STARTING SYSTEM – DIESEL ENGINES

Operation

The "14" Series Diesel engine, like all International Diesel engines, has the exclusive feature of starting on gasoline like a regular spark-ignition engine. This is accomplished by means of a starting mechanism which controls four starting valves in the engine head, two butterfly valves and a magneto grounding switch in the dual intake manifold, and a shut-off valve in the carburetor.

To start the engine as a conventional gasoline, spark-ignition engine, the operator moves the speed-control lever all the way to the off position. This prevents the fuel injection pump from delivering fuel to the nozzles even though the pump is running. Then the compression-release lever is pulled back until jaw "B" in Illust. 5, locks with latch "A".

Pulling the compression release lever back accomplishes four things:

1. It opens four starting valves (1) Illust. 5, thereby enlarging combustion chamber (2) by auxiliary chamber (3) in which spark plug (4) is located. This reduces the compression ratio to that of a conventional gasoline engine, or about 6.4 to 1.

2. It closes the two butterfly valves (5), shutting off the Diesel air intake passageway. The intake air then must pass down through the carburetor, around a disc-type air valve (8), Illust. 18, and then through the small high velocity passages in the manifold to the intake ports in the cylinder head. The air-gasoline mixture enters a cylinder on the suction stroke of the piston, is compressed on the upward stroke and ignited by the spark plug in the low-compression chamber (3) on the power stroke.

3. It connects the magneto electrical circuit by opening the magneto grounding switch located in the front end of the intake manifold. (See insert 7, upper left corner, Illust. 5).

4. It releases needle valve (4), Illust. 18, in the carburetor fuel bowl by turning cam (2), Illust. 18, allowing the needle to be actuated by the float.

The engine is then started in the normal way by hand cranking or with an electric starter which can be had as a special attachment. After the engine has operated on gasoline for about a minute the operator pushes the compression-release lever all the way forward, and the engine governor control lever is moved to the operating position at the same time. The engine then runs as a full Diesel.

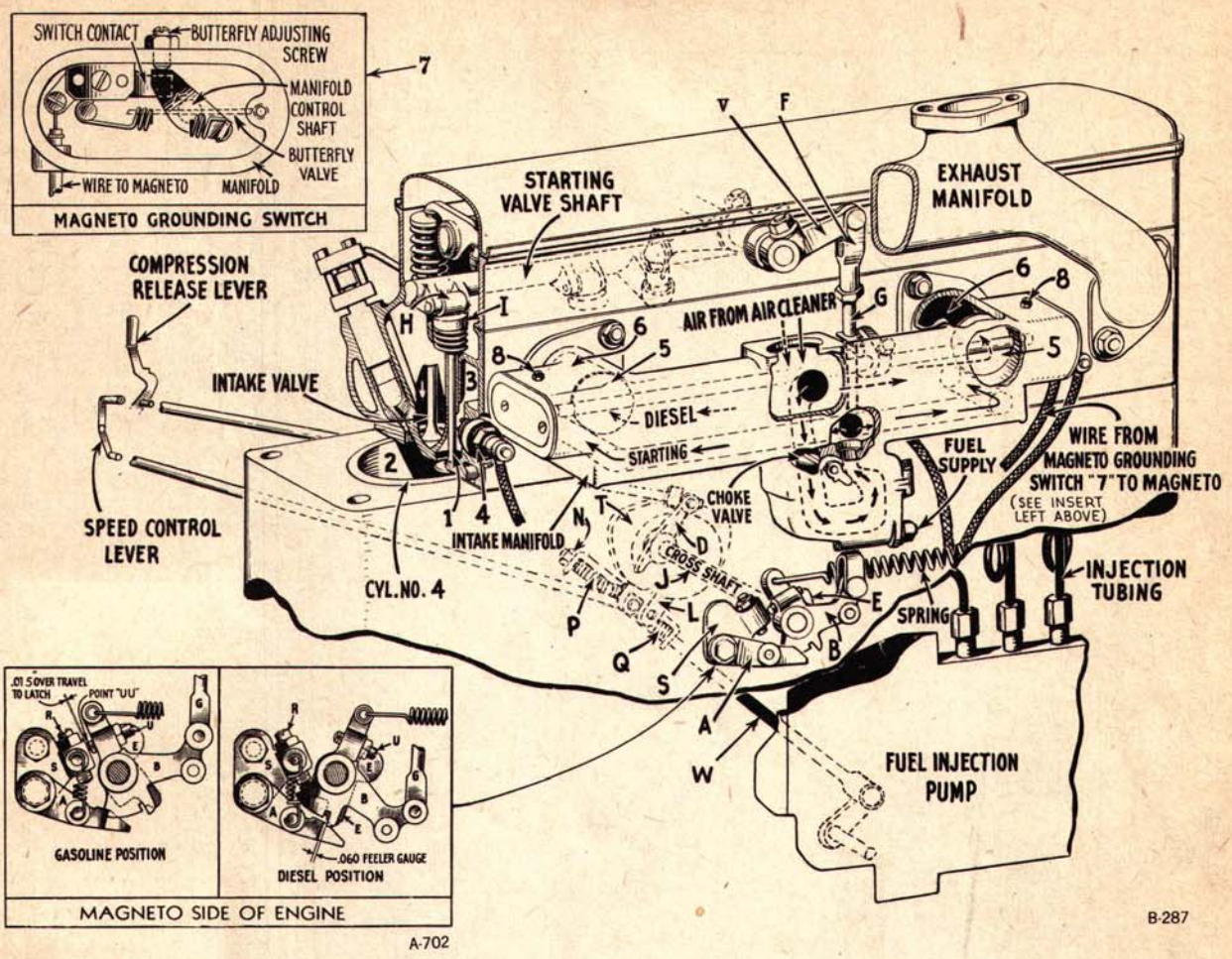
Raising the compression-release lever depresses latch "A", Illusts. 5 and 6, causing it to release jaw "B". Jaw "B" is actuated by a return spring which causes it to turn, pulling down rod "G". This movement opens butterfly valves (5), closes starting valves (1), locks the carburetor needle valve (4), Illust. 18, on its seat and closes the magneto grounding switch (7), Illust. 5. While the engine operates on the Diesel cycle, the carburetor, magneto, spark plugs, and low compression chambers do not function.

