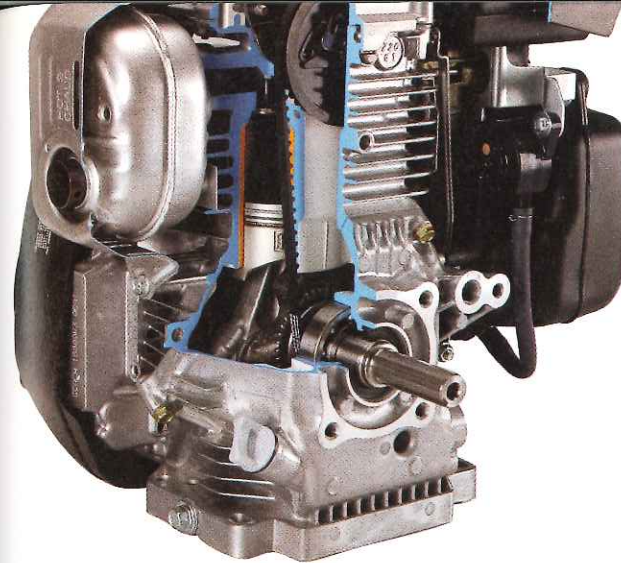




# CHAPTER 20

## Snow Throwers

After studying this chapter you will be able to:

- ▼ Safely operate and service snow-throwing equipment.
- ▼ List important purchasing considerations for snow throwers.
- ▼ Identify major parts of walk-behind snow throwers.
- ▼ Make adjustments to snow throwers.
- ▼ Properly maintain snow-throwing machines.

### Operating Safely

Safety is of primary importance when working with small gas engines. It is expected that persons servicing their own equipment, or the equipment of others, should at all times use good judgment. Before attempting to operate a snow thrower, all safety instructions provided by the manufacturer should be read and understood. Safety signs and labels placed on the machine should be read and understood before use.

Because there have been accidents involving users of snow throwers, it is important to be aware of certain possible dangers inherent in these machines. In practically every case, accidents resulted from a disregard of safety instructions. Too often consumers neglect to read instructions provided by the manufacturer or take chances that result in serious injuries. Unfortunately, most of the safety devices and guards provided by manufacturers can be circumvented by carelessness, ignorance, or a disregard for danger. Good judgment must always

be used when operating or working with any powered equipment. The specific make and model should be thoroughly understood by the operator or technician servicing a machine. Manufacturer's technical service manuals should be consulted whenever there is a question regarding safe repair, maintenance, or operating procedures.

Learn how to properly operate the machine and its controls. Keep the machine in proper operating condition. Do not let anyone operate the snow thrower who has not had proper instruction about its use. The following safety precautions are typical of those provided by manufacturers and cover most situations.

### ***Protect children***

When operating a snow thrower and approaching blind corners, shrubs, trees, or other objects that may block vision, be alert for children. *Never* let children operate the snow thrower.

Children are curious by nature, and are often attracted to operating machinery and associated activity. Children should be kept in the house under supervision, while a snow thrower is being operated. If children enter a work area, turn the snow thrower off. Take the children out of the area to a safe location where they will be supervised.

### ***Preparation for using a snow thrower***

Before using a snow thrower, there are a number of safety-related items that the operator

should be aware of. The following is a list of these items:

1. Never attempt to make adjustments while the engine is running.
2. Disengage all clutches (release drive levers) before starting the engine.
3. Wear the proper winter clothing. See **Figure 20-1**. Wear footwear with soles that improve footing on slippery surfaces. Do not wear dangling items, such as scarves outside the coat, draw-strings, etc.



**Figure 20-1.** Gasoline-powered snow throwers are an effective way of removing snow. Proper attire and well-maintained equipment can make the work safe and efficient. (Deere & Co.)

4. Handle gasoline carefully, away from any open flame or sparks.
  - a. Use an approved gasoline container. See **Figure 20-2**.
  - b. Never remove fuel tank cap or attempt to refuel a running or hot engine.
  - c. Never add fuel indoors.
  - d. Wipe up spilled gasoline and dispose of rags promptly.
5. Adjust the skid shoes to clear gravel or crushed rock surface. See **Figure 20-3**. See the *Adjusting Skid Shoes* section in this chapter for this adjusting procedure.



**Figure 20-2.** Gasoline should be stored in an approved and clearly marked container. Never store gasoline, or other flammable liquids in glass containers. Refuel outdoors away from any flames. (Jacobsen Manufacturing Co.)

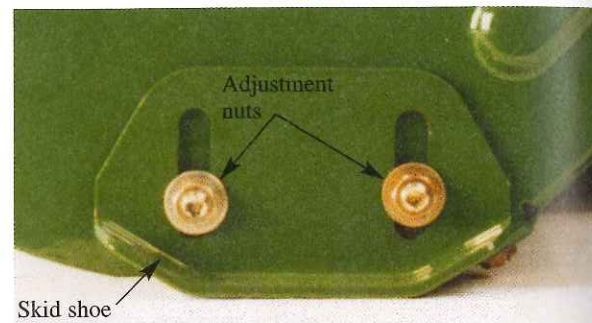


**Figure 20-3.** The skid shoe attached to the auger housing is adjustable to establish intake height and reduce wear on the housing edges.

### Using a snow thrower

Before attempting to operate the snow thrower, read the manufacturer's technical service manuals. The following is a list of rules to adhere to when using a snow thrower:

1. Inspect the machine and be sure all hardware is tight. Damaged or badly worn parts should be repaired or replaced. Guards and shields should be in good condition and in place. If adjustments are needed, make them before attempting to operate the machine.
2. Examine and clear the work area of objects that may be thrown. People should be well away from the work area and pets should be safely confined. If a person or pet does enter the work area, stop the machine.

3. If an object is hit, stop and inspect the machine. Make any repairs before resuming operation. Properly maintain the machine. All shields and guards should be in place at all times.
4. Do not allow snow to be thrown toward people, cars, buildings, windows, or anything that may be damaged.
5. Do not use a snow thrower above ground level, such as on the roof of a building.
6. If clearing snow from a gravel path, be extremely careful. Be aware that gravel may be picked up with the snow.
7. Do not leave a running machine unattended.
8. Operate the machine only during daylight or in well-lighted areas. Some machines have a headlight for night operation.
9. Make sure to have good footing. Operate machinery slower on a slippery surface. It is important to be especially careful when pulling a running machine backwards.
10. Do not blow snow *across* a sloped surface. Avoid clearing snow from steep slopes and keep away from edges of ditches and banks. If slopes must be cleared, do so up and down the slopes. Never clear going across the face of the slopes. Be careful when changing direction on slopes.
11. Avoid sudden starts and stops. Keep a firm grip on the machine handles.
12. Do not run the engine in a confined space, such as a shop or garage. Dangerous carbon monoxide from exhaust fumes can accumulate in such places.
13. Keep hands and feet away from rotating parts. Stay clear of the discharge chute opening at all times.
14. Always use a grounded, 3-wire plug receptacle for electric starting.
15. Do not overload the machine capacity by clearing snow at too fast of a ground speed.
16. Disengage the auger drive when transporting the unit, or when it is not in use.
17. Do not change engine governor speed settings or overspeed the engine.

### Maintenance and storage

Keeping snow throwers in good working order is an essential part of safe work habits. Storing the equipment properly will prevent any possible accidents. The following is a list of safety considerations for maintaining and storing snow throwers:

1. Keep all nuts, bolts, and screws tight. Check guards and shields.
2. Never store equipment with gasoline in the tank in a building where fumes may reach an open flame or spark. Remember, light switches may produce unseen sparks that could ignite gas fumes. Allow the engine to cool before storing in an enclosure.
3. For extended storage, refer to the manufacturer's technical service manuals.
4. Run the auger drive after each use to clear out snow and prevent freeze up.
5. As a reminder to the operator of the most important precautions, safety and warning decals are placed at strategic locations on the snow thrower. They must be read and obeyed. If any decals are lost, damaged, or worn off, replace them. These decals are available at a local snow thrower dealer.

### Purchasing Considerations

Walk-behind snow removal equipment is available for use in geographical areas where snowy conditions are an annual event. See **Figure 20-1**. Gasoline engines provide the power for the large majority of snow thrower machines. Because there are various sizes and kinds of snow-throwing equipment, the selection of one should be researched thoroughly.

Single-stage snow throwers and two-stage snow throwers perform the same function of snow removal. However, there is some difference in the way they perform the function. For practical purposes, the term *snow thrower* will generally be used except where specific reference to single-stage or two-stage type is made.

### Machine size and type

Snow throwers are available in various sizes and work capacities to meet the needs of varying conditions of snow removal. Engines for snow throwers are designed for easy starting in low temperatures.

### Small snow throwers

Small machines are available where snowfalls are generally light and the area to be cleaned is more limited, such as steps, walks, and small driveways. The cleaning width may be 16" to 20". Engine size is about 3 horsepower (hp), and

two-cycle engines are most common. Almost all small machines are recoil start (rope pull). See **Figure 20-4**. The handle on recoil start pull ropes should be large enough to grasp easily with a gloved hand. See **Figure 20-5**. Electric start is sometimes an option for this size of snow thrower. See **Figure 20-6**.

Small snow throwers are single-stage type. **Single-stage snow throwers** have steel or rubber blades that rotate like paddles and throw the snow upward and forward. See **Figure 20-7**. The chute can be rotated to the left, right, or straight ahead.

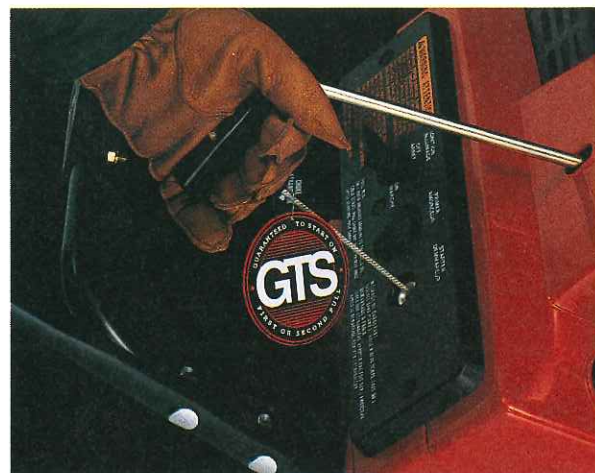


**Figure 20-4.** The recoil start rope handle on snow throwers should provide an easy, secure grasp with a gloved hand. The engine should start quickly with one or two pulls, even in cold weather. (The Toro Co.)

