

## **RIDING TRACTOR OWNER'S MANUAL**



# **HYDROSTATIC DRIVE HD-12**

**SHAW MFG. COMPANY - GALESBURG, KANSAS DIVISION OF BUSH HOG, INC. - SELMA, ALABAMA**

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## INTRODUCTION

The **Hydrostatic Drive Tractor** is manufactured to the traditionally high standard of Bush Hog, Inc. It has many quality features which have been designed with you, the customer, in mind.

Your dealer is sincerely interested in your new tractor and has the desire to help you get the most from it. After reading this manual thoroughly, you will find that you can do many of the regular service jobs quickly and easily. However, when you are in need of parts or major service, be sure to see your dealer. **Never attempt any transmission repairs.**

When you are in need of parts, be prepared to give your dealer both the tractor and engine serial numbers.

## DEALER SERVICES

Your dealer offers complete tractor service. His trained personnel have access to accurate, detailed service information. Some of these dealer services are listed below.

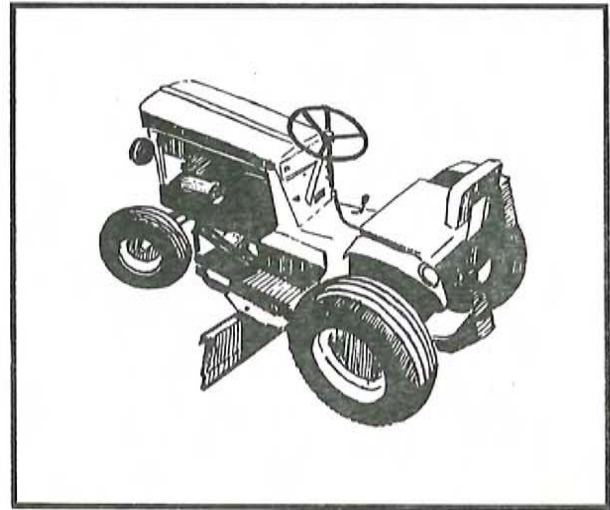
1. Testing battery and electrical components.
2. Cleaning and adjusting carburetor.
3. Cleaning out engine carbon.
4. Testing engine compression
5. Replacing motor-generator brushes, cleaning commutator.
6. Adjusting engine governor speed.
7. Checking transmission.
8. Tuning engine.
9. Servicing tires.

## WARRANTY

Bush Hog tractors are warranted to the original retail purchaser to be free from manufacturing defects under normal use and service for one year from the date of purchase or for 45 days if the tractor is used for commercial or rental purposes. The Bush Hog Company will replace defective parts free of charge, except items warranted by the original manufacturer such as engines or other products that carry a separate warranty. When defective parts are returned, they must be prepaid.

This warranty will not apply to Bush Hog products repaired or tered outside of a Bush Hog Dealer Service Station. Neither will a warranty apply on any failure from misuse, negligence or accident.

The placing on a Bush Hog product of any part or attachment not approved by the Company shall void the warranty.



## SPECIFICATIONS

### MODEL HD-12

#### ENGINE

	WISCONSIN	TECUMSEH
Make	S12D	HH820
Model	One	One
Cylinders	4	4
Cycle	3½ x 3	3½ x 2 7/8
Bore & Stroke	28.86 cu. in.	27.66 cu. in.
Displacement	1600 - 3600	1800 - 3600
Speeds	12.5 at 3600	
Horse Power		
Compression Ratio		
Valve Clearance (intake) Cold		.010
Valve Clearance (exhaust) Cold		.010

#### ELECTRICAL SYSTEM

Battery	45 AMP - 12 volt AABM Group 60	45 AMP - 12 volt AABM Group 60
Ignition	Key Type, Safety Switch	Key Type, Safety Switch
Starter Switch	Key	Key
Generator	Coil	Coil
Spark Gap	.030	.028 to .033
Breaker Point Gap	.020	.020

#### CAPACITIES

	WISCONSIN	TECUMSEH
Fuel Tank	8 quarts	6 quarts
Crank Case	2 quarts	3 pints

GROUND SPEED 0 ----- 11.28

#### HORSEPOWER

1800—7.2  
2400—9.8  
3000—11.6  
3600—12.5

#### BRAKES

Brakes integral with hydraulic circuit of transaxle. Also, mechanical hand-operated parking brake.

#### STEERING

Automotive Worm Gear Ratio: 14:12

#### TRANSMISSION

Type Transaxle - Hydrostatic Drive  
Lubricant - 4 quarts, Type A

#### TIRE SIZES

Front - 4.80/4.00 x 12  
Rear - 27 x 8.50 x 15

automotive transmission oil

#### WHEEL TREAD

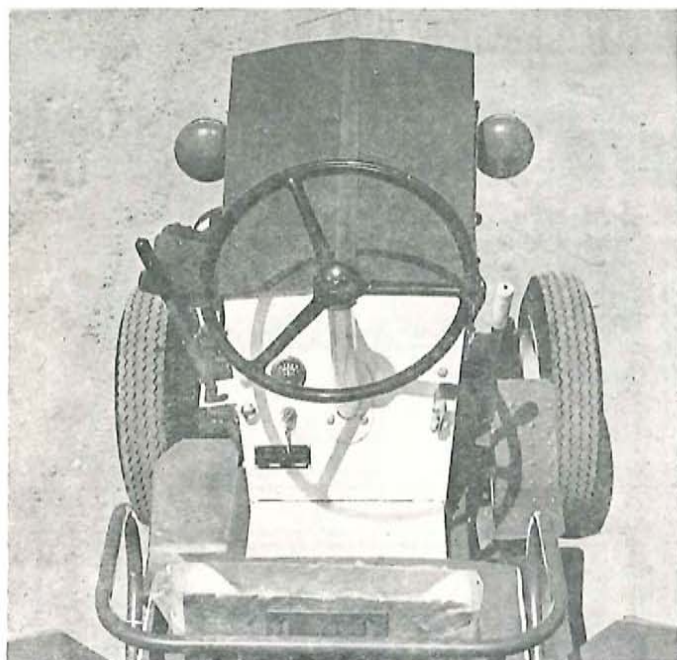
Front - 31 inches  
Rear - 33 and 38 inches

#### DIMENSIONS

Wheel Base - 54 in.  
Overall Length - 81 in.  
Overall Height - 44 in.  
Overall Width - (Max) 46 in.  
(Min) 41 in.

#### WHEEL BEARINGS

Front Taper Roller  
Rear Sealed Ball



## CONTROLS

1. **Starter Key**- Your tractor is equipped with a 12-volt electrical system and key ignition. Turn the key to the **right** to start the engine. When turning off the engine, turn the key to the **left** and the key will be in an upright position. The starter is equipped with a safety switch which allows the engine to be started only if the direction control lever is in neutral. Remove the key from the tractor when tractor is not in operation.

2. **Light Switch**- The light switch is located on the lower left hand side of the dash board. Pull the light switch out to turn on the front and rear lights. Push the switch in to turn off the lights.

3. **Implement Engaging Lever**- The lever is located left of the light switch. To engage implements, push the rod **forward**. Push the lever **back** to disengage implements. The lever is used to engage all implements such as mowers, snow throwers, etc. Refer to the Implement Clutch in the manual.

4. **Ammeter**- The Ammeter is located directly above the Starter Key. When the engine is started, the Ammeter should show a high charging rate and gradually fall back as the battery becomes charged.

5. **Direction and Speed Control Lever**- This lever is located on the right side of the dashboard. The Control Lever **must be in neutral** before the engine will start. Move the lever **upward** for forward movement of the tractor; move the lever **downward** for backward movement of the tractor. The further you move the lever, the faster the tractor will go. The lever is friction loaded so that it will remain in any

## FUEL AND OIL REQUIREMENTS

**IMPORTANT:** For all instructions pertaining to the operation of the tractor engine, refer to your instruction book Form 181-50 for Four Cycle Tecumseh Engines. Also refer to Issue MM304 for Four Cycle S12D Wisconsin Engines. For engine service, see your Tecumseh or Wisconsin Representative. Your Bush Hog dealer will refer you to the nearest Tecumseh or Wisconsin dealer.

### FUEL

Use a regular grade gasoline of a recognized brand. White gas may be used only if the octane rating is at least 75. Never use premium



desired position.

6. **Choke**- The Choke is located to the right side of the control handle. If the engine is warm, the Choke will not have to be used.

7. **Throttle**- The Throttle is located below the choke and is **labeled** with a "T". The Throttle can be locked in any position by turning the knob to the right. When the Throttle is pushed in as far as the engine should be idling.

8. **Hydraulic Lift Lever**- The Lift Lever is located below the seat on the left side of the tractor. The Lift Lever gives instant depth control of all implements such as mowers, plows, cultivators, etc. Just move the Lift Lever, and hydraulic power raises or lowers implements.

9. **Brake**- The Speed and Direction Control Lever acts as a brake. To bring the tractor to a smooth stop, move the lever to a neutral position.

Your tractor has a parking brake, which is located on the left side of the tractor - above and behind the Hydraulic Lift Lever. To set the parking brake, push down on the brake lever; the lever will automatically lock into position when it is in the extreme downward position. Always set the parking brake when you are dismounting from the tractor and when the tractor is not in operation. The rod which is connected to the brake lever has a clevis end which can be adjusted to increase or decrease braking pressure. **Do not maintain Brake Pressure while tractor is in operation.**

gasoline. **Note:** Do not mix oil with gasoline.

Be sure fuel containers are absolutely clean. Use a funnel with a screen to pour gasoline into the tank. To keep dirt out of the tank while you are filling it, wipe dust and dirt from around tank cover before removing it.

## ENGINE AND TRANSMISSION LUBRICANTS

**Engine Crankcase**- Oil used in the engine crankcase should have an

American Petroleum Institute (API/SAE) classification of service MS. Do not use oil marked MM or ML or oil that is unmarked. Multiple weight oils, such as all season 10W-30 are **not** recommended.

According to prevailing air temperatures, use oil of viscosity as shown in the following chart:

AIR TEMPERATURE-SEASON	SINGLE-VISCOSITY OIL
32 to 90 F. Summer	SAE 30
-0 to 32 F. Winter	SAE 10W

Do not fill crankcase above full mark on dipstick.

**Hydrogear Transmission-** The transmission has been filled with 4 quarts type A automatic transmission oil at the factory. Check oil periodically and maintain proper oil level. **THE TRANSMISSION MUST BE KEPT FULL OF OIL AT ALL TIMES.** Approximately 1/2 inch of oil should be visible in fill hole when the plug is removed.

Keep all oil you use clean and do not allow dirt in the transmission. Dirt and other foreign matter will ruin the transmission. **KEEP DIRT AND OTHER FOREIGN MATERIAL OFF THE HOUSING OF THE TRANSMISSION OR IT WILL BECOME TOO HOT.**

Parts service may be acquired from your dealer on your transmission.

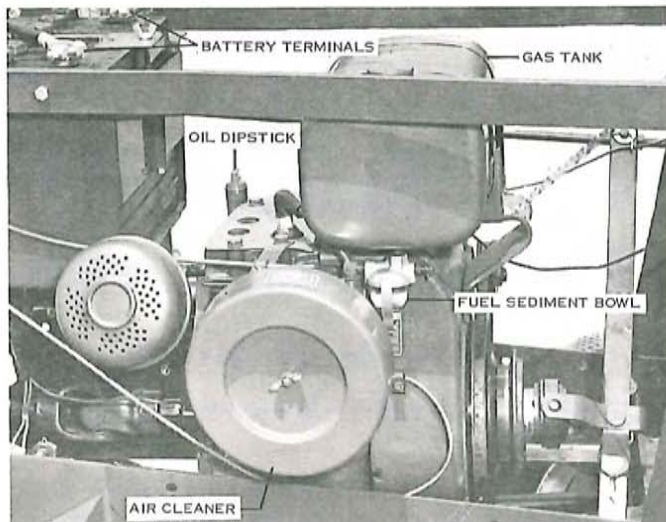
## PERIODIC LUBRICATION

Always lubricate your tractor at regular intervals. Regular and prompt service will insure trouble-free performance throughout the life of your tractor. Be sure to follow the instructions in this book for proper service.

The recommended lubrication and service periods for your tractor are as follows:

- Daily or every 5 hours of operation
- Every 25 hours of operation
- Every 50 hours of operation
- Every 100 hours of operation
- Every 500 hours of operation

2



The lubrication periods and procedures are given in order of frequency.

### Daily or Every Five Hours of Operation

Engine crankcase oil level must be checked every five hours. Raise the tractor hood, wipe off dust and dirt and unscrew oil dipstick. If necessary, add sufficient oil of the proper viscosity to bring oil level up to the full (F) mark on the dipstick when the dipstick is screwed in tight. **NOTE:** Oil should not be over the full mark. Before you check oil level, be sure tractor is on level ground and the engine is stopped. Refer to Fig. 2.

**Change engine oil after the first two (2) hours of operation.** Then follow instructions under "25 Hours of Operation."

### Every 25 Hours of Operation

**ENGINE CRANKCASE:** Drain engine oil every 25 hours of operation under normal conditions. See lube chart for recommended oil types.

Raise the hood. Remove the drain plug and allow the oil to drain into a container. The drain plug is located on the bottom left side of the engine.

Replace drain plug. Remove the dipstick and pour oil into filler tube from which the dipstick is screwed. **Do not overfill crankcase.** Refer to Fig. 2.

**NOTE:** The best time to drain the crankcase oil is at the end of a day's operation. At this time the oil is hot, and all dirt and other foreign material in the crankcase is in suspension.

**Caution:** If a non-detergent oil has been used, do not use a detergent oil.

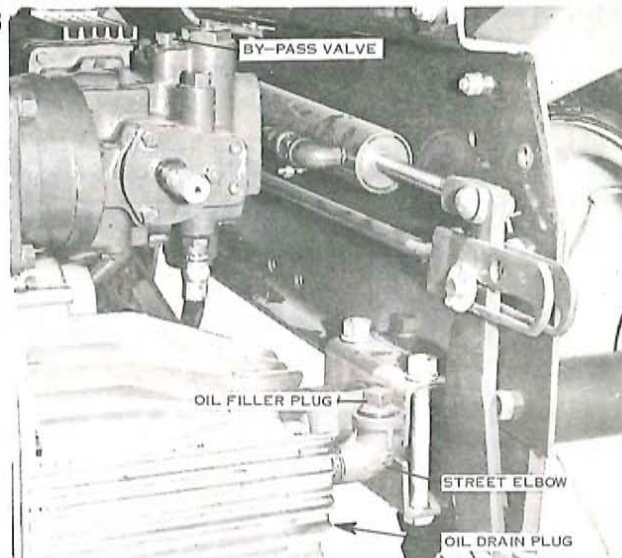
### Every 50 Hours of Operation

Repeat all 5 hour and 25 hour lubrication services and perform additional service as follows:

**HYDROGEAR TRANSMISSION:** After the first 50 hours, change transmission oil and filter. Use **type A automatic transmission oil.** Use filter S1166.

