TM 5-1254

WAR DEPARTMENT TECHNICAL MANUAL

POWER UNIT
GASOLINE ENGINE-DRIVEN
TRAILER-MOUNTED
4 STEEL WHEELS
120 TO 140-HP, MODEL 300-WA

FOR CRUSHING, SCREENING AND WASHING PLANTS
GASOLINE ENGINE-DRIVEN
PIONEER

★

MAINTENANCE INSTRUCTIONS AND PARTS CATALOG

WAR DEPARTMENT • 2 FEBRUARY 1944

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TM 5–1254, Power Unit, Gasoline Engine-Driven, Trailer-Mounted, 4 Steel Wheels, 120 to 140-HP, Model 300–WA, is published for the information and guidance of all concerned.

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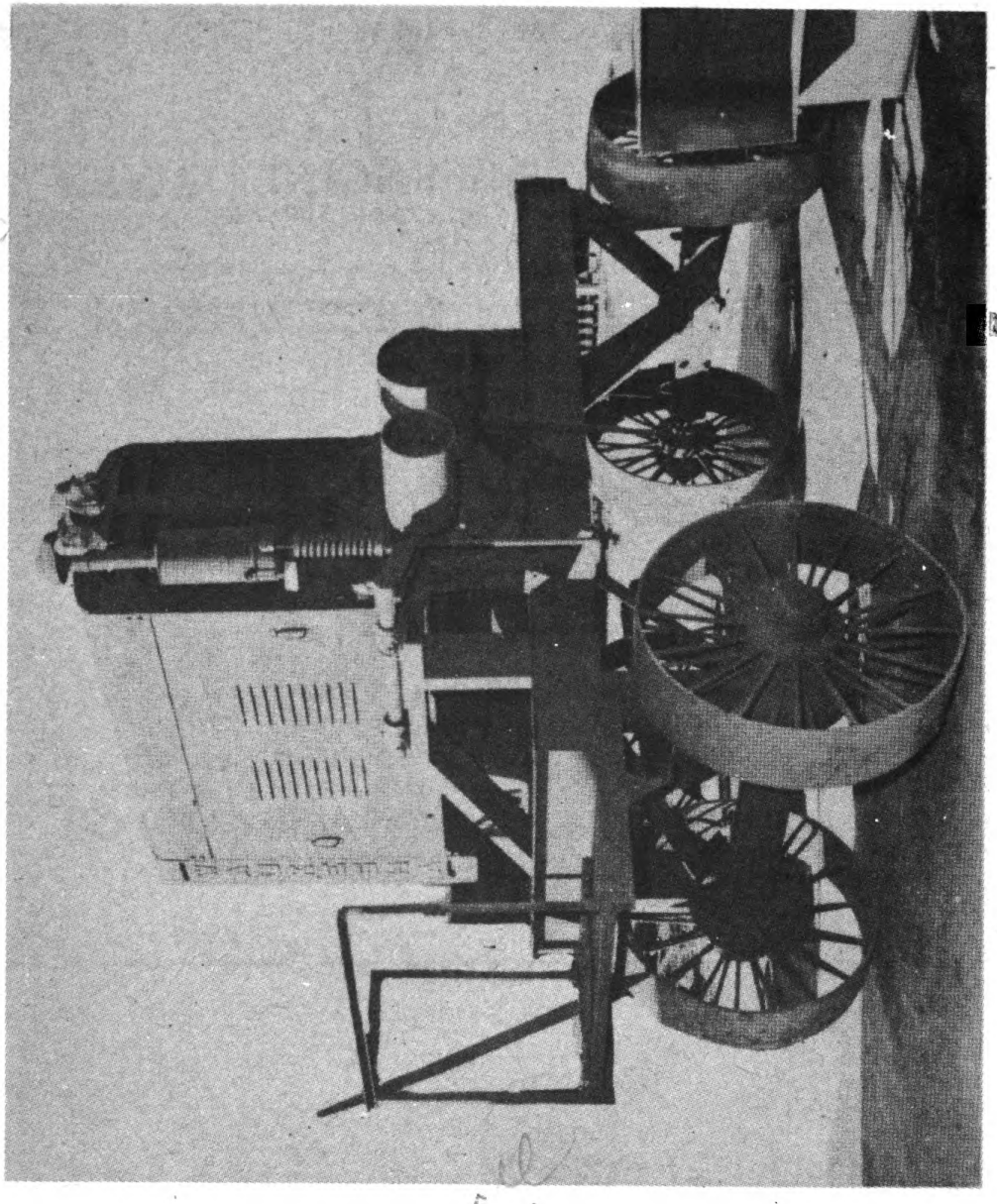


Figure 1. REAR RIGHT SIDE OF POWER TRUCK

300-WA POWER UNIT TRUCK

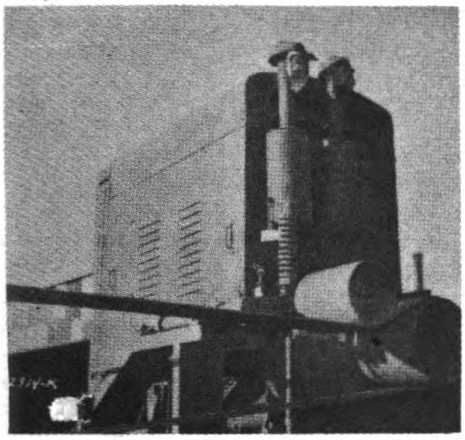


Figure 2. 300-WA POWER UNIT

The 300-WA Power Unit Truck is a portable unit used to supply the power for the 300-WA Washing Plant. It consists of a power unit mounted on a channel frame truck which has four steel wheels. The rear wheels are equipped with brakes which are hand operated from a platform located at the rear of the truck. The front wheel axle is equipped with a detachable pole for towing. Also mounted on the truck is the self-adjusting spring loaded belt idler.

The power unit furnished on the truck is a Waukesha gasoline engine, Model 6-WAKU, and is capable of delivering 125 horsepower at 1000 RPM. It is equipped with an air cleaner, oil filter, auxiliary starting motor, and clutch. The truck has mounted on it a 100 gallon fuel tank which provides ample capacity for an 8 hour run. This tank has a drain plug in the bottom for draining and cleaning.

The spring tension belt idler provides adjustment for the 14" x 100' drive belt to the plant. The idler pulley has Timken bearings and the idler pivot shaft has babbit bearings. The idler is held against the belt by a tension rod (1) which has one end running through a bracket on the truck frame and the other end through the idler arm and spring. The nut on top of the spring is for adjusting the belt tension. By making some of the belt adjustment with the spring loaded idler, automatic compensation is made for the stretching or shrinking of the belt which in turn prevents excess slippage or undue strains in the belt.