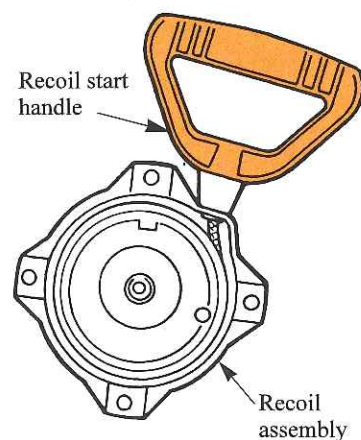


**Figure 20-5.** A recoil start handle designed to accommodate a gloved hand. (The Toro Co.)

See **Figure 20-8**. Direction of snow throwing is controlled by a discharge chute located above the housing. Direction and distance of snow throwing may be more limited compared to larger machines. The maximum quantity of snow removal for small snow throwers is about 1000 lb per minute depending upon other factors.

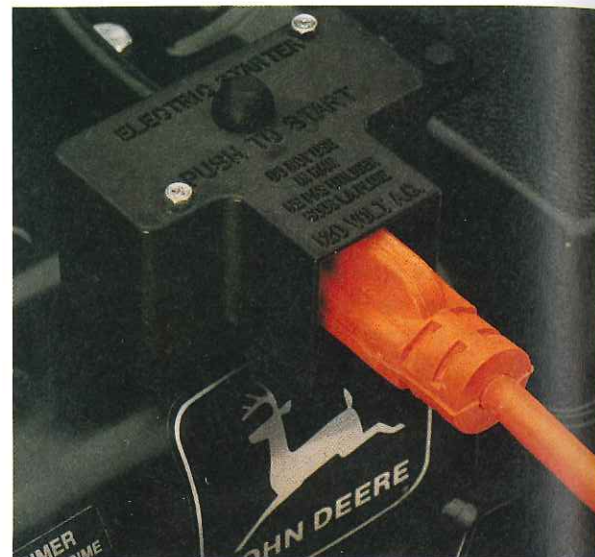


**Figure 20-6.** In addition to the recoil start, electric starters may also be installed for convenience where an electric source is readily available from an extension cord. (Deere & Co.)

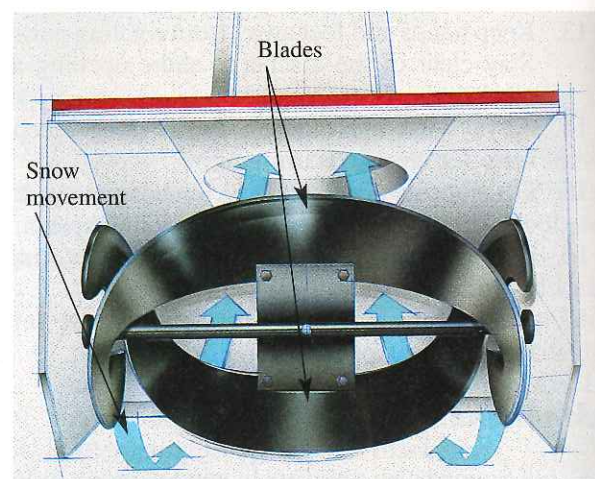


**Figure 20-7.** Some smaller snow throwers have paddle-like impellers that throw the snow upward and out the discharge chute. Various designs exist. (The Toro Co.)

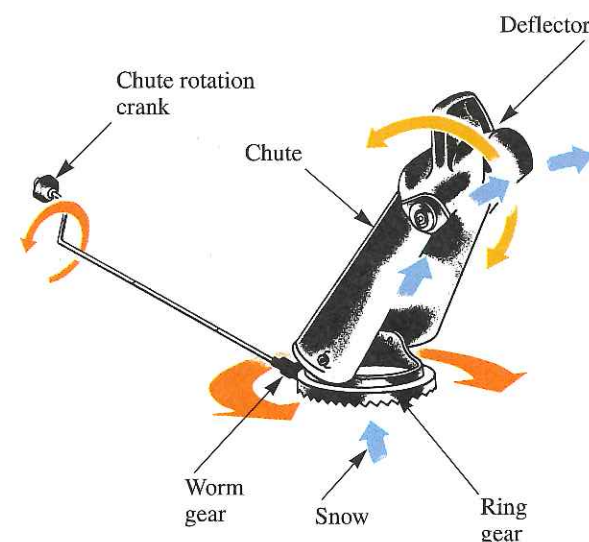


**Figure 20-8.** By turning the chute rotation crank, the discharge chute can be rotated left, right, or straight ahead. The deflector can be raised or lowered to establish throwing distance. (Simplicity Manufacturing Inc.)

Small snow throwers are pushed manually through the snow. They have small wheels with hard plastic tires. These tires should be checked every season. These tires can crack and make it difficult to push the equipment. If needed, replacement tires can be found at a local dealer.

### Mid-size snow throwers

Mid-size snow throwers are heavier and have engines from 3 hp to 8 hp. The engine may be two-cycle or four-cycle. Mid-size machines may be either single-stage or two-stage type. **Figure 20-9** illustrates a two-stage type. In two-stage snow throwers, the auger feeds the snow into a high-speed blower fan that ejects the snow out of the chute. Two-stage snow throwers are generally more effective than single-stage snow throwers.

Mid-size snow throwers have a chute and deflector to direct the snow and control the height and distance to which it is thrown. The chutes can be rotated as much as 230°. See **Figure 20-8**.

Some mid-size snow throwers are self-propelled. Three or four forward speeds, and one or two reverse speeds are available on most self-propelled snow throwers. Wheels are pneumatic rubber with heavy treads for traction. See **Figure 20-10**. With the traction engagement knob, the wheels can be adjusted to provide one- or two-wheel traction. A freewheeling feature allows for easy transporting.

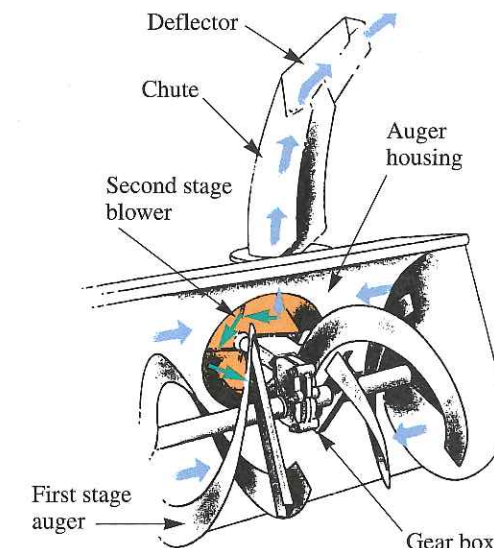


**Figure 20-9.** Two-stage snow throwers have an auger to draw snow into a high-speed, second stage blower fan. Single-stage snow throwers do not have a blower fan. (Simplicity Manufacturing Inc.)

Tire pressure should be periodically checked. Proper air pressure in the tires helps with traction, and eliminates improper wear of the tire tread. See **Figure 20-11**.

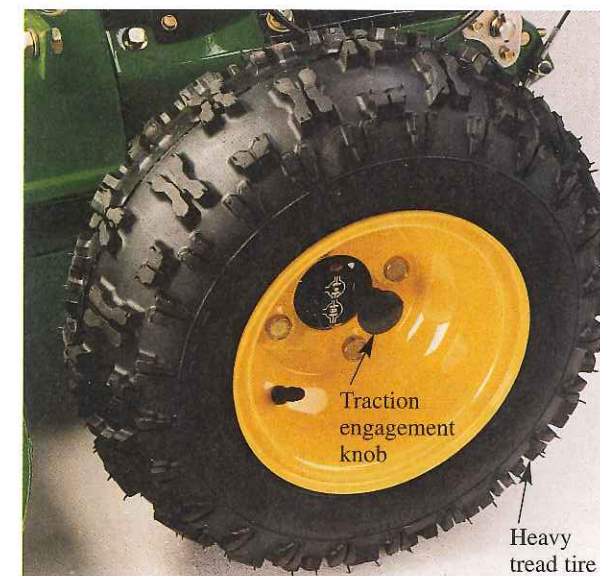


**Figure 20-10.** Heavy treads on rubber pneumatic tires provide good traction in snow. Chains can be installed to increase traction on ice. The traction knob is used to provide traction to one, or both wheels. (Deere & Co.)

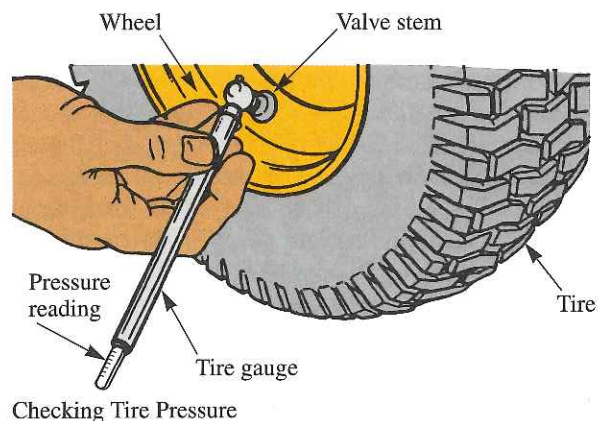


**Figure 20-11.** Proper tire inflation should be maintained by checking with a tire gauge. (Simplicity Manufacturing Inc.)

Electric start may be a standard feature or an option for a mid-size unit. Ignition systems are electronic (CDI modules) and alternators are available for powering a sealed beam headlight for night snow removal. See **Figure 20-12**.

The augers are helical-shaped steel that rotate and pull the snow into the machine. See **Figure 20-13**. Some augers have serrated edges to help break up ice and snow into finer particles before it enters the second stage blower. See **Figure 20-14**.



**Figure 20-12.** This model has a sealed beam headlamp for night work. Unless the electrical system is voltage regulated, the light will brighten and dim as engine speed varies. (Deere & Co.)

