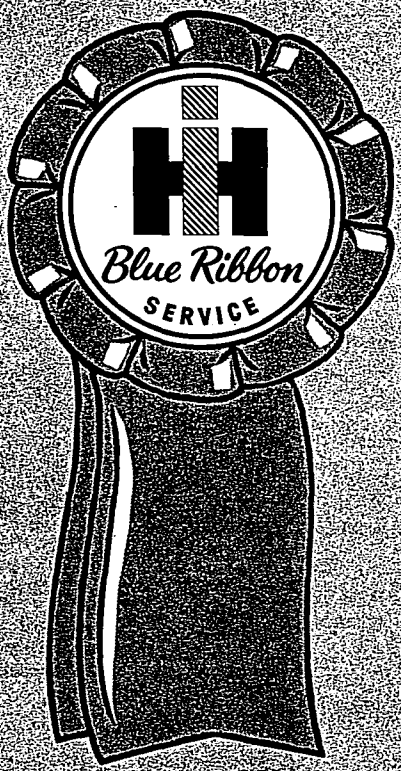


Blue Ribbon Service

Form GSS-1132

FUEL SYSTEM—CARBURETED ENGINES

Tractor Series — Cub, 140, 240, 340, 460, 560, and 660

File in Tractor Service Manual Binder

INTERNATIONAL HARVESTER COMPANY
180 NORTH MICHIGAN AVE. CHICAGO 1, ILLINOIS

CONTENTS

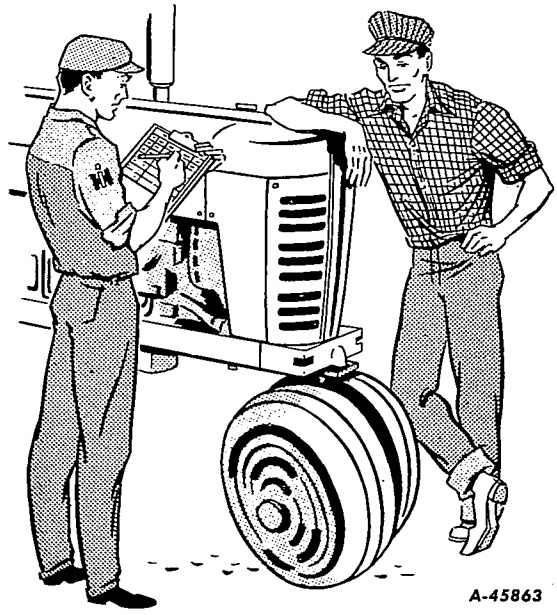
Make Yourself More Indispensable

SELL SERVICE

★ Servicemen can often sell related items or equipment by showing the customer how the items will be of value to him.

★ When you check a customer's equipment regarding the service he asks for, you can frequently show him how a few extra service dollars now can save him probable trouble and expense later.

★ A busy shop can be more efficient and a better place to work.



A-45863

SPECIFICATIONS

Tractor Series	CUB	140	240	
Engine Series	**C-60**	**C-123**	**C-123**	
Carburetor, Gasoline				
Model	IH 3/4"	ZTH.68X7	ZTH.68X7	
Part number *	364 579 R91	366 462 R92	367 822 R91	
Liquid level **	9/16"	1/2"	1/2"	
Float height **	1-7/16"	1-5/32"	1-5/32"	
Float drop **	1-5/8"	-	-	
Main metering jet	.032"	No. 20L	No. 21	
Idle jet	75	No. 11S	No. 11S	
Discharge nozzle	39	45	50	
Venturi	15	15	16	
Needle valve seat	52	35	35	
Air Cleaner				
Type	Oil bath	Oil bath	Oil bath	
Manifold, Gasoline				
Type	One piece	One piece	One piece	
Heat control	None	None	None	
Control spring wind	-	-	-	
Governor, Variable Speed				
Engine rpm				
Low idle ± 25	475	425	425	
Fast idle ± 25	2016	1575	2200	
Rated load ± 10	1800	1400	2000	

* The carburetor part number is stamped on a metal disc riveted to the throttle body. This number identifies the calibration for fuel flow for a given tractor model, and must be used when selecting replacement parts to maintain desired air-fuel ratio.

** Measurements are made from the machined face of the fuel bowl cover to the liquid level or to bottom of float assembly. See Illusts. 7, 8 and 9.

SPECIFICATIONS

	340 C-135	460 C-221	560 C-263	660 C-263
	ZTH.68X7 367 700 R91 1/2" 1-5/32" - No. 25L No. 11S 50 17 35	IH 1-1/4" 367 258 R91 9/16" 1-5/16" 1-15/16" .046" 75 25 28-13 45	IH 1-1/4" 367 259 R91 9/16" 1-5/16" 1-15/16" .051" 75 27 30-13 45	IH 1-3/8" 372 723 R91 9/16" 1-5/16" 1-15/16" .060" 75 27 34-13 45
	Oil bath	Oil bath	Oil bath	Oil bath
	One piece None -	Two piece automatic 1/4-1/2 turn	Two piece automatic 1/4-1/2 turn	Two piece automatic 1/4-1/2 turn
	425 2200 2000	425 1980 1800	425 1980 1800	425 2640 2400

GENERAL DESCRIPTION

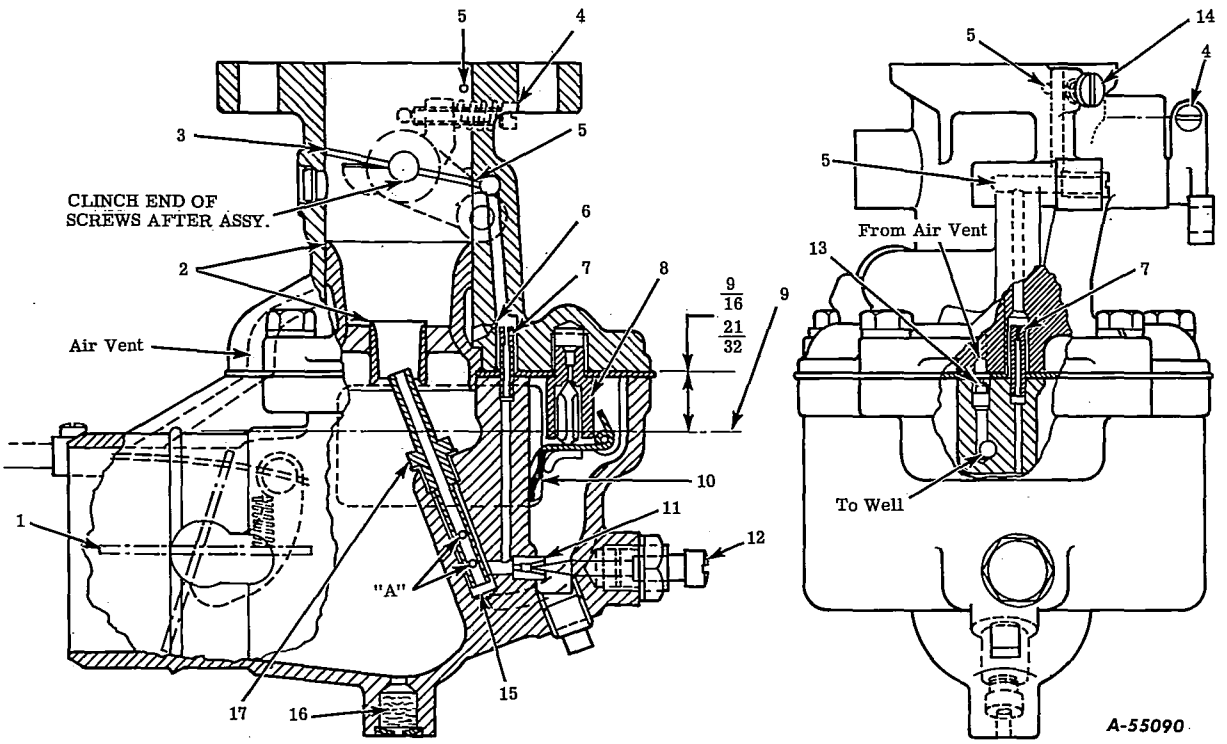
The fuel system consists, basically, of a fuel supply tank, fuel shut-off valve, fuel strainer, carburetor, intake-exhaust manifold, air cleaner and a variable speed governor.

Liquid fuel flows from the supply tank by gravity through the fuel strainer and sediment bulb to the carburetor. Air enters these naturally aspirated systems through the air cleaner, where dirt and abrasive material are removed.

Clean air and fuel is metered to the engine by the carburetor; in varying proportions to meet the changing demands of load and speed. The variable speed governor controls the carburetor throttle to admit a greater or lesser volume of air-fuel mixture. This supports the operator's demand for engine speed, and provides power to maintain that speed, up to the capacity of the engine.

The operation, inspection, repair and adjustment of the various parts of the fuel system are covered in the following divisions of this service manual section, under appropriate major headings.

CARBURETORS



Illust. 1. Cross section of a typical carburetor with identification of the principal parts.

1. Choke valve
2. Venturi
3. Throttle plate
4. Throttle stop screw
5. Idle ports
6. Idle air bleed
7. Idle jet
8. Needle valve and seat
9. Liquid level
10. Float assembly
11. Main metering jet
12. Main jet adjustment screw
13. Well air bleed
14. Idle adjusting needle
15. Metering well
16. Drip hole filler
17. Discharge nozzle

"A" Bleed holes in discharge nozzle

Principal Parts

The principal parts of a typical carburetor are shown in Illust. 1.

Carburetor Operation

The function of the carburetor is to meter the required amount of fuel to meet varying demands of engine load and speed, and to discharge this fuel into the intake air stream in as fine a spray as possible.

The air-fuel ratio is not constant for all loads and speeds. Idle and low speeds require rich fuel mixture; full load, full speed operation requires the leanest fuel mixture. These modern carburetors with their air-bleed-well method of compensation, will give these proportionate air-fuel mixtures to meet load-speed demands, resulting in smooth, economical engine performance. To simplify the explanation of how the carburetor functions, we will divide it into four systems and discuss each, separately.

- FUEL SUPPLY SYSTEM
- IDLING SYSTEM
- LOAD SYSTEM
- STARTING SYSTEM

Fuel Supply System

The fuel supply system is that portion of the carburetor consisting of the fuel inlet strainer, fuel needle valve and seat, fuel float, fuel bowl and the bowl air vent.

The function of the float and fuel needle valve is to maintain an even level of fuel in the bowl. The float assembly consists of one or two float bodies soldered to a float lever. This assembly hinges on the float axle supported by a bracket on the bowl cover. Fuel from the supply tank enters the bowl through the inlet strainer and the float needle valve. As the level of fuel rises in the bowl, the float is carried upward until the float lever forces the needle valve against its seat, stopping further inflow of fuel.

While the engine is in operation, fuel flows from the bowl through the main metering jet to the load system or idling system and the float valve maintains just enough opening to sustain a constant level of fuel in the bowl.

The bowl air vent passage is a drilling in the throttle body connecting the float chamber with an air vent channel surrounding the venturi. Air for the bowl vent, the well bleed and the idling system is taken from this channel in the venturi which, in turn, is vented to the carburetor main air intake. In this manner, all air taken into the carburetor is supplied through the air cleaner. This not only prevents entry of dirt and abrasives, but creates what is called a "balanced" vent.

The ratio of air and fuel mixture from a "balanced" carburetor will not be seriously affected by changes in condition of the air cleaner as it becomes restricted by accumulation of dirt. A balanced type carburetor must have an airtight seal between the bowl and the bowl cover, since any air admitted into the bowl other than through the calibrated vent, will upset the ratio of air-fuel delivery and also allow entry of dirt.

In review, sustained constant level of fuel in the bowl, together with controlled venting of the bowl, insures a stable supply of fuel to the various metering systems and is unaffected by the height of fuel in the supply tank or normal operating changes in air cleaner condition.

Idling System

The idling system consists of (5) idle discharge port (Illust. 1), (19) idle adjusting needle, (7) idle jet and the connecting channels and (6) air bleed. This system controls the mixture at partially opened throttle for idle and slow engine speeds, until the throttle is opened sufficiently to allow the load system to function.

Fuel for the idling system enters the (15) well through the (11) main metering

jet and is drawn through the (7) idle jet calibration into the idle passage where it is mixed with air from the (6) idle air bleed (Illust. 1). The air-fuel mixture enters the air stream past the throttle plate, from the (5) idle discharge port. The idle air adjusting screws on the carburetors of C-60, C-123 and C-135 engines are turned toward their seat to enrich the air-fuel mixture. This adjustment is reverse on carburetors of C-221 and C-263 engines, represented in Illust. 1, since these adjusting screws control the volume of air-fuel mixture.

Load System

The load system consists of the (2) venturi, (17) discharge nozzle, (15) well, (13) well air bleed, and (11) main metering jet. The load system as the name implies, controls the air-fuel mixture during the time the engine is loaded or is operating above idle speed.

When the throttle plate is opened a short distance beyond the (5) idle port, Illust. 1, a sufficient amount and velocity of air passes the (2) venturi and the (17) discharge nozzle to draw fuel from this source. This condition starts the load system functioning. Within a partial load-speed range of throttle plate movement, both the idling system and load system are delivering fuel. Further opening of the throttle plate, due to increased engine load-speed results in diminished delivery of fuel from the idling system. Ultimately, all delivery of fuel from the idling system is stopped and air is being drawn from this source into the (15) well.

The (11) main metering jet has a calibrated opening large enough to permit the flow of the maximum amount of fuel necessary for full load operation. When the engine is stopped or idling, the level of fuel in the (15) well and (17) discharge nozzle is similar to the level in the fuel bowl. As the load system goes into operation with increased load and throttle opening, the fuel is drawn from the discharge nozzle at a higher rate than supplied to the (15) well by the (11) main metering jet. This lowers the level of fuel in the (15) well. As the load and throttle opening is increased, the fuel level in the (15) metering well drops below a series of "A" air bleed holes in the discharge nozzle, admitting an increasing amount of air from the (13) well air bleed (Illust. 1). This metered addition of air to the discharge nozzle is necessary to compensate for the fact that the partial vacuum produced at the nozzle increases out of proportion with the increased velocity of air through the venturi. Were it not for this well-air-bleed compensation, the proportion of fuel to air would rapidly increase with the throttle opening, producing an extremely "rich" mixture at full throttle, full load operation.