To change transmission oil, remove drain plug and allow oil to drain into a container. Change oil filter and replace drain plug. Remove oil filler plug from the Street Elbow. Add 4 quarts transmission oil.

3



Replace oil filler plug. There should always be about ½ inch of oil visible in the filler hole when the plug is removed. Refer to Fig. 3.

Change oil and filter every 50 to 75 hours after the initial change. Change filter each time you change oil. **Do not allow dirt to get into the transmission.**

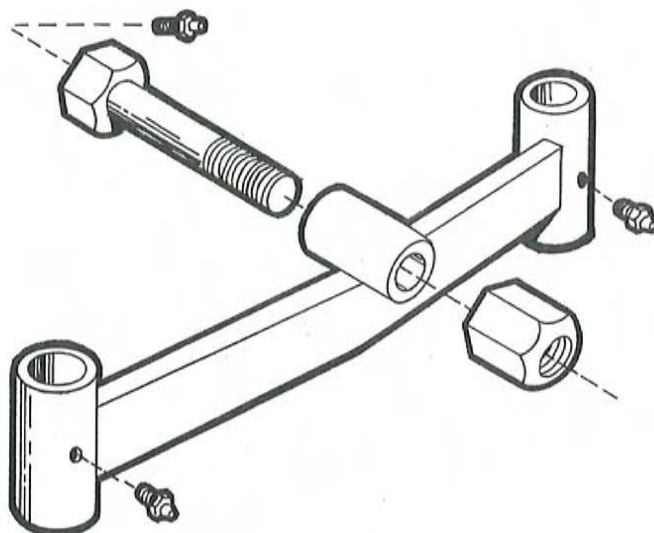
**Keep the transmission housing clean of all foreign material.** Keeping the housing clean is necessary for the dissipation of heat from the transmission. **Do not dismantle the transmission or attempt repairs.** See your dealer.

#### Every 100 Hours of Operation

Repeat all 5 hour, 25 hour, and 50 hour lubrication services and perform additional service as follows;

**LUBRICATION OF FRONT AXLE AND STEERING COLUMN:** Use pressure grease gun to lubricate front axle fittings with SAE (seasonal grade) multi-purpose-type grease. Wipe fittings clean after lubrication.

Use SAE 90 oil with EP additive in the steering gearbox. To check oil in the steering gearbox, remove the filler plug. Keep oil at proper level in the gearbox at all times.



## **PERIODIC MAINTENANCE**

### Daily or Every 5 Hours of Operation

**FLYWHEEL SCREEN:** Make a visual check of the outside screen. The engine is air cooled and must have an ample supply of air to prevent the engine from overheating. **Keep all dirt and debris off the screen.**

**BATTERY:** Check battery, making sure liquid level is up to the filler ring in each cell. If necessary, add distilled water. Keep terminals free of corrosion. Refer to figure. Check more often during summer than winter.

**TIRE PRESSURE:** Inflate front tires with 12 to 20 psi. Inflate rear tires with 6 to 10 psi.

**AIR CLEANER:** Neglecting air system maintenance is one of the most common causes of engine failure. Figure See your engine manual for maintenance instructions.

### Every 25 Hours of Operation

Repeat all 5 hour service checks and perform additional services as follows:

**FUEL SYSTEM:** Proper inspection of your tractor's fuel system will save you time and money. Check gasoline sediment bowl after every 25 hours of operation. If water or dirt particles are present, close fuel shut-off valve and loosen thumb nut. Remove the bowl. Clean the bowl thoroughly and replace it. Refer to figure.

**BATTERY:** Keep the water to ring level inside each filler hole. Use clean, distilled water when possible; otherwise use clean drinkable water.

Keeping the liquid at proper level during winter or freezing weather is especially important. Also, the battery must be kept fully charged to prevent freezing.

**Important:** When adding water to the battery during freezing weather, be sure the engine is running and continues to run until water has

had a chance to mix thoroughly. This running time should be at least an hour.

Battery connections should be tight at all times, especially when the battery is being charged. Loose cables will cause arcing and pitting of the connections and cause eventual battery failure. Refer to fig.

**NOTE:** Be careful not to allow sparks or flames near a charged battery.

### Every 100 Hours of Operation

Repeat all 5 hour and 25 hour service checks and perform additional service as follows:

**ENGINE SHROUDS:** Be sure the engine cooling fins and the shrouds which enclose them are clean at all times. Dirt, oil and other debris which may have entered through the screens may lodge on cooling fins, thereby restricting the normal air flow. This causes serious damage to engine parts because of overheating.

Remove the bolts which hold the engine shroud in place and brush out all dirt from cooling fins. Clean inside of shroud thoroughly. Soak off all oil deposits with a safe solvent. **CAUTION: Do not run engine with shrouds removed,**

Remove rotating screen and check for oil or dirty fins on the flywheel. Be sure screen is clean and not damaged.

**ADJUSTING POINTS:** Disconnect the spark plug cable to prevent accidental starting of the engine. Remove the ignition point cover and rotate engine flywheel until the points are fully open.

Check point gap with a .020-inch feeler gauge. If an adjustment is required, loosen locking screw and move screwdriver in v-slot until the points are properly set.

After tightening the locking screw, recheck the point gap.

To replace points, remove screws. Be sure lockwashers are in place before assembly.

**SPARK PLUG GAP:** Check spark plug gap and condition of electrodes after every 100 hours of operation. Distance between elec-

trodes should be: Tecumseh .028 to .033 inch and .030 inch on Wisconsin. Bend the outer electrode only for proper gap.

If electrodes have burned short or have become pitted, install a new spark plug.

Use a spark plug wrench to remove plug. Always use a new spark plug gasket when replacing plug. Tighten plug to 27 ft. lbs. torque.

**BATTERY:** Your tractor has a 12-volt electrical system. When you are replacing the battery, use a 12-volt, 45-amp, 20 hour rating or (AABM Group No. 60) equivalent.

**CAUTION:** Prevent accidental operation of the starter or engine. Always disconnect the spark plug cable when you are working on the electrical system. Also, disconnect plug cable when you are making adjustments to the engine or other moving parts.

**CLEANING BATTERY:** Remove battery cables and use a wire brush to remove corrosion from around battery terminals. Wash terminals with a solution consisting of one part baking soda to four parts water. Do not allow cleaning solution to run into battery cells.

Coat terminals with petroleum jelly and connect battery cables. Be sure the cables are tight. Refer to figure Page 72-21.

Wipe and wash entire battery case, platform and hold-down straps with clear water.

Be sure top and bottom vent holes in each cell cap are open.

### **Every 500 Hours of Operation**

Repeat all 5 hour, 25 hour, and 100 hour service checks.

## **OPERATION**

### **OPERATING THE ENGINE**

Your new tractor should be subjected to a break-in period before it is operated at full load. Drive the tractor long enough to get the feel of its operation. Do not lower or operate any attachments during the break-in period.

No special break-in oil is required. However, be sure to change oil after the first 5 hours of operation.

### **PRE-STARTING INSPECTION**

Before you start the engine each day, perform the following checks and services:

1. Check the fuel supply. Use regular gasoline only.
2. Be sure oil in engine crankcase is at the proper level. Add oil as needed to maintain indicated level. **CAUTION: Never overfill with oil.**
3. Be sure your tractor's speed control lever is in neutral. See Fig.
4. Be sure screen covering engine flywheel is clean. A screen filled with grass clippings or dirt will cause engine to overheat.
5. Be sure air cleaner is free of obstructions and excessive dirt.
6. Check transmission oil level. Keep Oil to Proper Level. See "Lubrication."
7. Do not allow dirt or other foreign material to get into the transmission.
8. Be sure transmission housing is free of all foreign material such

as dirt and grass clippings. If the housing is covered, the transmission will overheat.

### **STARTING THE ENGINE**

The engine will not start unless the direction and speed control lever is in neutral. Refer to your Tecumseh or Wisconsin manual for starting instructions.

### **STOPPING THE ENGINE**

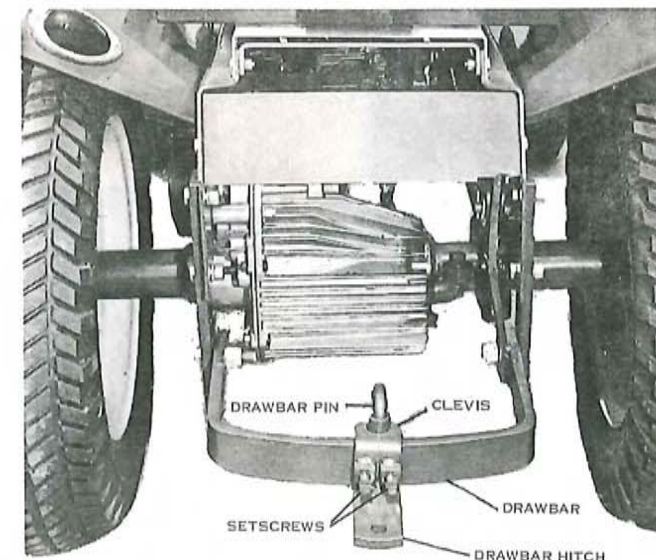
1. Move the speed and direction control lever to the neutral position.
2. Before stopping the engine, remove load and allow engine to idle for a few minutes. Sudden stopping of a hot engine can cause damage to engine parts.
3. Refer to your Tecumseh or Wisconsin engine manual for complete instructions.

## **USE OF DRAWBAR HITCH**

The dual purpose drawbar hitch can be attached to the drawbar as shown for general use, or it can be reversed on the drawbar with the clevis to the rear for use with a plow or cultivator.

If the hitch is to be used with a plow, disk harrow, or a cultivator, remove the hitch by loosening the two setscrews and removing the drawbar pin and the spacer. Attach the hitch to the drawbar so that the clevis end of hitch can be used. Tighten the two setscrews. You may also attach the hitch at any point on the drawbar by loosening the setscrews and moving the hitch to the desired position.

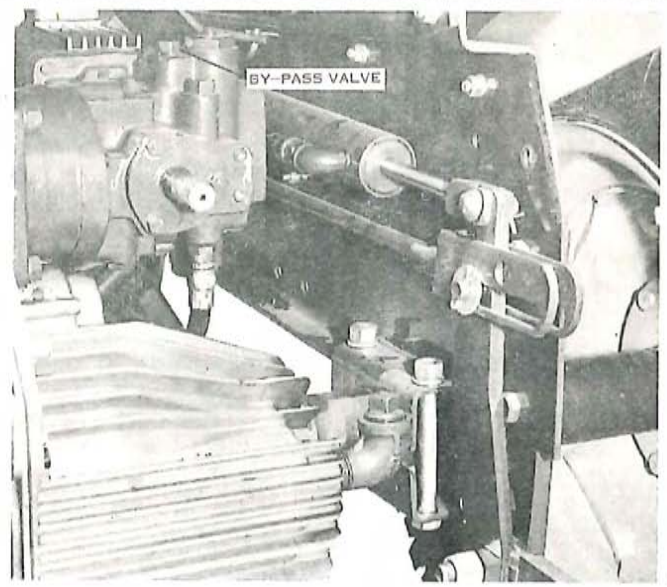
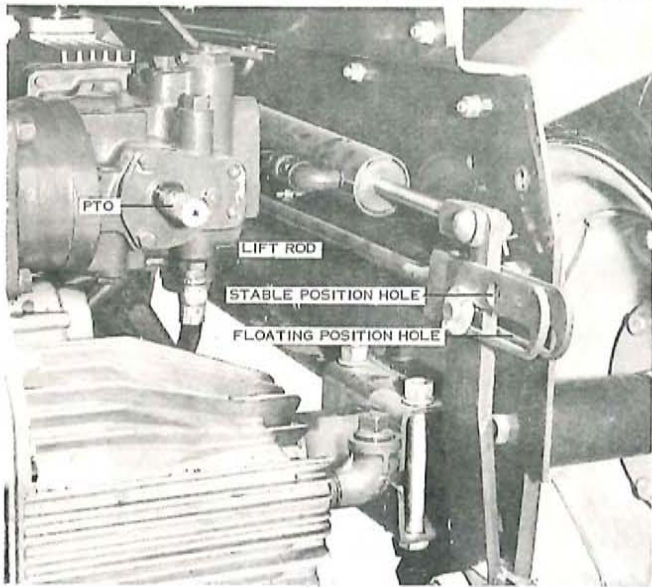
There are four holes in the frame to which drawbar is attached. These holes allow you to adjust the actual height of the drawbar from the ground.



## **FLOATING POSITION OF IMPLEMENT LIFT ROD**

Using the floating position for the mower will give a uniform cut because the mower is allowed to raise and fall with land contour according to the height at which you set the gauge wheels.

To use the floating position for mower, attach the implement lift



rod through the slotted hole.

To use the stable position for mower, attach the implement lift rod through the circular hole.

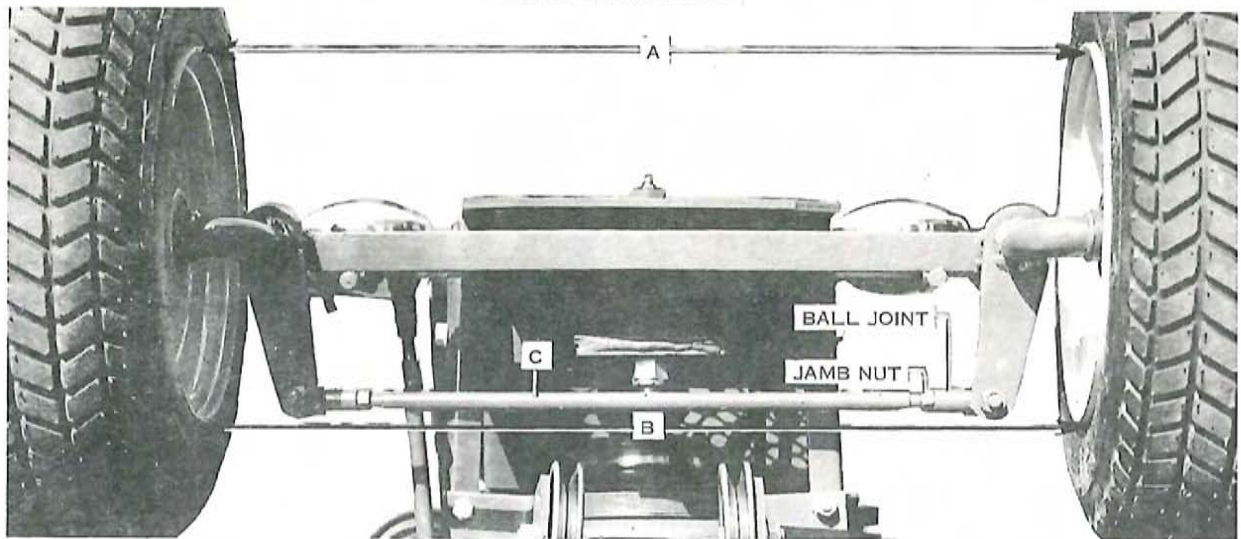
### **MOVING INOPERATIVE TRACTOR**

Do not tow the tractor under any circumstances. If the tractor is towed behind another vehicle, the transmission will be damaged. If the engine will not run, haul the tractor to its destination.