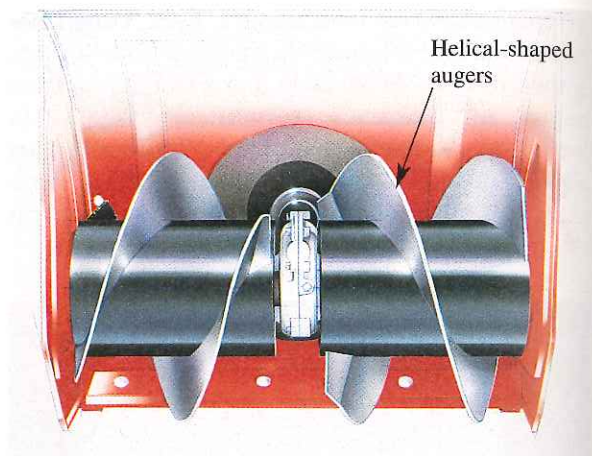


**Figure 20-13.** A helical steel auger for pulling the snow into the machine. (The Toro Co.)



**Figure 20-14.** An auger with serrated edges can break up ice and snow into finer particles before it enters the second stage blower. (Deere & Co.)

### Heavy-duty snow throwers

Heavy-duty snow throwers range from 8 hp to 20 hp, and are exclusively four-cycle overhead valve engines. They have all the same features as mid-size machines, but are heavier and clean wider paths. The greater horsepower allows larger quantities of snow to be removed. They can remove up to about 2500 lb per minute. The clearing width may be as great as 32".

Heavy-duty snow throwers are self-propelled, two-stage machines. Two-stage machines have an auger that pulls the snow into the auger housing. The snow is then picked up by a blower with blades

that force the snow at high velocity out through the chute above the machine. The distance snow is thrown may be as far as 40', but this is controllable by a deflector at the top of the chute. Plastic (polymer) chutes are often used, so snow will not stick in the chute causing an obstruction.

Large pneumatic tires are common to mid-sized and heavy-duty snow throwers. Correct tire inflation is important. Pneumatic tires can have chains installed to increase traction in icy conditions.

Cleated tracks are found on the larger models and provide exceptional traction on slippery ice and snow. See **Figure 20-15**. The tracks can be engaged singularly for steering, or together for maximum traction. Clutch levers are provided on each of the handles to control the direction of travel. See **Figure 20-16**. The tracks can be disengaged for ease of transporting.

Available on some models are features such as weight shifting by moving the wheels forward or backward; and raising, tilting, and lowering the auger housing. See **Figure 20-17**. These features should be considered, depending on the terrain and snow conditions to be encountered.

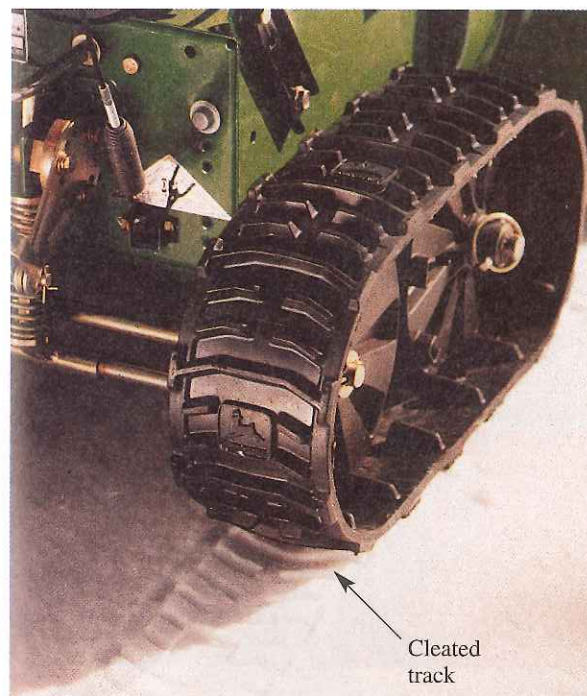
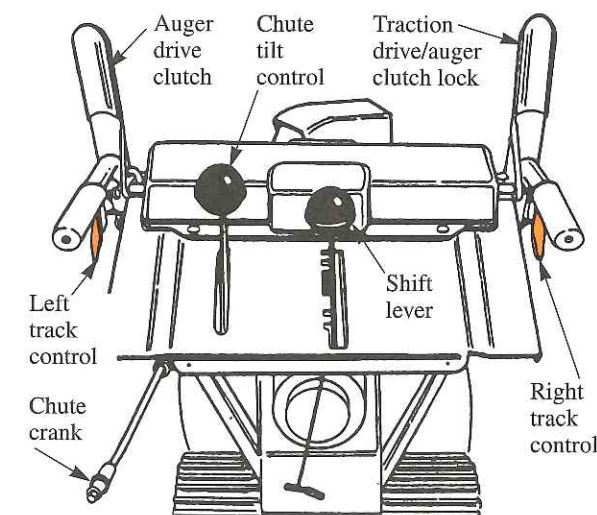


**Figure 20-15.** Rubber tracks provide exceptional traction on ice and snow and can be engaged singly, together, or disengaged entirely. (Deere & Co.)



Track Controls

**Figure 20-16.** Right and left track clutch levers permit responsive direction control. All controls are within easy reach of driver. (MTD Products, Inc.)

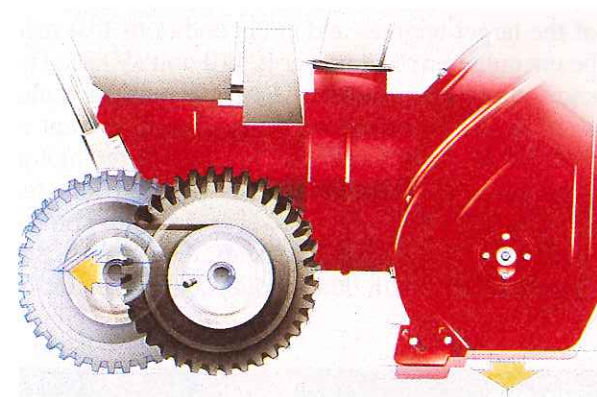


**Figure 20-17.** Weight shifting is accomplished by moving the wheels forward or backward. (The Toro Co.)

### Engine controls

Engine controls will vary from one make and model to another. **Figure 20-18** illustrates the basic controls that are quite common to four-cycle engines. Read the manufacturer's technical service manuals for specific details about engine controls.

It is common for snow thrower engines to have a recoil (rope pull) starter. Electric starters may be provided as standard, or optional equipment. Snow throwers with electric starts also have recoil starters. When supplemental electrical power is not available, the recoil starter can be used for starting.

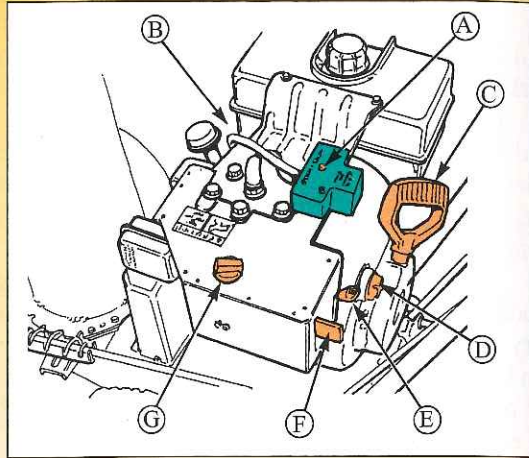
| Engine Controls |                                  |                                                                     |  |
|-----------------|----------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------|
| A               | Electric start button (optional) | Activates electric starter.                                         |                                                                                    |
| B               | Fuel valve                       | Turns fuel supply on or off.                                        |                                                                                    |
| C               | Starter handle                   | Used to start engine.                                               |                                                                                    |
| D               | Primer button                    | Primes carburetor for faster cold starting.                         |                                                                                    |
| E               | Throttle lever                   | Controls engine speed.                                              |                                                                                    |
| F               | Engine key                       | Prevents starting of engine without key. Stops engine when removed. |                                                                                    |
| G               | Choke knob                       | Adjusts air/fuel mixture.                                           |                                                                                    |

**Figure 20-18.** Basic engine controls vary from one make and model to another. (Simplicity Manufacturing Co.)

### Electric starting

Electric starting is convenient due to the size of the larger engines and cold conditions that may be encountered. The power is 110 volt (V) ac. The snow thrower is connected to a grounded outlet using a 3-wire extension cord. The ac current is reduced to 12V dc current for the starter motor. With some models, the cord is plugged into the receptacle on the snow thrower and a button on the receptacle is depressed to start the engine. See **Figure 20-19**. With other models, after the cord is

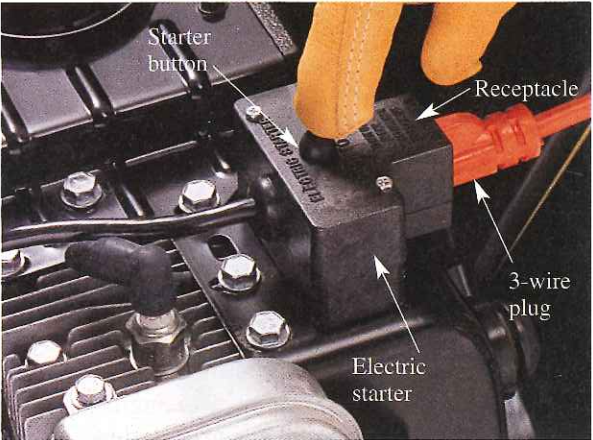


**Figure 20-19.** The 3-wire extension cord is plugged into the electric starter receptacle on the snow thrower. A button on the electric starter is depressed to start the engine. (The Toro Co.)

plugged in, the engine is started by depressing the start button on the control panel. See **Figure 20-20**.

### Drive systems

There are basically two driving systems. The first drive system is for driving the auger in single-stage machines, or for the auger and blower in two-stage machines. For those models that are self-propelled, the second drive system is for the wheels or tracks. There are many drive designs

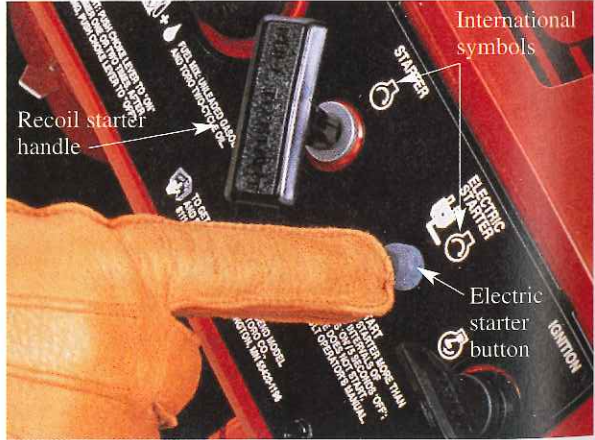


**Figure 20-20.** Electric start button on a control panel. Notice the recoil start handle to the left of the start button and the international symbols for the various controls. (The Toro Co.)

and each manufacturer may utilize different ones for different models. Transmissions may consist of gears, belts, chains, or combinations of gears, belts, and chains.

