



California Vocational Agriculture Curriculum Guidelines Instructional Unit

SMALL GAS ENGINES: IGNITION SYSTEMS

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SMALL GAS ENGINES: IGNITION SYSTEMS

Unit Goals:

To assist the student in developing their ability to recognize the different types of ignition systems, their component parts, and how to maintain and make adjustments on them.

Unit Performance Objectives:

Upon completion of this unit the student will be able to:

1. Be able to identify different types of ignition systems.
2. Be able to identify and explain the functions of a magento ignition system.
3. Make the correct adjustment on the breaker points.
4. Check and correct the air gap on the stator-plate.
5. Check the gap on a spark plug.
6. Test a spark plug.

Teaching Outline

- I. Ignition: To produce a high voltage current to ignite the fuel-air mixture in the engine cylinder.

- II. Types of Ignition Systems
 - A. Battery ignition system - Uses battery to supply source of current for the primary ignition circuit.

 - B. Magneto ignition system - (TM - 1) Produces current by magnetic induction for the primary ignition circuit without any outside source of electricity.
 1. Flywheel type
 2. External mounted

 - C. Solid state ignition system - Uses semiconductors in place of one or more standard ignition components.

 - D. Breakerless ignition system - Uses electronic parts in place of mechanically operated ignition points.

- III. Components of a Magneto Ignition System (TM - 1)
 - A. Primary system (low voltage)
 1. Flywheel with magnets
 2. Armature
 3. Switch stop
 4. Coil
 5. Contact points
 6. Condenser

 - B. Secondary system (high voltage)
 1. Spark plug
 2. High voltage wire

- IV. Components of a Solid State Ignition System (TM - 2)
 - A. Flywheel with magnets
 - B. Trigger coil
 - C. Resistor
 - D. Transistorized rectifier (solid state switch)
 - E. Diode rectifier
 - F. Ignition coil
 - G. Low voltage wire

(NOTE: The same secondary circuit components are used on the solid state ignition system that are used on the magneto ignition system.)

Suggested Learning Activities

- II. 1. Show different types of ignition systems. Have students look at junk engines, maybe they can bring some from home.
- III. 2. Disassemble ignition system and show students the different parts. Identify them.
- IV. 3. Identify the parts of a solid state ignition system.

Suggested Resource Materials

- 1. Briggs & Stratton Repair Instructions; VEP small gas engines for OH.
- 2. TM - 1,1A; AAVIM; Mid America.
- 3. TM - 2,2A; Texas VoAg Curriculum Materials.

V. Purpose of the Ignition System Components

- A. Battery - Source of electrical power
- B. Ignition switch - Opens and closes the primary circuit from the battery or coil to the contact points
- C. Coil - Transforms low voltage into high voltage necessary to jump the spark plug gap
- D. Contact points - Make and break the primary circuit to allow the coil to produce high voltage at the spark plug
- E. Condenser - Stores extra current as the contact points open to prevent arcing and burning
- F. Breaker cam - Opens the contact points
- G. Diode rectifier - Changes alternating (AC) current to direct (DC) current
- H. Capacitor - Used in solid state ignition systems and operates like the condenser
- I. Trigger coil - Generates a small amount of current that is used to activate the current from the capacitor
- J. Resistor - Reduces voltage in the primary circuit to protect the contact points
- K. Spark plug - Provides a spark gap inside the engine cylinder to ignite the fuel-air mixture
- L. Low voltage wire - Carries low voltage from the battery or armature to the primary side of the ignition coil
(NOTE: This is a wire with thin insulation.)
- M. High voltage wire - Carries high voltage from the secondary side of the coil to the spark plug
(NOTE: This is a heavily insulated wire.)

VI. Ignition System Adjustments (NOTE: Check operator's manual for correct clearances)

- A. Breaker point adjustment (TM - 3)
- B. Air gap on stator-plate (TM - 4)
- C. Spark plug gap (TM - 5)

Suggested Learning Activities

VI.

1. Demonstrate how to perform adjustments. Have students make same adjustments.
2. Visit local small tool rental shop or small engine repair shop.

