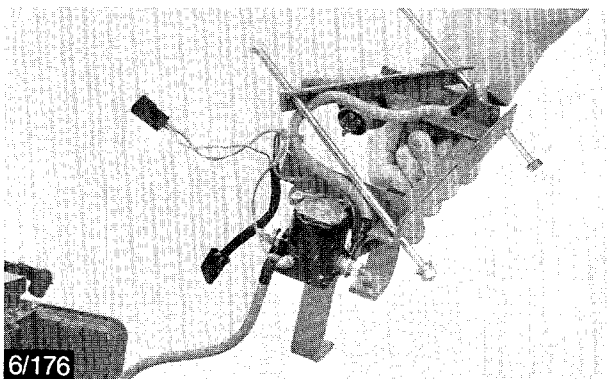
Disconnect recharging wire terminal.



Remove red starter cable from starter motor.



Remove two bolts that secure battery bracket to top of transmission cover.



Lift off battery bracket.

Replacement Steps

CAUTION: Before beginning, make sure the engine's spark plug wire is disconnected and the Forward/Reverse Lever is in Neutral. Do not replace the handlebars until the battery is fully hooked up.

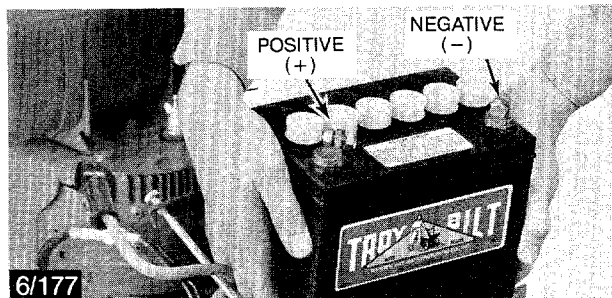
STEP 1. Replace the battery bracket on the transmission cover and thread in the two bolts securely — see Photos 6/176 and 6/175. The side of the bracket having the solenoid attached to it *must be* on the left side of the tiller (viewed from the operator's position).

STEP 2. Reconnect the red starter cable to the starter motor, shown in Photo 6/174.

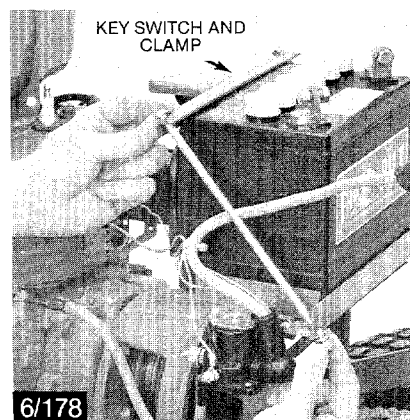
STEP 3. Reconnect the terminals for the recharging line — Photo 6/173. Make sure the terminals fit snugly together.

STEP 4. Replace the battery on the bracket, making sure that the posts on the battery are facing toward the rear (tine end) of the tiller. The positive (+) post must be on the *left-hand side* of the tiller as you face forward from the handlebars — see Photo 6/177.

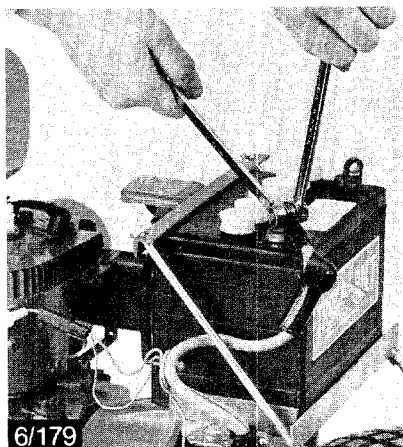
STEP 5. Loosely bolt on the battery hold-down clamp (Photo 6/178). To do this, center the clamp along the



Make sure positive (+) post is on left-hand side of tiller (viewed from operator's end).



Replace key switch clamp and loosely tighten both hold-down bolts.



Connect the positive cable (+) to the positive battery post.

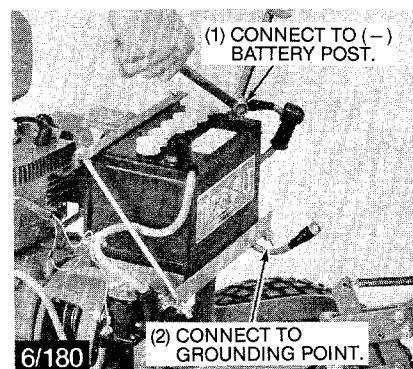
front edge of the battery and snug the two bolts down, *finger tight*. The left-hand bolt takes a plain washer and lockwasher; the right-hand bolt takes a lockwasher only.

STEP 6. As shown in Photo 6/179, connect the POSITIVE CABLE (+) to the POSITIVE BATTERY POST (+). The positive cable is the one already connected to the starter solenoid. Make sure the cable and post make a good tight connection, but don't crack the post in the process. Fit the insulated rubber boot snugly over the post.

STEP 7. Connect the NEGATIVE CABLE (–) to the NEGATIVE BATTERY POST (–), as shown in Photo 6/180. Again, make sure the cable is securely attached to the post. Cover the post with the rubber boot. Next, take off the lockwasher and nut from the bottom of the right clamp bolt, slip the terminal over the end of the bolt and put the lockwasher and nut back on. Now tighten the two battery hold-down bolts a little at a time on both sides for even pressure. The clamp should be snug, but don't overtighten it. Doing so could distort or break the battery case. Just turn the nut on each bolt hard enough so that the lockwasher flattens out.

STEP 8. Reconnect the terminal at the bottom of the key switch (Photo 6/172). Before you do, make sure the key is removed from the switch. **NOTE:** If the starter motor tries to turn over when you plug the receptacle in — or if there is a spark in the receptacle area — then there is an electrical short present. Keep the receptacle and key switch disconnected until you have contacted our Customer Service Department for further advice.

STEP 9. Finally, check all of the electrical connections to make sure they are properly and securely fastened. After doing this, you can replace the handlebars and the throttle cable.



First connect the negative cable (–) to the battery post (as shown), then connect the bottom end of the cable to the grounding point.

Transmission Removal and Replacement

Here are simple instructions to follow if you need to remove the transmission from your tiller for repairs or replacement.

TOOLS YOU'LL NEED

- Flat blade screwdriver
- Two 9/16" wrenches
- Two 1/2" wrenches
- 3/8" wrench
- 3/4" wrench
- Mallet or hammer

- 1/2" dia. drift pin, dowel, or steel rod
- Wood stick (about 5/16" thick, 1-3/4" wide, 12" long)
- Snap ring pliers (See Page 175).
- 1/4" to 5/16" drift pin or steel rod or a 16d nail
- General purpose grease
- Shallow pan, about 2" high
- Funnel

TRANSMISSION REMOVAL INSTRUCTIONS

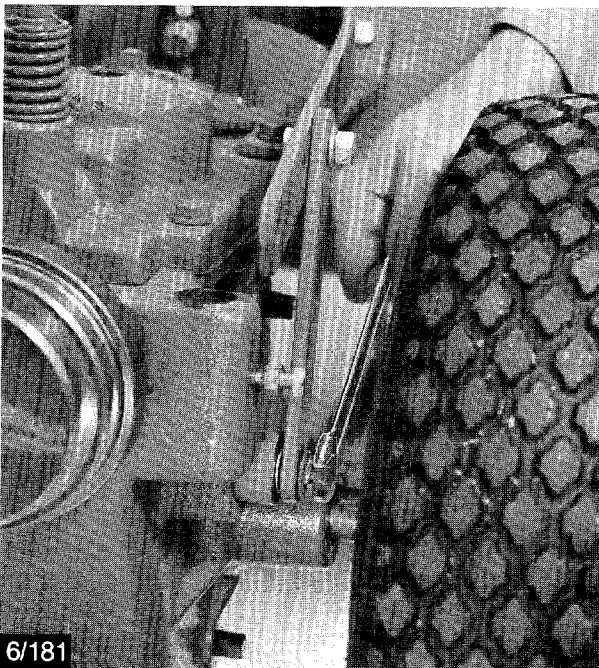
Part One: Remove the Throttle Cable, Handlebars and Engine

To remove the throttle cable, handlebars and engine, please refer to the "Engine Removal and Replacement" instructions that begin on Page 162. Complete

Parts One through Six of those instructions (Pages 162-165) and then return to Part Two below.

Part Two: Remove Forward/Reverse Lever and Clutch Yoke Assembly

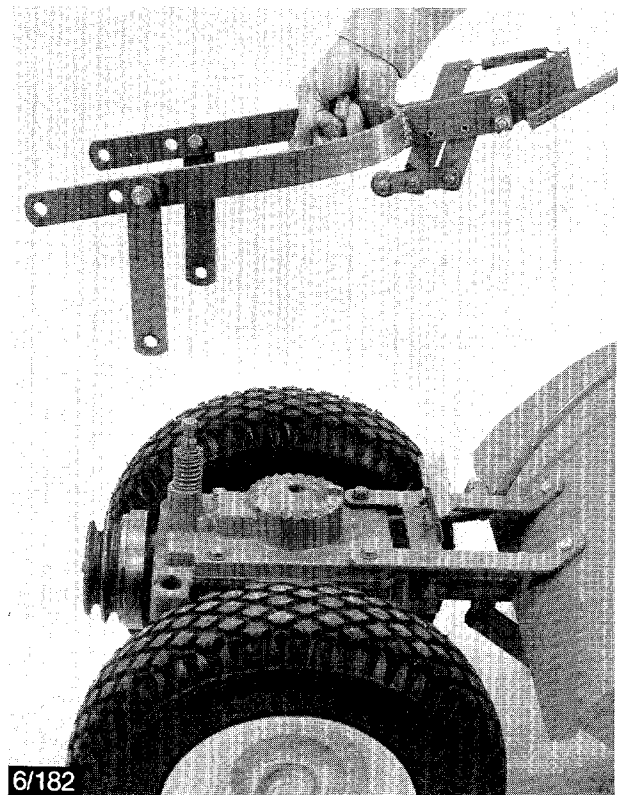
STEP 1. Using a 9/16" wrench, remove the bolts that fasten the control yoke pivot link to the pinion bearing retaining plug on the transmission housing; *one on each side* — see Photo 6/181. Temporarily replace the washer, bushing, washer and lockwasher (in that order) on the bolt and thread the bolt part way into the retaining plug so you won't misplace them.



6/181

Remove bolt that secures link to side plug.

STEP 2. The entire clutch yoke and Forward/Reverse Lever may now be lifted up off the tiller as a single assembly — see Photo 6/182. Place it carefully aside.



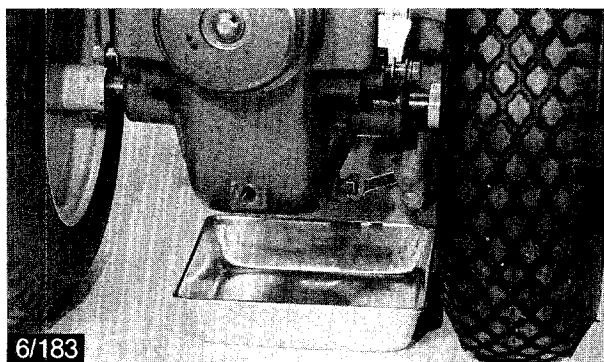
6/182

Remove yoke and lever as a single assembly.

Part Three: Drain Transmission Gear Oil

STEP 1. Place a shallow pan or bucket beneath the oil drain plug, as shown in Photo 6/183. If you plan on reusing the gear oil make sure the pan is clean. You will be draining out about 3½ quarts of oil.

STEP 2. Using a 3/8" wrench, remove the oil drain plug located below the left wheel shaft — Photo 6/183. It will take a while for the oil to drain out, so be patient. After about 2 quarts have been removed, gently tilt the tiller forward so the oil will also drain out of the rear housing area. When the oil has drained, securely replace the drain plug after first coating its threads with *non-hardening* gasket sealant.



6/183 Drain transmission gear oil into clean pan.

Part Four: Remove Transmission Drive Pulley

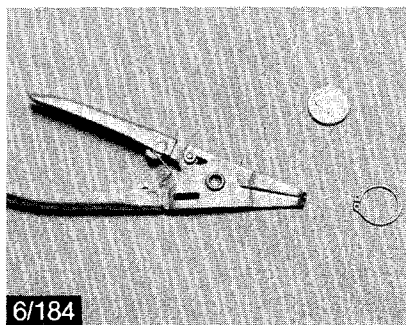
NOTE: It isn't always necessary to remove this pulley. Do so only if you are going to be installing a replacement transmission on your tiller, or if you

are going to remove the front oil seal on the drive shaft, or the drive shaft itself.

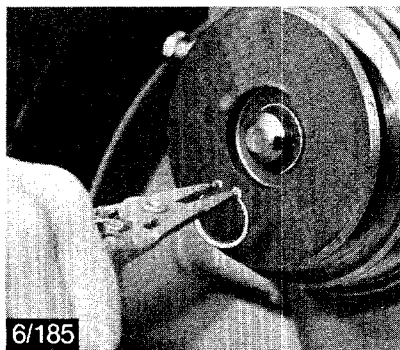
STEP 1. Remove the lower pulley from the drive shaft by gently spreading and lifting the front snap ring (retaining ring) on the shaft with a pair of small, external snap ring pliers — Photos 6/184 and 6/185. (Caution: Always wear safety goggles when removing or replacing snap rings.) *If you don't have snap ring pliers available, please see the "Service Hint" below.* Next, remove the 1/16" shim (it looks like a thick washer) from

the drive shaft.

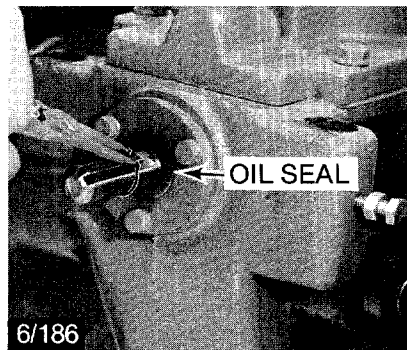
STEP 2. Once the pulley is removed, you may leave the rear snap ring on the shaft, unless you are going to remove the front oil seal, or the drive shaft. Before removing this snap ring (Photo 6/186) you must remove the 1-1/4" x 3/16" metal key in the drive shaft. If the key doesn't come out easily, use pliers or cutting pliers to lift it out.



6/184 External snap ring pliers come with fixed or interchangeable tips.



6/185 Remove front snap ring on lower pulley.

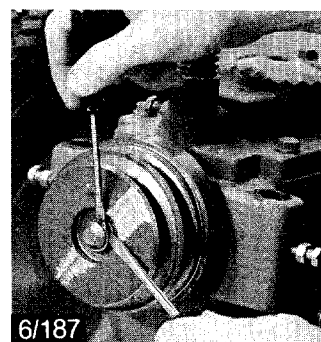


6/186 Remove rear snap ring (note oil seal).

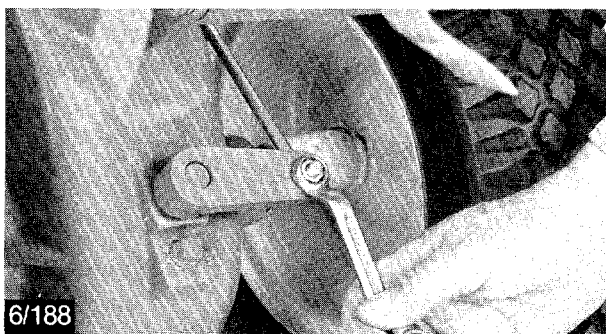
SERVICE HINT: External snap ring pliers can be obtained from good hardware, auto supply, or lawn and garden equipment stores.

If you need to buy a pair, you should take a Part No. 9500 snap ring with you to make sure that the tips of the pliers will fit the two small holes in the ring. If a spare snap ring isn't available, you can use two screwdrivers to remove the front snap ring, as shown in Photo 6/187. Then, you can take this snap ring with you to the store.

To remove the snap ring, just hold pressure on the ring with one screwdriver while you "peel" the snap ring out of the groove with the other. As you do, be careful not to scratch the surface of the drive shaft with the screwdrivers. Removing the snap ring in this fashion will, unfortunately, spoil the ring's spring tension, so be sure that you have another one available when you are ready to replace the pulley.



Part Five: Remove the Hood, Wheel Shift Lever and Depth Regulator as a Single Assembly



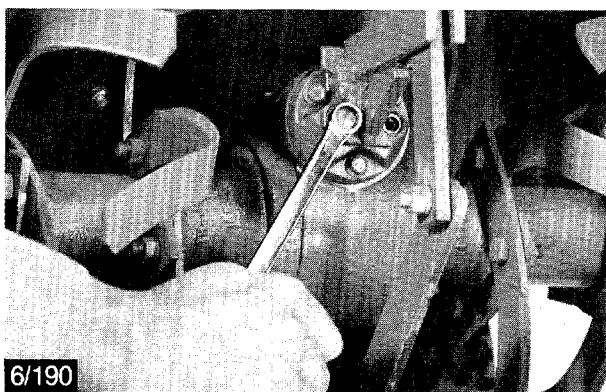
Disconnect linkage from eccentric lever.

STEP 1. Tilt your tiller gently forward and support it by propping the tines on a sturdy block. Using a 1/2" wrench, remove the locknut that connects the wheel shift lever linkage to the eccentric lever — Photo 6/188. Then disconnect the swivel from the lever. Replace the locknut on the swivel for safekeeping. NOTE: A liberal dose of penetrating oil should free-up a "frozen" nut. Follow the directions on the oil can.



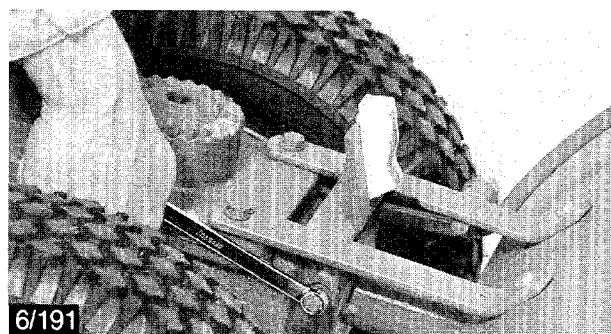
Disconnect drag bar from transmission tube.

STEP 2. Using two 9/16" wrenches, remove the bolt that attaches the drag bar to the tab on the transmission tube — see Photo 6/189. Replace the bushing, lockwasher and nut on the bolt for safekeeping.



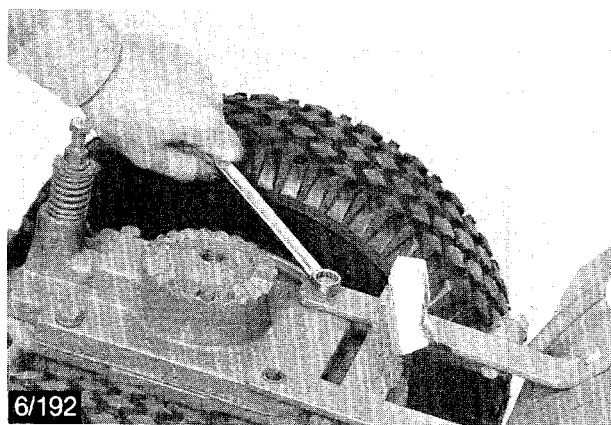
Remove bracket bolts from end cap.

STEP 3. Using a 1/2" wrench, remove the two rear hood bracket bolts and their lockwashers from the transmission end cap and return the tiller to its upright position — see Photo 6/190.



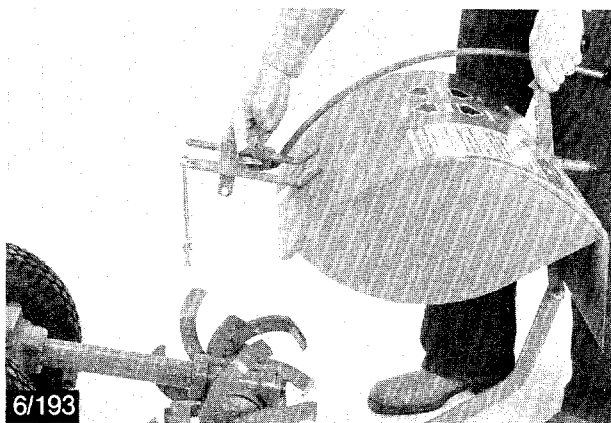
Remove side bolts from hood bracket.

STEP 4. Using a 1/2" wrench, remove the two bolts that fasten the front hood bracket to either side of the transmission housing (Photo 6/191).



Remove bracket bolts from transmission cover.

STEP 5. Using a 9/16" wrench, remove the two bolts that fasten the front hood bracket to the top of the transmission cover — Photo 6/192.

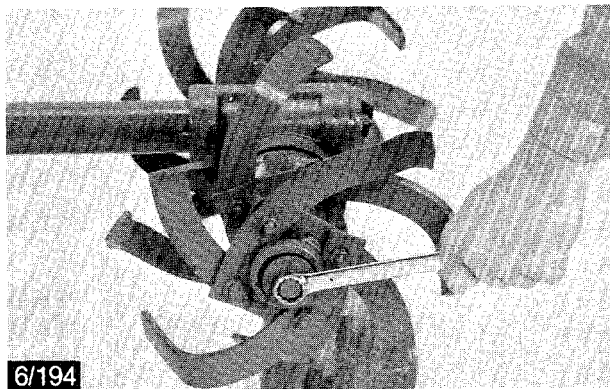


Remove hood, lever and depth regulator.

STEP 6. As shown in Photo 6/193, lift the hood brackets, shift lever and depth regulator as a single unit — pulling backward at the same time as lifting so as to clear the drag bar from between the tines. Place the assembly carefully aside.