A small additional amount of fuel is necessary to insure prompt response for engine acceleration. When the throttle is suddenly opened, the resulting rush of air through the venturi picks up this necessary extra fuel which remains above the (11) main metering jet in the (15) metering well during part throttle operation.

Carburetors on the C-221 and C-263 gasoline burning engines are equipped with a (12) main jet adjustment screw (Illust. 1) which may be used to limit the amount of fuel going into the engine when under light load conditions. Some increase in fuel economy can be obtained for periods of light load operation in this manner. However, when heavy work is to be performed in which the FULL POWER of the engine IS REQUIRED, the fuel adjusting screw must be set five turns off its seat. The (11) main metering jet in the carburetor has been calibrated to provide an economical, full-power mixture and must not be restricted by use of the adjusting screw when full power of the engine is required.

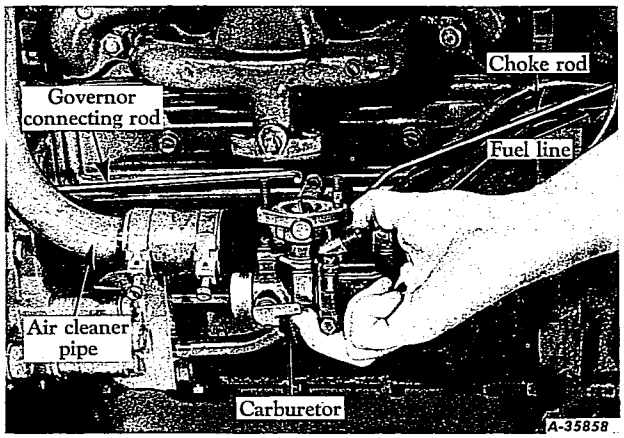
Starting System

The starting system consists of a manually operated choke valve mounted in the

carburetor main air intake. When the (1) choke valve plate (Illust. 1) is turned to the closed position, it restricts the air entering the carburetor. It does not, however, restrict the main air vent passage. This upsets the balance of the carburetor, allowing the increased suction to draw strongly upon the fuel discharge openings when starting the engine.

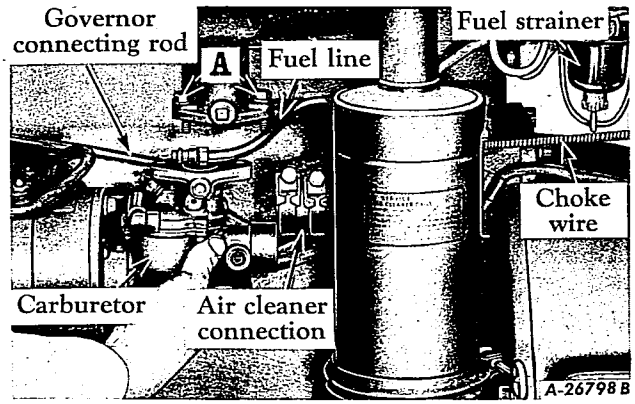
When the outside air, manifold, and engine combustion chambers are cold, it is necessary to supply a very "rich" starting mixture. Only the "lighter-ends" or more volatile portions of the fuel can be vaporized because of the low temperature and the slow movement of air past the discharge nozzle due to low cranking speed. The necessary large quantity of fuel is supplied by closing the choke valve during the cranking period. As the engine fires and engine speed increases, a spring-loaded valve in the choke plate opens to let in more air and lean out the "rich" mixture. As the engine gathers speed and warms up, the choke valve is manually opened to further lean out the air-fuel ratio to a normal mixture.

An opening is provided in the bottom of the carburetor main air intake to drain off any excess unvaporized fuel which may return from the manifold. This opening is protected against the entry of dust and abrasives by a felt filler. See (16), Illust. 1.

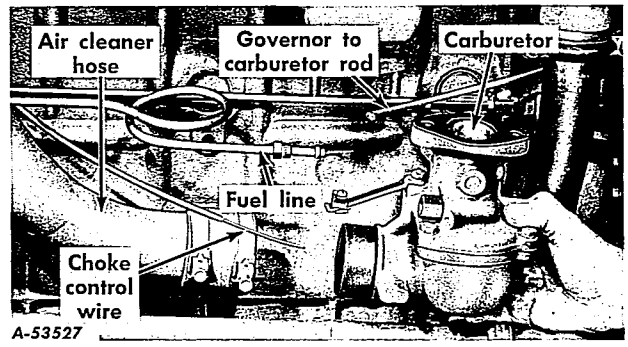


Illust. 2. Removing the carburetor, Farmall Cub and International Cub Lo-Boy tractors.

Should this filler shrink and deteriorate from age, dirt may be drawn into the engine contributing to excessive engine wear. Should this opening be painted over or otherwise plugged, no drainage is possible and flooding with raw fuel can occur if the fuel float valve leaks.



Illust. 3. Removing the carburetor, Farmall and International 140, 240 and 340 series tractors.



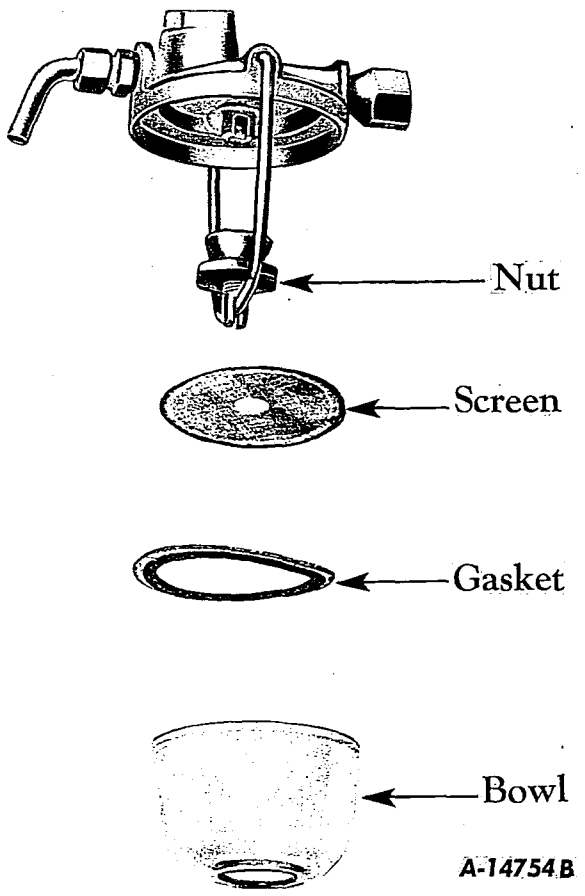
Illust. 4. Removing the Carburetor, 460, 560, and 660 series tractors.

Removal and Installation of Carburetor

Before removing the carburetor from the engine for cleaning, inspection or repair, clean the area and various connecting points to prevent entry of dirt into those parts which remain with the engine. Failure to perform this simple operation may result in an ultimate condition much worse than that which made the carburetor removal necessary.

After the carburetor is removed, inspect the air cleaner pipe and hose for possible air leaks wherein dirt and abrasives could enter the engine. Discard the carburetor flange gasket. Clean manifold flange of any scraps of old gasket which may adhere and would prevent sealing of new gasket.

When reinstalling the carburetor, care must be used in securing air and dust tight connections of air cleaner pipe and hose. Renew if necessary. Before reconnecting the fuel line to the carburetor, remove and clean sediment bowl and screen. Use new bowl gasket in replacing sediment bowl. Open the fuel tank valve momentarily to flush line and observe for free flow of fuel.



Illust. 5. Fuel strainer showing bowl removed for cleaning.

After the carburetor is reinstalled on the manifold, recheck the adjustment of the governor-to-carburetor control rod to insure wide open throttle at full load demand of governor, as follows. With engine stopped, advance engine speed control hand lever to create tension on the governor spring. Adjust length of governor-to-carburetor control rod so that the rod slides freely into the throttle lever, when the throttle is wide open. Lengthen governor-to-carburetor control rod by one turn in its clevis to place spring load on throttle lever, insert cotter pin and tighten lock nut on clevis. Return the speed control hand lever to a position slightly advanced from low idle position. In this condition, check the governor-to-carburetor control rod for any tendency toward binding. It may be necessary to loosen the clevis lock nut and reposition the clevis slightly to insure both ends being in the same plane to eliminate binding (after which the lock nut is retightened). Refer to the division on governor for coverage of governor adjustments.

Assemble the choke control wire and tube, being sure full movement of choke valve is assured with the full movement of choke control knob.

Inspection and Repair

Before disassembly of the carburetor, clean the outside surfaces of dirt accumulations so that the solvent used to clean the dismantled parts will not become contaminated.

In order that individual parts may be given a thorough inspection, cleaning is important. The use of a good carburetor cleaning solvent is necessary to dissolve gum and varnish-like coatings commonly found in carburetors. The slow buildup of these coatings in jets and calibrated openings of the carburetor restricts the normal flow of fuel, and must be completely dissolved and removed to restore the original fuel flow characteristics. Where a good commercial carburetor cleaner is

not available, equal parts of alcohol and benzol may be used.

After the dismantled parts have remained in the solvent long enough to dissolve the coatings, remove and rinse in petroleum base cleaning solution. Dry all parts with compressed air, blowing through all jets and channels in both directions to assure that they are clear and clean.

Caution: Do not use drills or wires to clean calibrated openings; any slight enlargement of these jet openings will affect the operation. Use only gum solvent and compressed air for cleaning.

Throttle Body and Fuel Bowl

The castings should be inspected for damage or broken flanges. Check mating surfaces for warpage. Where such warpage does not exceed 0.010 inch, the surface involved may be lapped on a flat surface using "00" sandpaper. Clean thoroughly after the sanding operation.

Normal clearance between the choke shaft and bowl casting bore is 0.002 to 0.005 inch. Where use of a new shaft will still result in a shaft clearance of 0.007 inch or more, the bowl casting should be replaced. Excessive wear at this point makes it impossible to seal out dirt at the seals.

The normal clearance between the throttle shaft and throttle body bore is 0.001 to 0.003 inch. Where the use of a new throttle shaft will not hold the clearance below 0.005 inch, the throttle body assembly should be replaced. Excessive wear of this throttle shaft bore will result in dirt and air leakage past seals and poor alignment of the throttle plate, affecting engine idling and governor action.

Throttle Plate

The throttle plate should be inspected for burrs or damaged edges which would prevent good contact with the throttle body bore when fully closed. Never use a buffing wheel or wire brush to clean this plate, its sharp edges must not be deformed.

When installing the throttle plate, insert it into the shaft from the top of the throttle body with the short end of the plate down (measured from the holes). Insert screws from the top, but do not tighten until the throttle plate is centered in the body bore.

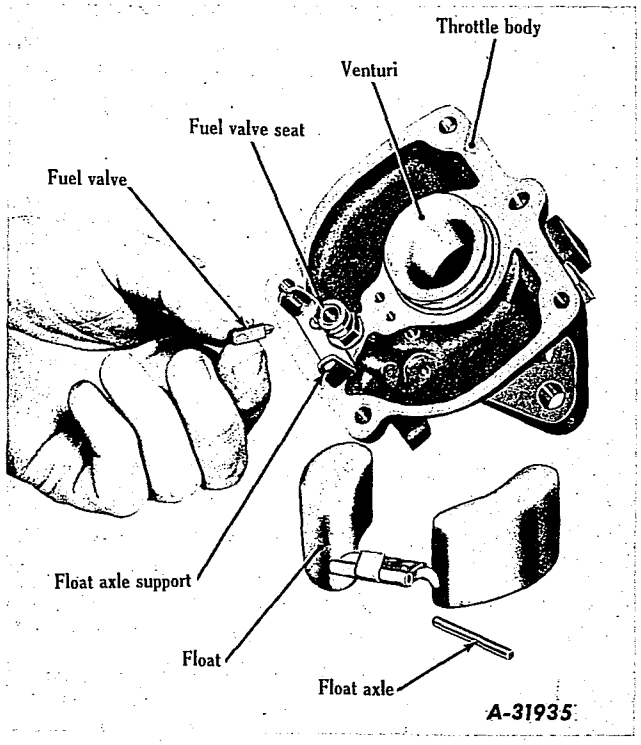
Unscrew the throttle stop screw until the plate is allowed to close fully. Holding the shaft lightly in the closed position, tap lightly on the face of the throttle plate with a brass rod to jar it into a centered position. The screws may then be tightened. The throttle plate must fit the bore closely with a minimum of light showing around its edges. The throttle shaft must be perfectly free to turn without binding at any point.

Clinch over the exposed end of the throttle plate screws to lock them in place. This can be done by clamping a 1/4-inch square rod vertically in a vise, and locating the throttle body on the rod through the venturi to bring the end of the rod directly under the end of each of the throttle screws in turn. A flat end punch can then be tapped against the outer end of the screw. This must be done with care to prevent distortion of throttle shaft or plate.

Float Assembly

Replace the float assembly if float is loaded with fuel or if the float lever axle bearing is worn excessively. Inspect top side of the float lever for wear where it contacts the fuel needle valve.

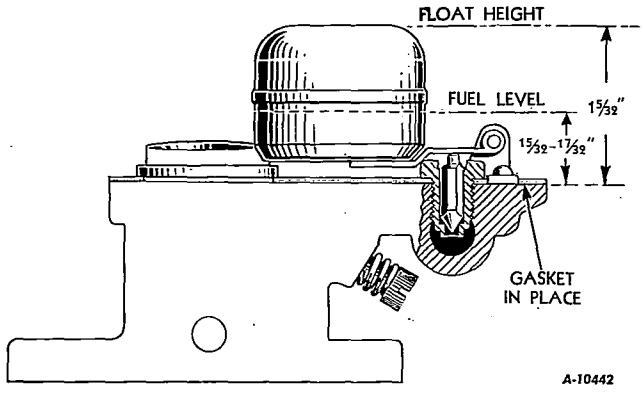
The float axle should be replaced if any wear can be detected on its bearing surfaces.