**Figure 20-21** shows a portion of chains and belts used in a wheel-driving system. **Figure 20-22**

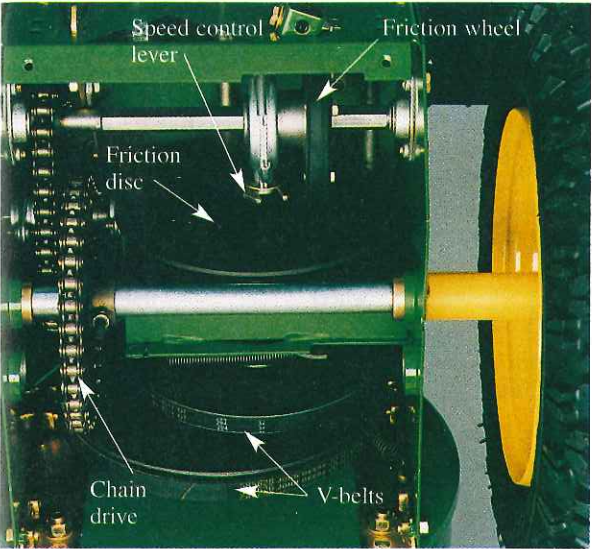


**Figure 20-21.** Belts and chains are used to transmit motion from the engine to the wheels and auger. The friction wheel drives the friction disc and changes speeds when it is moved right or left by the operator. Moving to the right slows down the wheels and moving left speeds the wheels up. (Deere & Co.)

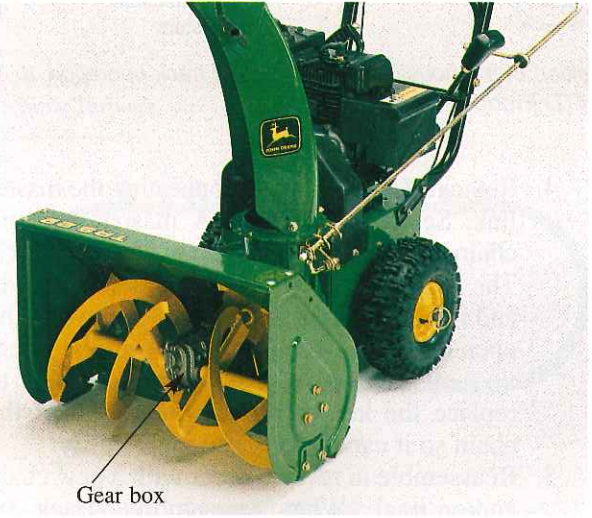


**Figure 20-22.** An auger reduction gear box reduces the rotation speed of the auger. (Deere & Co.)

shows the location of the reduction gear box transmission that drives the first and second stages from the engine. The internal parts of a typical gear box utilizing a ring gear and pinion gear are shown in **Figure 20-23**. Before beginning any service requiring disassembly and reassembly of parts, refer to the manufacturer's technical service manuals for the exact make and model.

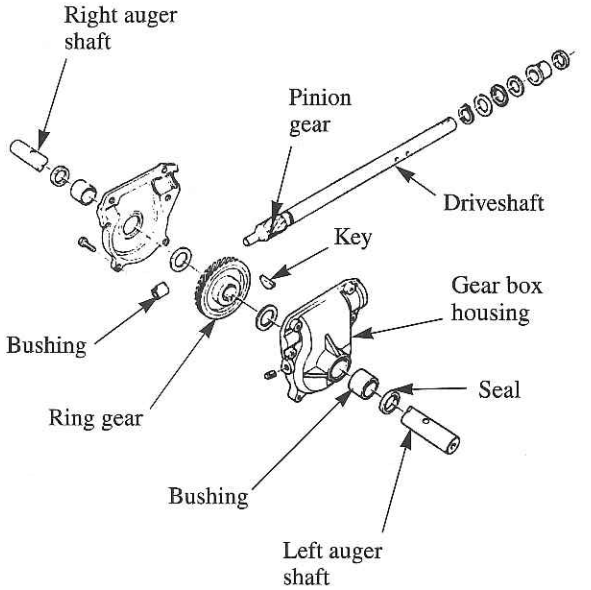


**Figure 20-23.** Auger gear box components. The pinion and ring gear reduce the rotation speed of the auger and increase auger torque. (The Toro Co.)

### Track drive snow thrower

Self-propelled snow throwers with rubber tracks may need service. The tracks may become worn out or damaged. Also, the chain drive may need a new chain. Track adjusters allow loosening or tightening of the tracks by moving the idler wheel assembly forward or backward. This is done by loosening a nut or bolt. **Figure 20-24** is an exploded view of a track drive system for one model of snow thrower.

### Track chain replacement

- To replace the track chain, proceed as follows:
1. Block up the frame of the unit so the tracks are off the ground.
  2. Loosen the nut on the track tension adjusters.
  3. Roll the track off the idler and drive wheel assembly as shown in **Figure 20-25**.

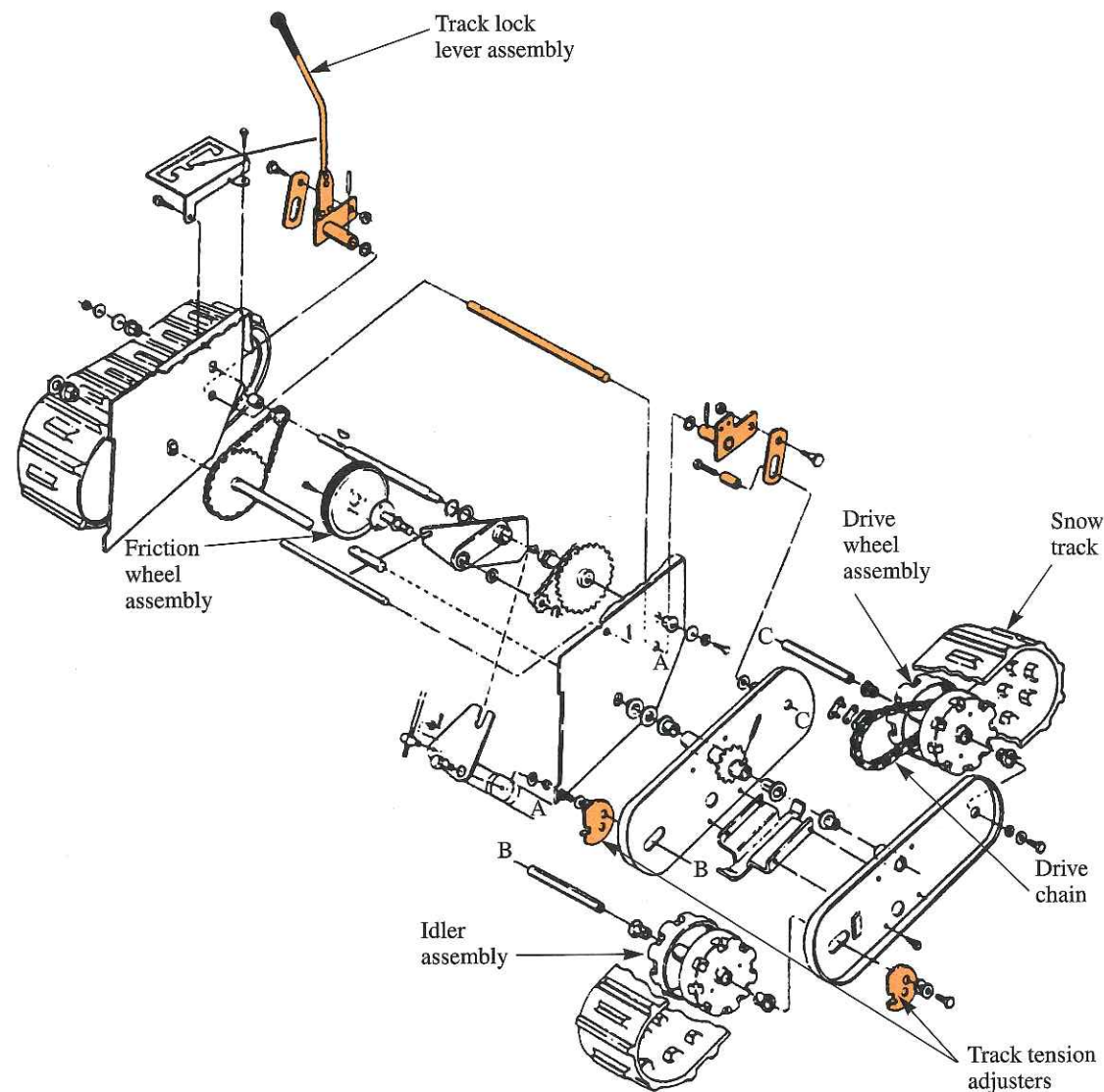


**Figure 20-24.** The track lock lever is used to select the position of the housing and method of track operation. It moves tracks forward or backward relative to the housing. (MTD Products, Inc.)

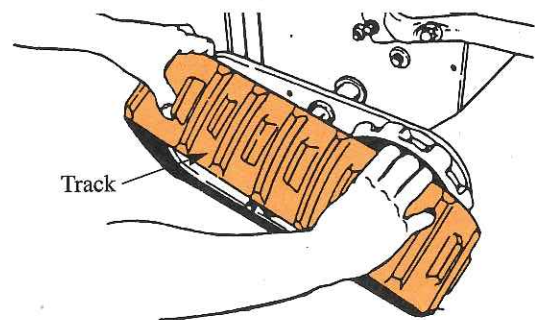


**Figure 20-25.** Rolling the track off the idler and drive wheel assembly after releasing tension. (MTD Products, Inc.)

4. Remove the chain by disconnecting the master link. See **Figure 20-26**. A master link and chain assembly is shown in **Figure 20-27**. The keeper is pried open with a screwdriver and removed so the link can be removed. The open end of the keeper should trail the direction of rotation of the chain. It is best to replace the keeper on the outer side of the chain so it can be removed more easily.
5. Reassemble in reverse order with a new chain and/or track. When reassembling track, be certain the tread of the track is running in the proper direction. See **Figure 20-28**.

