TECHNICAL
SERVICE MANUAL

OPERATION, SERVICE AND REPAIR

of

C. C. W.
ENGINES

Models

C. C. W. 340
C. C. W. 400
C. C. W. 440

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CANADIAN CURTISS-WRIGHT, LIMITED
500 CARLINGVIEW DRIVE, REXDALE, ONTARIO

PHONE: 677-3930—TELEX: 02-29647

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INTRODUCTION AND TECHNICAL DATA

1.1 INTRODUCTION

1.2 This manual contains instructions for the operation, service and repair of Canadian Curtiss-Wright CCW 340, CCW 400 and CCW 440 two cycle engines.

1.3 The Model CCW 340/400/440 engine is shown in Figure 1 1. One illustration is used, since the three engines are similar in external appearance. These engines are designed for use in various snowmobile configurations and are suitable for use in All Terrain Vehicles or similar applications.

1.4 The instructions detail the procedures and tools required to ensure efficient operation, servicing and repair of the engine and component parts. Refer to Parts Catalogue for tool cross-reference.
Engine nuts, bolts and threads are metric except for the engine mounting bolts, which are 7/16" SAE coarse, and the power take off (P.T.O.) end of the crankshaft which is 1/2" SAE fine (20TPI).

1.5 Carburetion data for the engine models covered in this manual is detailed under separate instructions. For carburetor technical requirements refer to Appendix I, or to applicable manufacturer's specifications.

1.6 MODEL DESIGNATION

1.7 The letters and numbers in the subject engine models designate the following:—

CCW	—	Manufacturer's type designation.
340/400/440	—	Cubic centimeter displacement
	— S	Manual Start
	— E	Electric Starter
	— G	Geared flywheel (for subsequent electric starter installation).

SERIAL NOS. COMMENCING	MODEL	
18	CCW 400/1	
19	CCW 340/1	For Physical
25	CCW 440/1	Differences
28	CCW 400/2	See Spec. Sheet
29	CCW 340/2	Page 1.4
35	CCW 440/2	
38	CCW 400/3	
39	CCW 340/3	

NOTES

a. Models CCW 340 of serial nos. 19— and 29—, manual start version are equipped with a Sawafuji ignition system comprised of one low voltage generating coil and two high voltage coils of opposite polarity.

b. Models CCW 340 of serial nos. 19-- and 29— electric start and gear ring equipped, 340 ser. no. 39—, and CCW 400 all models, all versions are equipped with a Kokusan ignition system comprised of two low voltage generating coils and two high voltage coils all of the same polarity.

c. Models CCW 440 all models, all versions are equipped with Denso ignitions comprised of two low voltage generating coils and two high voltage coils all of the same polarity.

1.8 TECHNICAL DATA

Table 1-1 details specifications applicable to all models of the CCW 340, 400, 440 engines in service at the present time.

1.9 TOOL REQUIREMENT

The following is a list of tools required for the overhaul and adjustment of models CCW 340, 400 and 440 engines.

a. Special Tools	**Reference**
Tool, Flywheel puller Part 43-0790-90	Para. 3.2.1 (1)
Tool, Main Spring, Starter Rewind. 43-0797-60	Para. 4.4
Tool, Bearing puller (crankshaft). Part 43-0791-70	Para. 4.8.1
Tool, Flywheel Locking. Part 43-0798-40	Para. 3.2.1(j)
Tool, Fan Pulley Locking. 43-0792-50	Para. 4.2.1(a)

b. Standard Tools

10/13 mm spanner	
13/21 mm Box spanner and handle	Feeler Gauge
22 mm spanner	Spark plug tap
22 mm socket wrench and ratchet	Spark plug wire gauge
Piston ring removal tool	Thread Cleaning tools
Piston ring compressor	Wire brush (spark plugs)
Piston ring groove cleaning tool	Soft metal (non ferrous)
Circlip removal tool	
Torque wrench (pounds feet)	Phillips screw driver set
Dial indicator	Common screw drivers
Degree wheel	Soft hammer

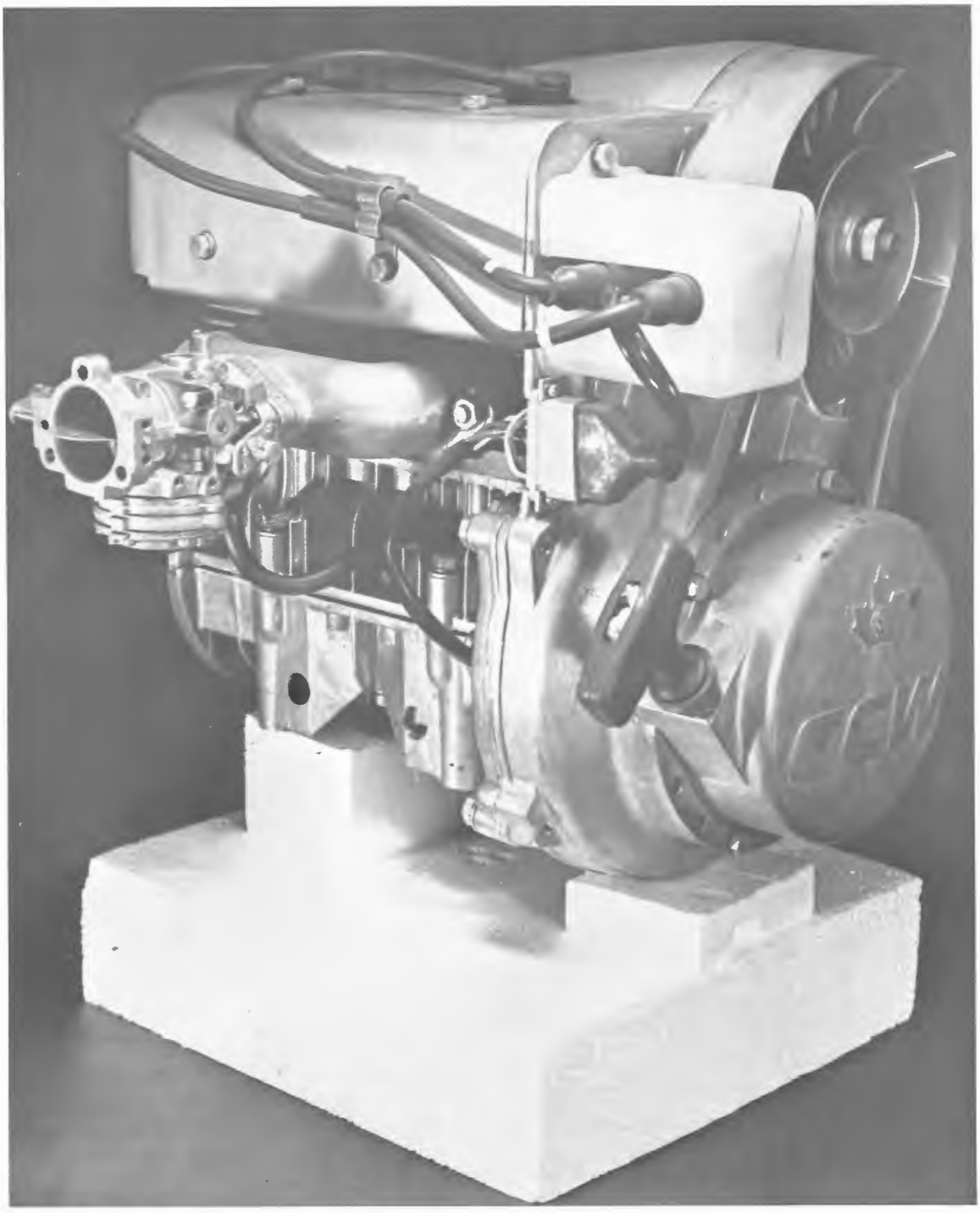
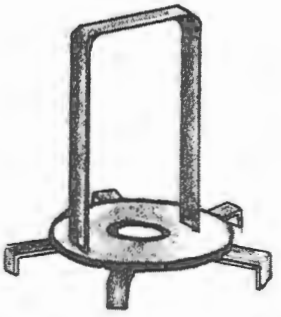


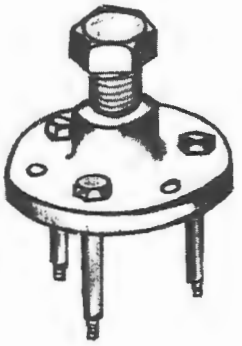
Fig. 1-1 Model KEC 340/400 Engine – Left Side View from Flywheel end.

CCW TOOL LIST

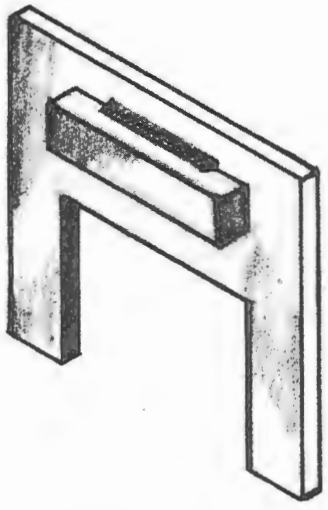
43-0791-70
BEARING PULLER



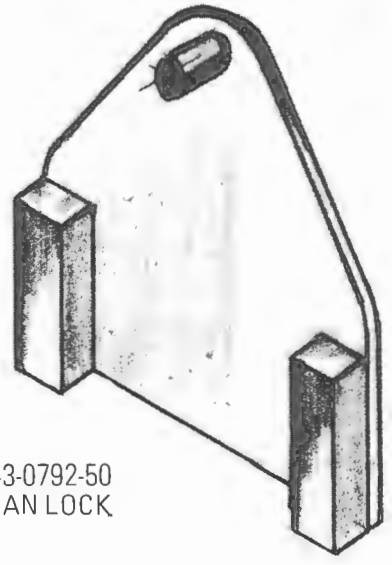
43-0797-60
REWIND SPRING TOOL



43-0790-90
FLYWHEEL PULLER



43-0798-40
FLYWHEEL LOCK



43-0792-50
FAN LOCK

TABLE 1-1 **TECHNICAL DATA CCW-340 MODELS**

SPECIFICATION	CCW 340 SER. 2900000 2999999	CCW 340 SER. 3900000 3999999
Cycle:	Two stroke	Two stroke
Number of cylinders:	Two	Two
Displacement:	339 cc (20.9 cu.in.)	339 cc (20.9 cu.in.)
Stroke:	60 mm (2.36 in.)	60 mm (2.36 in.)
Bore:	60 mm (2.36 in.)	60 mm (2.36 in.)
Compression ratio:	8.5	8.2
Rating:	25 BHP at 5800 rpm	28 BHP 6500 rpm
Maximum torque:	(23 lbs.ft.) at 5250 rpm	(22.4 lbs.ft) at 6000 rpm
Specific fuel consumption under full load:	400 gr/ps.h (0.88 lb/ps.h)	400 gr/ps.h (0.88 lb/ps.h)
Ignition system:	Auto-advanced flywheel ignition with lighting coil 12V-75W	Auto-advanced flywheel ignition with lighting coil 12V-75W
Contact breaker gap:	0.3 to 0.4 mm (.012 to .016 in.)	0.3 to 0.4 mm (.012 to .016 in.)
Ignition timing setting when fully advanced:	23° BTDC	2[illegible]° BTDC
(Static timing setting): BTDC	8° (.015" BTDC on Piston)	10° (.023" BTDC on Piston)
Spark Plug:	NGK B 8H or equivalent	NGK B 8H or equivalent
Spark plug gap:	0.5 to 0.6 mm (0.020 to 0.024 in.)	0.5 to 0.6 M.M. (0.020 to 0.024 in.)
Starter system:	Rewind starter with emergency starting pulley or electric starter (output 0.5 kw)	Rewind starter with emergency starting pulley or electric starter (output 0.5 kw)
Carburetor:	Tillotson HR or equivalent	Tillotson HR or equivalent
Fuel:	Mixture, gasoline of known brand and special air cooled two stroke engine oil. (See Table 2-2)	Mixture, gasoline of known brand and special air cooled two stroke engine oil. (See Table 2-2)
Mixture ratio:	20:1 (at normal operating conditions)	20:1 (at normal operating conditions)
Rotation direction of engine:	Left hand (standard configuration) see toward the power take off end of the engine.	Left hand (standard configuration) see toward the power take off end of the engine.
Weight:	60 lbs.	60 lbs.
Inlet port, timing	138°	154°
height	23 mm	25 mm
width	42 mm	45 mm
Exhaust port, timing	168°	168°
height	23 mm	23 mm
width	28 mm	36 mm
Piston height:	67 mm	66 mm
Piston ring, chromium plate, top	1	1
Piston ring, gray cast-iron, bottom	1	1
Cylinder head, volume	16.35 cc	16.3 cc
Cooling fan, blades	8	10
ratio	1.81:1	1.81:1
Magneto, make 340S only	Sawafuji	Kokusan
340 GE	Kokusan	Kokusan
IGNITION COILS (340S)	Sawafuji	Kokusan
Resistance, primary	.37 ohms ± 15%	1.65 ohms ± 10%
Resistance secondary	8.35 K ohms ± 15%	5.2 K ohms ± 10%
Current rating	1.75/2.25 amps	1.5/1.75 amps
Spark in free air (three needle gap)	8 mm @ 500 RPM 15 mm @ 5,500 RPM	9 mm @ 500 RPM 16 mm @ 5,500 RPM

(For Models G & E see Kokusan Data under CCW 340 Ser. 39–)

TABLE 1-1

TECHNICAL DATA CCW-400 MODELS

SPECIFICATION	CCW 400 SER. 2800000 2899999	CCW 400 SER. 3800000 3899999
Cycle:	Two stroke	Two stroke
Number of cylinders:	Two	Two
Displacement:	398 cc (24.3 cu.in.)	398 cc (24.3 cu.in.)
Stroke:	60 mm (2.36 in.)	60 mm (2.36 in.)
Bore:	65 mm (2.56 in.)	60 mm (2.56 in.)
Compression ratio:	8.5	8.2
Rating:	30 BHP at 5800 rpm	33 BHP 6500 rpm
Maximum torque:	(27.3 lbs.ft.) at 5500 rpm	(26.7 lbs.ft) at 6000 rpm
Specific fuel consumption under full load:	400 gr/ps.h (0.88 lb/ps.h)	400 gr/ps.h (0.88 lb/ps.h)
Ignition system:	Auto-advanced flywheel ignition with lighting coil 12V-75W	Auto-advanced flywheel ignition with lighting coil 12V-75W
Contact breaker gap:	0.3 to 0.4 mm (.012 to .016 in.)	0.3 to 0.4 mm (.012 to .016 in.)
Ignition timing setting when fully advanced:	23° BTDC	23° BTDC
(Static timing setting): BTDC	8° (.015" BTDC on Piston)	10° (.023" BTDC on Piston)
Spark Plug:	NGK B 8H or equivalent	NGK B 8H or equivalent
Spark plug gap:	0.5 to 0.6 mm (0.020 to 0.024 in.)	0.5 to 0.6 M.M. (0.020 to 0.024 in.)
Starter system:	Rewind starter with emergency starting pulley or electric starter (output 0.5 kw)	Rewind starter with emergency starting pulley or electric starter (output 0.5 kw)
Carburetor:	Tillotson HR or equivalent	Tillotson HD or equivalent
Fuel:	Mixture, gasoline of known brand and special air cooled two stroke engine oil. (See Table 2-2)	Mixture, gasoline of known brand and special air cooled two stroke engine oil. (See Table 2-2)
Mixture ratio:	20:1 (at normal operating conditions)	20:1 (at normal operating conditions)
Rotation direction of engine:	Left hand (standard configuration) see toward the power take off end of the engine.	Left hand (standard configuration) see toward the power take off end of the engine.
Weight:	60 lbs.	60 lbs.
Inlet port, timing	138°	146°
height	26 mm	25 mm
width	46 mm	48 mm
Exhaust port, timing	168°	168°
height	23 mm	23 mm
width	38 mm	40 mm
Piston height:	67 mm	66 mm
Piston ring, chromium plate, top	1	1
Piston ring, gray cast-iron bottom	1	1
Cylinder head, volume	17.0 cc	18.2 cc
Cooling fan blades	8	10
ratio	1.81:1	2.23:1
MAGNETO	Kokusan	Kokusan
IGNITION COILS	Kokusan	Kokusan
Resistance, primary	1.65 ohms ± 10%	1.65 ohms ± 10%
Resistance, secondary	5.2 K ohms ± 10%	5.2 K ohms ± 10%
Current rating	1.5/1.75 amps	1.5/1.75 amps
Spark in free air (three needle gap)	9 mm @ 500 RPM 16 mm @ 5,500 RPM	9 mm @ 500 RPM 16 mm @ 5,500 RPM

TABLE 1-1 **TECHNICAL DATA CCW-440 MODELS**

SPECIFICATION	CCW 440 SER. 2500000 2599999	CCW 440 SER. 3500000 3599999
Cycle:	Two stroke	Two stroke
Number of cylinders:	Two	Two
Displacement:	440 cc (26.6 cu.in.)	440 cc (26.6 cu.in.)
Stroke:	60 mm (2.36 in.)	60 mm (2.36 in.)
Bore:	68 mm (2.68 in.)	68 mm (2.68 in.)
Compression ratio:	7.8	7.8
Rating:	33 BHP at 6000 rpm	37 BHP 6500 rpm
Maximum torque:	(30.5 lbs.ft.) at 6000 rpm	(29.6 lbs.ft) at 5750 rpm
Specific fuel consumption under full load:	400 gr/ps.h (0.88 lb/ps.h)	400 gr/ps.h (0.88 lb/ps.h)
Ignition system:	Auto-advanced flywheel ignition with lighting coil 12V-75W	Auto-advanced flywheel ignition with lighting coil 12V-75W
Contact breaker gap:	0.3 to 0.4 mm (.012 to .016 in.)	0.3 to 0.4 mm (.012 to .016 in.)
Ignition timing setting when fully advanced:	23° BTDC	23° BTDC
(Static timing setting): BTDC	8° (.015" BTDC on Piston)	8° (.015" BTDC on Piston)
Spark Plug:	NGK B 8H or equivalent	NGK B 8H or equivalent
Spark plug gap:	0.5 to 0.6 mm (0.020 to 0.024 in.)	0.5 to 0.6 M.M. (0.020 to 0.024 in.)
Starter system:	Rewind starter with emergency starting pulley or electric starter (output 0.5 kw)	Rewind starter with emergency starting pulley or electric starter (output 0.5 kw)
Carburetor:	Tillotson HR or equivalent	Tillotson HD or equivalent
Fuel:	Mixture, gasoline of known brand and special air cooled two stroke engine oil. (See Table 2-2)	Mixture, gasoline of known brand and special air cooled two stroke engine oil. (See Table 2-2)
Mixture ratio:	20:1 (at normal operating conditions)	20:1 (at normal operating conditions)
Rotation direction of engine:	Left hand (standard configuration) see toward the power take off end of the engine.	Left hand (standard configuration) see toward the power take off end of the engine.
Weight:	60 lbs.	60 lbs.
Inlet port, timing	150°	154°
height	25 mm	26 mm
width	46 mm	48 mm
Exhaust port, timing	168°	168°
height	23 mm	23 mm
width	41 mm	43 mm
Piston height:	66 mm	66 mm
Piston ring, chromium plate, top	1	1
Piston ring, gray cast-iron, bottom	1	1
Cylinder head, volume	22.8 cc	23.7 cc
Cooling fan, blades	10	10
ratio	1.81:1	2.23:1
MAGNETO	Denso	Denso
IGNITION COILS	Denso	Denso
Resistance, primary	.37 ohms ± 10%	.37 ohms ± 10%
Resistance secondary	8.35 K ohms ± 15%	8.35 K ohms ± 15%
Current rating	1.75/2.25 amps	1.75/2.25 amps
Spark in free air	9 mm @ 500 RPM	8 mm @ 500 RPM
(three needle gap)	15 mm @ 5,500 RPM	15 mm @ 5,500 RPM

SECTION 11

OPERATION AND SERVICE INSTRUCTIONS

2.1 PRINCIPLES OF OPERATION

a. The CCW two stroke engine is designed to complete in one revolution, or two strokes of the piston, the complete cycle of (a) fuel/air induction, (b) compression of the fuel mixture, (c) combustion, (d) exhaust of the burned gases.

b. The construction of the engine requires a sealed crankcase and a cylinder having four carefully positioned ports as follows:
   1. Carburetor inlet for induction of the fuel/air mixture.
   2. Two transfer ducts leading to transfer ports for transferring the mixture from the crankcase to the combustion chamber.
   3. Exhaust port for exhausting the burned gases.

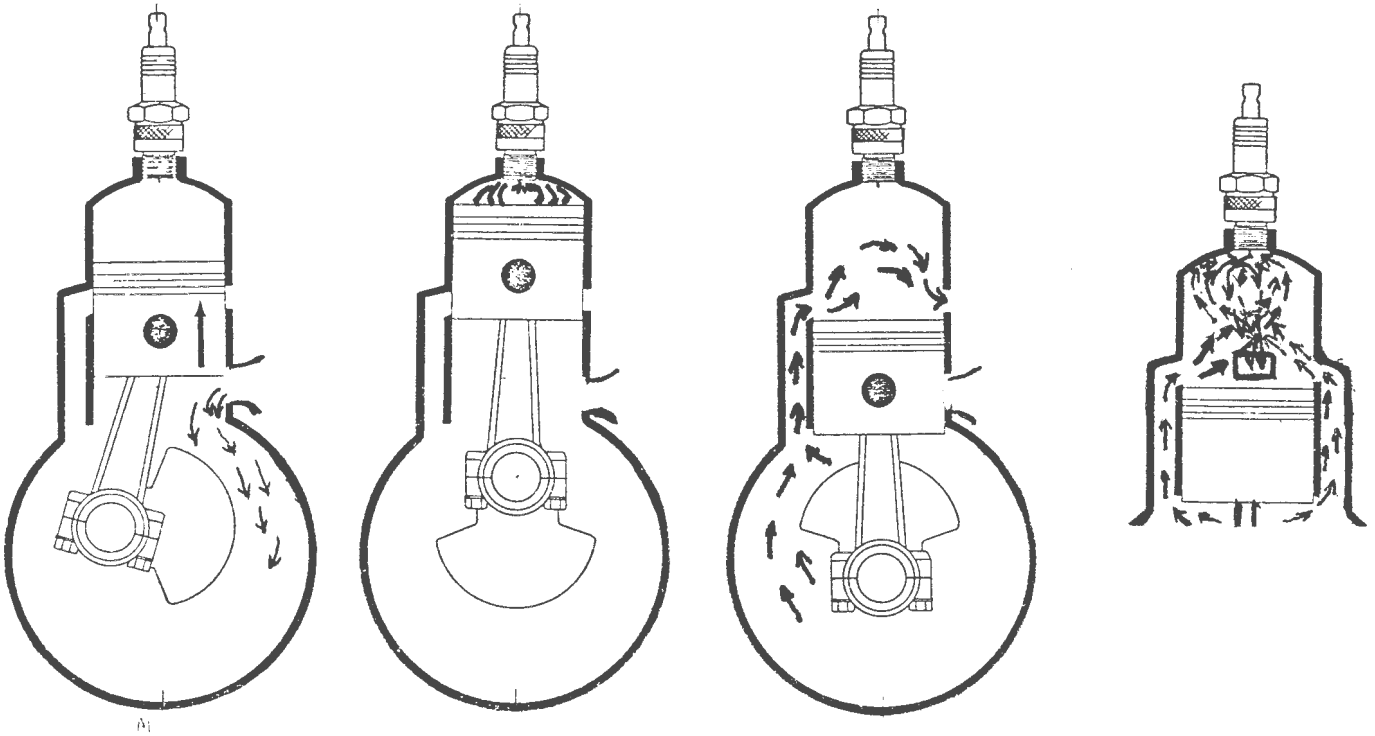
c. The first stroke of the piston, from bottom dead center (B.D.C.) to the top dead center (T.D.C.), has two functions:
   1. To induce a mixture of fuel and air into the crankcase via the carburetor.
   2. To compress the charge in the combustion chamber.

d. The second stroke of the piston, from T.D.C. to B.D.C., also has two functions:
   1. To uncover the exhaust ports and allow the burned gases to escape.
   2. To compress the fuel mixture in the crankcase and transfer it through the two transfer ducts to the combustion chamber.

2.2 SEQUENCE OF OPERATION (see Figure 2-1)

a. As the crankshaft rotates, the piston moves from the B.D.C. position, thus creating a depression (or partial vacuum) in the crankcase. When the piston uncovers the

Fig. 2-1



carburetor inlet port, fuel/air mixture, metered by the carburetor, is admitted to the crankcase.

b. Continued upward movement of the piston will compress the charge in the combustion chamber until, at a point near T.D.C., the spark from the spark plug will ignite the mixture.
c. Resultant expansion of the ignited fuel will push the piston toward B.D.C. Moving downward, the piston first uncovers the exhaust port and allows the hot gases, still under considerable pressure, to escape to atmosphere through the exhaust system.
d. Continuing downward, the piston will now uncover the two transfer ports and close the carburetor inlet port. The mixture in the crankcase and lower part of the cylinder is displaced by the piston and conducted through the transfer ducts to the combustion chamber above the piston. The fresh charge, entering through the two transfer ports will form a loop (see Figure 2-10), thus scavenging the cylinder of burned gases.
e. The cycle will repeat continuously as from paragraph (a) until the engine ignition is switched off.

2.3 IGNITION SYSTEM

2.3.1 General

The ignition system used with model CCW 340 and CCW 400 engines is basically the same as systems used with most conventional two stroke engines. It consists of a low tension magneto, two high tension ignition coils, two ignition spark plugs, spark plug (high tension) lead wires, an ignition switch and the required electrical wiring.
Model 340S engines differ from 340E, 340G, and 400 engines in magneto design. Magnetos in use on the model 340S incorporate only one low tension generating coil. All other models covered in this manual use two low tension generating coils. Refer to paragraphs 2.4.2.1 and 2.4.2.2.

2.3.2 Description

The magneto assembly is mounted to the engine crankcase at the flywheel end. It functions to generate low tension impulses in the primaries of the ignition coils. Two sets of contact breaker points, one set for each cylinder, are installed in the magneto. During engine operation, a cam, mounted on the flywheel, opens and closes the breaker points in sequence. A condenser, wired in parallel across each set of breaker points, protects the points from damage caused by self-inducted electrical surges in the primary coil. Lighting and battery charging coils (see paragraph 2.5) are mounted on the magneto coil plate. The coils produce the electrical power required to operate a 12-volt lighting system and to charge the battery used with electric started engines.
Low tension (primary wires) leading from the magneto are encased in a protective cover and routed through a grommet located in the fan cover case, to the ignition coupler on the fan cover.

2.3.2.1 Sawafuji Ignition (See Figure 2-2)

The magneto used with model 340S (SAWAFUJI) ignition systems has one low tension generating coil. Each end of the coil is connected in parallel to the primary of one ignition coil and one breaker point set. The condensers and breaker point sets are grounded to the magneto frame through a common ground.

2.3.2.2 Kokusan Ignition (See Figure 2-3)

The magneto used with model 340E, 340G and 400 (KOKUSAN) ignition systems has two low tension generating coils. One end of each coil is grounded to the magneto frame. The other end of the coil connects in parallel to the breaker point set and the primary of one ignition coil.

2.3.3 Operation (See Figures 2-2 and 2-3)

The ignition switch is connected in parallel with the primary windings of the ignition coils. Operation of the ignition switch to the "RUN" position, opens a circuit between the windings and allows the contact breaker points to control the ignition circuit.
The flywheel incorporates four permanent magnets and a breaker point cam and auto advance mechanism. In operation, as the flywheel rotates, an electrical current is generated in the low tension generating coil. The rotating breaker point cam activates the breaker points, opening and closing them in accordance with a timed ignition sequence. (Refer to Section V, paragraph 5.4.4). Closing the points causes the buildup of a magnetic field in the ignition coils. Opening the points causes a very rapid collapse of the field, thus inducing a high voltage current in the secondary windings of the coil. High tension spark plug wires conduct the high voltage current to the spark plugs.
Self induced high voltage current in the primaries is momentarily stored in the condensers to prevent arcing across the point contacts. When the contacts next close, the condensers will discharge back to the ignition coils, thus assisting in the buildup of the magnetic field in the coils.
The ignition circuit will continue to function until the ignition switch is turned to the "OFF" position which will maintain a circuit and prevent ignition.

2.4 DETONATION:–

The internal combustion engine is designed to induce a combustable mixture of gasoline and air into the cylinder which is subsequently ignited by a spark plug, and the resultant gas expansion utilized to produce the power stroke. Some considerable care is taken in the design to ensure that the combustion takes place at a controlled rate, but under certain conditions the charge will burn at a highly excessive rate, producing abnormal gas temperatures and pressures in the cylinder. This condition is called detonation and may, therefore, be defined as the rapid and uncontrolled burning of the chargewhich commences at the point of ignition by the spark plug and is completed prematurely over a very short movement of the piston.

2.4.1 The causes of detonation are many and varied, but all have the common effect of overheating the charge towards the spontaneous combustion temperature of the fuel. Consequently, when the charge is further heated by compression and ignited by the spark, the flame spread rate is very rapid indeed, resulting in the formation of the high pressure wave which impinges on the combustion chamber surfaces to create the sound of detonation of "pinging" which is so familiar to many people.

2.4.2 It cannot be emphasized too strongly that if detonation is allowed to persist, serious damage may result to the

2.3.2.3 Denso Ignition

This magneto is used on all models of the CCW 440 engine. It is functionally similar to the Kokusan ignition described in 2.3.2.2. and the Kokusan Schematic at the bottom of page 2-3. applies equally to the Denso Ignition System.

2.5.2.4 Denso Lighting System for CCW 440

All CCW 440 Engines are equipped with six terminal ignition couplers similar to later models of the other engines (See 2.5.2.2). Typical lighting circuit curves for the Denso Ignition System are included on insert page 2-10 A-C.