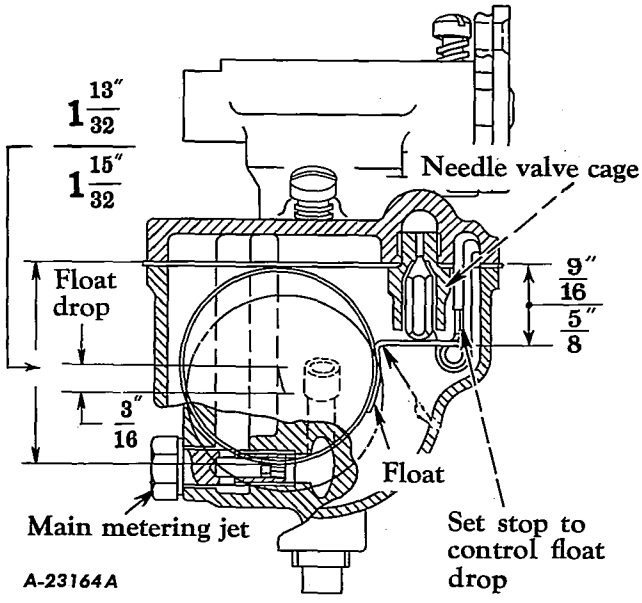
Illust. 6. Float assembly and fuel needle valve removed from carburetor.

Fuel Needle Valve and Seat

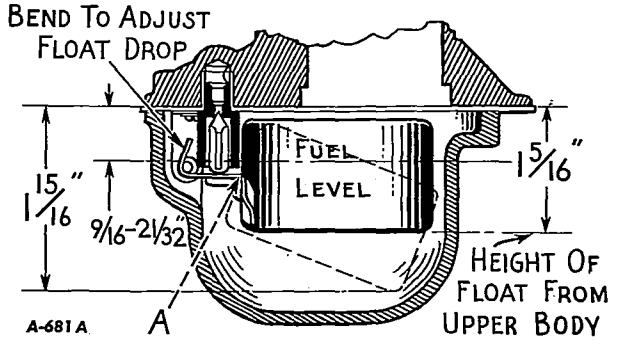
If any wear can be detected on the valve face, the needle valve and seat assembly should be replaced. The float assembly, its axle, and the fuel valve are responsible for maintaining a stable and correct fuel level; all parts must be maintained in good condition. Only slight bending of the float lever should be necessary to secure the correct float height. The float lever stop where used, should be adjusted to control float drop. Proper setting of float drop prevents the float from striking and wearing on the bottom of the bowl when operating over rough terrain.



Illust. 8. Float measurements and liquid level Zenith 68X7 carburetor, 140, 240 and 340 series C-123 and C-135 engines.



Illust. 7. Float measurements and liquid level, IH 3/4" carburetor Cub series C-60 engine.



Illust. 9. Float measurements and liquid level IH 1-1/4", 1-3/8" carburetors 460, 560 and 660 series C-221 and C-263 engines.

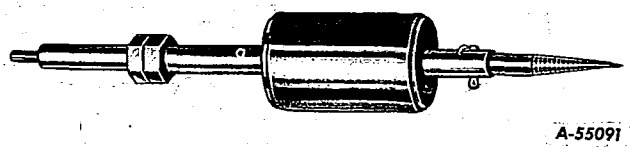
Adjusting Screws and Seats

The idle adjusting needle point must be smooth and free from grooves, caused by being closed forcibly against its seat. Where this condition is found, a new screw should be used.

The main jet adjusting screw (where used) and seat should be inspected for damage caused by the screw having been forced against its seat. Where evidence of this is found, both the screw and seat should be replaced. Service tool Number HC-80 is used to remove the main adjusting screw seat. The old seat must not, in any case, be reinstalled since the removal operation will destroy the tapered seat and the calibrated opening. The opposite end of the Number HC-80 tool is used to drive the new adjusting screw seat into place in the carburetor bowl casting (see Illust. 10).

Venturi and Jets

Inspect the venturi, jets, main adjusting screw seat, and other calibrated openings for possible damage from improper probing in previous cleaning operations. Use the carburetor identifying part number to be found stamped on a metal disc riveted to the throttle body when selecting replacement parts. Make sure you are using the parts catalog for the tractor and engine involved and that parts selected are from list headed with the carburetor identifying parts number. Failure to take this precaution when renewing parts could result in a carburetor completely out of calibration and an operation lacking power or economy.



Illust. 10. Service tool No. HC-80 for installing and removing main adjusting screw seats, 460, 560 and 660 tractors.

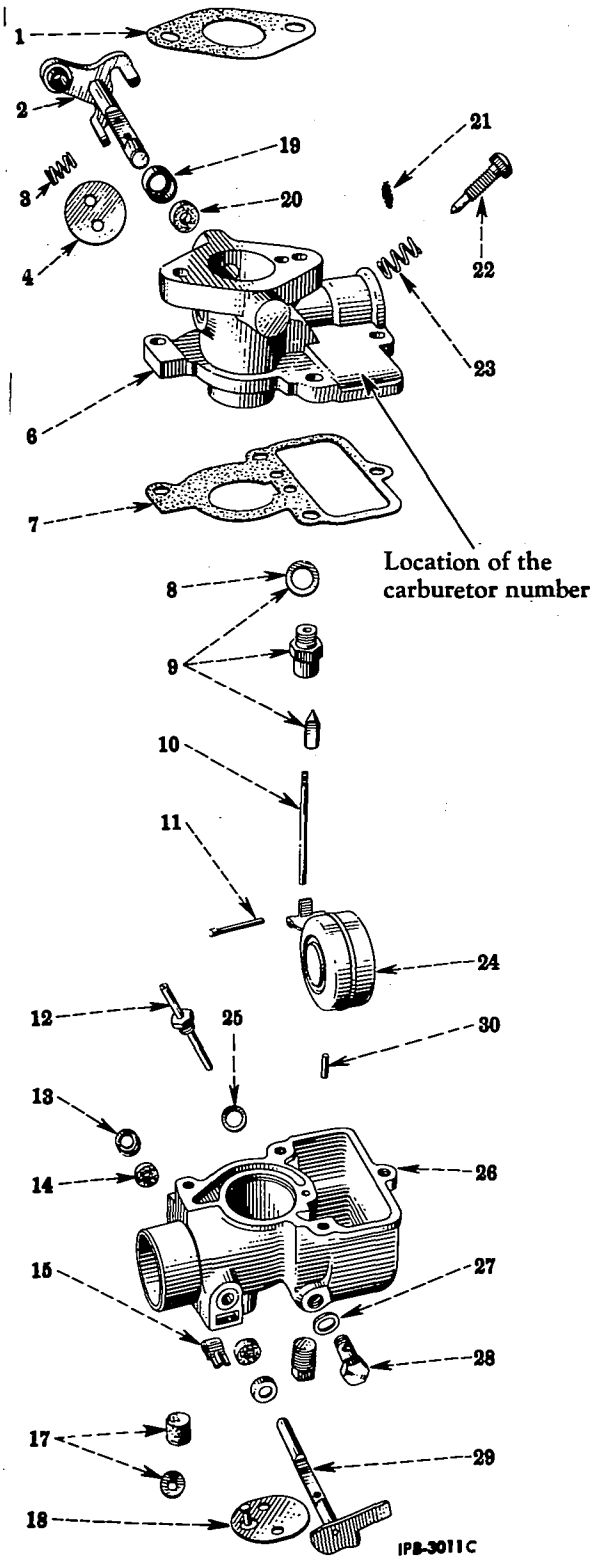
Assembly and Adjustment

Upon reassembly of the carburetor, be sure all new gaskets and seals are used throughout and are properly installed to insure gas tight connections. Use care when assembling fuel bowl to throttle body to prevent damage to the float assembly or the idle jet tube.

When replacing the idle adjusting screw and the main jet adjusting screw, turn them down carefully until lightly seated. Then back them up to approximately one turn open for the idle screw and five turns open for the main screw. Forcible seating of these screws will result in damage to the tapered face of the screw and to its seat. The throttle stop screw should be set to hold the throttle plate slightly open. These settings of the idle screw and the throttle stop screw serve only as a starting point for idle adjustment.

Adjustment of the carburetor should not be attempted until the engine has reached normal operating temperature. Then adjust throttle stop screw for the specified low idle speed and set the idle adjusting screw for smoothest engine operation. Advance the engine speed control lever for a few seconds and again idle the engine, rechecking the idle adjustments for specified low idle speed and smoothest operation.

Where gasoline carburetor is equipped with a main fuel adjustment screw, its only function is to limit the fuel going to the engine for greater economy when unit is to be used for extended periods under light loads. Where heavy work is to be performed, in which the full power of the engine is required, this main fuel adjusting screw must be set five turns off its seat. The main metering jet which forms the fuel adjustment screw seat, has been calibrated to provide a full-power mixture and must not be restricted by use of the adjusting screw when the full power of the engine is required. The main fuel adjusting screw packing nut should be tightened sufficiently to prevent leakage and to hold screw firmly in position.



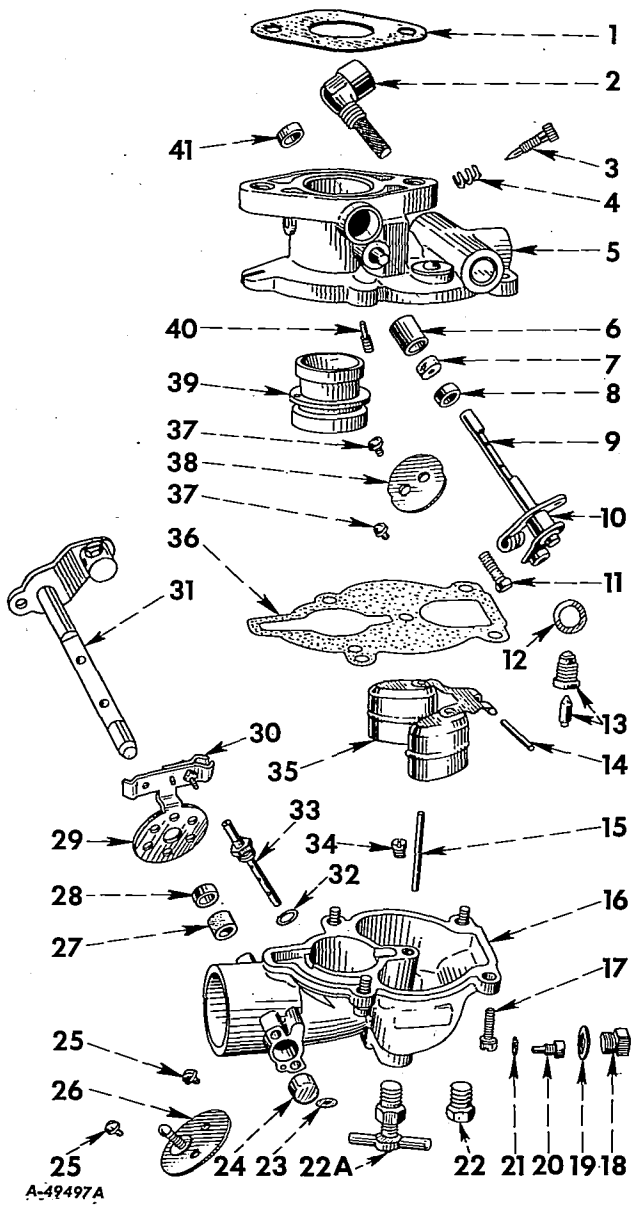
Illust. 11. Exploded view of IH 3/4" carburetor, Cub series tractors.

Legend for Illust. 11

1. Gasket, carburetor
2. Shaft, throttle valve
3. Spring, retainer, idle set screw
4. Plate, throttle valve
6. Body assembly, throttle
7. Gasket, fuel bowl
8. Gasket, needle valve cage
9. Needle valve assembly
10. Idle jet
11. Axle, float
12. Nozzle, discharge
13. Retainer, choke shaft seal
14. Seal, choke shaft
15. Spring, choke lever
17. Filler and plug, drip hole
18. Plate, choke valve
19. Retainer, throttle shaft seal
20. Seal, throttle shaft
21. Strainer screen
22. Valve, idle adjusting needle
23. Spring, retainer, idle adjustment
24. Float assembly
25. Gasket, discharge nozzle
26. Bowl assembly
27. Gasket, main jet
28. Jet, main metering
29. Shaft, choke valve
30. Air bleed, main

Diagnosing Engine Troubles

Servicemen should not be too quick in condemning carburetor operation. Poor fuel economy, loss of power, poor recovery from overload, or poor acceleration are not necessarily results of inadequate carburetion. Fuel system conditions that can affect fuel economy, while important, are relatively few in number. Make sure that none of the following conditions exist; but don't limit your investigation to the fuel system.



Illust. 12. Exploded view of Zenith 68X7 carburetor, 140, 240 and 340 series tractors.