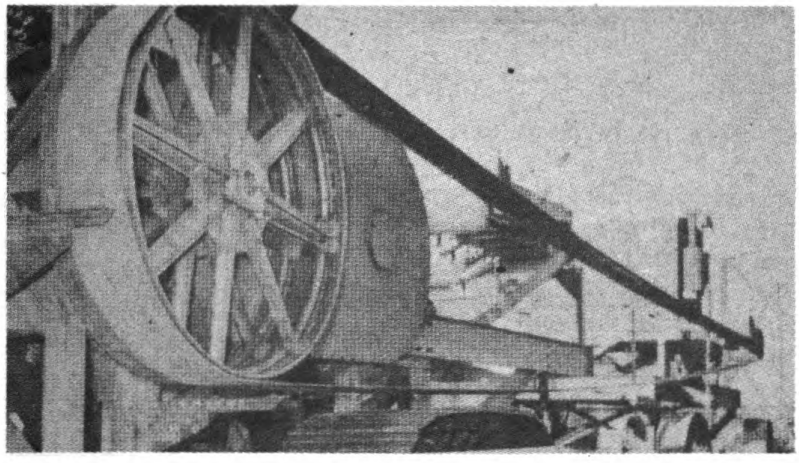
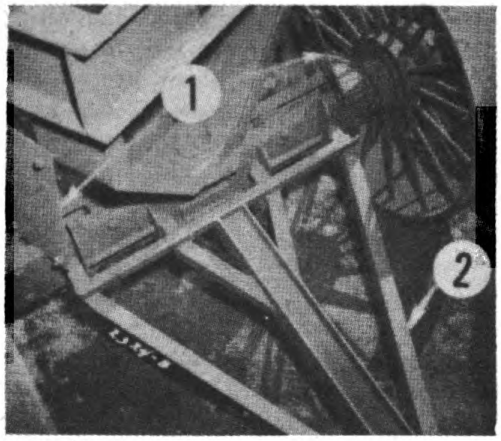


Figure 3. DRIVE BELT TO 300-WA WASHING UNIT

The drive belt is 14" wide by 100' long and is of endless rubber and cord construction.

SETTING UP POWER UNIT TRUCK

The power unit truck is mounted on the flatcar as a complete unit with only the pole removed. To remove from the flatcar, pull flatcar to end ramp or the side platform.



Remove wood blocking, banding iron, and the anchor plates (1) and attach pole (2). Place a man on the platform at the rear of the power unit to operate the brakes and tow power unit off the flatcar.

Figure 4. ANCHOR PLATES

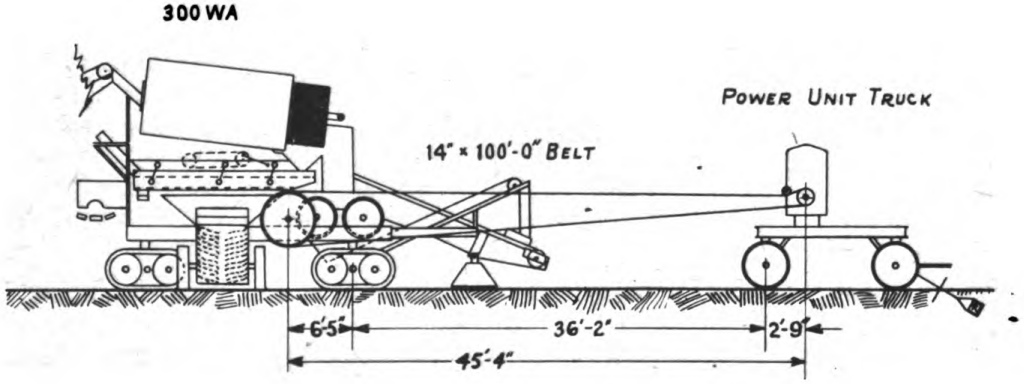


Figure 5. RELATION OF POWER UNIT TO 300-WA WASHING UNIT

On reaching the plant site, locate the power unit truck in the approximate location as shown in Figure 5. Be sure the pulley on the power unit lines up with the pulley on the 300-WA.

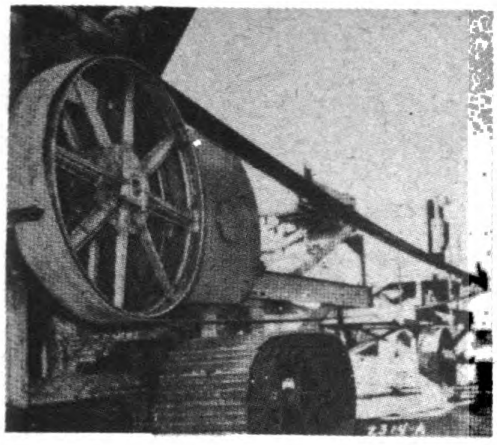


Figure 6. BELT DRIVE

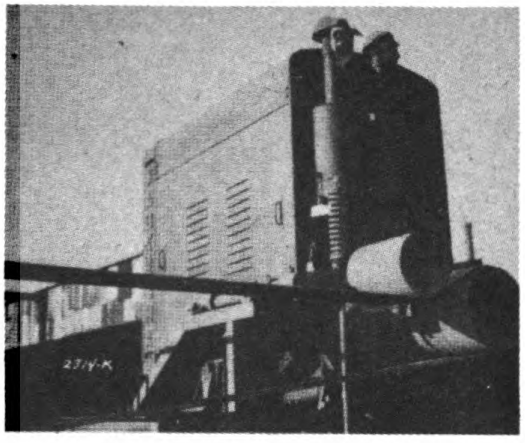


Figure 7. BELT IDLER ON BELT

Install belt as shown in Figure 6 and Figure 7. Be sure the idler rests on top of the belt as shown in Figure 7.

After the belt is in place, put a deadman in the ground in front of the truck. Attach either a chain hoist or cable between the deadman and power unit truck. This is necessary to prevent the belt from pulling the power unit truck toward the 300-WA when the power is applied. Attach anchor plates.

OPERATING POWER UNIT TRUCK

Before starting power unit truck, read instructions for starting the 300-WA. Then proceed as follows:

1. Disengage clutch to power unit.
2. Start engine. See instructions for 6-WAKU Power Unit.
3. Check engine speed. Speed should be 1000 RPM.
4. Engage clutch and follow precautions pointed out in the instructions for the 300-WA.

PREPARING POWER UNIT FOR TRAVEL ON ROAD

1. Remove drive belt.
2. Remove connection to deadman.
3. Remove anchor plates and attach towing pole.

LUBRICATION

Careful regular application of lubricant is not only a prime factor but a necessity if good plant operation with a minimum of breakdown is to be expected. Great care should be taken by personnel to see that only clean lubricants are used and that the following rules are carried out.

1. Keep grease and oil lubricant container in shed away from plant.

2. Keep covers on lubricant container removing them only when the lubricant is taken from the can.

3. Use only clean utensils and containers.

4. Wipe grease fittings and oil holes before applying lubricant.

In making these lubrication charts, two important elements are considered - time and kind of lubricant.

The time between applying lubricant which we give is the maximum that can elapse without detriment to the drive. Some conditions may warrant more frequent application of lubricant, in which case the operator should notice the added requirement due to excessive wear and act accordingly.

The kinds of lubricant vary according to the function they perform and according to other factors such as bearing temperature, bearing speed, moisture condition, dirt conditions and availability. The kinds of lubricant required on this plant are oil, grease, gear lubricant and water.

Oils to be used are specified by the U. S. Army Symbol and SAE number.

A certain amount of discretion must be used by the person in charge of greasing the plants in regard to the amount of grease put in the various lubrication points. When the chart indicates "fill housing", it does not mean that the person should pump grease in until large amounts leak through the seal but that at each time of greasing enough grease is put in so that after running a short time the grease will work out of the seal. With a little care and watching, the man doing the greasing can soon familiarize himself with just the right amount of lubricant to use.