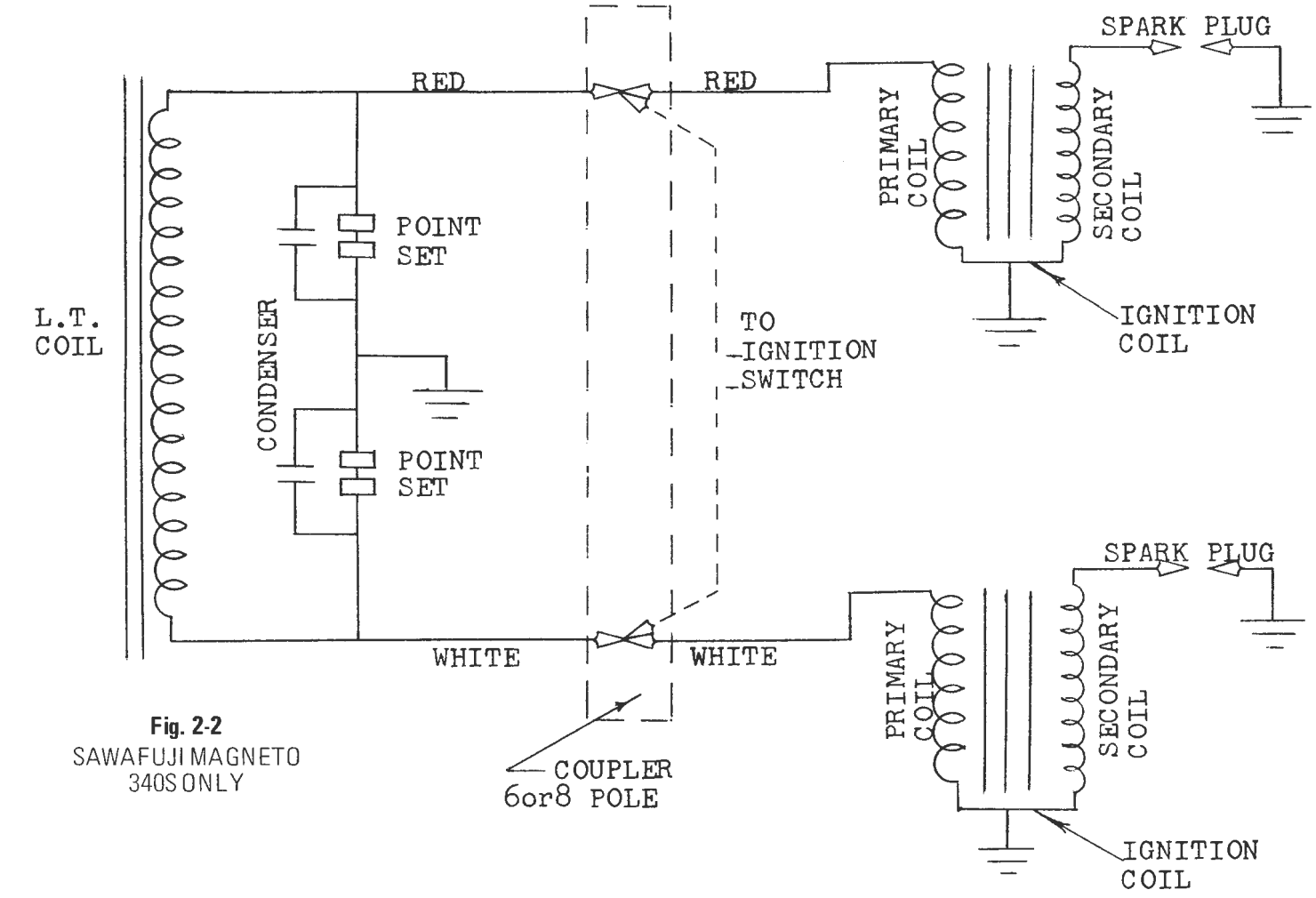


Fig. 2-2
SAWAFUJI MAGNETO
340S ONLY

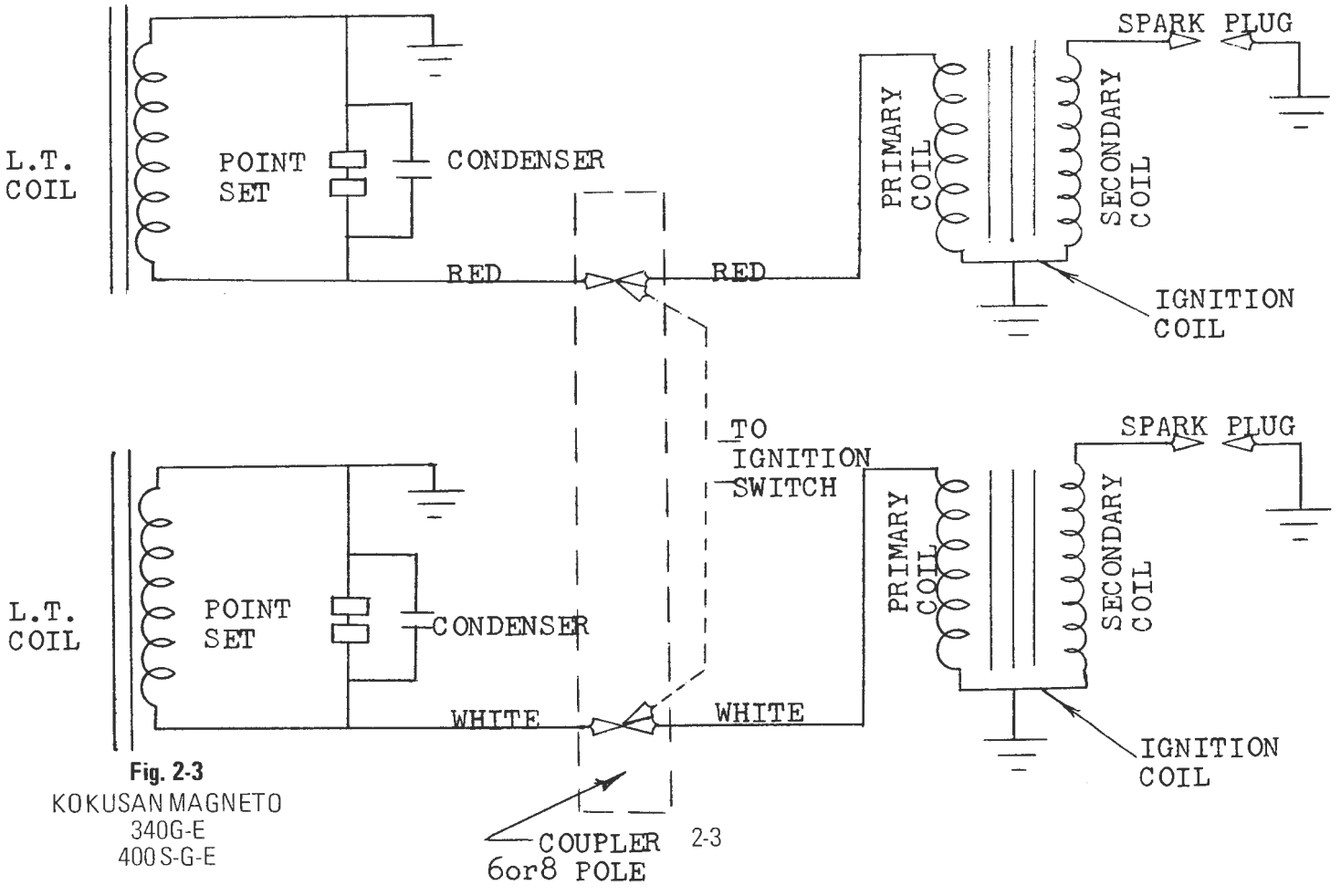


Fig. 2-3
KOKUSAN MAGNETO
340G-E
400S-G-E

engine. Overheating of the engine can cause distortion of the cylinder and cylinder head, seizing and burning of pistons, breaking of cylinder flanges and studs etc.,
In addition, prolonged detonation may lead into pre-ignition of the charge and even more serious consequences to the engine. It is essential, therefore, that detonation should be recognized and the cause eliminated as soon as possible.

2.4.3 Most of the common causes of detonation can be easily rectified:—

1. High compression pressures. (CCW 340/400 = 175-180 PSI. cold at 500 RPM.)
2. Incandescent points in the combustion chamber due to ash deposits.
3. Wrong type of spark plugs. (See Table 1-1)
4. Spark plug overheated due to seat washer being worn or missing.
5. Incorrect ignition timing. (See section 5.4.4)
6. Weak carburetor settings.
7. High ambient temperatures. (Over 95° F.)
8. Partially choked exhaust system causing high back pressure.

2.4.4 PRE-IGNITION may be defined as the premature burning of the charge due to spontaneous combustion, and before the specified timed ignition point by the spark plug. The resultant gas expansion, acting on the rising piston, generates extreme temperatures and pressures in the combustion chamber and frequently results in broken pistons, bent connecting rods, twisted or bent crankshaft and damaged bearings.
Pre-ignition is usually caused by overheating and can be readily identified by the very heavy knocking which is due to gas expansion on the rising piston. It is usually preceded by detonation, but certain conditions such as an under-sized or choked exhaust system, will cause the engine to go straight into pre-ignition without detonation. It is imperative that the engine should be stopped at once by closing off the air supply to the carburetor. It will be apparent that the engine cannot be stopped by switching off the ignition.

2.5 LIGHTING SYSTEM

2.5.1 Vehicle lighting is provided by lighting and battery charging coils in the magneto, and the necessary wiring and light switches required to operate the system.

2.5.2 Operation

2.5.2.1 Engines Previous to Serial Numbers:—

Model 340-2903614, Model 400-2809570. Typical vehicle lighting circuit, See Figure 2-11.
Engines bearing serial numbers previous to 340-2903614 or 400-2809570 are equipped with an eight terminal ignition coupler. The lighting and battery charging circuits include two separate coil windings which produce 75 watts AC (alternating current) during magneto operation. One coil winding supplies the power required to operate the lighting system and the other winding supplies the power required to charge a 12 volt battery for use with electric started engines.

MANUAL STARTED ENGINES (See Figure 2-4) Single head and tail lamp (12 V. 35 W-12 V. 3 W)

a. The two wires from the battery charging coil winding are blue in colour. Both of these wires are routed to the ignition coupler.
The lighting coil winding is yellow in colour. One end is routed to the ignition coupler and the other is grounded at the magneto.

A headlamp and tail lamp with maximum rating of 35 watts may be installed on the vehicle. The wire to operate the light switch is connected to the yellow terminal in the ignition coupler.

MANUAL STARTED ENGINES (See Figure 2-6) Twin head and tail lamps (12 V. 35 W - 12 V. 3 W).
See drawing Number E 340S-150. Two 12 volt, 35 watt headlamps are connected in series with the single yellow wire. Three 12 volt, 3 watt tail (or speedometer) lights complete the circuit in a series parallel connection with a ballast resistor rated 7 ohms, 40 watts. A parallel circuit with a single pole double throw switch is shown connected across the headlamps. In the event of a lamp failure, the switch can be placed in left or right position to provide a circuit to the remaining head and tail lamps.
N.B.—This circuit can be omitted if not required.
Materials required:—Load resister 7 ohms, 40 watts 1
SPDT Switch, 5 amps. 1
These items are available from Canadian Curtiss-Wright, Limited.

ELECTRIC STARTED ENGINES. (See Figure 2-5)

b. On engines equipped with an electric starter, the two blue wires at the ignition coupler are plugged into a C.C.W. rectifier, part number 43-0710-00, and the AC is converted to DC (direct current). The black wire is grounded. From the rectifier, DC is routed through a 7.5 ampere fuse to the battery. Power to operate the lights is taken from the battery.

2.5.2.2 Engines with Serial Numbers Model 340-G-F 2903614, Model 400-S-G-E 2809570 and Subsequent

a. Engines bearing serial numbers as above are equipped with a six pole terminal coupling for the ignition and lighting circuits. In addition, the separate lighting and battery charging coils as per paragraph 2.5.2.1 have been changed to a single center tapped coil. The ends have been terminated in two yellow wires and the internally center tapped ground connection has been extended by a brown wire to the terminal block.

N.B.

This brown wire may be disconnected provided a satisfactory ground is maintained between the lighting circuits and the engine.
The coil is rated at a nominal 12 volt 75 watt maximum and can be connected to meet the various electrical configurations.

1. ONE HEADLAMP 12 V 35 W - ONE TAIL LAMP 12V3W See Figure 2-7

A ballast resistor rated at 5.3 ohms 40 watts must be connected in parallel with the headlamp to prevent lamp burn out. It will be noted from Figure 2-7 that an alternative resistor at 7 ohms 40 watts will raise the operating voltage across the lamp to give a better light at the cost of reduced lamp life.

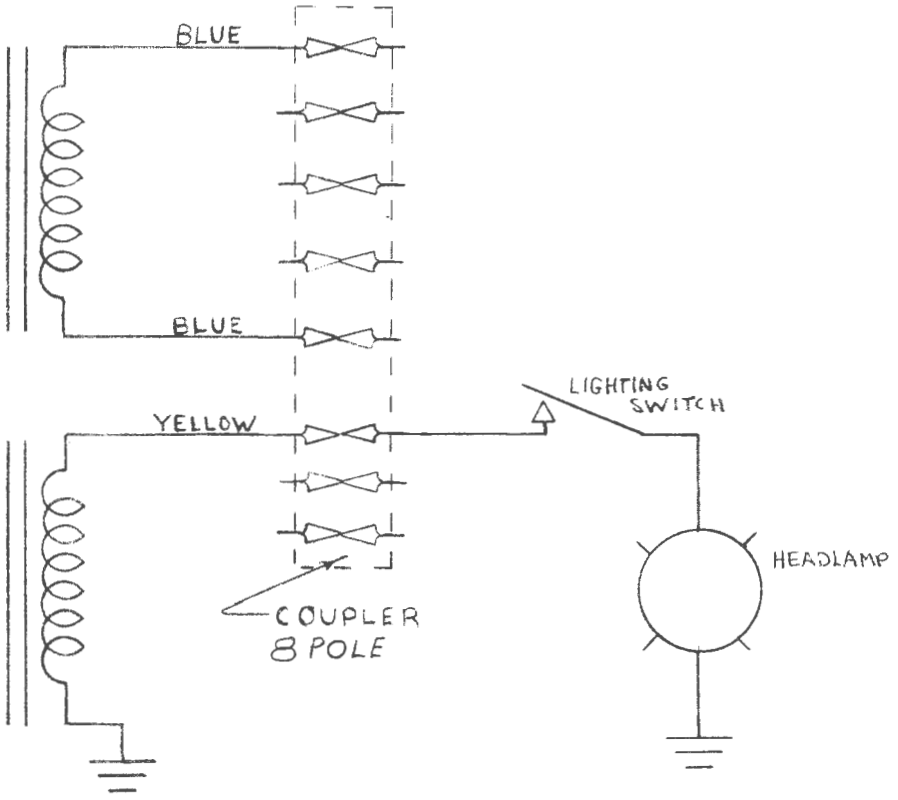


Fig. 2-4
340 S-G
400 S-G

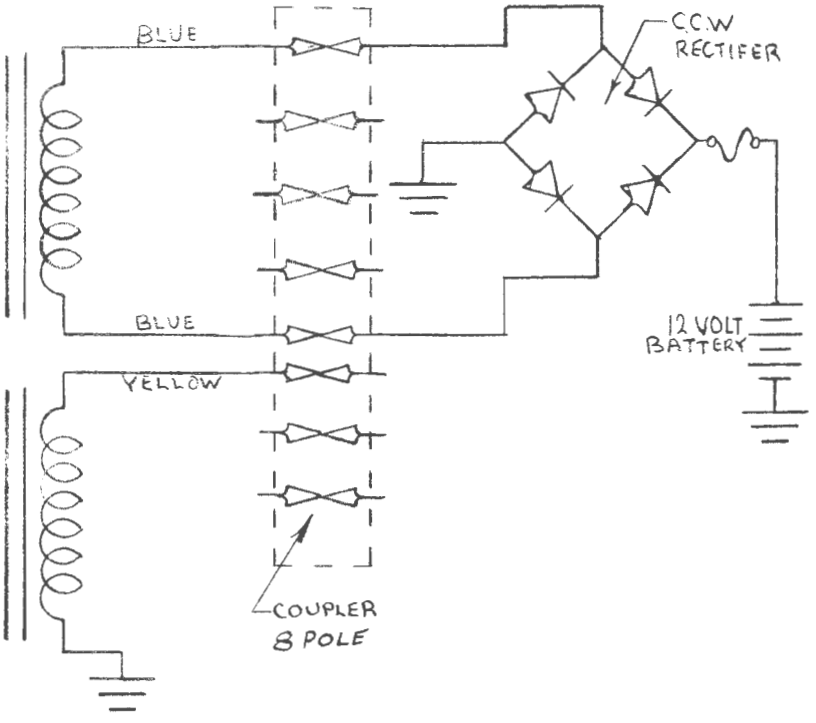


Fig. 2-5
340 E
400 E

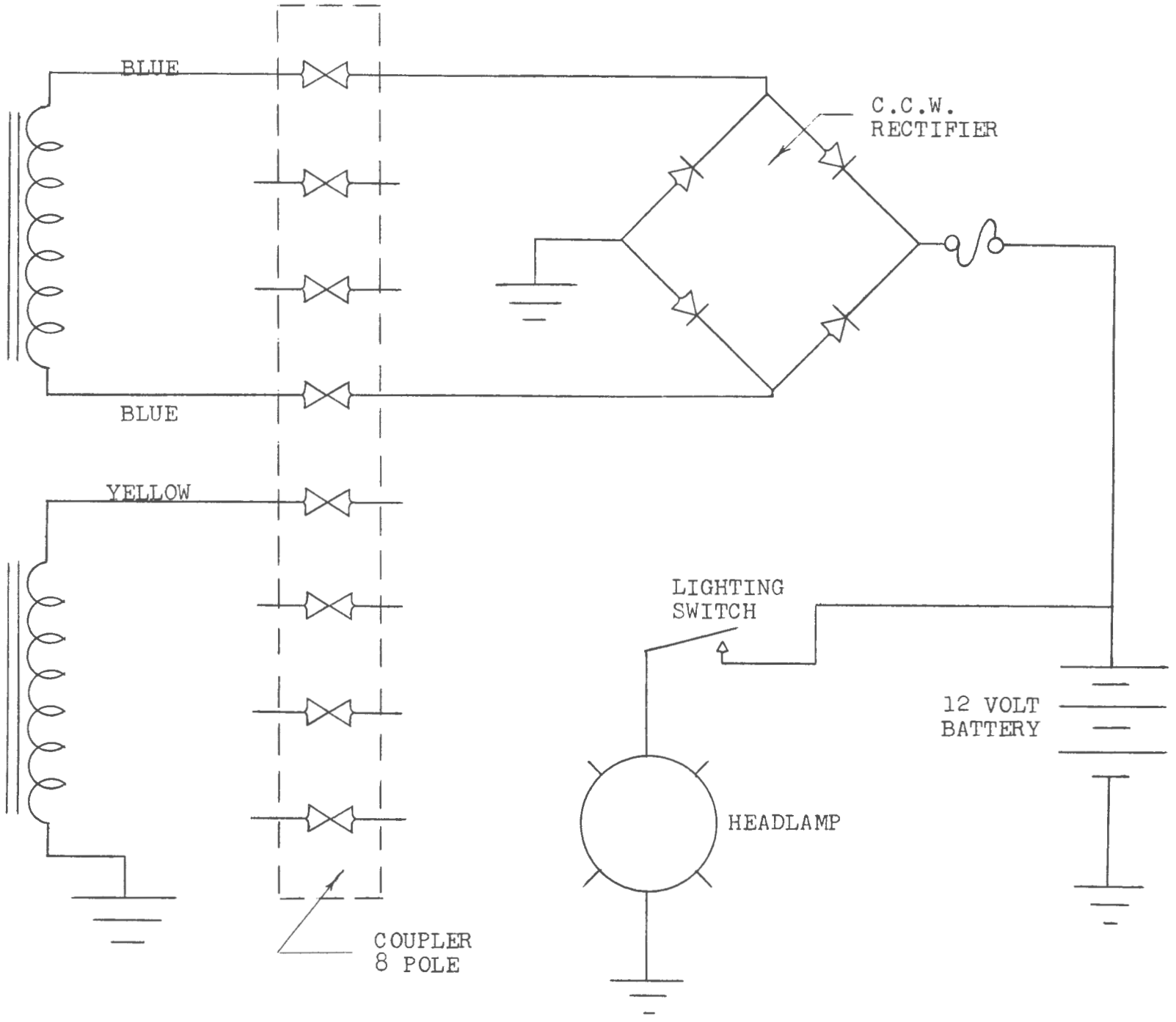

BLUE
BLUE
C.C.W.
RECTIFIER
YELLOW
LIGHTING
SWITCH
12 VOLT
BATTERY
HEADLAMP
COUPLER
8 POLE

Figure 2-6

2. Two Headlamps 12V35W - Two Tail Lamps 12V3W
(See Figure 2-8)
The head and tail lamps are connected in parallel across one yellow wire and ground through the lighting switch, and the ballast resistor is, of course, unnecessary.

3. Electrical Start Engines (See Figure 2-9)
On engines equipped with an electric starter motor, a full wave rectifier, CCW Part No. 43-0715-10, is connected to the two yellow wires at the terminal coupler and the A.C. output is converted to D.C. 7.5 amp fuse is connected to the D.C. output red wire and the circuit is completed via the lighting switch to charge the battery. Head and tail lamps are connected across the battery terminals as shown in Figure 2-9.

2.5.2.3 Model 340S only. Engines with serial numbers 2903614 & subsequent. See fig. 2-12.
Engines bearing serial numbers as above are equipped with Sawafuji magnetos & six pole connectors for lighting & ignition circuits. The separate lighting and battery charging coil, have been retained as per paragraph 2.5.2.1.

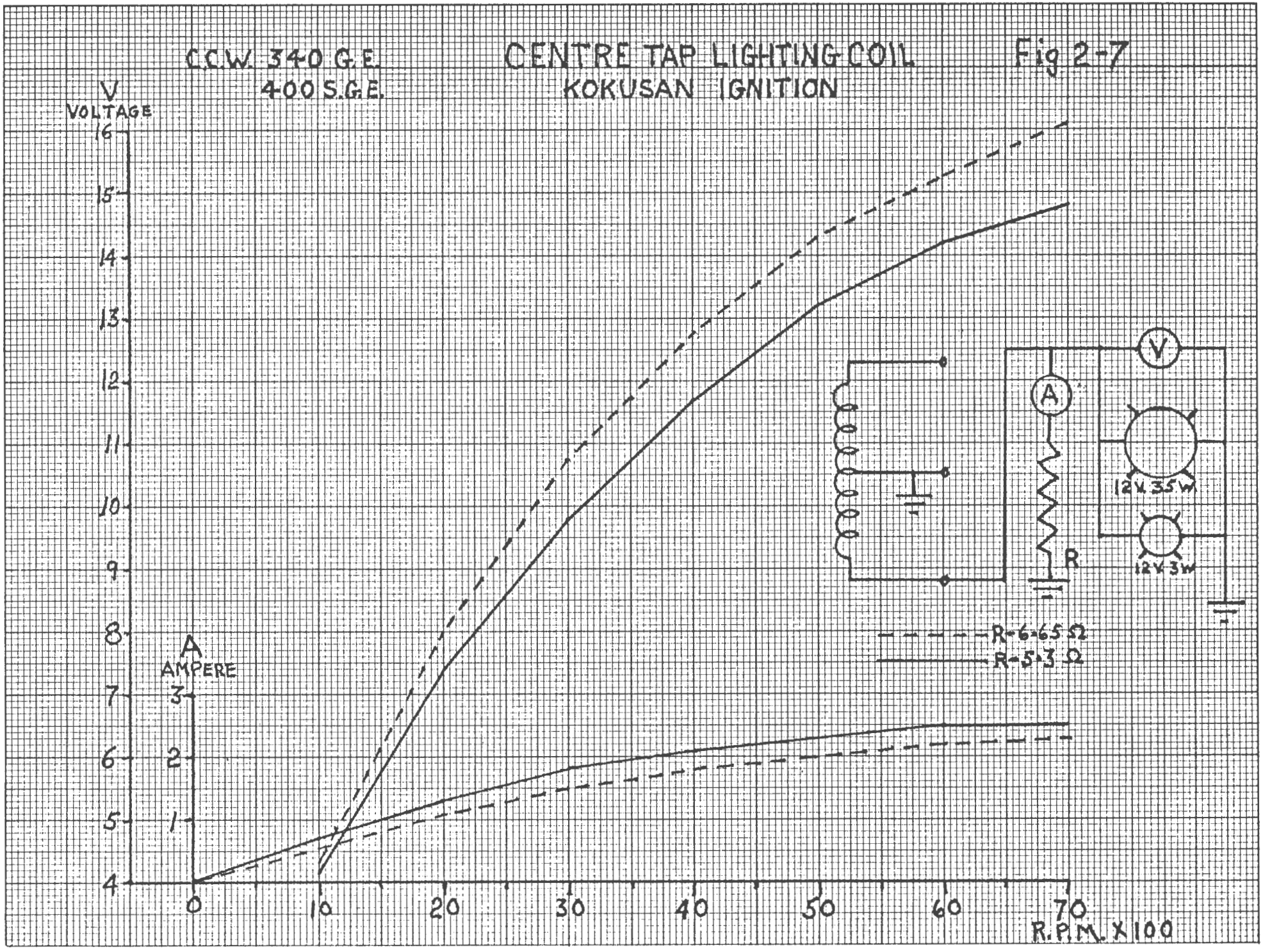
2.6 PERIODIC SERVICING

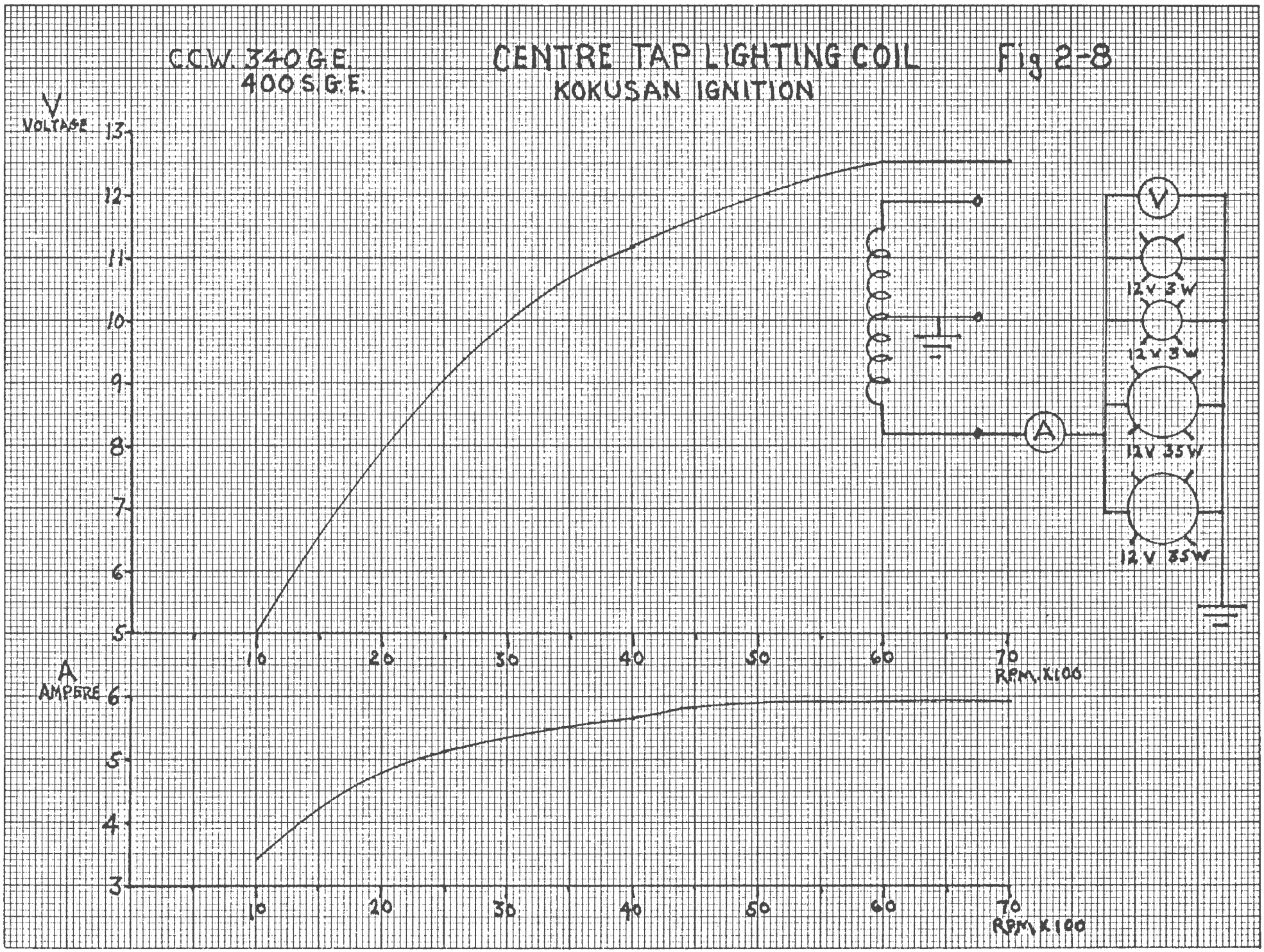
2.6.1 Spark Plugs
Remove, inspect, clean and/or adjust spark plugs at regular intervals as necessary. (See Section III, para. 3.3.4). Discard excessively burnt or damaged plugs. Install only specified spark plugs after adjusting to proper gap. (Table 1-1).

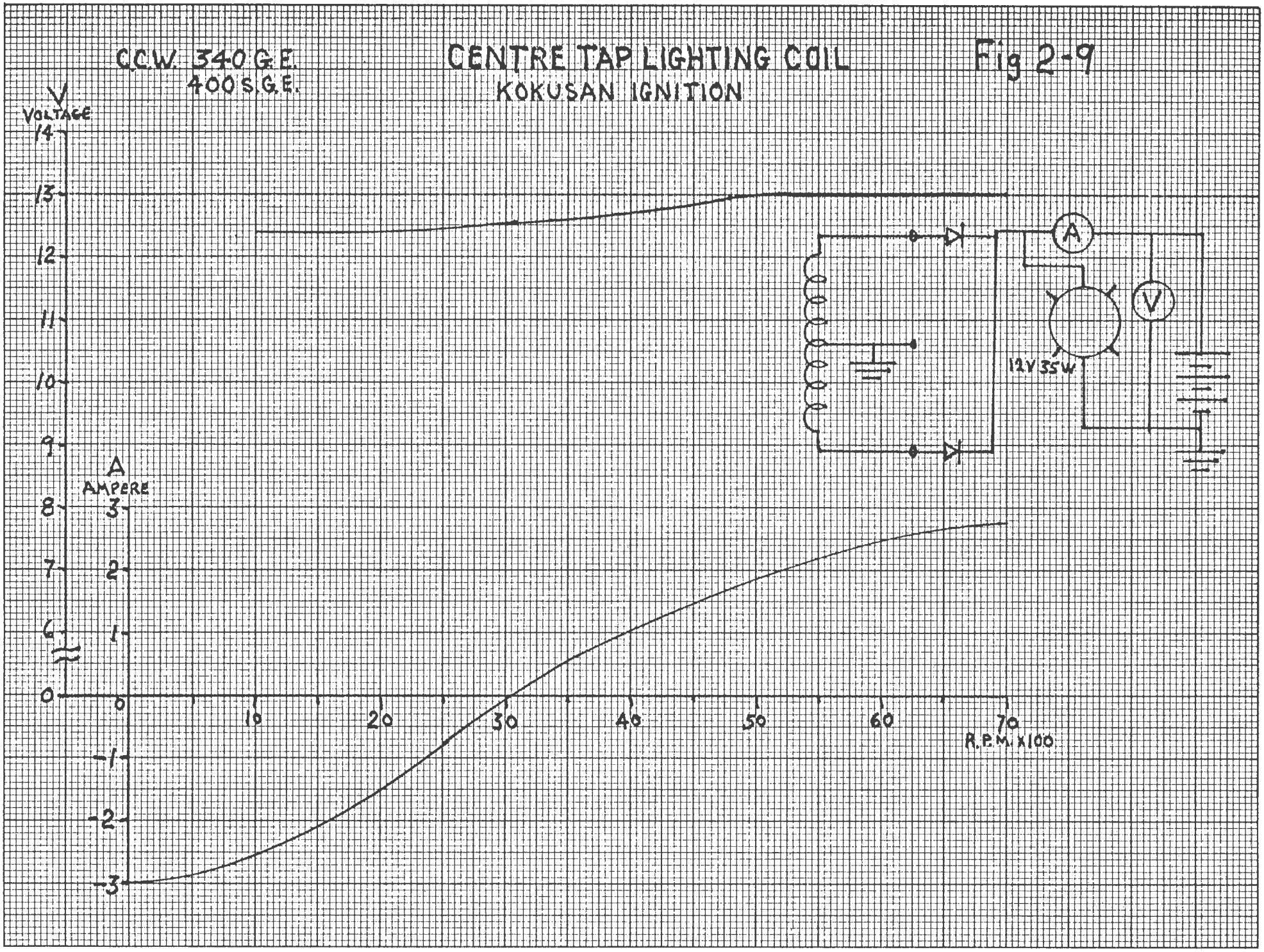
2.6.2 Fan Belt
Periodically check fan belt for wear, fraying and proper tension. A properly adjusted fan belt should leave approximately 1/4 inch side play when flexed by hand at a point near center of belt length.
Adjust fan belt tension as follows:
a. Remove 19 mm nut, lockwasher and plain washer from threaded end of fan shaft, using locking tool Part No. 43-0792-50.
b. Remove outer pulley. Remove spacer(s), as required, to achieve proper tension.
c. Install outer pulley, plain washer, lockwasher and nut. Ensure belt is properly engaged between pulley halves. Tighten nut securely.

NOTE: Retain surplus spacer(s) for use when a new belt is to be installed.

2.6.3 Troubleshooting
Table 2-1 lists probable causes of engine malfunction and remedial action required to correct faults. For spark plug, breaker points and engine timing specifications, refer to Technical Information, Table 1-1.