The TD-14 TracTracTor Diesel engine is equipped with a governor friction control (see the cross-section drawing shown in the insert in Illust. 6) which is part of the starting mechanism. It is located on the cross shaft "J" just below bracket "T". Its purpose is to prevent any play in the control linkage from interfering with speed regulation and also holds the governor control lever "K" at the speed selected.

The friction control consists of lever "L" which can turn freely on cross shaft "J". Brake friction is applied on the lever by a spring-loaded retainer acting on two friction discs with a stationary disc in between. Lever "L" has two arms-one connecting to the governor control rod "W" and the other to the speed-control lever rod. The shape of lever "L" is such that it will contact lever "D", which is connected to the compression-release lever, if the throttle is opened when the engine is operating on gasoline. This is a reminder to convert to the Diesel cycle before opening the throttle.

Adjustment

Have all the controls, levers, etc. that make up the starting mechanism assembled in place on the engine. Disconnect yoke "F", Illust. 6 from lever "V" and remove the valve cover. Levers "E" and "D" are the only ones rigidly attach-



ILLUST. 5. SCHEMATIC DRAWING OF DIESEL ENGINE STARTING SYSTEM.

ed to cross shaft "J". The cross shaft should have a .030" end play and turn freely in bracket "T". (If the intake manifold is removed from the engine, the starting mechanism can be adjusted with less interference).