Suggested Resource Materials

1. Operator's manuals from same companies as the engines you have.
2. Local businesses working on small gas engines.

Student Evaluation

1. State the purpose of the ignition system.

2. Match the types of ignition systems on the right to the correct descriptions.

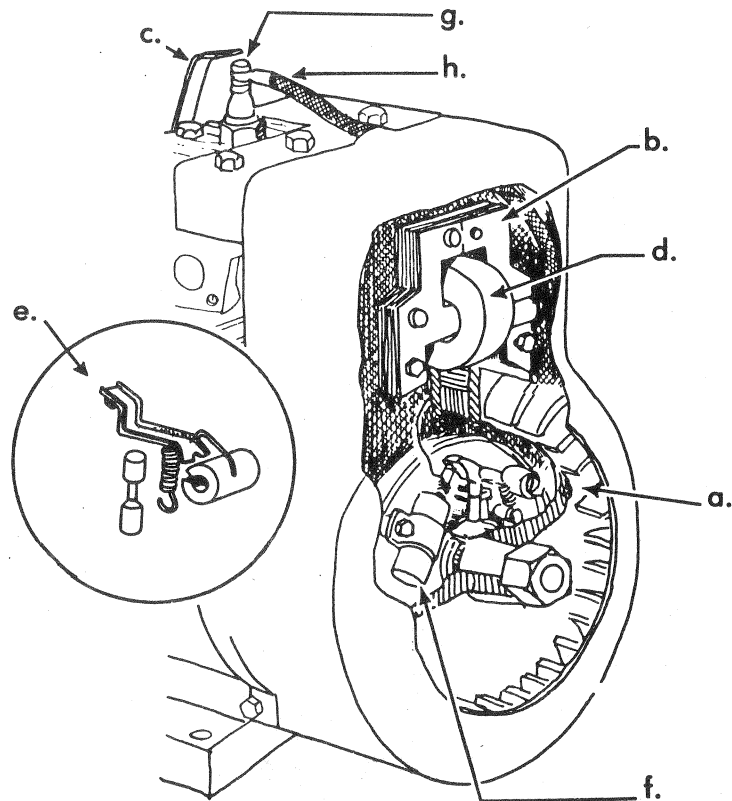
- | | |
|---|---|
| <p>_____ a. Produces current by magnetic induction for the primary ignition circuit without any outside source of electricity.</p> <p>_____ b. Uses semiconductors in place of one or more standard ignition components.</p> <p>_____ c. Uses electronic parts in place of mechanically operated ignition points.</p> <p>_____ d. Uses battery to supply source of current for the primary ignition circuit</p> | <p>1. Battery ignition system</p> <p>2. Magneto ignition system</p> <p>3. Breakerless ignition system</p> <p>4. Solid state ignition system</p> |
|---|---|

3. Distinguish between the components of the primary and secondary battery ignition circuits by placing a "P" in front of the components in the primary ignition circuit and an "S" in front of those in the secondary ignition circuit.

- | | |
|---|---|
| <p>_____ a. Resistance unit (resistor)</p> <p>_____ b. Condenser</p> <p>_____ c. Ignition switch</p> <p>_____ d. Flywheel with magnets</p> <p>_____ e. Armature</p> | <p>_____ f. High voltage wire</p> <p>_____ g. Low voltage wire</p> <p>_____ h. Contact points</p> <p>_____ i. Spark plug</p> <p>_____ j. Coil</p> |
|---|---|

4. Identify the components of a magneto ignition system.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____
- g. _____
- h. _____