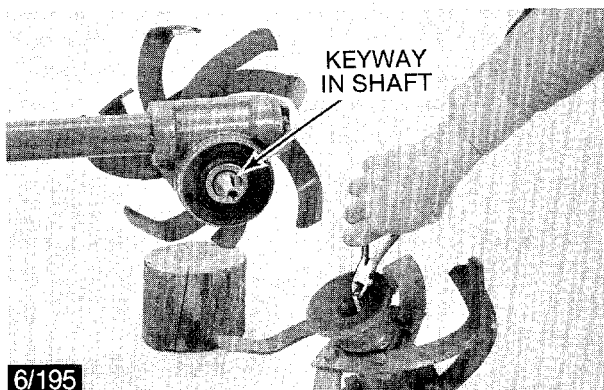
Part Six: Remove Tines and Holders

Using a 3/4" wrench, remove the bolt, lockwasher and plain washer that retains the tines and holder on the tiller shaft — Photo 6/194. With the bolt removed, use a mallet to tap the tines and holder free. Be careful not to lose the pair of 1" x 3/16" metal keys in the tiller shaft.



6/194 Remove tine bolt from tiller shaft.

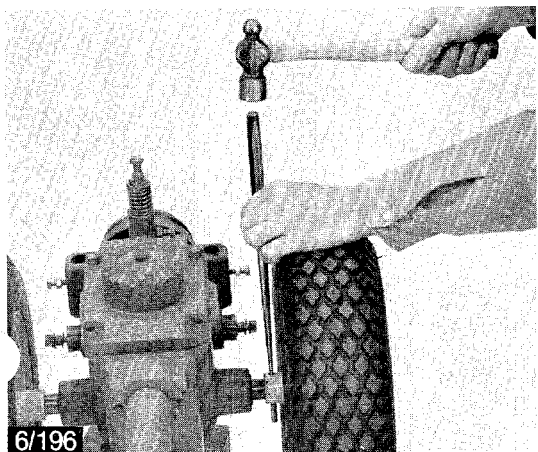
Lift them out with pliers or cutting pliers. NOTE: If a key remains in the tine holder, remove it with cutting pliers or tap it out with a hammer and screwdriver (Photo 6/195).



6/195 If key is missing, look in holder.

Part Seven: Remove Wheels

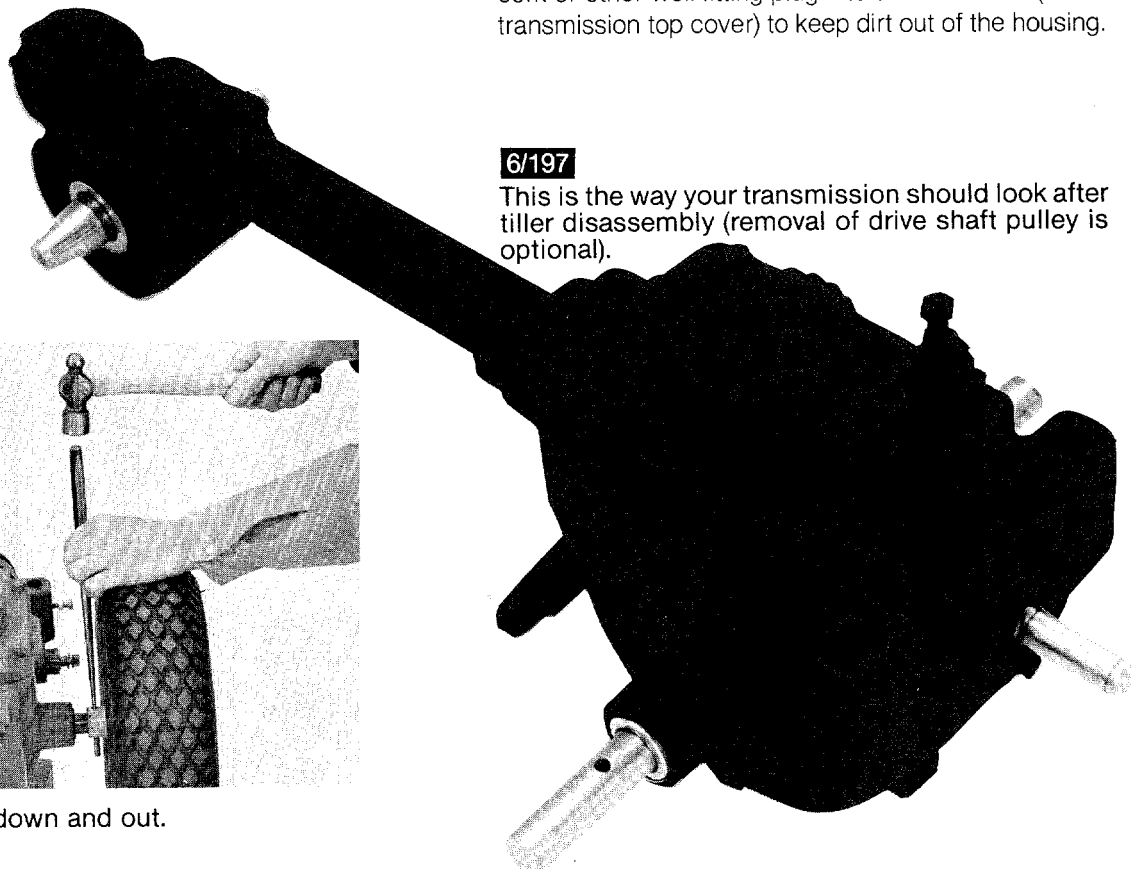
STEP 1. Support the tine end of the transmission with a block and prop the transmission up enough to raise the wheels off the floor. Using a 16d nail with blunted end, or a 1/4" to 5/16" drift pin or steel rod, drive the roll pin down through the wheel hub, as shown in Photo 6/196. Wear safety glasses while driving the roll pin out.



6/196 Drive roll pin down and out.

STEP 2. Remove the wheels. Squirt some penetrating oil, then regular oil, on the wheel shaft if you have trouble removing a wheel.

STEP 3. With the tines and wheels removed, transmission removal is completed — Photo 6/197. Put a cork or other well-fitting plug into the oil fill hole (in the transmission top cover) to keep dirt out of the housing.



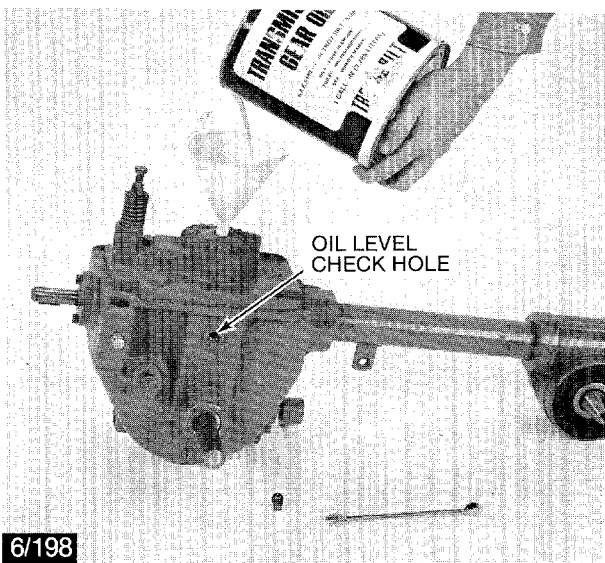
6/197

This is the way your transmission should look after tiller disassembly (removal of drive shaft pulley is optional).

Transmission Replacement Instructions

Part One: Add Gear Oil and Replace Tines

STEP 1. Before installing a new or repaired transmission on your tiller, make sure that you add SAE #90 or #140 gear oil to it. With the transmission on a level floor, add gear oil through the fill hole in the top cover (Photo 6/198). Fill to the point where it just begins to run out of the oil level check hole located 3" above the left wheel shaft (remove pipe plug with 3/8" wrench). Don't overfill. This angle is slightly steeper than normal and you'll tend to get a little more in anyway. After filling, securely replace the pipe plug.

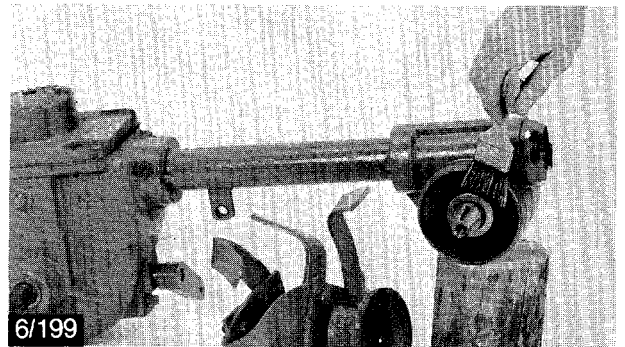


6/198 Add gear oil to transmission.

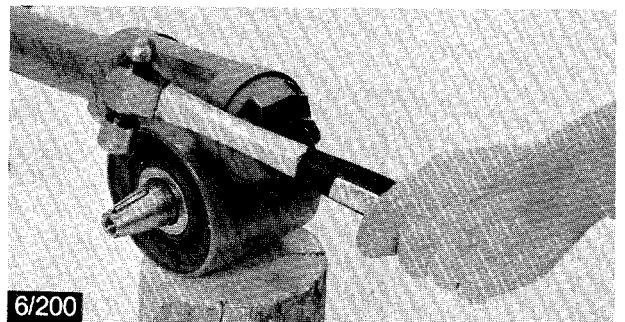
STEP 2. Before replacing the tines, clean away any dirt or debris from the tiller shaft and the inside of the tine holders (Photo 6/199). Be careful not to scratch the tiller shaft while cleaning. Next, *lightly* file away any nicks or burrs on the keyways of the tiller shaft and gently tap the 1" x 3/16" metal keys into place — see Photo 6/200.

STEP 3. When replacing the tines and holders, remember that Bolo Tines must be installed so that *their cutting edges will enter the ground first* when the tiller moves forward (tines rotate in same direction as wheels). Now, carefully line up the keyway in the tine holder with the key in the tiller shaft and tap the holder into place with a mallet.

STEP 4. Put the lockwasher on the tine mounting bolt, followed by the plain washer. Lubricate the threads of the bolt and thread it in as far as you can by hand. Finally, take a 3/4" wrench and tighten the bolt securely.



6/199 Make sure tine shaft and holders are clean.



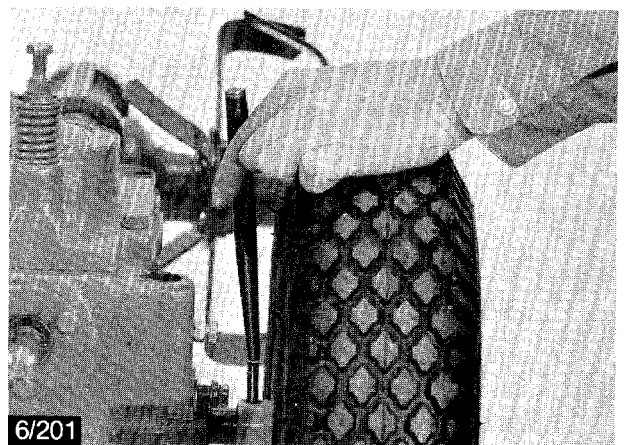
6/200 Tap key into keyway before installing tines.

Part Two: Replace Wheels

STEP 1. Support the transmission off the ground with sturdy blocks and grease the wheel shaft lightly in the area where the wheel hubs ride.

STEP 2. Slide one wheel at a time into place, and align the hole in the hub with the hole in the wheel shaft. Insert a roll pin into the aligned holes and tap it into place (Photo 6/201).

Take care not to peen over or spread the top of the roll pin or it cannot be driven through to remove the wheel again.



6/201 Replace roll pin in wheel hub and shaft.

Part Three: Replace Hood, Wheel Shift Lever and Depth Regulator as a Single Assembly

STEP 1. Holding the hood as shown in Photo 6/202, slide the drag bar under the tiller between the tines until the front hood bracket is aligned over the two bolts in the transmission cover — see Photo 6/203. Remove the $\frac{3}{8}$ " x $1\frac{1}{2}$ " bolts and their lockwashers and reattach one of the bolts, *loosely*, through the hood bracket and into the transmission cover. Leave the other bolt and lockwasher unattached, for now.

STEP 2. Using a $\frac{1}{2}$ " wrench, *loosely* install the two $\frac{5}{16}$ " x $\frac{3}{4}$ " bolts that fasten the hood bracket to the sides of the transmission — see Photo 6/204. Place the lockwasher and plain washer (in that order) on the bolt before installation.

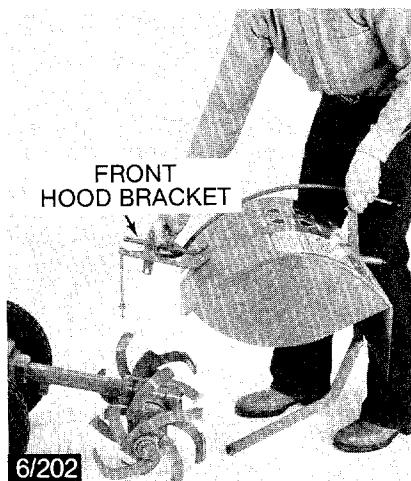
STEP 3. Attach the depth regulator drag bar to the tab underneath the transmission tube (Photo 6/205). The plain washer goes next to the $\frac{3}{8}$ " x 1" bolt and the lockwasher goes next to the nut. Use

two $\frac{1}{2}$ " wrenches to tighten the bolt *securely*.

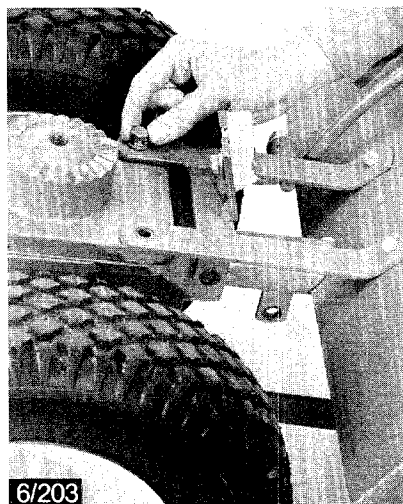
STEP 4. Prop the tines off the ground and use a $\frac{1}{2}$ " wrench to attach the two rear hood bracket bolts ($\frac{5}{16}$ " x $\frac{3}{4}$ ") and their lockwashers to the end cap. See Photo 6/206. Tighten these bolts *securely*.

STEP 5. With the rear hood bracket connected, return to *Step 1* above, and install the remaining bolt in the bracket and cover. Tighten both bolts *securely*. Now, return to *Step 2*, and tighten down the two side bolts.

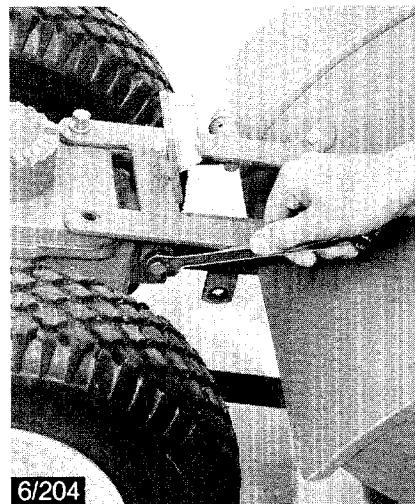
STEP 6. Reconnect the wheel shift connecting rod swivel to the eccentric lever by removing the locknut from the swivel, running the swivel through the lever, and tightening the nut *securely* with a $\frac{1}{2}$ " wrench (Photo 6/207). Insure that the connecting rod is installed in the same direction as it was removed. **NOTE:** Don't overtighten the nut so that it interferes with the shifting operation.



Replace hood, lever and depth regulator.



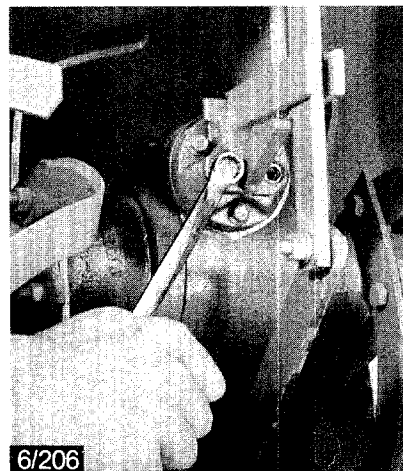
Attach bracket to top cover.



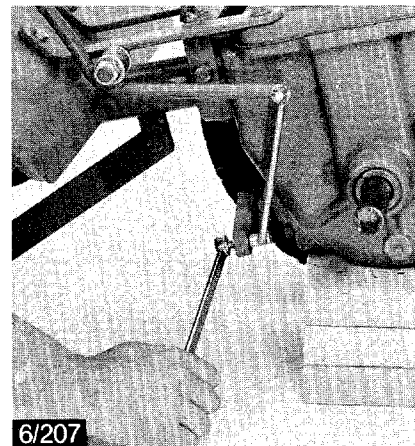
Replace bolts on both sides.



Attach drag bar to tab on tube.



Attach depth regulator to end cap.



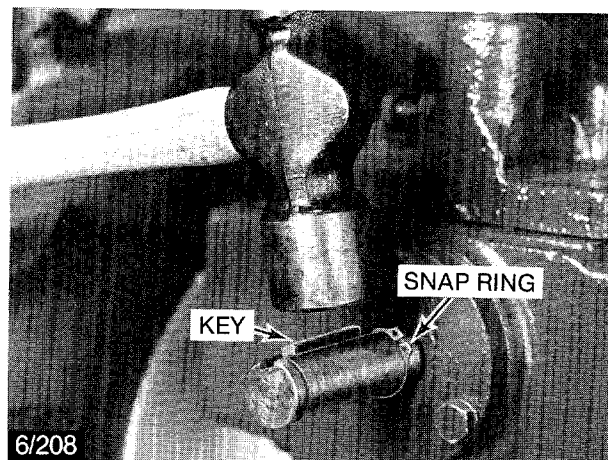
Replace locknut on connecting rod swivel (wheel removed for clarity).

Part Four: Replace Transmission Drive Pulley

STEP 1. Before replacing the pulley (if you removed it earlier), check that the drive shaft is clean, free of sharp burrs, and is lightly lubricated between the snap ring grooves. Then, tap the 1-1/4" x 3/16" metal key *gently* into the keyway — see Photo 6/208.

NOTE: The Part No. 9500 snap ring closest to the transmission must be in place before you install the pulley. If for any reason it is missing, be certain you install a *new* one using snap ring pliers (see Photo 6/186, Page 175) before inserting the key. Make sure that the snap ring is fully seated in the groove.

STEP 2. Slip the lower pulley onto the drive shaft, add the 1/16" shim, and then put a *new* snap ring in front of it (see Photo 6/185). Make sure that the snap ring is fully seated in the groove.



Replace pulley key in drive shaft.

Part Five: Install the Engine

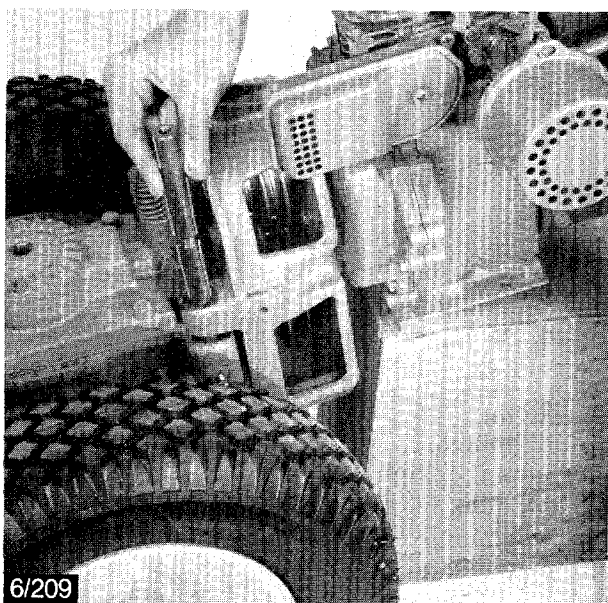
STEP 1. Clean off any old grease from the two engine mounting bars and grease them liberally with fresh, general purpose grease. Place them within easy reach of the engine and tiller.

STEP 2. Lift the engine by the left hand under the base with the right hand grasping the fuel tank bracket. *Do not lift by the air cleaner or the carburetor.* Place the engine mount over the front of the transmission housing so that the mounting holes are aligned. Then, while supporting the engine with one hand under the base, push the engine mounting

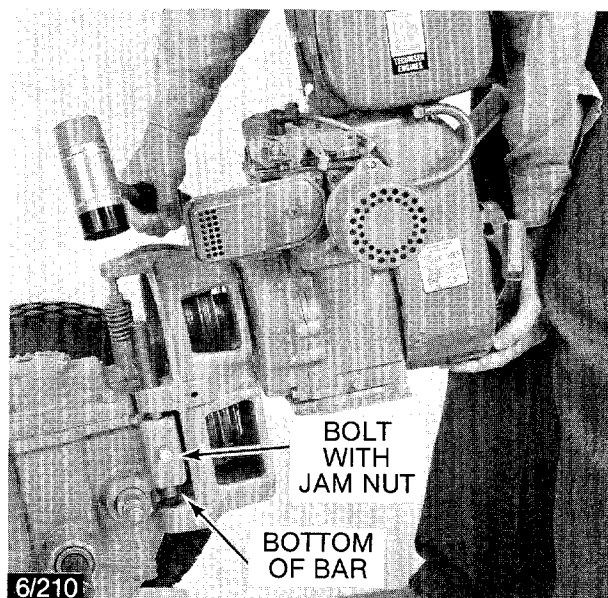
bars (Photo 6/209) halfway into position, making sure that the threaded holes in the bars are on top.

STEP 3. With the two mount bars installed part way in the holes, screw the holding bolt and the jam nut for each mounting bar partially into position. Don't let the end of the bolt protrude into the hole far enough to prevent passage of the mount bars.

STEP 4. Tap the bars down lightly with a mallet (Photo 6/210), until they have just penetrated the lowest hole of the transmission case (not the lowest hole in the engine mount!). Align the engine mount assembly as you do so.