The tractor transmission has a by-pass valve which may be opened

should it be desirable to push the tractor or relocate it without starting the engine. Open the valve by turning it approximately  $\frac{1}{2}$  round. Such a use might occur in a garage where it is simply desired to shift the tractor to a new location. Do not move the tractor manually without opening the by-pass valve. See photo-above right

### **FRONT WHEEL TOE-IN**



Measure distances A and B above. The tractor has proper toe-in or alignment when dimension A is  $\frac{3}{16}$  inch less than dimension B.

When it is necessary, remove ball joint on either end of rod C and adjust till proper toe-in is obtained. Tighten jamb nuts firmly.

### **IMPLEMENT CLUTCH**

The S2926 clutch is standard equipment on your Model HD-12 Tractor. Its purpose is to operate front mounted or belly mounted implements such as mowers, snow throwers, etc.

This is a disc type clutch. This is a well made mechanical device.

Treat is as such. It works somewhat as an automotive clutch.

When the clutch is disengaged, the pulley will come to stop as it then runs on an idler bearing. **Note:** When this clutch is not operating an attachment, it should be engaged to reduce wear on idler



bearing and give many years of trouble-free service. To engage the clutch move lever on left side of tractor forward in slot. Always check the screen behind implement clutch as your clutch will then run as cool as your engine.

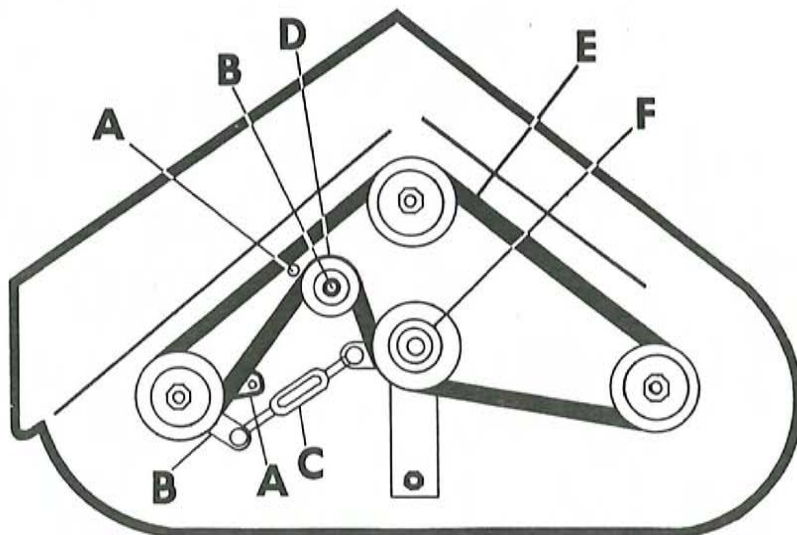
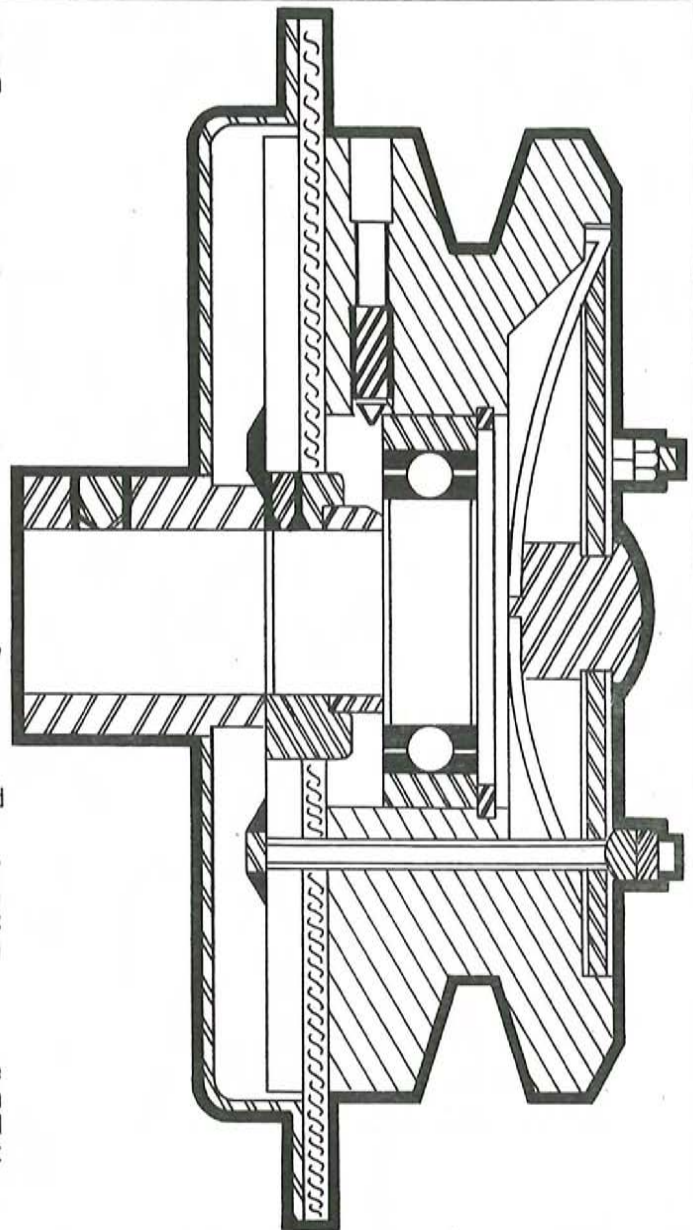
### LUBRICATION

The clutch is equipped with a packed idler bearing. The plunger which operates the clutch should be lightly greased every 100 hours of operation. All oils should be kept off of clutching disc.

### INSTALLATION OF IMPLEMENT CLUTCH

1. Installation S684 key in motor shaft.
2. Place S2400 clutch drive pan on shaft (with pins pointing outward) back against shoulder.
3. Slide bearing lock collar on shaft for bearing S2398.
4. Install S2398 bearing on shaft with bearing flush with end of shaft.
5. Lock collar to shaft and bearing by use of hammer and punch, secure with setscrew.
6. Install S2371 clutch assembly on bearing S2398.
7. Install three tapered setscrews in clutch pulley and tighten.
8. Install three short 15110 cup point setscrews to lock tapered setscrews.
9. Clutch has been adjusted at the factory. Should clutch slip after extensive use, remove three locknuts on front of clutch pulley, then turn clutch adjustment S2411 nuts to right  $\frac{1}{2}$  to 1 turn each. **NOTE:** All S2411 nuts must be turned the same amount as to apply even pressure on clutch disc.
10. Reinstall three locknuts without moving S2411 clutch nuts.

The tractor may be adjusted into different positions. Loosen the thumb screws and adjust the seat to a comfortable position. Tighten thumb screws. The back rest can also be adjusted to the desired height. Loosen the nuts in the adjusting slots and move back rest to the desired position. Retighten nuts.



### THREADING OF BELT ON M-42 MOWER FOR USE ON HYDROSTATIC (HD-12) TRACTORS

Pulley D should be in hole B to allow proper threading of Belt E. Belt E should be threaded as the drawing illustrates. Be sure that turnbuckle C is attached to lug B to give proper tension on belt E and proper alignment of mower drive pulley F. Hole A and lug A are used for mounting M-42 on Vari-drive and direct drive. Refer to figure 5 page 28-6 in M-42 operators manual.

## **TIRE SELECTION**

The following are tires which are recommended for use on your HD-12 tractor:

- Front Tires - 4.80 x 4.00 x 12 Sawtooth tread
- Rear Tires - 27 x 8.50 x 15 Extra-traction terra tread
- Rear Tires - 27 x 8.50 x 15 Super terra grip tread

## **REAR WHEELS**

Rear wheels are factory assembled in the narrow 33 inch tread. Wheels can be turned around on the hubs for a wide 38 inch wheel tread for greater stability. Remove wheel bolts, turn wheels around with valve stems inward, and reassemble wheels on hub.

## **TROUBLE SHOOTING**

### **HARD STARTING**

#### **A. FAULTY IGNITION**

Check for presence of spark by disconnecting high tension wire from plug and then holding wire close to the cylinder head while cranking engine with the starter. If there is no spark, check to see if:

1. Breaker point gap is incorrect.
2. Breaker points are worn or pitted. Replace points if they are damaged.
3. Spark plug gap is incorrect.
4. Spark plug electrodes are pitted or fouled. Replace plug.

If the foregoing fails to correct the problem—See your dealer.

#### **B. FAULTY CARBURETION**

1. Gasoline may not be getting to the carburetor because of an air lock in the line. Lines may be gummed and plugged.
2. Carburetor may be dirty or out of adjustment.

If the engine can be turned over slowly by hand with little effort, there is a loss of compression. See your dealer or serviceman.

### **ENGINE MISSING UNDER LOAD**

- A. Check spark plug for proper gap.
- B. Check for lean fuel mixture. Adjust the carburetor high speed screw.
- C. Check for dirty (fouled) spark plug or an improper type plug.
- D. Pitted or worn breaker points should be replaced with a new set.
- E. See your serviceman for proper ignition and carburetion adjustments.

### **BACKFIRING**

- A. Check carburetor for lean fuel mixture.
- B. Check for sticky intake valve or improper ignition. See your serviceman or dealer.

### **KNOCKING**

- A. Check fuel supply for low octane rating. Use only quality grade

of a regular gasoline.

- B. Check engine for overheating. See 'Overheating'.
- C. Check crankcase oil level. Fill to (F) mark on dipstick. **Note:** If an engine knock has developed because of lack of crankcase oil, have your dealer check the condition of the piston rod and cap.
- D. See your serviceman for possible loose connecting rod, improper timing or excessive carbon in combustion chamber.

### **LOSS OF ENGINE POWER**

#### **A. OVERHEATING**

1. Check and clean screens with engine shrouds.
2. Using premium gasoline with high octane rating is a possible cause. Use only regular gas.
3. Check carburetor for lean fuel mixture.
4. Check oil dipstick for excessive oil in engine crankcase, Do not fill above oil level mark.
5. Check breaker points for proper gap.

#### **B. DIRTY AIR CLEANER**

Refer to your Tecumseh Engine Manual.

#### **C. PARTLY CLOSED CHOKE.**

1. Check to be sure the choke control cable is not jammed.
2. Choke must be completely open (choke lever in) after engine is warmed up except on extremely cold days.

### **ENGINE OPERATING ERRATICALLY**

Check the following:

- (A) Carburetor set too lean (B) Clogged fuel line (C) Water in fuel (D) Faulty choke control (E) Loose electrical connections (F) Air leaks in carburetor connections or gasket (G) Carburetor jet clogged (H) See your serviceman for possible leaky valves or faulty condenser.

### **ENGINE WILL NOT IDLE**

- (A) Check carburetor adjustments (B) Check for dirty carburetor (C) Check and set spark plug gap (D) Check carburetor for air leaks in gasket (E) See your serviceman for possible leaky valves or faulty condenser.

### **IMPROPER STEERING OR EXCESSIVE FRONT TIRE WEAR**

Check wheel alignment and toe-in. Refer to figure Page 72-6

### **STARTER INOPERATIVE OR WILL NOT TURN ENGINE**

- (A) Check for discharged battery (B) If implement engaging rod is engaged, disengage. See Fig. (C) Tighten motor-generator belt (D) Check electrical connections.

### **TRACTOR WILL NOT MOVE WITH ENGINE RUNNING**

- A. Check transmission oil level. Remove filler plug and make sure oil is at proper level. Refer to Fig.
- B. Be sure the direction and speed control lever is in the proper position.
- C. Check the by-pass valve plug on the transmission. The valve plug must be tight for the tractor to move. Refer to Figure 4.
- D. If the above procedures do not correct this problem, you should contact your dealer.

## ADJUSTMENT OF NEUTRAL CONTROL

After removing tool box S3152 from under seat, you will find the adjustable selector plate S2834. Loosen bolt 19079, also loosen hex nuts 15584. Adjust one of these two nuts, which ever one is necessary to find neutral. Once neutral is found repeat the above instructions in reverse.

## STORAGE

If your tractor will not be used for a period of time such as through the winter season, perform the following operations:

1. Refer to your Tecumseh or Wisconsin Engine Manual for storage instructions.
2. Remove battery and store it where it will not freeze. Check water level and refill battery if necessary.
3. Clean tractor exterior thoroughly, removing all mud, dirt, grease, and other materials.
4. To prevent rust, touch up all unpainted and exposed surfaces with paint.
5. Check all visible moving parts for wear, breakage or damage. Now is the time to order any parts required and make necessary repairs to avoid needless delay when you use the tractor again next season.

6. Block up tractor to take weight off tires. If it is possible, store tractor in a cool, dark place to prevent excessive tire deterioration.
7. Loosen motor generator belt.
8. Lubricate all grease fittings.
9. Check worm gear steering oil level.

## PREPARING TRACTOR FOR USE AFTER STORAGE

### ENGINE

1. Drain and refill tractor crankcase with proper weight and grade oil.
2. Clean spark plug and set gap.
3. Check ignition point gap.
4. Clean fuel sediment bowl.
5. Service air cleaner.

### TRACTOR

1. Reinstall battery. Check liquid level and clean battery.
2. Check tire inflation.
3. Drain transmission oil and refill with type A automatic transmission oil. **See Lubrication.**
4. Tighten motor generator belt.

## HYDROGEAR TRANSMISSION

### TROUBLE SHOOTING PROCEDURE

#### 1. SYSTEM \* WILL NOT OPERATE IN EITHER DIRECTION.

##### A. SYSTEM LOW ON OIL

1. Check oil level in reservoir and replenish if necessary.
2. Locate and fix leak or leaks causing the loss of oil.

##### B. FAULTY CONTROL LINKAGE

1. Check the entire linkage to make sure it is connected and free to operate as it should.

##### C. FREE WHEELING VALVE OPEN

1. Make sure the Free Wheeling or Dumping Valve is closing properly.

##### D. DISCONNECTED COUPLING

1. Check to see that the coupling from the prime mover to the pump and the coupling from the motor shaft to the driven mechanism is not slipping or broken.