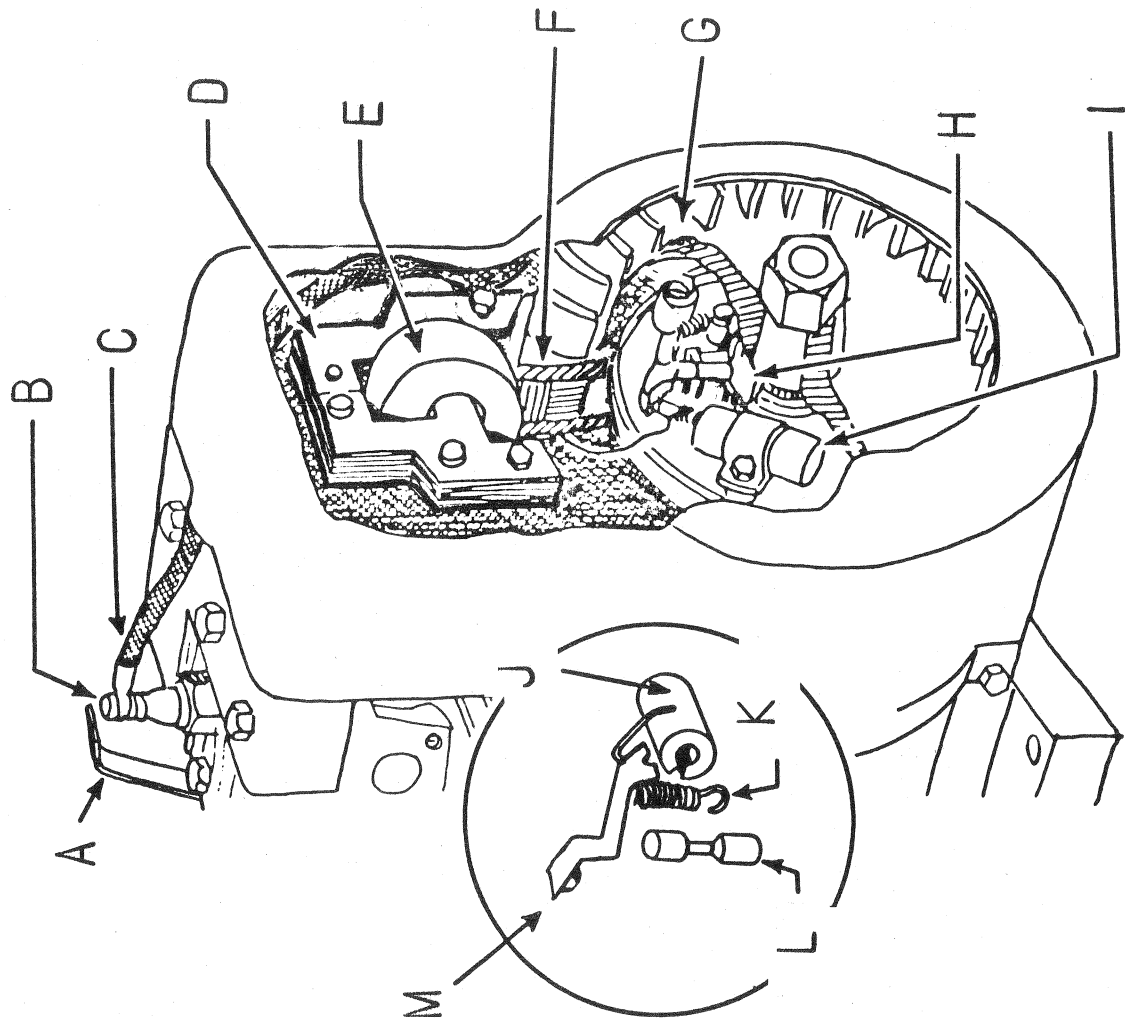


Student Evaluation (continued)

5. Match the components of the ignition system on the right to the correct purposes.

- | | |
|---|----------------------|
| _____ a. Source of electrical power | 1. Trigger coil |
| _____ b. Opens and closes the primary circuit from the battery or coil to the contact points | 2. Spark plug |
| _____ c. Transforms low voltage into high voltage necessary to jump the spark plug gap | 3. Coil |
| _____ d. Make and break the primary circuit to allow the coil to produce high voltage at the spark plug | 4. Resistor |
| _____ e. Stores extra current as the contact points open to prevent arcing and burning | 5. High voltage wire |
| _____ f. Opens the contact points | 6. Breaker cam |
| _____ g. Changes alternating (AC) current to direct (DC) current | 7. Battery |
| _____ h. Used in solid state ignition systems and operates like the condenser | 8. Diode rectifier |
| _____ i. Generates a small amount of current that is used to activate the current from the capacitor | 9. Contact points |
| _____ j. Reduces voltage in the primary circuit to protect the contact points | 10. Low voltage wire |
| _____ k. Provides a spark gap inside the engine cylinder to ignite the fuel-air mixture | 11. Ignition switch |
| _____ l. Carries low voltage from the battery or armature to the primary side of the ignition coil | 12. Capacitor |
| _____ m. Carries high voltage from the secondary side of the coil to the spark plug | 13. Condenser |