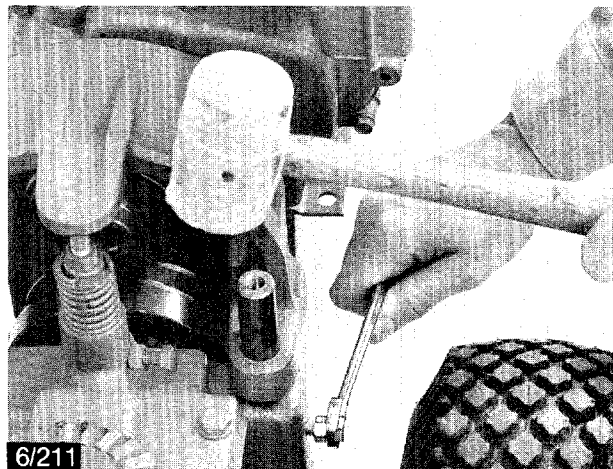


Align holes in engine mount and transmission case.



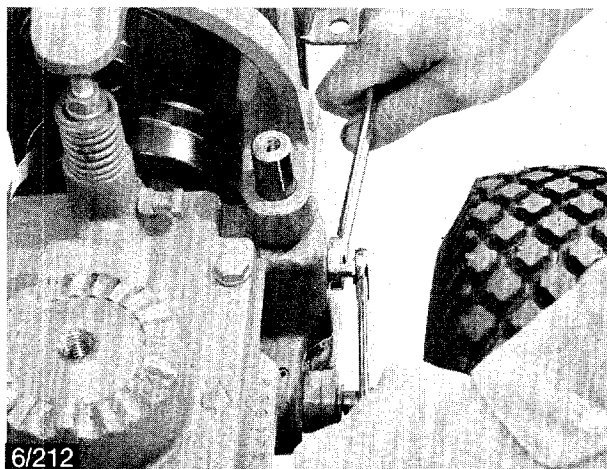
Tap bar down until it just penetrates hole in transmission case.

STEP 5. On one side of the engine mount, thread in the holding bolt until you feel pressure against the side of the mounting bar. Hold the bolt pressure against the bar with a 1/2" wrench while you continue to tap the bar down — Photo 6/211. When the pressure releases, you have reached the groove in the mounting bar.



Hold pressure on bolt and tap mount bar down until pressure releases.

Tighten the holding bolt as far as it will go — *without forcing* — then back it off 1/4 turn and hold the bolt in place with one wrench while you tighten the jam nut with another wrench (Photo 6/212). Repeat this process with the bar on the other side.



Tighten jam nut securely against motor mount.

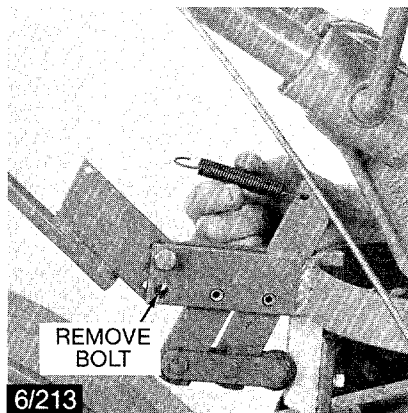
Part Six: Install the Forward/Reverse Lever and Yoke Assembly

STEP 1. Using two 1/2" wrenches, remove one of the bolts and lockwashers from the plate at the bottom of the Forward/Reverse Lever and tip the lever forward. Unhook the clutch pawl spring from one hole to take tension off the clutch roller — see Photo 6/213.

STEP 2. Place the lockwasher, plain washer and bushing (in that order) on the 3/8" x 1" bolt that fastens the end of the yoke to the engine mount. Now align the hole in the yoke with the hole in the engine mount and thread in the bolt assembly — see Photo 6/214. As you tighten the bolt (use a 9/16" wrench), the bushing will pop into place. Repeat this process with the bolt on the other side.

STEP 3. Now you are ready to attach the side links to the pinion bearing retaining plugs — see Photo 6/215. First place the lockwasher, plain washer and bushing on the 3/8" x 1" bolt. Thread this bolt assembly into the side link. Now place the remaining plain washer on the bolt and install the bolt in the retaining plug using a 9/16" wrench. Repeat this process on the other side.

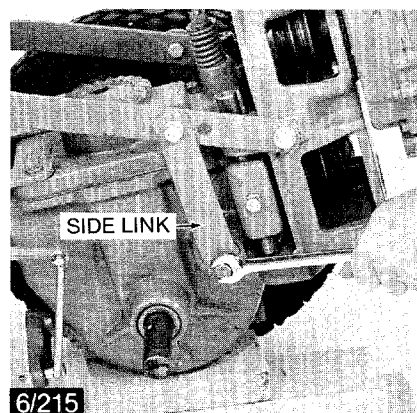
STEP 4. Reconnect the spring on the Forward/Reverse Lever and pinch the end of the spring together with a pair of pliers. Tip the lever back to align the holes and replace the bolt and lockwasher. Tighten both bolts enough to close up the lockwashers.



Remove one bolt and unhook end of spring.



Fasten yoke to engine mount.



Attach side link to retaining plug (wheel removed for clarity).

Part Seven: Install Reverse Disc and Belt

STEP 1. Install the reverse disc by referring to "Part Three: Replace the Reverse Disc" on Page 168.

STEP 2. Install the drive belt by referring to "Part Four: Replace the Drive Belt" on Page 169.

Part Eight: Replace Handlebar Assembly and Throttle Cable

STEP 1. Mount the handlebar assembly back on the tiller by turning the T-bar clamp in a clockwise direction.

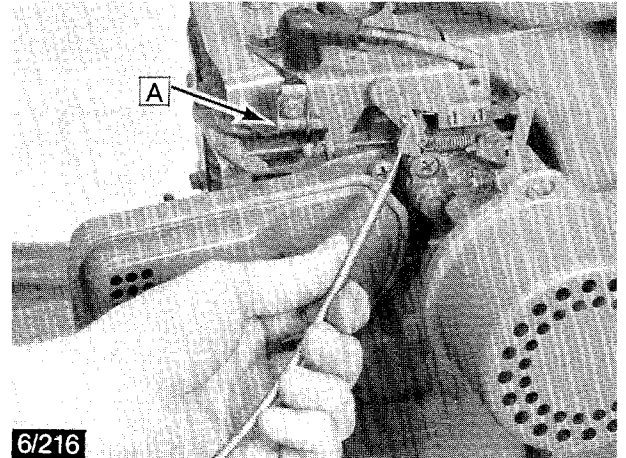
STEP 2. For 6 HP Tecumseh Engines — Route the throttle cable straight down the handlebar and over to the speed control lever. Connect the crimped end of the wire at the remote speed control, as shown in Photo 6/216. Then place the cable in the clamp ("A" in Photo 6/216) and move the throttle lever on the handlebar all the way to the right. Now, tighten the screw in the clamp. Finally, test the cable for proper throttle and shutoff settings, as explained on Page 183.

IF YOU HAVE AN ELECTRIC START TILLER...

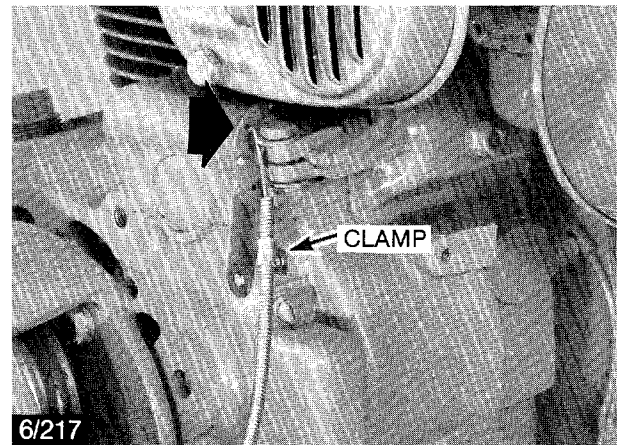
Before attaching the throttle cable, replace the battery and make your electrical connections as explained in the instructions beginning on Page 171. When hooking up your throttle cable, keep the cable away from the battery and its bracket. Route the cable behind the right leg of the battery bracket.

STEP 3. For 7 HP Kohler Engines — Route the throttle cable straight down the handlebar and over to the governor control disc, making sure the wire doesn't take an extreme bend. Then connect the wire in the first practical hole of the disc (Photo 6/217). Finally, replace the wire in the clamp and tighten it securely. Leave a little bit of the cable projecting beyond the clamp so it will hold properly.

STEP 4. Reconnect your spark plug. Your tiller is now fully assembled. Run through the Check List below before using your tiller.



Connect wire to speed control lever (6 HP).



Put crimped end of wire in nearest hole (7 HP).

CHECK LIST

- ☐ Check the gear oil level in the transmission by making certain it just starts to flow out when the plug is removed from the oil level check hole.
- ☐ Check the oil level in the engine. It should be at the Full mark on the dipstick.
- ☐ Shift into Forward, Neutral and then Reverse. The lever should hold properly in Forward and release promptly from Reverse.
- ☐ Check the alignment of the reverse disc to the lower pulley; check again after you have run the engine.
- ☐ Test the engine and tiller controls by running your tiller. Refer to the Troubleshooting Guide (Pages 197-204) for any needed corrections.
- ☐ Check the belt tension. Adjust if necessary.

Throttle Cable Hookup and Adjustments

Even though your tiller's throttle cable was hooked up at the factory before it was shipped to you, it may need adjustment at a later date. For instance, the engine could be difficult to start or stop, or it may not respond immediately when you move the throttle lever. Such symptoms could be due to a need for throttle cable maintenance or replacement.

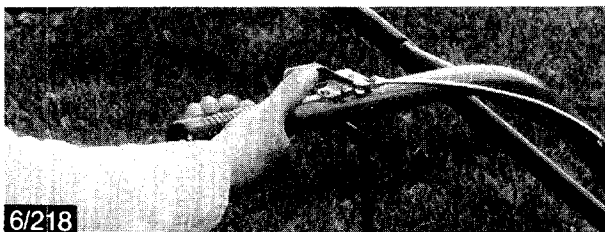
Occasionally, throttle cables become bent or "kinked" from being twisted or snagged in some way. Rarely, if ever, can cable "kinks" be straightened

properly to give satisfactory throttle control. If you have a badly kinked cable, please order a new throttle cable from us at the factory. When ordering, be sure to include the make and horsepower rating of your engine.

NOTE: If you have an 8HP Briggs & Stratton Engine, please refer to your green-covered, 8HP Owner's Manual Supplement for details on adjusting the throttle cable.

Lubricate Your Throttle Cable

Frequent lubrication of the throttle cable works wonders. Remember to lubricate the cable regularly with engine oil, grease, silicone oil spray, or graphite. All work well. Brush or spray the lubricant on the entire length of the cable casing and into both ends of the cable. Lubrication of the throttle cable prior to winter storage will pay off in smooth performance of the tiller in the spring.



6/218

Throttle lever provides remote control of 6 HP engine speeds and shut-off.

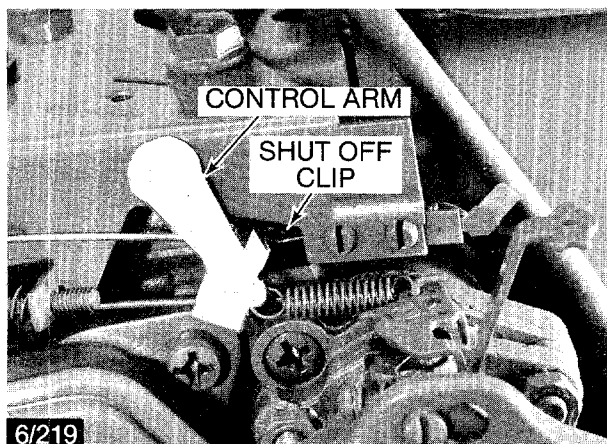
Cable Hookup and Adjustment for 6 HP Engines

On the 6 HP Tecumseh Engines, engine shut-off and a full range of engine speeds can be selected remotely by moving the speed control lever on the handlebar — see Photo 6/218.

When the speed control lever on the handlebar is all the way forward, the engine shuts off by touching a short-out clip — see Photo 6/219. In between the engine shut-off and high speed positions is the full range of throttle speeds. If you move the lever to the left (back) the engine runs faster. Moving it to the right (forward), makes the engine run slower, or stop.

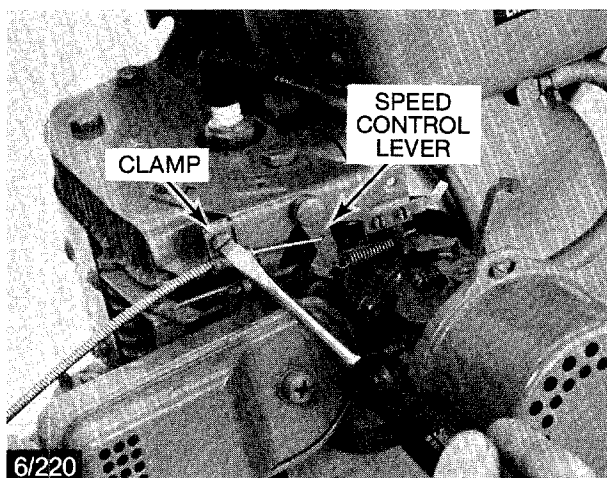
To adjust your throttle cable (if you don't get engine shut-off by moving the lever on the handlebar), loosen — but do not remove — the clamp that secures the cable to the engine — Photo 6/220. Now move the speed control lever on the handlebar all the way forward toward the engine. Next, move the casing and all so that the remote speed control lever makes contact with the shut-off clip (Photo 6/219). Finally, hold the casing in position and retighten the casing in the clamp, as shown in Photo 6/220.

Now, try the lever on the handlebar once again. All the way back is full speed. All the way forward should be shut-off. Idle and slow speed are in between.



6/219

Throttle control lever touches shut-off clip on 6 HP engine.



6/220

Cable clamp on 6 HP engine.

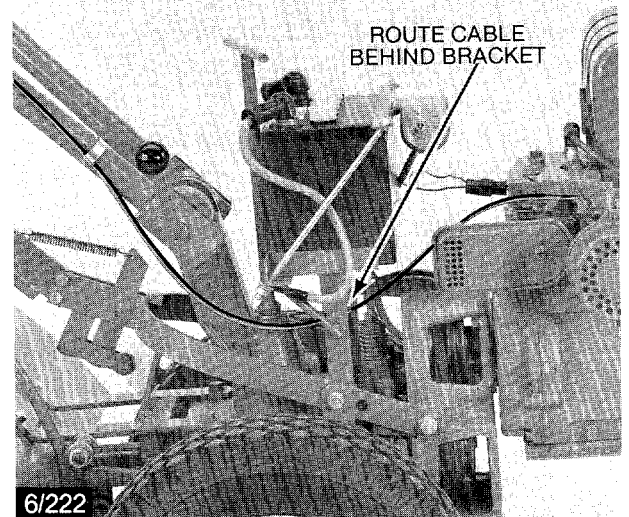
To Install A New Cable on the 6 HP Engine

On the standard recoil start engine, route the throttle cable straight down the handlebars and over to the engine (see Photo 6/221). On the electric start engine, route the cable down the handlebars and behind the battery bracket leg (Photo 6/222). Be careful not to allow the cable to touch the battery — it could short out the battery, and melt the cable.

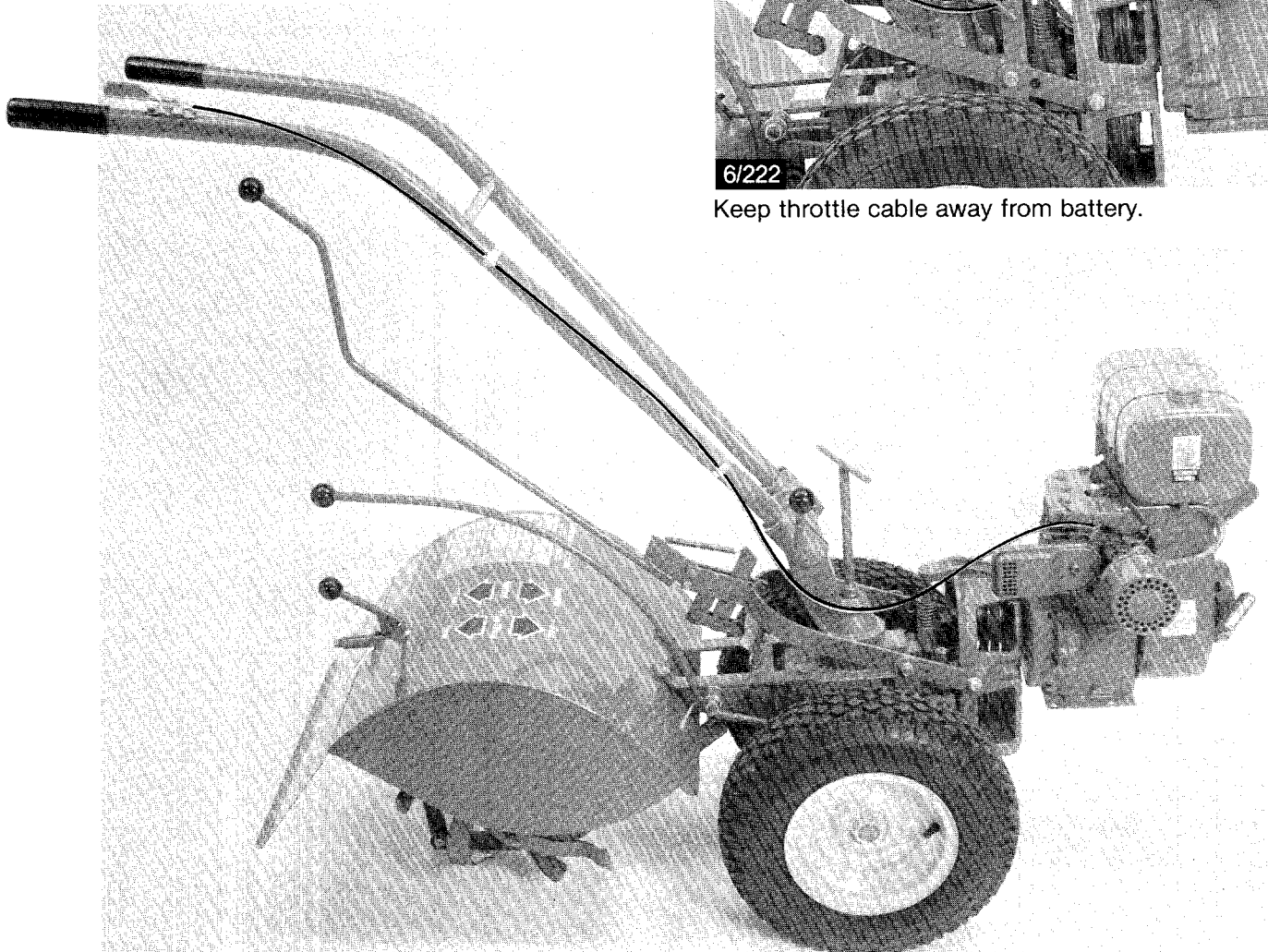
Attach the throttle control lever to the right handlebar and route the cable down the handlebar. Put one cable clip just below the top bend of the handlebar and one clip about 10 to 12 inches above the handlebar height adjustment stud. The clips are not designed to fit all the way around the handlebars.

Connect the crimped end of the throttle wire at the remote speed control as shown in Photo 6/220. Move the control lever on the handlebar all the way forward.

If the speed control lever on the engine doesn't make contact with the shut-off clip (Photo 6/219), then move the casing and all forward so that it does. Finally, hold the casing in position and tighten the casing in the hold-down clamp, as shown in Photo 6/220.



Keep throttle cable away from battery.



Throttle cable routing on 6 HP recoil start engine.

Cable Hookup for 7 HP Engine

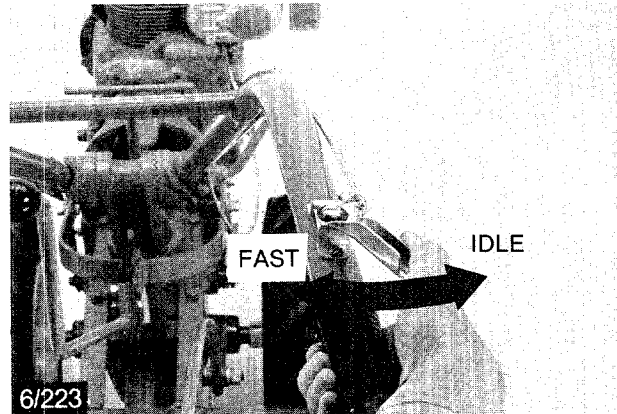
With the 7 HP Kohler engine, the full range of engine speeds from slow to fast is covered with very little throttle lever control movement — see Photo 6/223. If you move the lever to the left (back) the engine runs faster. Moving it to the right (forward), makes the engine run slower.

There really isn't very much adjustment required on the throttle cable. Once it is properly hooked up, all you'll need to do is oil the cable frequently and make sure the cable clamp is tight.

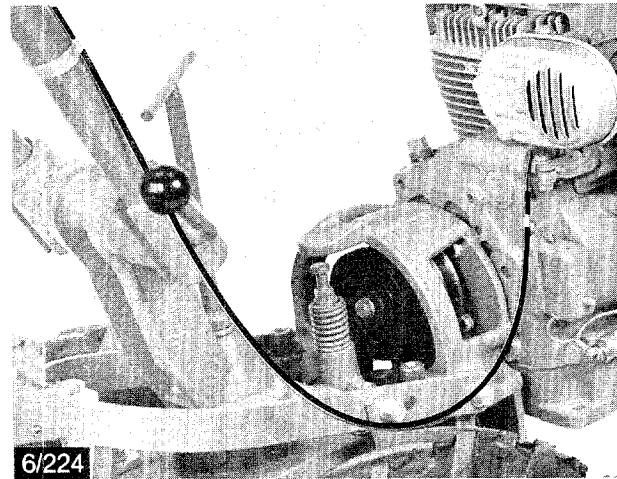
When hooking up the throttle cable, route the cable straight down the handlebar and over to the governor control disc, making sure the wire doesn't take an extreme bend — Photo 6/224. Attach the control lever to the right side handlebar and install the two clips on the handlebar. Locate one clip just below the top bend of the handlebar. Place the other clip about 10 to 12 inches above the handlebar height adjustment stud. The clips are not designed to fit all the way around the handlebars.