A. Set starting mechanism for Diesel operation:

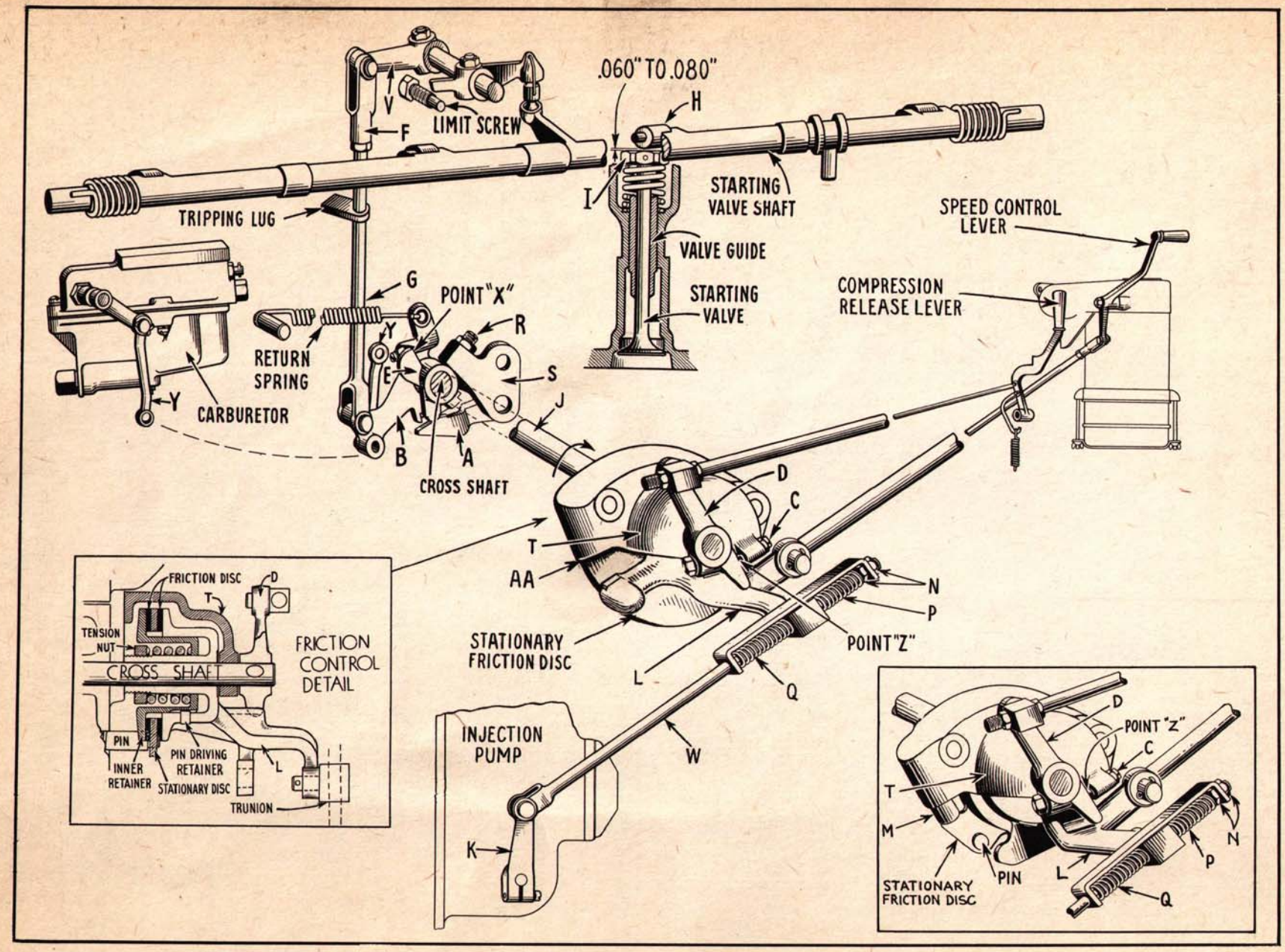
1. Adjust screw "R" until .060" exists between jaw "B" and latch "A". (See lower left insert, Illust. 5).

2. Adjust yoke "F", Illust. 5, on rod "G" so that when it is connected to lever "V" there will be a minimum clearance between the starting valve shaft roller "H" and spring retainer "I" of .060" over the closest valve.

   There should be no greater clearance than .080" over any of the other valves. If it is impossible to adjust the valve clearances on all four valves within the limits of .060" to .080", check the rollers for wear and the roller shaft for twist. Lock yoke "F" with the lock nut. Rotate the cross shaft with the compression-release lever until lever "E" contacts the pick-up face on jaw "B" at point "X", Illust. 6. Now adjust set screw "C" on the pump side to give .100" between the set screw "C" and lever "D" at point "Z"

B. Set starting mechanism for gasoline starting:

1. Adjust set screw "U", Illust. 5, in jaw "B" to .015" between set screw "U" and lever "S" at the point "UU". If the set screw has a rounded point it would be well to file a flat spot on lever "S" where the set screw contacted, and change the set screw to a flat type. Later model engines are equipped with flat-type set screws.



ILLUST. 6. SCHEMATIC DRAWING OF "14" SERIES DIESEL ENGINE STARTING MECHANISM. FRICTION CONTROL DETAIL DRAWING IN LOWER LEFT INSERT. FRICTION CONTROL USED ON TRACTRACTORS BEFORE TDFM-5268 SHOWN IN LOWER RIGHT INSERT.

2. If the intake manifold has been removed it should now be assembled in place and connect link "Y", Illust. 6, to the carburetor lever.