Legend for Illust. 12

1. Gasket, carburetor
2. Elbow and strainer assembly
3. Valve, idle adjusting needle
4. Spring, retainer idle adjustment
5. Body assembly, throttle
7. Seal, throttle shaft
8. Retainer, seal
9. Shaft assembly, throttle
11. Screw, throttle stop
12. Gasket, fuel Valve
13. Needle valve assembly
14. Axle, float
15. Tube, idle filler
16. Bowl assembly, fuel
18. Plug
19. Gasket, plug
20. Jet, main metering
21. Gasket, main jet
22. Plug, drain
22A. Cock, drain
23. Filler, drip plug
24. Plug, choke shaft hole
25. Screw, choke plate
26. Plate, choke
27. Seal, choke shaft
28. Retainer, seal
29. Bracket assembly
31. Shaft, choke
32. Gasket, discharge nozzle
33. Nozzle, discharge
34. Air Bleed, well vent
35. Float assembly
36. Gasket, bowl
37. Screw, throttle plate
38. Plate, throttle valve
39. Venturi
40. Jet, idling
41. Plug, throttle shaft hole

Fuel system conditions affecting fuel economy:

1. Float valve leakage or high fuel level.

2. Damaged or enlarged jet openings.

3. Unbalanced conditions due to bowl gasket failure or dirt-plugged air bleeds or vents.

4. Poor setting of idle or main adjustments to match fuel or to meet a continuing load condition.

5. Failure to return choke valve to full open position.

6. Plugged air intake and/or air cleaner.

7. Failure of manifold automatic heat control.

Other factors that can influence fuel economy:

1. Loss of engine compression due to piston and ring condition or valve leakage.

2. Improper valve timing.

3. Loss of valve lift due to cam wear or valve lever adjustment.

4. Unsatisfactory operating temperature due to water pump or thermostat failure, etc.

5. Spark plug burning or fouling.

6. Ignition timing error.

7. Misfiring due to poor condition of ignition system.

8. Use of high viscosity engine oil.

9. High friction loss in transmission or final drive due to lack of, or improper, lubrication.

10. Brakes dragging.

11. Excessive drive wheel slippage due to worn lugs or lack of sufficient wheel weights.

12. Improper adjustment of implement, resulting in excessive draft requirement.

13. Excessive drive belt slippage, in belt driven applications.

Fuel system conditions affecting power loss:

1. Low fuel float level.

2. Obstructed fuel passages, jets or screens from dirt or fuel gum.

3. Obstructed air bleeds in carburetor.

4. Lean setting of idle and main adjustments.

5. Air leakage between carburetor and manifold or between manifold and intake valve ports, or cracked intake manifold.

Note: Conditions where engine would draw in unfiltered air will also result in rapid and excessive engine wear from dust and abrasives.

6. Carbon or coke in intake manifold, at hot spot or heated jacket, restricting the amount of air-fuel mixture available to the engine.

7. Excessive clearance between throttle shaft and throttle body.

8. Poor governor action due to wear, misalignment or binding of moving parts.

9. Plugged air intake and/or air cleaner.

10. Failure of manifold automatic heat control.

Other conditions influencing power loss:

1. Loss of engine compression due to piston blow-by or valve leakage.

2. Valve timing error.

3. Excessive intake valve stem and guide clearance.

4. Loss of valve lift due to cam wear or valve lever adjustment.

5. Ignition timing error.

6. Detonation or surface-ignition due to:

   (a) "Hot spots" in the combustion chambers, exposed sharp corners or burned spark plugs.

   (b) High altitude piston equipment used in altitudes below that for which they were designed.

(c) Use of fuel having too low an octane rating.

7. Misfiring due to poor condition of ignition system or loss of engine compression.

8. Unsatisfactory operating temperature due to condition of cooling system.

9. Plugged exhaust system, muffler or spark arrester.

10. High pressure loading of hydraulic power supply.

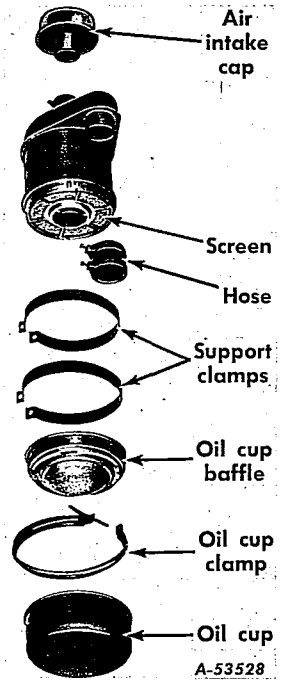
11. Slippage of drive wheels or drive belt.

12. High friction losses in transmission of power.

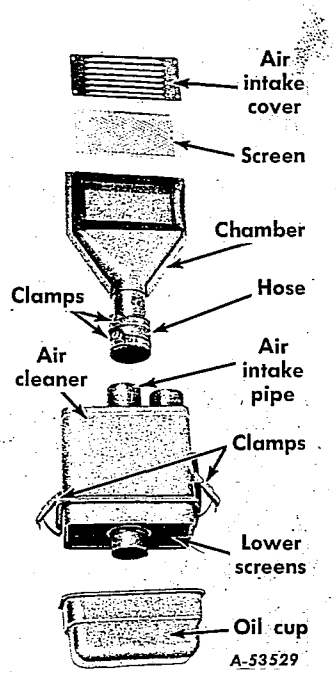
13. Indicated power loss, due to improper adjustment of implement and resulting excessive draft requirement.

AIR CLEANERS

Oil-bath type air cleaners protect the engines from entry of dust and abrasives only so long as they are properly maintained. The Operator's and Preventive Maintenance Manuals instruct the operator to "remove, clean and refill the oil cup every day, or after every ten hours of operation (more frequently when operating under dusty conditions)." The frequency of this cleaning under dusty operating conditions to be governed by the dirt build-up found in the cleaner oil cup. Again quoting the Operator's and Preventive Maintenance Manuals, "Never allow dirt to build up in the cup more than one-half inch deep." "After every fifty to sixty hours of operation, the entire air cleaner should be removed, disassembled and thoroughly washed."

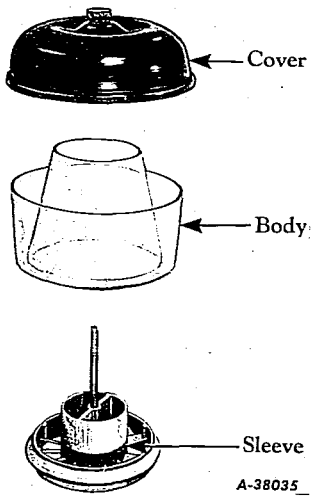


Illust. 13. Exploded view of typical air cleaner, Farmall and International series.



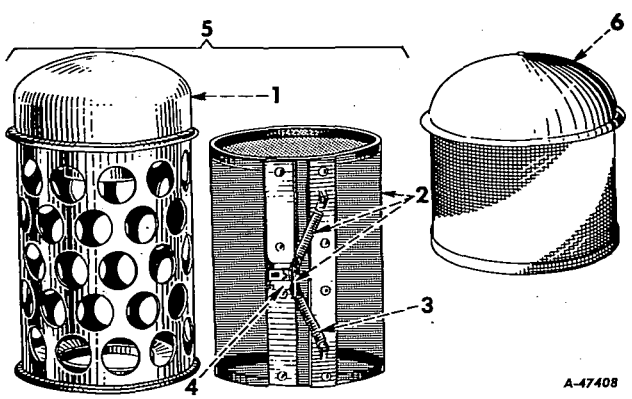
Illust. 14. Exploded view of typical air cleaner, utility series.

Collector pre-cleaners are available as special attachments for use in very dusty operating conditions to assist in extending the period of use between necessary cleaning and servicing. The collector pre-cleaners are used on the type of cleaners shown in Illust. 13 and replace the air intake cap.



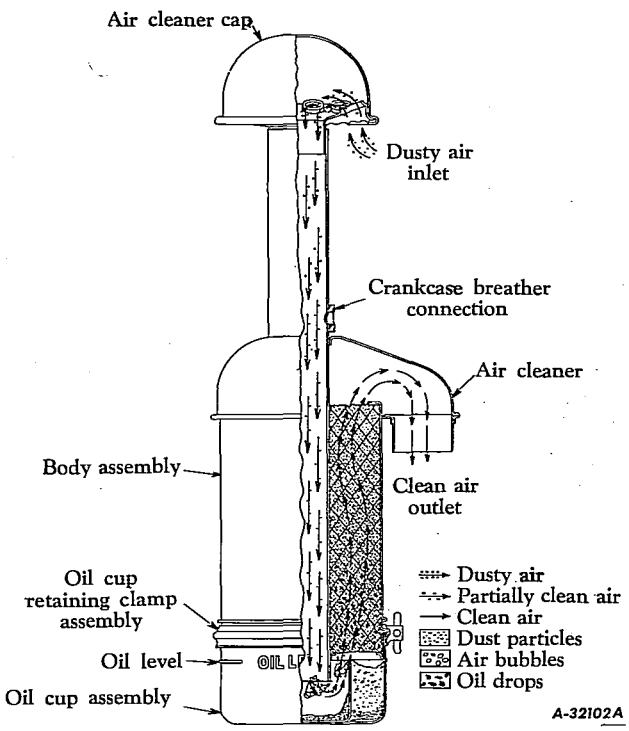
Illust. 15. Collector-type pre-cleaner disassembled for cleaning.

Pre-screener attachments are available for use where a considerable amount of leaves or coarse dirt is encountered to assist in extending the period of use between necessary cleaning of air intake cap. These attachments replace the regular air intake cap on the type of cleaners shown in Illust. 13.



Illust. 16. Disassembled (5) two-piece and (6) one-piece types of pre-screener attachments, to provide a greater intake screen area.

Illust. 17 shows air entering the air intake pipe through the regular cap where the heavy screen prevents entry of large particles of trash. The air then passes down to the oil cup, where it is drawn through the oil bath. As the air passes up through the screens above the oil cup, some oil is carried up with the air, coating the screens. Fine dust and abrasives are removed on contact with the oiled screens. As the oil drains back down from the screens, dirt is flushed back down to settle to the bottom of the oil cup.



Illust. 17. Cross section of a typical air cleaner showing movement of air and oil in the unit.

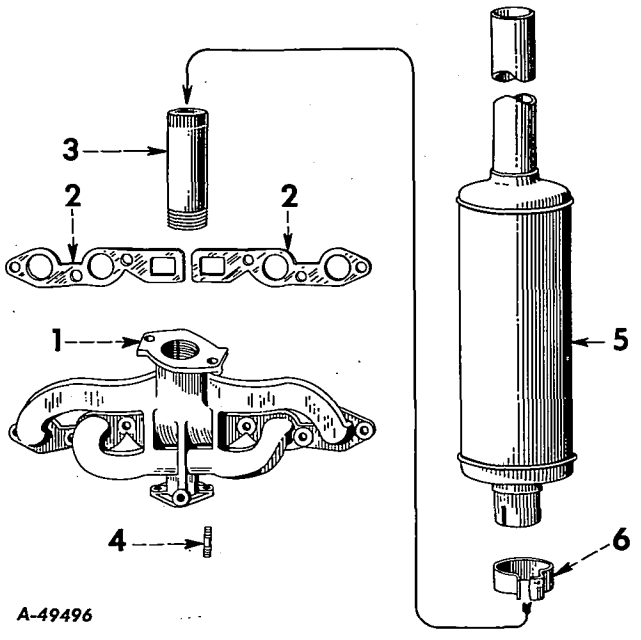
The efficiency of the air cleaner is at its best when oil and screens are clean; this efficiency drops rapidly as the oil and screens become loaded with foreign material.

Proper and efficient functioning of the air cleaner is an important factor in securing maximum power and maximum engine life. A most careful inspection

of the air cleaner and its connections should be a part of each engine tune-up or major engine overhaul. A small air leak which would allow the engine to draw in unfiltered, dirty air will result in rapid engine wear and early failure. A partly plugged air cleaner has a throttling effect on the engine resulting in loss of power and lowered fuel economy. These conditions would have a bad effect on an otherwise satisfactory tune-up or overhaul job.

The use of heavier oil than recommended for the season of use in the air cleaner will also result in a throttling effect similar to a plugged cleaner. Too heavy an oil in the air cleaner presents a problem in cold weather starting of the engine, since it limits the available air-fuel mixture. The use of too light an oil viscosity for the season of use will result in some carry-over of oil into the engine. This leaves too low an oil level in the cleaner cup to provide good air filtration.

MANIFOLD AND EXHAUST SYSTEM



Illust. 18. C-135 engine manifold with vertically mounted exhaust muffler; the C-60 and C-123 are similar.

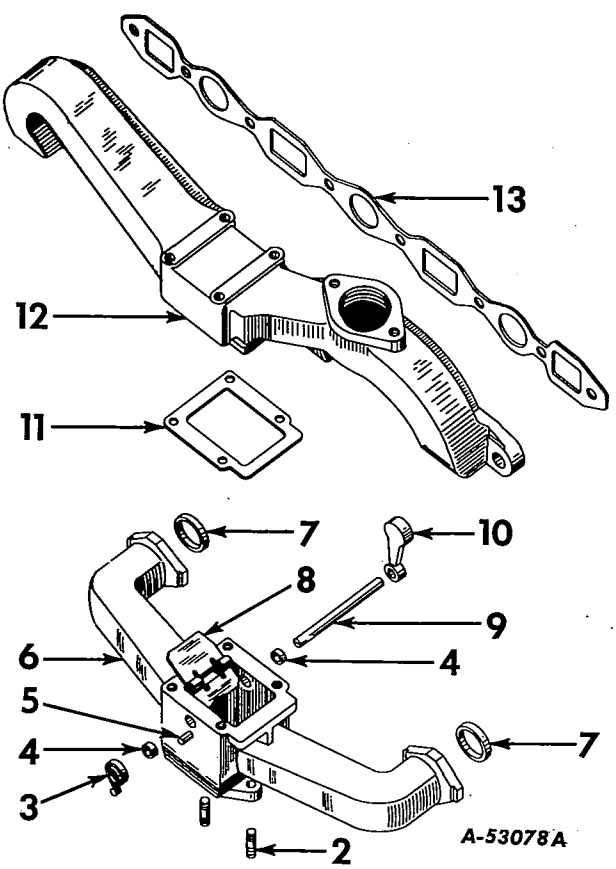
The exhaust and intake manifolds for the C-60, C-123, and C-135 gasoline burning engines are combined in a single casting. A small area located at the top of the intake riser is heated from the exhaust gases, which assists in vaporizing the droplets of fuel without adding materially to the temperature of the air-fuel mixture.

The exhaust and intake manifolds for the C-221 and C-263 gasoline burning engines are of two piece construction. The intake manifold riser is jacketed for circulation of exhaust gases to assist in vaporization of fuel. A thermostatically controlled valve allows circulation of hot exhaust gases to the intake jacket during engine warm up period. As the manifold approaches a normal operating temperature, the thermostat closes the control valve, reducing the heat applied to the intake jacket. The control valve is counter-balanced and must move freely in its mounting to be actuated by the bimetal

thermostat spring. At room temperature the thermostat spring will be wound 1/4 to 1/2 turn when hooked to its anchor pin and with the control valve open.