Connect the end of the wire in the first practical hole of the control disc (Photo 6/225). Then, replace the cable in the clamp and tighten it securely. Leave a little bit of the cable projecting beyond the clamp so it will hold properly.

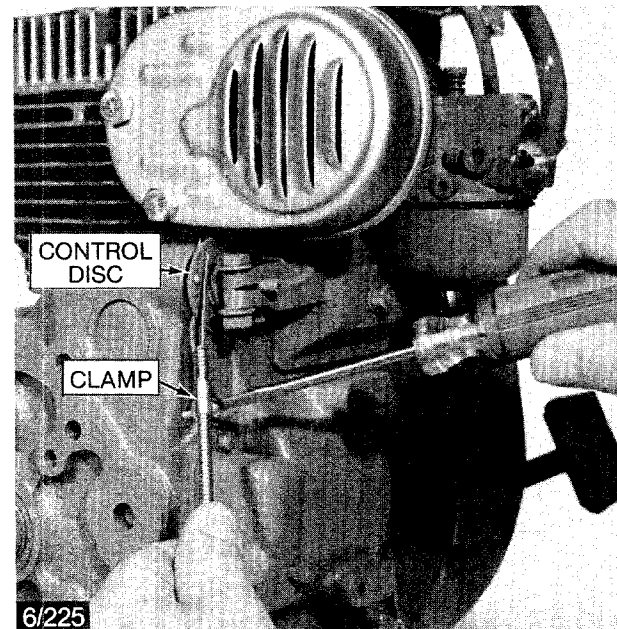
IMPORTANT: Since your throttle wire connects directly onto the governor control disc, you should be alert to the fact that the nut and bolt clamping the governor arm should not be loosened or otherwise fiddled with. It takes a trained engine serviceman to readjust a governor if you should loosen that bolt or the wide nut in front of the governor control disc. So please don't touch them unless you get some expert help first.



Speed ranges of 7 HP throttle control lever.



Throttle cable routing on 7 HP Kohler engine.



Put wire in nearest hole.

Carburetor Service

If you open the throttle lever, especially after the first few hours of operation, and your engine "stalls," "sputters," or "skips," the problem could be: a cold engine, a dirty air cleaner, an improperly adjusted idle adjustment needle (rare), or more likely, an over-rich fuel-to-air mixture.

Before making any adjustments to the carburetor, first make sure that the air cleaner is not clogged with dirt. Clean it if it is (Page 104). Also, be certain the spark plug is clean and properly gapped and that its porcelain is not cracked (Page 125).

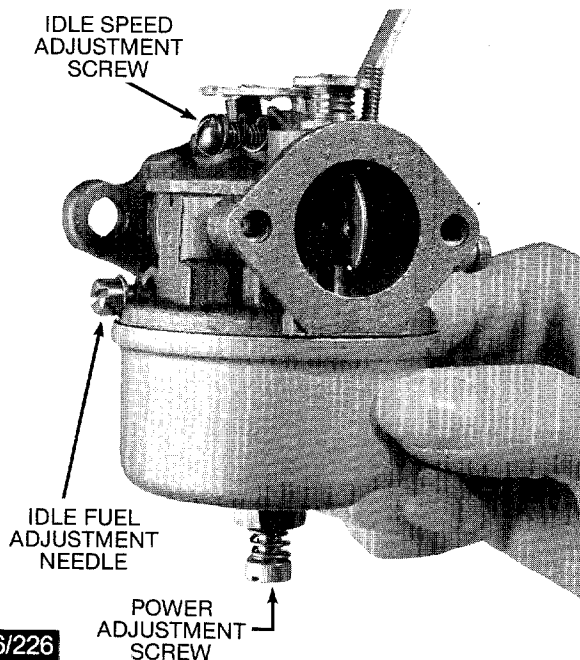
If you have an 8HP Briggs & Stratton Engine, please refer to your green-covered, 8HP Owner's Manual Supplement for details on adjusting the carburetor.

Adjusting the Power Adjustment Screw

The Power Adjustment Screw regulates the fuel-to-air mixture for high speed or power. If the mixture is too rich or too lean, no engine will run properly. An engine cannot develop all of its power unless the carburetor is adjusted properly. The Power Adjustment Screw is located on the bottom of the carburetor bowl on the 6 HP engine (see Photo 6/226) and on the top of the carburetor for the 7 HP engine (Photo 6/228).

It is true that every engine is tested at the engine manufacturer's factory and that the carburetor is properly adjusted and set for normal operation before shipment. But even so, the Power Adjustment Screw cannot be guaranteed to be 100% right — due to local variations in fuel, altitude and temperature.

To determine the proper Power Adjustment Screw



6 HP engine carburetor.

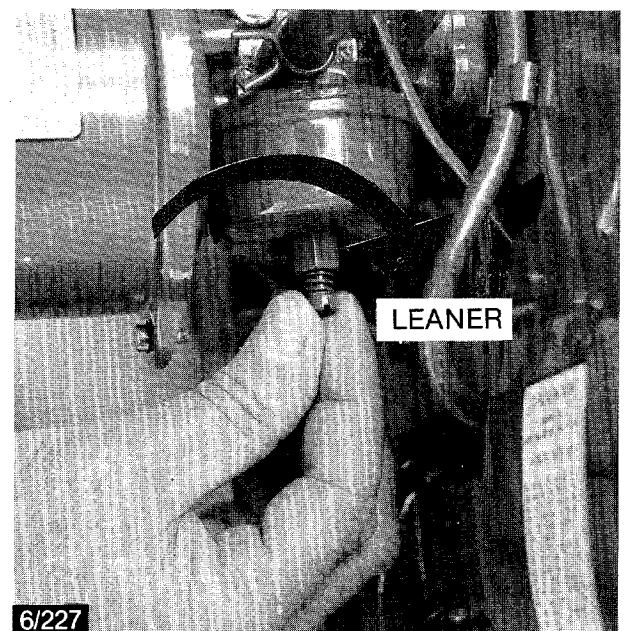
CAUTION: Do not run the engine in an enclosed area. Exhaust gases contain carbon monoxide, an odorless, tasteless, and deadly poison. Also, keep hands away from the muffler and surrounding areas.

setting, run the engine at full power (without choke engagement) and turn the screw counterclockwise (to the left) until you see black smoke or notice the engine "coughing". Then, counting the number of turns, turn the screw clockwise (to the right) until the engine slows down or sputters. Then, go back counterclockwise half-way between the two positions. That final position, or an additional 1/2 turn further counterclockwise, should be the proper setting for tilling.

Please remember that turning the screw to the right (clockwise) provides a *leaner* mixture (see Photos 6/227 and 6/229). For a *richer* mixture, turn the screw counterclockwise (to the left). Often, a 1/8 to 1/4 turn of the screw is all that is necessary. Also, remember to pause for 10 to 15 seconds after each adjustment to determine how the last adjustment affected engine operation.

If your engine seems to have enough power before you start tilling, and then loses power the minute you engage the tines deeply in the soil, it probably means that you have to open the Power Adjustment Screw about a 1/4 to 1/2 turn counterclockwise. But, don't run the engine so richly that it smokes — normally, you won't even see any exhaust.

IMPORTANT: Do not close the carburetor adjusting screws too tight. Doing so can result in damage to the screw or seat.



6 HP engine: Turn Power Adjustment Screw clockwise for leaner fuel mixture.

If Your Engine Won't Start...

If you can't start your engine to readjust the carburetor, you should first return the Power Adjustment Screw to its original setting, as described next.

6 HP Tecumseh Engines:

1. Turn the screw clockwise (towards lean) very carefully until it stops. Do not force the screw, or you will damage the needle and seat.
2. Turn the screw counterclockwise (open) for one full turn. This should be close enough to the operating position to start the engine.

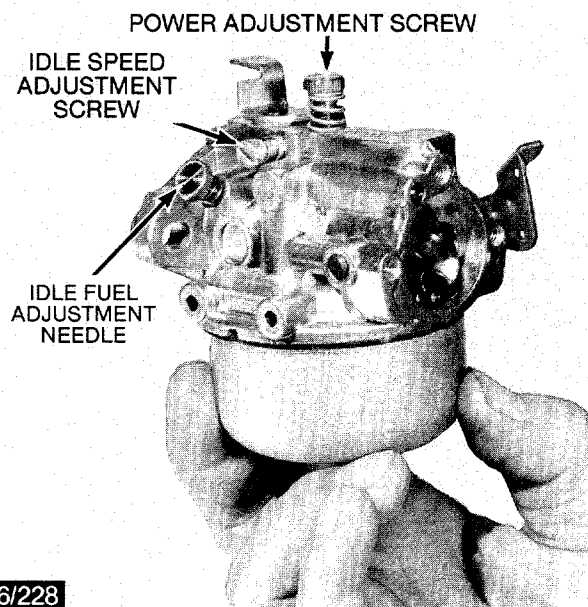
7 HP Kohler Engine:

1. Turn the screw clockwise (towards lean) very carefully until it stops. Do not force the screw, or you will damage the needle and seat.
2. Turn the screw back out (counterclockwise) 2 turns. This should be near enough to the operating position to start the engine.

Idle Speed Adjustment

The Idle Speed Adjustment Screw (see Photos 6/226 and 6/228) affects only the idling speed. This screw simply holds the throttle open mechanically to control idling speed. Change its setting only if you want to make the engine idle faster or slower.

To increase the idling speed of the engine, turn the screw to the right. Turn it to the left to decrease idle speed.



6/228

7 HP engine carburetor.

Idle Fuel Adjustment Needle

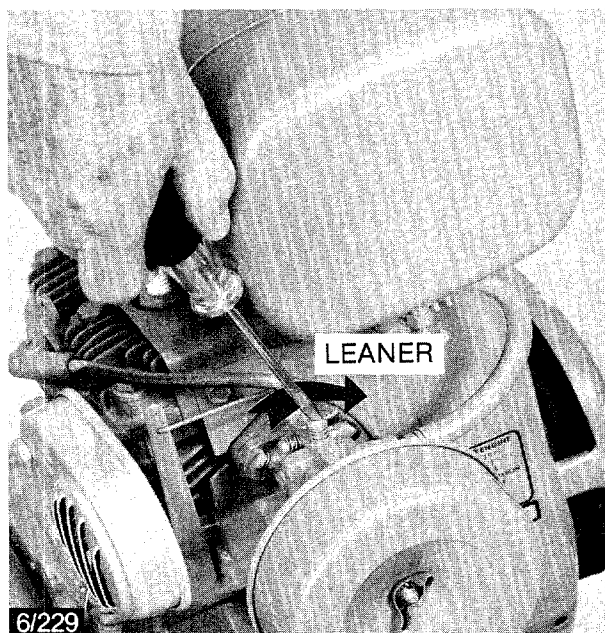
The Idle Fuel Adjustment Needle (Photos 6/226 and 6/228) affects the idle fuel mixture only. This needle screw adjustment seldom needs to be adjusted.

One way to tell if the idle needle needs adjustment is to move the throttle lever abruptly from the idle position to fast speed. If there is a hesitation or "miss" before the engine goes into high speed, the idle adjustment needle can be opened up (counterclockwise) until the engine runs smoothly in idle and does not pause when the throttle is opened abruptly. Turn the screw about 1/8 turn at a time and allow several seconds between each adjustment for the engine to react to each new setting. Make sure that the throttle control lever (on the handlebar) is in slow or idle position before adjusting this screw (needle). **IMPORTANT:** Do not force the screw, or you will damage the screw and seat.

Once you have adjusted the needle and have the engine idling smoothly, recheck the adjustment on the Power Adjustment Screw. It may need to be slightly readjusted.

IMPORTANT: If these carburetor adjustments do not get the engine running smoothly again, study the engine Owner's Guide that you received with your tiller. It covers engine operation and service in greater detail.

If you need further help, please contact your nearest authorized service dealer for your make engine. Or write to us at the factory, if you prefer. We'll put you in touch with your nearest authorized dealer, and also do anything else we can to help you get it fixed right!



7 HP engine: Turn Power Adjustment Screw clockwise for leaner fuel mixture.

Ignition System Service

If your engine won't start, the most common causes are ignition, electrical (for battery start engines), fuel, or carburetion problems. Many of these causes can be corrected easily, once the problem is identified.

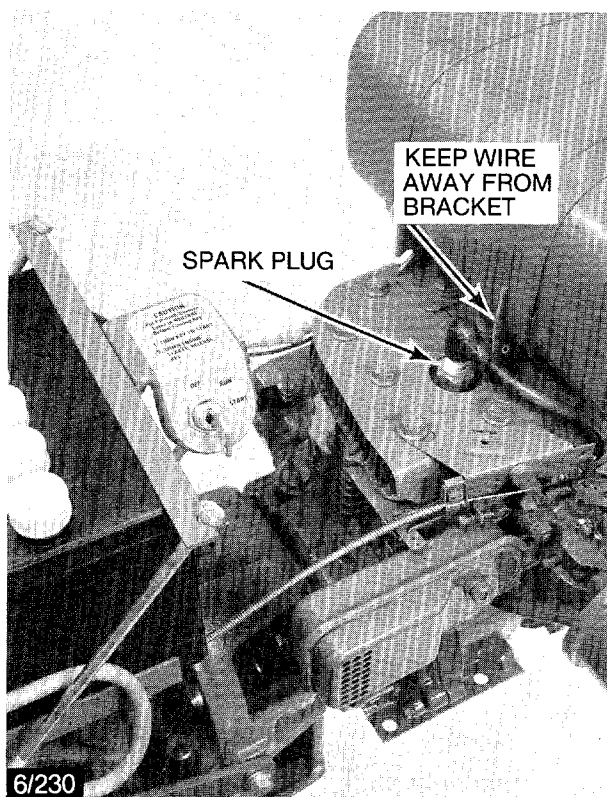
If your carburetor is adjusted correctly, and your fuel is fresh and clean (without any water in it), then not being able to start might well be the fault of your ignition system.

The first step in investigating ignition problems is to check the spark plug and its wire. Make sure that the connection to the wire is secure and there are no breaks or bare spots on the wire. On the 6 HP engine, be sure to keep the spark plug wire away from the fuel tank bracket (Photo 6/230). A short circuit could develop between that wire and the bracket which could make starting of the engine a frustrating job.

Next, remove the spark plug and carefully inspect it (see "Servicing the Spark Plug" on Page 125). If the plug is dirty, encrusted with deposits or corroded, you'd best replace it with a new one. If there is wet oil on the plug, look for the source of the oil problem (which is more likely your real problem). Is there too much oil in the engine crankcase; are the piston rings worn; is the crankcase breather clogged? Of course, when inspecting a spark plug or installing a new one, be sure it is the correct type and check the electrode gap to be certain

it is within proper tolerance.

To check the ignition system for operation, place a good or new spark plug on any metal part of the engine (but not near the fuel tank area!) and attach the plug lead wire to it (Photo 6/231). On 6 HP engines the throttle lever must be moved away from the shut-off position (on electric start engines place the key at RUN). Then, pull the starter rope with a firm pull and observe the gap in the spark plug. If you see a strong, bright blue spark, your spark plug and ignition system is probably all right, and you should check for other sources of engine starting trouble (see Section 7). If there is no spark, or a very weak, yellow one, the problem is probably in the ignition system. First, try another spark plug to be sure the other plug (even a new one) wasn't defective in some way. If that doesn't work, then you'll most likely need an authorized engine service dealer to help you check out the coil, condenser, breaker points, and possibly the flywheel. If your engine has over 100 hours of use on it, then it is probably time for a new condenser and breaker points. We offer do-it-yourself engine tune-up kits for this purpose...please see your Parts Order Form for complete details. NOTE: If you own a 6 HP Tecumseh engine, see the special instructions below concerning the engine shut-off clip.



6 HP Tecumseh engine.



Look for strong, bright spark from plug.

Engine Shut-off Switch on 6 HP Engines

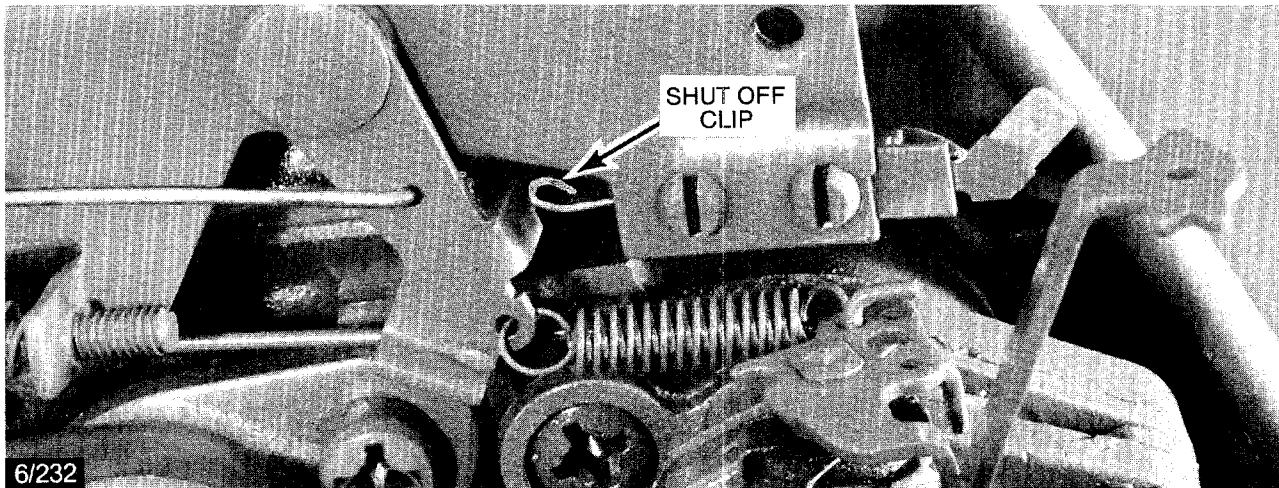
If you cannot start your engine for any apparent reason, one thing to do is to check the action of the engine shut-off clip (see Photo 6/232). If the spring clip is bent so that it touches the carburetor mounting bracket at all times, it will be doing the same thing as stopping the engine; and therefore, preventing you from starting the engine.

The engine shut-off switch can be easily checked by pulling the terminal wire off the shut-off switch and taping the metal terminal with electrical tape — see Photos 6/233 and 6/234. The tape will prevent the switch wire from touching any metal on the engine. Then, if you pull the starter rope and the engine starts, you know that the shut-off clip was touching the carburetor mounting bracket and preventing engine startup. Simply bend the clip away from the bracket

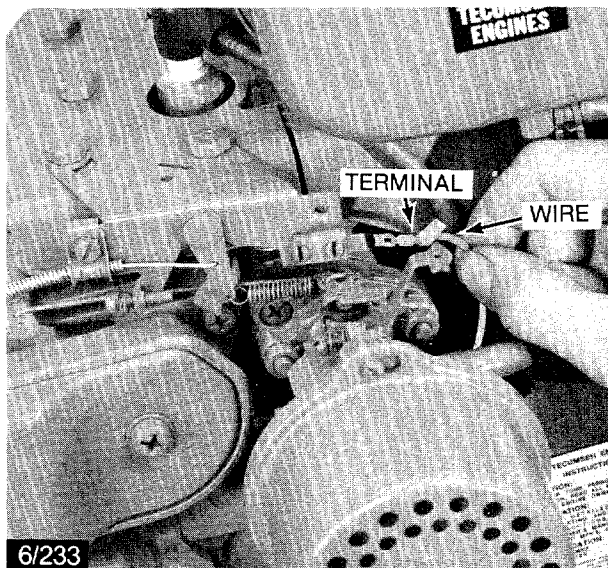
slightly. Now, make sure that the prong on the throttle lever still engages the shut-off clip when you move the handlebar throttle lever forward to the shut-off position.

To shut off an engine that is running while you have the short out wire taped up, move the throttle lever to a slow idle position and either remove the tape and touch the wire to any part of the engine's metal — away from the rotating flywheel for safety — or simply move the lever on the carburetor to the full choke position. Only stop the engine with the choke in emergencies, since repeated use of this method can be harmful to your engine.

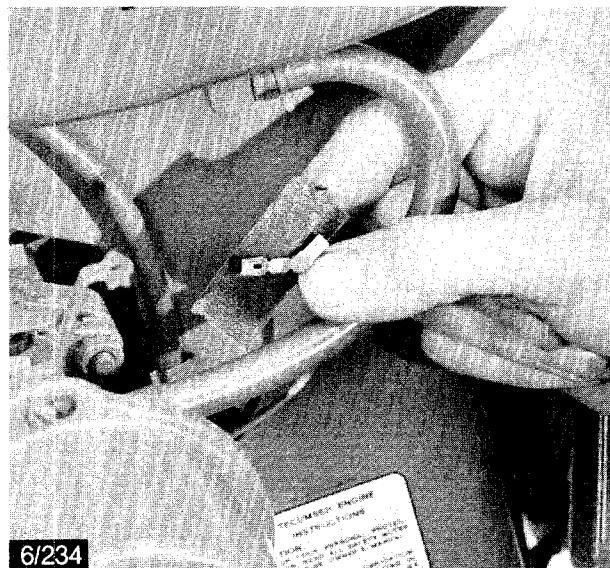
NOTE: A short somewhere else in the wire that leads from the shut-off switch to the engine's magneto would be more serious and would have to be taken care of by a service dealer. This, however, is a very rare occurrence.