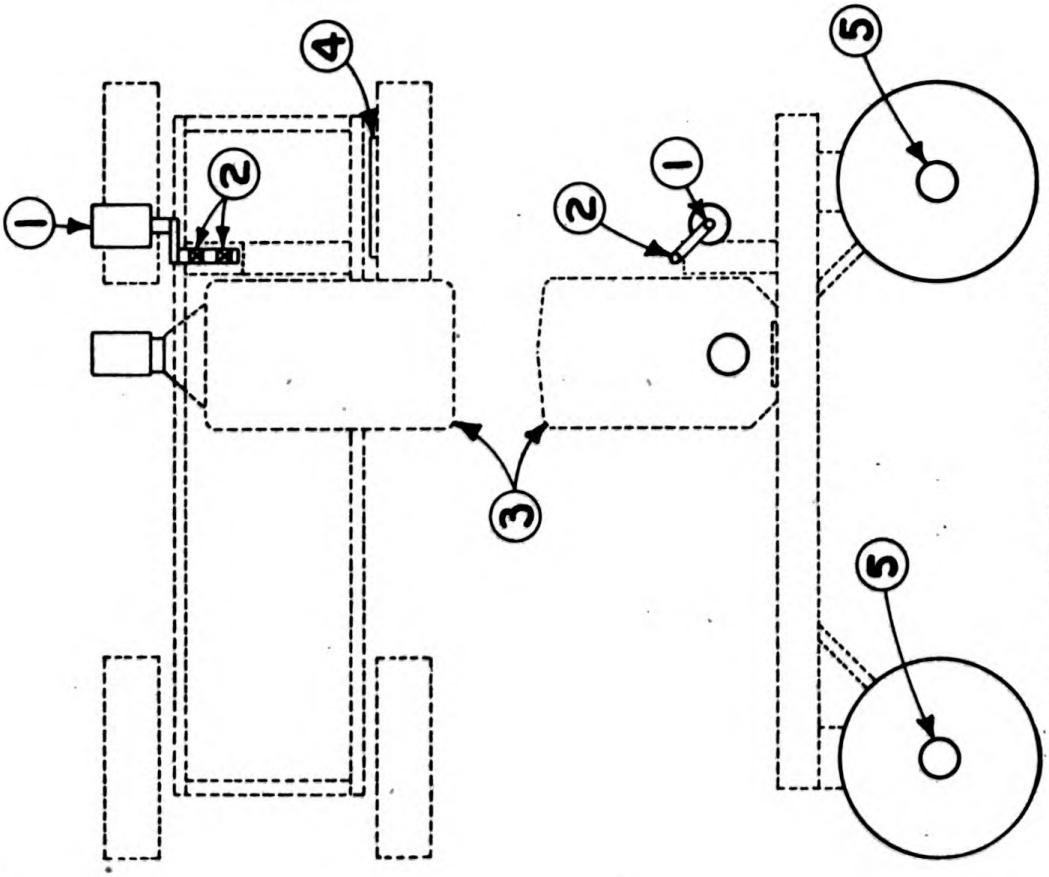


Figure 8. POWER UNIT TRUCK LUBRICATION CHART

PLACE	TIME LAPSE	LOCATION NO.	NO. OF LUBRICATION POINTS	ARMY SYMBOLS OF GREASE	AMOUNT
WHEEL HUBS	Once a year	(5)	4	WB-2	Pack hub
BRAKE	When about to move	(4)	2	CG-2	1 shot
BELT IDLER PIVOT	8 hrs.	(2)	2	CG-2	Fill bearing
BELT IDLER	8 hrs.	(1)	1	WB-2	Fill housing
POWER UNIT	See instructions on Waukesha 6-WAKU Engine.				

MAINTENANCE MANUAL

FOR

POWER UNIT TRUCK FOR 300-WA

INTRODUCTION

The majority of the maintenance work on the power unit truck will be done on the 6-SRKRU Waukesha Power Unit. Instructions for maintenance of the power unit are fully explained in the Waukesha Manual attached to this set of Power Truck Manuals.

The only other maintenance work which may be required would be on the truck itself and will be on either the belt idler, wheels, or brakes. Step by step repair instructions are given on these mechanical parts in the following write-up.

INDEX

BELT IDLERS

DISASSEMBLY OF SINGLE ARM SPRING LOADED BELT IDLER

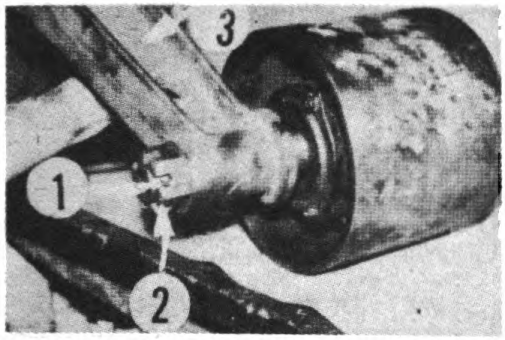


Figure 1. REMOVING ARM FROM IDLER ASSEMBLY

Remove cotter pin (1) and outer lock nut (2). Remove idler assembly from arm (3).

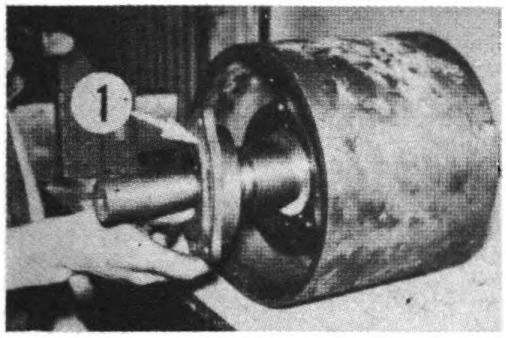


Figure 2. REMOVING OPEN COVER

Unbolt and remove open cover (1).

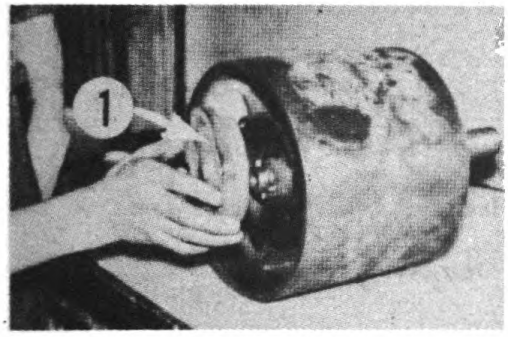


Figure 3. REMOVING CLOSED COVER

Unbolt and remove closed cover (1).

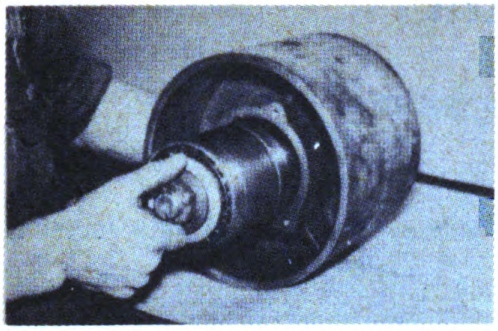


Figure 4. PULLING BEARING ASSEMBLY OUT OF PULLEY

Slide idler stud and bearings out of idler pulley.

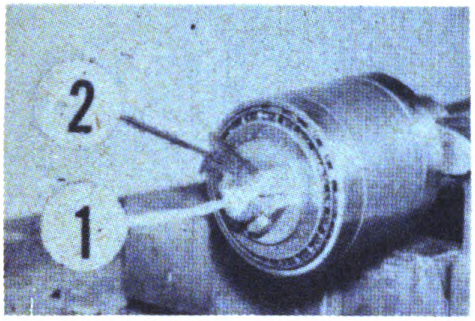


Figure 5. REMOVING LOCK NUT

Remove cotter pin (1) and inner lock nut (2).

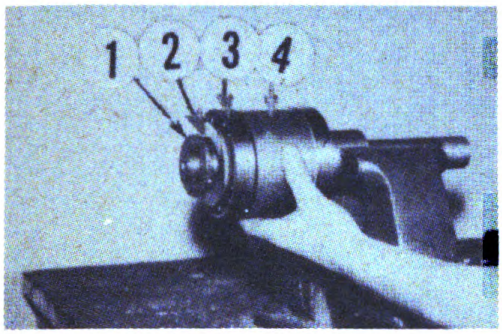


Figure 6. REMOVING TIMKEN CONE, CUP, AND BEARING SPACER

Remove inner cut washer (1), Timken cone with rollers (2), Timken cup (3), and bearing spacer (4).