##### E. LOW OR ZERO CHARGE

1. Charge pressure neutral should be 75 PSI or higher.
2. Set input speed to at least 500 RPM charge pressure should read at least 70 PSI or more when main pump control lever is in pumping position and fluid motor is operating.
3. Install pressure gage (capable of 600 PSI).
4. Low charge pressure may be caused by:
  - a. Charge pressure relief valve in center section stuck open.
  - b. Filter or suction line clogged.
  - c. Charge pump drive shaft sheared.
  - d. Internal damage to pump or motor.

\* The word "system" denotes both pump and motor plus all lines, valves, filters, controls, etc., leading to and in between them.

#### F. LOW AND FLUCTUATING CHARGE

1. Air in system. Air will also cause system to be noisy. Check pipe fittings suction side.
2. Check oil level in reservoir.
3. Internal damage to pump or motor.

#### G. FAULTY CHECK VALVES

1. Remove the check valves located in the center section and check the following:
  - a. Check valves to see if cone or spring is missing.
  - b. Check to see if the valve seat is eroded.

#### H. INTERNAL DAMAGE TO PUMP OR MOTOR

Indicated by :

1. Low or zero charge pressure (See I-3) charge pressure may also fluctuate rapidly.
2. Maximum obtainable operating pressure in both forward and reverse is less than the normal relief valve setting. Charge pressure, which will also be lower than normal, will drop to zero when the maximum pressure is reached.
3. Pieces or flakes of bass in the reservoir and filter.
4. Noisy unit (pump or motor).

**Note:** If either unit is considerably worn or damaged, the other unit should also be carefully checked.

#### I. MOTOR SEIZED

1. Open free wheeling valve and attempt to push vehicle.

#### 11. SYSTEM OPERATES IN ONE DIRECTION ONLY

##### A. FAULTY CONTROL LINKAGE

1. Check the entire linkage to make sure it is connected and free to operate as it should.
2. Make sure the control "stop", if used, is not out of adjustment.

##### B. ACCELERATION RELIEF VALVE STUCK OPEN

1. Disassemble metering plug portion of acceleration relief

valves and inspect for blocking by contaminate. Make sure upper piston is free in its bore and that both springs are present. Inspect relief cone for proper seal.

**C. ONE CHECK VALVE FAULTY**

Follow instructions given in 1 - G.

**111. NEUTRAL DIFFICULT OR IMPOSSIBLE TO FIND.**

**A. FAULTY LINKAGE**

1. Disconnect control linkage at directional control arm. If system can now be returned to neutral, the linkage to the control is out of adjustment or binding in some way.

**IV. SYSTEM OPERATING HOT (RESERVOIR TEMPERATURE ABOVE 180 )**

**A. OIL LEVEL LOW**

1. Replenish oil supply.

**B. AIR COOLING FINS ON PUMP HOUSING CLOGGED WITH DIRT ETC.**

1. Clean air cooling fins on pump housing.

**C. CLOGGED FILTER OR SUCTION LINE**

1. Replace filter. Clean or replace suction line.

**D. INTERNAL LEAKAGE (USUALLY ACCOMPANIED BY LOSS OF ACCELERATION AND POWER)**

1. One of the high pressure relief valves may be stuck partially open. Install gages and read the charge pressure and operating pressure in both directions. If the operating pressure is 200 PSI

or more, lower than normal in one direction and normal in the other switch the acceleration relief valves. If the low pressure also switches to the opposite side of the circuit, disassemble, check and clean the faulty (low) acceleration valve. Reinstall and recheck. Charge pressure should be normal at all times.

2. Internal parts of pump or motor (or both) worn. Maximum obtainable operating pressure lower than the normal high pressure relief valve setting in both directions. When this pressure is reached, charge pressure will drop to or very near to zero. System will also be noisy at this point with the most noise issuing from the unit that is most worn. If either unit is considerably worn or damaged, the other unit should also be carefully checked. Replace the worn parts in the units affected or replace the complete unit.

**V. SYSTEM NOISY**

**A. AIR IN SYSTEM**

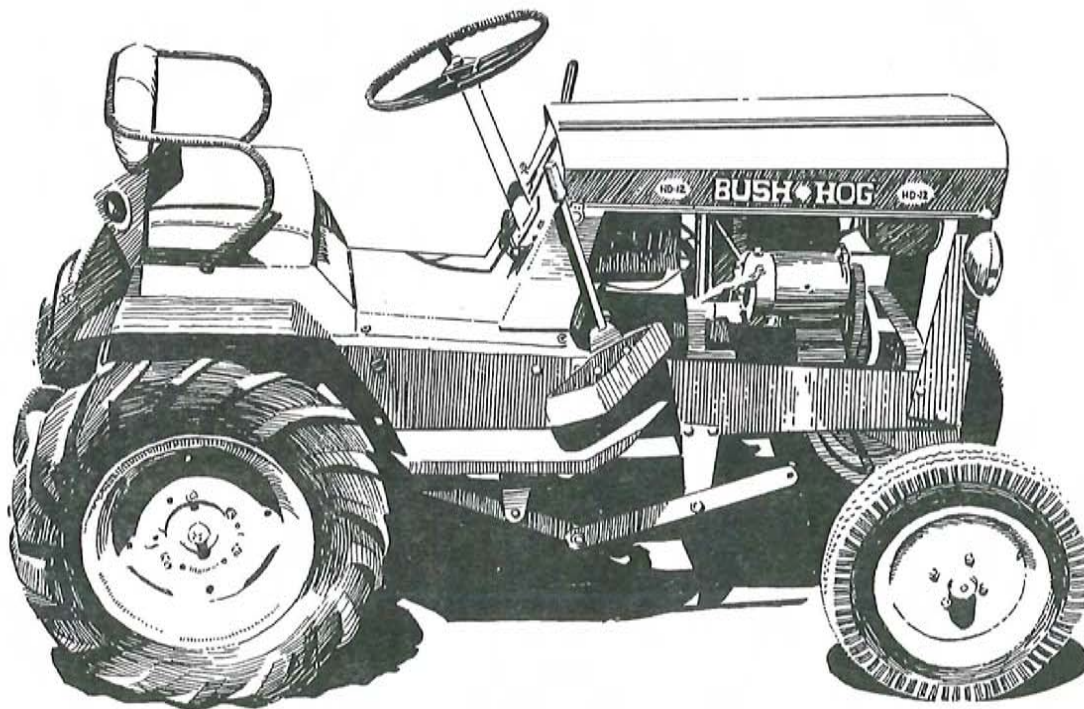
1. Low oil level in reservoir.

2. Suction passage between reservoir and charge pump, including suction filter leaking at some point and allowing air to be drawn into system. A good indication of air in the system is a considerable amount of foam in the reservoir.

**6. IMPLEMENT LIFT WILL NOT OPERATE**

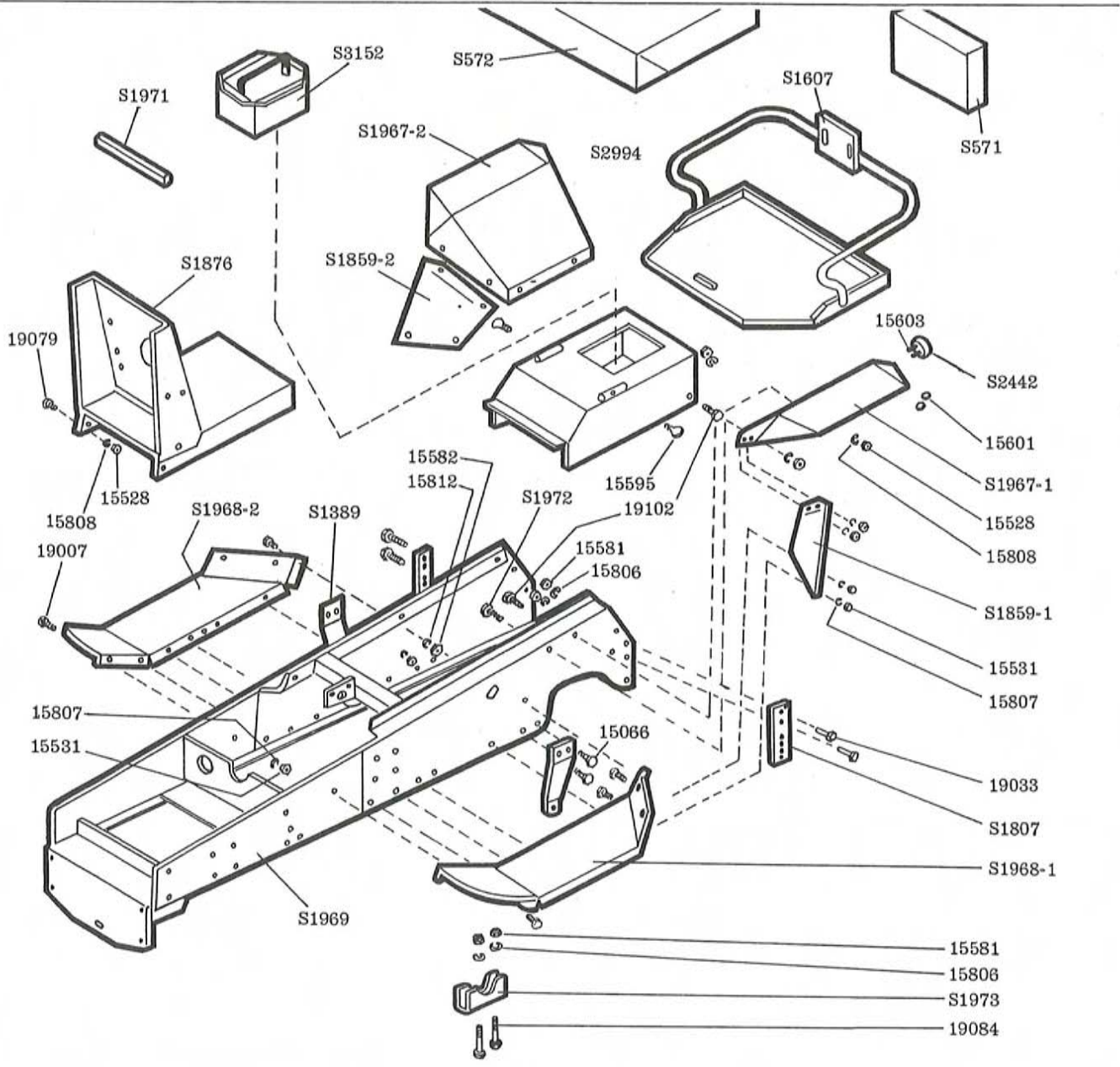
**A. FAULTY IMPLEMENT RELIEF VALVE**

1. Replace valve.



### SEAT, FRAME, FENDER, AND DASH ASSEMBLIES

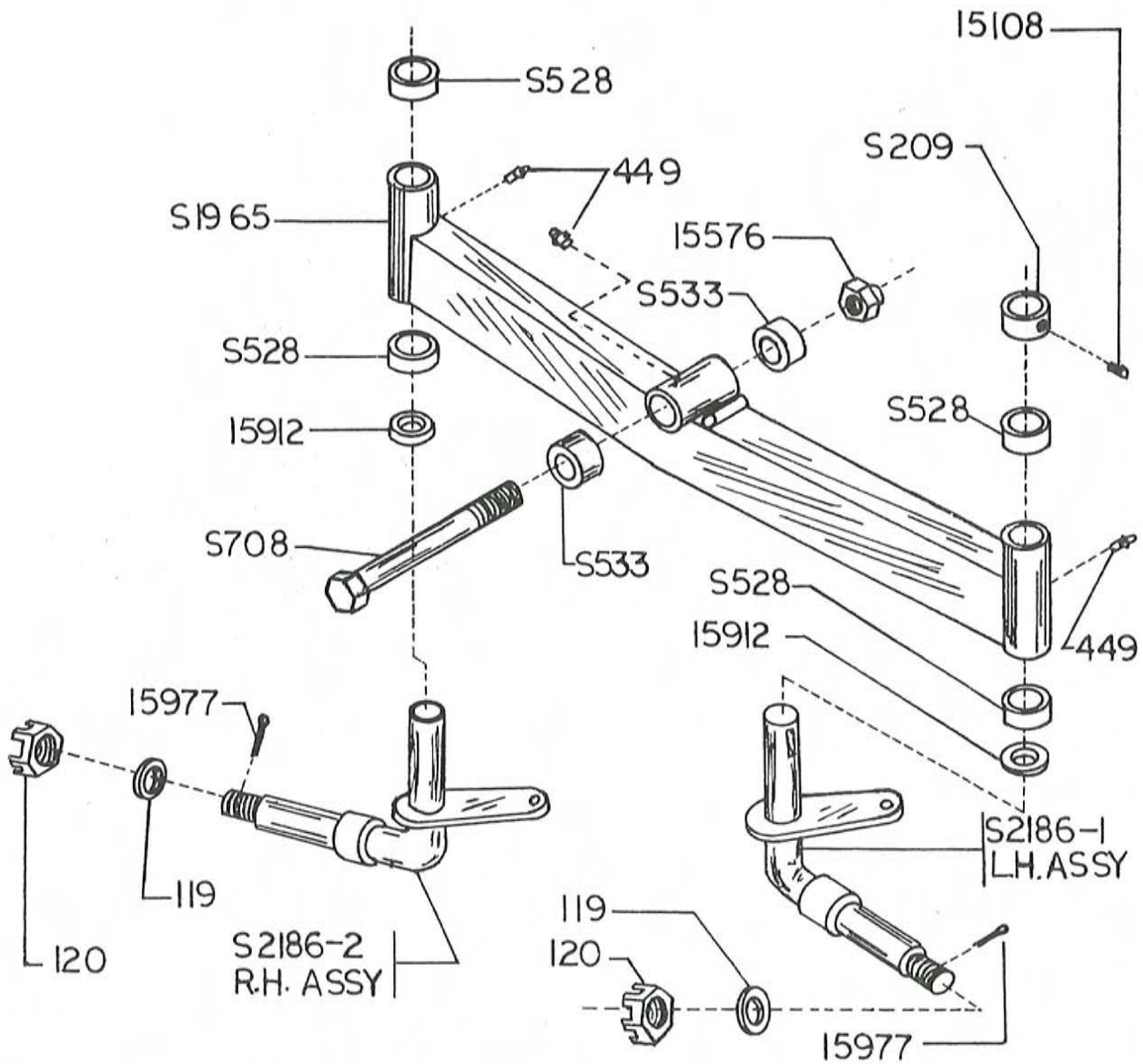
Part No.	Description	Qty.	Part No.	Description	Qty.	Part No.	Description	Qty.
S571	Seat Back	1	S1972	Brake Spring Bolt	1	19033	Capscrew 1/2 13 UNC x 1 1/4	4
S572	Seat Cushion	1	S1973	Clamp, Axle	1	19079	Capscrew 5/16 18 UNC x 3/4	4
S1389	Rear Lift Bracket	2	15601	Nut No. 10 - 32 UNF	2	19084	Capscrew 1/2 13 UNC x 4 1/2	2
S1607	Seat	1	S2442	Tail Light	1	19102	Capscrew 5/16 18 UNC x 1	5
S1807	Support, Drawbar	2	15066	Capscrew 3/8 16 UNC x 1	4	15603	Stove Bolt No. 10 - 32 UNF x 1/2	2
S2994	Seat Frame	1	15528	Nut 5/16 18 UNC	10	S3152	Tool Box	1
S1859-1	Fender Skirt - L.H.	1	15531	Nut 1/4 20 UNC	16			
S1859-2	Fender Skirt - R.H.	1	15581	Nut 1/2 13 UNC	6			
S1876	Dash Assembly	1	15582	Nut 3/8 16 UNC	4			
S1967-1	Fender - L.H.	1	15595	Thumb Screw 5/16 18 UNC	2			
S1967-2	Fender - R.H.	1	15806	Lockwasher 1/2	6			
S1968-1	Foot Rest - L.H.	1	15807	Lockwasher 1/4	16			
S1968-2	Foot Rest - R.H.	1	15808	Lockwasher 5/16	10			
S1969	Tractor Frame	1	15812	Lockwasher 3/8	4			
S1971	Rubber Trim	1	19007	Capscrew 1/4 20 UNC x 3/4	8			