Shut-off clip on 6 HP Tecumseh engine.



Pull wire terminal off shut-off switch.



Tape up metal terminal during test.

6 HP Engine Crankcase Breather Service

If your 6 HP engine constantly needs replacement of oil, or if oil constantly drips from your sponge air cleaner after the engine stops, one source of the trouble could be the crankcase breather.

First, make sure that your engine oil level has not been overfilled. Make sure that you fill the engine oil only up to the Full mark on the dipstick when the tiller is on level ground and the Depth Regulator Lever is set all the way down (top notch in lever engaged). This will place the engine at its correct sloping position. If instead you have leveled out the engine base and filled the oil up to the full mark, you have overfilled it with oil. This oil will be drawn up through the breather into the air cleaner where it will drip out. However, either a faulty functioning reed valve in the breather, or dirt in the breather could cause the same conditions.

It's easy to check and see if your crankcase breather has been clogged with oil and has not been able to function properly because of it. Underneath the carburetor you will see a plate fastened to the side of the engine with two Phillips screws (see Photo 6/235). It has a rubber hose coming out of it leading directly up to the air cleaner. This is the valve cover, which also covers the crankcase breather. Removing the screws and the plate will reveal the crankcase breather.

IMPORTANT: When removing the plate, make sure that you take care not to damage the gasket under the cover. Be prepared to replace it with a new one if necessary.

Inside the tub-like steel breather assembly, you will probably find some oil. Wipe off the oil and carefully pry out the tub-like steel breather assembly — Photo 6/236. If you look closely at the back side, in the bottom left and right corners, you will see two tiny oil drain holes (Photo 6/237). Oil that comes into the breather assembly is supposed to drain back into the engine crankcase through these holes. Therefore, these holes must be kept clean and open so that the oil can return

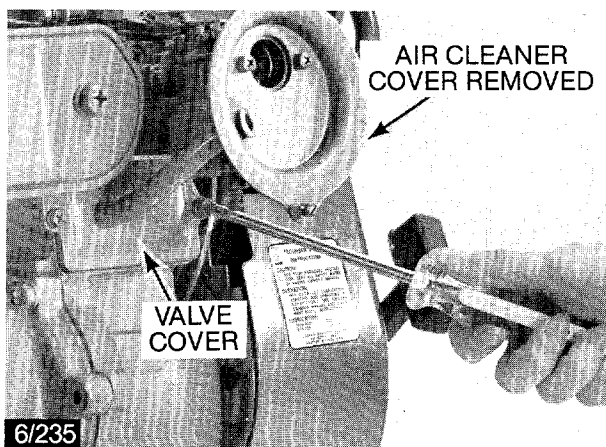
to the crankcase. If they are clogged with dirt, remove the steel assembly and clean them out. Also, see that the fiber filter inside the assembly is clean.

When the holes are clean, replace the two gaskets on the assembly (one in back, the other in front) and replace the assembly. Make sure that the breather goes back into the engine *with the small drain holes on the bottom*. Then, replace the fiber filter and the valve cover and its gasket. Tighten the two screws snugly to prevent any air leaks.

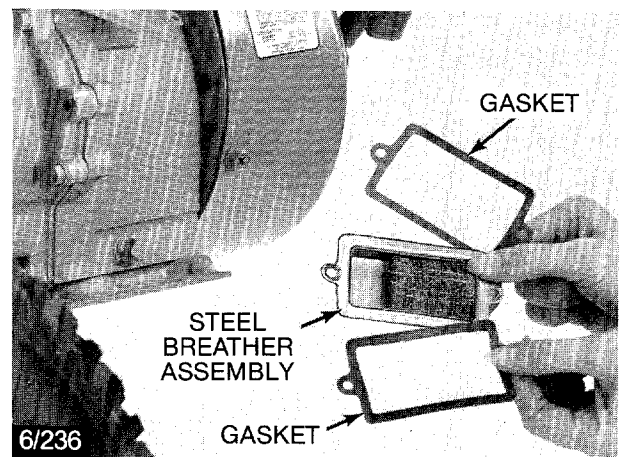
If oil has been dripping from your air cleaner, remove and clean the oil from the sponge (see instructions on Page 104). Also clean the excess oil from the air cleaner cover and its base. Re-oil the element and replace it.

If the above service does not solve your problem, get in touch with your authorized engine service dealer. It may be worn rings, or it may be that the breather assembly needs to be replaced.

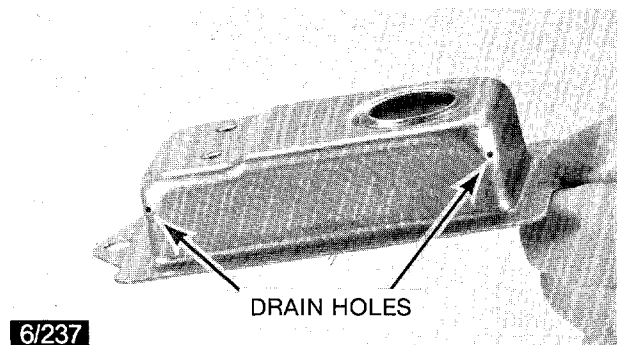
Please note that one simple, but often overlooked item that can lead to oil breather problems is a badly damaged gasket on the dipstick which makes it impossible to tightly seal the dipstick when you thread it in. So, check the gasket to make sure that it is in good condition and doesn't allow any air to leak in.



Remove valve cover to check breather assembly.



Carefully remove tub-like assembly.



Make sure these two holes are unobstructed.

Troubleshooting the 6 HP Electric Start System

Here are simple, step-by-step checks you can make... in this order... if your starter motor didn't turn over when you turned the Key Switch to START, or if it didn't stop when it should have.

IMPORTANT

Before taking the following steps, make sure that the Forward/Reverse Lever is in Neutral and the spark plug wire is disconnected and moved away from the plug and fuel tank area. Carefully read the battery safety precautions on Page 21 before proceeding.

1. Starter Motor Won't Turn Over

When you turn the key to the START position and hold it there (no longer than 10 seconds) the starter motor on your engine should turn over, indicating that the battery and the electric starting system is working properly. If your starter motor does not do anything, the first thing you should do is check all wires and cables to make sure they are snugly connected at the proper points. The exposed ends of each wire should touch only the connection studs. Also you should check the "grounding point" under the right battery clamp bolt on the bottom of the bracket. The cable terminal should make good contact with the bracket metal for a good ground. If not, tighten the connection at the battery bracket. If rust or corrosion is present around the contact area, scrape the paint or rust off the bracket to get a good connection. All wire insulation should be intact, with no bare spots or cracks showing. If you discover a bad wire, please let us know.

2. Wires O.K., Starter Motor Still Won't Turn Over

Next, you'll have to charge the battery briefly to see if you can activate it. First make sure that the Forward/Reverse Lever is in Neutral. Then turn the key to RUN, move the throttle lever out of the shut-off position and start the engine with the recoil starter (see complete engine starting instructions on Page 52). Run the engine for 45 minutes or more. (Remember, battery cells must be properly filled with acid before running the engine). Stop the engine and see if the starter motor will start the engine when the key switch is turned to START. If the starter motor turns over, all systems should be in working order now. If it doesn't turn over, then go on to Step 3.

NOTE: If the battery is over a year old and it has run down, then you should check for a possible problem with your automatic recharging system. See "Recharging System" on Page 194.

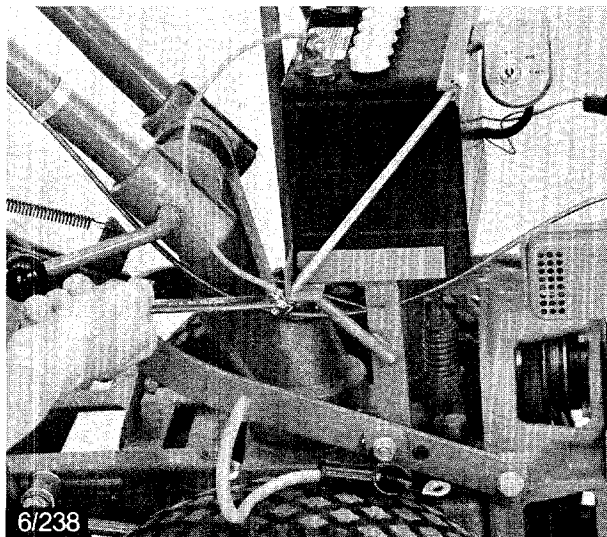
CAUTION: For safety's sake, don't jump the battery with your car's battery or charging system. Doing so could cause your battery to explode, and would also ruin the electric start system and possibly the engine's ignition system.

3. Engine Runs, Starter Still Won't Turn Over

If you were able to start the engine with the recoil rope, then at least you know that the starting problem is definitely somewhere in the electric start system, and not with the engine's ignition or fuel system. This next check will help you to further isolate the electrical problem.

First obtain about 12 inches of heavy INSULATED wire (Number 10 wire or larger). Strip away 3/4 inches of insulation on both ends of the wire. Then, disconnect the negative (—) battery cable (on the right side of the battery as you face forward from the handlebars) and replace it with this heavy wire — see Photo 6/238.

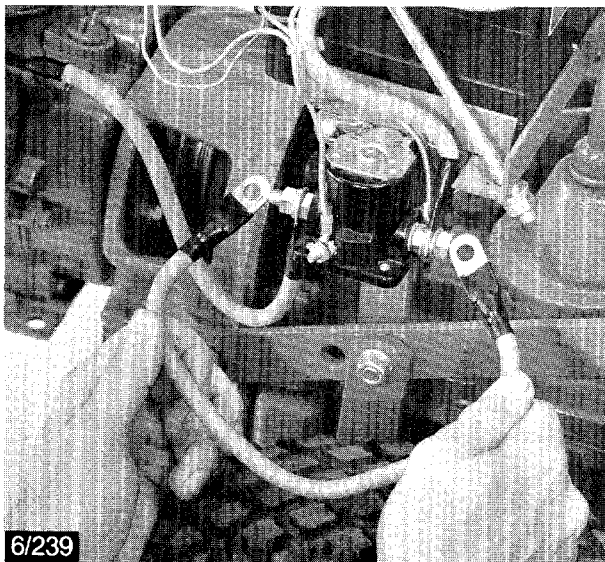
As a precaution, so that the tiller won't start up and move unexpectedly when you proceed with this test, you should place the Forward/Reverse Lever in Neutral and move the engine's throttle control lever all the way forward (to the right) to the engine's shut-off position. Also, disconnect the spark plug wire and move the wire away from the plug and fuel tank area.



Replace negative (—) cable with heavy, insulated wire.

Now, using the negative battery cable as a “jumper wire”, firmly touch one end of the cable to the right side post of the solenoid, as shown in Photo 6/239. Make sure you hold only the insulated parts of the cable. *Briefly* touch the other end of the cable to the left side post (shown in Photo 6/239) — the post from which another heavy cable leads over to the starter motor. This brief touch with the jumper cable will most likely cause a spark and should also energize the starter motor. If the starter motor energizes, you know that the battery and starter motor are OK. You also have further isolated the problem as being with the key switch or its wires, or with the solenoid (not very often the solenoid). You should now proceed to Step 4.

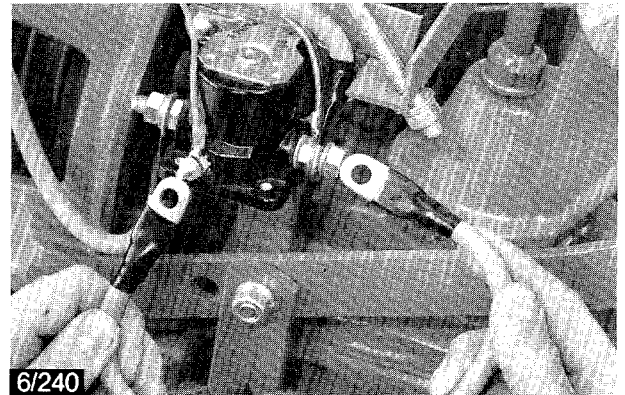
If the above test did not cause a spark or briefly energize the starter motor, it's a good indication that the battery is dead and you should remove it (Pages 112-113) and have it tested by your service station. However, you can still use your tiller without the battery. See Page 194 for instructions on how to run your tiller with the battery removed or dead.



6/239
Briefly touch negative cable to right and left posts on solenoid.

4. Jumper Cable Energizes Starter Motor, But Key Switch Still Won't Start Engine

In the following test, you will again use the negative cable (described in Step 3 above) as a “jumper wire.” Also, it is assumed that the battery is in good condition. Now, while holding the insulated portions of the cable, firmly touch one end to the right post of the solenoid and then the other end *momentarily* to the center post, as shown in Photo 6/240. NOTE: The positive (+) cable must be properly connected at all times.



6/240
Briefly touch negative cable to right and center posts on solenoid.

If the starter motor turns over, the test confirms that the solenoid is working properly, and that the problem lies with the wire to the key switch, the connections to the switch, or with the switch itself. See Step 5 for instructions on how to check these items.

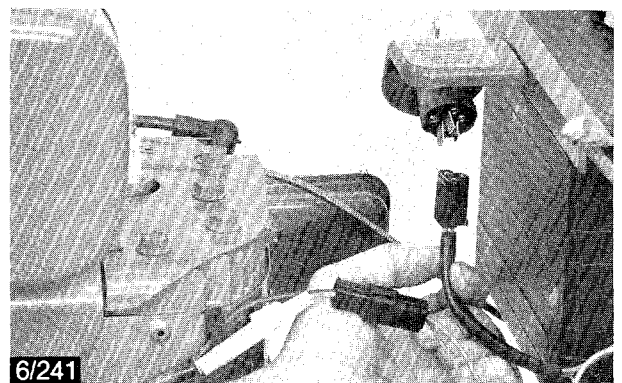
If the battery is good and you had no energizing of the starter motor in this test, then it indicates that the solenoid is bad (if the starter motor energized in Step 3). If this is so, please get in touch with our service department for further instructions.

5. Solenoid Test Energized Starter, But Key Switch Doesn't Energize Starter

At this point, you have either found the problem, or have isolated the problem to the key switch and its wiring (if the previous tests have energized the starter motor). Here is how to test the switch and its wiring.

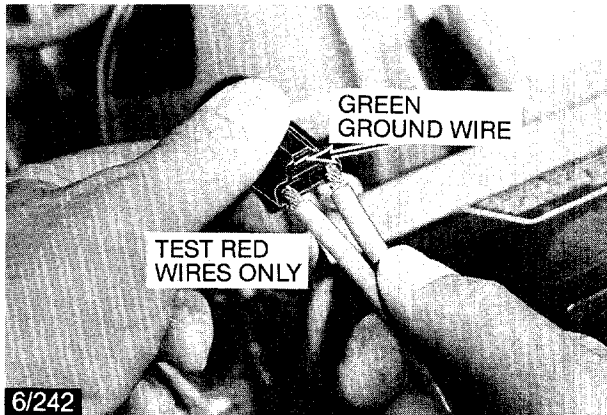
First, take your “test jumper cable,” which is the negative (–) battery cable, and put it back on the battery and grounding point. Make sure the connections at the battery post and the bottom of the hold-down bolt are snug.

Now, unplug the receptacle from the bottom of the key switch — see Photo 6/241. Take the #10 wire you



6/241
Unplug receptacle from key switch.

used to substitute on the negative side of the battery (in Step 3) and stick the ends of the wire in the left and right sides of the receptacle, as shown in Photo 6/242. If the starter motor energizes and tries to start the engine, then you know that the problem is with the key switch or the contact between the receptacle and the key switch. Make sure the receptacle is firmly connected to the key switch and try to start again.



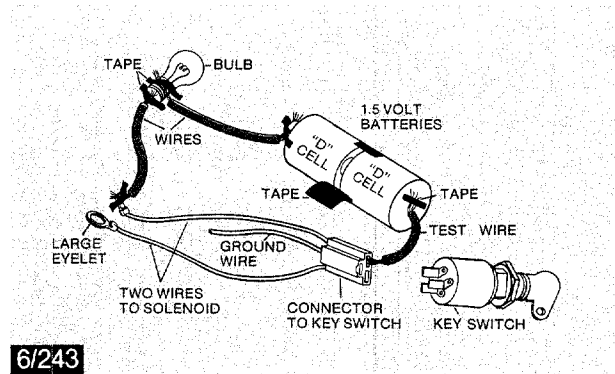
Use test wire to “jump” wire to key switch.

If this test does not energize the starter motor, the problem lies within the wiring to the switch or the starter motor itself. There is a way to check to see if the wiring is connected properly, even though you can't see anything wrong. To do this, you should use a tester (called a continuity tester). You can make one easily from two D-sized flashlight batteries, some wire, tape, and a flashlight bulb, as shown in Sketch 6/243. Or you can buy a continuity tester at a hardware store.

To test the two wires that lead to the solenoid for continuity, place the leads from your tester as shown in Sketch 6/243. If the bulb lights, it indicates that the wire or connection being tested is OK. Check each wire

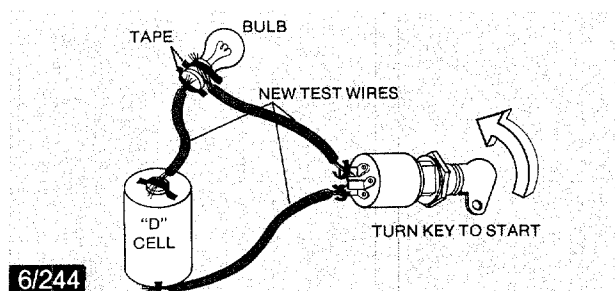
individually. Let us know if a wire does not light the bulb.

You can also check the Key Switch with the continuity tester, as shown in Sketch 6/244. If the bulb fails to light when you turn the key to Start, then you probably have a faulty key switch. Get in touch with us at the factory and let us know.



6/243

With your homemade tester, first test the wire with the small eyelet (shown tested here) then stick the test wire in the other socket below and the other end of the test wire on the large eyelet. Proper continuity should light the bulb.



6/244

To test the switch, tape end of test wire to side-by-side prongs on key switch, then turn switch to START. START should light bulb.

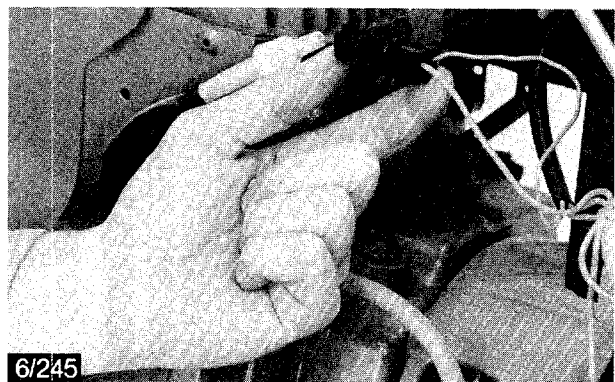
If the Key Switch Won't Stop the Engine

Your electric start tiller has been designed with two ways to stop the engine:

1. Turn the Key Switch to the OFF position.
2. Push the control lever on the handlebar all the way to the right, towards the engine.

Both ways stop the engine by “grounding out” the ignition system.

If your key switch does NOT shut the engine off, here's what to do. First, check the green wire that leads from the key switch receptacle to the plastic terminals shown in Photo 6/245. Push these terminals together to insure a good connection. Now test for OFF with the key switch.



Make sure plastic terminals are tightly connected.

Next, unplug the receptacle from underneath the key switch (Photo 6/241). Using a jumper wire (Number 10 wire or larger, as described in Step 3, Page 191), stick one end in the single hole (green ground wire) of the receptacle and touch the other end to the left side (as viewed from operator's position) battery hold-down bolt, as shown in Photo 6/246. If that stops the engine go on to check the key switch. **CAUTION:** Do not touch the battery posts with the jumper wire!

To check the switch, remove it from its metal plate using big pliers or a 7/8" wrench. To shut the engine off, the washer underneath the nut must be contacting bare metal. If the decal on the plate is blocking that metal-to-metal connection, scrape some of the decal away so good contact is made. Replace the switch and test... there should be no problem if a proper grounding connection is made. If the switch still doesn't work, please contact us for further advice.



Run jumper wire from single hole in receptacle to hold-down bolt on positive (left-side) of battery.

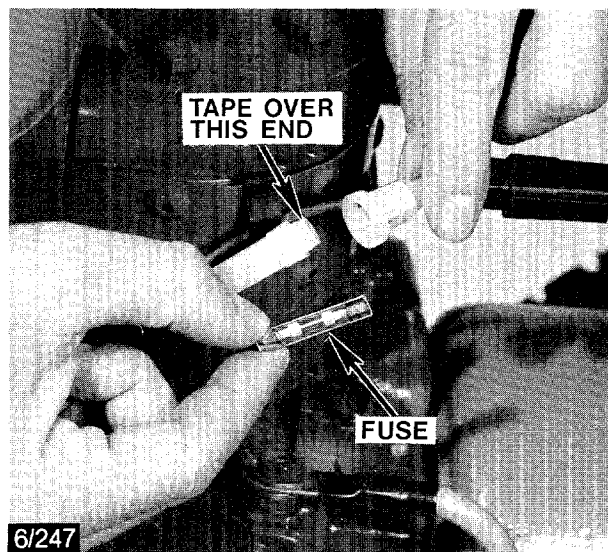
In Case of a Dead Battery

If your battery is dead, or one or both battery cables is disconnected, your recoil starter can be used to run the tiller, but only after you have taken the following steps to protect your electrical system from harm.

1. Make sure that all battery cells are full of battery acid — with no lead plates exposed. If the engine is run with a dry battery (or one low in acid), the battery and other electrical parts can be damaged.