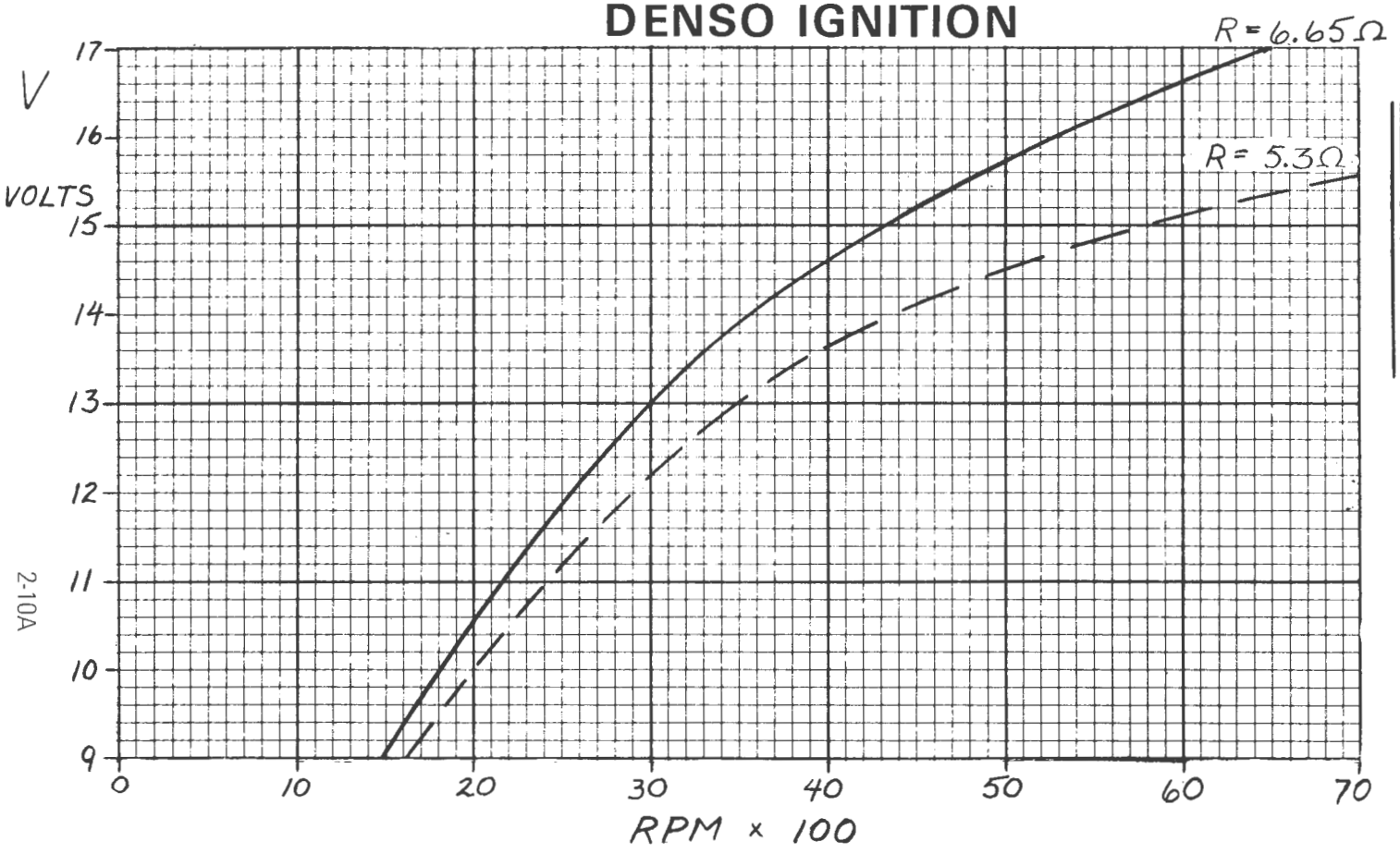


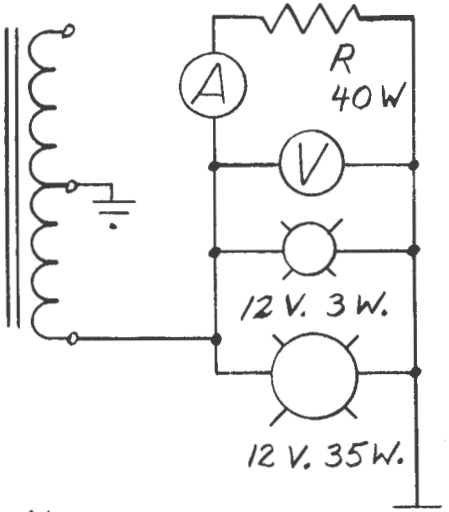




CCW 440

CENTRE TAP LIGHTING COIL
DENSO IGNITION





NOTE: SWITCH IS OMITTED TO SIMPLIFY CIRCUIT.

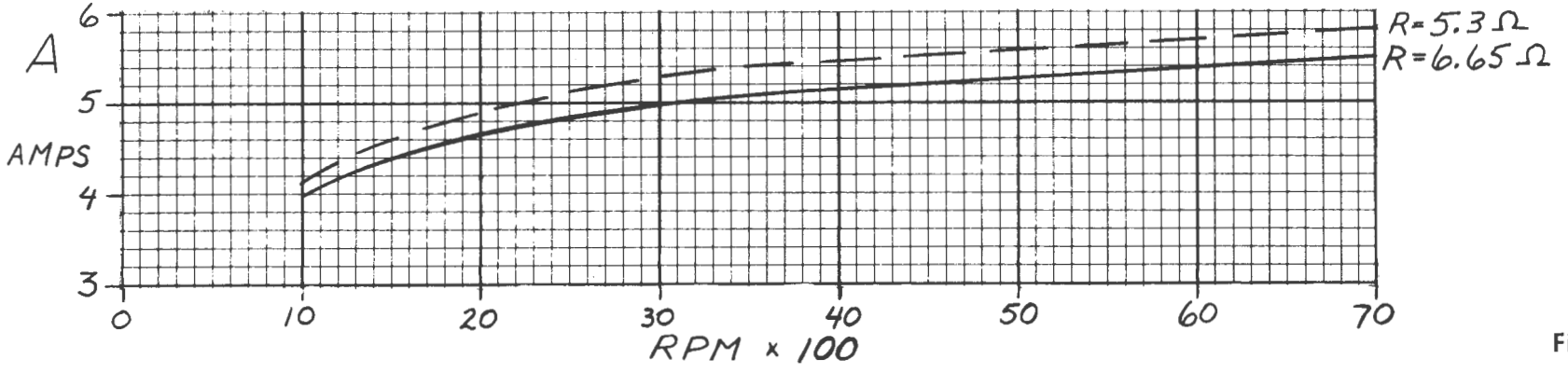


Fig. 2-9A

2-10A

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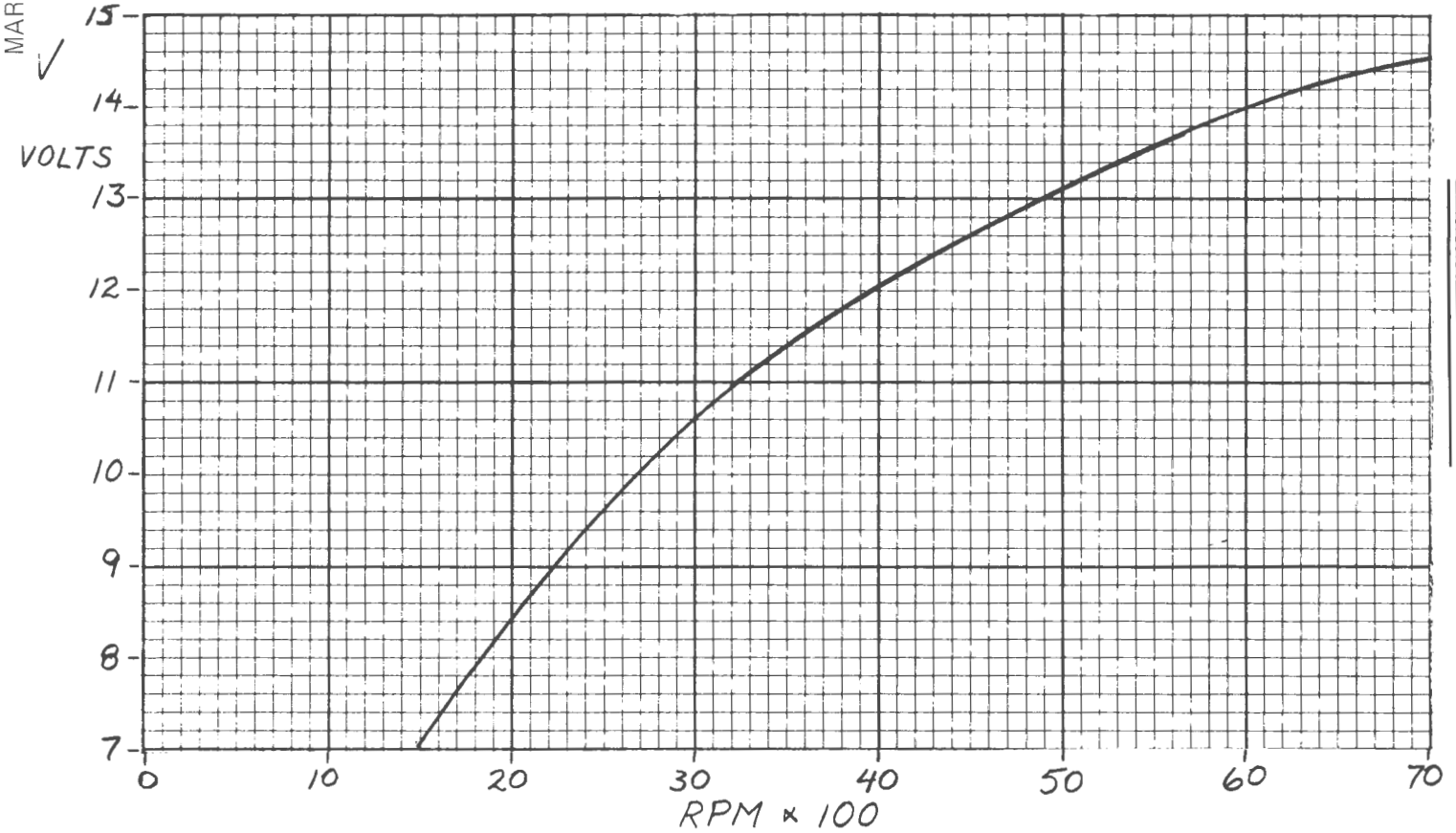
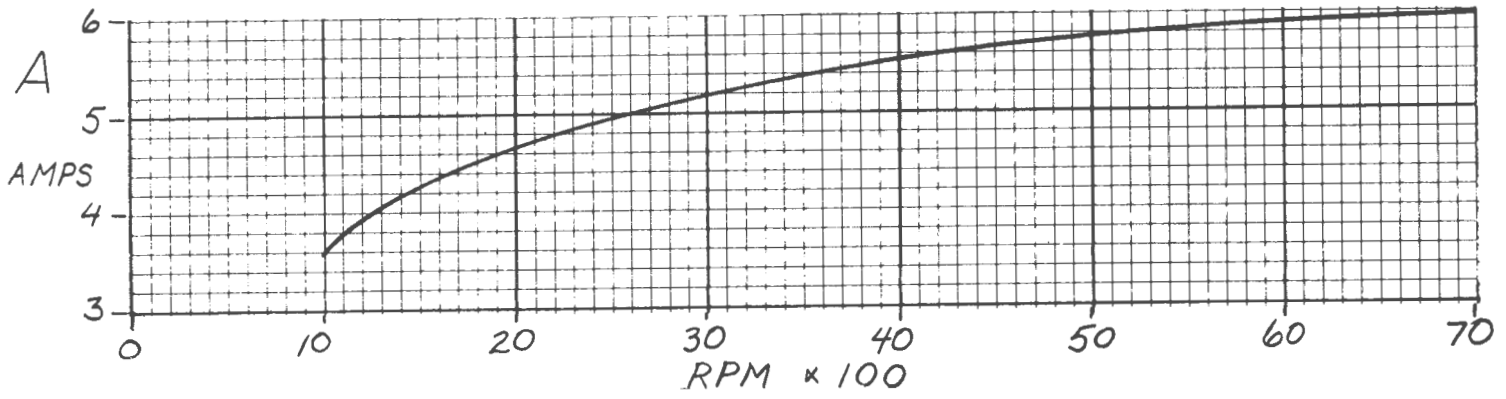
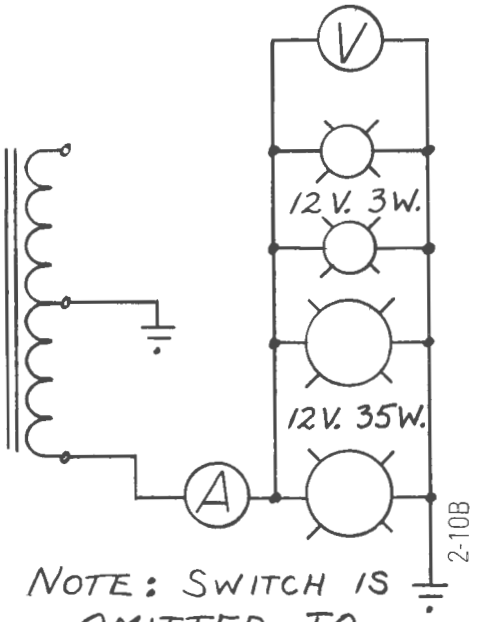
CCW 440

CENTRE TAP LIGHTING COIL
DENSO IGNITION







NOTE: SWITCH IS OMITTED TO SIMPLIFY CIRCUIT.

CCW 440

CENTRE TAP LIGHTING COIL
DENSO IGNITION

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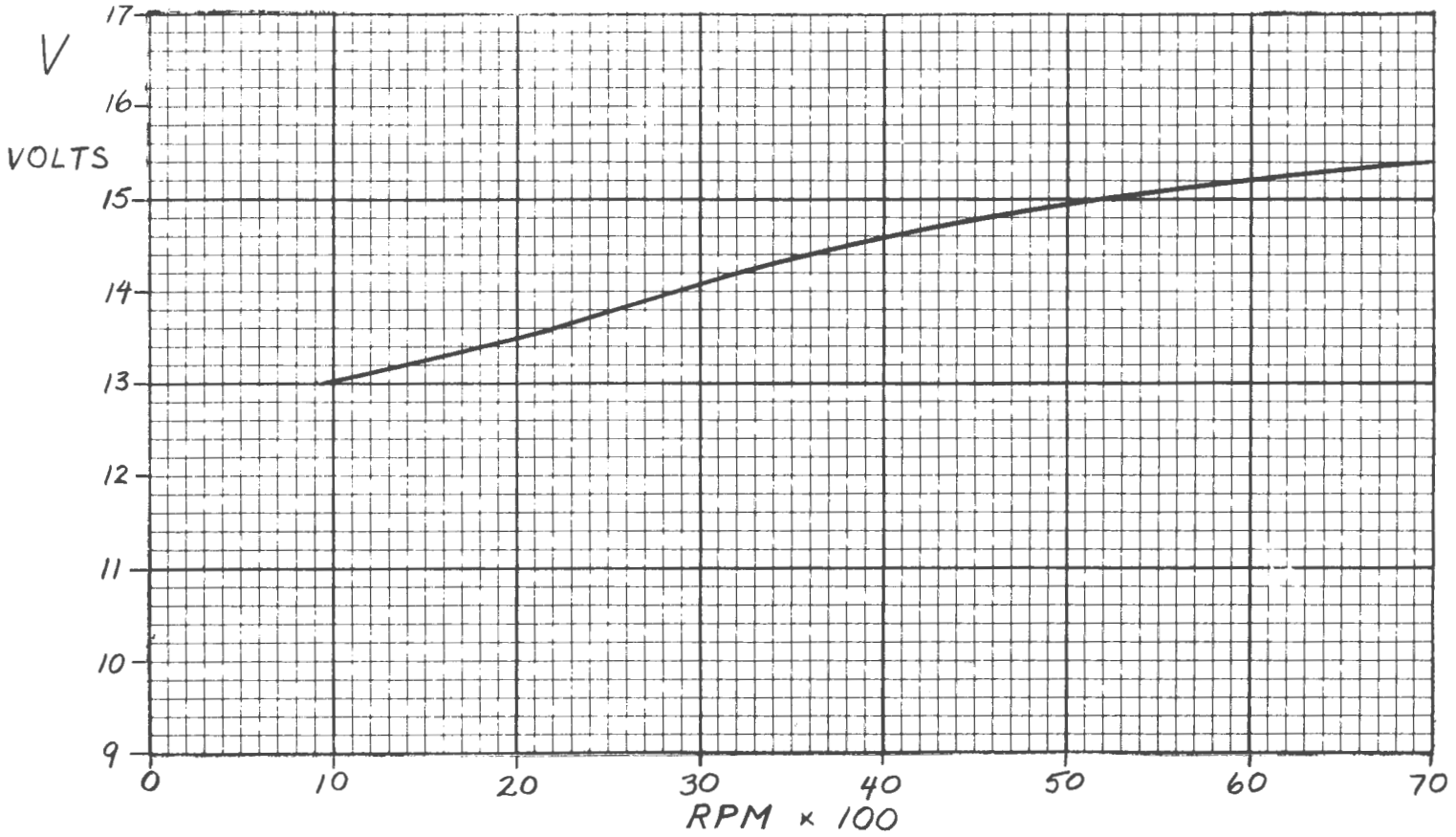
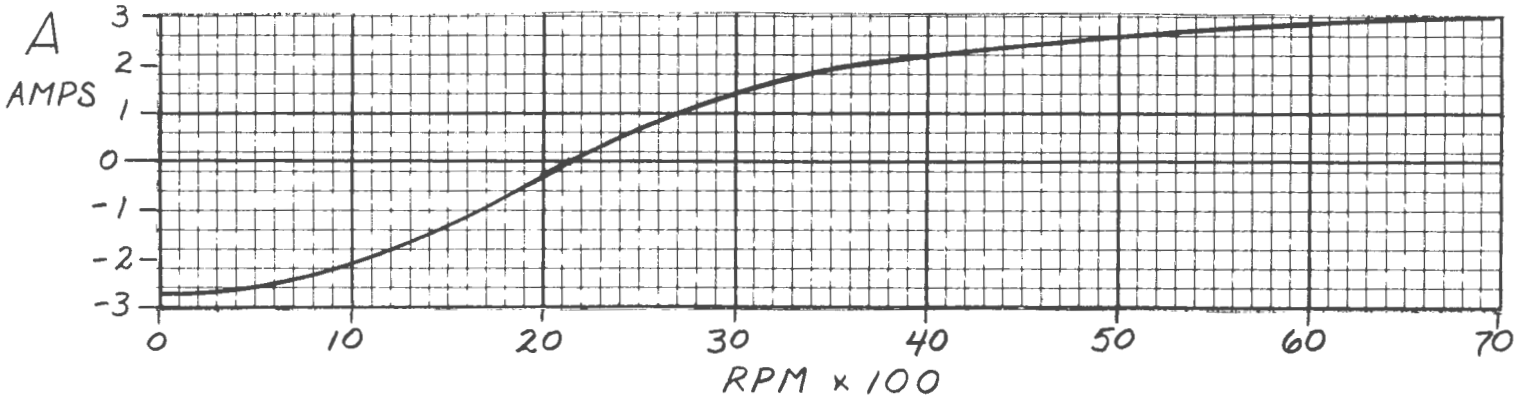
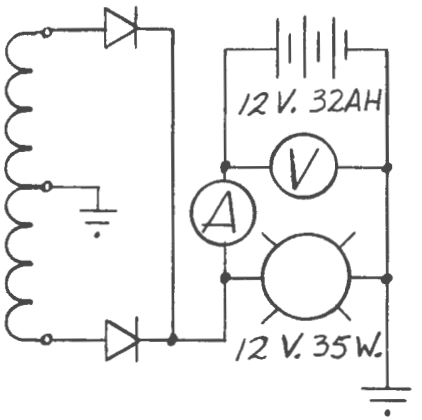
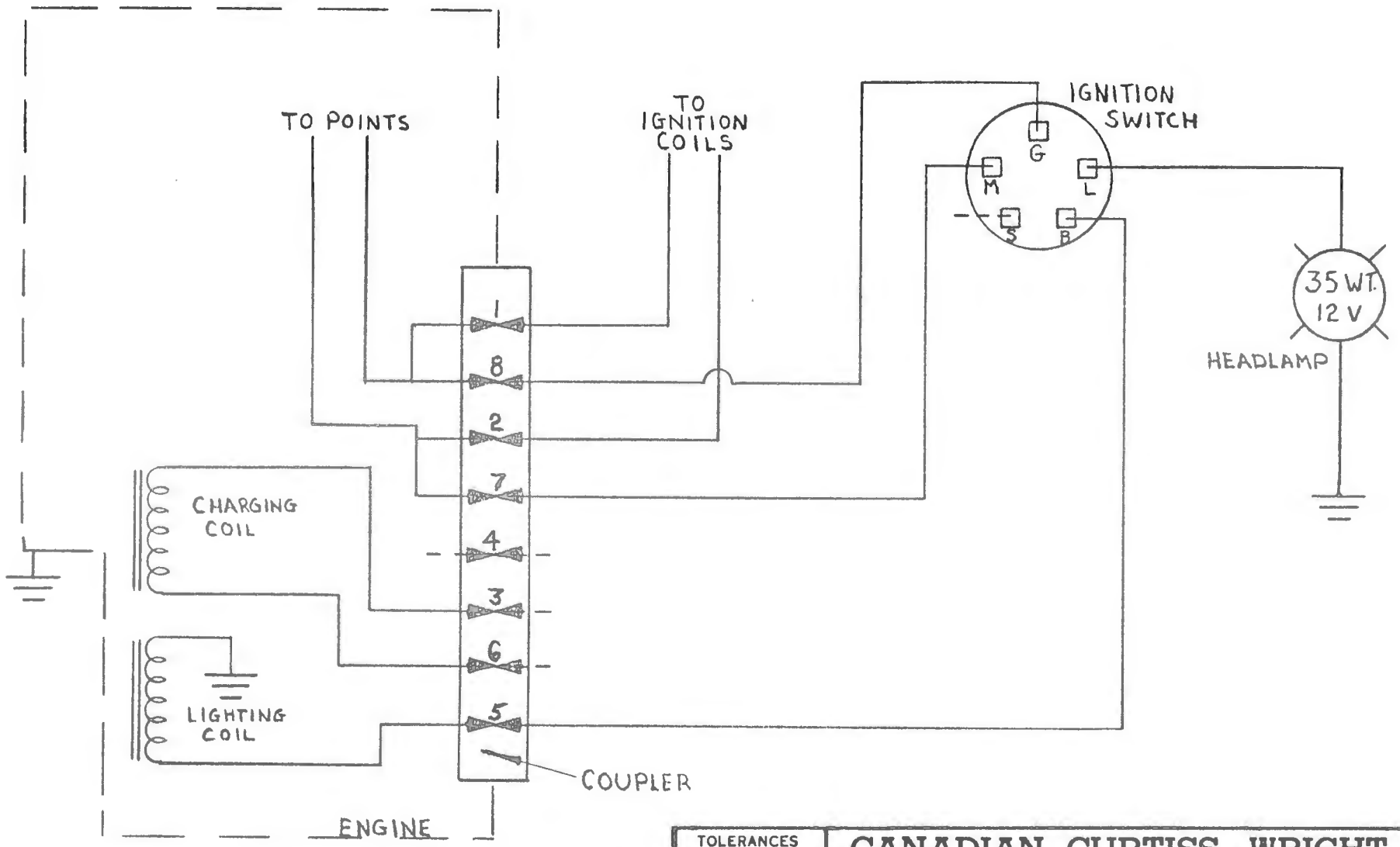
MARCH 1971

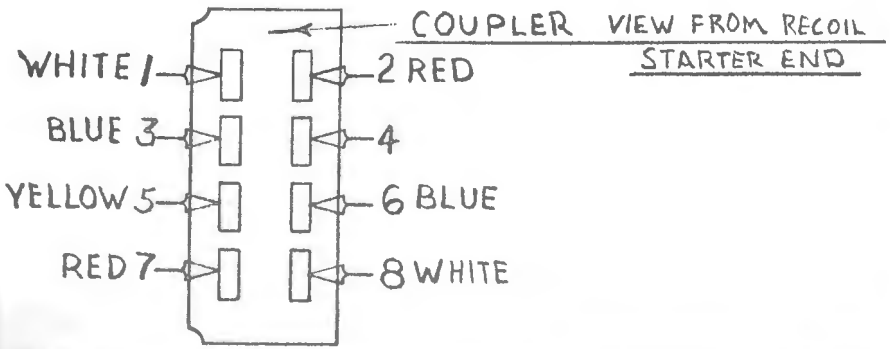




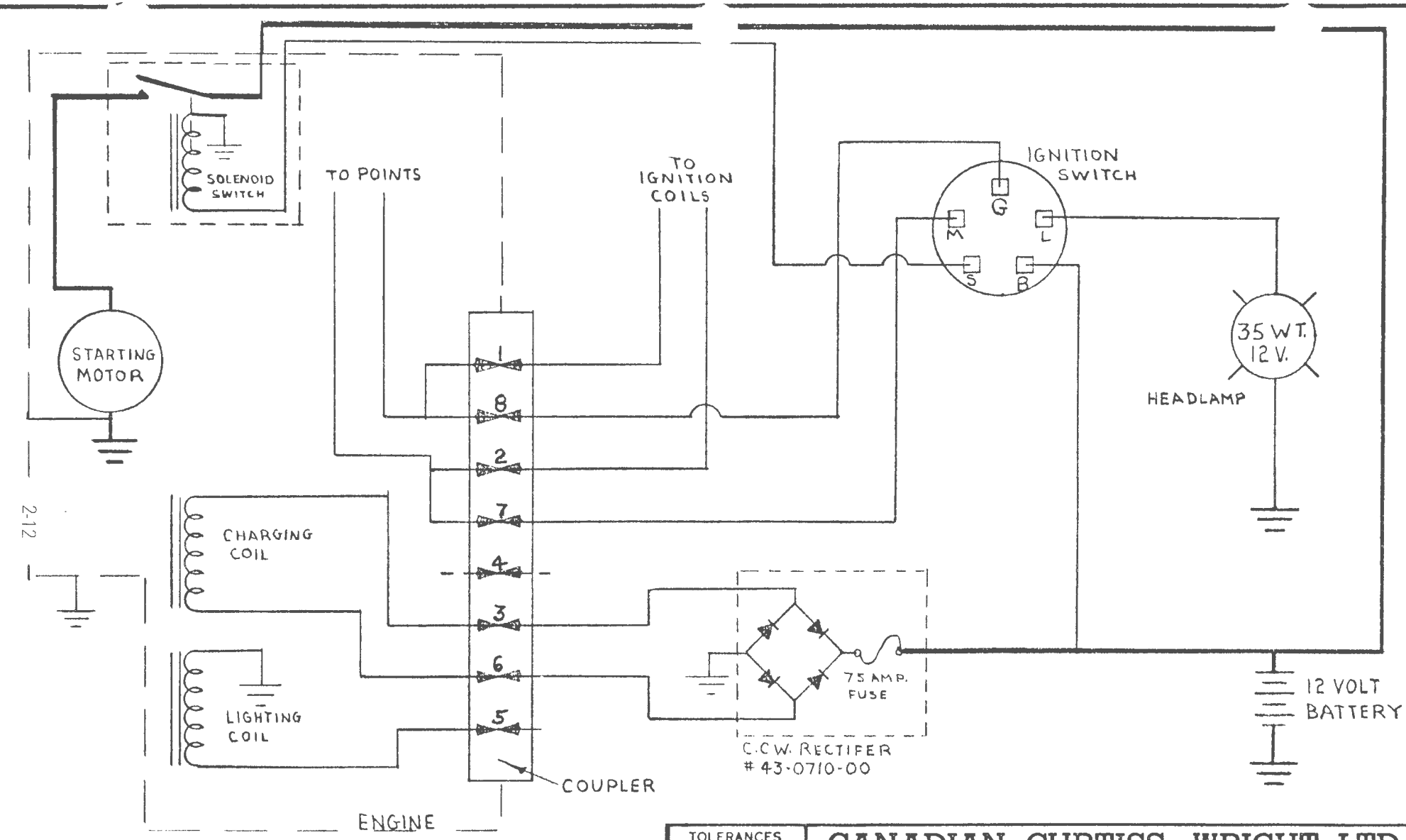


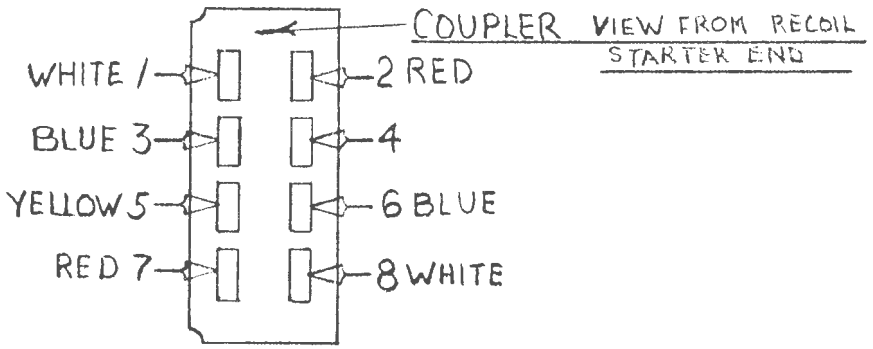
NOTE: SWITCH IS OMITTED TO SIMPLIFY CIRCUIT.



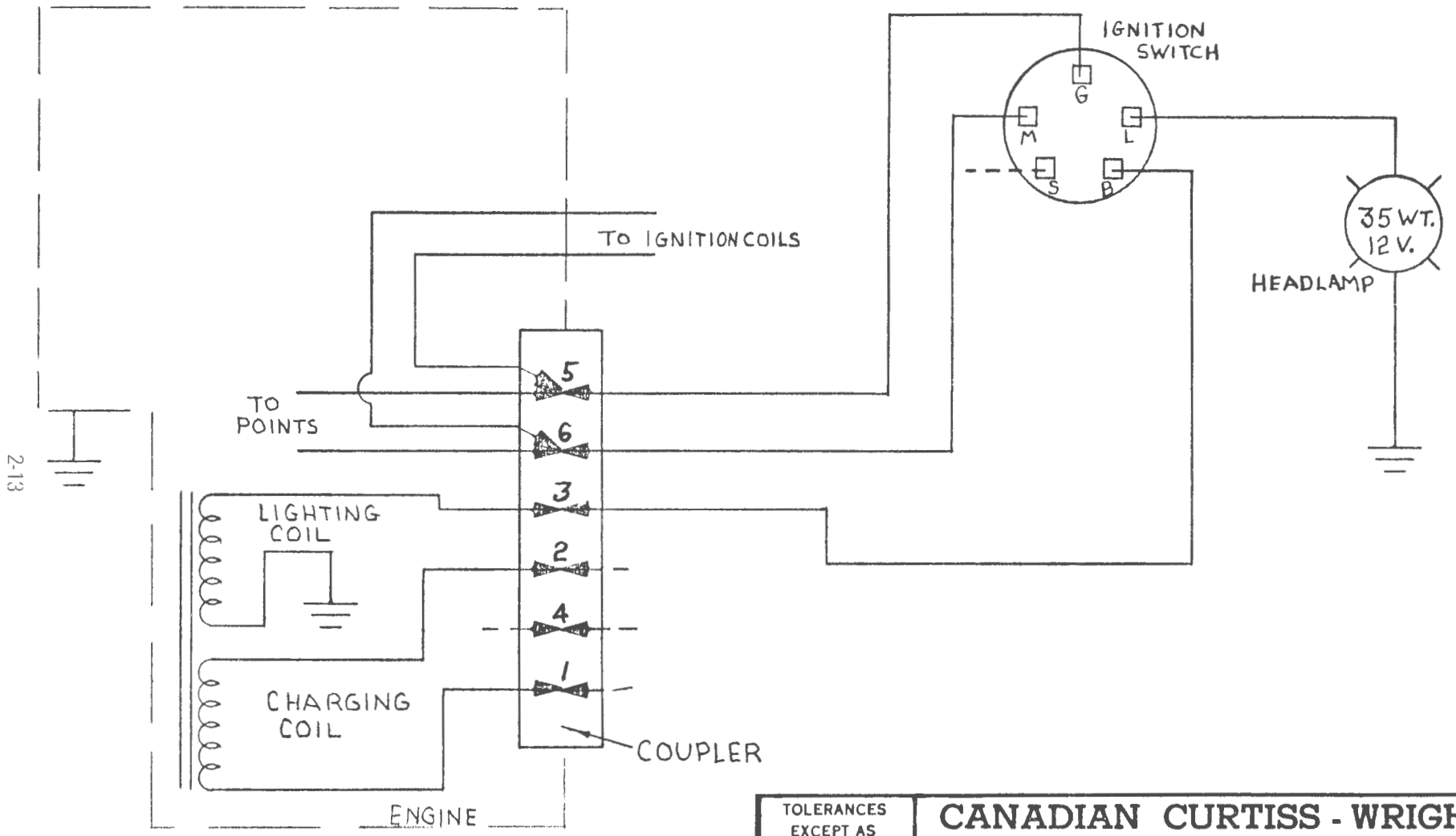


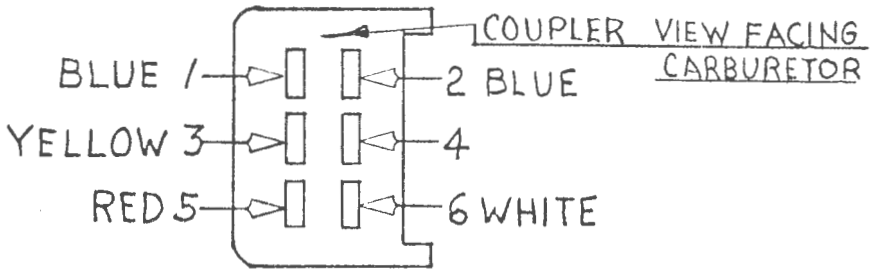
TOLERANCES EXCEPT AS NOTED	CANADIAN CURTISS - WRIGHT LTD. TORONTO ONTARIO		
DECIMAL ±	C.C.W. ENGINE	SCALE	DRAWN BY / APPROVED BY
FRACTIONAL ±	TITLE: MANUAL START TYPICAL 8 POLE WIRING DIAGRAM		
ANGULAR ±	DATE: Nov. 2, 1970	DRAWING NUMBER: FIGURE 2-10	340 S.G. 400 S.G.