With extended use, the heat control valve parts may burn and blister and tend to become inoperative. Should the valve stick open, some loss of power and economy will be experienced due to application of excessive heat to the intake manifold. Should the valve stay in the closed position, the lack of heat on the intake manifold will cause slow warm up and require extended use of the choke valve.

Extended use of either the one-piece or two-piece manifolds may result in carbon or coke-like deposits in the heated area of the intake manifold. Such deposits act as an insulator, preventing the transfer of heat from the effective surfaces, and also restrict the amount of air-fuel mixture available to the engine through the reduction of the internal diameter of the manifold. Either condition will result in loss of power and unsatisfactory operation. Correction is by removal of the deposits. Extremely heavy deposits may result in uneven expansion and cracking of the manifold casting, requiring replacement of the part.



Illust. 19. C-221 and C-263 engine manifold showing construction of automatic heat control valve.

Manifold gaskets must be in good condition to prevent entrance of dirt and abrasives into the engine and to maintain the air-fuel ratio of the intake mixture. To prevent overstressing of studs and to insure even compression of the gaskets, the stud nuts should be tightened to specifications with a torque indicating wrench. On the four-cylinder engines the manifold to engine stud nuts should be tightened to 20-25 ft. lbs. On six-cylinder engines covered in this section, the manifold to engine stud nuts should be tightened to 20-30 ft. lbs. The four bolts attaching the intake and exhaust halves of the six cylinder manifold should be tightened to 25-30 ft. lbs.

After removal and replacement of intake and exhaust manifold assembly, for any reason, it is advisable to re-check the carburetor throttle position in relation to governor position. This is necessary due to possible change in center-to-center distance between governor and carburetor; see number 1 adjustment "Synchronizing the Governor" under heading "Governor Installation and Adjustment."

Exhaust mufflers in vertical and underslung mountings are used on tractors covered by this section. Some applications of these tractors may call for the use of a spark arrester attachment as insurance against fire hazards from exhaust sparks. These items require no servicing but should be examined from time to time for damage which would restrict the exhaust of the engine. Such restriction would cause loss of power and reduce engine valve life.

Specifications

Tractor Series	CUB	140	240	340	460	560	660
Engine Series	C-60	C-123	C-123	C-135	C-221	C-263	C-263
Governor Spring							
Use rockshaft lever hole	- -	"A"	"A"	"A"	- -	- -	- -
Spring number	251 464 R1	46 944 DA	369 686 R2	369 686 R2	367 739 R1	367 739 R1	372 709 R1
Outside diameter	.6250"	.5625"	.7700"	.7700"	.8125"	.8125"	.8125"
Wire size	.0915"	.080"	.0915"	.0915"	.0915"	.0915"	.1055"
Number of coils	8-1/2	15	6	6	15-1/2	15-1/2	14-1/2
Bumper spring	Yes	Yes	Yes	Yes	No	No	No
Governor weight to pin clearance	.001-.004"	.001-.004"	.001-.004"	.001-.004"	.001-.010"	.001-.010"	.001-.010"
Engine rpm							
Low idle ±25	475	425	425	425	425	425	425
Fast idle ±25	2016	1575	2200	2200	1980	1980	2640
Rated Load ±10	1800	1400	2000	2000	1800	1800	2400

Principles of Operation

The engine governors used with the carbureted engines covered in this section are all of the fly-ball, variable-speed type. They are designed to maintain a selected engine speed within reasonably constant limits under varying load conditions, by proportioning the fuel to the load.

For its action, the governor depends upon centrifugal force developed by weights rotating about a shaft. A variable governor spring is used to counteract the centrifugal force or outward movement of the weights. This movement of the governor weights, through suitable linkage, controls the carburetor throttle opening.

When the operator starts the engine and sets the engine speed control lever for a desired speed, the governor weights move outward with the increasing speed until the centrifugal force on the weights counterbalances the tension of the governor spring. When this condition is reached, the carburetor throttle has also been moved to a position where the air-fuel mixture admitted is sufficient to maintain this desired speed.

The operator controls engine speed by use of the engine speed control lever, increasing or decreasing the governor spring tension -- not by direct connection with the carburetor throttle valve.

Increasing the governor spring tension moves the governor weights inward which, in turn, moves the throttle further open, thereby increasing the engine speed until the increased centrifugal force of the governor weights counterbalances the greater spring tension.

Decreasing the governor spring tension allows the centrifugal force to move the weights outward, closing the throttle and thereby decreasing the engine speed until the decreasing centrifugal force and the reduced spring tension again balance each other.

When a change in load occurs, there is a momentary change in engine speed. This causes the governor weights to move inward or outward, thereby opening or closing the throttle sufficiently to maintain a reasonably constant engine speed up to the full load capacity of the engine. The speed variation between fast idle and rated load speed will normally be about 10 percent in these tractor governors.

Adjustment is provided in the linkage between the governor and the carburetor to synchronize the position of the throttle with a position of the governor weights. This adjustment is most important, since it insures the full power response of a wide open throttle when the governor weights are collapsed by the reduction in speed due to application of a full load to the engine.

In review: With an engine supporting its load and maintaining a desired governed speed, three factors have reached an almost perfect balance. These are the forces of (1) governor spring tension (2) centrifugal force on governor weights, counteracting the effects of (3) load on the engine speed. Slight changes in load (within engine capacity) will cause slight changes in engine speed, upsetting the balance of forces and thereby opening or closing the carburetor throttle until the forces are again brought into balance.

To insure smooth, surgeless, and prompt response of the governor, all of its moving parts and linkage must move freely to follow slight changes in engine load-speed. Should binding occur at any point, a greater change in speed will take place before sufficient centrifugal force or spring tension is built up to overcome the friction and move the throttle valve. Friction increases and binding often occurs because of wear and misalignment of the carburetor throttle shaft. Sludge deposits in the governor housings can

cause sluggish or rough action of governor parts and linkage. Wear of governor weights, pins, sleeve, rockshafts, or rockshaft lever also result in surging and erratic governor action.

Removal, Inspection, and Repair

In the four cylinder engine governors, the governor drive gear also serves as the ignition unit drive. These governor drive gears are marked for proper mesh with mating gears at top dead center of number one cylinder compression stroke. Some reassembly time may be saved if the engine is turned to this position before removal of the governor assembly.

Before removing any of the governor assemblies for inspection or repair, clean the surrounding area and the various connecting points to prevent entry of dirt into those parts which remain with the engine. After disassembly of the governor, start the cleaning of parts with a clean container of clean solvent. Wash ball bearings first. Do not spin bearings while washing. Turn them slowly back and forth while dipping the bearing up and down in the solvent to dislodge dirt. Blow out with compressed air, holding the parts to prevent the air blast from spinning them, to avoid possible scratching of balls and grooves. Flush again in clean solvent and blow-dry a second time. Examine under good light to determine if further cleaning is necessary. Add a few drops of oil to the balls and grooves, then, and only then, spin by hand to test for roughness and wear.

Wash and clean the remainder of the rotating parts in solvent, examining the weights, carrier and weight pins for damage or wear. Clearance between new weights and new pins for each governor are shown on specification page. Clearances found to exceed those specified by 0.003 inch or more would be considered excessive and parts should be renewed.

Wash and clean the housing and remaining parts and examine each for damage or excessive wear. No attempt should be made to salvage old gaskets or seals. They should be carefully removed from the assembly and replaced with new to insure an oil tight, dust proof operation.

Where sludge accumulations are found in the governor housing, corrosion of bearing surfaces may have occurred. These rough bearing surfaces and their increased frictional drag are responsible for poor governor action. Excessive bearing clearance also results from sludge corrosion.

Note: Moisture and sludge accumulations in the engine indicate that the engine has been running over long periods of time below normal operating temperature. Thermostat operation should be checked on those tractors so equipped and the tractor operator informed on his need to maintain operating temperature.

The decision on what new parts should be used to rebuild the governor assembly will be based upon the wear found and the condition of the following groups of parts:

1. Weights, pins, and weight carrier: Clearance in excess of 0.003 inch over that specified between pins and weights or carrier.

2. Governor shaft bearings and thrust bearing: Rough, pitted bearing surfaces of either plain or ball type bearings.

3. Rockshaft, rockshaft fork, bearings and levers: Worn or damaged rockshaft, rockshaft fork or spring levers. Rough, pitted bearings and bearing surfaces.

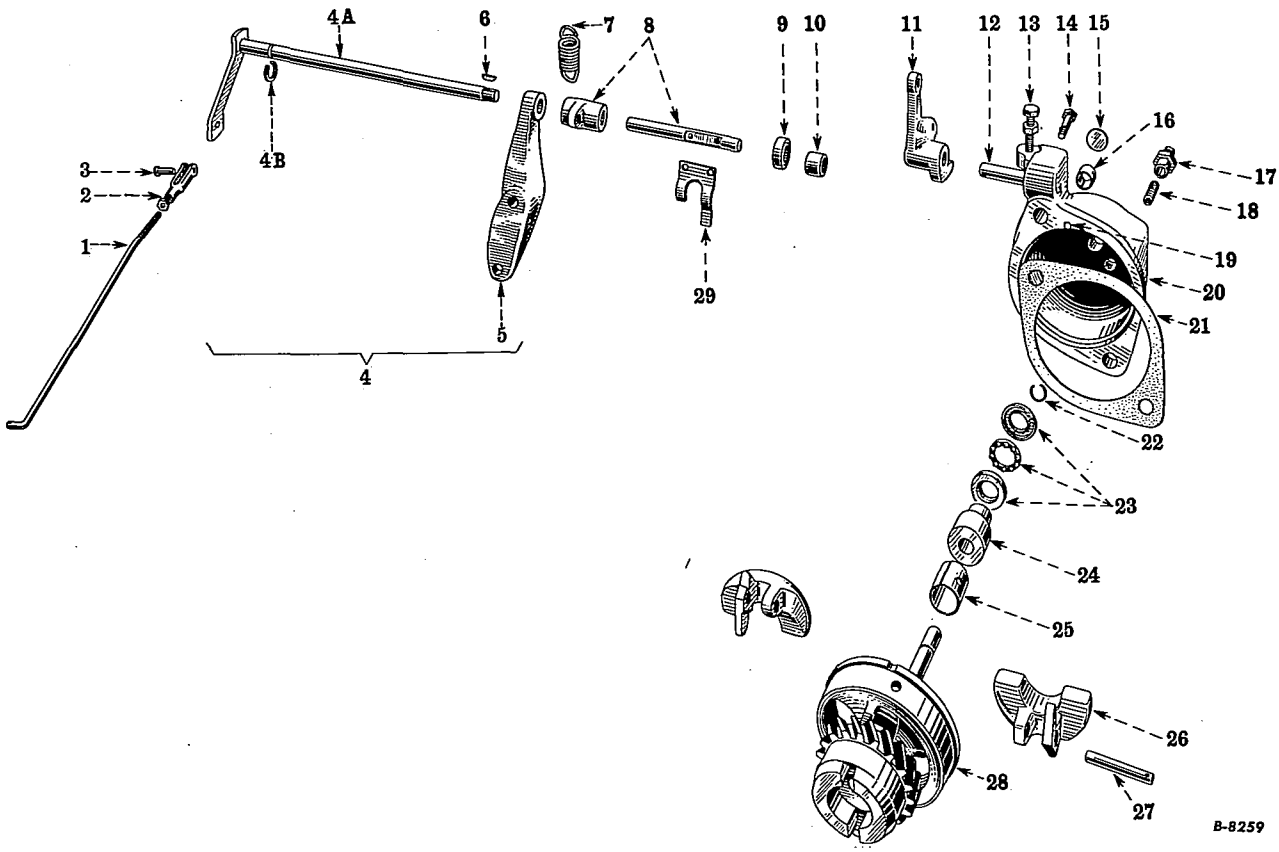
Where all three conditions are found, the use of new complete governor assembly should be considered, since the few parts which can be salvaged may not cover the labor cost of overhaul.

Where conditions 1 and 2 are involved, the rotating assembly, including new bearings, weights and pins, should be used.

Where only the governor weight and pin clearance is found questionable, only these individual parts need be replaced. In all cases new gaskets and new seals must be used to prevent entry of dirt and lost of oil.

Examine hook ends of governor springs and mating holes in spring levers for wear. Replace these parts where appreciable wear is found.

Care must be taken in the reassembly

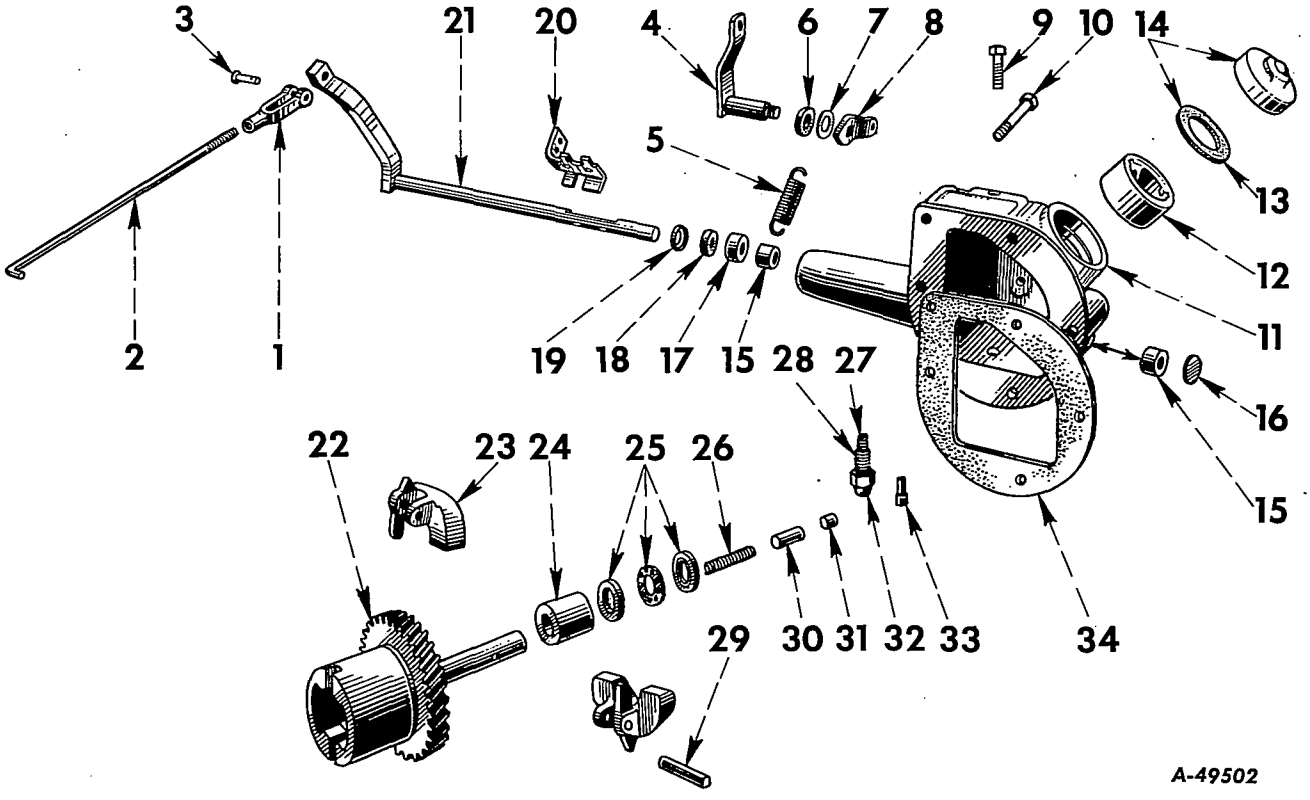


Illust. 20. Exploded view of C-60 engine governor.