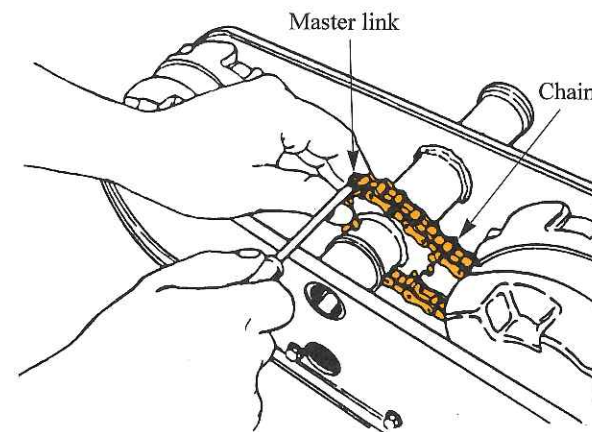


**Figure 20-26.** Removing drive chain by disconnecting the master link with screwdriver. (MTD Products, Inc.)

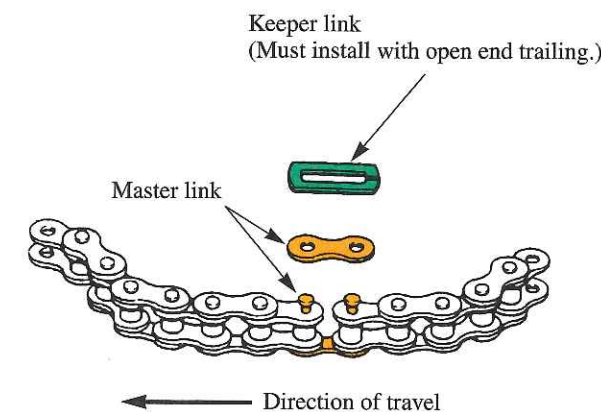


**Figure 20-27.** Details of a roller chain and master link with keeper. (Simplicity Manufacturing Co.)

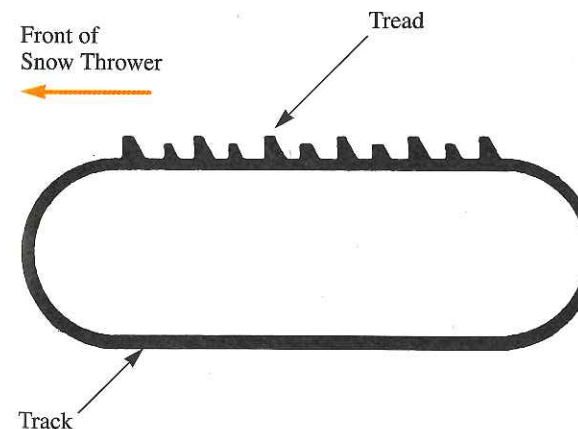


**Figure 20-28.** Direction of track tread must be as shown when installing the track on the idler and drive wheels. (MTD Products, Inc.)

### Track tension adjustment

It is important that the track tension on both sides be adjusted properly and equally. There are track adjusters for adjusting the tension. To adjust track tension, proceed as follows:

1. Disconnect the spark plug wire and ground it against the engine.
2. Drain the fuel from the fuel tank.
3. Tip the snow thrower forward so that it rests on the auger housing.
4. Loosen the track adjuster bolt.
5. Insert a screwdriver between tab on the track adjuster to tighten or loosen track. See **Figure 20-24**. The track is adjusted properly when it can be deflected about 1/2" (12.7mm).
6. Tighten the track adjuster bolts.

### Track lock lever

The track lock lever assembly, shown in **Figure 20-24** on the right side of the snow thrower, is used to select the position of the auger housing and the method of track operation. The lever can be moved to the right, then forward or backward to one of three positions. The lever positions are used to meet the following operating conditions:

- **Transport.** Raises front end of snow thrower for easy transporting, or to clear snow from gravel driveways without disturbing the gravel.
- **Normal snow.** Allows tracks to be suspended independently for continuous ground contact.
- **Packed snow.** Locks front end of snow thrower down to the ground for hard-packed or icy snow conditions.

### Skid shoes

Skid shoes establish the height of the scraper bar above the surface. The shoes are located at the bottom, outer edges of the auger housing, and absorb the wear during operation. Fasteners fitted into slotted holes on the skid shoes allow easy adjustment and replacement. See **Figure 20-29**. The scraper bar is a metal bar fastened along the bottom edge of the auger housing intake. The scraper bar adds stiffness to the sheetmetal housing and can be replaced when it becomes worn.

On smooth surfaces such as concrete or asphalt, the scraper bar should lightly scrape the surface or clear by about 1/8" (3mm). On gravel surfaces, the scraper bar should be high enough so

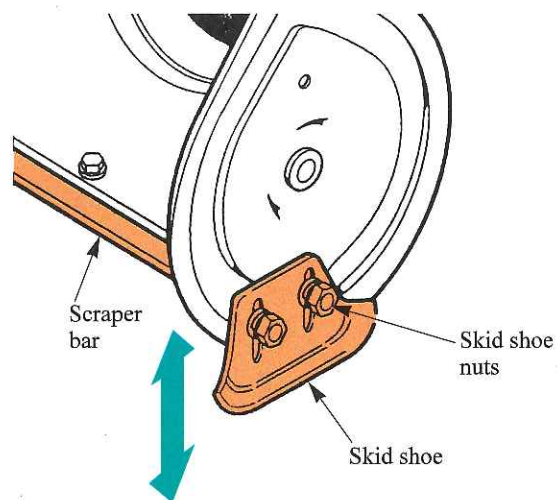


**Figure 20-29.** Skid shoes establish height of scraper bar above the surface. (Deere & Co.)

that it will not pick up gravel or debris; about 1 1/4" (30mm). If the scraper bar is damaged or worn excessively, replace it before adjusting skid shoes.

### Skid shoe adjustment

The skid shoes shown in **Figure 20-30** are adjusted in the following manner:

1. Park the snow thrower on a hard, smooth surface.
2. Stop the engine, remove key, wait for all moving parts to stop.

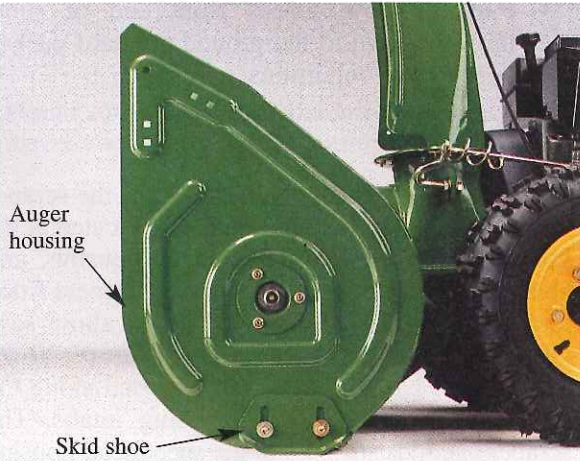


**Figure 20-30.** On a level surface, place two pieces of wood of desired thickness under the scraper bar. Loosen the skid shoe nuts, lower the skids to surface, and tighten the nuts; 1/8" (3mm) for smooth surfaces and 1 1/4" (30mm) for gravel surfaces. (Deere & Co.)

3. Remove wire from spark plug and ground it to engine to prevent accidental start up.
4. Check tire pressure with a tire gauge:
  - a. Air pressure should be equal in both tires. Check for a maximum of 20 psi (138 kPa) in each tire. Recommended tire pressure may be printed on the side wall of the tire or printed in the manufacturer's technical service manuals.
  - b. Each tire must be resting on a hard surface, not a cross-link of the tire chain.
5. Put a block of the desired height under the scraper bar of the auger housing.
6. Inspect the skid shoes. If the shoes have excessive wear, replace them.
7. Loosen the adjustment nuts, lower the shoes to the surface, and tighten the nuts.

### Operator presence

To provide additional safety, **operator presence controls** require that the auger automatically stops rotating when the drive (traction) lever is released. The auger (impeller) is engaged by depressing a spring-loaded **auger control** lever on top of the right handle. See **Figure 20-31**. When the **drive control** lever on the left handle is engaged, traction is established and the snow thrower moves forward. Due to a ratchet mechanism, when the drive control lever is engaged the impeller lever will stay engaged without holding it. When the drive control lever is released, it also releases the ratchet mechanism holding the auger control lever and the auger stops. This allows one hand guidance of the snow thrower, but stops all movement when the drive control lever is released. In an emergency, all one has to do is let go of the drive control lever and all movement stops, except the engine continues to run.

Some snow throwers have two spring-loaded control handles. One handle (right handle) engages the auger when depressed. The second handle (left handle) engages the drive wheels when depressed. When both handles are released all motion stops, except the engine continues to run. See **Figure 20-32**. This requires the operator to hold both handles down while removing snow.



Never reach into the chute or auger housing without stopping the engine, and removing and grounding the spark plug wire.

### Snow Thrower Controls

|   |                         |                                                                       |
|---|-------------------------|-----------------------------------------------------------------------|
| 1 | Speed selector          | Selects forward speeds 1-5, reverse speeds 1-2.                       |
| 2 | Drive control           | Engages drive to wheels as it is depressed, disengages when released. |
| 3 | Auger control           | Engages auger/impeller as it is depressed; disengages when released.  |
| 4 | Chute direction control | Rotates discharge chute to desired direction.                         |
| 5 | Chute deflector         | Controls vertical angle snow is thrown.                               |
| 6 | Chute deflector knob    | Locks chute deflector at desired angle.                               |
| 7 | Skid shoes              | Controls height of scraper bar.                                       |
| 8 | Traction lock pins      | Engages and disengages for drive or free-wheeling.                    |

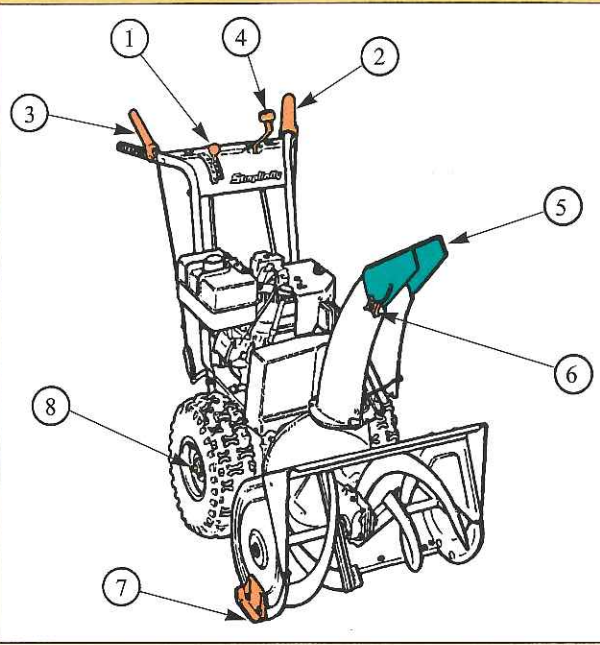


**Figure 20-31.** Controls 2 and 3 require the operator to be present at the controls during operation. If the drive control lever 2 is released, auger control lever 3 also releases. The wheels and auger stop. (Simplicity Manufacturing Co.)