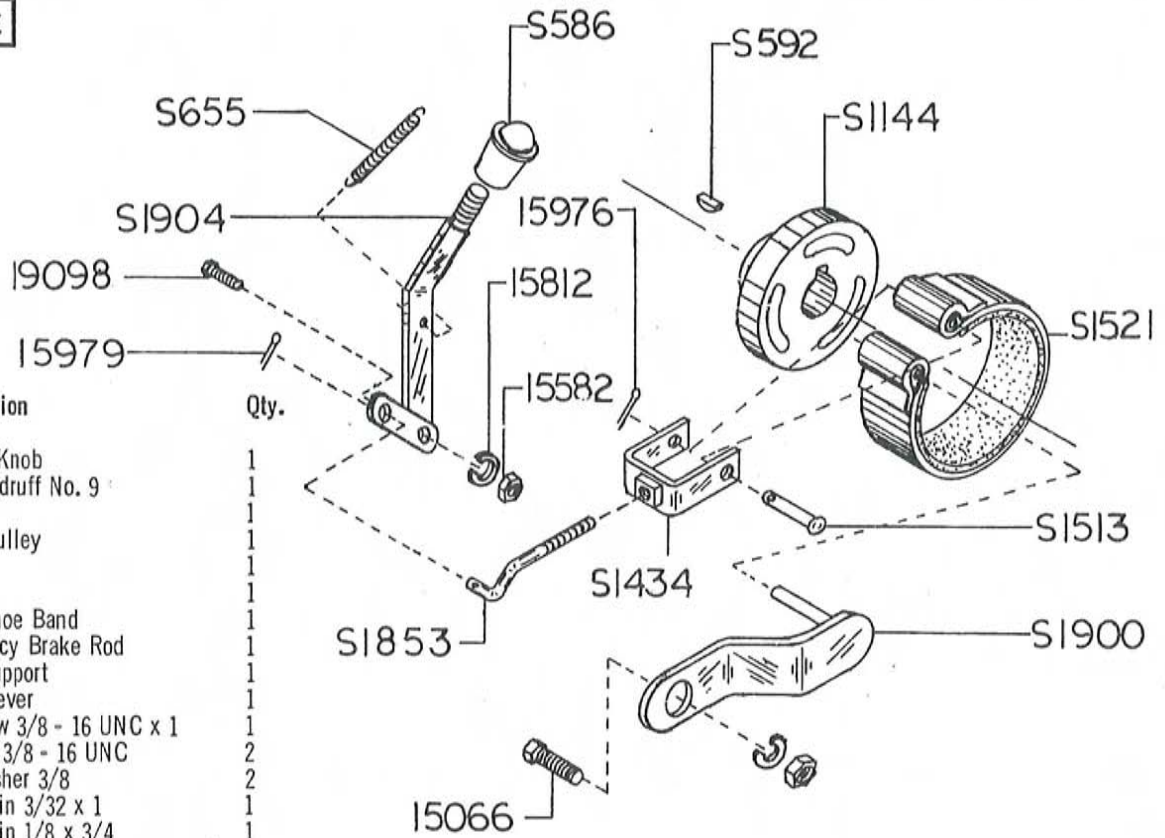


# AXLE ASSEMBLY

Part No.	Description	Qty.
S209	Set Collar	1
S528	Bushing	4
S533	Bushing	2
S708	Bolt	1
S2186-1	Spindle Assy. L.H.	1
S2186-2	Spindle Assy. R.H.	1
S1965	Axle Assembly	1
119	Flatwasher 3/4	2
120	Nut	2
449	Grease Fitting	3
15108	Setscrew	1
15576	Locknut	1
15912	Bushing	2
15977	Cotter Pin	2



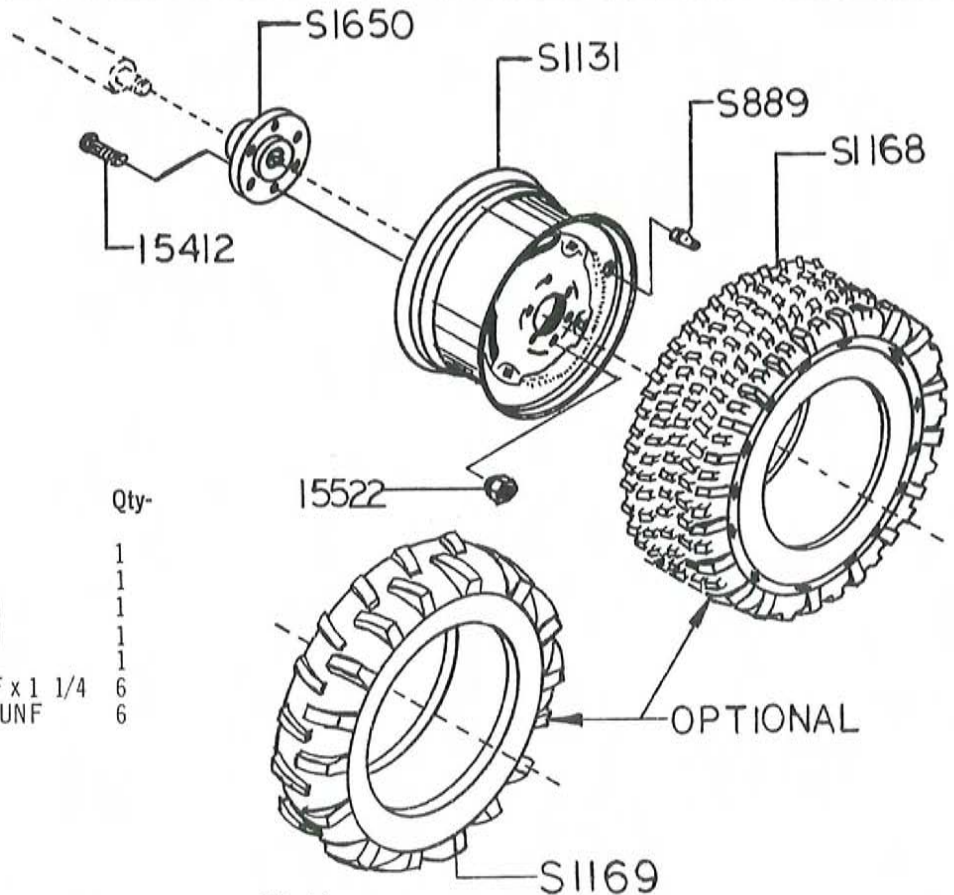
**PARK BRAKE**



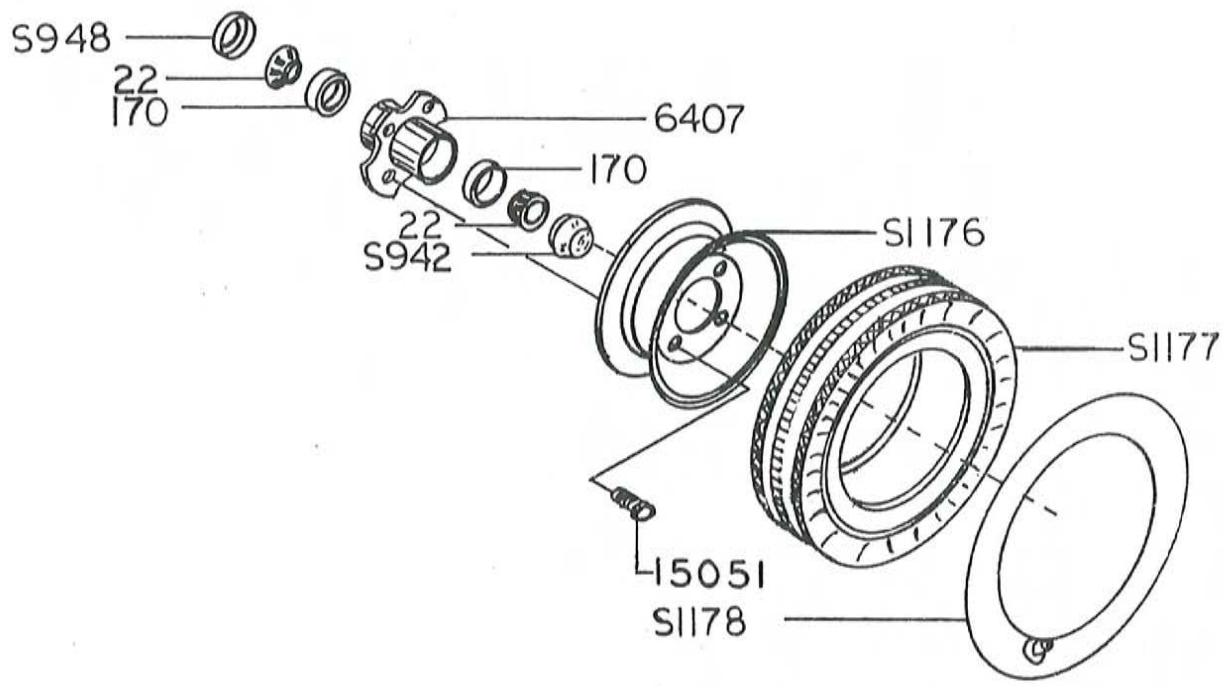
Part No.	Description	Qty.
S586	Control Knob	1
S592	Key Woodruff No. 9	1
S655	Spring	1
S1144	Brake Pulley	1
S1434	Clevis	1
S1513	Pin	1
S1521	Brake Shoe Band	1
S1853	Emergency Brake Rod	1
S1900	Brake Support	1
S1904	Brake Lever	1
15066	Capscrew 3/8 - 16 UNC x 1	1
15582	Hex Nut 3/8 - 16 UNC	2
15812	Lockwasher 3/8	2
15976	Cotter Pin 3/32 x 1	1
15979	Cotter Pin 1/8 x 3/4	1
19098	Capscrew 3/8 - 16 UNC x 1 1/4	1

**REAR TIRES**

Part No.	Description	Qty.
S889	Valve Stem	1
S1131	Rim 15 x 6 lbs.	1
S1168	Tire 27 x 8.50 x 15	1
S1169	Tire 27 x 8.50 x 15	1
S1650	Hub	1
15412	Hub bolt 7/16 UNF x 1 1/4	6
15522	Hub Nut 7/16 - 20 UNF	6





