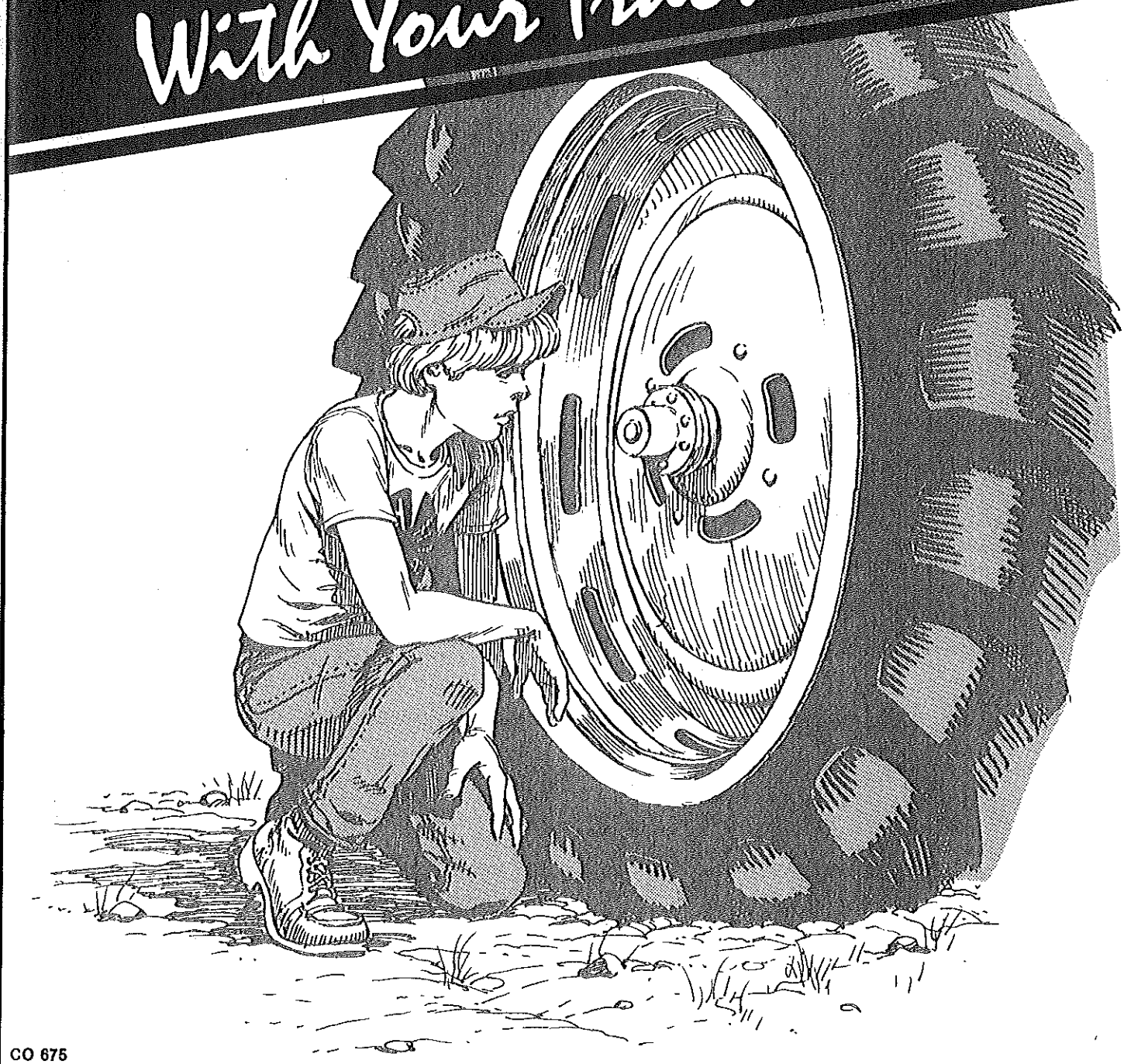
Petroleum Power Program

TRACTOR PROJECT

Getting Acquainted With Your Tractor



CO 675

Clutches and Shifting Levers

A clutch is a device for disengaging or disconnecting a rotating shaft. We have already mentioned one clutch–the main or engine clutch used to disconnect power from the engine to the transmission when you want to stop or change gears. When disengaged, the gearshift lever can be moved to the desired position. When the clutch is engaged, that is when the pedal is released, the tractor will start moving. *To be safe, always engage a clutch gradually after checking to the front, rear and both sides of the tractor.*

A type of clutching mechanism is also used to control power to the PTO shaft or belt pulley. In most cases these clutches can be used when the tractor is moving. Your operator's manual will describe which types of clutches are on your tractor.