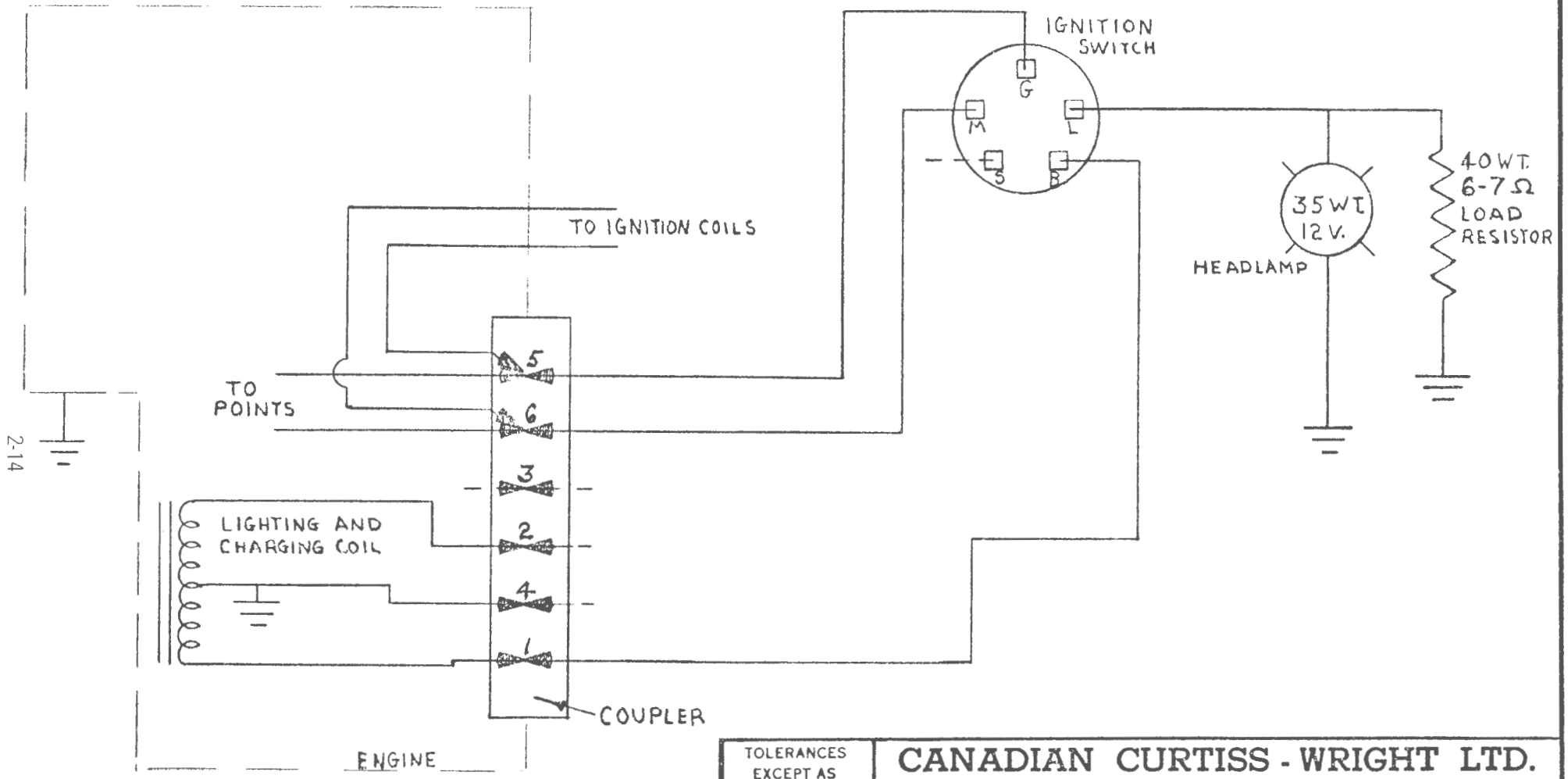


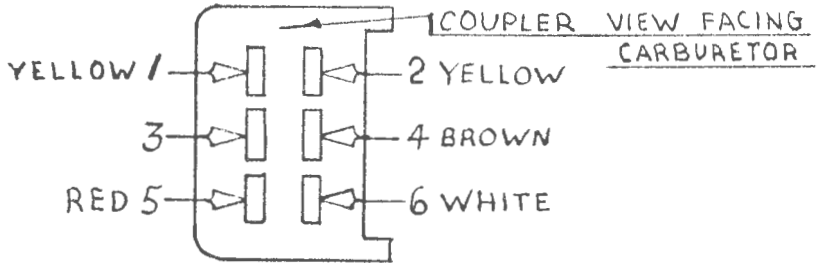
TOLERANCES EXCEPT AS NOTED	CANADIAN CURTISS - WRIGHT LTD. TORONTO ONTARIO		
DECIMAL ±	C.C.W. ENGINE	SCALE	DRAWN BY / APPROVED BY
FRACTIONAL ±	TITLE: ELECTRIC START TYPICAL 8 POLE WIRING DIAGRAM		
ANGULAR ±	DATE: Nov. 2, 1970	DRAWING NUMBER: FIGURE 2-11	340 E. 400 E.



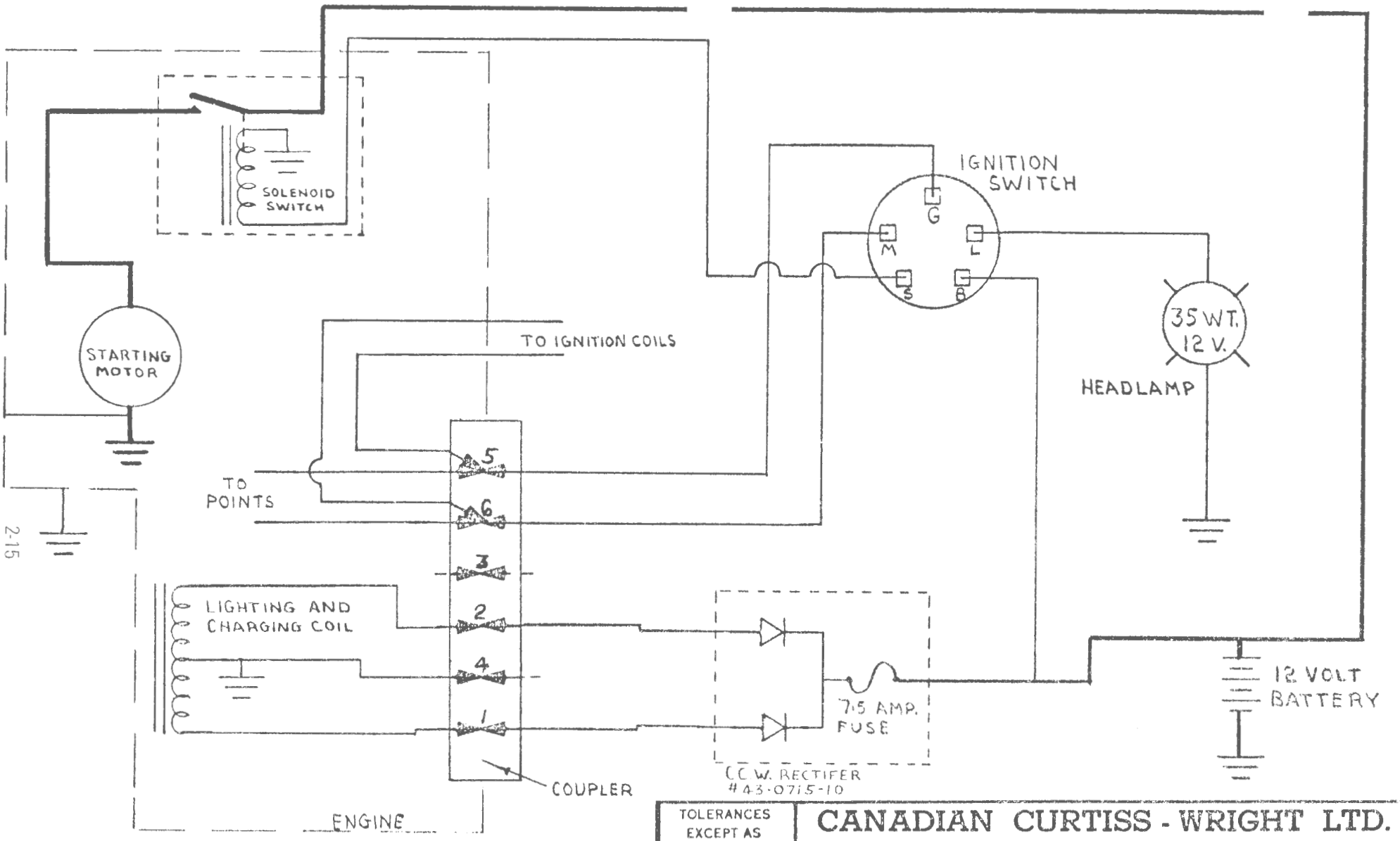


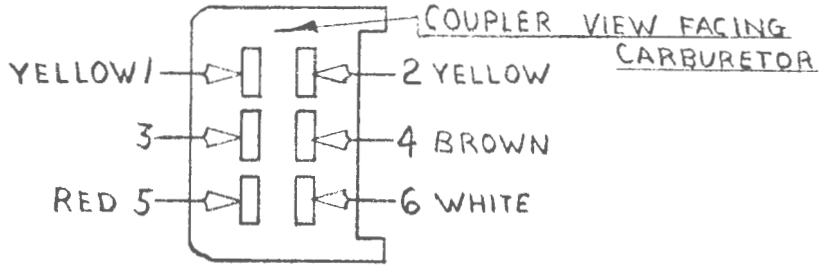
TOLERANCES EXCEPT AS NOTED	CANADIAN CURTISS - WRIGHT LTD. TORONTO ONTARIO		
DECIMAL ±	C.C.W. ENGINE	SCALE	DRAWN BY / APPROVED BY
FRACTIONAL ±	TITLE 340 S. ONLY MANUAL START TYPICAL 6 POLE WIRING DIAGRAM		
ANGULAR ±	DATE Nov 16.1970	DRAWING NUMBER 340 S. ONLY	
	FIGURE 2-12		





TOLERANCES EXCEPT AS NOTED	CANADIAN CURTISS-WRIGHT LTD. TORONTO ONTARIO		
DECIMAL ±	C.C.W. ENGINE	SCALE	DRAWN BY / APPROVED BY
FRACTIONAL ±	TITLE: TYPICAL 6 POLE WIRING DIAGRAM — MANUAL START		
ANGULAR ±	DATE: Nov 2. 1970	DRAWING NUMBER: FIGURE 2-12A	340 G. 4r S.G.





TOLERANCES EXCEPT AS NOTED	CANADIAN CURTISS-WRIGHT LTD. TORONTO ONTARIO		
DECIMAL ±	C.C.W. ENGINE	SCALE	DRAWN BY / APPROVED BY
FRACTIONAL ±	TITLE: ELECTRIC START TYPICAL 6 POLE WIRING DIAGRAM		
ANGULAR ±	DATE: Nov. 2. 1970	DRAWING NUMBER: FIGURE 2-13	340 E. 400 E.

TABLE 2-1 **TROUBLE SHOOTING CHART**

Trouble	Probable Cause	Remedy
Manual starter rope comes out but pawls don't engage.	1. Lack of friction plate return spring action. 2. Defective pawls.	1. Check friction plate returnspring. Replace spring as required. 2. Check for broken or bent pawls. Replace pawls as required.
Manual starter rope doesn't return.	1. Recoil spring broken or bent. 2. Pulley housing warped or bent. 3. Starting pulley worn.	1. Replace spring. 2. Replace housing. 3. Replace pulley.
Electric starter inoperative	1. Loose electrical connections. 2. Poor ground 3. Faulty battery or circuits. 4. Faulty electric starter	1. Retighten connections. 2. Secure ground connection. 3. Check, recharge or replace battery. 4. Check starter solenoid. Repair or replace. 5. Inspect starter motor for evidence of moisture and broken or worn brushes. Dry out as necessary. Replace brushes as required. 6. Check starter switch. Replace if required. 7. Check harness or connector for broken wire. Repair or replace.
Hard to start or won't start	1. Carburetor adjustments too lean (not allowing enough gas to engine). 2. Inoperative diaphragm or flapper valve. 3. Engine not being choked to start. 4. Spark plugs improperly gapped, dirty or broken. 5. Magneto breaker points improperly gapped or dirty. 6. Head gasket blown or leaking 7. Empty gas tank or improper fuel mixture. 8. Water in fuel system 9. Weak coil or condenser 10. Obstructed fuel system 11. Air leak in crankcase or inlet system. 12. Primary wire broken. 13. Engine not timed properly. 14. Secondary wire not connected or spark plug protector not installed properly.	1. Adjust carburetor. Refer to Manufacturer's Specifications. 2. Refer to Manufacturer's Specifications. 3. Ensure choke is fully closed. 4. Remove plugs. Clean, adjust or install new plugs. 5. Clean, adjust or replace points. 6. Replace gasket 7. Refill tank with specified fuel/oil mixture (See Table 1-1). 8. Drain fuel from carburetor. Add carburetor de-icer as required to fuel. 9. Replace faulty coil or condenser 10. Disconnect fuel lines—clear obstruction. Flush system. Connect fuel lines. 11. Check crankcase pressure Table 3-1. 12. Repair or replace primary wire. 13. Re-time engine to proper specifications. 14. Secure secondary wire or spark plug protector.
Impossible to adjust idle	1. Spark retarding mechanism not working properly. 2. Pistons or rings worn. 3. Faulty carburetor	1. Repair retard mechanism 2. Replace as necessary. 3. Check carburetor, check valve. Refer to Manufacturer's Specifications.

TABLE 2.1 **TROUBLE SHOOTING CHART**

Missing at low speed or won't idle smoothly or slowly	1. Incorrect carburetor idle adjustment.	1. Adjust idle – Refer to Manufacturer's Specifications.
	2. Spark plugs improperly gapped or dirty.	2. Clean, adjust or install new plugs.
	3. Head gasket blown or leaking	3. Replace gasket.
	4. Loose or broken magneto wires	4. Repair or replace wires.
	5 Magneto breaker points improperly gapped or dirty.	5. Adjust, clean or install new points.
	6 Weak coil or condenser	6. Replace coil or condenser
	7. Improper fuel mixture (1) Too much oil (2) Too little oil	7. Refuel, using specified fuel/oil mixture (See Table 1-1).
	8. Leaking crankshaft seal	8. Replace seal.
Missing at high speed or intermittent spark.	1. Spark plugs improperly gapped or dirty.	1. Clean, adjust or install new plugs.
	2. Loose or broken magneto wires.	2. Repair or replace wires.
	3. Magneto breaker points improperly gapped or dirty.	3. Clean, adjust or install new points.
	4. Weak coil or condenser	4. Replace coil or condenser
	5. Heat range of spark plug incorrect.	5. Install specified spark plugs.
	6. Leaking head gasket.	6. Replace head gasket.
	7. Engine improperly timed.	7. Re-time engine.
Coughs, spits, slows down, surges	1. Idle or high speed jets too lean.	1 to 5. Adjust carburetor or fuel pump. Refer to Manufacturer's Specifications.
	2. Leaking gasket flange.	
	3. Inlet control lever set too low	
	4. Pulsation line obstructed	
	5. Fuel pump not supplying enough fuel due to: (1) Punctured diaphragm (2) Inoperative flapper valve.	
	6. Crankcase not properly sealed.	6. Reseal crankcase.
	7. Idle or main carburetor nozzle obstructed.	7. Refer to Manufacturer's Specifications.
	8. Fuel line obstructed.	8. Remove fuel line. Clear obstruction. Replace line.
	9. Carburetor inlet needle and seat obstructed.	9. Refer to Manufacturer's Specifications.
	10. Welch plug leaking.	10. Refer to Manufacturer's Specifications.
Overheating	1. Carburetor too lean	1. & 2. Adjust carburetor. Refer to Manufacturer's Specifications.
	2 Carburetor too rich	
	3. Incorrect timing	3. Retime engine to Specifications.
	4. Too much carbon	4. Remove cylinder heads. Clean top of pistons and inside compression chamber. Clean out exhaust port.
	5. Spark plug too hot	5. Install specified spark plugs.
	6 Air deflector not installed	6. Install air deflector.
	7. Air leak in manifold	7. Tighten nuts or change gaskets.
	8. Crankcase seal leaking	8. Fit new seal.
Vibrates excessively or runs rough and smokes.	1. Idle or high speed carburetor adjustment too rich.	1. to 5. Adjust carburetor. Refer to Manufacturer's Specifications.
	2. Choke not opening properly (bent linkage).	

TABLE 2.1 **TROUBLE SHOOTING CHART**

	3. Inlet control lever too high (carburetor floods).	
	4. Idle air bleed plugged.	
	5. Welch plug loose.	
	6. Muffler obstructed	6. Check and clear muffler.
	7. Engine not secured tightly to engine support.	7. Tighten engine mounting bolts.
	8. Water in gas.	8. Add carburetor de-icer fluid as required.
	9. Water in the ignition switch.	9. Dry out switch, using suitable de-icer spray or heat.
Won't start, kicks back and backfires.	1. Spark plug wires reversed	1. Install wire correctly.
	2. Flywheel key missing or sheared	2. Replace key.
	3. Faulty condenser	3. Replace condenser
	4. Improper timing	4. Re-time engine
	5. Faulty breaker points	5. Adjust or replace points.
	6. Unhooked spark retarding mechanism-or spring broken	6. Reconnect mechanism or replace spring
No acceleration, low top R.P.M., hard to start	1. Spark plugs improperly gapped or dirty.	1. Clean, adjust or install new plugs.
	2. Magneto breaker points improperly gapped or dirty.	2. Clean, adjust or install new points.
	3. Faulty coil or condenser.	3. Replace coil or condenser.
	4. Loose or broken magneto wires.	4. Repair or replace magneto wires.
	5. Blown head gasket.	5. Replace head gasket.
	6. Inlet lever adjustment too low	6. Refer to carburetor manufacturer Specifications.
	7. Crankcase leaking	7. Install new seal.
Good spark but engine runs on one cylinder.	1. Leaking cylinder head	1. Check head for warps, cracks. Install new gasket and cylinder head
	2. Magneto wires broken inside (coil ground broken).	2 Repair or replace wires.
	3. Cracked cylinder wall	3. Replace faulty cylinder.
	4. Defective spark plug.	4. Clean, adjust or install new plug
	5. Breaker points improperly gapped	5. Re-adjust points.
	6. Crankcase seal leaking.	6. Install new seal
No acceleration. Idles well but dies down when put to full throttle.	1. High speed needle set too lean.	1. to 7. Adjust carburetor. Refer to Manufacturer's Specifications
	2. Dirt behind needle and seat.	
	3. High speed jet obstructed.	
	4. Inlet lever set too low.	
	5. Choke partly closed.	
	6. Silencer obstructed.	
	7. Fuel pump not supplying enough fuel due to: (1) Punctured diaphragm (2) Flapper valves distorted.	
	8. Fuel line obstructed.	8. Remove fuel line. Clear obstruction. Replace line.
	9. Not enough oil in gas.	9. Refuel, using specified fuel/oil mixture.
	10. Breaker points improperly gapped or dirty.	10. Adjust, clean or install new points.
	11. Engine improperly timed.	11. Re-time engine to specifications
Engine runs by using choke at high speed.	1. High speed needle set too lean.	1. & 2. Adjust carburetor. Refer to Manufacturer's Specifications.
	2. Dirt behind needle and seat.	

TABLE 2.1 TROUBLE SHOOTING CHART

	3. Fuel line obstructed	3. Remove line, clear obstruction, replace line.
	4. Inoperative fuel pump	4. Refer to Manufacturer's Specifications
No power under heavy load	1. Magneto breaker points improperly gapped or dirty.	1. Clean, adjust or install new points.
	2. Ignition timing too far advanced	2. Adjust timing
	3. Magneto coil plate loose	3. Check magneto and secure coil plate.
	4. Faulty carburetion	4. Refer to Manufacturer's Specifications.
Cranks over extremely easy on one or both cylinders. Loss of compression.	1. Scored piston due to: (1) Not enough oil in gas. (2) Lack of cooling	1. Replace faulty piston.
	2. Blown head gasket.	2. Replace head gasket.
	3. Loose spark plug	3. Check plug for security.
	4. Head bolts not tight enough	4. Torque head bolts to proper specifications.
Engine won't crank over. Unable to rotate flywheel.	1. Piston rusted to cylinder wall	1. Remove piston and cylinder. Replace defective parts.
	2. Crankshaft seized to bearing (main or rod).	2 & 3. Disassemble engine. Replace defective parts.
	3. Broken connecting rod.	
	4. Flywheel seized to coil plate.	4. Remove flywheel. Replace defective parts.
	5. Engine improperly assembled after repair.	5. Recheck re-assembly procedure.

2.7 OPERATING INSTRUCTIONS

2.7.1 Preparation For Operation:

Ensure that the fuel tank is filled with the correct mixture of recommended gasoline and special air-cooled two stroke engine oil. See Table 1-1.

CAUTION: When filling or topping up the fuel tank, use a fuel strainer to prevent possible contamination of engine and fuel system components.

2.7.2 Starting

2.7.2.1 Starting the engine using recoil starter.

a. Adjust throttle lever to approximately one-half full open position.
b. Close carburetor choke lever. When starting a warm engine it may not be necessary to close the choke.
c. Switch the ignition to the RUN position.
d. Pull lightly on the handle of the rope until a click is heard when the pulley engaged with the flywheel and then pull strongly on the rope. Let the handle return quickly to the original position. Do not let go of the handle until the rope has fully retracted.
e. If engine does not start, repeat step (d) and adjust throttle lever as required until the engine starts.
f. After the engine has started, gradually open the choke lever and close throttle lever until the engine runs smoothly at idling speed (1000-1200 rpm). When the engine is running at normal operating temperature the choke should remain in the fully open position.

NOTE: If the engine fails to start after repeated attempts, refer to Trouble Shooting Chart, Table 2-1.

2.7.2.2 Starting the engine using electric starter.

a. Adjust throttle lever to approximately one-half full open position.
b. Close carburetor choke lever. When starting a warm engine it may not be necessary to close the choke.
c. Engage the applicable ignition switch. If engine does not start within 5 seconds, disengage the ignition switch. Adjust throttle lever as required; wait approximately 30 seconds and repeat the starting procedure.
d. After the engine has started, gradually open the choke lever and close the throttle lever until the engine runs smoothly at idling speed (1000-1200 rpm). When the engine is running at normal operating temperature the choke should remain in the fully open position.

NOTE: If the engine fails to start after repeated attempts, refer to Trouble Shooting Chart, Table 2-1.

2.7.3 Stopping the Engine

To stop the engine, close throttle; switch off the ignition. Do not stop engine by grounding the spark plugs or disconnecting spark plug wires.

2.8 LUBRICATION

Lubrication chart, Table 2-2, details periodic lubrication requirements. Further periodic lubrication of these engines is not required.

TABLE 2-2 LUBRICATION CHART

Component	Periodicity	Type/Method	Access
Recoil Starter Center hub. Main spring. Pawls.	Once yearly or during overhaul	Grease, low temperature, Lubriplate or equivalent (by hand)	Remove recoil starter cover. Remove friction plate. (See Section III, Para. 3.2.1d and Section IV, para. 4-3).
Electric Starter drive shaft and spring (if installed).	Once yearly or during overhaul	Grease, low temperature, Lubriplate or equivalent (by hand)	Remove starter (See Section III, Para. 3.2.1g).
Contact Breaker Points (oil-felt pads)	Once yearly or during overhaul	1 or 2 drops good quality light machine oil (oil can).	Remove recoil starter and starter pulley. (See Section III, Para. 3.2.1d and 3.2.1h). Lubricate through breakerpoint access hole.
Contact Breaker Point Cam	Once yearly or during overhaul	Grease, low temperture, Lubriplate or equivalent. Lightly coat governor assembly and flywheel collar (by hand)	Remove flywheel (See Para. 3.2.1j) Remove snap-ring. Lift out cam. Replace cam and snap ring. (See Section IV, Para. 4.4).

The following is a list of recommended brands of two stroke engine oil:

Esso Snowtrac
Veedol Snowmobile
Shell Two Cycle Snowmobile
Mercury 50 New Formula "Quicksilver"
"Bardahl" Snowmobile VBA

SECTION III

DISASSEMBLY, CLEANING AND INSPECTION

3.1 PREPARATION FOR DISASSEMBLY

a. Remove muffler and exhaust pipe as applicable. Disconnect electrical wiring and controls. Remove engine mounting bolts; place engine on a suitable workbench.

b. Thoroughly clean exterior surfaces of engine, using suitable cleaning solvent.

3.2 DISASSEMBLY

NOTE: To prevent loss and expedite reassembly procedures, keep attaching hardware with each part as it is removed.

3.2.1 Disassemble the engine as follows:

a. Disconnect spark plug wires at spark plugs. Remove plugs.

b. Remove the ten bolts securing cylinder cover to engine body. Remove cover. See Figure 3-1

c. Remove the four hold-down nuts, washers and lockwashers securing intake and exhaust manifolds to cylinders.
Remove manifolds. Remove intake manifold with carburetor attached. Remove carburetor if it requires servicing. Refer to applicable carburetor manufacturer's specifications. Remove insulators from intake side. Discard gaskets.

Figure 3-2.

d. Remove the four bolts securing recoil starter to fan cover. Remove starter to expose starter cup and fan belt pulley.

Figure 3-3.

e. Disconnect coupler attached to fan cover. Remove two bolts securing coil cover to fan cover. Remove cover to expose high tension coils.

Figure 3-3.

f. Remove the two bolts and spacers securing high tension coils to fan cover. Remove coils with spark plug wires attached.

g. Remove the two hold-down nuts, two attaching bolts and lockwashers securing electric starter to engine body (if so equipped). Remove starter.

Remove starter.

h. Remove the three bolts securing starter cup, fan belt pulley and window plate (if installed) to flywheel. Pull outward and up on pulley to remove from flywheel. Remove fan belt.

i. Remove the two Phillips screws securing ignition terminal coupler and bracket to fan cover, and four bolts securing fan cover to fan cover case. Remove fan cover to expose flywheel.

j. Lock the flywheel using CCW Tool Part #43-0798-40 remove the nut, lockwasher and flat washer securing flywheel to crankshaft. Remove the flywheel as follows:
1. Install flywheel puller to the three tapped holes in flywheel.
2. Tighten the center bolt of puller to 40 pounds-feet maximum.
3. Using a wooden mallet or block and hammer, tap each side of the flywheel alternately while maintaining the torque setting on center bolt until the flywheel is removed.

CAUTION: 1. Do not over torque center bolt on flywheel puller. Excessive torque may result in breaking the puller attachment bolts.
2. Do not hammer on end of crankshaft to remove flywheel. Damage to the shaft or bearings may result.

Figure 3-6.

k. Remove the four bolts securing fan covercase to crankcase. Remove covercase.

Figure 3-7.

l. Remove the two screws securing stator assembly to crankcase. Remove stator assembly.

Figure 3-8.

NOTE: Unless being serviced, stator assembly should be stored inside flywheel to ensure retention of magnetic properties.

m. Remove the five hold-down nuts securing each cylinder head to cylinder. Remove cylinder heads.
Discard cylinder head gaskets.
Tool: 13 mm box spanner.

NOTE: Before proceeding any further check crankshaft for bend and twist as follows:

1. Check for twist:
(a) Rotate engine to T.D.C. on No. 1 cylinder using a dial indicator mounted on the cylinder.
(b) Install and zero a degree wheel on the crankshaft.
(c) Rotate crankshaft 180°. The piston on No. 2 cylinder should be at T.D.C. Permissable tolerance is 2°.
2. Check for bend on either end:
(a) Mount a dial indicator at the junction of the parallel and tapered sections of the shaft.
(b) Zero the indicator. Rotate the crankshaft one full turn. Permissable runout is 0.003 inch on one rotation.

n. Remove the four hold-down nuts securing each cylinder to crankcase. Remove cylinders to expose piston and connecting rod assemblies. Discard cylinder base gaskets.
Figure 3-10.

CAUTION: If disassembly is discontinued after cylinder or piston removal, ensure that crankcase is kept covered to prevent ingress of dirt or foreign objects to crankcase.