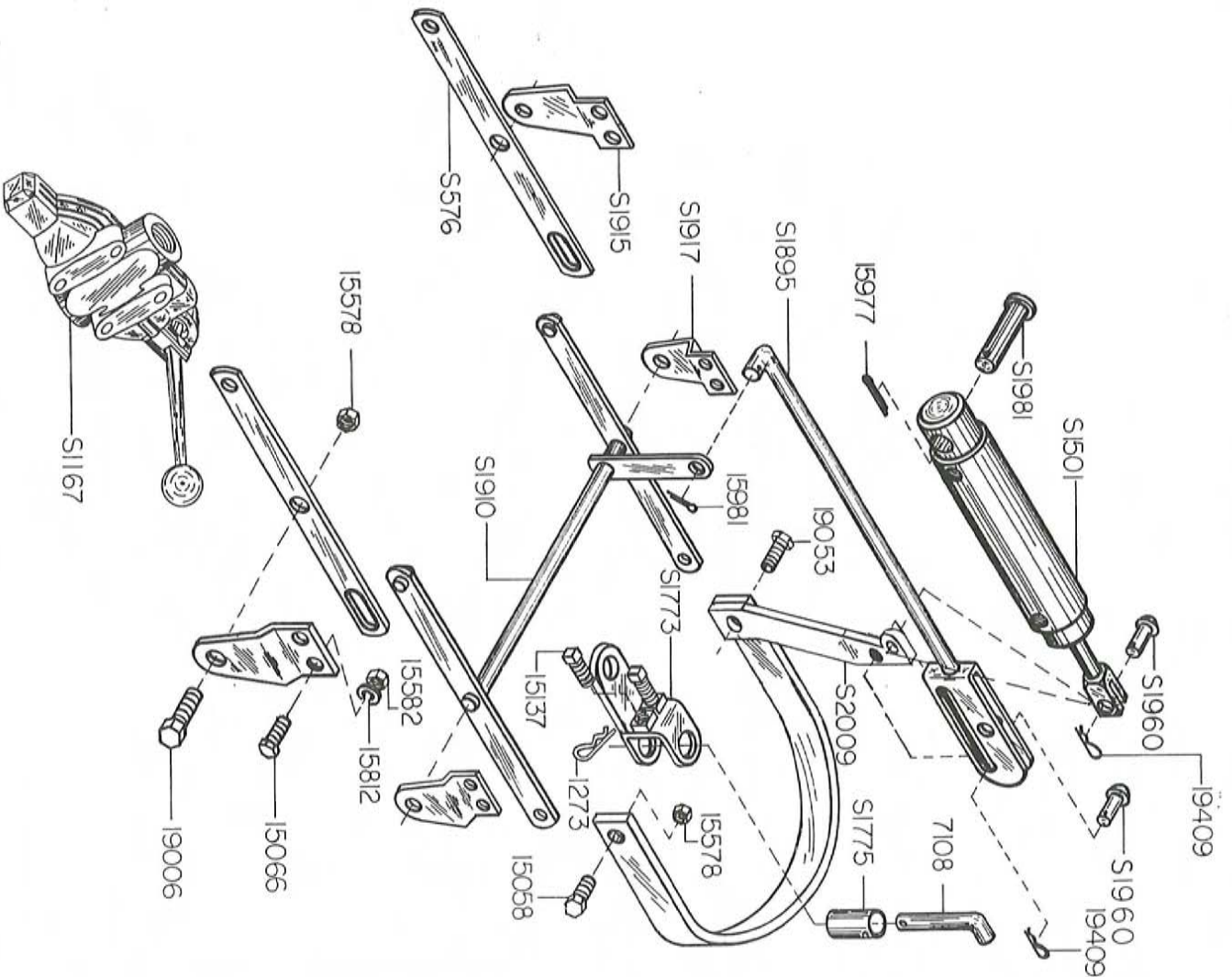


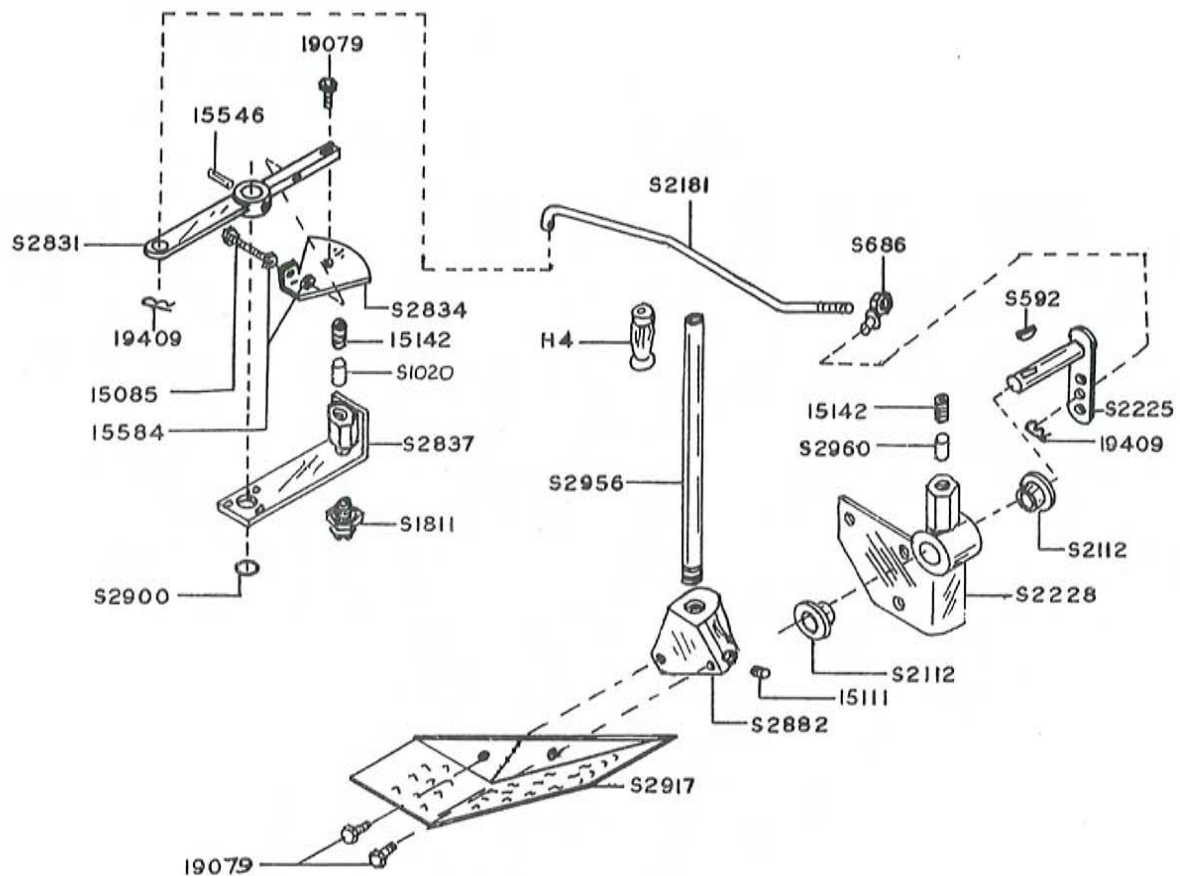
**FRONT ALL PURPOSE TIRE**

Part No.	Description	Qty.
22	Bearing Cone	2
170	Bearing Cup	2
S942	Dust Cap	1
S948	Grease Seal	1
S1176	Rim 4.00 x 12	1
S1177	Tire 4.80 x 4.00 x 12	1
S1178	Tube 4.00 x 12	1
6407	Hub	1
15051	Hub Bolt 1/2 - 20 UNC x 1	1

**LIFT ASSEMBLY**

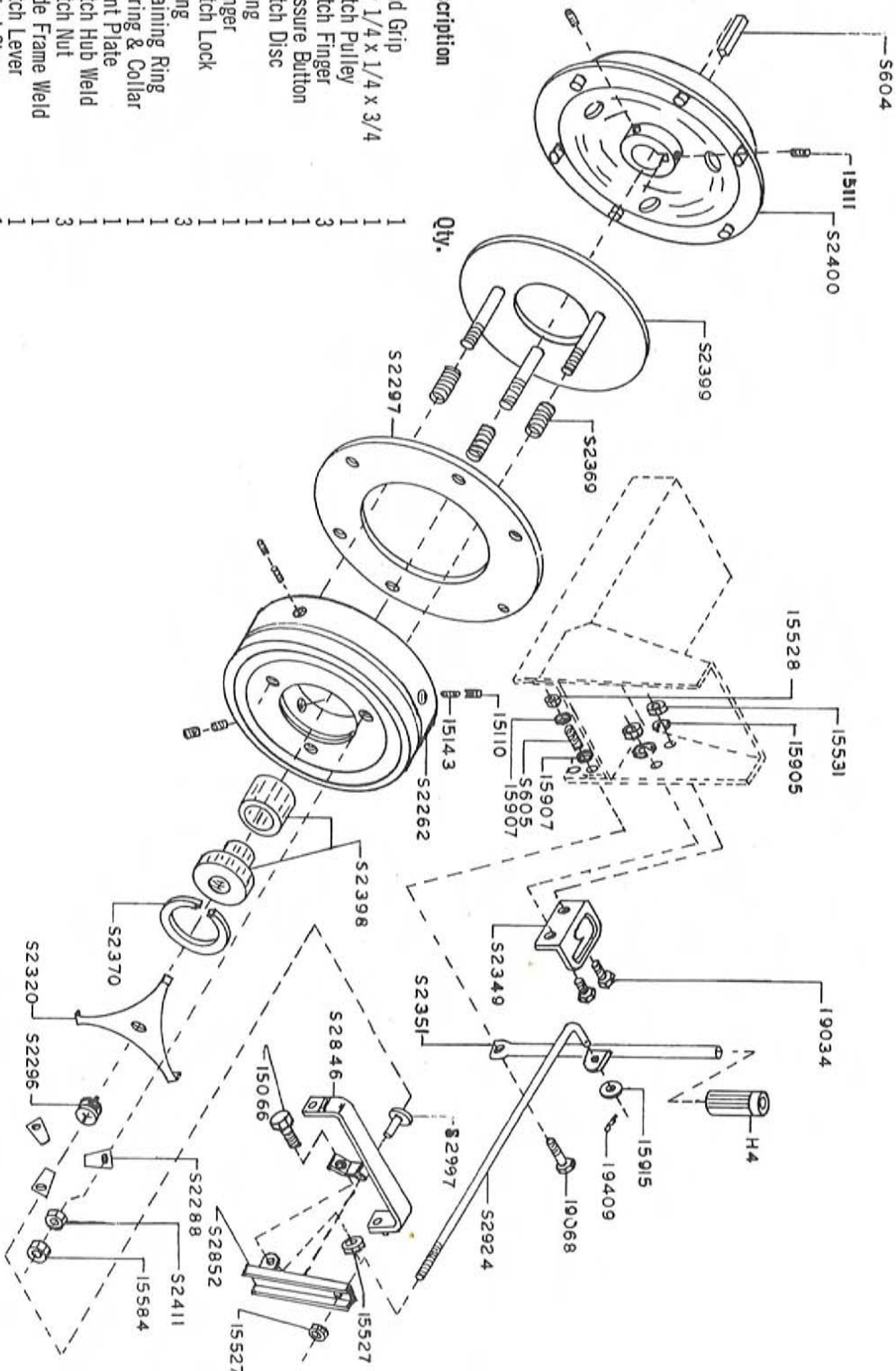
Part No.	Description	Qty.
S576	Lift Bar	2
S1167	Control Valve	1
S1501	Lift Cylinder	1
S1773	Clevis Hitch	1
S1775	Hitch Tube	1
S1895	Lift Rod	1
S1910	Rear Lift Welded Assembly	1
S1915	Lift Bracket - Front	2
S1917	Lift Bracket - Rear	2
S1960	Lift Rivet	2
S1981	Cotter Pin	1
S2009	Drawbar	1
1273	Presto Pin	1
7108	Hitch Pin	1
15058	Capcrew 5/8 - 11 UNC x 1 3/4	1
15066	Capcrew 3/8 - 16 UNC x 1	8
15137	Setscrew	2
15578	Locknut 5/8 - 11 UNC	4
15582	Hex Nut 3/8 - 16 UNC	8
15812	Lockwasher 3/8	8
15977	Cotter Pin	1
15981	Cotter Pin	1
19006	Capcrew 5/8 - 11 UNC x 1 1/2	2
19053	Capcrew 5/8 - 11 UNC x 2 1/4	1
19409	Presto Pin	1





Part No.	Description	Qty.
H-4	Hand Grip	1
S592	Key 3/16 x 3/4	1
S686	Adjusting Pin Assy.	1
S1811	9242 Safety Switch	1
S2112	Bushing	2
S2181	Control Rod	1
S2225	Shift Welded Assy.	1
S2228	Shift Mount Welded	1
S2831	Top Shifter Drive	1
S2834	Selector Plate	1
S2837	Position Block Welded	1
S2882	Pedal Casting	1
S2900	O Ring	1
S2917	Foot Control	1
S2956	Control Lever	1
S1020	Friction Dowel	2
15085	Capscrew 1/4 - 20 x 1 3/4	1
15111	Setscrew 5/16 - 18 x 5/16	1
15142	Setscrew 1/2 - 13 x 1/2	2
15546	Roll Pin	1
15584	Nut 1/4 - 20 UNC	2
19079	Capscrew 5/16 - 18 x 3/4	3
19409	Presto Pin	2

To adjust neutral if tractor is creeping forward loosen nut 15584 and capscrew 19079 and then move shifter S2834 toward rear of tractor and retighten nuts and capscrew. To adjust neutral if tractor is creeping backward, reverse above instructions.