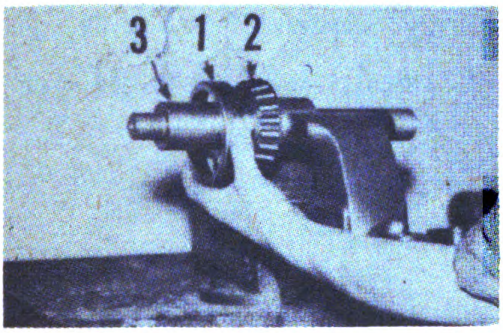


Figure 7. REMOVING INNER TIMKEN CUP AND CONE

Remove Timken cup (1) and Timken cone with rollers (2) from idler stud (3).

REASSEMBLY OF SWINGING ARM BELT IDLER

1. Place Timken cone with rollers (2) on idler stud (3) against shoulder. Slip on Timken cup (1). See Figure 7.

2. Put bearing spacer (4), Timken cup (3), Timken cone (2), and inner cut washer (1) on idler stud. See Figure 6.

3. Tighten inner lock nut (2). Loosen 1 – 2 slots, replace cotter pin (1) and bend over end to lock in place. See Figure 5.

4. Slip idler stud and bearing assembly into idler pulley. See Figure 4.

5. Bolt on closed cover (1). See Figure 3.

6. Bolt open cover (1) in place. See Figure 2.

7. Place idler stud in end of idler arm (3). Tighten outer lock nut (2) on idler stud and lock with cotter pin (1). See Figure 1.