2. IMPORTANT: On 6HP engines, disconnect the fuse holder, remove the fuse, and tape over the fuse holder's half nearest the engine to protect the diode. See Photo 6/247. You can ignore this step with 8HP engines because their electrical system does not require a fuse. However, be sure to insulate the positive battery cable terminal as explained on Page 13 of the 8HP Owner's Manual Supplement.

3. When starting the engine with the recoil starter, the key switch must be placed at the RUN position and the throttle control lever moved away from the shut-off position.



Push the two halves of the fuse holder together and turn one part counterclockwise. Place tape over the half of the holder closest to the engine.

Recharging System

Your tiller's electric start system is designed to automatically recharge the battery whenever the engine is in operation (see Sketch 1/36 on Page 20).

If an older battery is run down, you should check the condition of the fuse located on the battery recharging line (on 6HP engines only). See Photo 6/247. If the thin metal strip inside the fuse is broken, the recharging

current will not reach the battery when the engine is running. Replace the fuse with a new one. If the fuse is OK, you should check for loose or bare wires, or corroded connections. If they're OK, then have the battery tested for a bad cell. Finally, have your authorized engine dealer check for a possible problem with the diode or with the engine's recharging system.

Removing the Top Transmission Cover

Here's a handy way of removing the top transmission cover whenever you want to peek inside the transmission to check for wear or damage.

TOOLS YOU'LL NEED

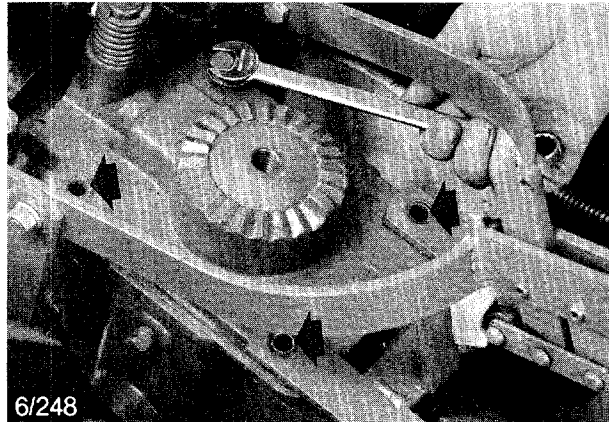
- 3/8" wrench
- 9/16" wrench
- 1/2" wrench
- Short length of stick about 5/16" thick
- Non-hardening gasket sealant
- Shallow pan

STEP 1. Unthread the T-bar handle on the handlebars and remove the handlebars, being careful not to put a sharp bend or kink in the throttle cable. Set the handlebar base and T-bar on a clean surface so they won't pick up any dirt that could enter the transmission when they are replaced.

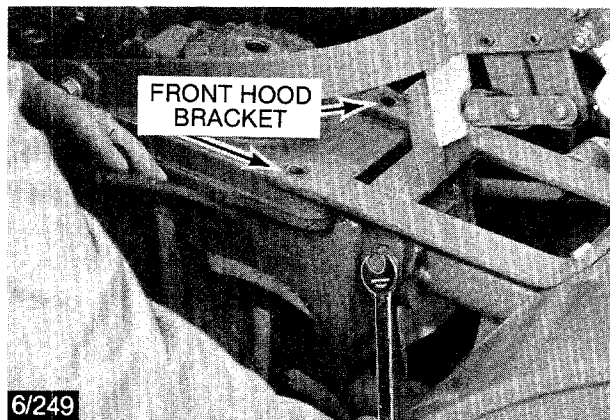
STEP 2. Clean off any dirt or debris from the top and sides of the transmission cover. Then use a 9/16" wrench to remove the four bolts and their lockwashers from the cover. See Photo 6/248.

STEP 3. Using a 1/2" wrench, remove the two bolts that fasten the front hood bracket to either side of the transmission housing (Photo 6/249).

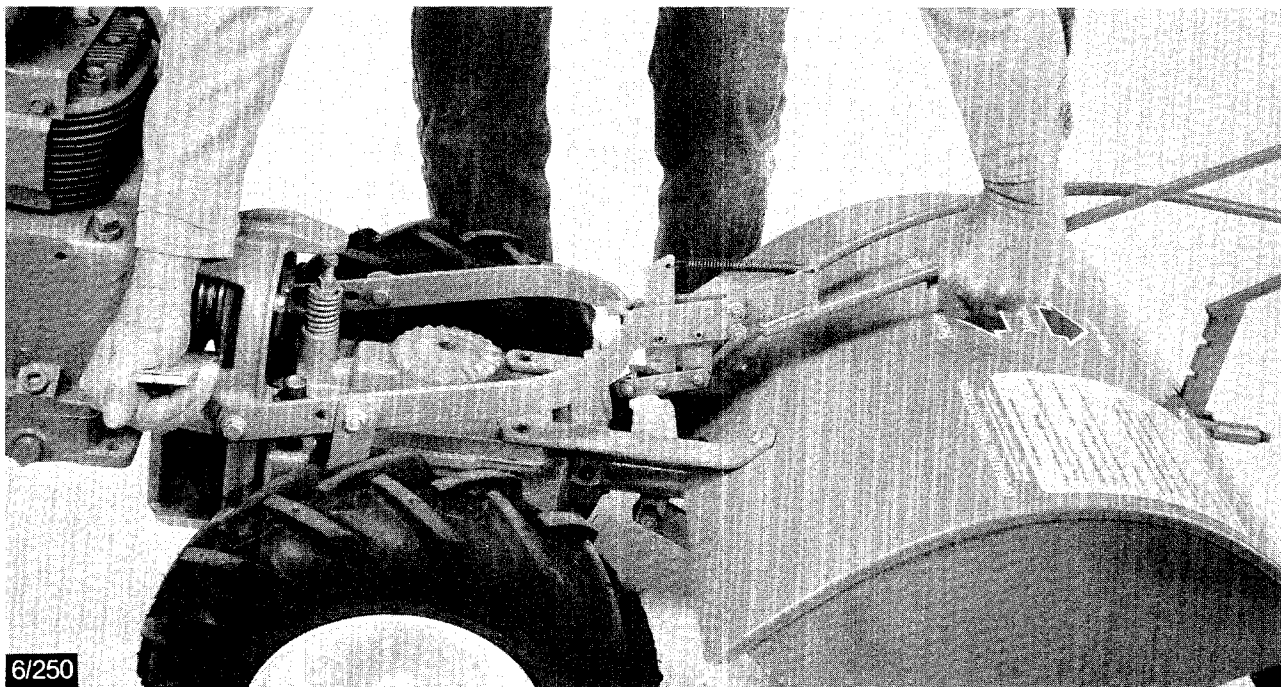
STEP 4. To give you the clearance needed to remove the cover, push the Forward/Reverse Lever down into Forward position. Take your stick and wedge it between the engine and transmission pulleys, as shown in Photo 6/250 (don't touch the drive belt with the stick).



Remove four bolts from transmission cover.



Remove side bolts from hood bracket.



Wedge stick between pulleys to keep them separated.

STEP 5. Pull upwards on the front hood bracket to give you additional clearance at the rear of the transmission cover. Now, lift and twist the cover as necessary, and remove it. See Photo 6/251. Try not to damage the gasket beneath the cover. If it gets torn, you should replace it with a new one (Part No. 1123).

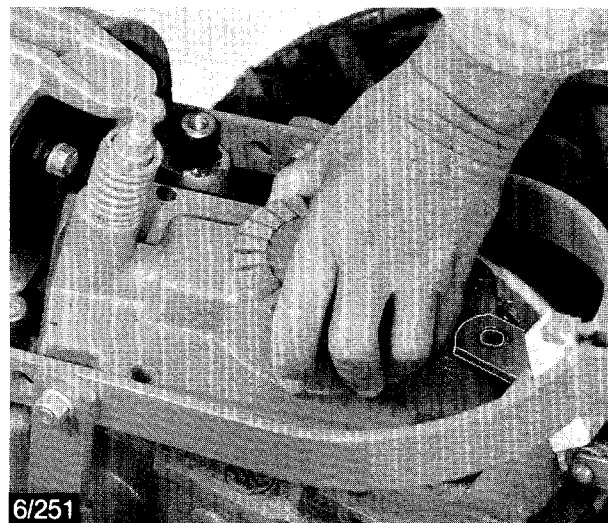
STEP 6. Using a $\frac{3}{8}$ " wrench, remove the oil drain plug located below the left wheel shaft and drain the gear oil into a clean pan. When the oil level drops enough for you to see inside the transmission, securely replace the plug, after first coating its threads with *non-hardening* gasket sealant.

STEP 7. Your tiller is equipped with either the single piece welded drive shaft shown in Photo 6/252, or with the assembled drive shaft shown in Photo 6/253. Both style drive shafts are equal in performance and dependability. You can easily identify which style you have by comparing your drive shaft with the photos. To identify the other parts inside the transmission, please refer to your *Master Parts Catalog*.

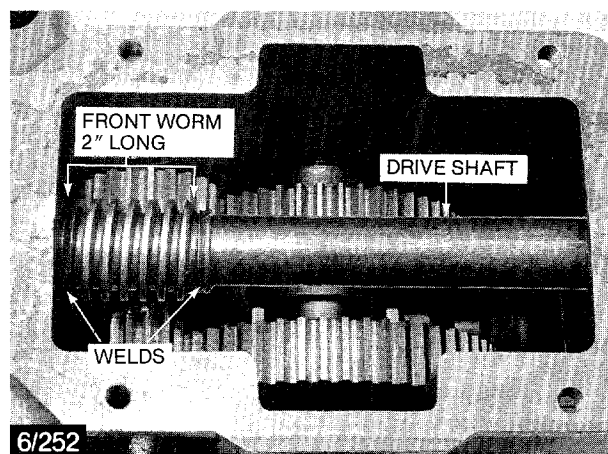
STEP 8. When replacing the top cover, first make sure that a good gasket is in place on the transmission. Then, slip the cover into place and carefully align the holes in the cover and the gasket. When replacing the cover, remember to lift up on the front hood bracket to give you additional clearance at the rear. Also, it may be necessary to lift up on the engine slightly in order to slide the spring and plunger assembly of the cover under the projecting tab of the cast iron motor mount. When lifting the engine, do so from the base of the engine only — do not grasp the carburetor or air cleaner. Be sure to remove the stick from between the pulleys after you have the cover in place.

STEP 9. Replace the four bolts in the top of the cover, snugging them down almost tight. Then replace the two bolts in either side of the front hood bracket. Now, tighten all six bolts securely.

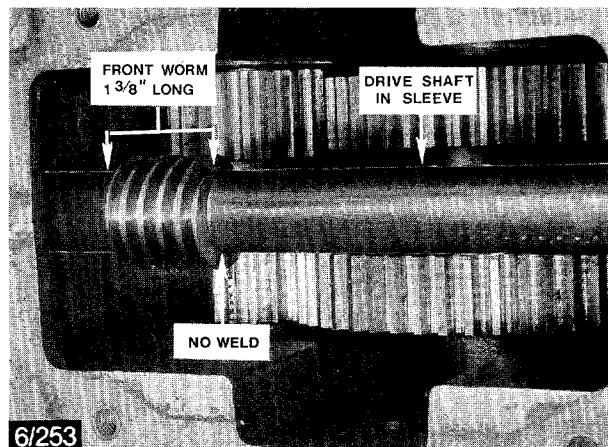
STEP 10. Replace the gear oil in the transmission and check the level (see "Checking Gear Oil Level" on Page 118). Finally, replace the handlebars, again taking care not to bend or kink the throttle cable.



Lift hood bracket up, then twist and remove cover.

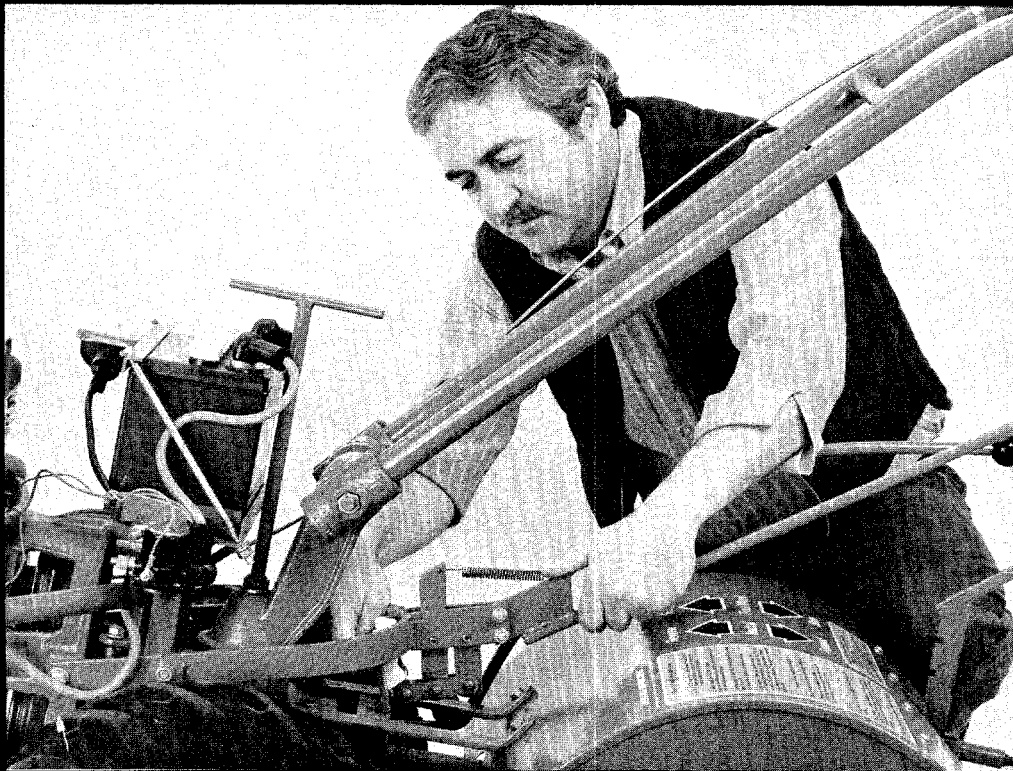


If your drive shaft has a weld bead as shown, or if the worm measures 2" in length, you have a welded drive shaft.



If there is no weld joint between the sleeve and worm as shown, or if the worm measures $1\frac{3}{8}$ " in length, then you have an assembled drive shaft.

TROUBLE- SHOOTING



7

Section 7: Troubleshooting

The following guide lists most of the more common problems that you might encounter with your tiller and its engine. If you don't find your problem here, or if you don't understand the possible solution(s) given, please don't hesitate to write or call your Customer Service Department here at the tiller factory. We'll be more than glad to give you all the help we can.

Please note that the possible causes and solutions for each problem are not necessarily listed according to their frequency of occurrence. In other words, the

solution to your problem may be the last item given, or vice versa.

Please refer to the Horse Model Master Parts Catalog for location and identification of tiller part numbers named in the solution to specific problems. You should have received the Master Parts Catalog along with this Owner's Manual when your tiller was delivered. The page numbers and/or photo numbers given below pertain to those in this Owner's Manual.

TROUBLESHOOTING THE TILLER

PROBLEM

WHAT TO DO & REFERENCE

1. FORWARD/REVERSE LEVER:

A. Jumps out of "gear".

- Drive Belt may be too tight — raise yellow-colored Belt Adjusting Block (#1133) a little. See Page 105.
- Clutch Pawl Spring (#1492) might be over-stretched. See Page 106.

B. Hard to get into Reverse.

- Check Reverse Disc (#1485) for excessive wear. Replace disc if badly worn or cracked. See Page 120.
- Check adjustment of Reverse Spring and Plunger. See Page 120.
- Grease Motor Mount Bars (#1034) and Belt Adjustment Block (#1133). Oil linkages for Forward/Reverse Lever. See Page 110.
- Forward/Reverse Lever may be hitting handlebars, especially when using dozer/snow blade. See Page 90.

C. Reverse remains engaged when Lever is released.

- Grease Motor Mount Bars (#1034) and oil linkages for Forward/Reverse Lever. See Page 110.
- Check adjustment of Reverse Spring and Plunger. See Page 120. If problem continues, contact Customer Service Representative for further advice.

D. Locks in Forward position.

- Make sure you have grease on bottom of Belt Adjusting Block (#1133) and on Motor Mount Bars. Oil linkages for Forward/Reverse Lever. See Page 120. If problem continues, contact Customer Service Representative for further advice.

E. Hard to shift Lever into Forward.

- Follow advice for 1-D. Also check for bent Motor Mount Bar that is binding in mount holes.

2. WHEEL SPEED SHIFT LEVER:

A. Drops out of Fast Wheel Speed.

- Tighten locknut (#9806) on pivot point of lever. See Page 107. Replace nut if it doesn't hold.

B. Hard to shift wheel speeds.

- Loosen locknut (#9806) on pivot point of lever. See Page 107. Oil shift lever linkage and hole in pivot point. See Page 120.
- Check for rust on external portion of Eccentric Shaft (#1027) where Eccentric Lever (#1029) fits. See Page 110. Use penetrating oil on shaft and work back and forth by hand.

PROBLEM

WHAT TO DO & REFERENCE

- | | |
|---|--|
| C. Very hard to shift or stuck in Fast or Slow gear. | <ul style="list-style-type: none">• Oil shift lever linkage and hole in pivot point. See Page 110.• Possible binding Clutch (#1237) inside transmission. Disconnect speed shift linkage at end of lever and work Eccentric Lever (#1029) by hand. See Page 179. If difficult or impossible to move, it might be necessary to replace the Wheel Shaft (#1235). The shaft could be swollen around the key, preventing the clutch from moving. Contact Customer Service Representative for advice and instructions. |
| D. Lever can't shift into Slow gear, but will go into Fast gear. | <ul style="list-style-type: none">• Connecting Rod (#1231) at bottom of Wheel Speed Lever might be backwards, or bent in toward transmission and hitting it. Other linkage might be bent inward. Straighten out.• Possible binding Clutch (#1237) inside transmission. See 2-C, above.• Fork Shoes (#1094) may be worn on sides that push Clutch towards Slow speed gear. If so, replace shoes. Contact Customer Service Representative for advice and instructions. |
| E. Lever will shift into Fast or Slow gear, but won't stay engaged. | <ul style="list-style-type: none">• Bronze Fork Shoes (#1094) may be worn (on well-used tillers). Fork shoes help hold clutch in place when engaged with wheel gear. If shoes are worn, clutch may slip out of gear. Contact Customer Service Representative for advice and instructions. |
| F. Can't shift out of Fast or Slow gear - tiller runs at only one wheel speed. | <ul style="list-style-type: none">• Oil shift lever linkage and hole in pivot point. See Page 110.• Shifting pin on end of Eccentric Shaft (#1027) may be broken (or worn on well-used tillers). To check for broken pin: remove tiller top cover, drain ½ gear oil out, look for pin where it fits into Clutch Fork Shaft (#1016) at rear of Clutch — see Page 195. If it is missing, replacement of Eccentric Shaft is necessary. Contact Customer Service Representative for advice and instructions.• Bronze Fork Shoes (#1094) may be broken. If so, they won't move Clutch (#1237) out of gear. With top cover removed and ½ gear oil drained out (see Page 195), look for shoes at both ends of clutch. If missing, replacement of shoes is necessary. Contact Customer Service Representative for advice and instructions. |
| G. Moves freely up and down, but can't shift out of (or into) gear. | <ul style="list-style-type: none">• Make sure lever is not too loose. Check locknut (#9806) on pivot point of lever for tightness. See Page 107.• Possible broken Eccentric Shaft (#1027) inside transmission. Disconnect shifting linkage from Eccentric Lever (#1029) and try moving Eccentric Lever by hand (see Page 195). Easily moving lever, without rolling tiller a few inches to lock clutch lugs in gear indicates probable broken eccentric. Contact Customer Service Representative for advice and instructions.• Possible broken Bronze Fork Shoes. See 2-F, above. |

3. TINES OR WHEELS WON'T TURN WHEN FORWARD/REVERSE LEVER IS SHIFTED INTO FORWARD OR REVERSE

- Review operation of tiller controls, Section 3.
- Key (#9303) for Engine Pulley (#1483) may be missing or broken. If so, pulley won't turn, and won't transfer engine power to drive belt or reverse disc. See Page 165 to remove engine pulley.

PROBLEM

WHAT TO DO & REFERENCE

3. TINES OR WHEELS WON'T TURN (Cont'd.)

- Key (#9302) for Transmission Drive Pulley (#1484) may be missing or broken. If so, drive belt, reverse disc, and lower Pulley will turn, but lower Pulley will not turn main drive shaft. See Page 175 to remove lower pulley.
- Both front and rear Bronze Worm Gears (#'s 1221 & 1064) may be worn (rare). If so, they will not receive power from Drive Shaft Worms to turn wheel and tiller shafts. Contact Customer Service Representative for advice and instructions.
- Both front and rear Drive Shaft Worms may be worn (very rare). Contact Customer Service Representative for advice and instructions. Worms are replaceable on Assembled Drive Shafts (#1024), but not on Welded Drive Shafts (#1268) — See Page 196.

4. TINES WILL TURN, BUT WHEELS WON'T TURN IN EITHER WHEEL SPEED GEAR (WHEEL SPEED SHIFT LEVER GOES INTO EITHER GEAR)

- On Assembled Drive Shafts (#1024) only: Key (#9301) may be missing from Front Drive Shaft Worm (#1220). Remove tiller top cover (see Page 195) and try to turn worm by hand. If worm turns alone, key is missing. Contact Customer Service Representative for advice and instructions.
- For all tillers: Hi-Pro Key (#9305) possibly missing from Wheel Shaft (#1235). If so, clutch will not turn wheel shaft under power. Remove tiller top cover and drain ½ gear oil (see Page 195). With Wheel Speed Lever in Free Wheel, try to turn Clutch (#1237). If it spins freely on wheel shaft, key is missing. Contact Customer Service Representative for advice and instructions.
- Bronze Wheel Drive Gear (#1221) may be worn and not meshing with front drive shaft worm. Or, drive shaft worm may be worn (rare) and not meshing with Bronze Wheel Gear. Contact Customer Service Representative for advice and instructions.