There may be only one or several gear shifting levers on your tractor. Modern, heavy tractors often have several power and speed ranges available. Shifting between these ranges is done with different levers. Sometimes it is possible to change ranges and directions without using the clutch.

Engine Speed Control

The engine speed control is often called the "throttle." Actually, it is a governor control on most tractors. On gasoline or LP-Gas tractors, the throttle lever regulates the governor spring pressure, and a rod leading from the governor controls a throttle plate in the carburetor throat. The throttle plate controls the amount of fuel and air mixture entering the cylinders. The speed of an engine is determined by the amount of fuel and air mixture that is burned during the power stroke.

Brakes

Unlike a car or truck, the brakes on a tractor are used for more than slowing down or stopping. Tractor brakes have three functions: (1) to assist two-wheel drive tractors in making short turns in field operations; (2) for emergency stops; and, (3) for parking. Your tractor is equipped with two brake pedals; each one controls the brake on one side of the tractor. If only one pedal is pushed, pressure is applied to the brake in the wheel on that side of the tractor. This slows or stops movement of that wheel and causes the tractor to turn in a circle until the brake is released. Most four-wheel drive tractors have only one brake pedal so there is no brake assistance when turning.

The two brake pedals may be locked together to stop both wheels evenly during travel on the road. *For traveling in "road gear" both brakes must be locked together. If you hit only one brake hard when the tractor is traveling fast, the tractor may upset. Always keep both brakes adjusted equally.*

Most modern tractors have power or hydraulic brakes. These require less foot pressure, so you need to be very careful in operating them until you are familiar with how they act.

Steering

The steering wheel is used to transmit turning effort to the front tractor wheels. Turning effort may be transmitted by shafts, linkage and gears, or it may be transmitted by oil under pressure. Most newer tractors use the latter system called "hydrostatic power steering." Less effort is required to turn the steering wheel, which helps make it less tiring to operate the tractor on rough ground or for long periods.

Four-wheel drive tractors may steer by angling the wheels (crab steering) or by pivoting the tractor in the center (articulated steering). Tractors with articulated steering can easily crush a person standing near the pivot point as they are turned.

Hydraulic Controls

The hydraulic system of your tractor may have several different levers. These control the various remote systems and the three-point hitch. Your operator's manual will tell you how the systems operate and which levers control which functions.

Universal Symbols

Figure 8-7 shows several universal symbols you are likely to find on your tractor. Learn their meaning so you will know them instantly if needed.

STARTING AND STOPPING THE TRACTOR

You have now learned basic facts about some of the main systems of the tractor. You have also learned many safety rules as well as the importance of making sure your tractor is ready to operate.

Learning the proper way to start and stop a tractor is another important step toward becoming a safe, skilled tractor operator. The best place to start is by reading your operator's manual. Study the manual carefully to learn the exact procedures for your tractor.

General Starting Procedures

Not all tractors use the same starting procedures. This is particularly true for diesel or LP-Gas engines. Here are some rules that should be included in the procedures for starting any tractor safely.

1. Make a daily maintenance and safety check as outlined in the previous unit.
2. Sit in the operator's seat. Adjust the seat so you can reach and operate all of the controls.
3. Place the gearshift in "Neutral" or "Park". This is necessary on some tractors to make the starter work.
4. Make sure the PTO and hydraulic lift levers are in the "neutral" position.
5. Look out for the safety of others. Check carefully to make sure any persons who may be nearby are well out of the way of the tractor and any equipment that may be attached.
6. Put your foot on the clutch. Depress the clutch by pressing down. This reduces the load on the starter and is a good safety precaution in case the tractor is in gear. On newer tractors, a safety switch is provided so the tractor cannot be started unless the clutch pedal is depressed.
7. Turn on the switch and start the tractor.
8. After the engine starts, let it run at half throttle for a few seconds to let the oil pressure stabilize. Avoid pulling heavy loads for the first few minutes of operation.

Starting a Gasoline Engine

In order for a gasoline engine to start and run, the mixture of air and fuel delivered to the cylinders must be in the proper ratio. It takes about 13 1/2 pounds of air to provide enough oxygen to burn 1 pound of fuel for full-load operation. However, an engine with the carburetor adjusted properly for full-load operation may not start without "choking." The engine must be choked to start properly in cold weather.

The choke is a valve in the carburetor that cuts down on air intake for starting a cold engine. When the choke valve restricts the air flow, more fuel is pulled into the engine; the fuel-air mixture is said to be "rich". When the intake manifold begins to heat up, more of the fuel is vaporized and the choke can be opened. Excessive choking causes many troubles. Raw gasoline washes the oil from the pistons and cylinder walls. Fuel dilutes the oil in the crankcase. When the engine puffs black smoke from the exhaust, it is telling you that the mixture is too rich.