1-2-3.	Governor to carburetor control rod
4-5.	Rockshaft extension and bracket
6.	Key
7.	Governor spring
8.	Rockshaft and spring lever
9.	Rockshaft oil seal
10.	Rockshaft bearing
11.	Governor speed change lever
12.	Lever shaft
13.	Maximum speed stop screw
14.	Housing cap screw
15.	Housing expansion plug
16.	Governor shaft front bushing
17-18.	Bumper spring and adjustment
19.	Dowel pin
20-21.	Housing and gasket
22.	Sleeve retainer ring
23.	Thrust ball bearing
24.	Thrust sleeve
25.	Governor rear bushing
26-27.	Governor weights and pins
28.	Governor shaft, carrier and base
29.	Rockshaft fork

of the governor rockshaft, rockshaft fork, bearings and seal to insure uniformly smooth movement of the rockshaft from one extreme of movement to the other. Lubricate the rockshaft oil seal thoroughly upon installation. Some slight friction resulting from drag of the oil seal on the shaft is unavoidable, but friction from any other source must be held to a minimum. Any rough, jerking movement of the rockshaft must also be eliminated to prevent surging and erratic governor action.

Governor shaft end clearance is adjusted in the C-60 engine governor by placing 0.020 inch thickness of feeler gauge stock



Illust. 21. Exploded view of C-123 and C-135 engine governor.

1-2-3.	Governor to carburetor control rod	19.	Seal retainer
4.	Governor speed change lever	20.	Rockshaft fork
5.	Governor spring	21.	Rockshaft
6.	Oil seal	22.	Drive gear, carrier and shaft
7.	Washer	23.	Governor weights
8.	Governor spring lever	24.	Thrust sleeve
9.	Maximum speed stop screw	25.	Thrust ball bearing
10.	Housing cap screw	26.	Governor shaft spring
11.	Housing	27-28-32.	Bumper spring and adjustment
12-13-14.	Oil filler cap	29.	Weight pins
15.	Rockshaft needle bearings	30-31.	Governor shaft thrust and stop pins
16.	Plug, expansion	33.	Rockshaft retainer pin
17.	Rockshaft bushing	34.	Gasket
18.	Rockshaft seal		

between drive gear and governor base when pressing the gear on the assembly. After gear is pressed in place, the end clearance should be within the range of 0.020 to 0.025 inch. See Illust. 28.

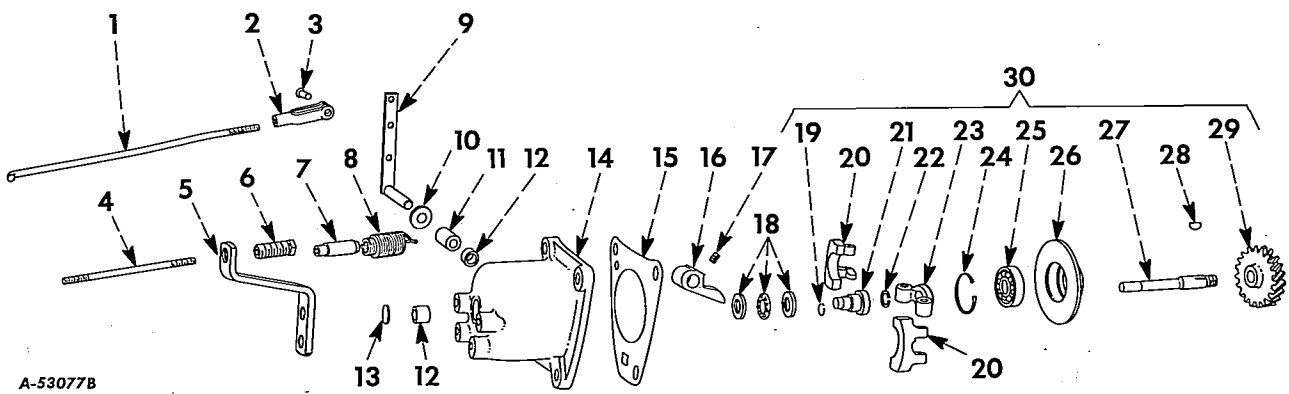
End clearance in the C-123 and C-135 engine governor shaft is eliminated by the (26) governor shaft spring and thrust pins used in its design. See Illusts. 21 and 29.

In the C-221 and C-263 engine governor, the internal fit of the (25) governor shaft ball bearing controls its end clearance. See Illusts. 22 and 30. A new ST 552 ball bearing will have end clearance in the range of 0.004 to 0.0065 inch. This bearing should be replaced when, after thorough cleaning, it is found rough.

Installation and Adjustment

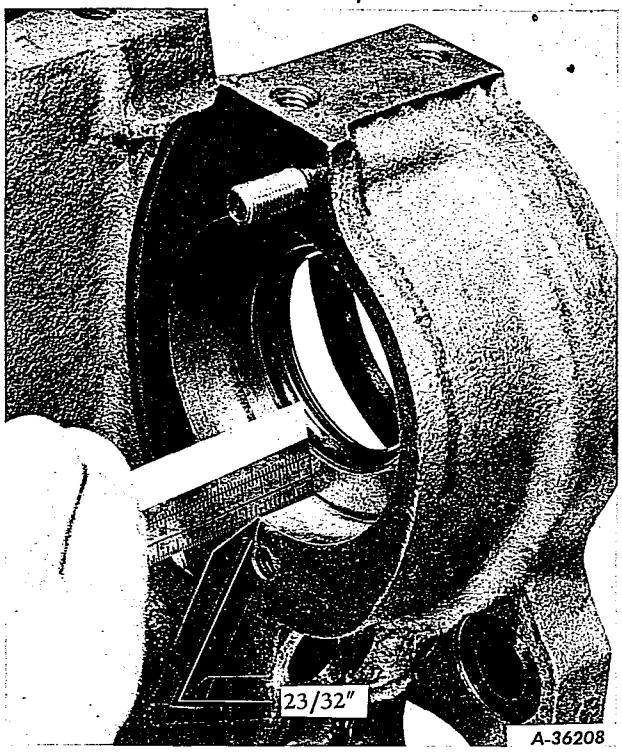
Install the C-60 engine governor - ignition drive oil seal with seal lip facing forward; the seal must be square in the crankcase bore and positioned 23/32 inch in from the ignition mounting flange face. See Illust. 23. The seal mating surface on the outside diameter of the gear hub must be smooth and free of cuts or scratches to prevent rapid wear or damage to seal lip. Any sharp edges on gear hub slots should be removed to prevent damage to seal during installation of governor assembly.

Install the C-60 engine governor assembly and ignition unit using new mount-

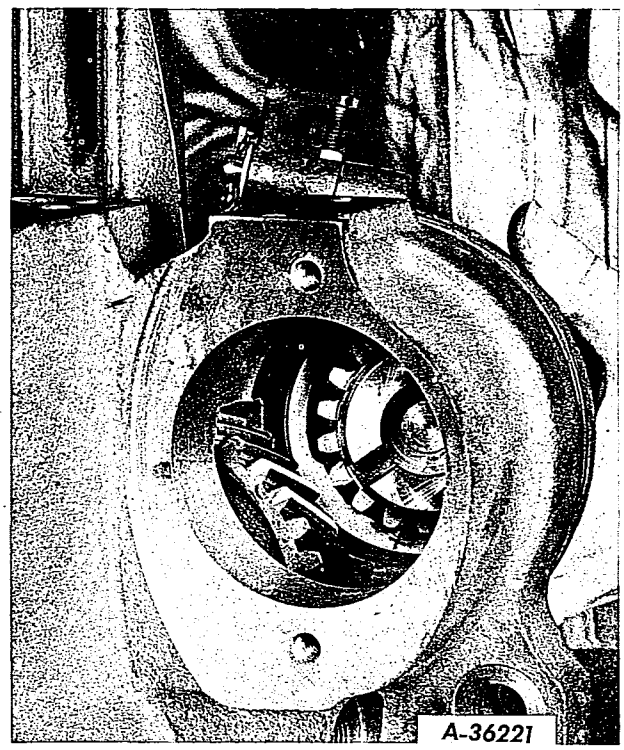


Illust. 22. Exploded view of C-221 and C-263 engine governor.

1-2-3.	Governor to carburetor control rod
4.	Governor speed change rod
5.	Bracket
6.	Maximum speed stop adjustment
7.	Governor spring retainer
8.	Governor spring
9.	Lever and rockshaft assembly
10.	Oil seal, rockshaft
11-12.	Bushings
13.	Plug, expansion
14-15.	Housing and gasket
16.	Rockshaft fork
17.	Set screw
18.	Thrust ball bearing
19.	Sleeve retainer ring
20.	Governor weights
21.	Thrust sleeve
22.	Carrier retainer ring
23.	Carrier
24.	Bearing retainer ring
25.	Governor shaft ball bearing
26.	Bearing retainer
27-28.	Governor shaft and key
29.	Drive gear
30.	Complete rotating assembly



Illust. 23. C-60 engine, locating governor - ignition drive oil seal in crankcase.



Illust. 24. C-60 engine, installing governor assembly (seal omitted to better illustrate gear mesh).

ing gaskets, insure proper ignition timing as follows:

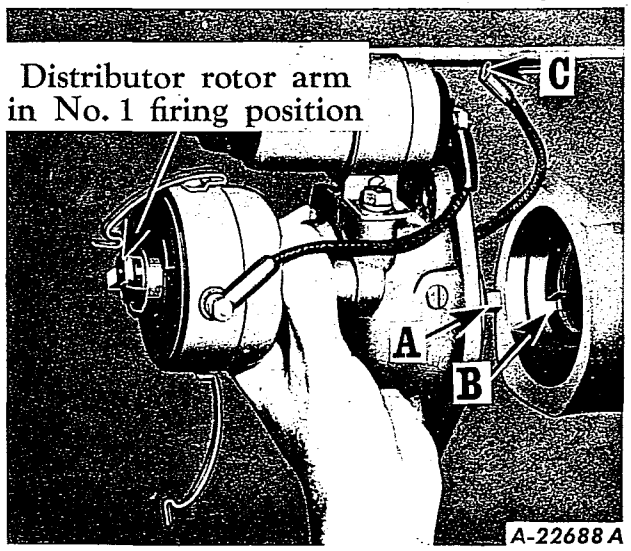
1. With the engine positioned at top dead center of number one cylinder firing stroke, locate the single punch mark between teeth of idler timing gear. Use chalk to mark top surface of two teeth on each side of punch mark.

2. Chalk the rear end of the punch marked tooth on the governor drive gear.

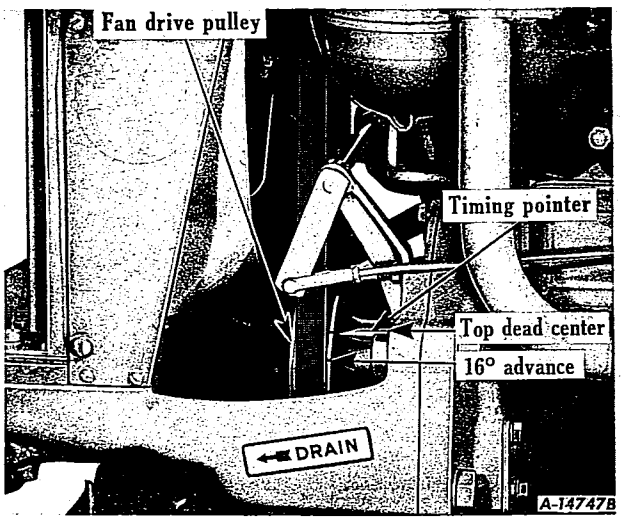
3. Install the governor assembly, meshing the marked gear teeth as shown in Illust. 24.

4. Position the ignition unit distributor rotor arm and (A) drive shaft lugs for firing number one cylinder. See Illust. 25. Install ignition unit on engine, meshing (A) lugs and (B) drive slots.

5. Advance or retard ignition distributor, until spark occurs as the Top Dead Center mark on fan drive pulley aligns with pointer while hand cranking engine. (See Illust. 26.)



Illust. 25. Assembling the ignition unit to engine, with unit and engine in No. 1 firing position.



Illust. 26. C-60 engine timing pointer and timing marks.