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DISASSEMBLY OF FRONT WHEELS

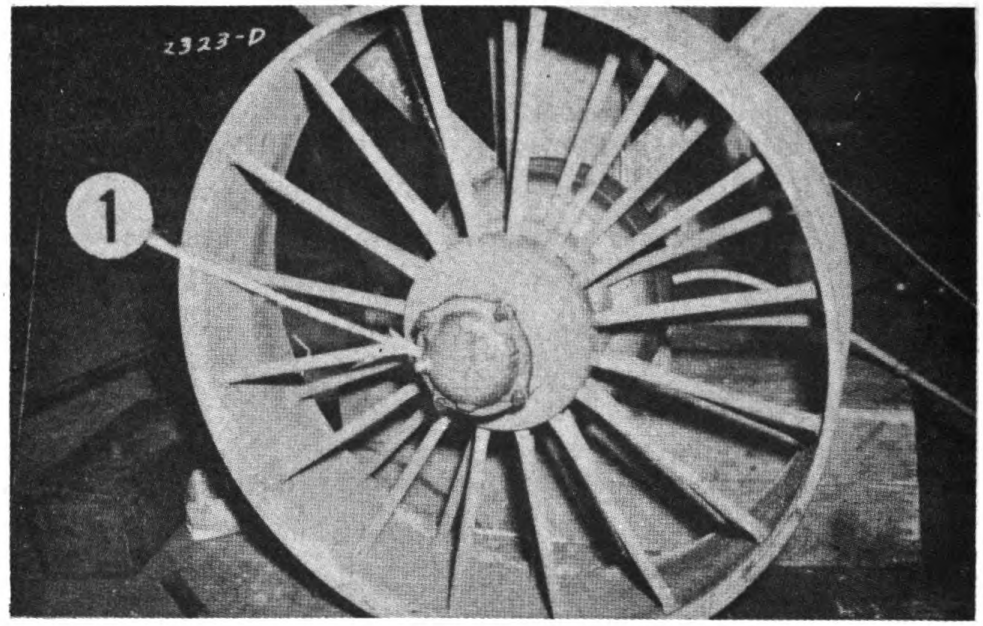


Figure 8. STEEL WHEEL

1. Remove hub cap (1) after unfastening bolts.

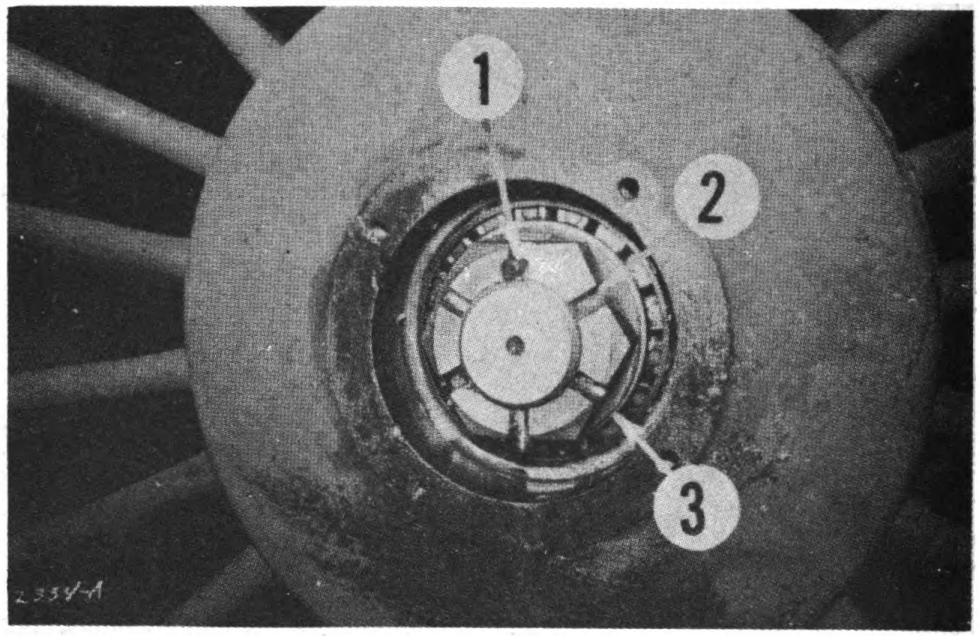


Figure 9. HUB CAP REMOVED

2. Remove cotter pin (1), Timken nut (2), and Timken washer (3).

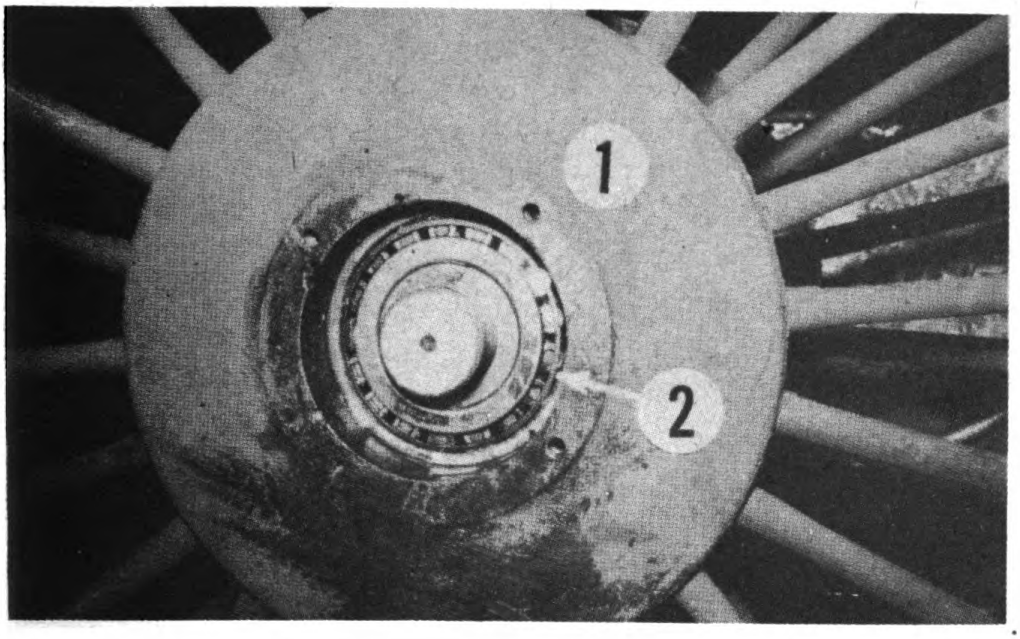


Figure 10. TIMKEN NUT AND WASHER REMOVED

3. Pull wheel hub (1) with Timken cups and outer Timken cone with rollers (2).

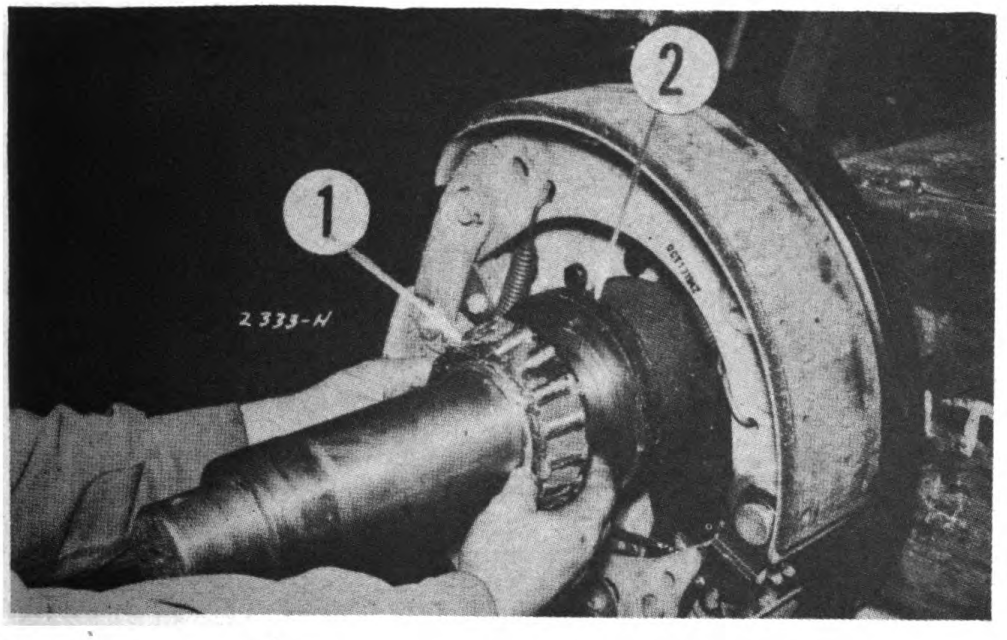


Figure 11. REMOVING TIMKEN CONE

4. Remove inner Timken cone (1) with rollers.

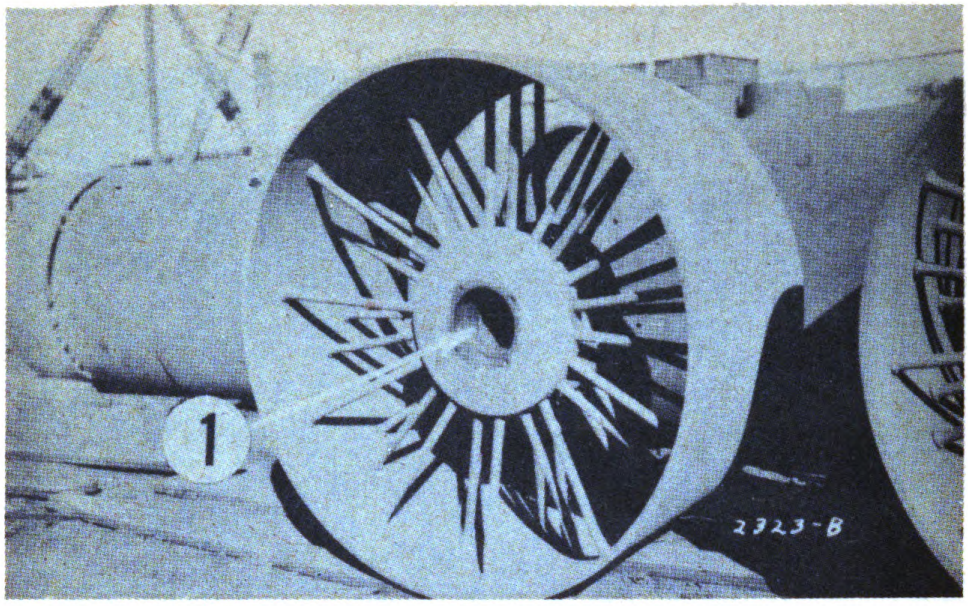


Figure 12. WHEEL HUB WITH TIMKEN CUPS

5. Drive Timken cups (1) out of wheel hub.

REASSEMBLY OF FRONT WHEELS

1. Drive Timken cups (1) in wheel hub against shoulder. See Figure 12.

2. Place Timken bearing cone (1) on spindle next to dust collar (2). See Figure 11.

3. Put wheel hub (1) with Timken cups in place on axle spindle and slip in outer Timken cone with rollers (2). See Figure 10.

4. Put Timken washer (3) and Timken nut (2) on end of spindle. Tighten nut fully, then back off nut 1 - 2 notches until cotter pin (1) may be slipped in place and locked. Wheel must turn freely. See Figure 9.

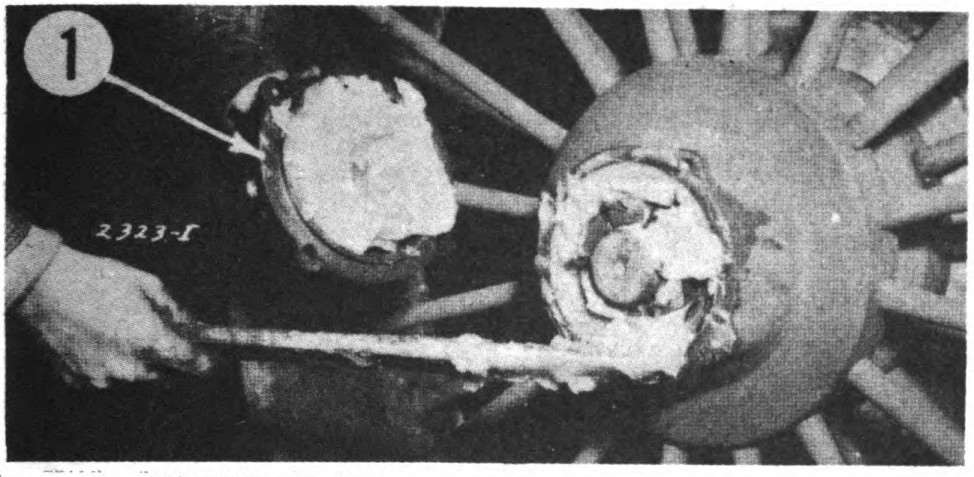


Figure 13. REPLACING HUB CAP

5. Replace hub cap (1) and tighten bolts.

6. Grease should be applied to inner Timken bearing while assembling. The space between outer bearings and hub should be packed with grease.