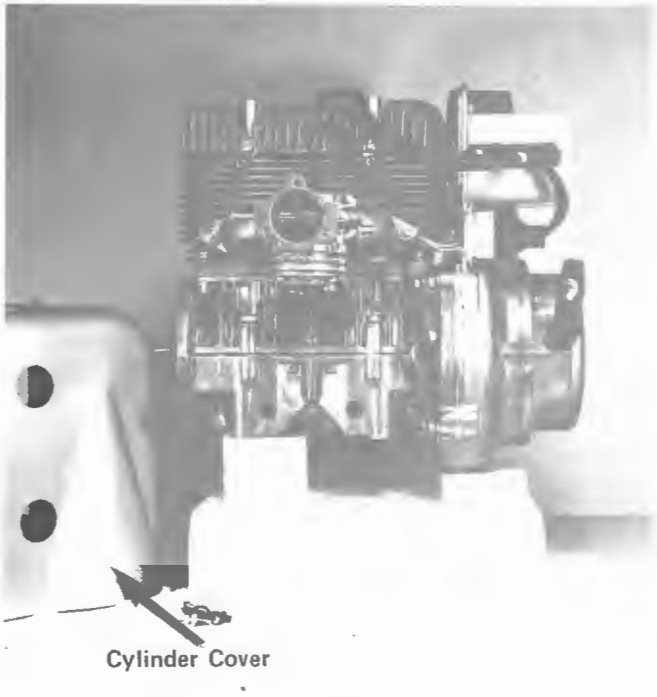


Fig. 3-1 Cylinder Cover Removed

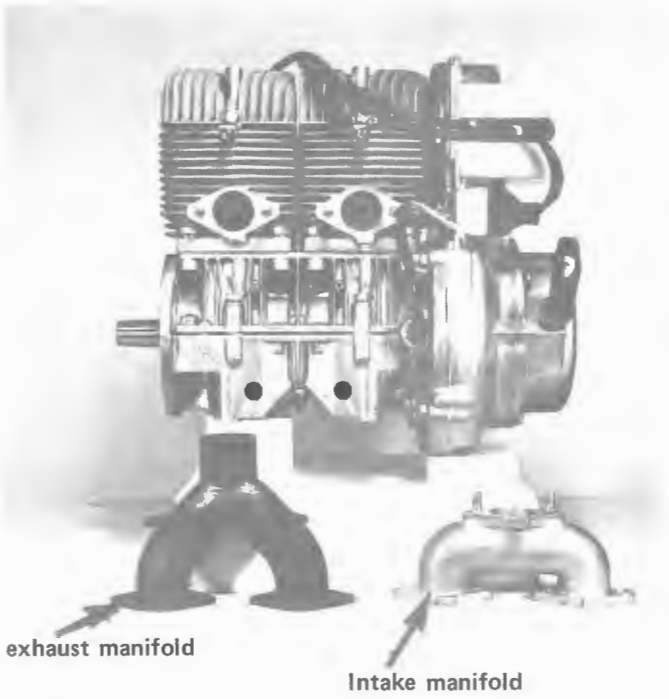


Fig. 3-2 Intake and Exhaust Manifolds Removed

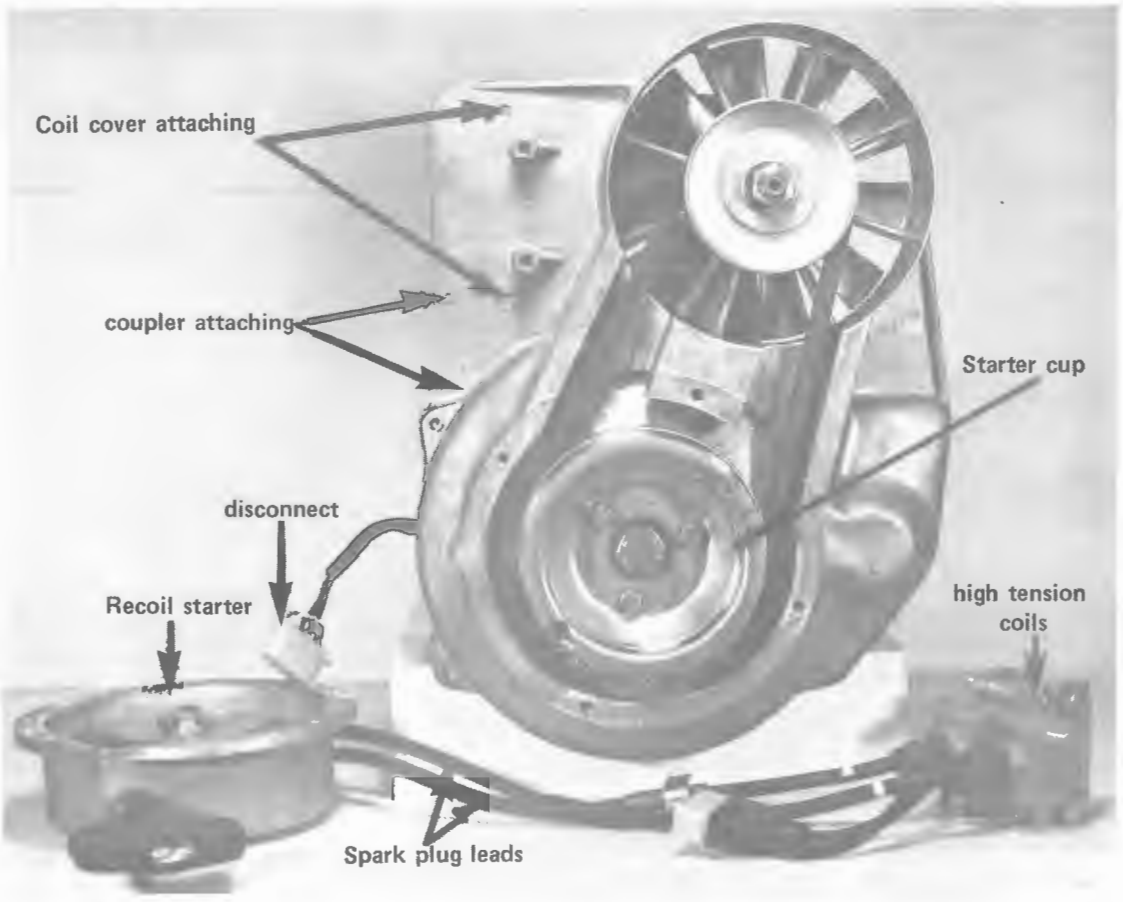


Fig. 3-3 Recoil starter and high tension coils removed

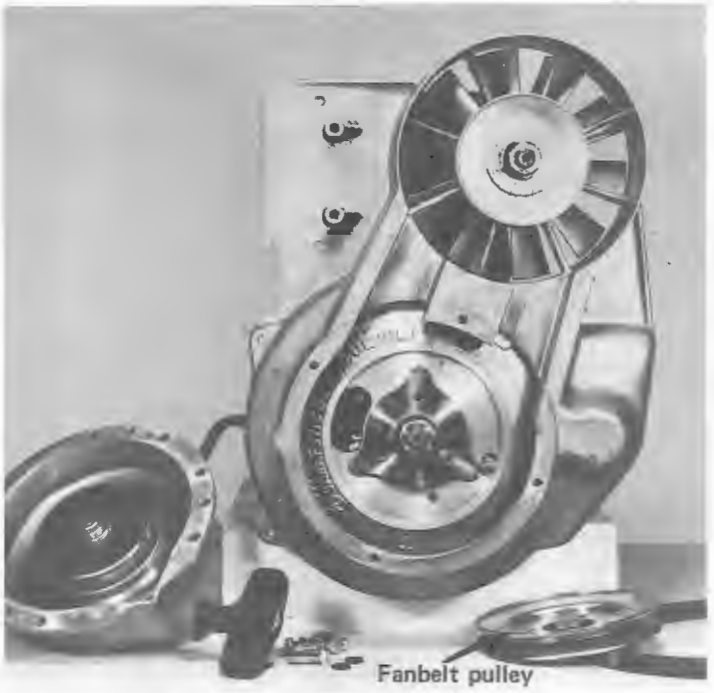


Fig. 3-4 Starter cup and fan belt pulley removed

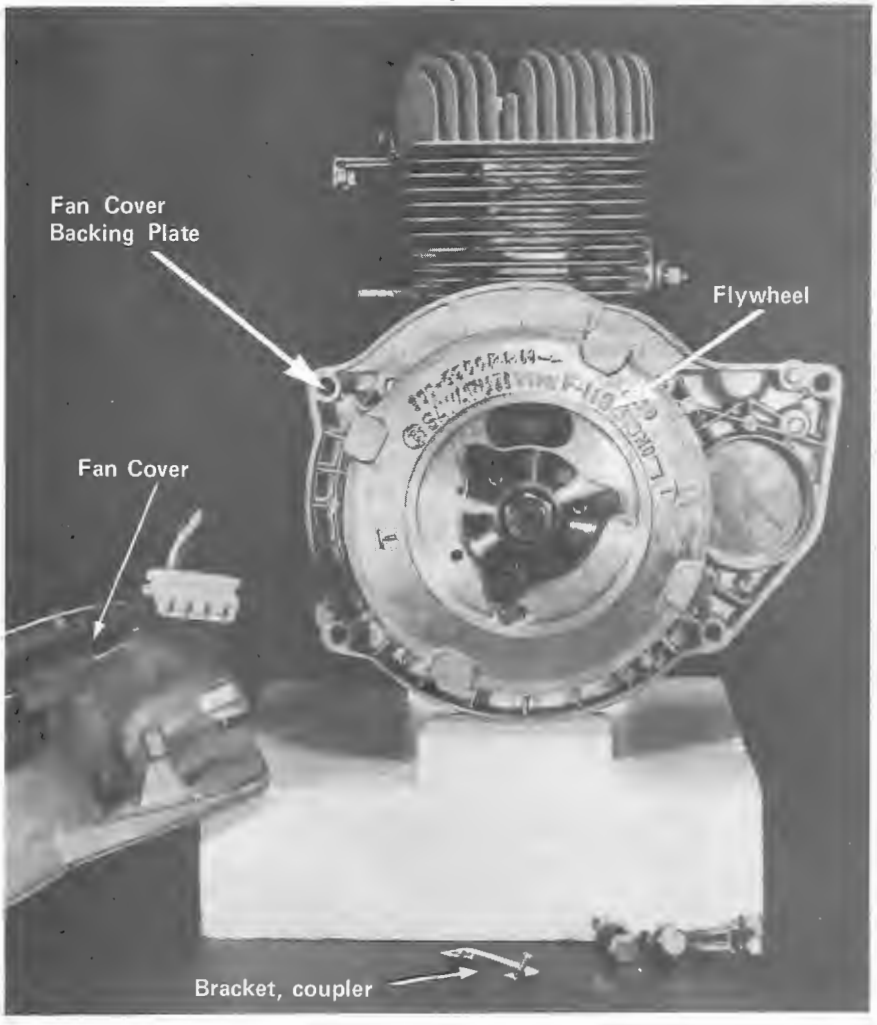


Fig. 3-5 Fan cover removed

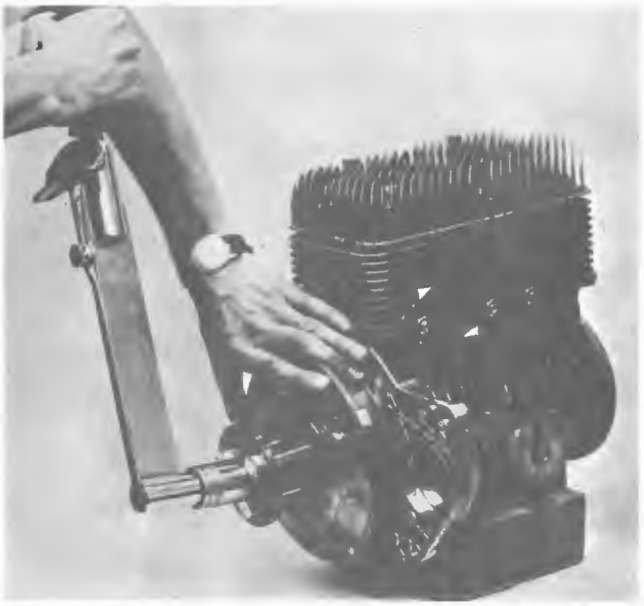
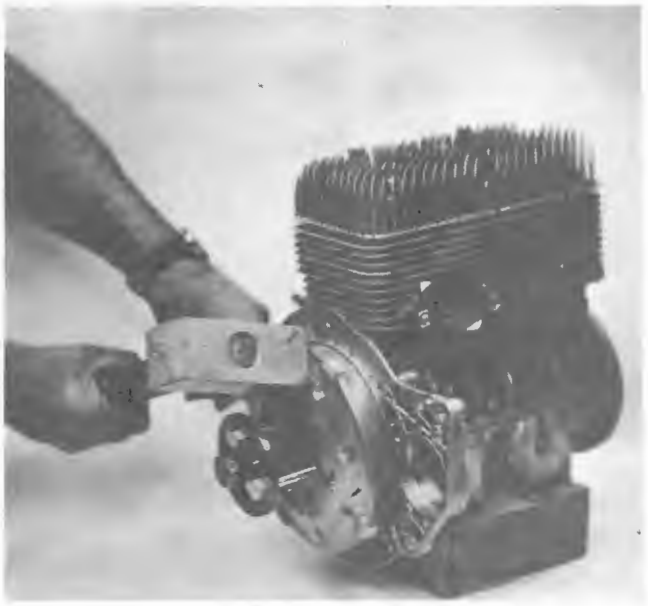


Fig. 3-6



Removing flywheel

Fig. 3-6A

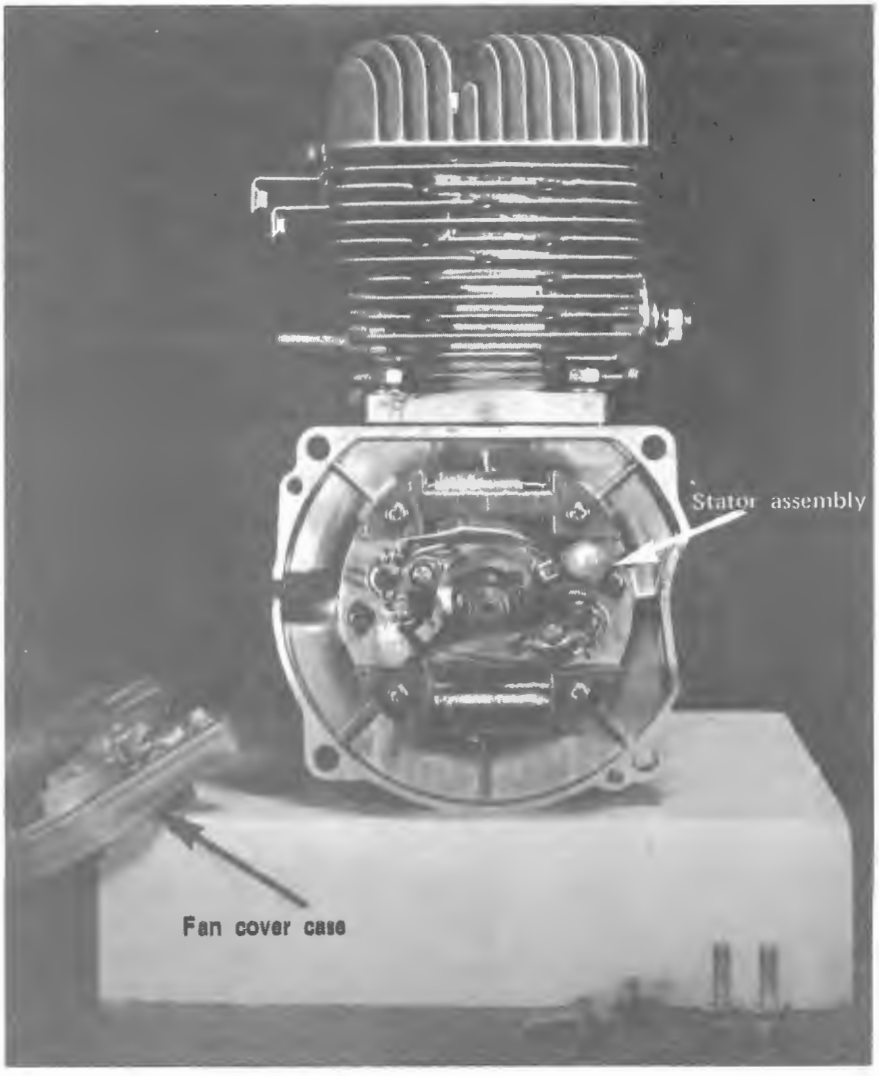


Fig. 3-7 Fan cover case removed

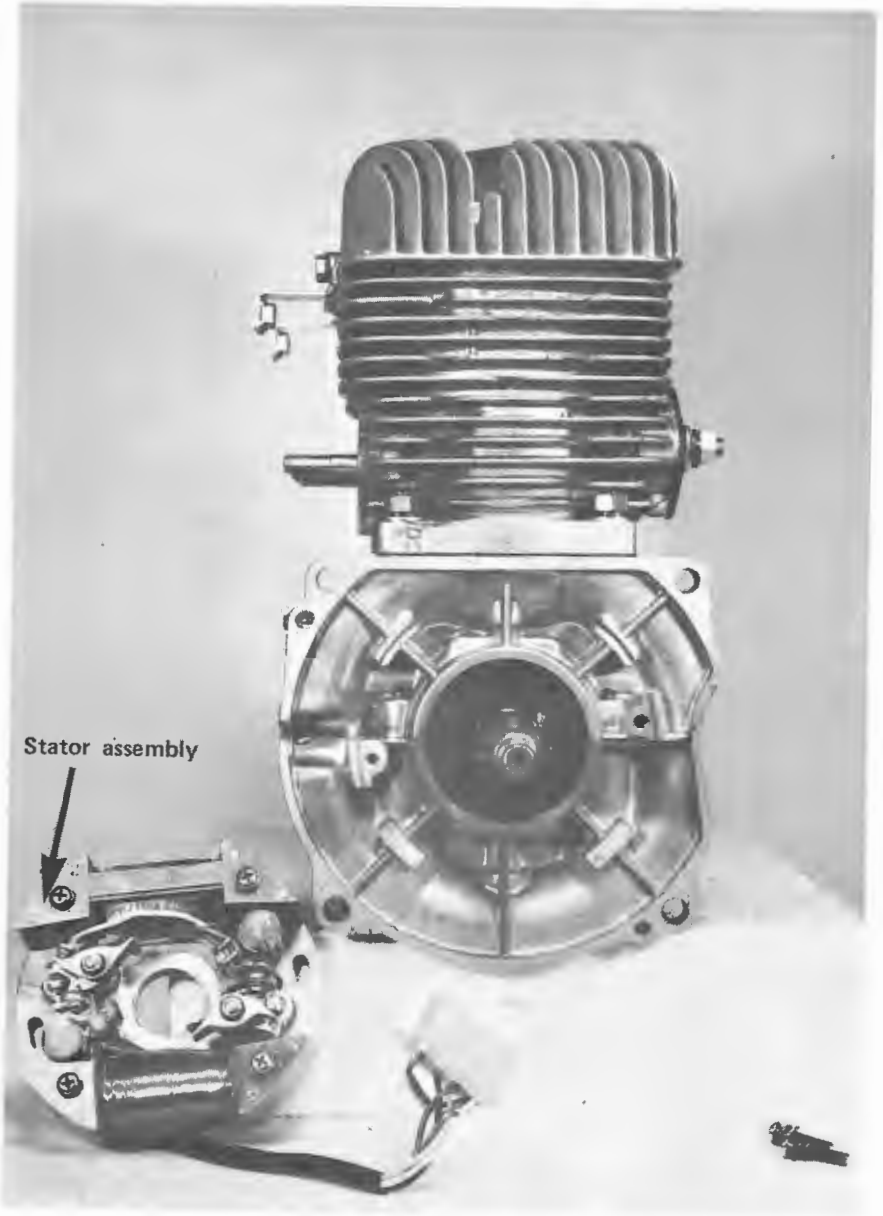


Fig. 3-8 Stator assembly removed

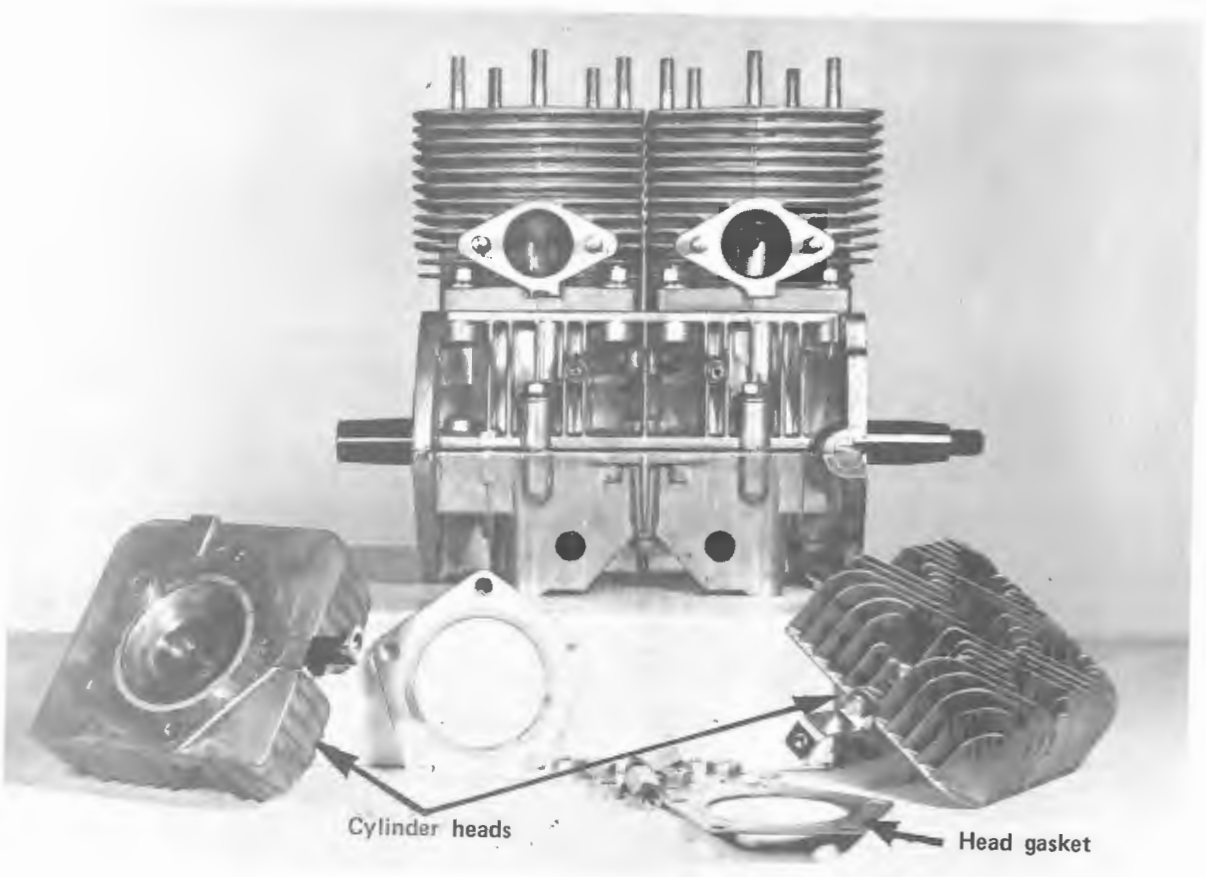


Fig. 3-9 Cylinder heads removed

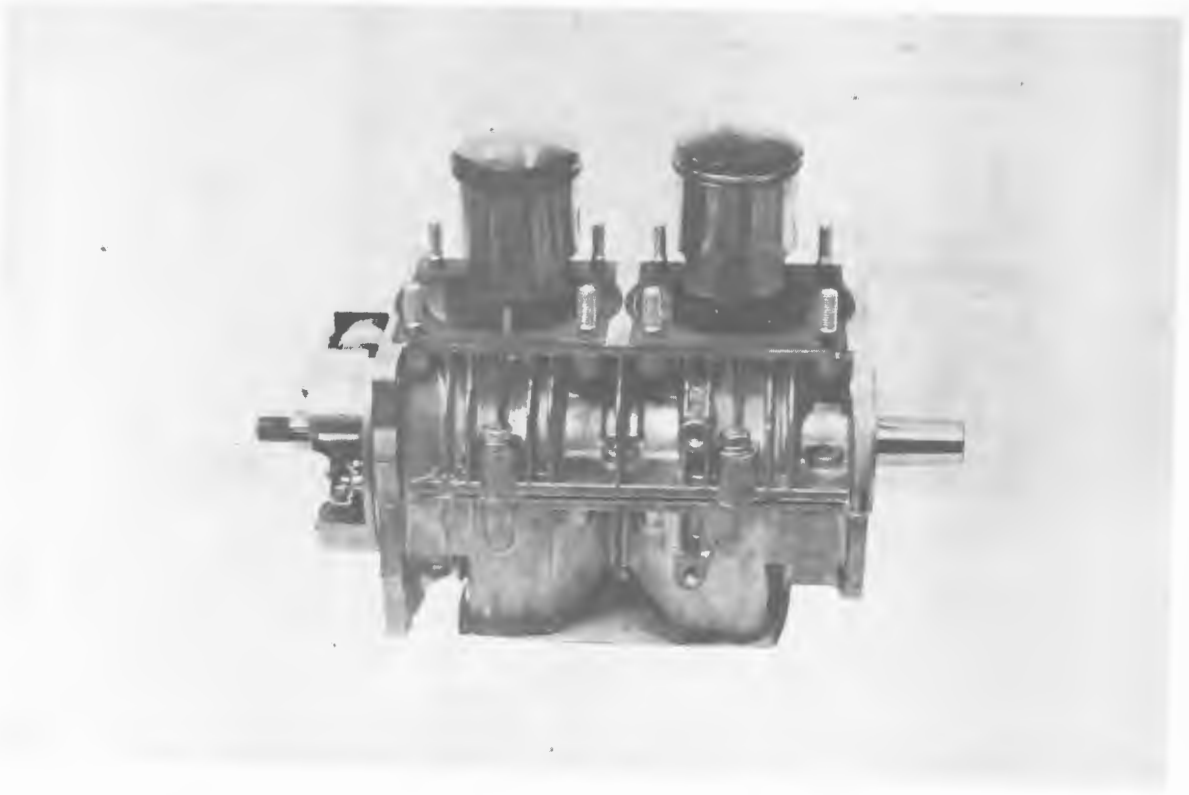


Fig. 3-10 Cylinders removed

o. Refer to Section IV, Figure 4-7
Before removing pistons (5), ensure that the piston crown is marked with an arrow directed toward the exhaust port. If no arrow is legible, inscribe the piston crown accordingly. Using a suitable circlip removal tool, remove one of the two circlips (7) securing each piston pin (6) in position. Use a propane torch or cloth soaked in hot water and heat the pistons until warm to the touch (120°-140° F). Use a soft drift to push the pins out from the opposite side. Remove needle bearings (10) from connecting rods small end.

CAUTION: Exercise care when removing piston pins to prevent damage to needle bearings. Keep bearings adequately protected until time of assembly. Figure 3-11.

p. Remove piston rings from piston ring groove, using a suitable ring removal tool.

q. Remove the ten bolts, plain washers and lockwashers joining the two halves of crankcase. Separate crankcase by pulling the two halves apart. Remove the crankshaft. Remove the four seal retaining circlips from crankcase lower half. (Refer to Section V, figure 5-1).

CAUTION: Do not use a screw driver to pry the crankcase apart. If necessary, use a soft hammer and tap the case lightly on either end.

Figure 3-12

3.3 CLEANING AND INSPECTION

3.3.1 Cleaning

Prior to inspection clean all parts, except the magneto assembly, by immersing and soaking in a suitable cleaning solvent or using specified methods. Clean the crankshaft before cleaning other components, to protect bearings from possible damage due to dirty cleaning solvent. Thoroughly dry all parts after cleaning.

Pay particular attention to the following special instructions:

a. Spark plugs:
Remove light carbon deposits by brushing lightly with a wire brush. If plug is excessively dirty and proper cleaning equipment is not available, install a new spark plug.

b. Piston ring grooves, piston crowns, cylinder heads:
Use the proper groove cleaning tool for cleaning piston ring grooves. Normal cleaning methods should be sufficient for cleaning piston crowns and cylinder heads.

c. Spark plug holes and exhaust ports:
Carefully remove heavy carbon deposits from these areas, using a soft metal (non-ferrous) scraper. Use a spark plug tap to clean threads.

CAUTION: Do not scrape down to base metal surfaces when removing heavy carbon deposits. Exercise care while cleaning spark plug holes, to prevent damage to the threaded area.

d. Magneto:
Thoroughly dryclean the magneto using compressed air or suitable cleaning materials. Ensure no moisture or oily film remains after cleaning.

3.3.2 Inspection

3.3.3 General

a. After disassembly, clean all parts in accordance with paragraph 3.3.1. Inspect all parts for obvious damage, wear, cracks, and evidence of corrosion; attaching hardware and attachment holes for wear and condition of threads. If it is necessary to dress the threads, use suitable thread cleaning tools. Repair or replace damaged parts and any parts that fail to meet applicable specifications. Refer to Section IV, Repair and Replacement.

b. Perform additional inspections as detailed in paragraphs 3.3.4 to 3.3.13.

3.3.4 Spark Plugs Inspection and Adjustment

a. Inspect spark plugs for general condition, cracked or broken insulators and burned electrodes.
Guide to spark plug serviceability:
1. Center electrode burned brown indicates plug is functioning normally.
2. Center electrode burned white indicates the plug is too low in thermal value. Discard plug and install new plug of specified type.
3. Center electrode burned black indicates the plug is too high in thermal value. Discard plug and install new plug of specified type.

b. Adjust spark plug gap to 0.6 to 0.7 mm. (0.023 to 0.025) in). Bend the outside (ground) electrode only. Use a spark plug wire gauge to measure the gap. Discard plug if electrode is burned excessively or if specified gap cannot be maintained.

c. Inspect spark plug wires for condition of insulation; rubber bushings for splitting or deterioration; tips for security. Replace defective wires.

3.3.5 Fan Covers

a. Inspect fins for cracks; fan for blade damage, freedom of movement and evidence of binding. Dress out nicks or dents. Replace fan if a blade is cracked or broken since the balance will be affected.

b. Inspect fan belt for stretch, fraying and deterioration.

3.3.6 Recoil Starter

a. Pull starter rope out and permit it to recoil. Do not let rope snap back on recoil. Rope should pull out smoothly and recoil without hesitation. A weak or incomplete recoil indicates a defective or maladjusted main spring.

b. Check for smooth operation of pawls. When the rope is pulled out, pawls should move outward; when the rope recoils, pawls should move inward.

c. Inspect handle and rope guide for general condition and security of attachment.

3.3.7 Electric Starter (if installed)

a. Inspect drive shaft and spring for condition, smooth operation and security. Lubricate in accordance with Lubrication Chart, Table 2-2.

NOTE: Disassembly or repair of electric starters should be performed by authorized dealers only. Replace defective starters if overhaul facilities are not available.

3.3.8 Magneto Assembly

a. Inspect coil plate for damage and security.

b. Inspect low tension generation coil(s) and lighting coils for general condition and security.

c. Inspect contact breaker points and condensers for condition; breaker points for wear, burning or pitting. Serviceable points appear a greyish frosty color. If points are in

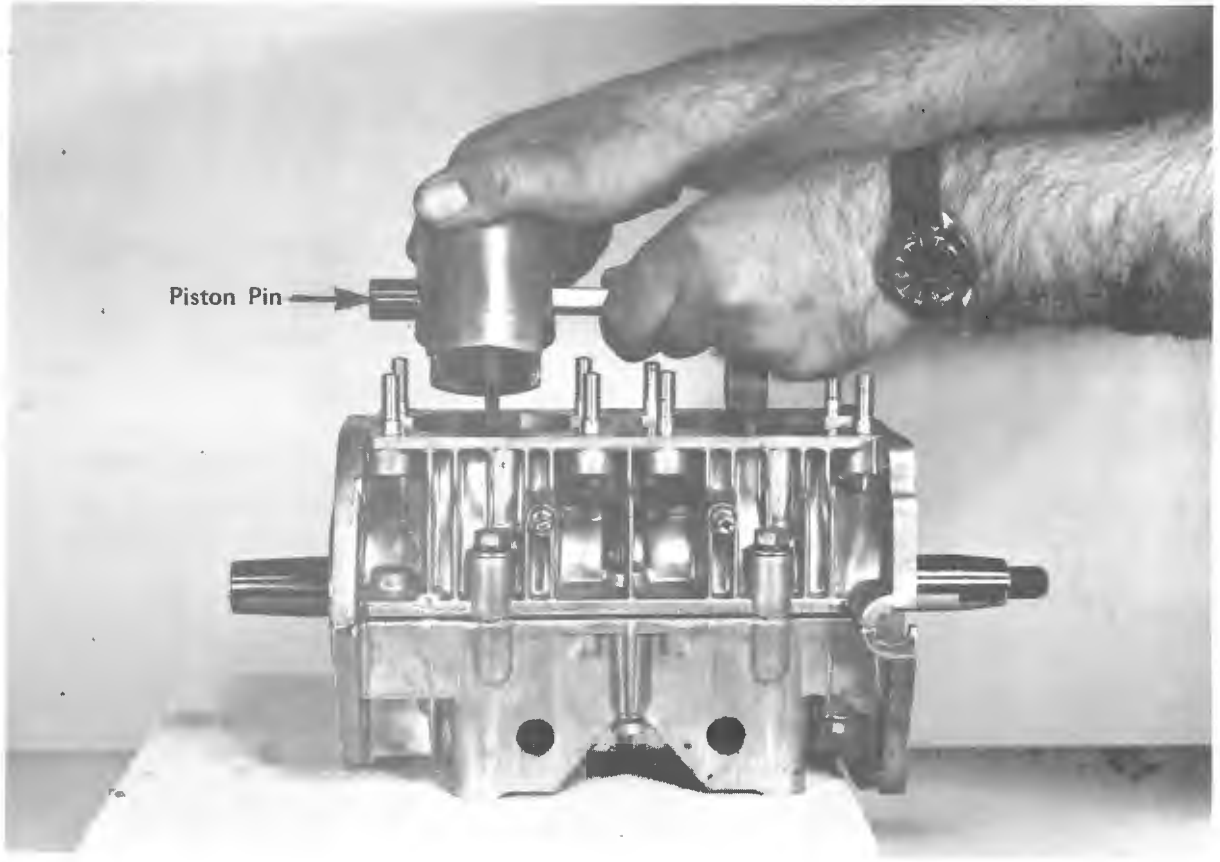


Fig. 3-11 Removing pistons

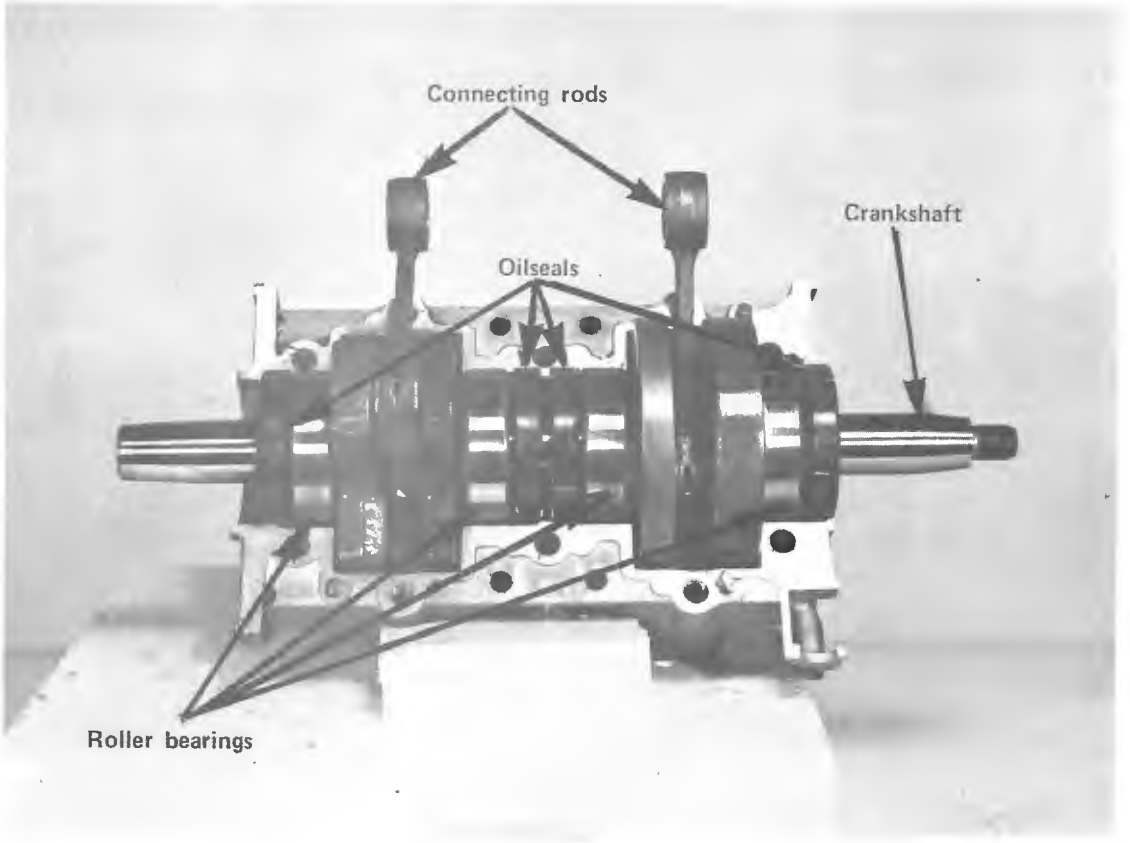


Fig. 3-12 Upper Crankcase half removed

serviceable condition, the condenser can be considered serviceable. Inspect oil felt pads for condition and security; lubricate in accordance with Lubrication Chart, Table 2-2.

d. Inspect all electrical connections for security; insulation for chafing and deterioration.