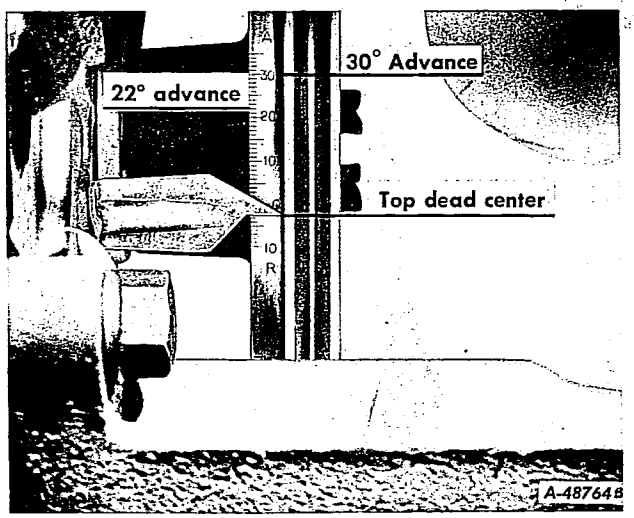
Install the C-123 and C-135 engine governor assembly and ignition unit using new mounting gaskets, insure proper ignition timing as follows:

1. With the engine positioned at top dead center of number one cylinder firing stroke, insert governor pinion with complete rotating assembly into the crankcase, meshing the marked tooth on the cam gear with the marks between teeth of the governor pinion.

2. Install the governor housing assembly, being sure first that the governor spring is properly assembled. See Illust. 29. See also that the governor shaft spring and thrust pin is in place in the front end of the shaft.

3. Position the ignition unit distributor rotor arm and (A) drive shaft lugs for firing number one cylinder. Install ignition unit on engine meshing (A) lugs and (B) drive slots, Illust. 25.

4. Advance or retard the ignition distributor, until spark occurs as Top Dead Center mark on fan drive pulley aligns with pointer while hand cranking the engine. See Illust. 27.



Illust. 27. C-123 and C-135 engine timing pointer and timing marks.

Install the C-221 and C-263 engine governor assembly using new mounting gaskets. The governor drive gear may be meshed in any position, in these engines, since ignition unit is not involved in the governor drive.

After installation of either new or overhauled governor assemblies in the engines covered in this manual section, it is important that a thorough check of all four adjustments be made. The basic governor assembly may be in perfect condition, but in order to insure its full range of control it must be adjusted to its individual engine.

1. Synchronizing the governor-to-carburetor throttle movement.

Because of possible change in center-to-center distance between governor and carburetor, due to removal and replacement of manifold, carburetor or governor assemblies, the linkage between the governor and carburetor must be adjusted to establish the throttle position in relation to governor weight position. This adjust-

ment insures the full power response of a wide open throttle when the governor weights are collapsed by reduction in rpm by application of heavy load. This governor-to-carburetor linkage must be free from binding throughout its range of movement. Adjustment procedure for all engines follows:

(a) With engine stopped, advance the operator's engine speed control lever to about half speed position; sufficient to create tension on the governor spring.

(b) Disconnect governor-to-carburetor control rod (either end). Hold carburetor throttle against its stop in wide-open position and adjust length of governor-to-carburetor control rod so that it may be reconnected freely without moving throttle lever or governor lever.

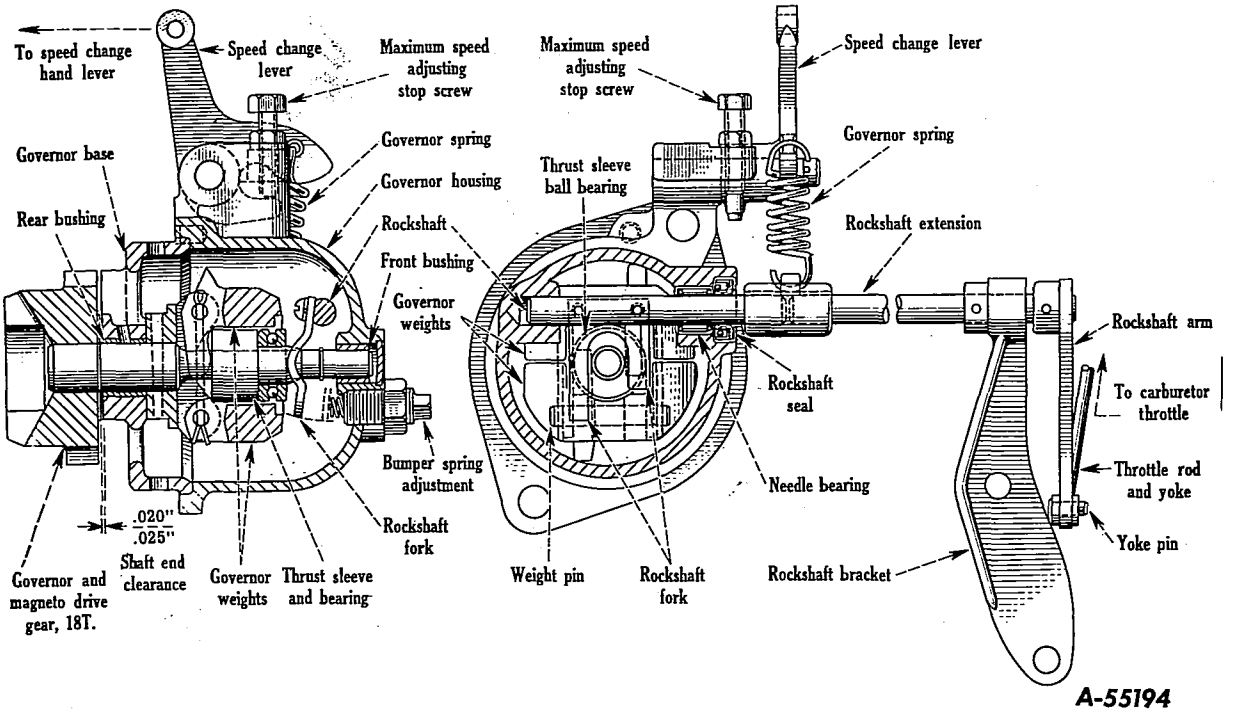
(c) Lengthen control rod one turn from the above condition, to compensate for wear, and reconnect.

(d) After tightening the control rod clevis lock nut, check to be sure that both ends of the control rod are in the same plane, to eliminate possibility of binding on levers.

(e) Move operator's engine speed control lever a few times between half speed and low speed position, checking the governor-to-carburetor control rod in all positions for interference or binding.

2. Adjusting governed fast idle speed.

To protect the engine from excessive

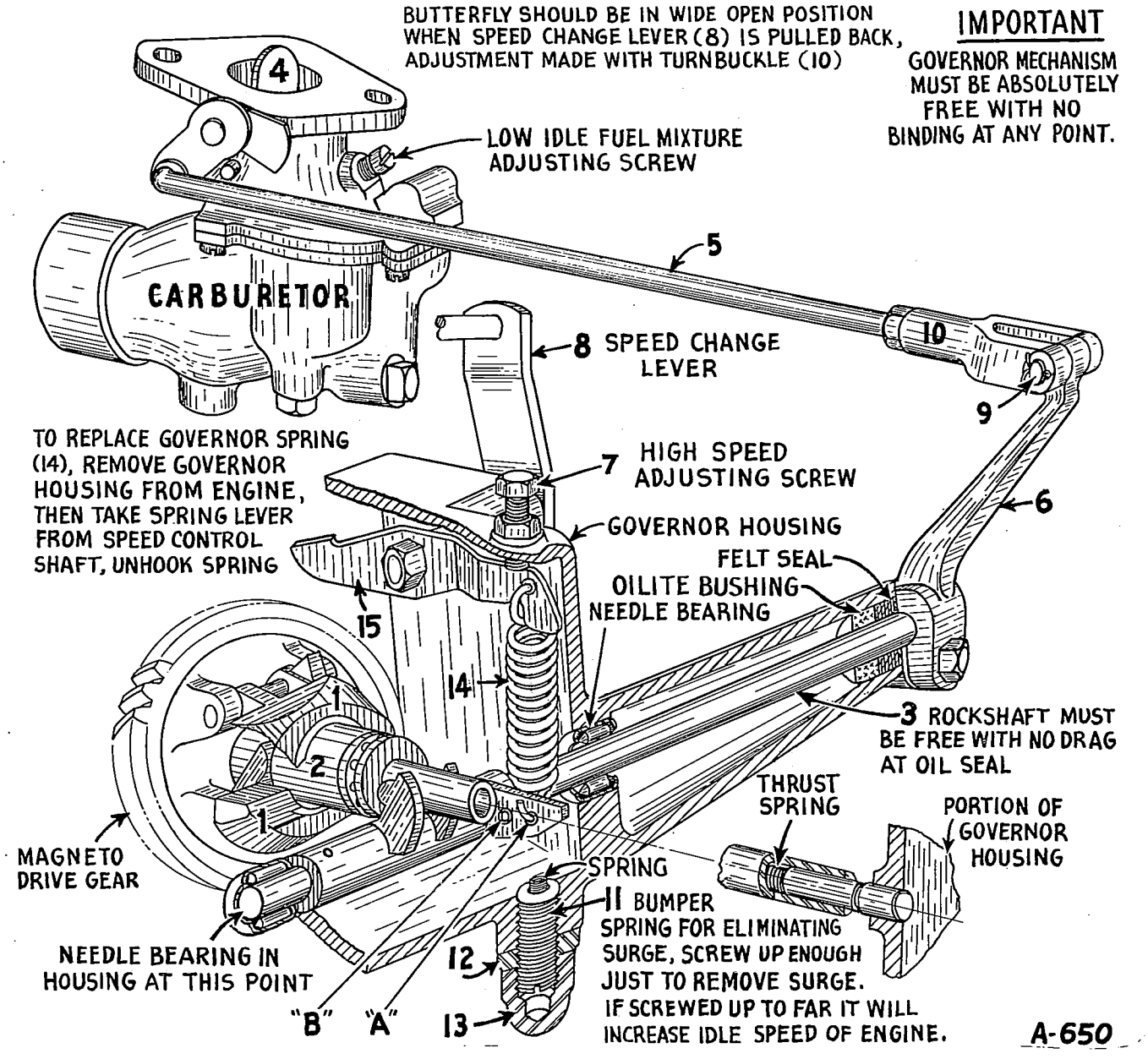


Illust. 28. Cross section of C-60 engine governor assembly.

speed, and also to provide sufficient speed to maintain the engine's rated load, the governed fast idle speed adjustment must be properly made. Be sure the service tachometer used is accurate. Do not expect the tractor tachometer to be sufficiently accurate for this operation. Adjustment procedure for all engines follows:

(a) Before adjustment is attempted, the engine must be brought up to operating temperature. Air cleaner oil and engine lubricant viscosity should be correct for the season of use and both should be near operating temperature.

(b) With engine running and accurate service tachometer in use, advance operator's engine speed control lever to maximum



Illust. 29. Schematic drawing of C-123 and C-135 engine governor. Assemble governor spring as shown, using hole "A" in rockshaft lever.

speed position. Be sure also that operator's speed change linkage is being held firmly against the governor maximum speed stop adjustment; reset linkage if necessary.

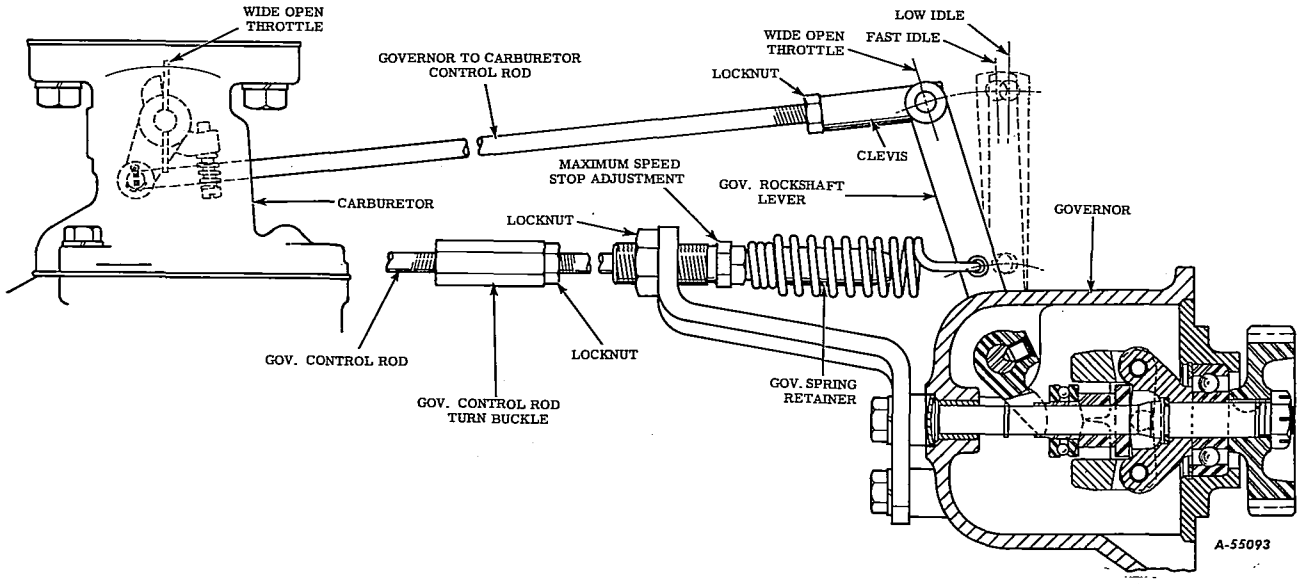
(c) Adjust the governor maximum speed stop screw or adjustment to secure specified fast idle speed. See reference and illustration numbers, Item 13, Illust. 20, Item 9, Illust. 21 and Item 6, Illust. 22. Be sure that governor speed change linkage is being held against the stop screw in its new position when the tachometer reading is taken.

Note: Adjustment of the maximum speed stop, to allow increased tension to be placed on the governor spring by the operator's engine speed control lever, will result in increased engine speed. Adjustment to reduce tension which can be placed on the governor spring, will result in reduced engine speed.