MAGNETO IGNITION SYSTEM



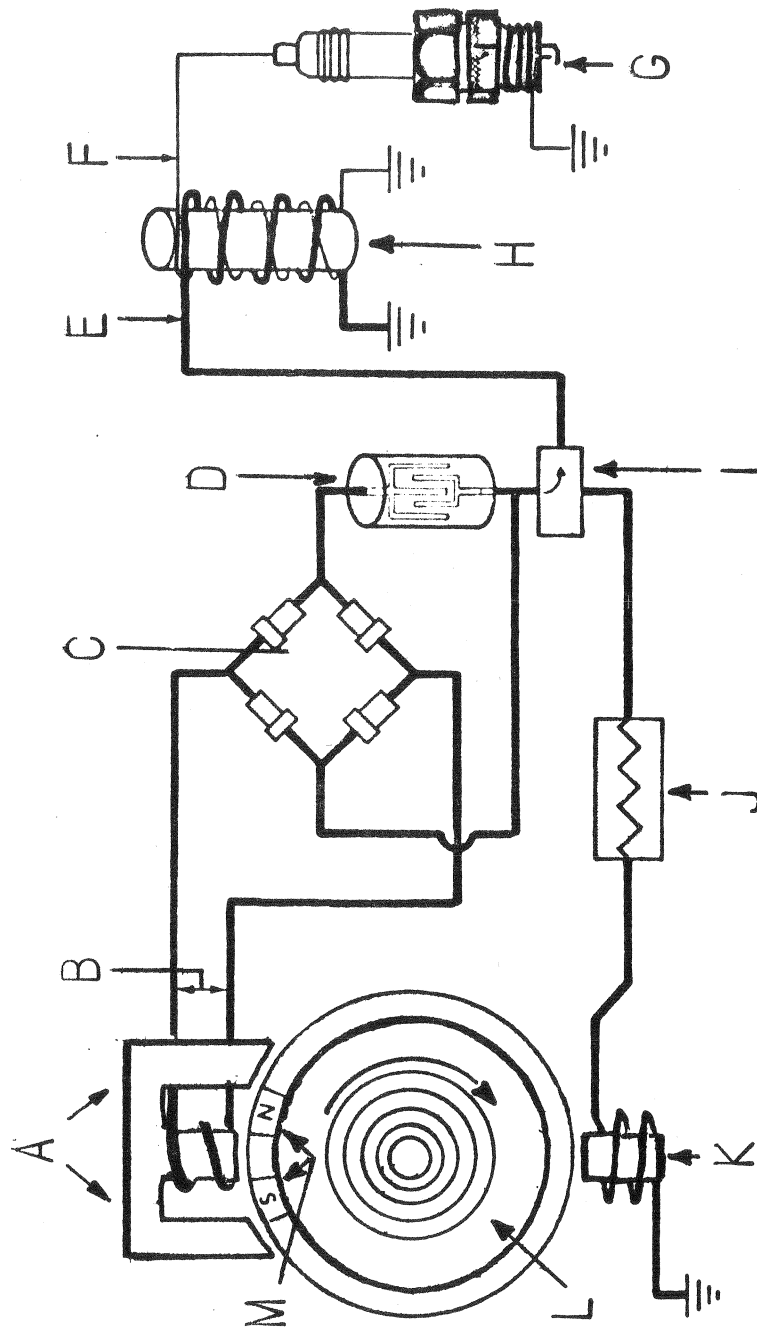
A B C D E F G H I J K L M

MAGNETO IGNITION SYSTEM

TM-1A

- A. Switch Stop
- B. Spark Plug
- C. High Voltage Wire
- D. Armature
- E. Coil
- F. Magnet
- G. Flywheel (Rotor) with Magnets
- H. Flat on Crankshaft
- I. Condenser
- J. Support
- K. Spring
- L. Plunger
- M. Contact Point

SOLID-STATE IGNITION SYSTEM



A: B: C: D: E: F: G: H: I: J: K: L: M:

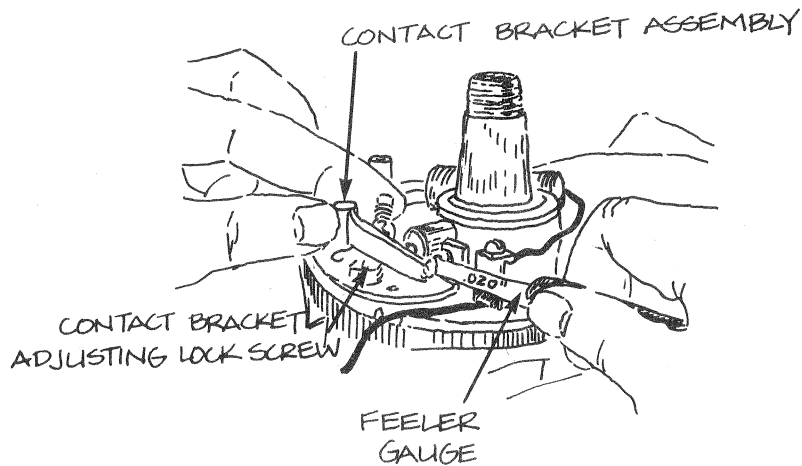
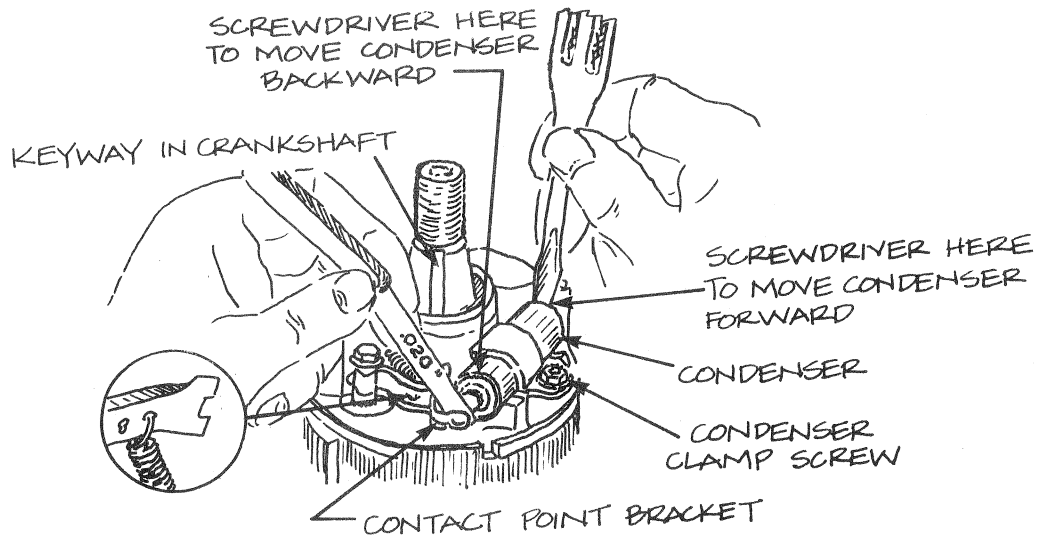
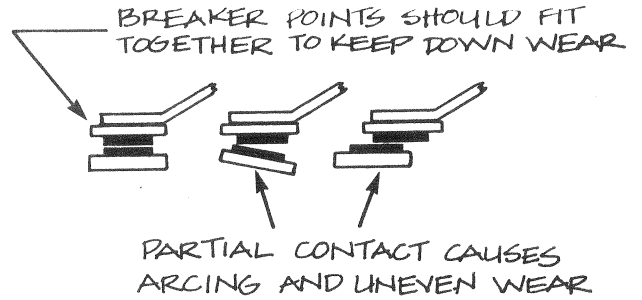
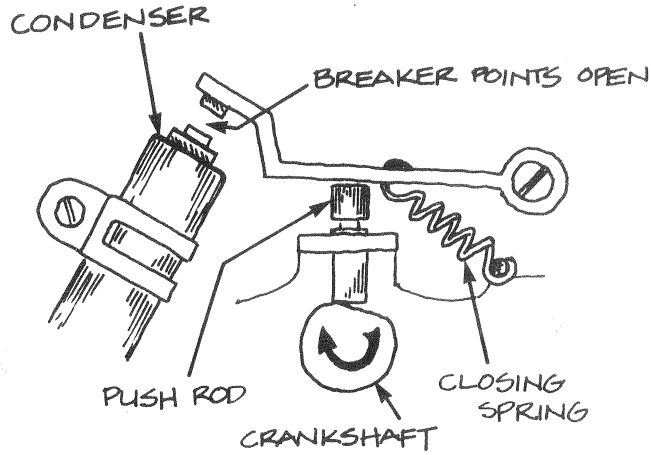
TM-2