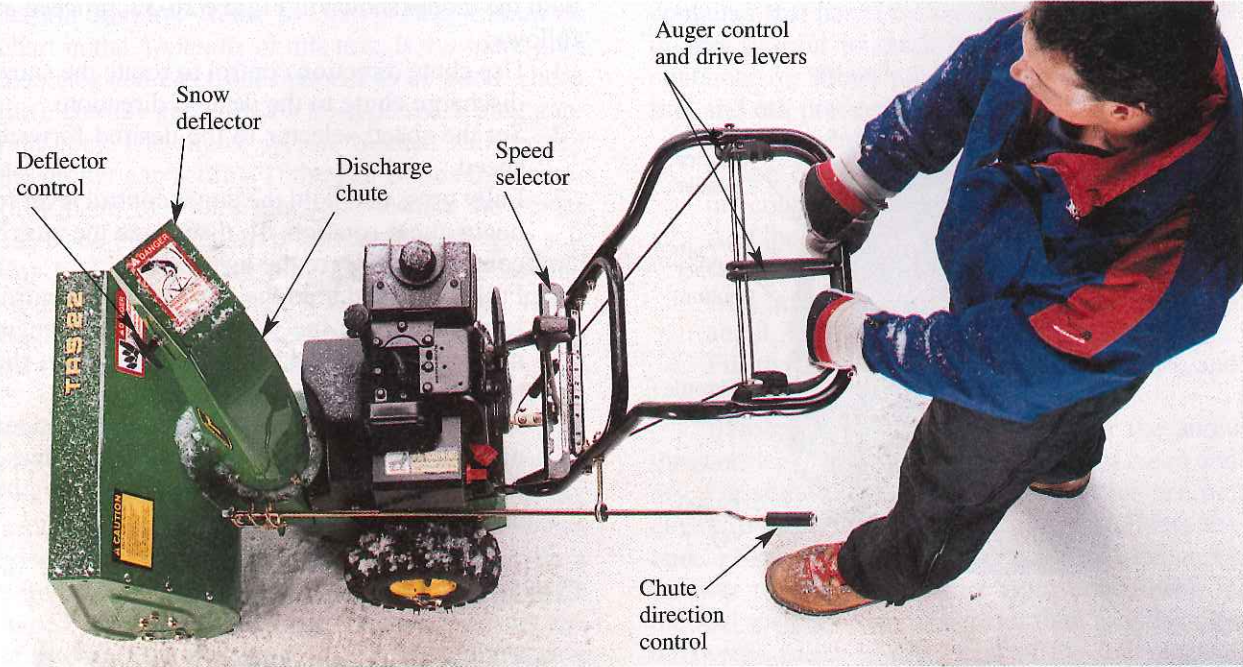


**Figure 20-32.** Two handles must be held down to operate this snow thrower. When both are released, the wheels and auger stop. The engine continues to run. (Deere & Co.)

## Snow Thrower Operation

There are a variety of models of snow throwers, but starting and using them is similar. Always refer to the manufacturer's technical service manuals for instruction for the specific model being used.

### Engine starting

The procedure for starting a cold engine is slightly different than the procedure for warm engine restarting. See **Figure 20-33** for the location of parts and controls for a snow thrower. Since snow thrower models differ, refer to the manufacturer's technical service manual for the specific model. To start a cold engine (references to warm engine restarting included), proceed as follows:

1. Turn the fuel valve on. Fuel valves are located where the fuel exits the bottom of the tank.
2. Insert the engine ignition key into the switch and turn to the *Run*, or *Start*, position. This switch may be located on a control panel.
3. Move the throttle lever to the *Fast* position. The throttle lever may be located on a control panel.
4. Close the choke knob. Do not choke a warm engine to restart.
5. Press the primer button several times if the engine is cold. Do not prime a warm engine for restarting.

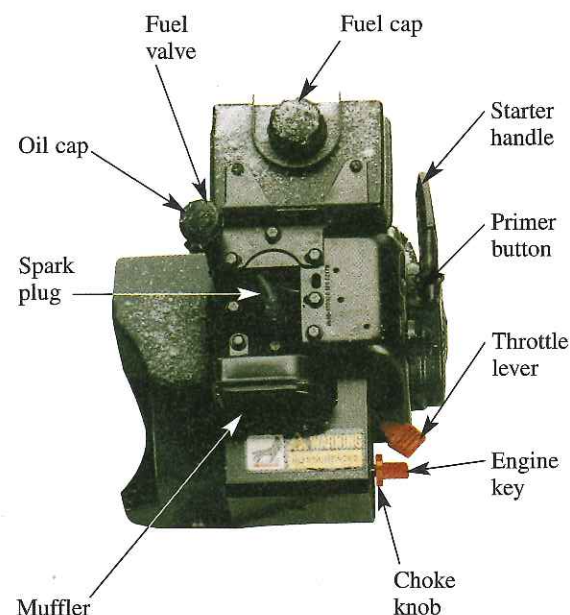


**Figure 20-33.** Shown are many of the parts and controls for this snow thrower engine. (Deere & Co.)

6. Pull starter handle rapidly, or push starter button if equipped with electric starter. Do not let the starter handle snap back. Let the starter rope rewind slowly, while keeping a firm grip on the starter handle.
7. As the engine starts and begins to operate evenly, turn the choke knob to the *Off* position, and set the throttle lever to *Slow*. If the engine begins to slow down and run roughly, turn the choke knob until the engine runs smoothly. Let the engine warm up more and return the choke knob setting to *Off*.



Allow the engine to warm up at *Slow* throttle before operating the snow thrower at full speed. The engine must reach operating temperature before it can develop full power. For best performance, when at operating temperature, run the snow thrower engine at full operating speed. Use the throttle lever to set the engine speed.

### Snow throwing

The procedure for snow throwing may vary from model to model. Refer to the manufacturer's technical service manuals. To start snow throwing with the model shown in **Figure 20-32**, proceed as follows:

1. Use chute direction control to rotate the snow discharge chute to the desired direction.
2. Set the speed selector to the desired forward speed.
3. Fully press and hold the auger control lever to begin auger rotation. To disengage the auger, completely release the lever.
4. Fully press and hold the traction drive control lever to engage the traction drive and begin moving the snow thrower. To disengage the traction drive, release the lever.
5. To select the forward or reverse speed as needed, use the speed selector lever. Release the drive control lever, and change to the desired speed or direction.

### General Maintenance

Maintenance is an important part of working with small gas engines and the machines they power. Small gasoline engines in snow throwers are

similar to the engines in other kinds of implements. Snow thrower engines are designed to start easily and run under moderate to extremely cold working conditions. When working with snow throwers, there are a number of components that need checking, service, and periodic adjustments. Performing these on a regular basis, will result in a properly running snow thrower.

### Spark plugs

The spark plug should be removed for inspection and cleaning. Before removing the spark plug, blow dirt away from its base with compressed air. Remove the high tension wire by pulling only on the insulating boot. Do not pull or jerk the wire. Install a deep spark plug socket on the plug and carefully turn the ratchet handle counterclockwise. Unscrew the spark plug and examine the electrode end of the plug. The electrodes and ceramic insulator should be dry. If it is wet with fuel or oil, there may be more serious engine problems. The following are several reasons for a wet spark plug.

- Over choking.
- Excessively rich fuel mixture.
- Water in fuel.

If the insulator is dry and has a beige or gray/tan color, the plug is in good condition. Next, examine the electrodes for any erosion, burning or carbon fouling. Refer to *Spark Plug Condition* chart in the *Appendix* of this text. If the spark plug insulator and electrodes appear to be good, check the electrode gap with a wire-type spark plug gapping tool. The engine service manual will specify the proper gap setting. If the gap is too large, carefully bend the outer electrode toward the center electrode until the gap is correct. Use the gap setting tool. If the spark plug appears to be beyond simple servicing, replace it with a new one. Refer to the manufacturer's technical service manuals for the proper replacement spark plug.

Before replacing the spark plug, clean the external ceramic insulator by wiping it with a clean cloth. Condensation can cause flashover (sparking externally) and erratic running if the insulator has a coating of dirt on it. If the metal base is rusty, clean it on a wire wheel or with a wire brush. If the threads are dirty, they should be wiped clean or wire brushed before inserting the plug back into the spark plug hole. The gasket should be in good condition or replaced with a new one.

Insert the spark plug in the spark plug hole and turn it clockwise by hand until it stops. Be careful not to cross thread the spark plug in the hole. If it will not turn, do not force it. Remove it and examine the threads in the hole. If they are damaged, a thread chaser (special thread tapping tool) may be needed to clean and correct the threads. If the spark plug turns smoothly by hand until it seats, tighten the plug with a torque wrench to 13 to 15 lb-ft. Do not overtighten.

Examine the high tension wire for deterioration before replacing it on the spark plug. Heat and dirt can make the insulation brittle and insulation cracking can occur. Cracked wire insulation can allow sparking to the metallic parts of the engine and cause hard starting and erratic running. Oil- or fuel-soaked wires will leak current and cause weak firing of the plug. The insulating boot should be dry and in good condition.

### Snow thrower engine fuel

Snow throwers that have a two-cycle engine must have the oil mixed with the fuel in proper proportions. Use only oil labeled for two-cycle engines. Refer to the manufacturer's technical service manuals for proper fuel-to-oil mixture ratio. Most two-cycle engines use a ratio of 40 or 50 parts fuel to 1 part of oil. Use a one gallon fuel container that has *Gasoline* clearly printed on it. It is very helpful to mark the fuel/oil ratio on the container for future mixing reference. To mix the fuel and oil, proceed as follows:

1. The procedure for mixing is to add about 1/4 gallon of clean, fresh, lead-free gasoline to the container.
2. Add the amount of premeasured oil. Close the container and shake the mixture well.
3. Add more gasoline until the container is about 3/4 full. Shake it again.
4. Fill the container to the one gallon mark and shake. The fuel is ready for use.