3.3.9 Flywheel Assembly

a. Inspect cam, governor weight(s) and spring(s) for general condition and security; cam for wear, particularly at point of contact with governor weights.
b. Check flywheel taper for snug fitting. When placed on crankshaft hand tight, the flywheel should not wobble.
c. Inspect magnets for nicks, scores or burrs. Use a suitable stone to smooth off high spots.
d. Inspect ring gear and teeth (if installed) for wear, general condition and security.
e. Lubricate cam, governor weight and spring in accordance with Lubrication Chart, Table 2-2.

3.3.10 Cylinder Heads and Cylinders

a. Inspect cylinder heads and cylinders for pitting, scoring and evidence of corrosion.
b. Check cylinder heads for warp or distortion as follows:
   1. Place cylinder head, flat side down, on a surface plate or suitable measuring device.
   2. Using a feeler gauge, measure amount of distortion at point of contact between cylinder head and surface plate.
      Take a reading at each of the five locations between cylinder head hold down studs.
      Maximum allowable distortion at any one location is 0.002 inch.
c. Check cylinders for distortion as follows:
   1. Install a serviceable head on cylinder to be checked. Do not install hold down nuts.
   2. Using a feeler gauge, measure amount of distortion at point of contact between cylinder head and cylinder. Take a reading at each of the five locations between cylinder head hold down studs.
      Maximum allowable distortion at any one location is 0.002 inch.
d. Using a dial indicator or suitable measuring device, check inside diameter of cylinders. Cylinders, worn beyond standard tolerances, may be rebored to accomodate the installation of oversize pistons. Refer to Table 3-1 for standard and oversize fits and tolerances. The oversizes listed in the table are the maximum allowable. Discard cylinders that require boring in excess of tolerance shown. Replace with serviceable cylinders.

NOTE: Rebored cylinders should be honed with a fine finishing stone.

3.3.11 Pistons, Pins and Rings

a. Inspect pistons, pins and rings for scoring and wear; piston crowns for pitting, evidence of corrosion and distortion.
b. Check diameter of pistons, pins and pin bore; piston ring end and side clearances. Refer to Table 3-1 for method of inspection and tolerances.
c. Discard any parts that fail to meet applicable specifications and note the following:
   1. If cylinder has been inspected and found serviceable, replace defective piston with new standard size piston.
   2. If cylinder has been rebored and honed, replace defective piston with oversize piston as listed in Table 3-1.

3.3.12 Crankshaft and Connecting Rods

a. Inspect threads on each end of shaft. The mating nut on the flywheel end of the shaft should turn on all the way by hand without excessive looseness.
   Use a suitable thread cleaning tool to remove burrs from the threads. Replace worn nuts.
b. Check tapered surface of flywheel end of shaft for scoring and wear. When placed on the shaft hand tight, the flywheel should not wobble.
c. Inspect keyway and Woodruff key for damage and wear. Replace worn keys.
d. Inspect ball bearings for wear, free movement and security.
e. Using Vee blocks (2) on a flat surface, support the crankshaft on the center main bearings. Mount dial indicators at junction of tapered and parallel sections of the shaft and rotate crankshaft by the connecting rods. Refer to Table 3-1 for tolerances.
f. Check crankshaft for bend or twist on the crankshaft journals. Use a dial indicator placed on the main bearing journals. Zero the indicator. Rotate crankshaft one full turn. Refer to Table 3-1 for tolerances.
g. Check connecting rod diameter at small end; side and vertical clearance at large end. Refer to Table 3-1 for method of inspection and tolerance.
h. Check connecting rod twist as follows:
   1. Insert a bar, 100 mm long or any other convenient length, into the connecting rod small end. Centralize the rod using a depth gauge and lock in position.
   2. Support connecting rod horizontally. Using a dial indicator measure the maximum height at opposite ends of the bar when the rod is twisted to the right and to the left. Any variation indicates connecting rod twist. Refer to Table 3-1 for tolerance.
i. Check connecting rod tilt as follows:
   1. Repeat step h(1).
   2. Support connecting rod vertically. Using a dial test indicator, measure the amount of movement at ends of bar when bar is tilted to the right and to the left. The difference between the two readings indicates the amount of tilt. Refer to Table 3-1 for tolerance.

3.3.13 Crankcase

a. Inspect crankcase mating surfaces for deep scratches, scoring and pitting.
b. Inspect bearing and oil seal retaining inserts for wear, scoring or conditions which could cause leaks.
c. Inspect attaching dowel pins for wear and security.
d. Discard crankcase if normal repair procedures are not sufficient to correct defects.

3.3.14 Fits and Tolerances

Table 3-1 lists standard fits and tolerances to be checked during inspection of pistons, piston pins, cylinders and crankshaft. It also lists allowable oversizes of pistons and rings. If suggested method of inspection is not available, use suitable measuring devices.

CCW Model 340-400 **TABLE 3-1 (FITS AND TOLERANCES)**

Component	Std. Size In.	Std. Size Mm	Tolerances Inches Minus	Tolerances Inches Plus	Remarks	Method of Inspection
Cylinder CCW 340	2.36	60	N/A	.0007		Dial Indicator
CCW 400	2.56	65	N/A	.0007		
CCW 440	2.67	68	N/A	.0007		
Connecting Rod, small end	.867	22	N/A	.0003 .0008		Dial Indicator
big end	1.261	32	N/A .001	.0004		
side clearance			.014 .016'	N/A		
vertical clearance			N/A	.0004 .0015		Dial Indicator
twist				.003	Measured at ends of bar 3.94" centred in small end (See Manual)	Dial Indicator
bend			N/A	.001		
Crankshaft permissable misalignment due to bend or twist.			N/A	.0035	Measured at junction of taper and parallel sections (see manual).	Dial Indicator
Crankshaft, end float			N/A	.003		Feeler gauge.
Piston, at CCW 340	2.36	60		N/A		Micrometer
CCW 400	2.56	65		N/A		
CCW 440	2.67	68		N/A		
Top land	—	—	.011 .012			
Piston Pin, c/l	—	—	.007 .008	N/A		
Bottom of skirt	—	—	.004 .0047	N/A		
Piston Pin Bore	.709	18	.0004	N/A		Dial Indicator
Piston Pin	.709	18	.0003	N/A		Micrometer
Piston Ring, No. 1	.083		.0025	N/A		Feeler Gauges
groove clearance			.004			
end clearance	—	—	.004 .012	N/A		
Piston Ring, No. 2	.083		.0014	N/A		
groove clearance			.003			
end clearance			.004 .012	N/A		

SECTION IV

REPAIR AND REPLACEMENT

4.1 GENERAL

4.1.1 The repair and replacement instructions detailed in this section are included to assist in the disassembly, replacement of defective parts and assembly of major sub-assemblies. It is not necessary to completely disassemble the sub-assemblies unless inspection procedures reveal defects. Perform only those steps necessary to gain access to the defective part(s) and to effect the necessary repairs.

4.2 FAN COVER (See figure 4-1)

4.2.1 Disassembly

a. Remove nut (2), lockwasher (3), and plain washer (4) from threaded end of fan shaft. Spacer (5) is permanently secured to outer pulley (6).
   Tool: 19 mm box spanner, Locking tool, Part No. 43-0792-50.

NOTE: Drill one 1/4" hole in pulley to take pin of locking tool.

b. Remove outer half (6) of fan belt pulley, spacers (7, 8, 9) inner half (10) of pulley, and spacer (11) from shaft.
c. Tap lightly on end of fan shaft to remove fan (16) from fan cover.
d. Inner bearing (15) should remain on fan shaft assembly and can be removed by sliding it off the shaft. To remove outer bearing (12), turn the case over; use a suitable soft drift to tap bearing out of retainer. Remove spacer (13). It is not necessary to remove snap ring (14) unless it is found defective. Use suitable removal tool to remove snap ring.
e. Clean all parts, except bearings, using suitable cleaning solvent. Wipe bearings clean, using a clean cloth moistened with cleaning solvent. Thoroughly dry all parts after cleaning.

4.2.2 Assembly

a. Replace defective parts.
b. Install snap ring (14) if it has been removed.
c. Install outer bearing (12). Turn case over; install spacer (13) and inner bearing (15). Ensure bearings are properly seated with no evidence of binding. If necessary, use a soft steel drift to tap bearings into position. Ensure that no dirt or foreign material enters bearings.
d. Reverse disassembly steps (a) to (c). Tighten retaining nut securely, using lock tool No. 43-0792-50.
e. Check fan for proper operation.

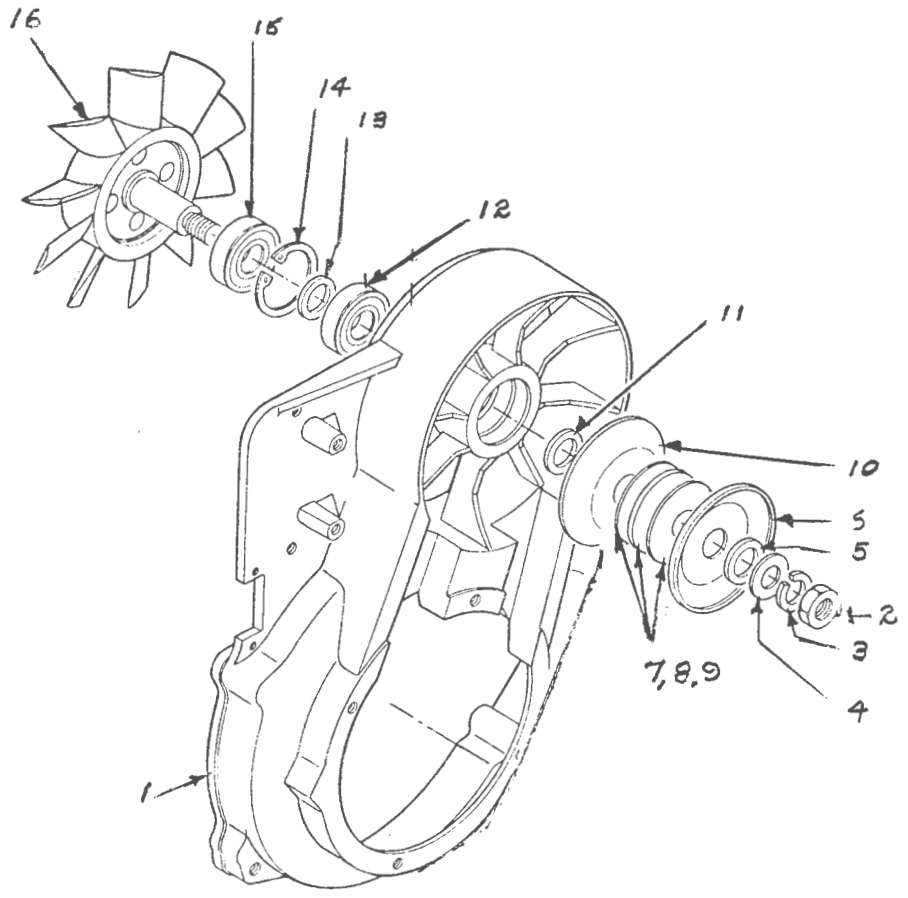
4.3 RECOIL STARTER (See Figure 4-2)

4.3.1 Disassembly

a. Untie the knot in the rope at rope handle (15). Remove handle and allow the rope to recoil slowly into the case (12). Unscrew and remove rope guide (13).
b. Remove retaining nut (2), lockwasher (3) and flatwasher (4) from threaded shaft of reel hub (10).
c. Manipulate friction plate (5) on reel hub until eye end of return spring (7) aligns with retaining slot (22). Remove friction plate.
d. Remove the three pawls (6).
e. Remove return spring (7), spring (8) and cup washer (9). Note position of plain end of return spring in the spring retaining hole in reel hub.
f. Remove reel (10). Unwind the rope; lift and untie the knotted end from center hub of reel.
g. Lift long rolled end of main spring (11) from the fixed spring retaining pin in the case and carefully remove the spring.
h. Clean all parts, except rope, using a suitable cleaning solvent. If rope requires cleaning, wash it in a solution of soap and water. Thoroughly dry all parts after cleaning.
i. Inspect all parts for obvious damage and wear.

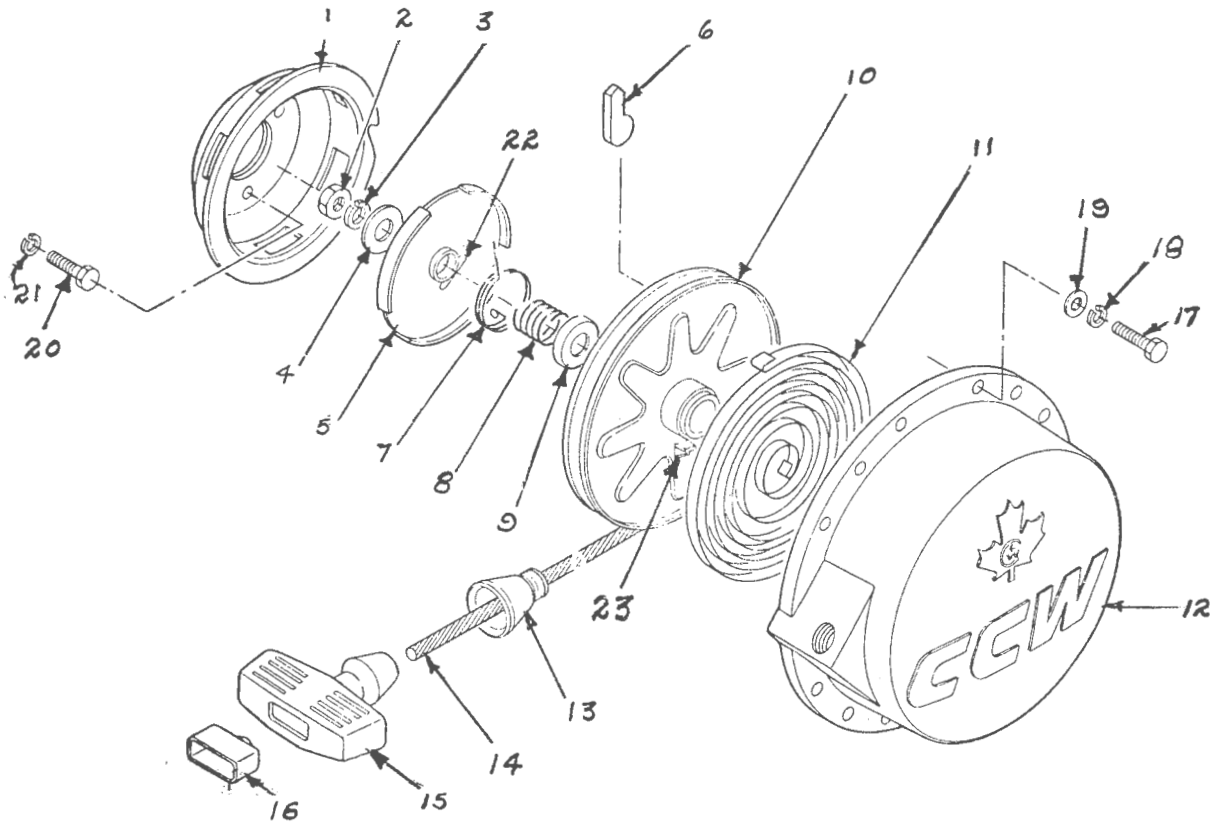
4.3.2 Assembly

a. Replace defective parts.
b. Install main spring as follows:
   1. Secure main spring winding tool, part number 43-0797-60, or equivalent tool, circular end up, in a suitable bench vise.
   2. Start with the long rolled end of main spring (11) and wind spring into circular end of tool in a clockwise direction.
   3. Remove tool from vise. Grasp the tool by its handle and lower the tool, with spring installed, into case (12).
   4. Secure the long rolled end of spring over the fixed spring retaining pin. Remove winding tool. Apply a light film of Lubriplate, or equivalent, to spring.
c. Secure case, open side up, in bench vise.
d. Tie a knot at one end of the rope. Secure knotted end around center hub of reel (10). Pull rope taut and wind entire rope around reel in an anti-clockwise direction until the free end protrudes through the notched section of the reel.
e. Apply a light film of Lubriplate, or equivalent, to center hub of case and install the reel. Push down and rotate



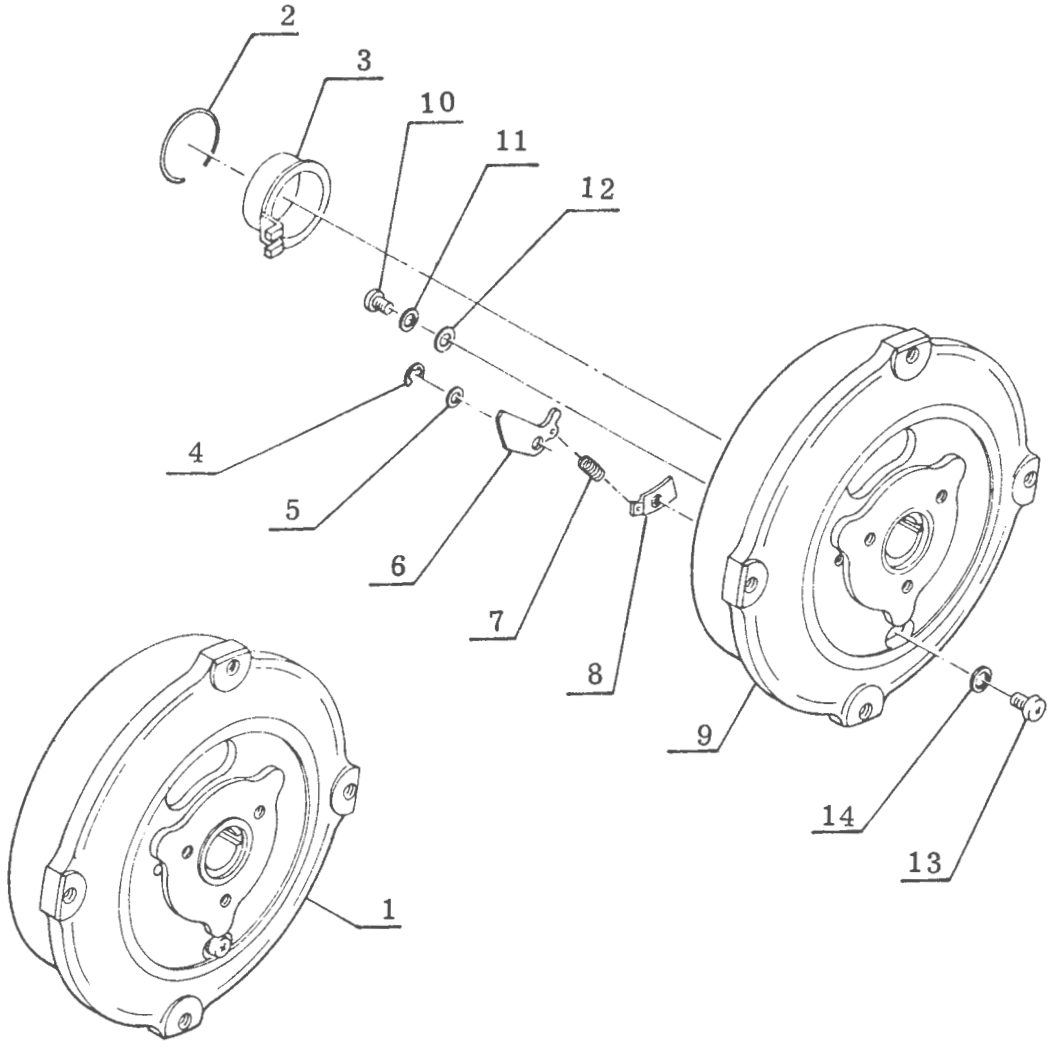
1. Fan cover
2. Retaining nut
3. Lockwasher
4. Plain washer
5. Spacer
6. Outer pulley
7. Spacer
8. Spacer
9. Spacer
10. Inner pulley
11. Spacer
12. Outer bearing
13. Spacer
14. Snap ring
15. Inner bearing
16. Fan

FIGURE 4-1 FAN COVER ASSEMBLY



1. Starter pulley
2. Retaining nut
3. Lockwasher
4. Flatwasher
5. Friction plate
6. Pawl (each 3)
7. Friction plate return spring
8. Spring
9. Cup washer
10. Reel
11. Main spring
12. Case
13. Rope guide
14. Rope
15. Handle
16. End piece
17. Bolt, starter to fan cover attaching
18. Lockwasher
19. Flatwasher
20. Bolt, starter pulley to flywheel attaching
21. Lockwasher
22. Slot, return spring retaining
23. Hook, main spring retaining

FIGURE 4-2 RECOIL STARTER ASSEMBLY



1. Flywheel assembly
2. Snap ring
3. Cam
4. Snap ring
5. Washer
6. Governor weight
7. Governor spring
8. Lug plate
9. Flywheel
10. Screw, lug plate attaching
11. Spring washer
12. Washer
13. Screw, governor stop
14. Spring washer

FIGURE 4-3 FLYWHEEL ASSEMBLY – 340S

reel in an anti-clockwise direction until the hook (23) engages with the free end of main spring. Tension will be felt when reel and spring are properly engaged.

f. Rotate reel a maximum of three complete turns in an anti-clockwise direction. Do not exceed three turns; hold reel in this position and feed free end of rope through case at the rope guide hole. Install rope guide. Loosely knot the rope to prevent recoil.
g. Apply a light film of Lubriplate or equivalent to pawls (6) and install them on the reel in the pawl retainers.
h. Install cup washer (9) flat side down, spring (8) and return spring (7). Ensure that plain end of return spring is properly engaged in the retaining hole in reel hub.
i. Install friction plate (5) over reel hub. Manipulate plate until eye end of return spring engages and locks crosswise in retaining slot (22).
j. Rotate friction plate until the three notches are aligned with pawls when pawls are at the recoil position.
k. Install flatwasher (4), lockwasher (3), and nut (2). Tighten nut securely.
l. Untie the temporary knot in free end of rope and install the rope handle. Tie a permanent knot and fit handle securely.
m. Check starter for proper operation. When handle is pulled outward, pawls should move outward.

NOTE: If main spring is to be installed without the use of a spring winding tool, wind main spring into case in an anti-clockwise direction. Clockwise installation on the winding tool is necessary to ensure correct anti-clockwise installation of the spring when tool is placed upside down in the case.

4.4 FLYWHEEL ASSEMBLY–SAWAFUJI–MODEL 340S

(See Fig. 4-3)

4.4.1 Disassembly

NOTE: Complete disassembly of flywheel assemblies should be performed by authorized dealers only. The auto advance mechanism is pre-set during manufacture and should require no further adjustment. If inspection reveals faulty governor parts or defective magnets, install a new flywheel assembly or return flywheel to overhaul facility.

a. Remove snap ring (2) securing breaker point cam (3) to flywheel collar, using a suitable snap ring removal tool. Lift cam off collar. Check cam and collar for scoring and wear; governor weight stop screw (10) for wear and security. Replace defective parts.

4.4.2 Assembly

a. Apply a light film of Lubriplate or equivalent to outer surface of flywheel collar.
b. Reverse removal procedure.
c. Lubricate in accordance with Lubrication Chart, Table 2-2.
d. Check mechanism for proper operation.

4.5 FLYWHEEL ASSEMBLY–KOKUSAN–MODELS 340E, 340G and all 400 MODELS (See Figure 4-4)

4.5.1 Disassembly

NOTE: Complete disassembly of flywheel assemblies should be performed by authorized dealers only. The auto-advance mechanism is pre-set during manufacture and should require no further adjustment. If inspection reveals faulty governor parts or defective magnets, install a new flywheel assembly or return flywheel to overhaul facility.

a. Remove snap ring (3) securing breaker point cam (4) to flywheel collar, using a suitable snap ring removal tool. Lift cam off collar. Check cam and collar for scoring and wear; governor weight stops for wear and security. Replace defective parts.

4.5.2 Assembly

a. Apply a light film of Lubriplate or equivalent to outer surface of flywheel collar.
b. Reverse removal procedure.
c. Lubricate in accordance with Lubrication Chart, Table 2-2.
d. Check mechanism for proper operation.

4.6 STATOR ASSEMBLY–SAWAFUJI–MODEL 340S (See Figure 4-5)

NOTE: Complete disassembly of stator assemblies should be performed by authorized dealers only. Normal disassembly should be restricted to removal and replacement of defective contact breaker point sets, oil felt pads or condensers. If inspection reveals additional maintenance requirements, install a new assembly or return stator to overhaul facility.

4.6.1 Contact Breaker Point sets

NOTE: Removal and installation procedure is applicable to both point sets.

4.6.1.1 Removal

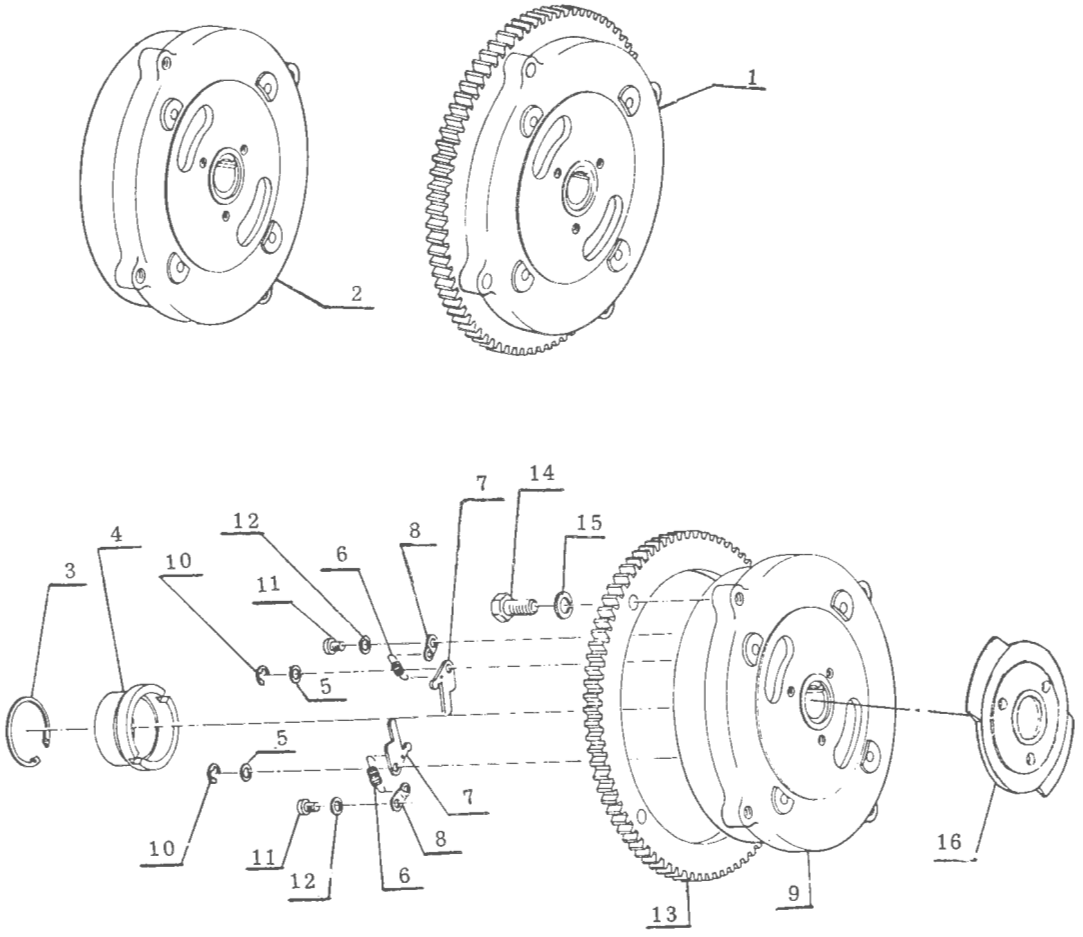
a. Loosen electrical terminal connector (28) securing condensor primary wire at contact breaker point set (7). Disconnect primary wire.
b. Remove retaining screw (18), lockwasher (16) and washer (17) securing contact breaker points to coil plate (2). Remove breaker point set.

4.6.1.2 Installation

a. Apply a light film of Lubriplate or equivalent to pivot shaft.
b. Reverse removal procedure.

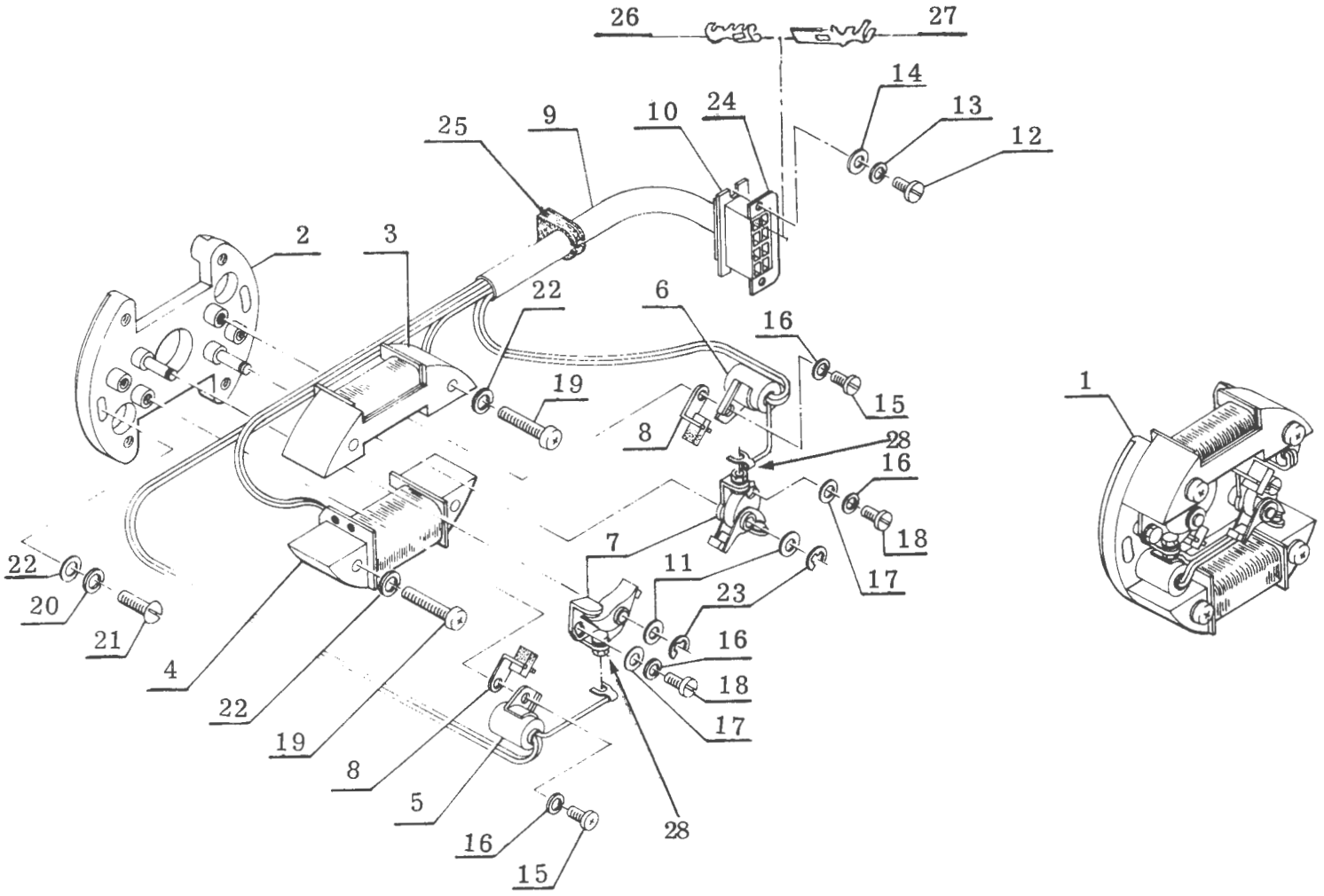
CAUTION: Ensure no lubricant gets on breaker points during installation. Contaminated points will burn during engine operation.

c. Adjust points to specified gap. Refer to Section V, Paragraph 5.4.3.