C. Start the engine and run as a Diesel:

(TD-14 Engines with Bosch "A" and "K" Pumps) before TDFM-5268. (See insert in lower right corner, Illust. 6).

1. Retard the throttle until the finger on "L" just contacts plunger "M".

2. Adjust nuts "N" on rod "W" until springs "P" and "Q" are of equal length, and the engine runs at low idle speed.

3. Move the speed control lever to the extreme pump shut-off position; adjust the yoke on the speed control rod until plunger "M" is compressed to 3/32" from the boss in stop bracket "T".

4. Operate the engine at full throttle. Adjust the speed control lever stop screw so spring "P" is compressed but not compressed solid.

(TD-14 engines with I.H.C. single-plunger pump or Bosch "K" Pump) TDFM-5268 and after (see Illust. 6).

1. Retard the speed control lever until the poppet in lever "L" locates in a countersunk hole in the stationary friction disc: this is the low idle speed position.

2. Adjust nuts "N" on rod "W" until springs "P" and "Q" are of equal length, and the engine runs at low idle speed.

3. Move the speed control lever to the extreme shut-off position. Adjust the yoke on the speed control rod so that lever "L" just contacts bracket "T" at point "AA".

4. Operate the engine at full throttle. Adjust the speed control lever stop screw so spring "P" is compressed but not compressed solid.

(UD-14 Power Unit)

The power unit engine does not have the governor friction control located on the cross shaft. It is a separate unit and attached to the flywheel housing, Illust. 23. The governor controls used with the "A" and "K" Bosch pumps (before UDFM-4719) were not equipped for locating the low idle speed. Later units have a spring-actuated poppet in the control lever which locates in a countersunk hole provided in the control bracket when the engine operates at the low idle speed. An adjustable yoke is used on the governor control rod to vary its length to obtain the proper low idle speed. Two stop screws are provided in the governor control lever body to regulate its travel either in full-load position or stop position.