Before removing the fuel cap on the snow thrower, wipe the cap and area around it clean and dry. On some machines, if snow and ice are not cleared away they can accumulate and fall into the tank. Fill the fuel tank after each use of the snow thrower to prevent moisture from condensing in the fuel system. Water is heavier than gasoline and will settle in the lowest point of the fuel tank or fuel system. The water will freeze when the outside air temperature drops below 32°F (0°C). Fuel

line freeze-up will prevent the engine from starting. Should this happen, the snow thrower will have to be moved to a warm area until the ice melts.

Four-cycle engines for snow throwers do not require mixing oil with fuel. The fuel tank can be filled with clean, fresh, lead-free gasoline. Some engine manufacturers caution against using fuels containing alcohol, such as gasahol. If gasoline with alcohol must be used, it should be limited to 10% Ethanol and must be removed before storage. To avoid damage to gaskets and other synthetic materials in the carburetor, gasoline with methanol must not be used. As with two-cycle engines, top off the tank with fuel after each use to prevent condensation. Close the fuel valve below the tank and leave a little air space for expansion of the fuel to avoid spilling over.

If the snow thrower has an in-line fuel filter, check it for contaminants. In-line filters are not cleanable. Remove it and replace it if needed. The normal replacement interval for in-line filters is once each year, before seasonal use.

### Four-cycle engine lubrication

Unlike two-cycle engines, four-cycle engines receive their lubrication from oil in the crankcase. This oil must be the correct viscosity and service type. Generally, SAE 5W-30 to 10W-30 detergent oil is recommended. The oil must be drained periodically and replaced with new oil. The manufacturer's technical service manuals will specify the oil change intervals and correct oil to use. A new engine must have the oil changed after 5 to 8 hours of operation to remove any manufacturing particulates and break-in residue.

The engine will have an oil drain plug at the lowest point in the crankcase. The engine should be run before draining to heat the oil so it thins and drains completely. Place a metal or plastic pan under the drain plug and remove the plug.

Remove the oil filter cartridge with an oil filter wrench. Allow the oil to drain thoroughly. If the engine utilizes an oil filter cartridge, it should be replaced during the first oil change. Discard the old filter cartridge. Select the correct, new, oil filter cartridge. Apply a film of engine oil to the rubber gasket and replace the cartridge on the engine, hand tight. Using the oil filter wrench, turn the filter cartridge another 1/2 to 3/4 turn. Do not over tighten the cartridge.

After installing the new filter cartridge, replace the plug and inspect the old oil for contamination of metal or other particles. Remove the oil filler cap and dip stick and pour in the new oil. Wipe and check the dip stick. Add oil until the oil level shows full. Do not overfill. Excess oil will cause spark plug fouling and other internal problems. Run the engine for 30 seconds, stop the engine, and check the dip stick again. Add oil if necessary. Check the oil level before each use of the snow thrower. Add oil as needed.

### Optional oil accessories

Some engines may have an oil pressure switch with a light on the instrument panel. If the engine runs low on oil, the pressure switch will activate the warning light or stop the engine. An oil level light may also be available to indicate a low level condition. If the light flickers during starting, the oil level should be checked and filled to the *Full* mark on the dipstick.

### Air filter

The air filter prevents dirt and abrasive particles in the air from entering the carburetor and engine. An air filter is fastened to the intake side of the carburetor. The filter element may be in a metal or plastic case. Remove the cover and take out the filter element. Examine the element for dirt accumulation. Air filters may be of the cartridge, dual element, or dry-type filter. The dry-type element is cleaned by tapping it gently on a flat surface to shake off the dirt. Do not use compressed air or solvents. If it still appears to be dirty, replace it with a new element. Reinstall the filter element and cover.

### Muffler

The purpose of the muffler is to reduce engine noise and produce the proper back pressure in the exhaust system. Mufflers get very hot when the engine is running and should be cool before touching or examining them. If there are signs of rust causing pin holes, the muffler should be replaced. If the muffler sounds excessively loud, the baffles inside may be corroded. This can cause overheating and warpage of exhaust valves. If the muffler shows serious deterioration, it should be replaced immediately.

### Preventing freeze-up

Normal use of a snow thrower may result in a build-up of snow packed in and around the starter cord housing and engine controls. Engine heat will prevent the snow from freezing solid while the machine is running. After the engine is stopped and the engine cools, some snow may continue melting and later freeze around moving parts. To prevent freeze-up around engine controls and external parts, it is good practice to do the following after each use:

1. Before stopping the engine, pull the starter rope out several times and allow it to rewind slowly. This will help clear packed snow from the starter cord area.
2. Stop the engine by moving the throttle lever to the *Stop* position, or by removing the ignition key.
3. Disconnect the spark plug wire and ground it on the engine away from the spark plug. Tie it away with string or tape if necessary.
4. Brush snow and ice from the snow thrower. Be sure to clear the engine and snow thrower controls, discharge chute, worm and chute rod gears, clutch rod areas, and anywhere snow has accumulated.
5. Remove and store the ignition key in a safe place to prevent unauthorized use.
6. If the snow thrower is kept in a cold shelter, fill the fuel tank to prevent condensation. Do not store near sparks or flames.
7. Reconnect the spark plug wire.

### Auger and auger gear box lubrication

The auger shaft is driven from a gear box that requires lubrication. A filler plug may be located near the top of the case as in **Figure 20-34**, or at a lower level on the gear box housing. If the filler plug is at the top, it may be necessary to add the necessary quantity by first draining the oil and adding the correct weight in ounces. If the filler plug is at a level below the top of the gear box, it is only necessary to fill oil to the lower edge of the plug. See **Figure 20-35**. See manufacturer's technical service manuals for amount and type of oil to add. The following procedure can be used to add a winter weight worm gear oil to the auger gear box:

1. Place the snow thrower on a level surface.
2. Disconnect the spark plug wire and ground it on the engine, away from the spark plug. Tie

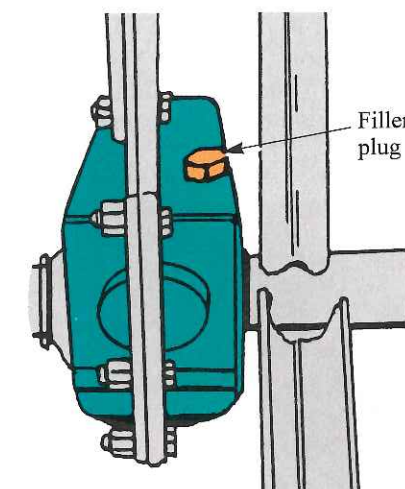


**Figure 20-34.** When the filler plug is located at the top of the auger gear box, oil must be measured out before filling. (MTD Products, Inc.)

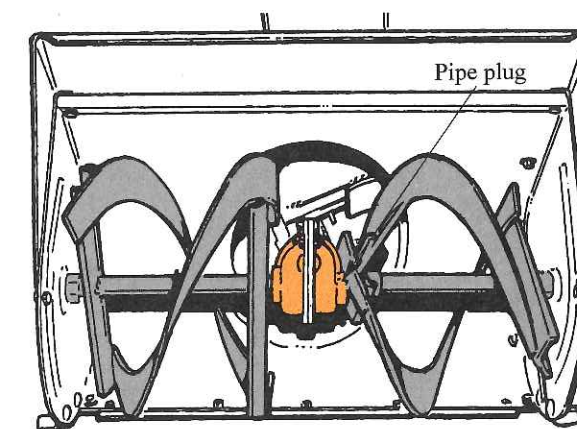


**Figure 20-35.** If the filler plug is located on the side of the auger gear box, remove the plug and fill to the lower edge of the plug hole. (Simplicity Manufacturing Co.)

it away with string or tape if necessary. Remove the key from the ignition.

3. Remove the filler plug.
4. Check the level. Add the proper oil in the amount specified.
5. Replace the filler plug and tighten it securely.

The auger blades are made in two halves. The center driving members are hollow tubes installed over the solid shafts on each side of the gear box. A *shear bolt* or *pin* is installed through each hollow tube and the solid shaft to connect them together. Should something become lodged in the auger housing and stop the auger, the bolt(s) or

pin(s) will shear to protect the auger and gear box from more serious damage. See **Figure 20-36**. After removal of the obstruction and the sheared bolts or pins, new bolts or pins can be installed.



**Figure 20-36.** Each auger blade has a shear bolt or pin that protects the auger gear box from damage resulting from an obstruction in the auger housing. (Deere & Co.)

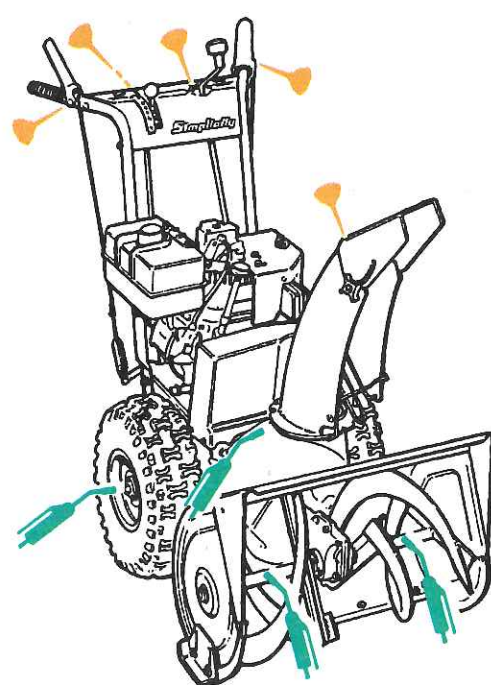


Replace sheared bolts or pins with the exact same kind of bolts or pins. Replacements must have the proper shear strength. Stronger bolts or pins may not shear. This can cause serious damage to the gears in the auger gear box.