DISASSEMBLY OF REAR WHEELS

1. Follow 5 steps under Disassembly of Front Wheels.

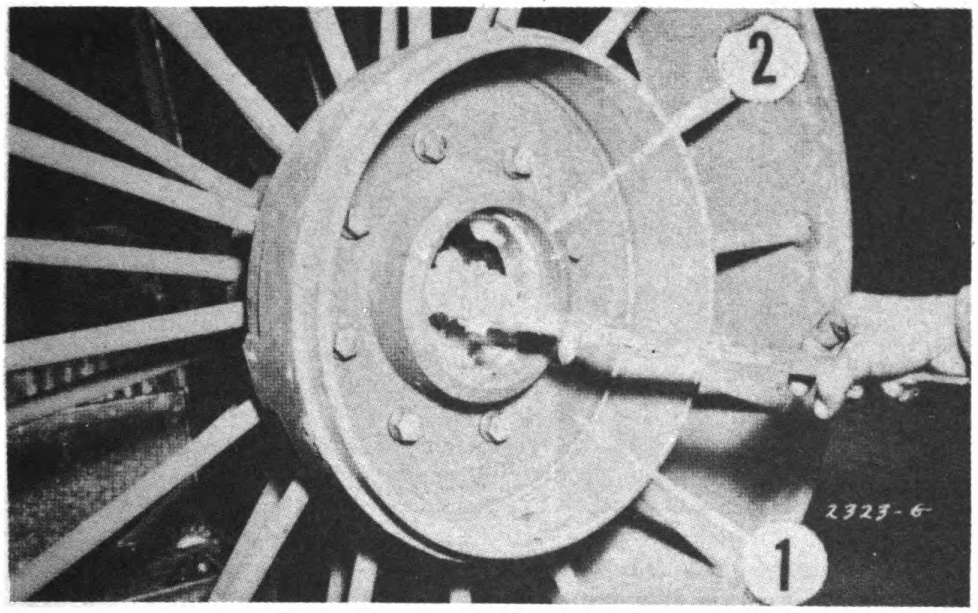


Figure 14. BRAKE DRUM

2. Brake drum (1) may be unbolted and removed from wheel hub (2).

REASSEMBLY OF REAR WHEELS

1. Bolt brake drum (1) to wheel hub (2). See Figure 14.

2. Follow 6 steps under Reassembly of Front Wheels.

DISASSEMBLY OF BRAKE SHOES

1. Remove wheel hub and brake drum from axle. Follow instructions for Disassembly of Rear Wheels.

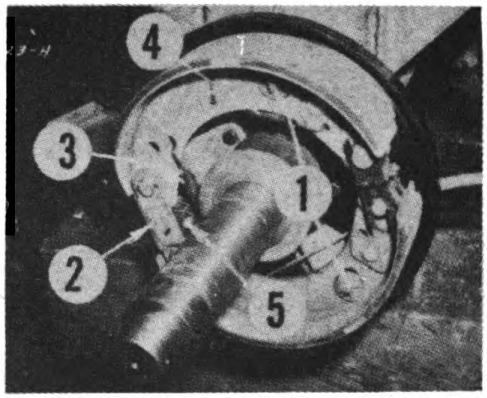


Figure 15. BENDIX BRAKES

2. Remove cotter pins and unscrew spacer pin hex nut (1). Remove spacer pin washer.

3. Remove cotter pins and lift off anchor pin strut (2).

4. Remove primary to secondary shoe spring (3).

5. Unhook and remove anchor to shoe spring (4).

6. Spread shoes and lift out shoe assembly.

7. Remove cam block (5) from operating lever cam.

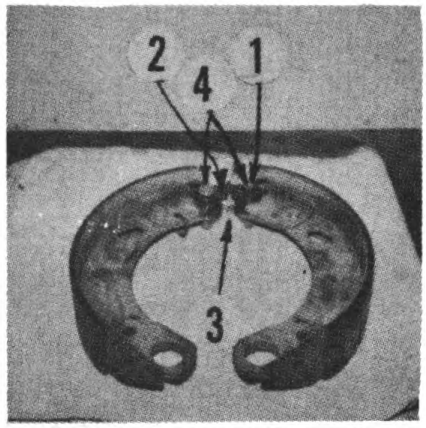
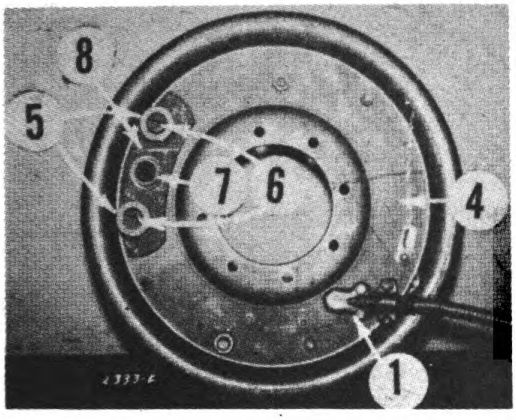


Figure 16. BRAKE SHOES WITH ADJUSTING SCREW AND SPRING AND PIVOT NUTS

8. Remove cotter pin (1) to remove adjusting screw spring (2).

9. Turn adjusting screw (3) to spread shoes apart until completely unscrewed. Remove pivot nuts (4) from shoes.

DISASSEMBLY OF BENDIX BRAKES



1. Unbolt and remove brake cable clamp (1).

2. Unhook cable clevis (2) from operating lever cam (3). Pull cable through opening in backing plate (4).

3. Unscrew and remove anchor pin nut (5) and remove lock washer. Remove anchor pin and shoe guide (6).

4. Remove crank retaining washer (7). Remove anchor bracket (8) after unbolting.

Figure 17. BRAKE BACKING PLATE

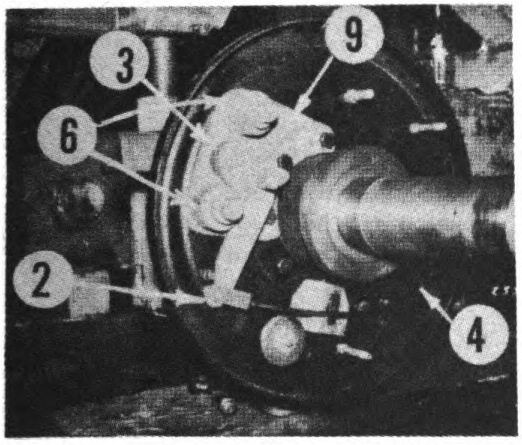


Figure 18. OPERATING LEVER CAM

5. Remove operating lever cam (3). Remove reinforcement plate (9).

REASSEMBLY OF BENDIX BRAKES

1. On backing plate (4) with flange turned up, lay reinforcement plate (9). See Figure 18.

2. Place bushing in center hole of reinforcement plate. Drop operating lever cam (3) into bushing.

3. Place anchor pins (6) in outer holes with threaded ends down.

4. On opposite side of carrier plate (4), put anchor bracket (8) in place. Push crank retaining washer (7) on groove at end of operating lever cam. See Figure 17.

5. Place lock washers and nuts (5) on anchor pins. Note that the nut end of each anchor pin is longer on one side of the screwdriver slot. Rotate anchor pins so that the longer sides of the slots are facing each other. Tighten nuts enough to hold anchor pins in position.

6. Bolt cable clamp (1) to backing plate and hook clevis on end of cable in notch on operating lever cam.

REASSEMBLY OF BRAKE SHOES

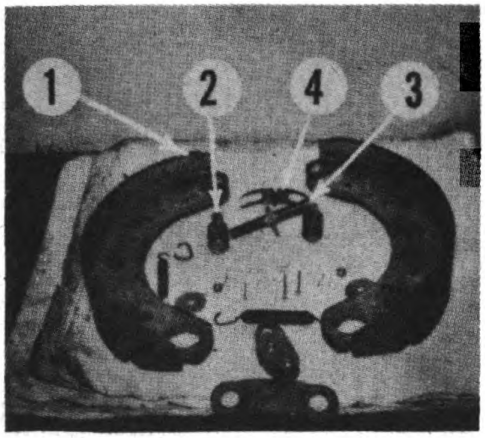


Figure 19. BENDIX BRAKE PARTS

1. Place the brake shoes (1) on a bench so that the anchor pin holes are away from you.

2. Lubricate the pivot nuts (2) and the threads on the adjusting screw (3).

3. Pick up the pivot nut that has a cotter pin hole in one end and insert this pivot nut in the shoe at your left with the cotter pin hole end up. Then insert the other pivot nut (the one having an undercut shoulder) in the shoe at your right with the shoulder end up. Now thread the adjusting screw into both pivot nuts to full travel of threads, left hand thread at the left and right hand thread at the right.