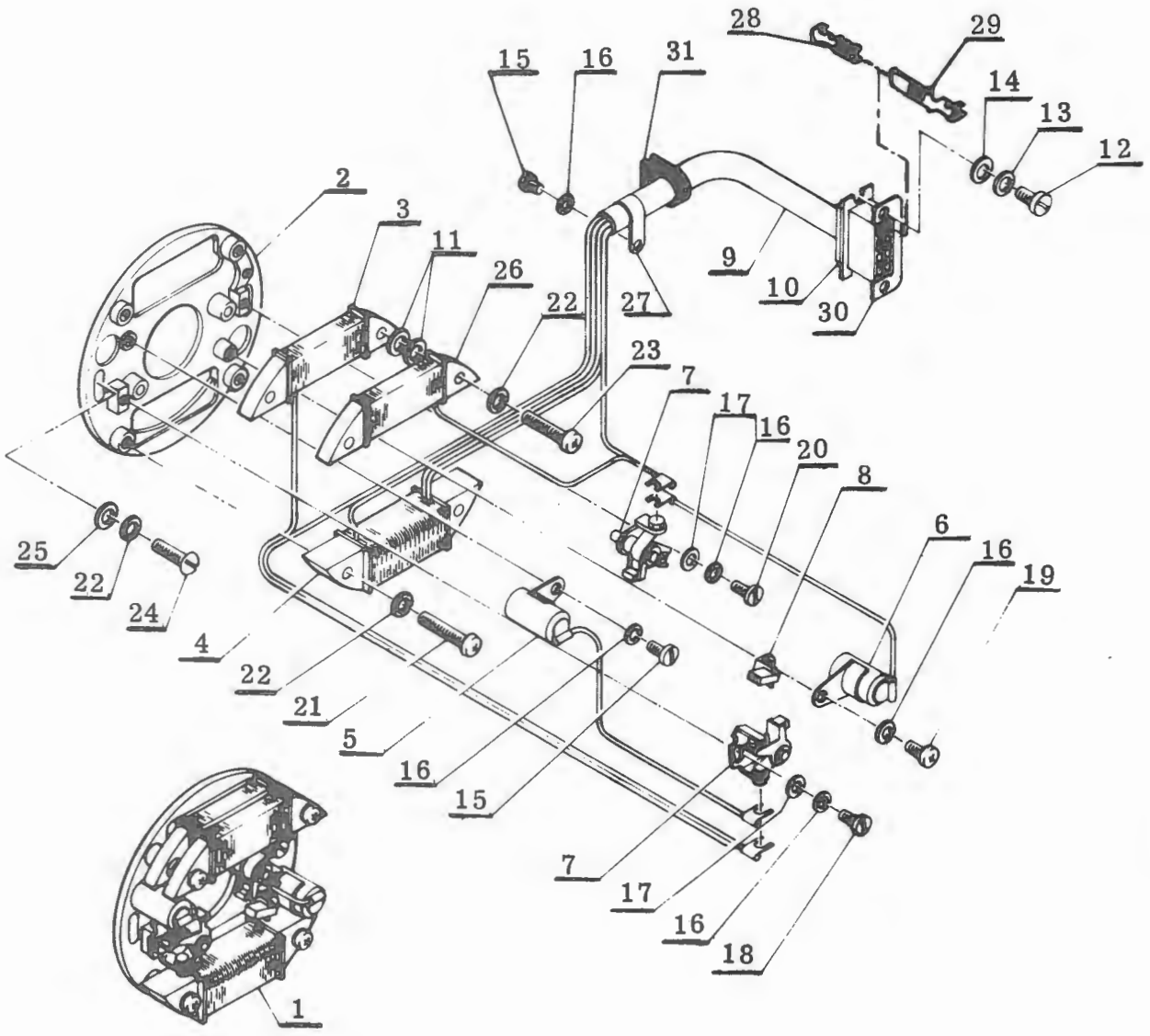
1. Flywheel assembly with ring gear
2. Flywheel assembly, less ring gear
3. Snap ring
4. Cam
5. Washer
6. Governor Spring (2)
7. Governor weight (2)
8. Lug, spring to governor weight attaching
9. Flywheel
10. Ring, governor weight attaching
11. Screw, lug plate to flywheel attaching
12. Spring washer
13. Ring gear
14. Bolt, ring gear
15. Spring washer
16. Window plate

FIGURE 4-4 FLYWHEEL ASSEMBLY (KOKUSAN MAGNETO) 340E, 340G, 400



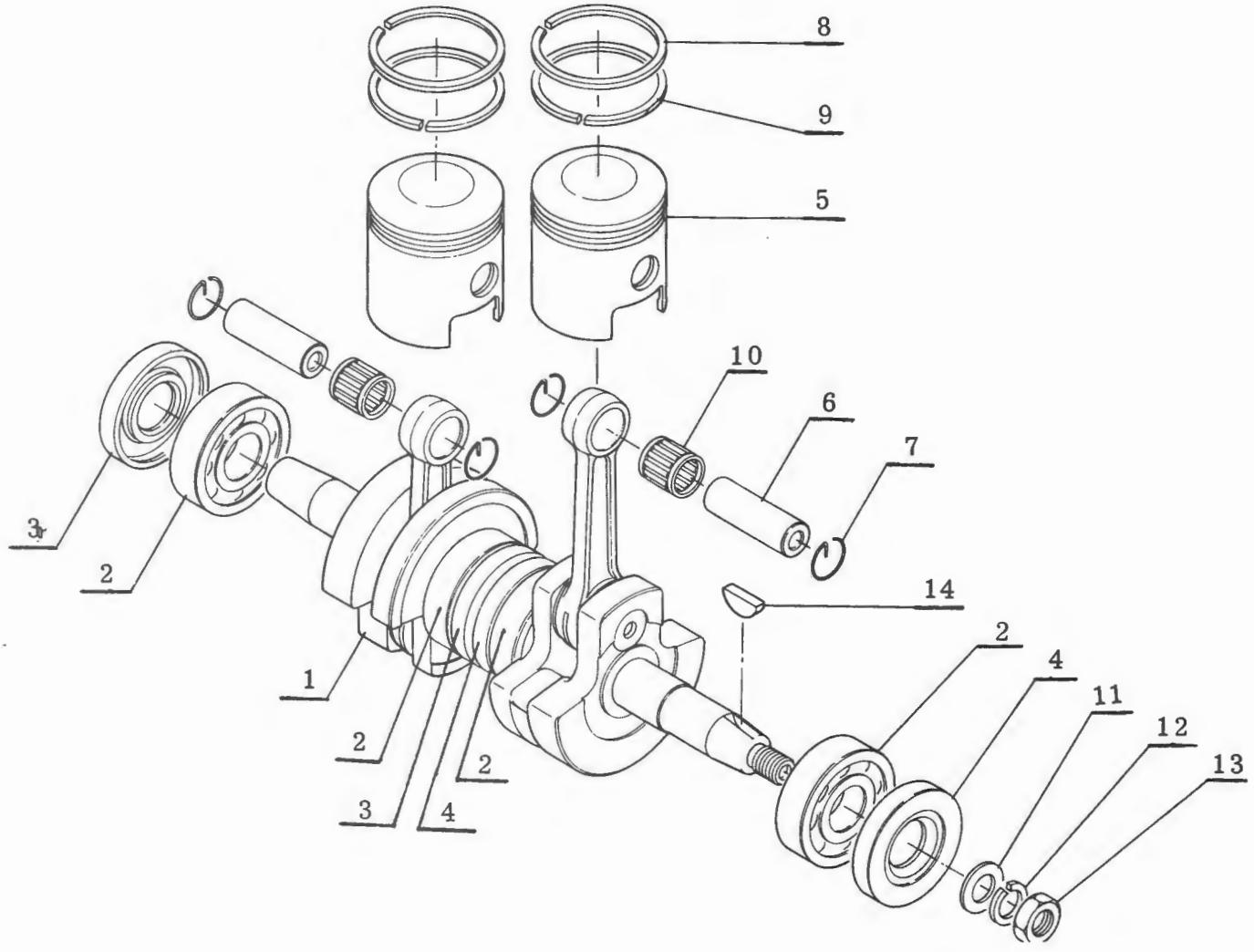
1. Stator assembly
2. Coil Plate
3. Primary Ignition Coil
4. Lighting coil
5. Condenser (White)
6. Condenser (Red)
7. Point Set
8. Oilfelt & Holder
9. Protector
10. Coupler
11. Washer
12. Screw
13. Spring washer
14. Washer
15. Screw
16. Spring washer
17. Washer
18. Screw
19. Screw
20. Spring Washer
21. Screw
22. Washer
23. E Ring
24. Bracket, Coupler
25. Rubber Bushing
26. Spade Connector
27. Spade Connector
28. Terminal Connector

FIG. 4-5 STATOR ASSEMBLY (SAWAFUJI IGNITION)



1. Stator Assembly
2. Coil Plate
3. Low Tension Generating Coil
4. Lighting Coil
5. Condenser (Red)
6. Condenser (White)
7. Point Set
8. Oil Felt & Holder
9. Protector
10. Coupler
11. Washer
12. Screw
13. Spring Washer
14. Washer
15. Screw
16. Spring Washer
17. Washer
18. Screw
19. Screw
20. Screw
21. Screw
22. Spring Washer
23. Bolt, Ignition Coil Attaching
24. Bolt, Coil Plate Attaching
25. Washer
26. Primary Ignition Coil
27. Clamp
28. Spade Connector
29. Spade Connector
30. Bracket, Coupler
31. Rubber Bushing
32. Terminal Connector

FIG. 4-6 (KOKUSAN IGNITION)



1. Crankshaft ass'y
2. Ball bearing
3. Oil seal
4. Oil seal
5. Piston (note inscribed arrow)
6. Piston pin
7. Circlip
8. Piston ring # 1
9. Piston ring # 2
10. Needle bearing
11. Washer
12. Spring washer
13. Nut
14. Woodruff key

FIGURE 4-7 PISTON AND CRANKSHAFT ASSEMBLY

Fig. 4-8 Oil seals identification

4.6.2 Condensers and Oil Felt Pads

NOTE: Removal and installation procedure is applicable to both condensers.

4.6.2.1 Removal

a. Loosen electrical terminal connector (28) and disconnect primary wire at contact breaker point set (7).
b. Unsolder condenser wires at terminal on low tension generation coil (3) and at connector on engine body.
c. Remove retaining screw (15) and washer (16) securing condenser and oil felt pad (8) to coil plate (2). Remove condenser and oil felt pad. Check pad for condition and replace if lubricating capacity is questionable.

4.6.2.2 Installation

a. Reverse removal procedure. Resolder condenser wires at primary coil and ignition coupler.
b. Secure condenser primary wire to contact breaker point set at terminal connector (28).
c. Lubricate oil felt pad. Refer to Lubrication Chart, Table 2-2.

4.7 STATOR ASSEMBLY–KOKUSAN–MODELS 340E, 340G, and ALL 400 MODELS. (See Figure 4-6)

NOTE: Complete disassembly of stator assemblies should be performed by authorized dealers only. Normal disassembly should be restricted to removal and replacement of contact breaker point sets, oil felt pads or condensers. If inspection reveals additional maintenance requirements, install a new assembly or return stator to overhaul facility.

4.7.1 Contact Breaker Point Sets

NOTE: Removal and installation procedure is applicable to both point sets.

4.7.1.1 Removal

a. Loosen electrical terminal connector (32) securing ignition wiring at contact breaker point set (7). Disconnect the wires.
b. Remove retaining screw (18) or (20) as applicable, lockwasher (16) and washer (17) securing breaker point set to coil plate (2). Remove breaker point set.

4.7.1.2 Installation

a. Apply a light film of Lubriplate or equivalent to pivot shaft.
b. Reverse removal procedure.

CAUTION: Ensure no lubricant gets on breaker points during installation. Contaminated points will burn during engine operation.

c. Adjust points to specified gap. Refer to Section V, Paragraph 5.4.3.

4.7.2 Condensers and Oil Felt Pads

NOTE: Removal and installation procedure is applicable to both condensers.

4.7.2.1 Removal

a. Loosen electrical terminal connector (32) at contact breaker point set (7). Disconnect the condenser lead wire.
b. Remove retaining screw (15) or (19) as applicable, and washer (16) securing condenser to coil plate (2). Remove condenser and oil felt pad (if attached). Check pad for condition and replace if lubricating capacity is questionable.

4.7.2.2 Installation

a. Reverse removal procedure.
b. Lubricate oil felt pad. Refer to Lubrication Chart, Table 2-2.

4.8 CRANKSHAFT (See Figure 4-7)

NOTE: If inspection reveals maintenance requirements beyond outer ball bearing or outer oil seal removal and installation, install a new crankshaft.

4.8.1 Oil Seal and Outer Bearing

4.8.1.1 Removal

a. Remove Woodruff key (14) from tapered end of crankshaft assembly, using suitable pliers or removal tool.
b. Remove oil seals (3) and (4). Seals are a snug fit, and can be removed by sliding them along the shaft. Discard seals.
c. Remove outer bearings (2), one from each end of crankshaft, using bearing puller or suitable removal tool.

4.8.1.2 Installation

NOTE: Keep bearings in the packaged condition or adequately protected from dust, dirt and other contaminants until ready for use.

Reverse removal procedure and note the following:

a. Bearings are a press fit on the crankshaft. Install new bearings as follows:
   1. Apply a light film of lubricating oil to crankshaft and ball bearing inner race.
   2. Preferred Method
      The preferred method of installation is with the use of an arbor press. Lay the new bearing on a face block having a slot or hole slightly larger than the bearing inner bore; press shaft down until bearing is firmly seated.
   3. Alternate Method
      An alternate method of installation is with the use of a soft tube. Use a suitable length of mild steel tubing, accurately squared at the ends, with large enough inside diameter to slip loosely over the crankshaft. Start bearing on end of crankshaft. Using the tube, gently tap the bearing down the shaft until bearing is firmly seated.

CAUTION: Prevent damage to the shaft and bearings until installation. Ensure that bearing is started true and not cocked on the shaft and that no loose metal chips are allowed to fall into bearings.

b. Use new oil seals. Oil seals are marked with an arrow indicating direction of crankshaft rotation. Correct direction of arrow rotation is clockwise from flywheel end and anti-clockwise from power take-off end. (Refer to Figure 4-8). Ensure seal is installed with cup facing inward and arrow directed as shown in the illustration. Exercise care when installing seals, to prevent seal damage and leaks during engine operation.

CCW 440 DENSO IGNITION

4.9 STATOR ASSEMBLY—Repair & Replacement

NOTE: Complete disassembly of stator assemblies should be performed by authorized dealers only. Normal disassembly should be restricted to removal and replacement of contact breaker point sets, oil felt pads or condensers. If inspection reveals additional maintenance requirements, install a new assembly or return stator to overhaul facility.

4.9.1 Contact Breaker Point Sets

NOTE: Removal and installation procedure is applicable to both point sets.

4.9.1.1 Removal

a. Loosen electrical terminal connector securing ignition wiring at contact breaker point set (7). Disconnect the wires.
b. Remove retaining screw (22), lockwasher (21) and washer (20) securing breaker point set to coil plate (2). Remove breaker point set.

4.9.1.2 Installation

a. Apply a light film of Lubriplate or equivalent to pivot shaft.
b. Reverse removal procedure.

CAUTION: Ensure no lubricant gets on breaker points during installation. Contaminated points will burn during engine operation.

c. Adjust points to specified gap. Refer to Section V, Paragraph 5.4.3.

4.9.2 Condensers and Oil Felt Pads

NOTE: Removal and installation procedure is applicable to both condensers.

4.9.2.1 Removal

a. Loosen electrical terminal connector at contact breaker point set (7). Disconnect the condenser lead wire.
b. Remove retaining screw (23), and washer (21) securing condenser to coil plate (2). Remove condenser and oil felt pad (if attached). Check pad for condition and replace if lubricating capacity is questionable.

4.9.2.2 Installation

a. Reverse removal procedure.
b. Lubricate oil felt pad. Refer to Lubrication Chart, Table 2 2.

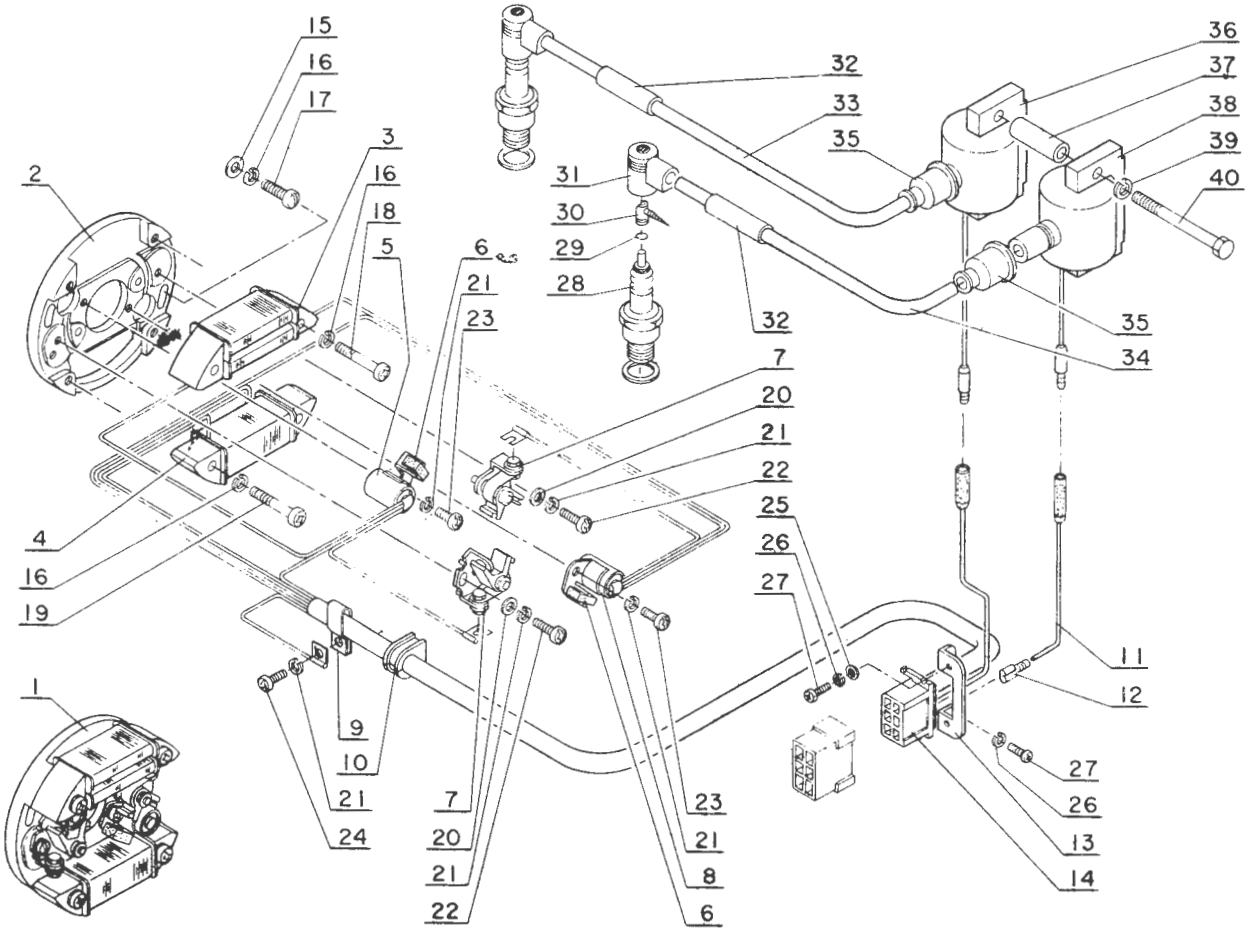


Fig. 4-9

4.10 FLYWHEEL ASSEMBLY–CCW 440

(See Fig. 4-12)

4.10.1 Disassembly

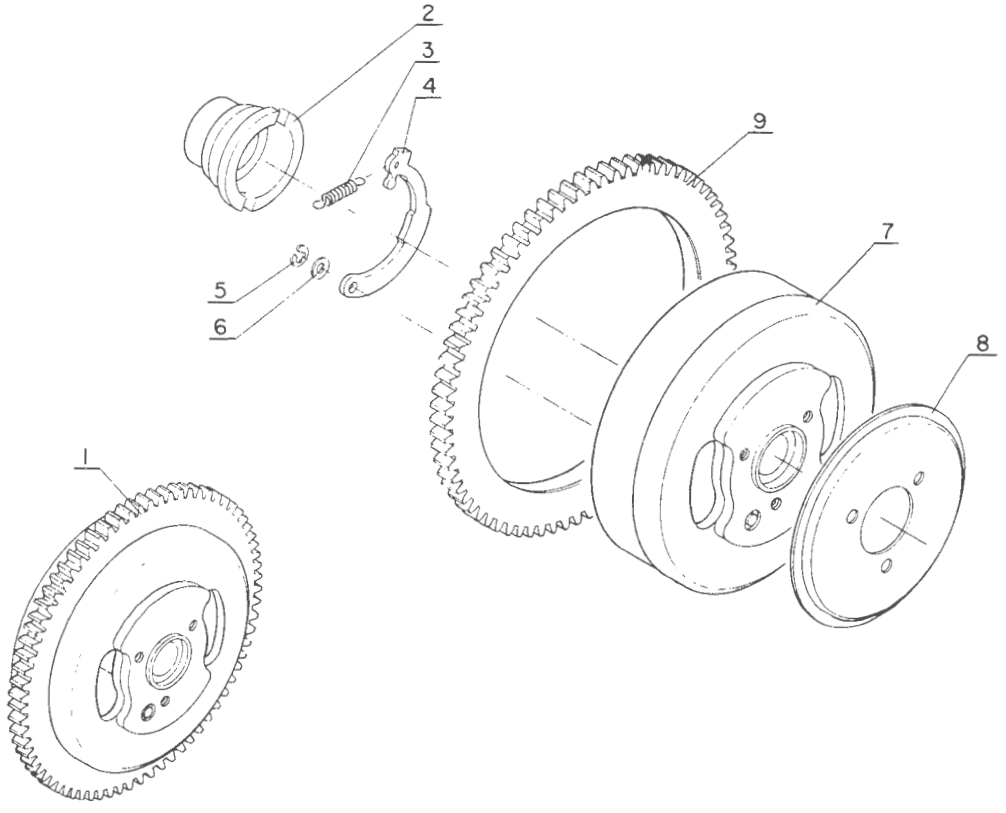
NOTE: Complete disassembly of flywheel assemblies should be performed by authorized dealers only. The auto advance mechanism is pre-set during manufacture and should require no further adjustment. If inspection reveals faulty governor parts or defective magnets, install a new flywheel assembly or return flywheel to overhaul facility.

Remove snap ring (5) and governor weight (4) to release the breaker point cam.

Lift cam off collar. Check cam and collar for scoring and wear; governor weight stop screw for wear and security. Replace defective parts.

4.10.2 Assembly

a. Apply a light film of Lubriplate or equivalent to outer surface of flywheel collar.
b. Reverse removal procedure.
c. Lubricate in accordance with Lubrication Chart, Table 2-2.
d. Check mechanism for proper operation.



SECTION V

REASSEMBLY, TESTING AND ADJUSTMENTS

5.1 GENERAL

5.1.1 Prior to reassembly, check all parts for cleanliness and serviceability in accordance with paragraph 3.3.

5.1.2 During assembly, tighten all screws, bolts and nuts securely. Ensure that correct torque values are applied where specified. Do not overtorque.

5.1.3 Use only new gaskets and seals during assembly procedure.

5.1.4 During assembly, lubricate all bearings and friction surfaces with new, clean two stroke engine oil.

5.1.5 If procedures are discontinued during assembly, ensure that intake and exhaust ports, spark plug holes and all other openings are covered to prevent ingress of dirt or foreign objects to cylinders and crankcase.

5.2 REASSEMBLY

5.2.1 Crankcase and Crankshaft (See Figure 5-1)

a. Place crankcase lower half on work bench with flanged fan cover end to right hand side; insert the four seal retaining circlips.
   Install the crankshaft into lower half of crankcase with externally threaded (flywheel) end of shaft toward right hand side. (See Section III, figure 3-12). Ensure that seal retaining circlips do not become dislodged.
b. Apply a liberal amount of two-stroke engine oil to crankshaft and bearings.
c. Apply a good quality, non hardening sealing compound evenly to sealing surfaces of both crankcase halves.
d. Reseat the crankcase halves; ensure that the two dowel pins are properly engaged with mating holes in crankcase upper half.
e. Refer to Figure 5-2.
   Install four 8 x 65 and six 8 x 45 attaching bolts, washers and lockwashers. Install the four longer bolts at locations 2, 3, 4 and 7. Loosely tighten the four bolts at locations "A", then torque all bolts down evenly to 15-18 foot-pounds maximum in accordance with sequence shown in the illustration.

5.2.2 Pistons, Piston Rings and Pins (See Figure 5-3)

a. Lubricate piston pin needle bearing with two-stroke

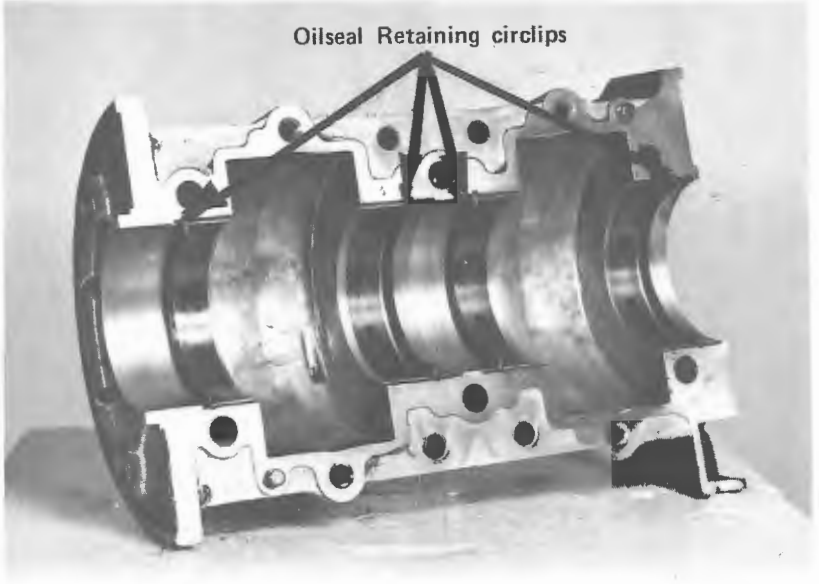


Fig. 5-1 Crankcase Lower Half

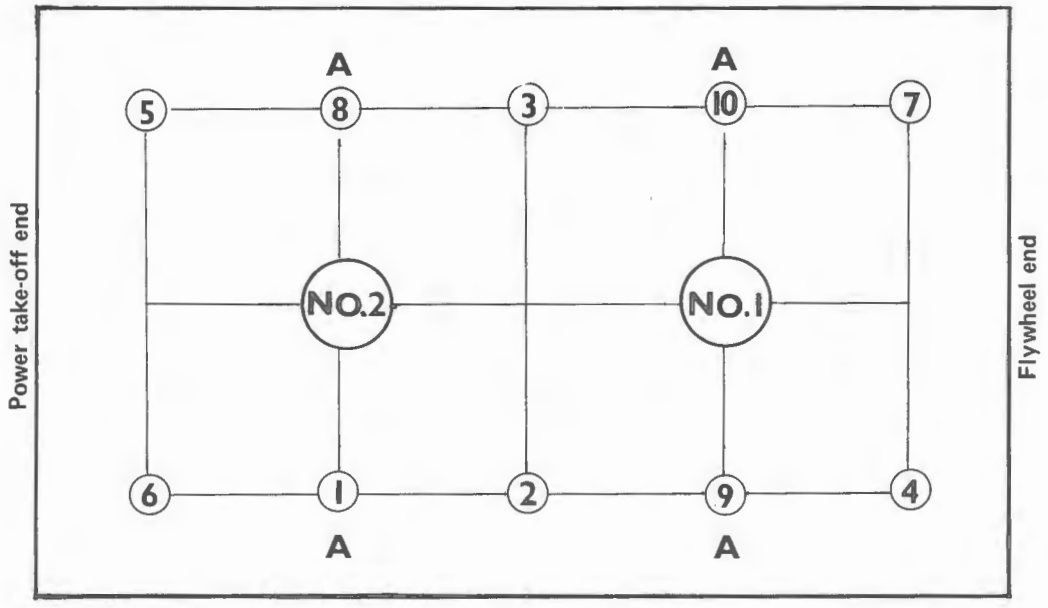


Fig. 5-2 Crankcase Bolt Torquing Sequence

engine oil and install bearing into connecting rod small end.

b. If both piston pin retaining circlips have been removed from piston, use a suitable tool and install a circlip at one piston pin bore.

c. Use a propane torch or cloth soaked in hot water and heat piston until warm to the touch (120 to 140°F). Ensure that the arrow on piston crown is directed toward the exhaust port and align piston pin bore with center bore of connecting rod. Lubricate piston pin and, using a soft drift, push pin into piston until it bottoms on the installed circlip. Exercise care to prevent damage to needle bearing. Install remaining circlip.

d. Install piston rings in ring grooves, using a suitable ring installing tool. Ensure that piston ring gap is correctly positioned at the ring groove locating pin.

e. Repeat steps (a) to (d) for second piston.

NOTE: The chromium plated ring should be installed in the top groove

5.2.3 Cylinders (See Figure 5-4)

a. Install new base gaskets over cylinder hold down studs.

b. Cylinders are identified by the letters "L" (left hand) and "R" (right hand) stamped on the cylinder flange. Locate right hand (No. 1) cylinder at flywheel end of crankcase.

c. Lubricate pistons, rings and cylinders with two-stroke engine oil.

d. Place a suitable wooden block between piston and

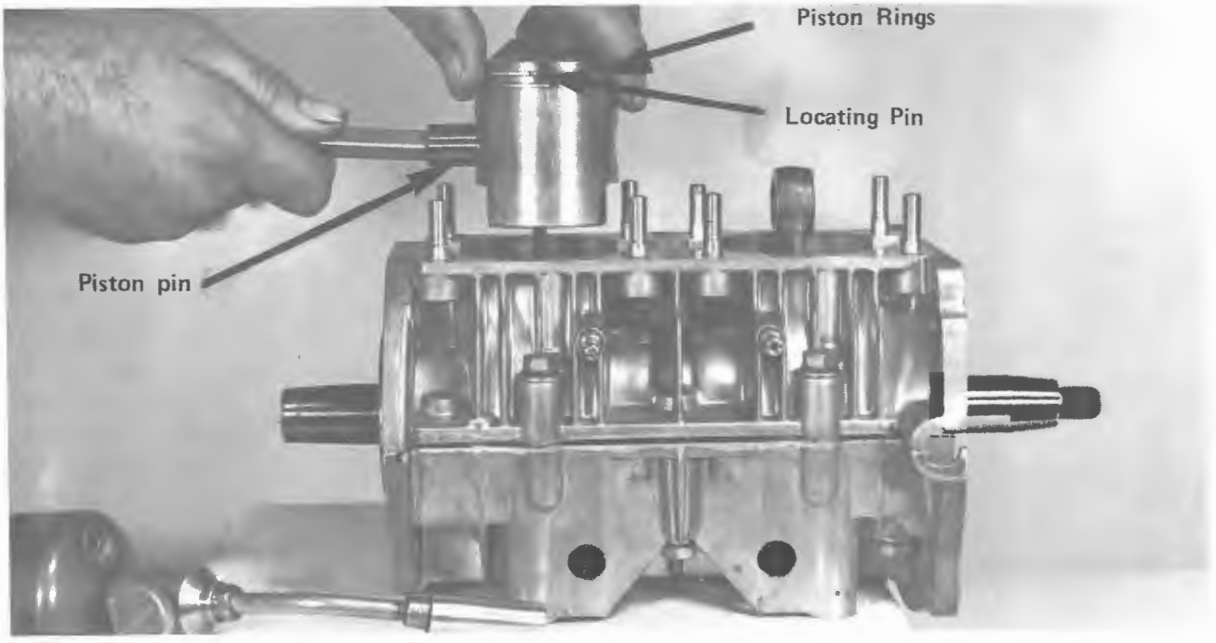


Fig. 5-3 Installing Pistons, Rings and Pins

crankcase to steady the piston. Using a piston ring compressing tool, compress rings flush with piston.

e. Slide cylinder over piston and ring assembly. Remove ring compressing tool.

f. Repeat steps (c), (d) and (e) for No. 2 cylinder.

g. Install cylinders on the crankcase and fit flat washers, spring washers and securing nuts. Tighten the nuts evenly to hold the cylinders firmly on the crankcase. DO NOT TIGHTEN TO FULL TORQUE AT THIS STAGE.

h. Install inlet manifold using new gaskets and tighten securely to ensure alignment of the cylinder and manifold flanges.

i. Finally tighten the cylinder flange nuts as per Figure 5-5. to recommended torque of 15-18 lbs.-ft.