SOLID-STATE IGNITION SYSTEM TM-2A

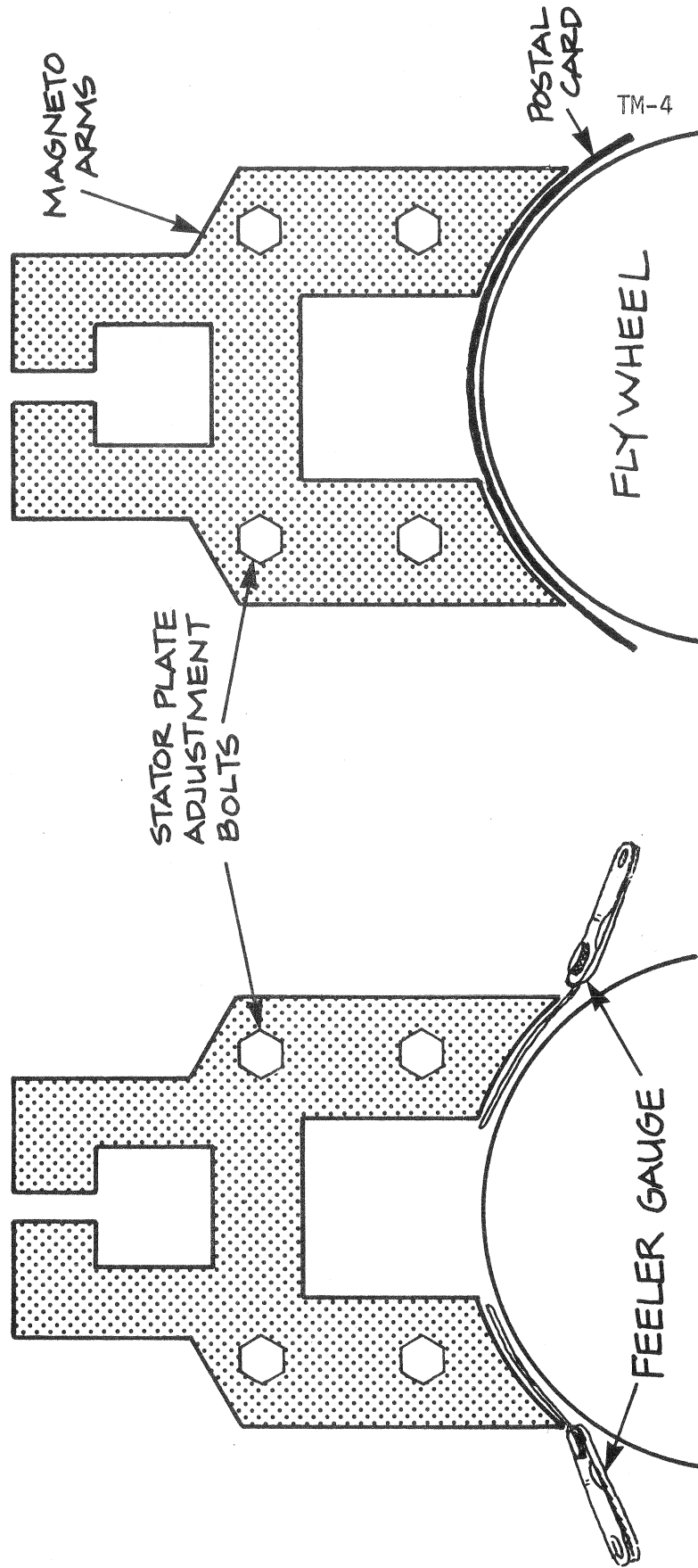
- A. Pole Pieces
- B. A.C. (Alternating Current)
Lines
- C. Rectifier
- D. Capacitor
- E. Primary Circuit
- F. Secondary Circuit
- G. Spark Plug
- H. Coil
- I. Switch
- J. Resistor
- K. Trigger Coil
- L. Flywheel
- M. Magnets