Starting an LP-Gas Engine

LP-Gas tractors are started in almost the same way as a gasoline tractor. Most LP-Gas engines are designed to start on the vapor from the special fuel tank. After starting the normal fuel delivery system takes over.

Normally the vapor valve is opened for starting and the liquid valve is left closed. The vapor valve should be opened slowly, allowing vapor from the top of the fuel tank to become available. If this valve is opened too quickly, the sudden rush of gas will cause the excess gas valve to close. You will then have to wait a few minutes for the excess gas valve to open again. The purpose of the excess vapor gas valve is to provide an instant shut-off in case a leak develops in the fuel line from the main tank.

Once the LP-Gas engine has started and warmed up to the proper operating temperature, the liquid withdrawal valve should be opened and the vapor valve closed.

Starting a Diesel Engine

You have already learned that diesel engines do not use a spark for igniting the fuel in the cylinder. Due to the cold temperature of the cylinder and surrounding parts, diesels need some kind of help in starting, particularly in cold weather. Sometimes a heating element is used to heat the air before it reaches the cylinder. More common now is a special device for injecting a small quantity of ether gas with the first few turns of the engine by the starter. Diesels do not have a choke. In cold weather, excess fuel is supplied by adjusting the throttle or by pushing an excess fuel button.

If the Engine Doesn't Start

If the engine–whatever its type–doesn't start on the first try, wait until the engine parts stop rotating before trying again. If the starter is engaged while the engine is turning, there is a chance of damaging the starter or the ring gear of the engine. In trying to start any tractor, don't engage the starter for longer than 15 seconds at a time to prevent the battery from overheating, running down, and to protect the starter motor.

Failure to start after several attempts indicates either that something in the starting sequence has not been done or that something may be wrong with some system of the tractor. Perhaps you forgot to turn on the fuel supply, or there might be a loose or broken ignition wire. Then too, the engine may be flooded by excessive choking, or perhaps you did not have the choke out at all. If you cannot find the trouble right away, check with someone who is familiar with the tractor.

On the diesel tractor, the fuel shut-off control must be returned to the RUN position before the engine can be started.

Stopping the Tractor

Just as it is important to know how to start the tractor, there are some rules that must be followed when the engine is shut off. The following procedure is suggested. Your operator's manual will tell you any other things which should be done.

1. Reduce the engine speed with the throttle and let the engine idle for a few minutes. This cools down the engine some and helps prevent warped valves and damaged turbochargers. It also will help keep the engine from backfiring.
2. Shut off the engine. This is done with a switch on a gasoline or LP-Gas tractor. Diesels usually have a fuel shut-off valve, either separate from or included with the throttle.
3. When the engine is completely stopped, put the gearshift lever in "Park" or low gear. Putting the transmission in gear or park will prevent the tractor from rolling away if it must be parked on a slope.
4. Set the brakes. This will also help to make sure the tractor will not accidentally roll downhill.

Use caution when dismounting from the tractor. A safe tractor operator doesn't jump on or off a tractor. Use the steps and handholds that are provided and watch your step!

Tractor Driver Certification

If you are 14 or 15 years old and want to be employed off your family's farm, you must complete the "Hazardous Occupation Certification Program." This program is required by the U.S. Department of Labor to make sure that you can safely operate farm tractors and machinery. Check with your leader or Extension 4-H Agent to see when and where the training will be held.

A student manual titled "Safe Operation of Agricultural Equipment," is available for use in the certification program. Write to Hobar Publications, 1234 Tiller Lane, St. Paul, Minnesota 55112. Order number 10076. The manual was written for use by the Cooperative Extension Service, 4-H and Vocational Agriculture Departments.

If you're younger than 14, you may want to take the classes to help you personally develop farm machinery operation and safety skills. However, you cannot become certified until age 14.

Now that you have learned some safety practices and can start and stop a tractor, it's time to begin acquiring some basic driving skills. Try the following "Learn By Doing" activities.

Learn by Doing

Practice getting on and off your tractor properly. How many "paths" are there for mounting and dismounting?

Practice starting and stopping the tractor.

Practice backing the tractor and forward turning.

Drive around open areas, without implements attached, to get the feel of driving.

If your county has a Junior Tractor Operator Contest, plan to enter it. Check with your leader or Extension 4-H Agent.

Learn to operate the garden tractor with a small wagon or other implement such as a plow attached. Practice starting, stopping, backing and turning with the wagon or implement attached.

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