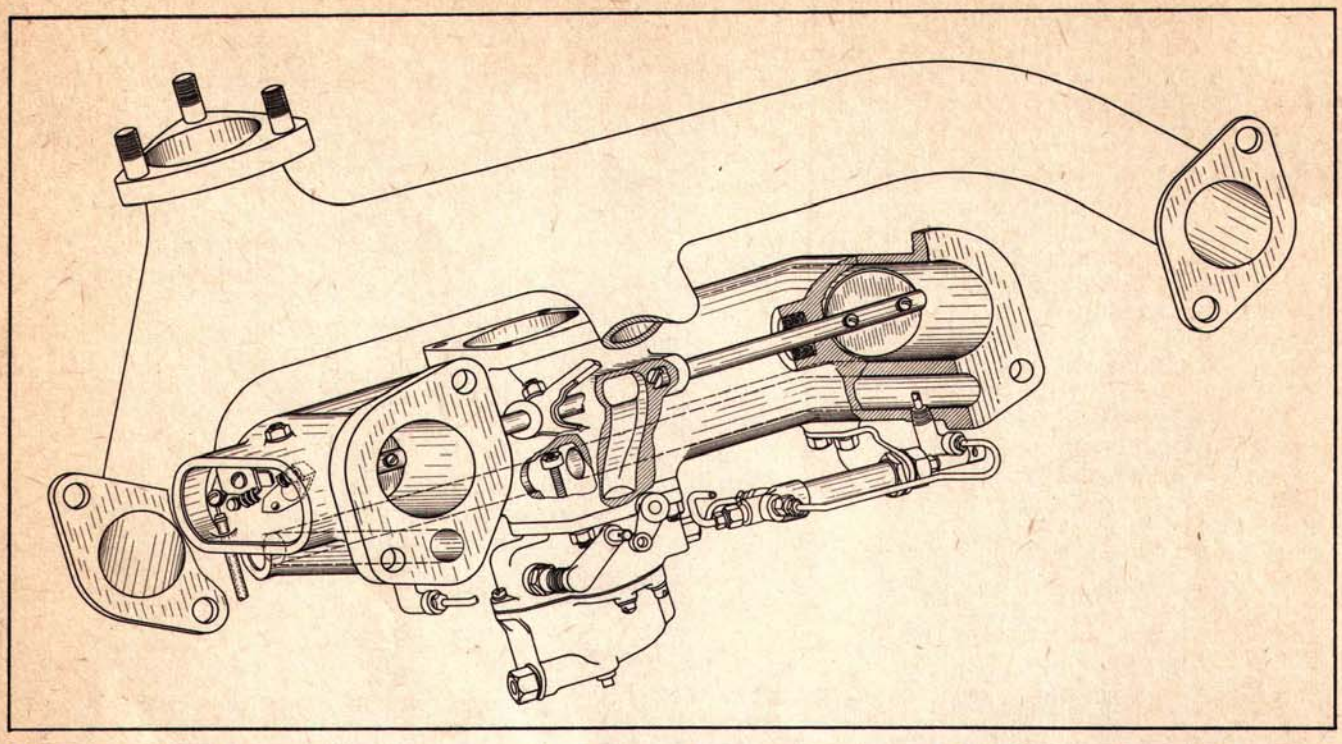
Manifolds

Diesel:

The intake manifold on the Diesel engines are of the dual type. A small, high-velocity passageway is used during the starting operation only and a large passageway is used when operating on Diesel. Two butterfly valves in the large passage way close it when the engine is on the gasoline cycle. An automatic switch in the front of the manifold grounds out the magneto when the engine is switched from gasoline to Diesel. The lever and springs at the ends of the valve shaft provide an over-center action and hold the valves securely in the open or closed position.

To remove the manifold, take off the cover from the front end of the manifold and remove the wire from the grounding switch; shut off the gasoline and disconnect the gasoline pipe at the carburetor; take out the cotter key and disconnect the choke control; take off the primer control; take out four capscrews at the air intake flange; take out the pin and remove the carburetor control link "Y", Illust. 6, from the carburetor; and remove two nuts at each intake port flange. When replacing the manifold, be sure all gaskets are in good condition and that the holes in the gasket line up with the holes in the manifold at both the cylinder head and carburetor.

Butterfly valves can be removed after they are tripped to the closed position and the two screws in each are taken out. Turn the shaft to the open position and withdraw the valves. Remove the nut and taper pin from the yoke on the valve shaft and pull the shafts from the manifold. Dust or air seals for the shafts are assembled with the lips facing each other.



ILLUST. 7. DIESEL ENGINE INTAKE MANIFOLD AS SEEN WHEN LOOKING FROM THE CENTER OF THE ENGINE TOWARD THE MANIFOLD. FRONT OF ENGINE IS AT LEFT.

When replacing the valves, the 12° stamp should be on the top side facing the intake port. Remove any burrs from slots in the shaft to avoid damaging the angular edges on valves. Turn the shafts to the closed position, insert the screws, center the valves, and then tighten the screws. Maximum clearance between the valves and the manifold should be .0015", using a 1/8" wide feeler gauge for not over 1/3 of circumference for best performance of the starting carburetor. Upset the threaded end of the screws after tightening. Effective with TDFM-2402 and UDFM-2272, shakeproof lockwashers under round-head screws are used; do not upset the threads.

The control lever on the valve shaft locates with a taper pin and groove in the forward shaft. The forward shaft drives and connects the rear shaft by a tongued and slotted connection. The control lever is assembled with the flat side down. Valves should be adjusted to a horizontal position for Diesel operation to prevent any restriction of air flow. Adjustment is made by loosening the lock nut and turning the butterfly adjusting screws (8) Illust. 5, located on top of each end of the manifold. Set screws contact the valve shafts inside the manifold end chambers. Do not change the adjustment after the manifold is assembled to the engine. The over-center springs hold the valves in the open or closed position.

The magneto grounding switch inside the chamber at the front of the manifold consists of an insulated terminal plate that contacts with the lever on the end of the control shaft to make a ground connection when in the Diesel position (see insert (7) Illust. 5). Bend the thong of the terminal plate to make good contact. Check spark plugs while the engine is running on the Diesel cycle to determine whether the switch grounds the magneto. There should be no spark. As the tripping lug moves up, the over-center action snaps the switch to the open position for gasoline operation.

A manually operated, plunger-type primer is located on the underside of the manifold, permitting the operator to force a slug of gasoline into the small air passage to aid in starting a cold engine.

Carbureted:

The manifold on the carbureted engine is a combination intake and exhaust manifold. As the engine is designed to operate on gasoline only, adjustments on the intake manifold are not necessary.

Manifold gaskets, particularly for the intake, should be in good condition and nuts drawn to 65 ft.-lbs. with a torque wrench. Entrance of dirt through the intake gaskets will naturally shorten the life of the pistons and cause excessive oil consumption.