DISTRIBUTOR ADJUSTMENTS

TM-3

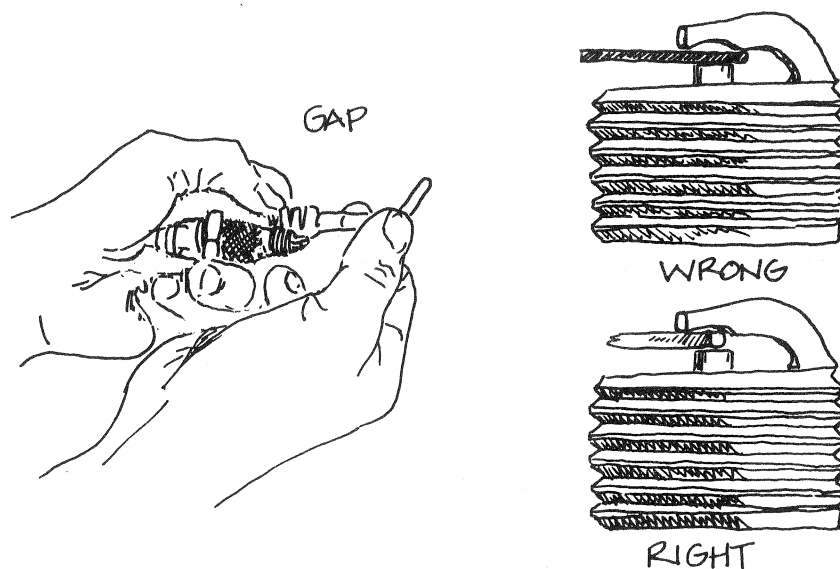
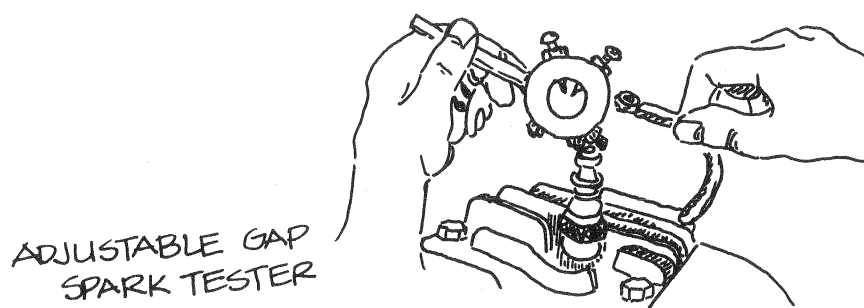
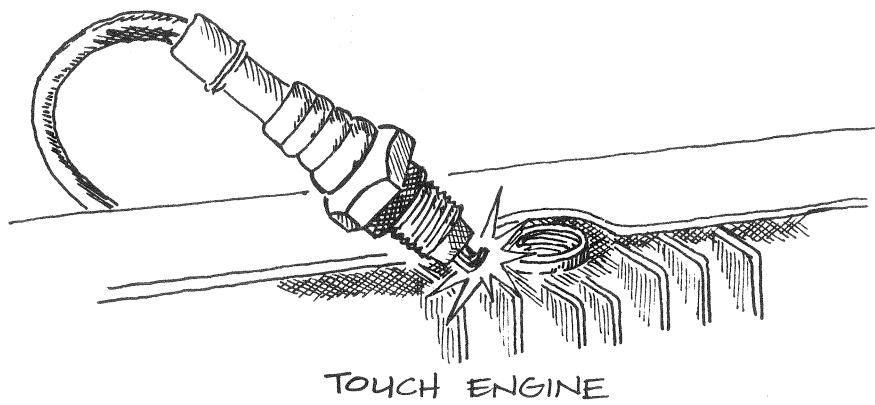


STATOR PLATE AIR GAP



SPARK CHECK

TM-5



General References

Briggs & Stratton Corp.
Milwaukee, Wisconsin 53201

MAVQC Small Engine Repair
Mid-America Vocational Curriculum Consortium
1515 West Sixth Avenue
Stillwater, Oklahoma 74074

AAVIM Small Engines Vol. I and II
American Association for Vocational Instructional Materials
Engineering Center
Athens, Georgia 30602

Texas Curriculum Materials
Vocational Instructional Materials
Texas A & M University
College Station, Texas 77843