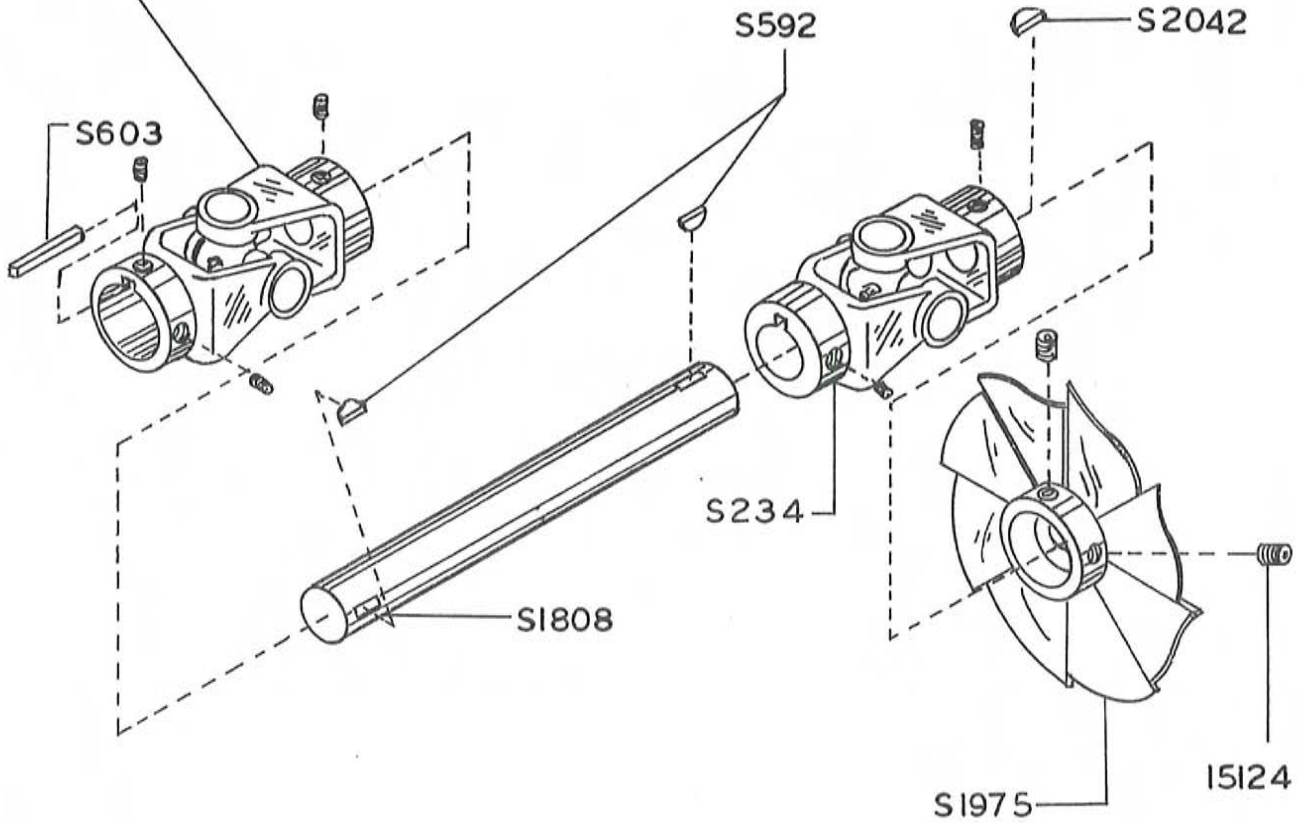


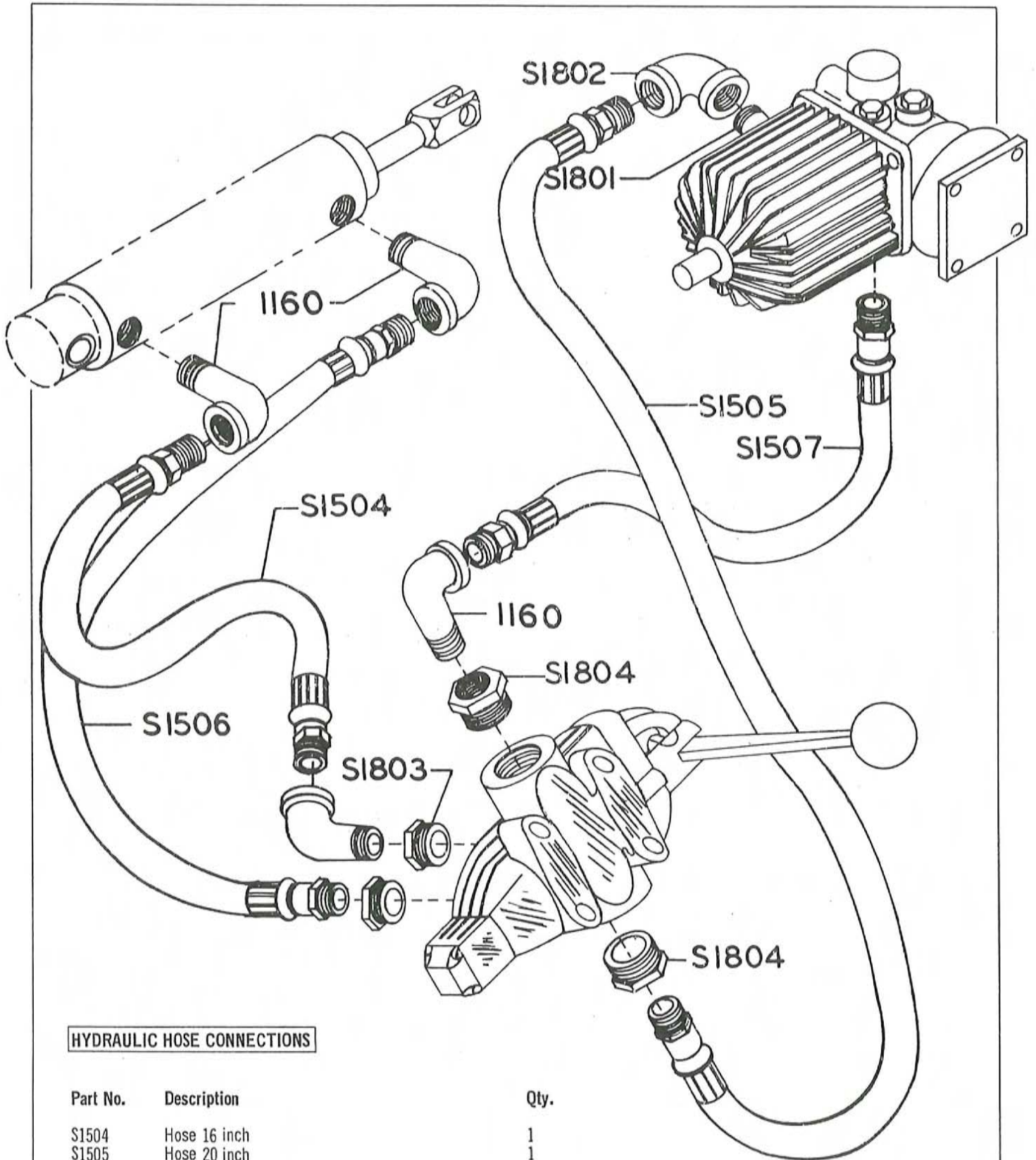
Part No.	Description	Qty.
H-4	Hand Grip	1
S604	Key 1/4 x 1/4 x 3/4	1
S2262	Clutch Pulley	1
S2288	Clutch Finger	3
S2296	Pressure Button	1
S2297	Clutch Disc	1
S2320	Spring	1
S2345	Plunger	1
S2349	Clutch Lock	1
S2369	Spring	3
S2370	Retaining Ring	1
S2398	Bearing & Collar	1
S2399	Mount Plate	1
S2400	Clutch Hub Weld	1
S2411	Clutch Nut	3
S2846	Guide Frame Weld	1
S2351	Clutch Lever	1
S2852	Control Strap	1
S2924	Control Rod	1
S605	Spring	1
15066	Cap screw 3/8 - 16 UNC x 1	1
15110	Set screw	3
15111	Set screw	2
15527	Locknut 3/8 - 16 UNC	2
15528	Nut 5/16 - 18 UNC	2
15531	Nut 1/4 - 20 UNC	1
15584	Locknut 1/4 - 20 UNC	2
15905	Lockwasher 1/4 std.	1
15907	Flatwasher 5/16 std.	2
19034	Cap screw 1/4 - 20 UNC x 1	2
19068	Cap screw 5/16 - 18 UNC x 2 1/2	1
19409	Presto Pin	1
15143	Set screw	3
15915	Flatwasher 3/8 std.	1

**DRIVE SHAFT**

Part No.	Description	Qty.
S234	Universal Joint	1
S235	Universal Joint	1
S592	Key Woodruff No. 9	3
S603	Key 1/4 x 1/4 x 2	1
S1808	Drive Shaft	1
S1975	Fan	1
S2042	Key	1
S3002	Universal Joint	1
15124	Setscrew 3/8 - 16 UNC x 3/8	7

S235 FOR TECUMSEH ENGINES  
S3002 FOR WISCONSIN ENGINES

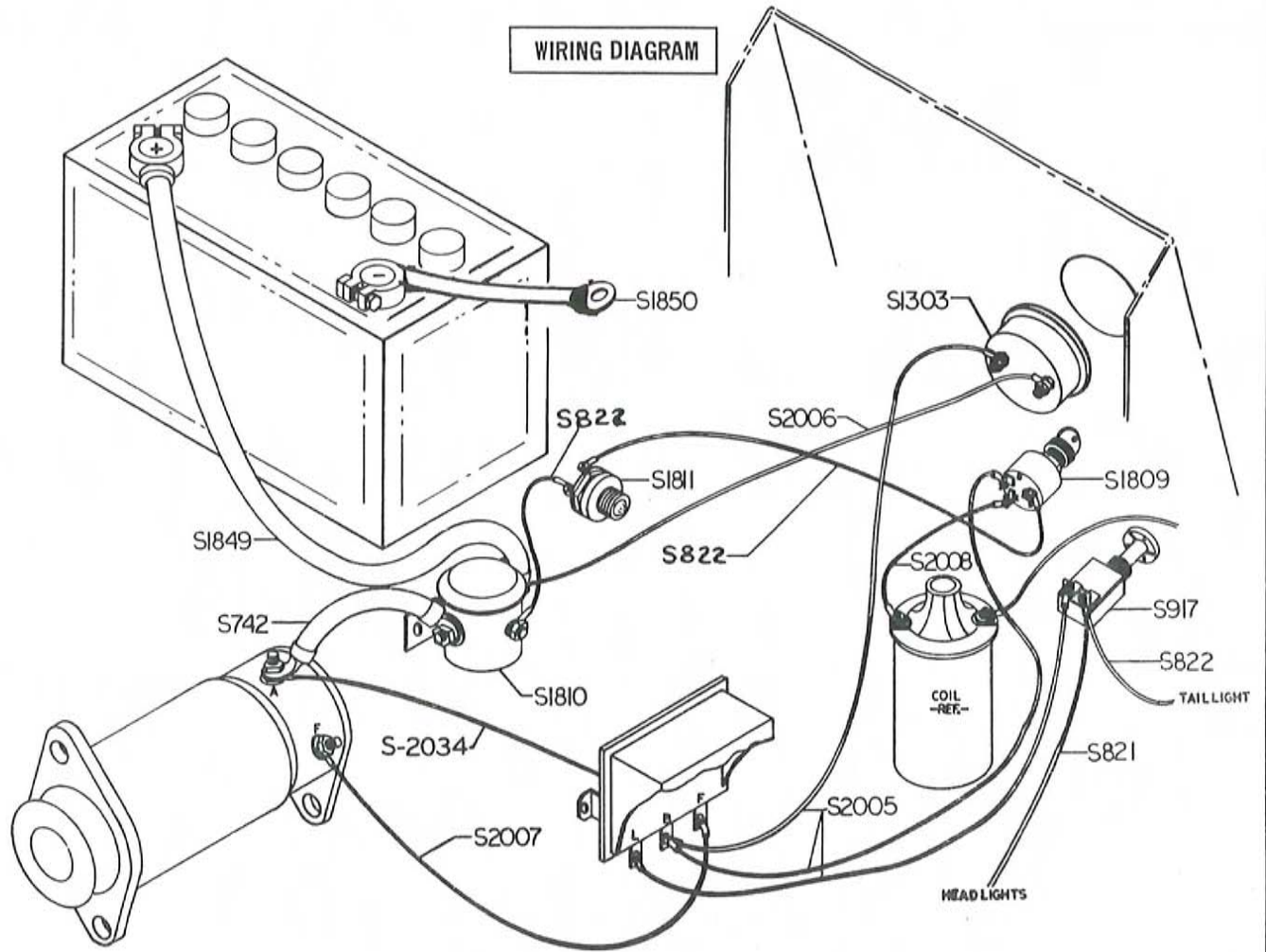




**HYDRAULIC HOSE CONNECTIONS**

Part No.	Description	Qty.
S1504	Hose 16 inch	1
S1505	Hose 20 inch	1
S1506	Hose 24 inch	1
S1507	Hose 26 inch	1
1160	1/4 Street Elbow x 90 Degree	4
S1801	1/4 Pipe Nipple x 1 1/2	1
S1802	1/4 90 Degree std. straight elbow	1
S1803	1/2 x 1/4 Hexagon Pipe Bushing	2
S1804	3/4 x 1/4 Hexagon Pipe Bushing	2

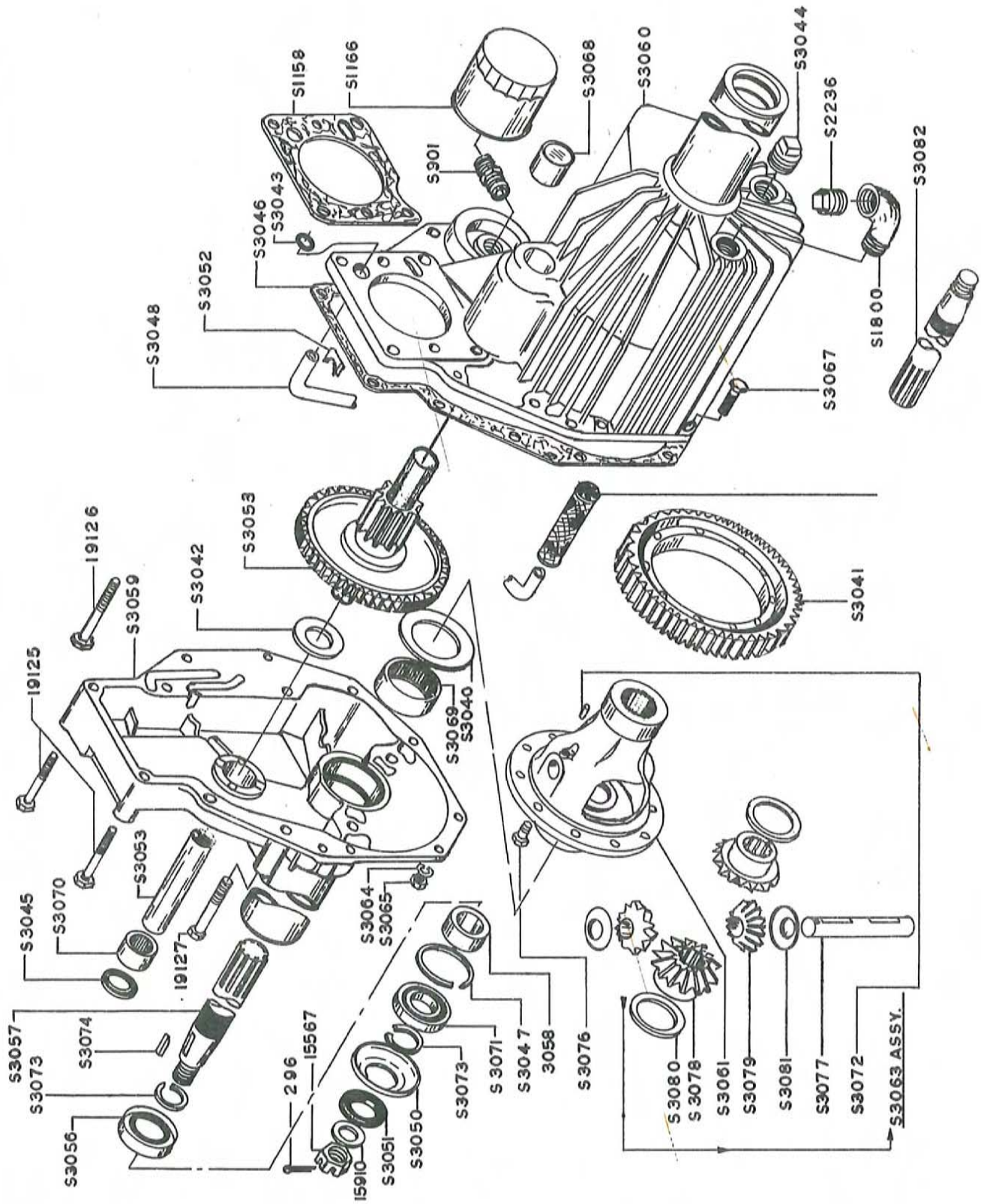
WIRING DIAGRAM



Part No.	Description
S742	Cable, Generator to Solenoid
S821	Headlight Wire
S822	Tail Light
S917	Light Switch
S1303	Ammeter
S1809	Ignition Switch
S1810	Starter Solenoid
S1811	Safety Switch
S1849	Cable, Battery to Solenoid
S1850	Cable, Battery to Ground
S822	Wire, Solenoid to Safety Switch
S2005	Wire, Ammeter to Voltage Regulator
	Wire, Voltage Regulator to Ignition Switch
	Wire, Light Switch to Voltage Regulator
S2006	Wire, Ammeter to Solenoid
S2007	Wire, Voltage Regulator to Generator
S2008	Wire, Coil to Ignition Switch
S2034	Wire, Voltage Regulator to Generator