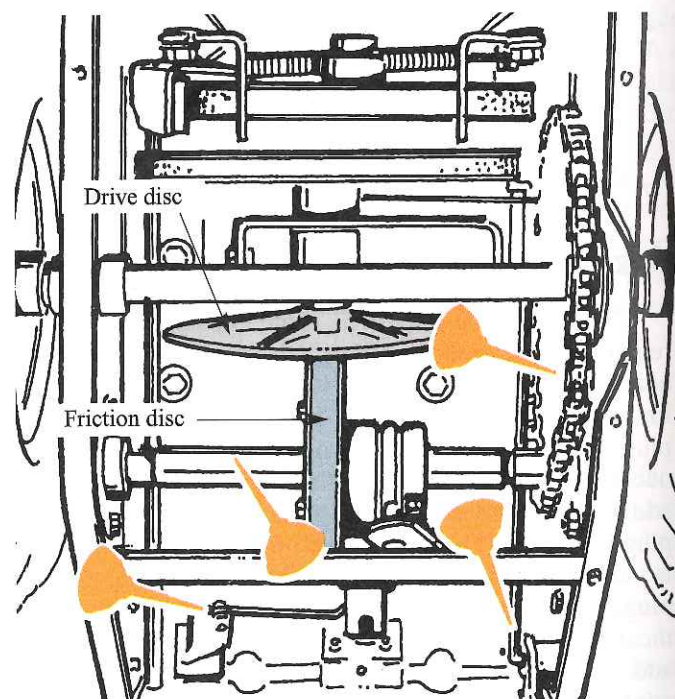
## Lubrication

There are various places on snow throwers that need periodic lubrication to extend the useful life of the machine. Some parts require application of oil, while others require grease. Where contact between moving metal parts is made, oil should generally be applied. External parts can be oiled with an oil can filled with a medium weight (10W) oil. When oiling parts, it is important not to over oil. Excess oil might drip on floors or on parts that should be kept dry, such as the traction drive or friction disc. Visible, excess oil generally provides no lubricating value. It mixes with dirt.

**Figure 20-37** shows most of the parts that need oiling and greasing. Oil locations are shown by an



A



B

**Figure 20-37.** A—General lubrication points on a snow thrower. B—Lubrication points of a drive area with the bottom cover removed from the snow thrower. (Simplicity Manufacturing Co.)

orange oil can, and grease locations are shown by a green grease gun. Use a grease gun to apply grease directly to the grease (zerk) fittings. See **Figure 20-38**. When grease fittings are not present, parts must be disassembled to apply the grease and then reassembled.

It is very important that grease fittings on the auger shaft be lubricated regularly. If the auger rusts to the shaft, damage to the worm gear may occur if the shear bolts or pins do not break. There are two grease fittings on the auger shaft. See **Figure 20-37A**. Wipe the fittings clean and apply grease, using a grease gun. Wipe away any excess grease from fittings or seepage between parts. If there are no grease fittings, waterproof grease must be applied liberally to auger shafts during assembly to prevent corrosion and seizing of parts.



**Figure 20-38.** Shown is the grease (zerk) fitting located on the auger shaft. (Deere & Co.)

## Off-Season Storage

When preparing to store a snow thrower for an extended period of time, refer to the manufacturer's technical service manuals for any *specific* instructions about the make and model being stored. If storing outside, a weather resistant cover may be placed over the snow thrower to protect it against severe weather conditions.



Gasoline may develop gummy deposits if left in the tank unused for more than 30 days. This can adversely affect the carburetor and filter, causing the engine to malfunction. To avoid this condition, add a fuel stabilizer to the fuel tank or drain all fuel from the system. Once drained, start and run the engine until it uses all of the remaining fuel.

Remove the spark plug and spray a fogging oil into the spark plug hole while cranking the engine slowly with the recoil starter. This will allow the fogging oil to enter between the valve seats and faces. This will prevent corrosion. Now replace the spark plug.

Clean the snow thrower thoroughly with a clean cloth. Protect any bare metal surfaces from corrosion by coating with paint, oil, or grease.

Store the snow thrower in its normal position. This prevents any oil from the crankcase from entering into the cylinder head of the engine.

## Starting after storage

After being stored for an extended period of time, there are some important steps to take when starting a snow thrower. To start a snow thrower after storage, proceed as follows:

1. Remove the spark plug, wipe it dry and inspect it for excess carbon, burned electrodes, and proper gap. Replace the plug with a new one if necessary.
2. If the fuel tank was emptied before storing, fill the fuel tank with fresh gasoline. Skip this step if a fuel stabilizer was used before storing.
3. Make sure the cooling fins are clean and no air flow obstructions exist.
4. Check the engine oil level and lubricate the snow thrower. Change the oil if its condition warrants. If an oil filter is used on the engine, change it when changing the engine oil.
5. Belts that are worn or loose should be adjusted or replaced.
6. Start the engine outdoors. Warm up the engine by running at *Slow* speed for a few minutes before running at *Fast* speed or removing snow.
7. Check the operating condition of all controls. Make any adjustments that may be needed.
8. If the engine or snow thrower does not perform as expected, refer to a troubleshooting chart such as the one in **Figure 20-39**.

| Troubleshooting Guide—Snow Thrower |                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trouble                            | Possible Cause(s)                                                                                                                                                                               | Corrective Action                                                                                                                                                                                                                                                                                                              |
| Engine fails to start              | 1. Fuel tank empty, or stale fuel.<br>2. Blocked fuel line.<br>3. Key not in switch on engine.<br>4. Spark plug wire disconnected.<br>5. Faulty spark plug.                                     | 1. Fill tank with clean fresh gasoline.<br>2. Clean fuel line.<br>3. Insert key.<br>4. Connect wire to spark plug.<br>5. Clean, adjust gap or replace.                                                                                                                                                                         |
| Engine runs erratically            | 1. Unit running on CHOKE.<br>2. Blocked fuel line or stale fuel.<br><br>3. Water or dirt in fuel system.<br>4. Carburetor out of adjustment.                                                    | 1. Turn choke knob to OFF position.<br>2. Clean fuel line; fill tank with clean fresh gasoline.<br>3. Use carburetor bowl drain to drain fuel tank. Refill with fresh fuel.<br>4. Adjust carburetor.                                                                                                                           |
| Loss of power                      | 1. Spark plug wire loose.<br>2. Gas cap vent hole plugged.                                                                                                                                      | 1. Connect and tighten spark plug wire.<br>2. Remove ice and snow from cap. Be certain vent hole is clear.                                                                                                                                                                                                                     |
| Engine overheats                   | 1. Engine oil level low.<br>2. Carburetor not adjusted properly.                                                                                                                                | 1. Fill crankcase with proper oil.<br>2. Adjust carburetor.                                                                                                                                                                                                                                                                    |
| Excessive vibration                | Loose parts or damaged impeller.                                                                                                                                                                | Stop engine immediately and disconnect spark plug wire. Tighten all bolts and nuts. Make all necessary repairs. If vibration continues, have unit serviced by authorized service dealer.                                                                                                                                       |
| Hard to shift, or will not shift   | Shift rod misadjusted.                                                                                                                                                                          | Adjust drive clutch.                                                                                                                                                                                                                                                                                                           |
| Unit fails to propel itself        | 1. Incorrect adjustment of drive clutch.<br>2. Drive belt loose or damaged.                                                                                                                     | 1. Adjust drive clutch.<br>2. Replace drive belt.                                                                                                                                                                                                                                                                              |
| Unit fails to discharge snow       | 1. Auger shear bolt broken.<br>2. Discharge chute clogged.<br><br>3. Foreign object lodged in auger.<br>4. Incorrect adjustment of auger drive clutch.<br>5. Auger drive belt loose or damaged. | 1. Replace auger shear bolt. Refer to Maintenance section.<br>2. Stop engine immediately and disconnect spark plug wire. Clean discharge chute and inside of auger housing.<br>3. Stop engine immediately and disconnect spark plug wire. Remove object from auger.<br>4. Adjust auger clutch.<br>5. Replace auger drive belt. |

Figure 20-39. Troubleshooting Guide—Snow Thrower. (MTD Products, Inc.)



### Know These Terms

single-stage snow throwers  
operator presence controls

auger control  
drive control  
shear bolt  
shear pin



### Chapter 20 Review Questions

Answer the following questions on a separate sheet of paper.

1. List four safety considerations to protect children from snow thrower accidents.

2. When removing snow on sloped surfaces, it is safest to travel \_\_\_\_\_.
  - a. across the face of the slope
  - b. up and down the face of the slope
  - c. at a 45° angle to the slope
3. List five safe operating practices for operating a snow thrower.
4. Before making any mechanical adjustments to a snow thrower, always \_\_\_\_\_ first.
5. Snow throwers are of two basic types. They are either \_\_\_\_\_-stage or \_\_\_\_\_-stage.
6. The more effective type of snow thrower is the \_\_\_\_\_-stage type.
7. Heavy-duty snow thrower engines are \_\_\_\_\_.
  - a. exclusively two-cycle
  - b. exclusively four-cycle
  - c. Neither A or B
8. Snow is drawn into a snow thrower by a device called a(n) \_\_\_\_\_.
9. On heavy-duty machines, wheels or tracks can be engaged independently for easier \_\_\_\_\_.
10. When operating a snow thrower, run the engine at \_\_\_\_\_.
  - a. High speed
  - b. Low speed
  - c. Medium speed
11. Heavy-duty snow throwers can remove as much as \_\_\_\_\_ lb per minute.
  - a. 1100
  - b. 1600
  - c. 2300
12. To prevent damage and excessive wear to the auger housing, \_\_\_\_\_ are fastened at the outer edges.

13. The auger housing height is established for various terrain and snow conditions by adjusting the \_\_\_\_\_.
14. List four steps to prevent freeze-up of a snow thrower.
15. How is the auger gear box protected from having something accidentally jammed into the impeller?



### Suggested Activities

1. Identify and point out all the external parts of a snow thrower.
2. Check a snow thrower for proper condition of all visible parts.
3. Demonstrate and/or describe lubrication procedures for a snow thrower.
4. Check tire condition and pressure. If there are tracks, check condition and tension. Adjust track tension, or show how it is adjusted.
5. Demonstrate skid shoe adjustment.
6. Check engine condition and prepare for starting.
7. Demonstrate safe and proper engine starting procedures, and start the engine.
8. If snow is available, demonstrate proper use of snow thrower to clear snow. If snow is not available, briefly perform a simulated snow clearing operation on a clean, dry, outdoor surface.



*Example of a two-stage snow thrower in use. (MTD Products, Inc.)*