4. Assemble the adjusting screw lock plate (4) and insert and spread cotter pin. Before mounting the relined shoes to the backing plate, clean exposed portion of cable. Then pull the cable back and forth in conduit and spread brake cable lubricant on the cable. Also use brake cable lubricant on the cable ramp over which the cable passes to the inside brake lever. Lubricate the following friction points:

   a. Where the pivot nuts (2) bear against the backing plate.
   b. Where the shoe webs bear against the steady rest pins and at the end of the eccentric adjustment.
   c. Where the cable hooks onto the lever.
   d. On the cam between the cam plates where the ends of the shoes enter the cam and also the cam pin on the inside lever.

NOTE: Use only reasonable amounts of lubricant since any excess may work onto the lining and cause erratic brake action.

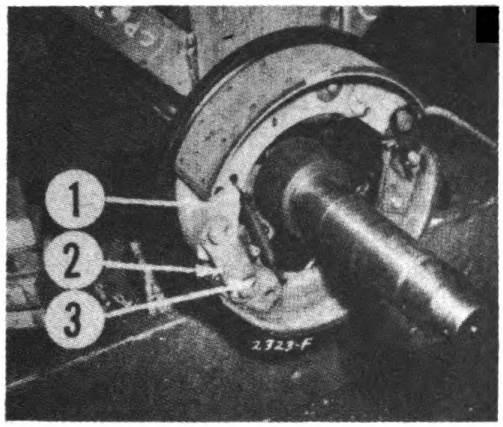


Figure 20. BENDIX BRAKE ASSEMBLED

5. Assemble the brake shoes (1) onto the backing plate. Assemble the anchor pin strut (2) and insert cotter pins (3) and curl ends around anchor pin. Put lubricant on the rounded edge (next to shoe web) side of the spacer pin washer (4). Assemble spacer pin washers and nuts (5) with nuts loose. Assemble the primary shoe return spring (6) and primary and secondary shoe spring (7) with Bendix special spring tongs. Now tighten the spacer spring castellated nuts so the spacer pin washers can be turned with your fingers. Insert cotter pins and spread.

MINOR ADJUSTMENT OF BRAKES

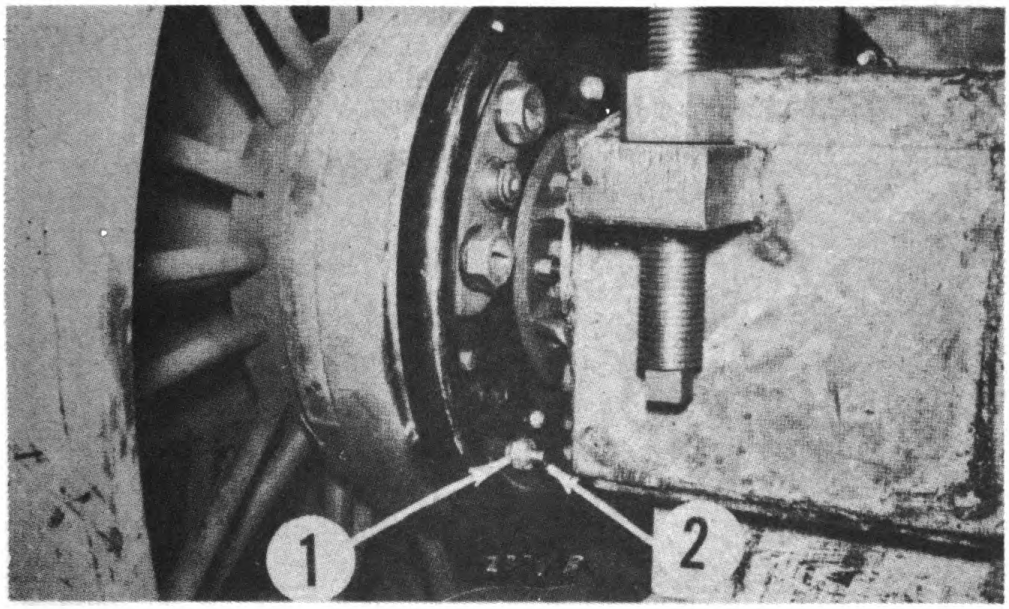


Figure 21. SETTING SHOE CLEARANCE

1. Jack all wheels clear off the floor. Disconnect cables or rods at the "frame" levers.

2. Loosen the eccentric lock nut (1) and rotate the eccentric (2) in the direction of forward wheel rotation until there is a brake drag. Then rotate the eccentric very slowly in the opposite direction until the drum is free of brake drag.

3. Tighten the eccentric lock nut (1). Be sure the eccentric does not turn as the nut is tightened.

4. Uncover the adjusting screw hole (3) and rotate the adjusting screw (notched wheel) toward the drum with screw driver, moving the outer end of the tool toward center of wheel until the shoes are tight against the drum. See Figure 22.

    a. With the control system in the released position, pull cables or rods toward "frame" levers to remove all slack and lost motion at cam levers. Adjust clevises so that clevis pins will barely enter clevises and levers easily. Lock clevis jam nuts and insert clevis pin cotters.
    b. At each wheel, back off on the adjusting screw until brake does not drag.

5. Lower the vehicle and test for brake balance on brake tester or road. Always loosen adjusting screw on tight brakes rather than tighten adjusting screw on loose brakes. This is a safeguard against the vehicle going into service with one or more brakes too tight. Replace the adjusting screw hole cover at each backing plate.

MAJOR ADJUSTMENT OF BRAKES

Make major adjustment only after relining brake shoes or when minor adjustment fails to give satisfactory performance.

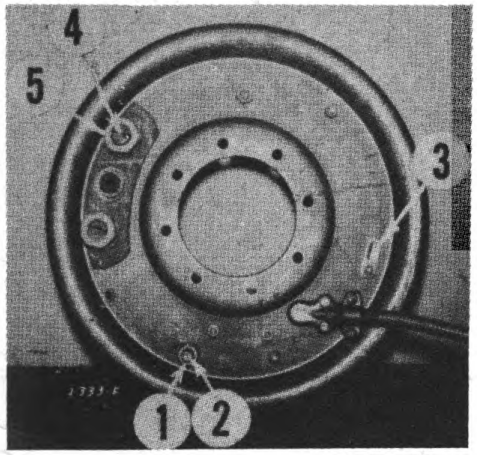


Figure 22. BRAKE BACKING PLATE

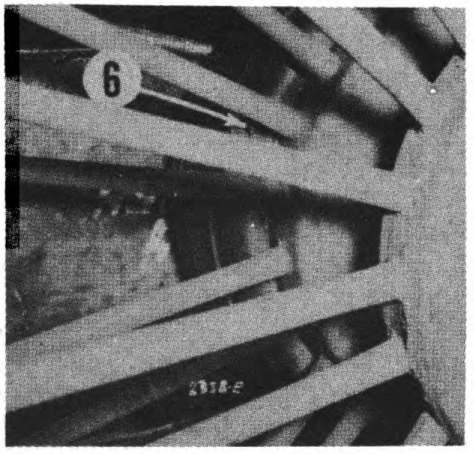


Figure 23. FEELER GAGE COVER ON DRUM

1. Disconnect cable or rod ends at "frame" levers. If necessary, adjust that portion of the brake control system ahead of the cable or rods to secure its correct "return" position. Leave cable or rod ends disconnected.