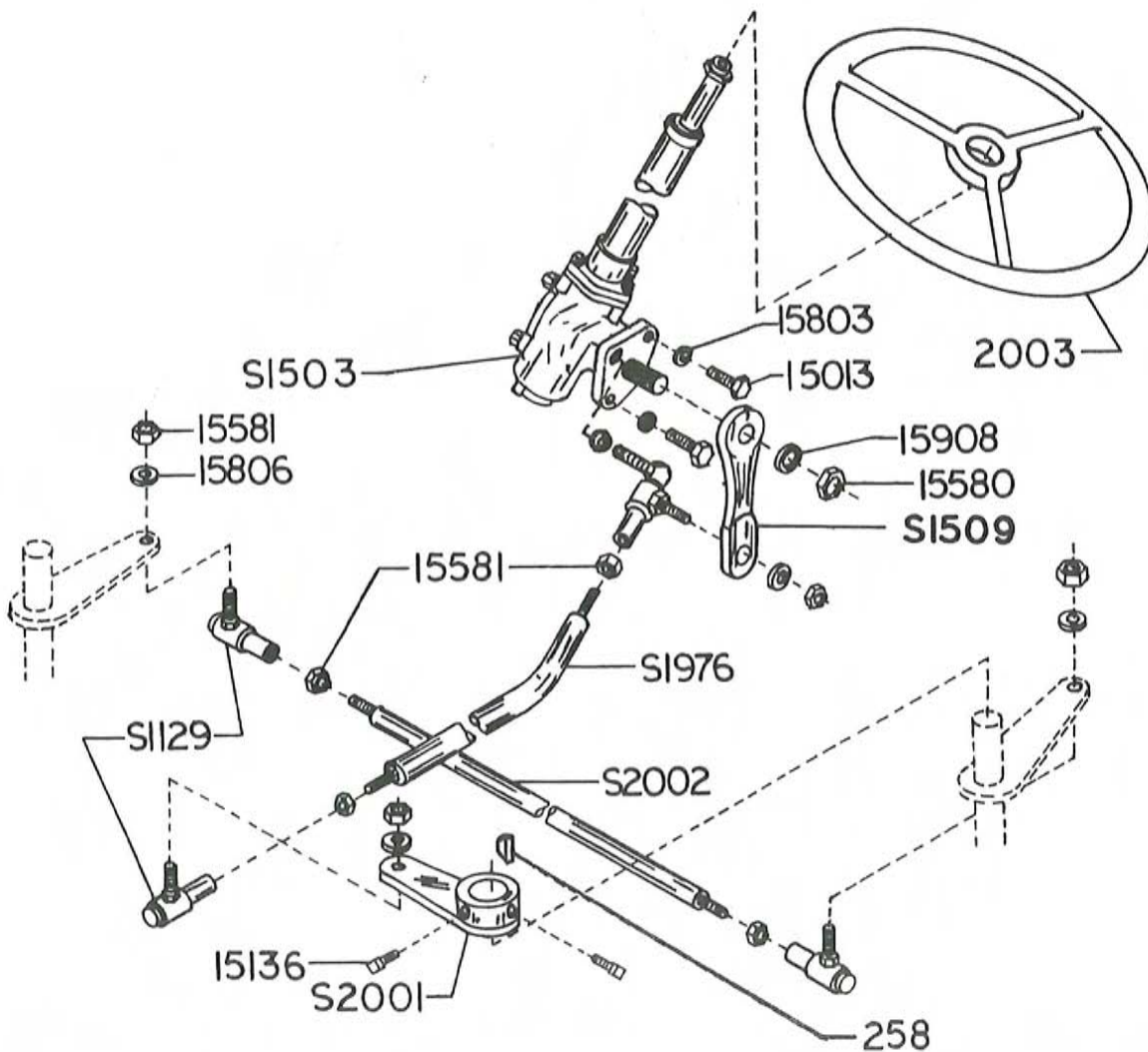
Part No.	Description	Qty.
S3040	Differential Case Thrust Washer	2
S3041	Differential Drive Gear	1
S3042	Countershaft Gear Thrust Washer	2
S3043	Oil Strainer Tube "O" Ring	1
S3044	Magnetic Drain Plug	1
S3045	Countershaft Oil Seal	1
S3046	Cover Gasket	1
S3047	Tube Snap Ring	2
S3048	Oil Strainer Tube	1
S3049	Oil Strainer	1
S3050	Bearing Retainer	2
S3051	Felt Seal	2
S3052	Oil Strainer Tube Clip	2
S3053	Countershaft and Gear Assembly	1
S3056	Tube Oil Seal	2
S3057	Axle Shaft Fin.	1
S3058	Seal Sleeve	2
S3059	Cover & Tube Assembly Fin.	1
S3060	Housing & Tube Assembly Fin.	1
S3061	Diff. Case Sub-Assembly	1
296	Cotter Pin	2
S2236	Filler Plug	1
S3064	Housing Bolt Nut Lockwasher	7
S3065	Housing Bolt Nut	7
15567	Axle Shaft Nut	2
S3067	Housing Bolt	7
S3068	Countershaft Bearing	1
S3069	Diff. Needle Bearing	2
S3070	Countershaft Bearing	1
S3071	Wheel Bearing	2
S3072	Pinion Mate Shaft Lock Pin	1
S3073	Snap Ring	4
S3074	Axle Shaft Key	2
15910	Axle Shaft Nut Washer	2
S3076	Drive Gear Screw	10
S3077	Pinion Mate Shaft	1
S3078	Differential Side Gear	2
S3079	Differential Pinion Mate	2
S3080	Diff. Side Gear Thrust Washer	2
S3081	Diff. Pinion Mate Thrust Washer	2
S3082	Axle Shaft	1
S1166	Oil Filter	1
S1800	Street Elbow	1
S901	Filter Connector	1
S3063	Differential Assembly	1
S1158	Gasket	1
15819	Lockwashers 7/16 Med.	6
15609	Hexnuts 7/16 - 20 UNF	5
19128	Capscrew 7/16 - 20 UNF x 1 1/2	1
19127	Capscrew 7/16 - 20 UNF x 3	1
19126	Capscrew 7/16 - 20 UNF x 3 1/4	2
19125	Capscrew 7/16 - 20 UNF x 4	2





### STEERING ASSEMBLY

Part No.	Description	Qty.
S1129	Tie Rod End	4
S1503	Steering Gear Assembly	1
S1509	Arm	1
S1976	Drag Link	1
S2001	Front Drag Link Arm	1
S2002	Tie Rod	1
S2003	Steering Wheel	1
15013	Capscrew 7/16 x 1 UNC	3
15136	Setscrew 3/8 UNC x 5/8	2
15580	Nut 5/8 UNF	1
15581	Nut 1/2 UNF	8
15803	Lockwasher 7/16	3
15806	Lockwasher 1/2	4
15908	Lockwasher 5/8	2
258	Key, Woodruff 1/4 x 3/4	1

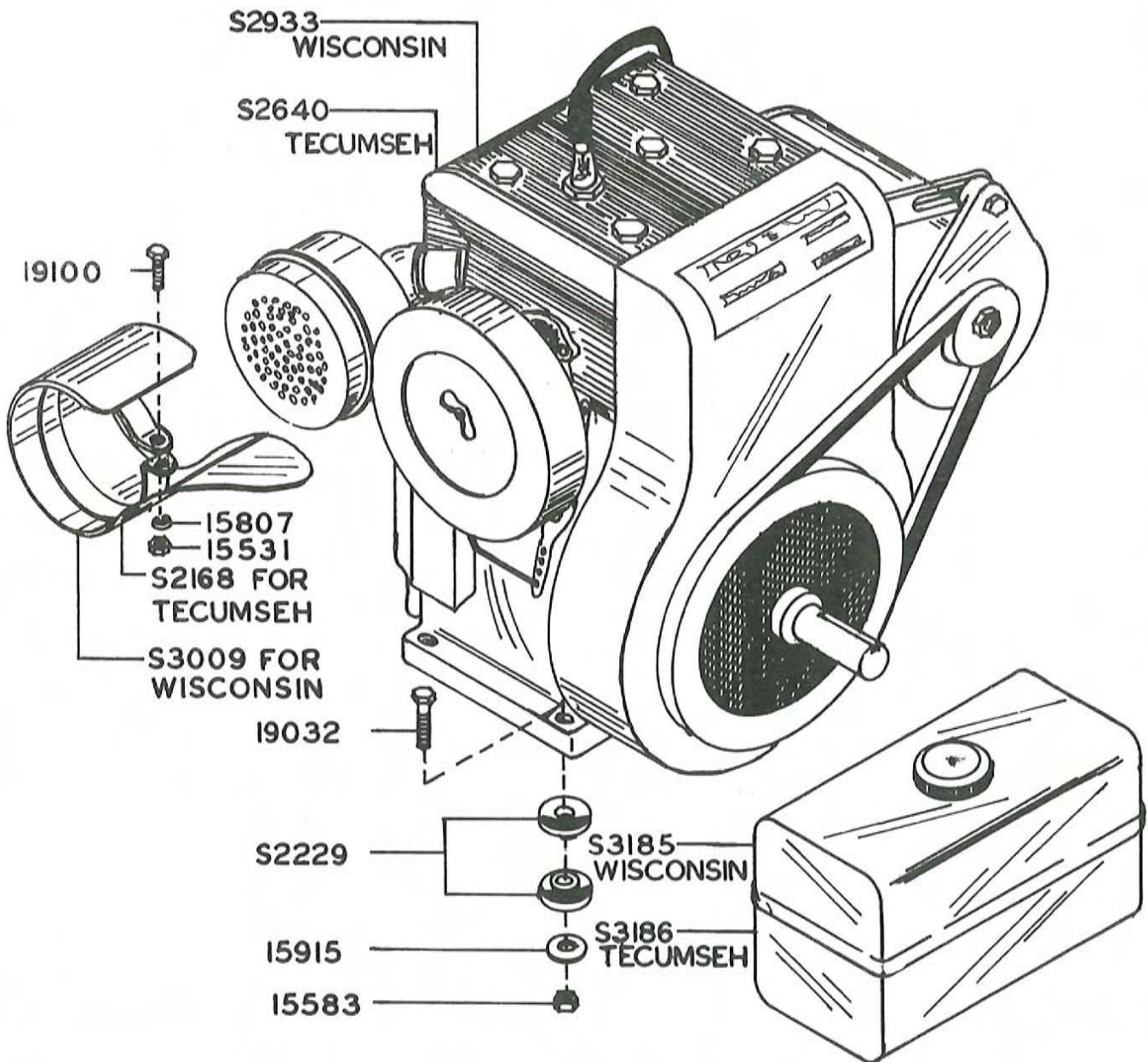




Part No.	Description	Qty.
S524	Pin	1
S592	Woodruff Key (3/16 x 3/4)	1
S655	Spring	1
S1008	Input Gear	1
S1082	Bearing, Ball	3
S1089	Oil Seal	1
S1092	Woodruff Key (1/4 x 7/8)	2
S2052	Bearing, Ball	1
S2446	Pin. Drive (1/4 x 1 1/4)	1
S2700	Oil Seal	1
S2952	V-Belt	1 set
S2962	Input Housing	1
S2963	Output Housing	1
S3010	Input Pulley	1
S3028	P.T.O. Attachment Plate	1
S3030	Lever	1
S3032	Belt Guide	1
S3035	Drive Shaft	1
S3037	Cover Stop	1
S3038	Clevis	1
S3039	Eye Bolt	1
S3102	Secondary Pulley	1
S3117	Pipe Plug (1/4)	1
S3127	Bushing	1
S3140	Safety Guard-Bottom	1
S3141	Safety Guard-Top	1
S3145	Gear Box Assembly	1
S3146	Stabilizer Weldment	1
S3147	Drawbar	1
S3148	P.T.O. Shaft Weldment	1
S3150	Gasket	1
S3153	Drawbar Spacer	2
S3183	Roll Pin (1/4 x 1/2)	2
648	Bearing and Collar	1
649	Bearing Flange	2
15110	Setscrew (1/4 x 1/4)	2
15111	Setscrew (5/16 x 5/16)	2
15430	Sheet Metal Screw	1
15527	Locknut (3/8 - 16 UNC)	1
15531	Hex Nut (1/4 - 20 UNC)	10
15581	Hex Nut (1/2 - 13 UNC)	2
15582	Hex Nut (3/8 - 16 UNC)	4
15806	Lockwasher (1/2)	2
15807	Lockwasher (1/4)	10
15808	Lockwasher (5/16)	2
15812	Lockwasher (3/8)	3
15907	Flatwasher (5/16)	2
15911	Flatwasher (1/4)	1
15916	Flatwasher (1/2)	2
19007	Capscrew (1/4 - 20 UNC x 3/4)	4
19036	Capscrew (1/4 - 20 UNC x 2)	1
19079	Capscrew (5/16 - 18 UNC x 3/4)	2
19100	Capscrew (3/8 - 16 UNC x 1)	4
19103	Capscrew (1/2 - 13 UNC x 1 1/4)	2
19116	Capscrew (1/4 - 20 UNC x 7/8)	4
19436	Presto Pin	1



Part No.	Description	Qty.
S2933	Wisconsin S12D Engine	1
S2640	Tecumseh HH120 Engine	1
S2168	Heat Shield for Tecumseh	1
S3009	Heat Shield for Wisconsin	1
19100	Capscrew 1/4 - 20 UNC x 3/4	1
15807	Lockwasher 1/4 Med.	1
15531	Hex Nut 1/4 - 20 UNC	1
S2229	Motor Mounts	8
19032	Capscrew 3/8 - 16 UNC x 2	4
15915	Flatwasher 3/8 Med.	4
15583	Lock Nut 3/8 - 16 UNC	4



## SUPPLEMENT TO TRACTOR OPERATING MANUALS AND PARTS LIST

### IMPLEMENT QUICK HITCH (KIT NUMBER S3320)

The purpose of this hitch is to make the job of attaching all front mounted attachments, easier, faster and more positive. The tractors manufactured in 1968 will include this hitch in the tool box.

The serial numbers of tractor with these hitch brackets will begin with:

Vari-Drive Tractors No. 1475

Direct Drive Tractors No. 9052

Hydraulic Drive Tractors No. 5315

Attachments ordered for older tractors prior to this, the hitch kit must be ordered with the attachments.

The attachments converted to this front hitch are as follows:

Snow Throwers

Sickle Bar Mowers

Front Bumpers

Sweepster Broom

Weight Box

M-42 Mower (1968 Model Only)

M-32 Mower (1968 Model Only)