5. WHEELS TURN, BUT TINES WON'T (WHEEL SPEED SHIFT LEVER GOES INTO EITHER GEAR)

- Possible missing keys at rear Drive Shaft Worm, #1063 (assembled drive shaft only), Bronze Tiller Worm Gear (#1064), or Tiller Shaft (#1026). Before proceeding further, tilt the tiller gently up on its engine and put the Forward/Reverse Lever in Forward and the Wheel Speed Shift Lever in either Fast or Slow. Try to rotate tines by hand (make sure engine is off and spark plug wire is disconnected before moving tines by hand). A key is missing if tines rotate while belt is taut and tiller is in gear.
 - To check for missing Tine Holder Keys (#9301) remove tines and holders (see Page 146). These keys lock holders to tiller shaft.
 - To check for missing worm key (#9301) on assembled drive shaft, remove the Tiller Housing Cover, #1023, (see Page 139) and rotate the tiller shaft with a hand on each side of the shaft (all levers in neutral). If the bronze gear and worm turn, but the front transmission pulley does not, then the worm key is missing. Contact Customer Service Representative for advice and instructions.
 - To check for missing key (#1104) in bronze tiller worm gear, the tiller shaft assembly will have to be removed from the tiller housing. See Page 135.

PROBLEM

WHAT TO DO & REFERENCE

6. WHEELS AND TINES TURN ON TOP OF GROUND, BUT STOP OR HESITATE IN SOIL

- Drive belt possibly loose and needs adjusting (noise not a factor). See Page 105.
- Possible missing key (#9302) in Transmission Drive Pulley (#1484). If so, front end may be quite noisy and belt may over-heat. See Page 175 to remove lower pulley.

7. TILLER JUMPS DURING TILLING

- Depth Regulator Lever set too deep for soil conditions. Lower lever to obtain shallower setting.
- Engine throttle speed too high.
- Tiller wheel speed too fast for soil conditions. Change to Low Belt Range or Slow Wheel Speed.

8. ENGINE RUNS WELL WITH NO LOAD, BUT LABORS WHEN TILLING

NOTE: Also see Problem 1, "Troubleshooting the Engine" on Page 203.

- Tilling depth possibly too deep, lower Depth Regulator Lever.
- Check engine governor linkage for freedom of movement.
- Check engine throttle setting and carburetor adjustment. See Page 186 for carburetor service.
- Possible worn Bronze Tiller Worm Gear (#1064), and loose drive shaft and bearing (on well-used tiller). Contact Customer Service Representative for advice and instructions.

9. DEPTH REGULATOR LEVER HARD TO MOVE UP OR DOWN

- Lubricate its spring and plunger and depth adjustment bar. See Page 110.
- Check for bent Depth Adjustment Bar (#1117).

10. CAN'T TURN HEIGHT ADJUSTMENT STUD TO RAISE AND LOWER HANDLEBARS

- Loosen stud and lubricate stud threads and nut. Check both for stripped threads. See Page 110.

11. WHEEL AND AXLE MOVE OUT TO ONE SIDE

- Snap Ring (#9501) is out of its groove in Wheel Shaft (#1235). Raise wheels off ground and check for back and forth play in wheel shaft. Contact Customer Service Representative for advice and instructions.

12. AFTER REPLACING BOLO TINES, TINE BOLT BREAKS OR HOLDERS LOOSEN

- Make sure Keys (#9301) are in the keyways of tiller shaft. Without key in holder, left tine bolt will tighten and break. Right holder will loosen. See Page 146.

13. CULTIVATING TINES BREAK WITH FIRST USE

- It might be that inside holders on left and right side were put on wrong side. Cutting edge of tine must face forward and strike the ground first when tiller goes forward. Tip follows edge into ground. See Page 153.

14. TINES RATTLE

- Even though bolts are tight, tines may rattle and make noise. This is due to shrinkage of casting of tine holder. No correction is necessary. Just make sure that tines don't hit transmission tube or hood sides. Sometimes an extra washer under tine clip (Cultivating and Pick Tines only) will quiet it down.

PROBLEM

WHAT TO DO & REFERENCE

15. AFTER BELT ADJUSTMENT BLOCK IS REPLACED, FORWARD/REVERSE LEVER LOCKS IN FORWARD

- Check to make sure that block (#1133) was not installed upside down or backwards. Indentation on face of block should be at bottom as it is installed. Also see Problem 1-D on Page 198.

16. TILLER PULLS TO RIGHT OR LEFT

- Check air pressure in both tires. See Page 128.

17. TRACTION IS POOR WHILE TILLING, FURROWING OR USING DOZER/SNOW BLADE

- Use Bar Tread tires or tire chains.

18. OIL LEAKS FROM:

A. Wheel Shaft

- Give new seals (#9601) time to “lap” in around shaft.
- Replace worn or damaged seals. See Page 132.

B. Left side of tiller housing (tine shaft)

- Check for loose Housing Cover (#1023). Tighten cover screws (first apply non-hardening gasket sealant to screws). Replace Oil Seal (#9602) if bad. See Page 135.

C. Right side of tiller housing (tine shaft)

- Worn or damaged Oil Seal (#9602). See Page 135.

D. End cap

- Check for loose screws in end cap. See Page 108. If screws are tight, check for excessive main drive shaft end play — see Page 160. Apply non-hardening gasket sealant to screws.

E. Bottom of reverse spring and plunger

- Check gear oil level to be sure it is not overfull. See Page 118. This spot acts as an oil relief point. No further action necessary.

F. Under front of tiller transmission

- Check to make sure engine oil isn't dripping from air cleaner or engine base and traveling along yoke to tiller transmission. Make sure oil doesn't come from reverse spring and plunger and run down front of transmission. (Look for oil in bottom of engine mount (#1002). See Page 114.
- Check Oil Seal (#9600) and Gasket (#1124) in front tiller cap (#1114). See Page 116.
- Check engine seal on Power Take Off (PTO) Shaft. See Page 117.

NOTE: Oil can't leak from threaded hole at bottom front of transmission (with plastic cap in it). That hole doesn't go through transmission case. It is for mounting of lower part of optional Bumper attachment.

G. Eccentric Lever at back of transmission case

- O-Rings (#9603) on Eccentric Shaft (#1027) may be worn or damaged. Contact Customer Service Representative for advice and instructions.

H. Any of three pipe plugs in transmission case

- Tighten plugs. If leak continues, drain gear oil below level of plug and coat threads with non-hardening gasket sealant.

I. Between top transmission cover and case

- Tighten four bolts in cover.
- Replace cover gasket if leak is serious.

J. Side plugs (pinion bearing plugs) in transmission housing

- O-Ring (#9604) on plug may be worn or damaged. See Page 116. Contact Customer Service Representative for advice and instructions.

TROUBLESHOOTING THE ENGINE

PROBLEM

WHAT TO DO & REFERENCE

1. ENGINE LACKS POWER

- Breather hole in fuel tank cap blocked with dirt. See Page 105.
 - Air cleaner restricted with dirt and/or oil. See Page 104.
 - Spark plug wire loose or damaged. Spark plug worn or fouled. See Page 125.
 - Engine under excessive work load. Use Slow Wheel Speed and Low Belt Range.
 - Throttle cable clamp on engine could be loose or misadjusted. See Page 183.
 - Make sure engine isn't running with choke partially engaged. See engine information in Section 3.
 - Power Adjustment Screw on carburetor might need adjustment. See Page 186.
 - Engine overheating. Check oil level, clean cooling fins. Oil may be dirty. Allow hot engine to cool down before restarting.
 - Dirt or water in fuel or fuel system.
 - Engine crankcase low in oil, or overfull. Check with dipstick. See Pages 14-16.
 - Tecumseh 6 HP: Return holes clogged in crankcase breather. See Page 190.
 - Low Engine compression. See Problem 10 on Page 205.
 - Breaker points worn, pitted or improperly adjusted. Adjust or replace points. *1, *2.
-

2. ENGINE HARD STARTING

- Air cleaner restricted with dirt and/or oil See Page 104.
 - Fuel tank empty.
 - Breather hole in fuel tank cap blocked with dirt. See Page 105.
 - Dirt or water in fuel or fuel system.
 - Fuel line restricted.
 - Choke not set properly. See engine information in Section 3.
 - Spark plug worn or fouled (weak spark). See Page 125.
 - Throttle cable and wire may not be properly adjusted. See Page 183.
 - Remote control throttle lever not free to move full distance.
 - Throttle wire and linkage binding, or bent and not free to move.
 - Low engine compression. See Problem 10 on Page 205.
-

3. ENGINE WON'T START

- Tiller controls not in NEUTRAL.
- Fuel tank empty.
- Fuel line restricted or clogged, or fuel valve (7 HP Kohler only) turned off.
- Choke not set properly. See Engine Operating Information in Section 3.
- Water or dirt in fuel, and/or fuel system.
- Spark plug fouled or worn. Spark plug wire loose or damaged. See Page 125.

*1 Check with authorized engine service dealer.

*2 If engine is out of warranty, write for tune-up instructions.

PROBLEM

WHAT TO DO & REFERENCE

3. ENGINE WON'T START (Cont'd.)

- Carburetor power adjustment screw not set properly. See Page 186.
- Air filter clogged with oil or dirt. See Page 104.
- Engine stop switch (6 HP Tecumseh) shorting out ignition system. See Page 189.
- Faulty coil or condenser—check spark plug for bright blue spark. See Page 188. *1, *2.
- Breaker points out of adjustment, or pitted and worn. External breaker assembly cover on Kohler can be removed to service points. *1, *2.
- Electrical connections (6 HP Electric) loose or shorted against metal frames, brackets or covers. See Page 191.
- Battery discharged (6 HP Electric). See Page 191.
- Electric starter motor faulty (6 HP Electric). *1 Also see Problem 14 on Page 205.
- Carburetor float faulty (or float valve leaking) – if so, tap side of bowl lightly with handle of screwdriver. See engine service dealer if it doesn't stop.
- Stale fuel – won't vaporize properly, gums up carburetor float, channels and valves. Drain and add new fuel.
- Ignition timed incorrectly. *1, *2.

4. ENGINE IDLES TOO FAST

- Adjust carburetor idle speed set screw. See Page 186.
- Check throttle cable adjustment. See Page 183.
- Check all throttle linkage for freedom of motion.

5. ENGINE WON'T IDLE AT ALL

- Check carburetor idle speed screw. See Page 186.
- Adjust carburetor idle speed adjustment needle while engine is at lowest throttle setting. See Page 186. (Recheck power adjustment screw setting after you achieve proper idling).

6. ENGINE HAS SLOW RECOVERY AFTER ABRUPTLY MOVING THROTTLE FROM IDLE TO HIGH SPEED

- Open up carburetor idle adjustment needle (counterclockwise). See Page 186.
- Condenser may be defective or weak. *1, *2.

7. ENGINE STALLS OUT (WITHOUT LOAD)

- Cold engine, allow few minutes warm-up time before moving tiller.
- Open vent hole in fuel cap with a fine wire. See Page 105.
- Fuel line restricted or blocked.
- Carburetor – Power adjustment screw and/or idle adjustment needle improperly set. See Page 186.
- Loose ignition system connections. *1.
- Faulty condenser. *1, *2.

8. ENGINE OVERHEATS

- Clean engine cooling fins and engine shroud and covers. See Page 103.
- Check for flywheel fins broken off (under engine shroud). *1, *2.

*1 Check with authorized engine service dealer.

*2 If engine is out of warranty, write for tune-up instructions.

PROBLEM

WHAT TO DO & REFERENCE

8. ENGINE OVERHEATS (Cont'd.)

- Check oil level for too much or insufficient oil. See Pages 14-16.
- Ignition timing improperly set. *1, *2.

9. ENGINE BLOWS BLACK SMOKE

- Power adjustment screw on carburetor set too rich. Lean out. See page 186.

10. LOW COMPRESSION

- Pull recoil starter rope a few inches until you feel resistance. Judge if amount of resistance you feel is normal. *1.
- Blown head gasket, or loose head bolts – check two bolts nearest muffler first. See Page 123. *1.
- Valve stuck open, no real compression. *1.
- Excessive piston ring wear. *1.

11. ENGINE BACKFIRES

- Mixture too lean, adjust carburetor power adjustment screw. See Page 186.
- Loose cylinder head, or head gasket leak. *1.
- Engine ignition timing set improperly. *1, *2.
- Loose carburetor or intake adaptor plate.
- Possible weak or defective condenser. *1, *2.

12. ENGINE RUNS ERRATICALLY

- Water or dirt in gasoline or carburetor.
- Carburetor adjustments not set properly. See Page 186.
- Spark plug fouled or dirty. Spark plug wire loose or damaged. See Page 125.
- Loose or cracked carburetor.
- Hole plugged up in fuel cap. See Page 105.
- Governor linkage not adjusted properly, or binding. *1 Do not attempt to service by yourself.
- Governor not functioning properly. *1 Do not attempt to service by yourself.
- Condenser possibly weak or defective. *1, *2.

13. ENGINE CONSUMES EXCESSIVE AMOUNTS OF OIL

- 6 HP Tecumseh: Oil or dirt clogged crankcase breather assembly (indicated by oil dripping from air cleaner after engine shutdown). Clean drain holes in breather. See Page 190.
- Breather assembly put in upside down (drain holes must be on bottom) – 6 HP. See Page 190.
- Piston rings worn, broken or not installed properly. Dirt might be getting through carburetor to engine. *1.
- Check pan gasket, engine seals and drain plugs for leaks. See Page 117.

14. ELECTRIC STARTER MOTOR WON'T TURN ENGINE OVER

- Check battery terminals for corrosion. See Page 112.
- Check battery charge. Start engine with recoil start and run for 1 hour, then recheck electric start. See Pages 191-194.

*1 Check with authorized engine service dealer.

*2 If engine is out of warranty, write for tune-up instructions.

PROBLEM

WHAT TO DO & REFERENCE

14. ELECTRIC STARTER (Cont'd.)

- Check mounting bolts of starter motor for looseness.
 - Have service dealer check starter motor pinion gear and spring, and starter pinion alignment with engine ring gear.
-

15. ENGINE WON'T RECHARGE BATTERY

- Fuse on recharging line blown out. See Page 194.
 - Battery won't take a charge. Have it tested.
 - Diode or engine stator might be defective. *1.
 - Battery recharging wire loose or broken.
-

16. BATTERY GETS HOT AND/OR FOAMS

- Battery acid level low – refill with distilled water. See Page 22 for minimum specific gravity of acid in battery.
 - Battery acid level too high (foams).
-

17. TURN KEY SWITCH AND NOTHING HAPPENS

- Discharged battery. Check acid level and recharge battery. See Page 22.
 - Short in Key Switch, or Key Switch wires. See Pages 191-194.
 - Defective solenoid. See Pages 191-194.
 - Bad starter or short in fields of armature. *1.
-

18. FUSE ON RECTIFIER KEEPS BURNING OUT

- Look for loose wires, or wires touching metal.
 - Short in fields of starter. *1.
 - Positive and negative battery cables reversed (fuse blows immediately).
-

19. ENGINE RUNS WELL, BUT LABORS UNDER TILLER LOAD

- Check for worn bronze tiller worm gear inside tiller housing and loose drive shaft and bearing. Contact Customer Service Representative at tiller factory.
 - Check governor linkage for freedom of movement.
 - Check throttle setting and carburetor adjustment.
 - Tilling depth possibly too deep, lower adjustment bar.
-

*1 Check with authorized engine service dealer.

*2 If engine is out of warranty, write for tune-up instructions.

TILLER AND ENGINE SPECIFICATIONS

TILLER SPECIFICATIONS

HORSEPOWER

6 HP Tecumseh, cast iron block engine with recoil starting.

6 HP Tecumseh, cast iron block engine with 12-volt battery electric starting (automatic recharging during tiller operation).

7 HP Kohler, cast iron block engine (industrially rated), with recoil starting and Automatic Compression Release.

SPEEDS

At 3000 RPM (revolutions per minute) engine speed, the Horse Model ground speed and tiller tine speeds are:

Belt Position	Wheel Speed Shift Lever		Tine Speed
	Position	Wheel Speed	
Low Range	Slow	.5 MPH	146 RPM
Low Range	Fast	1.2 MPH	146 RPM
High Range	Slow	.7 MPH	200 RPM
High Range	Fast	1.72 MPH	200 RPM

DIMENSIONS

Height: Can be varied for easier loading into a station wagon or car trunk by turning down handlebars, having Forward/Reverse Lever disconnected, depth regulator adjusted all the way up or down, and depth drag bar propped up to lower engine. Height can range from 32" (without handlebars or Forward/Reverse Lever) to any height suitable for operator.

Length: 66" with handlebars
51" without handlebars

Width: 23" hood width
20" tilling width

WEIGHT

268 lbs. (approx.) with a 6 HP engine.

294 lbs. (approx.) with 6 HP engine and battery electric starting system.

286 lbs. (approx.) with 7 HP engine.

TRANSMISSION

Worm gear driven. Bronze worm gears that drive wheel shaft and tiller shaft are themselves driven

by steel worms. Heavy duty spur gears provide final reduction to wheels.

Entire power drive assembly operates in a bath of gear oil. A super strong, single drive belt transmits engine power from the engine pulley to the transmission pulley, thereby turning the main drive shaft—providing power to the wheels and tines.

Wheel Speed Shift Lever and linkage is used to shift clutch into Slow, Free Wheeling, or Fast. Sliding clutch engages proper spur gear for selected wheel speed and turns wheel shaft.

Tapered roller bearings are used on the main drive shaft and the tiller shaft. Ball bearings are used on the pinion shaft. The wheel shaft is supported by bronze bushings.

Transmission case and tiller housing are cast iron, connected by a threaded and spot welded steel tube. One gear oil fill position provides lubrication for entire transmission, including tiller shaft assembly.

WHEELS

Single piece steel, 8-inch.

TIRES

4:80 x 8", tubeless standard tread tires, with deep traction grip (diamond type tread design).

4:80 x 8" tubeless bar tread tires (optional at extra cost).

Note: Tire chains available for either style tire.

DEPTH REGULATOR

Eight-position depth regulator provides instant selection of tilling depth, even while in motion. "Travel" position clears tines 1 or 2 inches above lawns, driveways and floors.

HOOD

Heavy duty steel. Completely encloses revolving tiller tines. Trailing hood flap contains churning soil from the rear, smooths out seed beds and protects operator's feet and legs.

HANDLEBARS

Quickly adjustable up and down or sideways without tools.

ENGINE SPECIFICATIONS

6 HP Tecumseh Engine

GENERAL DESCRIPTION

Four-cycle, single cylinder, air cooled. Recoil start is standard; 12-volt battery electric key start, with automatic recharging during tiller operation, is optional.

MODEL

HH 60-105113G (Recoil Start). HH 60-105114G (Electric Start). Precision cast iron alloy cylinder

block and crankcase. Compression release included for easy starts.

CRANKSHAFT

Steel, with integral counterweights. Crankpin and both main bearing journals are induction hardened.

MAIN BEARINGS

Durable bronze bushing with large bearing surface supports Power Take Off (PTO) end of crankshaft, bronze bushing at other end.

LONG LIFE MATERIALS

Resist heat and wear. Exhaust System: valve is austenitic (high quality carbon steel) and valve seat is iron alloy insert. Intake System: valve is heat treated alloy steel. Valve seat is cast integral with cylinder. Valve guides are iron alloy inserts. Valve lifters are precision machined and heat treated. Piston rings: two compression and one oil ring.

GOVERNOR

Reliable internal mechanical type, with external adjustment for trained servicemen.

BREATHER

Closed crankcase vent keeps dirt and dust from entering directly into crankcase.

FUEL TANK

Top mounted tank for full fuel flow on slopes; 1½ gallon capacity with fuel strainer screen.

ENGINE SPEED AND ENGINE SHUT OFF

Controlled from operator position at handlebar. With electric start models, operator can stop engine by turning key to STOP position.

CHOKE

Manually operated at engine.

AIR CLEANER

Dual stage: polyurethane sponge element and paper cartridge element.

ENGINE WEIGHT

53 lbs., 3 oz.

SETTINGS

- Spark plug gap: .030"
- Point setting: .020" (Breaker points are Tecumseh Part #30547A).
- Valve clearance: .010"
- Head Bolt torque: 160 to 200 in. lbs. (13-16 ft. lbs.)
- Condenser is Tecumseh Part #30548A.

7 HP Kohler Engine

GENERAL DESCRIPTION

Four-cycle, single cylinder, air cooled. Recoil start is standard. Model #K161. Specification Number 281287J.

CRANKSHAFT

Heat treated ductile iron casting with integral counterweights and induction hardened crankpin.

MAIN BEARINGS

Ball bearings on both ends of the crankcase.

LONG LIFE MATERIALS

Resistant to heat and wear. Valves: forged steel alloy intake valve. Heat resistant (Stellite®) exhaust valve. Valve tappets: hardened and precision ground. Exhaust valve seat: (Stellite®) insert, with positive valve rotation. Piston rings: two compression and one oil control ring.

GOVERNOR

Mechanical flyweight type, with external adjustments for trained servicemen.

FUEL TANK

Large, 1½ gallon capacity, top mounted tank for full fuel flow on slopes. Equipped with fuel strainer screen and fuel shutoff valve.

CHOKE

Manually operated at engine.

BREAKER POINTS AND CONDENSER

Readily accessible and externally mounted beneath breaker point cover for quick service.

ENGINE SHUT OFF

Stop button mounted outside on breaker point cover.

ENGINE SPEED CONTROL

Controlled from operator position at handlebar.

AIR CLEANER

Replaceable dry paper element type. Optional pre-cleaner is available.