Fig. 5-4 Installing Cylinders

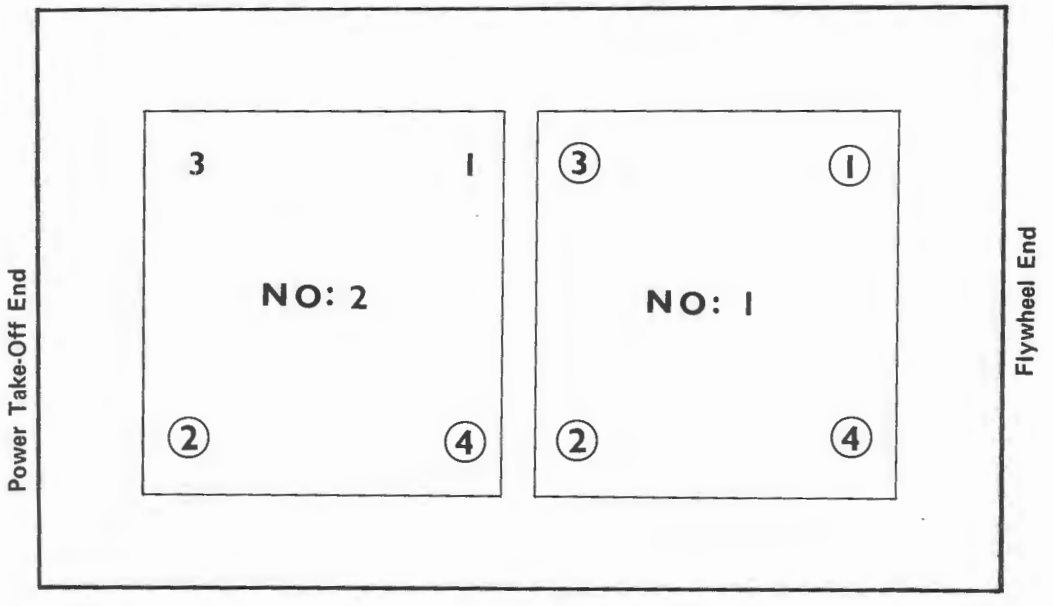


Fig. 5-5 Cylinder Hold-down nut torquing sequence

5.2.4 Cylinder Heads (See Figure 5-6)

a. Install new cylinder head gaskets over cylinder head hold down studs.

b. Install cylinder heads over hold down studs with machined side facing inwards and cylinder cover attaching brackets facing toward intake ports.

c. Refer to Figure 5-7.
Install the ten washers, lockwashers, and hold-down nuts; install the two long internally threaded nuts above the intake ports at location (5).
Torque nuts down evenly to 15-18 foot-pounds maximum in accordance with the sequence shown in the illustration.

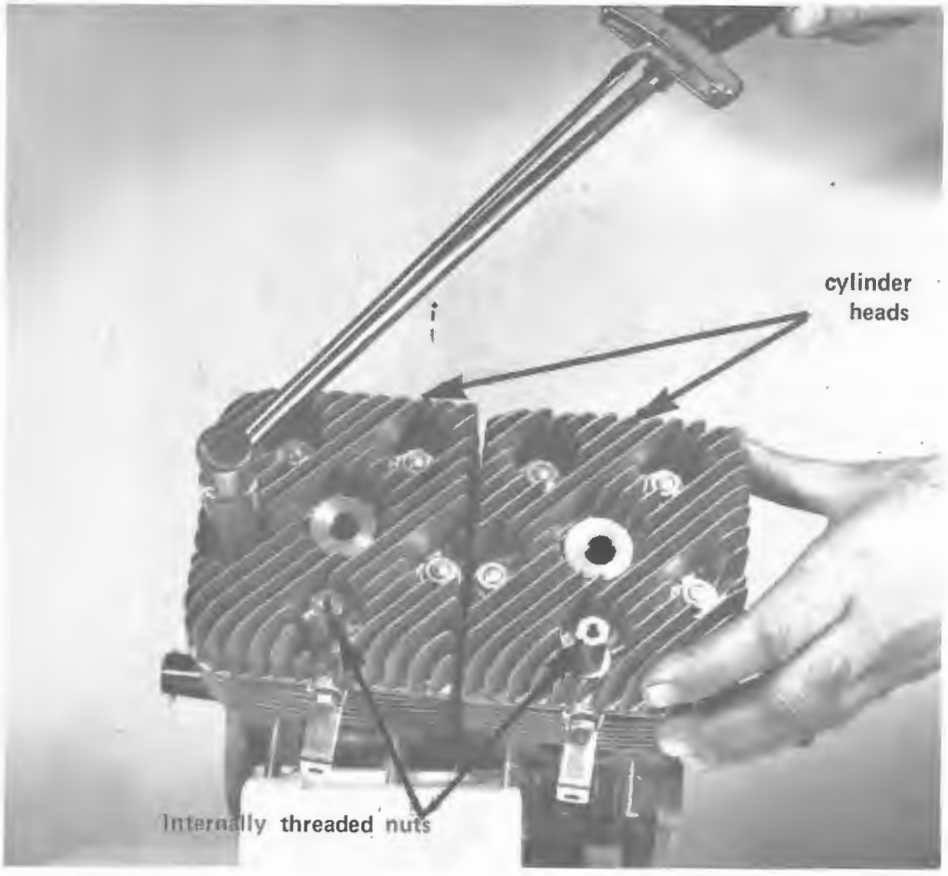


Fig. 5-6 Installing Cylinder Heads

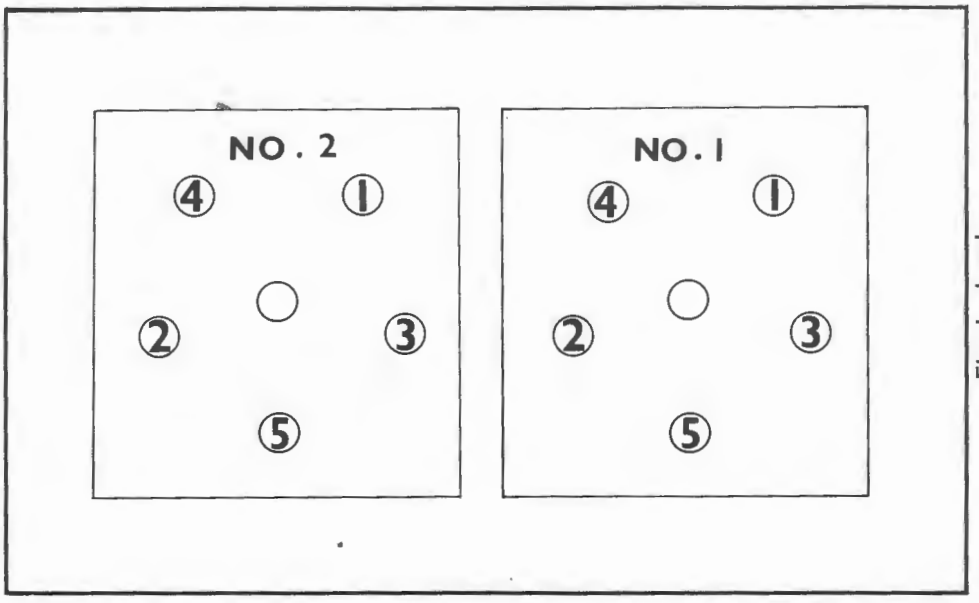


Fig. 5-7 Cylinder head hold-down nut torquing sequence

5.2.5 Stator Assembly (See Figure 5-8)

a. Install and secure stator to engine crankcase using two Phillips head screws. Position ignition wire bundle in the recess provided, and install rubber grommet.

5.2.6 Fan Cover Case and Flywheel (See Figure 5-9)

a. Install and secure fan cover case to crankcase using four 8 x 28 bolts, plain washers and lockwashers.

b. Place a Woodruff key in the slot on the crankshaft. Ensure flywheel center bore and tapered end of crankshaft are free of oil or grease. Align keyway and key; slide flywheel

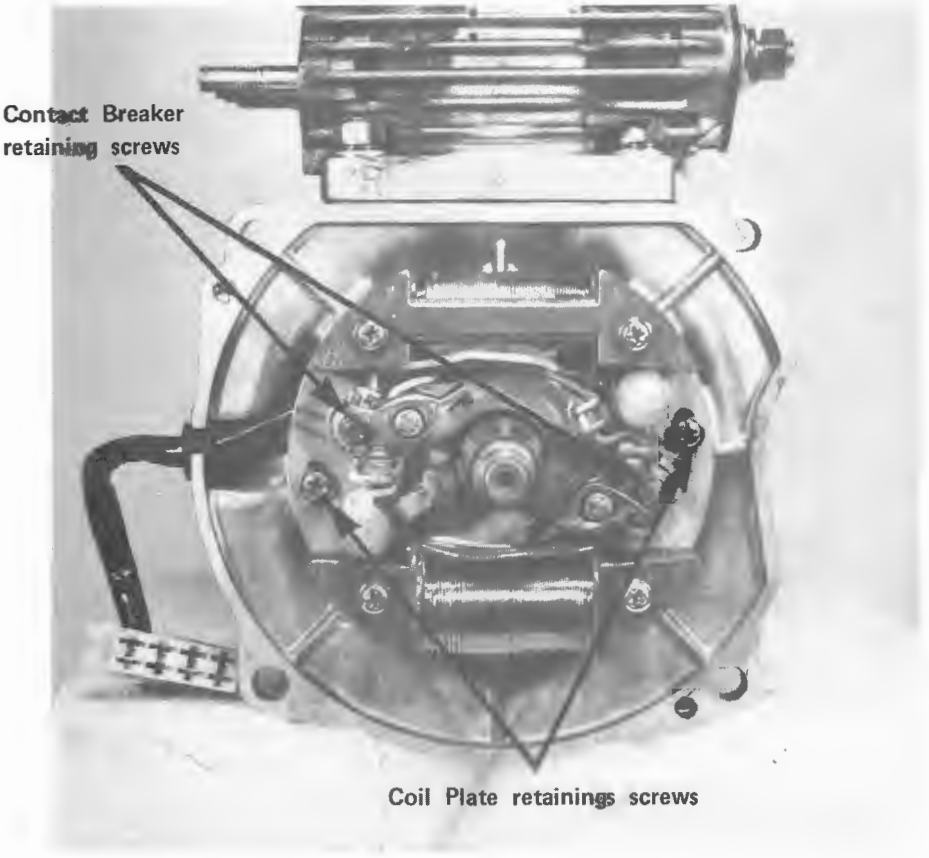


Fig. 5-8 Stator assembly installed

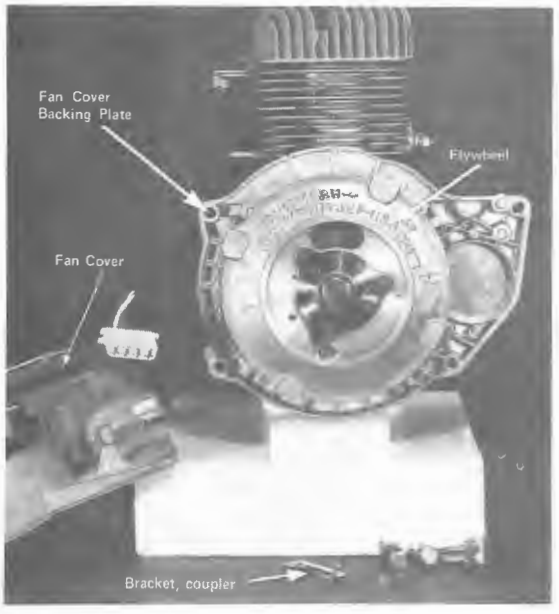


Fig. 5-9 Fan cover backing plate and flywheel installed

on to shaft as far as it will go. Rotate flywheel to ensure freedom of movement with no evidence of binding. Lock the flywheel using CCW Tool #43-0798-40; install flat washer, lockwasher and nut. Tighten nut to 40-50 pounds feet maximum torque. Set timing to proper specifications. Refer to paragraph 5.4.4.

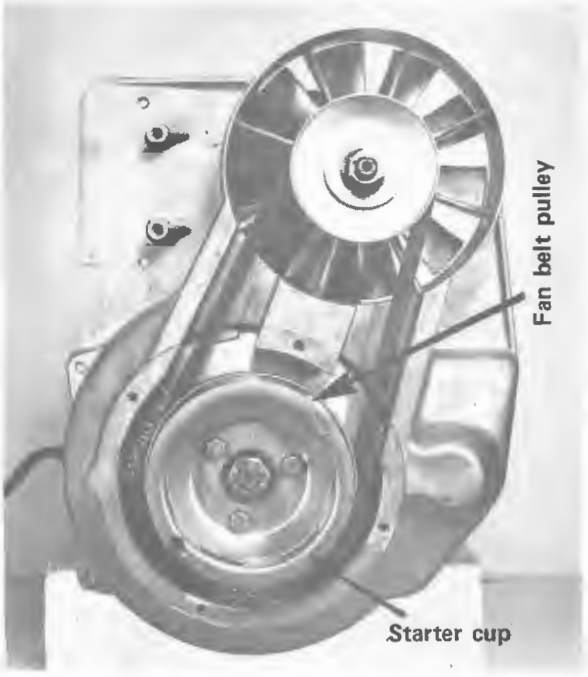


Fig. 5-10 Fancover, Starter Cup and Fan belt pulley installed

5.2.7 Fancover, Starter Cup and Fan Belt Pulley (See Figure 5-10)

a. Install and secure fan cover to fan cover case using four 8 x 35 bolts, plain washers and lockwashers. Secure ignition terminal coupler and bracket using two Phillips head screws.

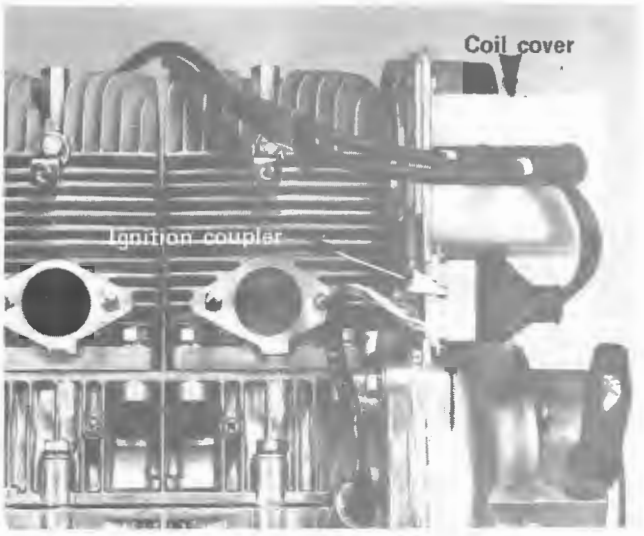


Fig. 5-11 High Tension Ignition Installed

Fig. 5-12 Recoil Starter Installed

b. If a window plate was removed during disassembly, replace it behind fan belt pulley with a lip facing outward. Install and secure fan belt pulley and starter cup to flywheel using three 6 x 22 bolts and lockwashers. Install fan belt and adjust to proper tension. (Refer to Section II, Paragraph 2.6.2.)

5.2.8 Electric Starter (if so equipped)

a. Install and secure electric starter to hold down studs at covercase. Secure to crankcase using two 8 x 20 bolts, washers and lockwashers.

5.2.9 Ignition Coils—Testing and Installation

a. Coil output can be tested on a Merc-O-Tronic or other comparable analyzer. See Table 1-1 for specifications. A three needle air gap tester may also be used. See Table 1-1. Note:--A 12 volt battery will be required on the older model of Merc-O-Tronic analyzers.
b. Install and secure high tension ignition coils to fan cover using two 6 x 65 attaching bolts and spacers. Connect low tension wires to ignition coupler.
c. Install and secure coil cover using two 6 x 10 bolts, plain washers and lockwashers. **Figure 5-11**

5.2.10 Recoil Starter (See Figure 5-12)

a. Install and secure recoil starter to fan cover using four 6 x 22 bolts, flat washers and lockwashers.

5.2.11 Intake and Exhaust Manifolds

a. Install two new intake manifold gaskets and the two insulators over intake manifold hold down studs.
b. Install two additional new gaskets over insulators and mount intake manifold to hold-down studs. Secure with four flatwashers, lockwashers and hold-down nuts. Do not overtorque the nuts.
c. Install two new exhaust manifold gaskets and mount exhaust manifold to hold-down studs. Secure with four flatwashers, lockwashers and hold-down nuts. Do not overtorque the nuts.

5.2.12 Covers

a. Install and secure cylinder cover and adapter to engine using four 6 x 10 and six 6 x 12 attachment bolts and lockwashers; install the four shorter bolts at intake and exhaust manifold sides of cover. Start each attachment bolt before tightening any bolts; then tighten all bolts securely. Ensure spark plug wires are properly secured as shown in figure 5-12.

5.2.13 Engine Installation

a. Install engine to applicable mounting location; attach muffler and tailpipe; connect electrical wiring and controls.
b. Remove protective plugs from spark plug holes; install specified plugs and connect high tension leads.
c. Check engine for proper operation. Refer to paragraph 5.3.

5.3 TESTING AFTER OVERHAUL

5.3.1 General

A five to ten percent power loss may be expected on a newly overhauled engine until it has been subjected to a suitable run-in period. Carefully run the engine at varying engine speeds for the first twenty-five hours of operation.

5.4 ADJUSTMENTS

5.4.1 Carburetor (Refer to applicable manufacturer's specifications)

5.4.2 Spark Plugs (Refer to Section III, Paragraph 3.3.4)

5.4.3 Contact Breaker Points (See Figure 5-13)

a. Remove recoil starter, starter cup and fan belt pulley.
b. Remove window plate (Kokusan magneto only).
c. Loosen applicable breaker point retaining screw.
d. Adjust breaker points gap to 0.014±.002 inch. Use a feeler gauge to measure the gap.
e. Tighten breaker point retaining screw.
f. Check engine ignition timing. See Paragraph 5.4.4.
g. Replace window plate, starter cup, fanbelt pulley and recoil starter.

5.4.4 Engine Ignition Timing (See Figure 5-14)

After engine overhaul or whenever contact breaker points have been replaced or adjusted, check and/or adjust ignition timing to ensure continued engine operating efficiency.

5.4.4.1 Preferred Method

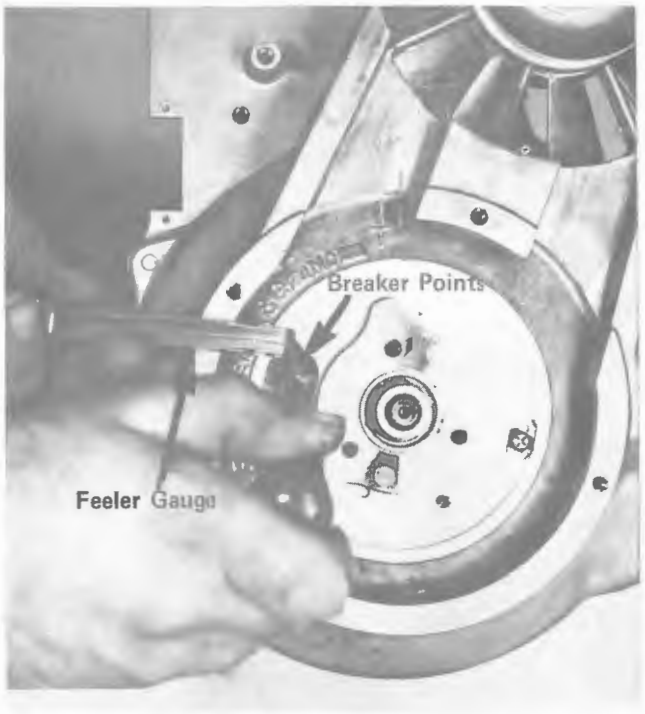
The recommended method of engine ignition timing is with a dial indicator and a timing light having a self contained battery. This method is considered the most convenient means of determining piston position in respect to true top dead center.

Time the engine as follows:

a. Remove recoil starter, starter cup and fan belt pulley; remove window plate (if installed).
b. Remove spark plugs; disconnect ignition at coupler.
c. Install a suitable dial indicator into No. 1 cylinder spark plug hole.
d. Rotate flywheel to locate No. 1 piston position at true top dead center. True top dead center is that point on the indicator scale where the pointer begins to reverse direction of motion. Zero the dial indicator at true T.D.C.
e. Refer to figure 5-13. Adjust No. 1 cylinder breaker point gap to 0.014 inch. This point set has red ignition wiring. Connect one lead of a timing light to the red wire at ignition coupler and the other lead to ground.
f. Rotate flywheel until pointer of dial indicator reaches 0.015 inch before true top dead center. At this instant the timing light should go out to indicate breaker points just starting to open.
   If necessary, adjust ignition coil plate to the right or to the left until the light goes out. Secure ignition coil plate in this position; recheck piston travel to verify timing accuracy.

NOTE: If coil plate cannot be adjusted enough to accurately set No. 1 cylinder timing, recheck breaker point gap. Gap may be re-adjusted to 0.014±.002 inch to obtain desired timing sequence. Breaker point gap must remain within specified tolerance.

g. Remove dial indicator and install it into No. 2 cylinder spark plug hole. Disconnect timing light from ignition coupler.
h. Adjust No. 2 cylinder breaker point gap to 0.014 inch. This point set has red ignition wiring. Connect one lead of timing light to the red wire at coupler and the other lead to ground.
i. Locate No. 2 piston position at true T.D.C. Refer to procedural step (d).



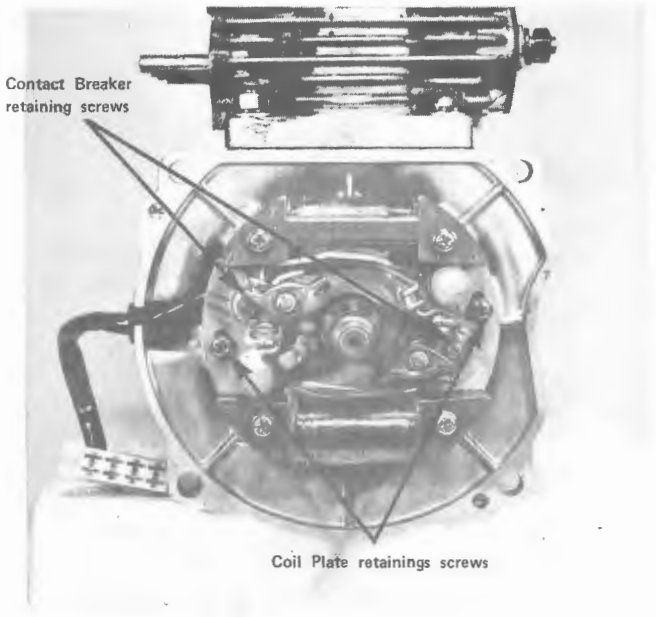


Fig. 5-13 Adjusting Contact Breaker Points

j. Rotate flywheel until pointer of dial indicator reaches 0.015 inch before true T.D.C. At this instant the timing light should go out to indicate breaker points just starting to open. If necessary, point gap may be re-adjusted to 0.014±.002 inch to obtain the desired timing sequences. Breaker point gap must remain within specified tolerance. Recheck piston travel to verify timing accuracy.
k. Replace window plate, starter cup, fan belt pulley and recoil starter.
l. Replace spark plugs; check engine for proper operation.
m. Using a Stroboscope, check ignition timing setting, auto advance mechanism, when fully advanced in accordance with specifications, Table 1-1.

5.4.4.2 Alternate Method (See Figure 5-14)

As an alternate method of engine ignition timing, use the two sets of reference marks on the flywheel and the top dead center (zero) reference line marked on the fan cover. The reference marks on the flywheel include a "T" which indicates piston position at top dead center when aligned with the zero reference line on fan cover, and 5^0, 8^0 and 10^0 reference lines in advance of top dead center. One set of reference lines is 180^0 opposed to the other set. If using the alternate method, time the engine as follows:

a. Remove spark plugs; disconnect ignition at coupler.
b. Remove recoil starter, starter cup and fan belt pulley. Remove window plate (if installed).
c. Refer to Figure 5-13.
Adjust No. 1 cylinder contact breaker point gap to 0.014 inch. This point set has white ignition wiring. Connect one lead of a timing light having a self contained battery, or suitable instrument to the white wire at coupler and the other lead to ground.
d. Rotate flywheel until No. 1 piston is approaching top dead center and the nearest 8^0 reference line is aligned with the zero reference line on the fan cover. At this instant, the timing light should go out or suitable instrument should activate to indicate No. 1 cylinder breaker points just starting to open. If necessary, adjust ignition coil plate to the right or to the left until the correct indication is given. Secure ignition coil plate in this position. Recheck timing to verify accuracy.

NOTE: If coil plate cannot be adjusted enough to accurately set No. 1 cylinder timing, recheck breaker point gap. Gap may be re-adjusted to 0.014±.002 inch to obtain desired timing sequence.

e. Refer to Figure 5-13.
Adjust No. 2 cylinder contact breaker point gap to 0.014 inch. This point set has red ignition wiring. Connect one lead of timing light or suitable instrument to the red wire at coupler and the other lead to ground.
f. Rotate flywheel 180^0 to the opposite set of reference marks. Adjust flywheel until No. 2 piston is approaching top dead center and the nearest 8^0 reference line is aligned with the zero reference line on fan cover.
At this instant the timing light should go out or suitable instrument should activate to indicate No. 2 cylinder breaker points just starting to open. If necessary, breaker points may be re-adjusted to 0.014±.002 inch to obtain desired timing sequence. Recheck timing to verify accuracy.
g. Replace window plate, starter cup, fan belt pulley and recoil starter.
h. Replace spark plugs; check engine for proper operation.
i. Using a stroboscope, check ignition timing setting, auto advance mechanism when fully advanced, in accordance with Specifications, Table 1-1.

5.4.4.3 Crankshaft Angle Versus Piston Travel

Table 5-1 lists piston position relative to crank angle.

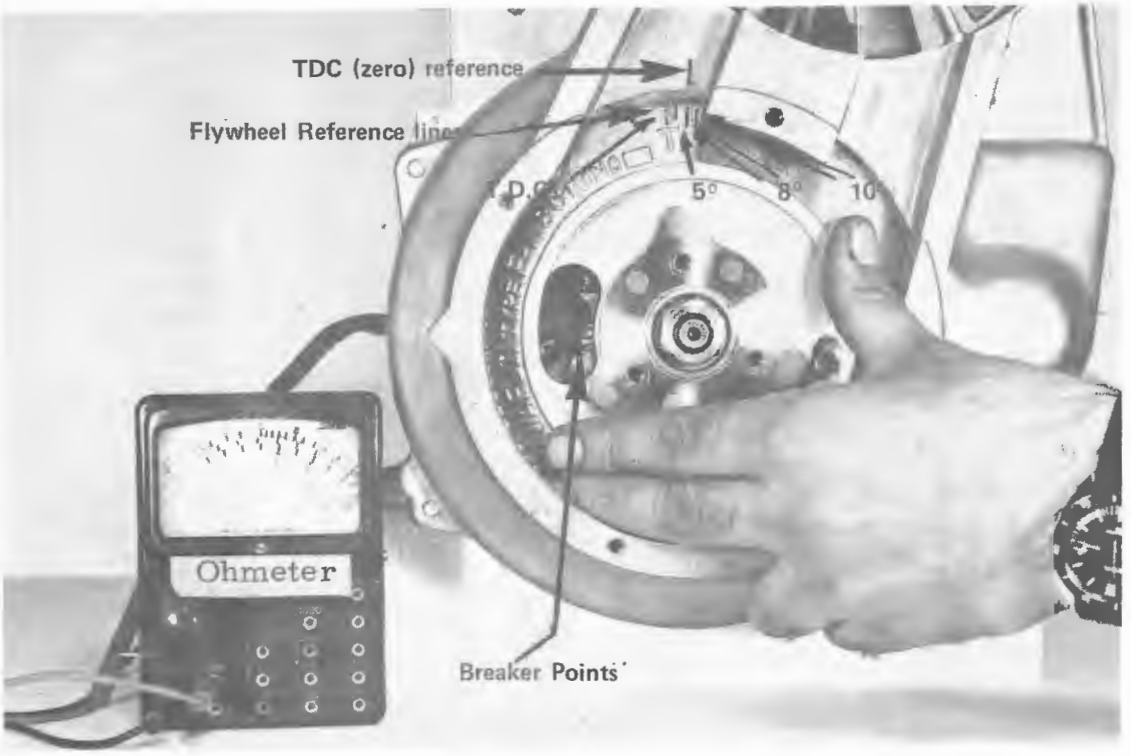


Fig. 5-14 Setting Engine Ignition Timing—Alternate Method

TABLE 5-1

CRANK ANGLE VERSUS PISTON TRAVEL

Crank Angle	Distance from Top Dead BTDC
5°	0.006
6	0.008
7	0.011
8	0.015
9	0.018
10	0.023
11	0.028
12	0.033
13	0.038
14	0.044
15	0.051
16	0.058
17	0.065
18	0.073
19	0.081
20	0.089
21	0.099
22	0.108
23	0.118
24	0.129
25	0.139
26	0.150
27	0.162
28	0.174
29	0.186
30	0.198

TABLE 5-2
TORQUE SPECIFICATIONS

Location	Type	Size	Lbs. Ft.
Crankcase	Screws	8 mm.	12-15
Cylinder Head	Nuts	8 mm.	15-18
Cylinder to Crankcase	Nuts	8 mm.	12-15
Flywheel to Crankshaft	Nut	14 mm.	45-50
Fan Pulley	Nut	12 mm.	28-31

TABLE 5-3
METRIC/LINEAR CONVERSION TABLE

Multiply (Known)	by	to Obtain (Unknown)
Millimeters (mm)	0.03937	Inches
Inches (in.)	25.4	Millimeters
Centimeters (cm)	.3937	Inches
Inches (in.)	2.54	Centimeters
Kilometers (km)	.6214	Miles
Miles (mi)	1.609	Kilometers
Meters (m.)	3.281	Feet
Feet (ft.)	.3048	Meters
Cubic Centimeters (cc.)	.061	Cubic Inches
Cubic Inches (cu.in.)	16.387	Cubic Centimeters
Liters (l.)	.264	Gallons
Gallons (gal.)	3.785	Liters
Liters (l)	1.057	Quarts
Quarts (qt.)	.946	Liters
Cubic Centimeters (cc.)	.0339	Fluid Ounces
Fluid ounces (fl.oz.)	29.57	Cubic Centimeters
Kilograms (kg.)	2.205	Pounds
Pounds	.4536	Kilograms
Grams (g.)	.03527	Ounces
Ounces (oz.)	28.35	Grams
Metric Horsepower (ps)	1.014	bhp.
Brake horsepower (bhp.)	.9859	ps.
Kilogram-meter (kg.-m.)	7.235	Foot-pounds
Foot-pounds (ft.-lbs.)	.1383	kg.-m.
Square millimeters (sq.mm)	0.00155	sq. in.
Square inches	645.2	sq. mm.

TABLE 5-4
LIST OF APPROVED CARBURETORS

CCW Model	Carburetor Manufacturer	Model	Fuel Return Yes	Fuel Return No
340	Walbro	WR 6	* Yes	
340	Tillotson, Diaphragm	HR92		No
340	Tillotson, Diaphragm	HR99A	Yes	
340	Bendix Zenith, Float Chamber	1408.5/013586	*	
400	Tillotson, Diaphragm	HR101A		No
400	Tillotson, Diaphragm	HR100A	Yes	
400	Walbro, Diaphragm	WR 6	Yes	
400	Bendix, Diaphragm	16Y10/013599	*	

*Not Required