3. Low idle speed adjustment.

Smooth low speed engine operation depends upon careful adjustment of carburetor idle air-fuel mixture at the specified engine low idle speed. Good governor performance also is dependent on this smooth engine operation and free throttle shaft movement near closed throttle positions. Any tendency of the carburetor throttle to stick or bind in its low idle (closed) position will cause the governor to surge excessively. C-221 and C-263 engine carburetors have throttle shaft positioned off center to overcome tendency of manifold vacuum to hold throttle plate in closed position. Governors on the four cylinder engines are equipped with an adjustable bumper spring to counteract the effect of manifold vacuum on the closed position of the throttle.

Causes for binding or sticking of the throttle shaft are misalignment due to wear or interference due to improper assembly. Excessive tension adjustment of bumper spring, in an attempt to overcome these ills, will prevent the throttle from closing against its stop, resulting in great-



Illust. 30. Cross section of C-221 and C-263 engine governor.

er than specified low idle speed. See carburetor "Inspection and Repair" portion of this manual section.

Low idle speed adjustment for all engines:

(a) Start engine and allow it to reach operating temperature.

(b) Place operator's speed change lever in the extreme low speed position. See that operator's speed change lever linkage will allow the throttle to close against its stop screw. Adjust speed change linkage if necessary. See also that governor bumper spring adjustment is not interfering with closing of throttle (C-60, C-123, and C-135 engines only).

(c) Adjust carburetor throttle stop screw to secure the specified low idle speed and set idle fuel mixture screw for smoothest engine operation.

(d) Advance operators speed change lever for a few seconds and again idle the engine, rechecking adjustments for specified low idle speed and smoothest operation.

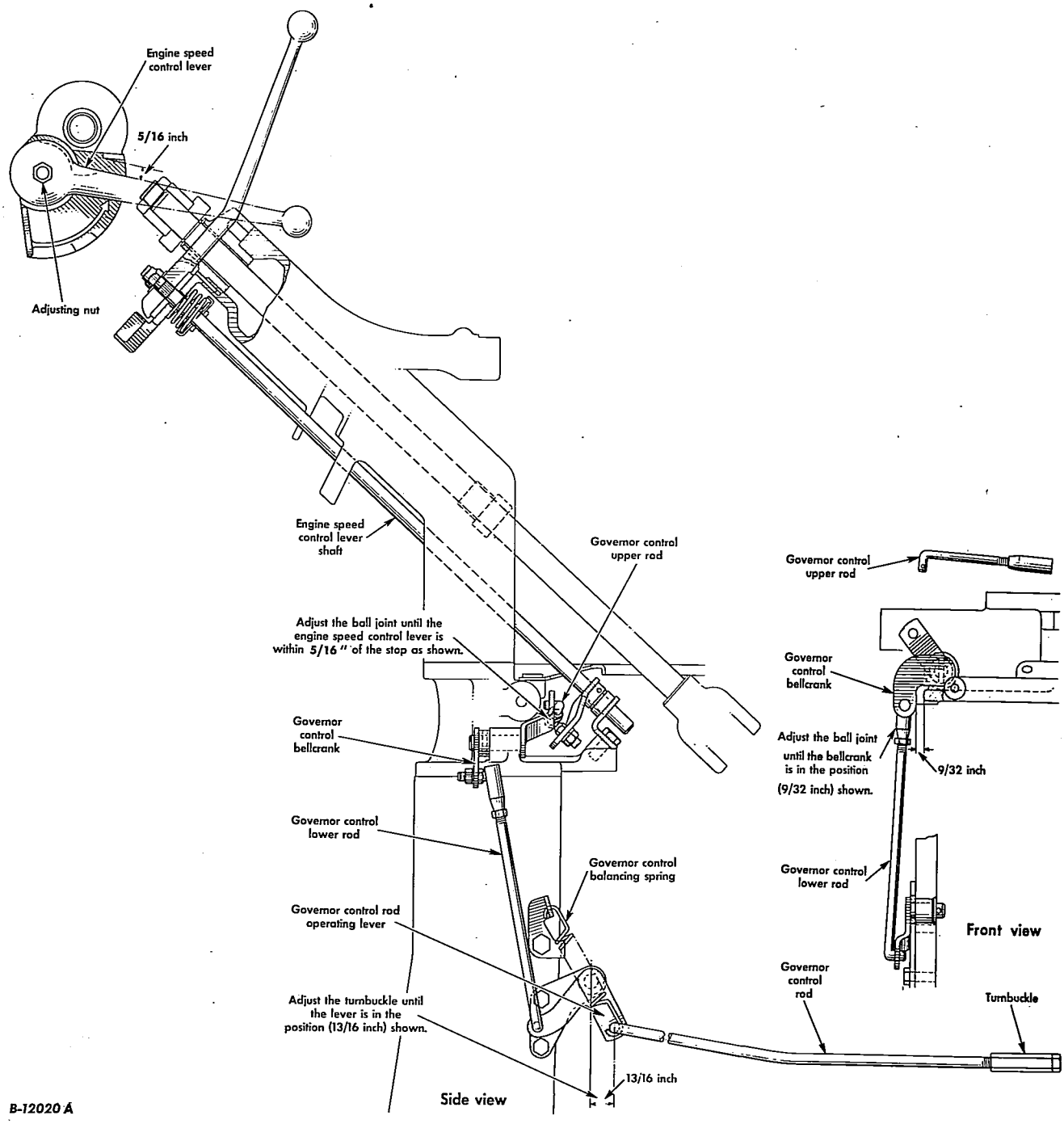
(e) Place operators speed change lever in maximum speed position. Notice the fast idle speed on service tachometer. With thumb and finger, pull carburetor throttle lever toward open position, sufficient to gain 50 rpm fast idle speed. Release throttle lever instantly; the governor will react by closing the throttle and opening again, seeking its balance. Under this condition two or three surges of the governor are considered normal. Excessive surging would indicate binding in carburetor throttle assembly or governor rockshaft and linkage assembly as outlined previously under carburetor and governor headings.

(f) Bumper Spring Adjustment (C-60, C-123 and C-135 engine governors only) may be turned in one-half turn at a time, just sufficient to reduce surging to normal. Test, as in operation (e) above, after each slight adjustment. If screwed in too far, the bumper spring will prevent the throttle from closing to low idle stop screw. Where such extreme setting of bumper spring is found necessary, it would indicate excessive friction or sticking is occurring in throttle assembly or governor rockshaft assembly. This should be corrected and the bumper spring readjusted.

4. Operator's engine speed control lever linkage.

In the preceeding adjustments covering fast idle and low idle speeds, it was noted that some readjustment of the operator's speed control lever linkage may be required in each case. This may have been found necessary in order to contact the maximum speed stop at one extreme, or to contact the throttle lever stop screw at the other extreme.

After both fast idle and low idle speed adjustments have been completed, it is suggested that both extremes of speed be rechecked with the service tachometer, to be sure that the operators control is capable of moving the system into contact with both stop adjustments. Failure to attain either stop (with engine running) would require readjustment of linkage. Where considerable lost motion in the linkage has occurred because of wear, the worn parts must be replaced to restore a full range of movement to governor speed change lever. Loose brackets, which act as supports for linkage levers and bellcranks, will also result in lost motion and failure to secure full range of engine speeds.



Illust. 31. Adjustments to correct engine speed control lever position. Farmall 460 and 560 series International 460 utility series tractors.

To insure an effective range of operator's engine speed control lever movement on the 460 and 560 Series Tractors, the following linkage adjustments are necessary. These basic settings are made with governor rockshaft lever in position to hold the carburetor throttle closed. They will result in a full range of governor movement in response to the hand lever movement where linkage is not worn excessively.

Farmall 460 and 560 Series Tractors

To correctly position the operator's engine speed control lever, proceed as follows:

(a) Set the governor at low idle by moving governor rockshaft lever to vertical position (to hold carburetor throttle closed against its stop screw). This governor position must be held until adjustments are completed.

(b) Disconnect the governor control balancing spring and the governor control rod and adjust turnbuckle (Illust. 30) until the governor control rod operating lever is in the position (13/16") shown in Illust. 30.

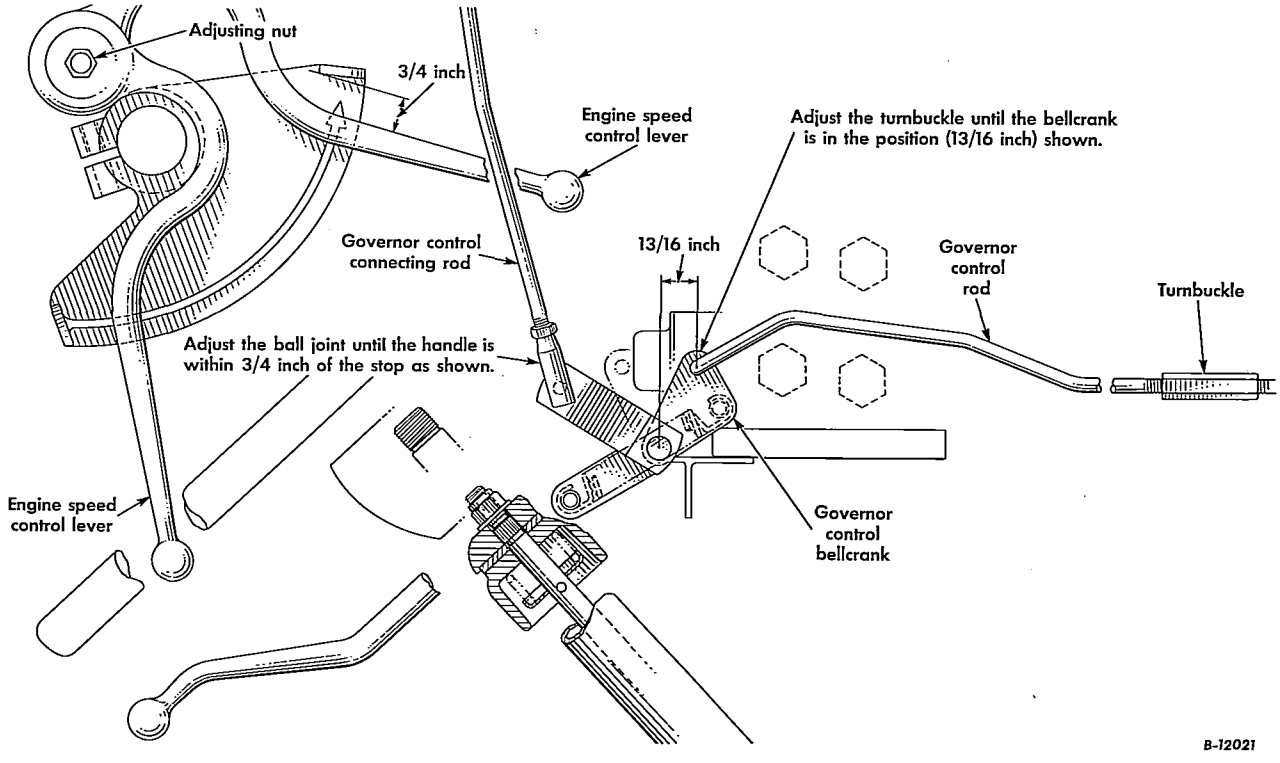
(c) Disconnect the governor control upper rod and adjust the ball joint on the governor control lower rod until the governor control bellcrank is in position (9/32") shown in Illust. 30.

(d) Adjust the ball joint on the governor control upper rod until the upper edge of the operator's speed control lever is within 5/16 inch of the upper stop on the sector. See Illust. 31. After adjustments are completed, connect the governor control upper and lower rods and governor control balance spring.

International 560 Tractor

To correctly position the operator's engine speed control lever, proceed as follows:

(a) Set the governor at low idle by moving governor rockshaft lever to vertical position (to hold carburetor throttle closed



Illust. 32. Adjustments to correct engine speed control lever position, International 560 tractors.

against its stop screw). This governor position must be held until adjustments are completed.

(b) Disconnect the governor control balancing spring and the governor control rod. Adjust turnbuckle (Illust. 32) until the governor control bellcrank is in position (13/16") shown.

(c) Disconnect the governor control connecting rod. Adjust the ball joint on the governor control connecting rod until the upper edge of the operator's speed control lever is within 3/4 inch of the upper stop on the sector. Illust. 32. After the adjustments are completed, connect the governor control rod and the governor control connecting rod. Replace the control balancing spring.

To prevent creeping of operator's engine speed control lever, more tension may be placed on the friction surfaces by tightening the adjusting nut which holds the operator's lever to its shaft (Illusts. 31 and 32). Be sure that friction surfaces are free from grease or oil. Replace worn control lever friction disc when adjustment will not correct creeping. Replace balancing spring if damaged or weak.

Where a service dynamometer is available, a very good final check of governor operation may be made. After adjustment #1, Sychronizing the Governor-to-Carburetor Throttle Movement, proceed as follows:

(a) Attach dynamometer, start engine and place under load for at least 30 minutes, to normalize operating temperatures of engine oil, air cleaner oil, fuel and transmission lubricant.

(b) Disengage power take-off, use accurate service tachometer and check fast idle speed. This must be within the specified range; correct if necessary. Check for governor surge as outlined under adjustment #3, Low Idle Speed paragraph (e).

(c) Re-engage power take-off, advance operator's speed control lever to full speed position and bring dynamometer load up slowly. Check carburetor throttle position with each slight increase in load.

Read the service tachometer at the instant the loading causes the throttle to reach its wide-open position (throttle lever against stop). This rpm should be within the range of Rated Load Speed as given in specifications.

Note: Failure to meet the range of rated load speed would indicate wrong governor spring in the assembly, weak governor spring, wear of spring hook ends or worn holes in spring levers; lost motion due to wear or loose assemblies; incorrect assembly of governor spring in rockshaft lever (C-123 and C-135 engines); or sluggish governor action due to excessive friction in moving parts.

(d) Low idle speed may be checked after power take-off is desengaged, to remove all load of P.T.O. drive and dynamometer from engine.

SERVICE BULLETIN RECORD

Important: Information in this manual section is subject to change or supplementing from time to time as a result of field experience and engineering modifications. As Service Bulletins are received, record them on this page for handy reference whenever this manual is to be used...Print entries in ink.

Bulletin No.	Date Issued	Book No.	Topic or part of machine involved.

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