ENGINE WEIGHT

70 lbs.

SETTINGS

- Spark plug gap: .025"
- Point setting: .020" (Breaker Point Kohler Part #471500)
- Valve Clearance: (Intake) .006" to .008" (cold); (Exhaust) .015" to .017" (cold).
- Head Bolt torque: 180 to 240 in. lbs. (15 to 20 ft. lbs.)
- Condenser is Kohler Part #235286.

NOTE: The Breaker Points and Condenser are readily accessible beneath the cover where the engine Stop Button is located.



The Troy-Bilt Tiller Factory in Troy, N.Y.

Why we call it the Horse Model **TROY-BILT® Roto Tiller-Power Composter.**

Throughout this OWNER'S MANUAL or other Troy-Bilt® sales literature and Order Forms, we call your tiller the Horse Model Troy-Bilt®. The name aptly describes its work-horse ruggedness and distinguishes this model from other models that have been available in the past, or might be produced in the future.

Perhaps you already know that our company, Garden Way Manufacturing Company, Inc., is a once-removed outgrowth of the original Rototiller Corp., which was also a Troy, New York based company from 1934 until 1960.

Rototiller Corp. introduced rotary tillage to the United States in the early 1930's, and led the field for over 25 years with many unique and important developments in roto tilling equipment. Rototiller Corporation was sold in 1960, and moved out of Troy at that time.

The business of supplying replacement parts to former Rototiller dealers and thousands of Rototiller owners was sold to our present company, which at that time was called Watco Machine Products Corp. In 1968, we changed our name to Garden Way Manufacturing Company, Inc., to more aptly describe the

company's full commitment to promoting home vegetable gardening as a better way of life.

In 1961, George W. Done, who was then president and a founder of our Watco Machine Products Corp., designed a new medium size roto tiller, which he called the Trojan Horse Model. This machine (which is much the same machine we build today, with several small but important improvements) combined all of the best ideas from George Done's 25-year experience as chief engineer and designer for the original Rototiller Corp.

In 1968, when we were still known as Watco Machine Products Corp., we were forced to change the name of our Trojan Horse Model because it conflicted with the product trademark of a large earth-moving equipment manufacturer. It was then that we chose Troy-Bilt® as our tiller trademark, along with the Horse Model designation. Over the years, our Troy-Bilt® Horse Model has been continually refined and improved to the point that its performance and reliability have long been recognized by many thousands of serious vegetable gardeners as being unmatched by any other tiller of its size or design.

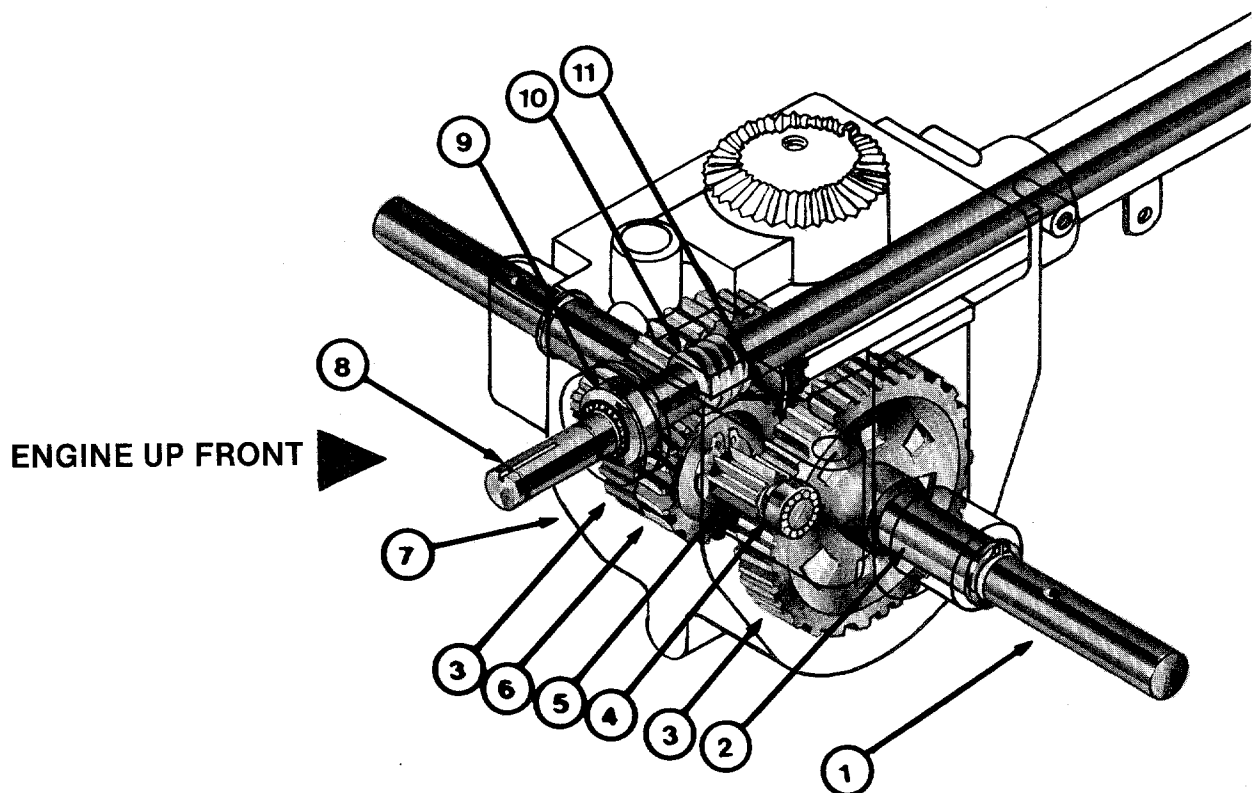
Here Is a Look Inside the Transmission Case and Tiller Housing of Your Troy-Bilt Roto Tiller-Power Composter

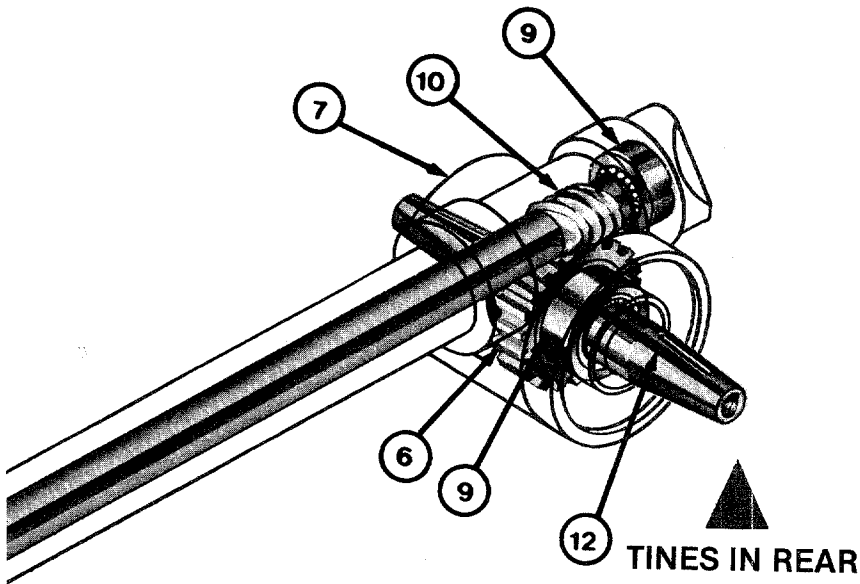
- 1.** Full one-inch diameter steel wheel shaft.
- 2.** Bronze bushings support wheel shaft.
- 3.** Heavy duty cast iron spur gears provide final speed reduction to wheels.
- 4.** Shaft for pinion gears is mounted on ball bearings.
- 5.** Heavy duty steel pinion gear cluster is rigidly

assembled with forged bronze worm gear. Together they provide a reduction of high and low speeds for wheels.

6. Bronze worm gears are forged to make them more durable.

7. Heavy duty cast iron transmission and tiller housings are extra strong. Heavy weight of transmission is better for tilling traction.





- 8.** Main drive shaft is made of heavy duty steel.
- 9.** Automotive-type tapered roller bearings can withstand the heaviest loads in several directions. For this reason, they are used on the main drive shaft and tiller shaft.
- 10.** Steel worms on the main drive shaft deliver engine power to the front and rear bronze worm gears.

- 11.** Cast iron sliding clutch engages proper spur gear for selected wheel speed and turns wheel shaft.
- 12.** Steel tiller shaft is tapered on the ends for better holding power and for easier installation and removal of tine holders.

WHEELS IN CENTER

TROY-BILT Tiller Service Bulletins .

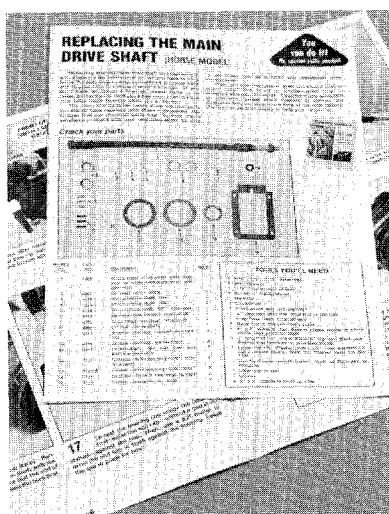
In addition to the maintenance and repair instructions found in this Owner's Manual, we also have a number of clear, easy to follow, service and maintenance brochures that are available to you. All of them (see sampling below) are generously illustrated and feature step-by-step "no surprise" instructions.

Please note that these service bulletins are only instructions...not parts or sales messages. They're just

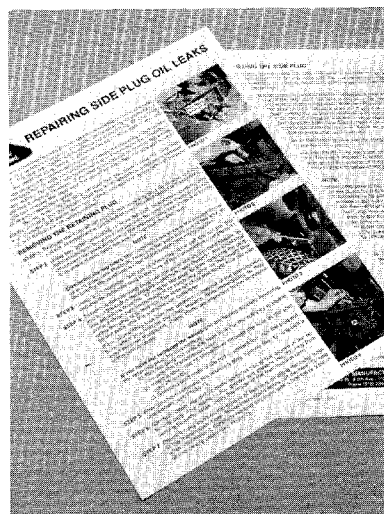
for your information, to use if needed. Of course, they are usually included in the shipping package if you order the related parts from us.

To receive any of these brochures, simply write or call your Troy-Bilt Customer Service or Parts Order Departments here at the tiller factory. Remember to mention the specific "SER" number you want.

Thank you



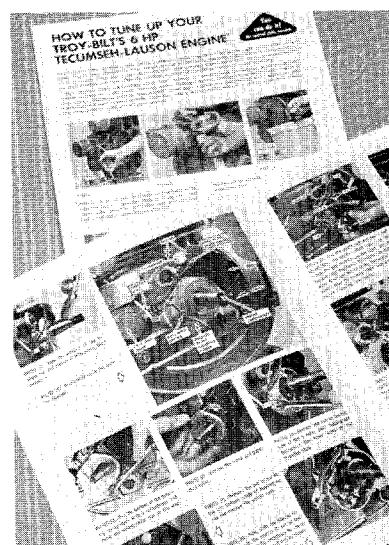
REPLACING THE MAIN DRIVE SHAFT. Shows you how to remove your old drive shaft and replace it with a new one. 8 pages, 22 illustrations. Ask for SER-59 (free).



REPAIRING SIDE PLUG OIL LEAKS. Shows you how to replace the "O" ring on the side (pinion bearing) plug. 2 pages, 8 illustrations. Ask for SER-29 (free).



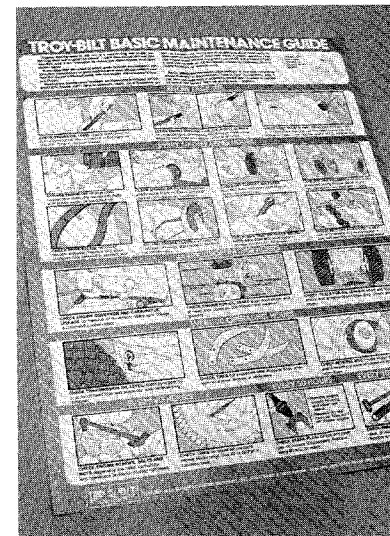
HOW TO TUNE UP YOUR TROY-BILT'S 7 HP KOHLER ENGINE. Shows you how to replace your points, condenser and spark plug. 4 pages, 12 illustrations. Ask for SER-33 (free).



HOW TO TUNE UP YOUR TROY-BILT'S 6 HP TECUMSEH-LAUSON ENGINE. Shows you how to replace your points, condenser, spark plug and head gasket. 8 pages, 51 illustrations. Ask for SER-28 (free).



REPLACING THE CARBURETOR FOR THE 6HP TECUMSEH-LAUSON ENGINE. Shows you how to remove your old carburetor (with remote controlled choke) and replace it with a new one. 6 pages, 19 illustrations. Ask for SER-20 (free).



TROY-BILT TILLER MAINTENANCE GUIDE. Big 17"x22" poster-size wall chart comes with new tillers. If you don't have a copy, and you wish to keep track of your maintenance, ask for SHP-7 (free).

Especially for You.

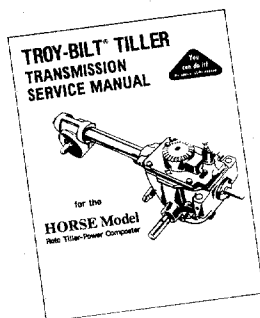
TROY-BILT TILLER TRANSMISSION SERVICE MANUAL

We originally intended this manual strictly for use by skilled mechanics who make a living by working on gardening equipment, such as your Troy-Bilt Tiller. However, we knew that some of our more mechanically-minded owner's might be interested in having a copy too, so we ordered a small quantity to be set aside for sale to tiller owner's only.

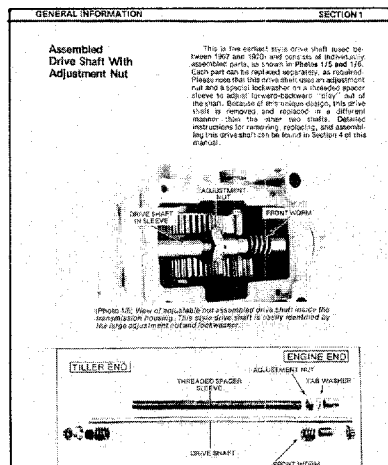
To be perfectly honest... although we want you to know that the manual is available... we're not urging you to purchase one since it's extremely doubtful that you'll ever have a problem with your transmission. (And besides if you do have a problem, your Customer Service Representative will send you selected portions of

the manual — at no charge — to help you with that particular repair). However, if you're the type person that likes to know what makes your equipment "tick" both inside and out, then you'd probably enjoy having a complete manual for your very own use and reference.

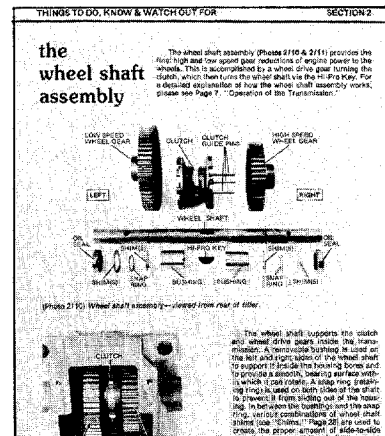
So, if you think you'd like to purchase a copy, please write or call your Customer Service Department here at the tiller factory and ask for information on the Horse Model Transmission Service Manual (MNL-8). Since we're not selling the book to make a profit (only to help defray our considerable printing costs), we are able to offer the manual to you for just \$6.95.



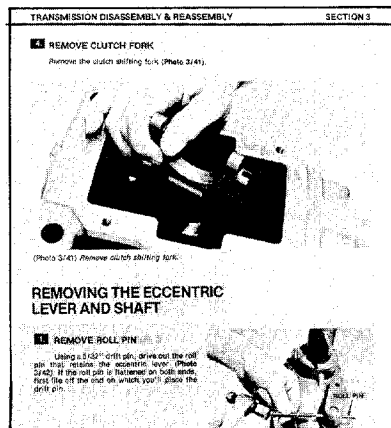
- Complete step-by-step transmission disassembly and reassembly instructions.
- 8 1/2" x 11", 152 pages, 221 illustrations.
- Includes transmissions made from Tiller Serial Number 14139 to present.



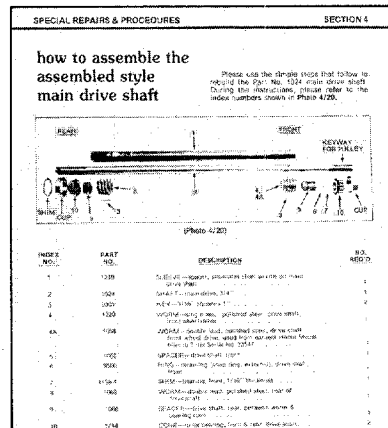
Section 1 details major changes in design that have taken place over the years.



Section 2 offers an in-depth look at each of the transmission assemblies, including inspection and repair information.



Section 3 guides you step-by-step through the complete transmission disassembly and reassembly procedures.



Section 4 covers special repairs and procedures, such as assembling earlier style drive shafts.

TRANSMISSION TROUBLESHOOTING	
PROBLEMS/SYMPTOMS	WHAT TO DO & REFERENCE
3. Wheel Speed Shift Lever moves freely into High Gear, but not into Low Gear.	a. Connecting rod (part #1231) at bottom of Wheel Speed Shift linkage might be backwards, or bent or twisted. Straighten out. b. Clutch may be binding on wheel shaft. Test for backlash. See Page 20 in this manual. c. Bounce turn shoes may be worn on slides that push clutch towards Low speed gear.
4. Wheel Speed Shift Lever moves freely into Low Gear, but not into High Gear.	a. Clutch may be binding on wheel shaft. Test for backlash. See Page 20 in this manual. b. Bounce turn shoes may be worn on slides that push clutch towards High speed gear.
5. Wheel Speed Shift Lever moves to shift clutch into Low or High gear, but clutch won't stay engaged.	a. Bounce turn shoes may be worn. Fork shoes help hold clutch in place. If shoes are worn, clutch may slip out of gear.
6. Wheel Speed Shift Lever moves freely, but can't shift out of or into gear.	a. Bounce turn shoes may be worn or broken. If so, they will not move clutch on wheel shaft. b. Eccentric fork shoes may be broken inside transmission. If so, it will not move clutch fork when you turn eccentric lever. Checkshaft linkage from eccentric lever and try moving by hand. If you moved fork, without making prior a few inches to lock clutch into gear, backlash possible between eccentric.

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LIMITED WARRANTY

NO TIME LIMIT

Your **TROY-BILT®** Roto Tiller-Power Composter and all attachments will be carefully inspected and tested at the factory. We, or your Dealer, will at any time replace any part which is defective in materials or workmanship — except for the engine (which is warranted by the engine manufacturer for 1 year; write us for details).

PLUS...

Please write or call us if you have any problems. If you are not entirely pleased and satisfied with your Troy-Bilt Roto Tiller-Power Composter any time within 30 days after you first use it in your gar-

den, you may notify us or your Dealer and return it for full refund less shipping costs.

Even after your first 30 days of use, if you ever have any problems, we will make good even if it means sending you a completely new machine or having you return machine, parts or attachments for exchange, repair or full refund of purchase price, whichever you prefer...except for shipping costs and an allowance for normal wear and tear.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

HALF-PRICE FACTORY REBUILDING AGREEMENT

At any time, no matter how new or old your TROY-BILT Roto Tiller-Power Composter may be, we will rebuild and repaint it, replacing every worn part (such as bearings, gears, seals, tines, belts and including a new engine) for one-half the current retail price at the time of repair of that model or its

equivalent (if that exact model has been changed); owner to pay shipping and container costs to and from Factory. If any other than wearing parts need replacement, an estimate will be submitted to owner for approval. This offer, of course, is subject to fire, war, strikes, and other contingencies beyond our control.

Dear Troy-Bilt Tiller Owner:

Please remember that no matter how many times your tiller changes hands, its warranty is still good. So, if you at some time in the years ahead *should* decide to buy a new Troy-Bilt Tiller, would you please do us, and the new owner of your tiller, a favor?

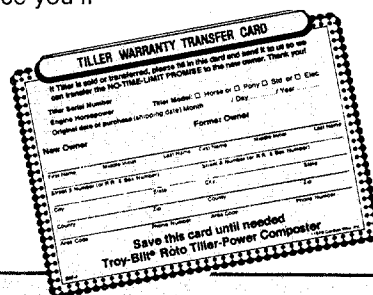
If you'll look between pages 128 and 129 of this manual, you'll find a green-colored, Tiller Warranty Transfer Card. When you transfer ownership of your old tiller, we'd appreciate your asking the new owner to fill out and return that card to us just as soon as possible. Doing so means the new owner will be covered by the above warranty...plus it entitles him or her to the *Troy-Bilt Owners News* and other gardening information FREE! (We'd also like you to pass on this manual, since you'll receive another with your tiller.)

Thanks in advance for helping us out.

Yours for good faith and fairness in all matters,

Dean Leith, Jr.

Dean Leith, Jr., Sales Manager



The image shows a 'Tiller Warranty Transfer Card' with a perforated edge. It contains fields for 'Your Serial Number', 'Your Model' (with checkboxes for Horse or Pony, and Gas or Electric), 'Engine Horsepower', 'Original date of purchase (including day's month)', 'Former Owner', 'New Owner', 'Date of Transfer', 'Tiller #', 'Engine #', 'Gear #', 'Deck #', 'Tine #', 'Belt #', 'Roller #', 'Drive #', 'Chain #', 'Sprocket #', 'Gear #', 'Tine #', 'Belt #', 'Roller #', 'Drive #', 'Chain #', 'Sprocket #'. At the bottom, it says 'Save this card until needed' and 'Troy-Bilt® Roto Tiller-Power Composter'.

GARDEN WAY MANUFACTURING COMPANY

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