2. Note that the nut end of each anchor pin (4) is longer to one side of the screw driver slot. This long end corresponds to the high side of the eccentric section of the anchor pin at the shoe web. Loosen the anchor lock nuts (5) and rotate the anchors so the long side of the anchor ends face each other. Tighten the anchor nuts so the anchors can just be rotated.

3. Move adjusting screw hole cover (3) on the backing plate to one side and rotate the adjusting screw through the hole in backing plate with screw driver until slight brake drag occurs.

4. Loosen lock nut (1) on the shoe eccentric adjustment one turn and rotate the eccentric (2) in the direction of forward wheel rotation until brake drag occurs. Then release adjustment very slowly until drum is free of brake drag.

5. Remove feeler gauge hole cover plate (6) from the drum.

6. Check the shoe lining to drum clearance with the use of a feeler gauge inserted through the feeler gauge hole in the drum. The shoe against which the shoe eccentric operates should be adjusted first. A check showing .008" lining to drum clearance at the anchor end and .014" lining to drum clearance at the adjusting end of this shoe indicates a properly positioned shoe. The .008" and .014" clearances can be obtained by rotating the anchor and manipulating the shoe eccentric adjustment.

   NOTE: Rotating the anchor so the long end moves toward the axle increases the clearance between the lining and the drum at the anchor end and decreases the clearance of the adjusting end. Rotating the anchor so the long end moves away from the axle causes the opposite condition. When the .008" and .014" clearances have been obtained, tighten the anchor nut down tight with a 22" long wrench taking care not to change the position of the anchor.

7. Tighten eccentric lock nut taking care not to change the eccentric position.

8. The opposite shoe position can be obtained by rotating the shoe anchor and turning the adjusting screw until the same clearances (.008" and .014" anchor end and adjusting end respectively) are obtained. Tighten anchor nut down tight but do not change the position of the anchor.

   NOTE: Rotating the adjusting screw does not affect the position of the shoe against which the shoe eccentric operates until the adjusting screw moves the opposite shoe against the drum, unless the spacer pin washer is too tight against the shoe web.

9. Replace drum feeler gauge hole cover.

10. At each of the brakes, spread the shoes by means of the notched adjusting screw until the shoes are tight against the drum.

11. With the control system in the released position, pull cables or rods tightly toward "frame" lever to remove all slack and lost motion at cam levers. Adjust clevises so that clevis pins will barely enter clevises and cross shaft levers easily. Lock clevis jam nuts and insert clevis pin cotters.

12. Back off 8 notches at each adjusting screw to free drum of brake drag.

13. Lower vehicle to floor and test for brake balance. Always back off at the adjusting screw on the tight wheel. Never take up on the loose wheel until proper balance is obtained.

14. Replace adjusting screw hole covers.

PARTS MANUAL

FOR

300-WA POWER UNIT AND TRUCK

300-WA POWER UNIT AND TRUCK

INDEX

PREPARATION OF REQUISITIONS

Sample Copy for Use in the Preparation of Requisitions

Revisions in QMC Form 400 for requisitioning spare parts are confined to new column headings. Until new forms are available all organizations are to continue using the present form and either type or write in corrections indicated in column headings.

Under revised heading "Nomenclature and Unit" list the article and the unit (ea for each; lb for pound, etc.). Under heading "Authorized or Maximum Level" list the authorized depot stock levels or organizational allowances given in Part III of the Corps of Engineers Supply Catalog. The total number on hand for each item is listed under "On Hand". In column headed "Due In" enter the total quantity previously requisitioned but not delivered. For "Initial" and "Replenishment" requisitions, the sum of "Required", "Due In", and "On Hand" should equal the "Authorized or Maximum Level"

On this page is shown a sample requisition on QMC Form No. 400 which conforms to the latest revisions. The marginal notes give instructions for preparing a requisition for spare parts for Engineer equipment. Additional information on this subject is contained in section AA-1 of Part III Engineer Supply Catalog, available from the Engineer Field Maintenance Office, P. O. Box 1679, Columbus, Ohio.

State PERIOD designation by use of one of the following terms:
(1) "INITIAL"—first requisition of authorized allowances.
(2) "REPLENISHMENT"—subsequent requisitions to maintain authorized allowances.
(3) "SPECIAL"—requisitions for necessary repairs not covered by allowances.

Type "SPARE PARTS" in upper right hand corner of requisition.

(SAMPLE) SPARE PARTS

WAR DEPARTMENT
Q. M. C. Form No. 400
(Revised 10 Aug. 1943)

REQUISITION

To: Engineer Field maintenance Office No. of Sheets 1 Sheet No. 1
P.O. Box 1679, Columbus, Ohio
Requisition No. E-531-3-44 Date 6 October 1943 Period Special

SHIP TO Engineer Property Officer, Pine Camp, NEW YORK

MARK FOR: Supply Officer, 147th Engineer Regiment, Pine Camp, New York

Requisitioned By (Show Signature, Rank, Organization, Destination. If different from "SHIP TO" include address):
Robert E. Roe
Major, C.E.
Engineer Property Officer

Approved By: For the Commanding Officer
John D. Doe
Colonel, C.E.
Executive Officer

MFG. NO.	NOMENCLATURE AND UNIT		AUTH. or MAX. LEVEL	ON HAND	DUE IN	REQUIRED	APPROVED
	PARTS FOR ROCK CRUSHING, SCREENING AND WASHING PLANT, PIONEER MODEL RC-201 MACHINE SERIAL NUMBER 3000						
	Basis: Repair of disabled equipment						
	Delivery requested by 20 October 1943						
	ROLL CRUSHER						
L-1264	SHELL, Roll	ea	-	0	0	2	
L-1467	PLATE, Key	ea	-	0	0	2	
	VIBRATOR SCREEN						
CP-21772	SPRING	ea	-	0	0	12	
	CLUTCH						
G-175	RING, Shifter	ea	-	0	0	2	
	PUMP UNIT						
30567-1	SHAFT	ea	-	0	0	1	

Give complete shipping instructions. Special instructions for packing, marking, routing, etc., should be given at the end of the requisition.

State proper nomenclature of machine, also make, model, machine serial number and U. S. A. registration number.

Prepare a separate requisition for each different machine.

State basis or authority and date delivery is required, immediately below description of machine.

Double space between items.

Group parts required under group headings as shown in manufacturers' parts catalogs (Technical Manual).

State manufacturers' parts numbers and nomenclature descriptions accurately and completely. Do not use abbreviations.

*Nonexpendable items such as tools must be accounted for, when requisitioned, by a statement that they have been placed on REPORT OF SURVEY or STATEMENT OF CHARGES.

Emergency requisitions sent by telephone, telegraph or radio must always be confirmed immediately with requisition marked: "Confirming (state identifying data)."

PREPARATION OF REQUISITIONS

A sample requisition in the correct form for submission by the Engineer Property Officer is shown on the opposite page.

THIS SHALL BE FOLLOWED IN MAKING OUT REQUISITIONS

In order to eliminate duplication of work, Property Officers may authorize organizations to prepare requisitions in final form, leaving requisition number space blank for completion by Property Officer.

THE FOLLOWING RULES WILL BE OBSERVED CAREFULLY IN PREPARING REQUISITIONS FOR SPARE PARTS:

a. Prepare a separate requisition for each different machine.

b. Type "SPARE PARTS" in upper right hand corner of requisition form.

c. State PERIOD designation by use of one of the following terms:

(1) "INITIAL"—first requisition of authorized allowances.

(2) "REPLENISHMENT"—subsequent requisitions to maintain authorized allowances.

(3) "SPECIAL"—requisitions for necessary repairs not covered by allowances.

d. Give complete shipping instructions.

e. State proper nomenclature of machine, and make, model, serial number and registration number.

f. State basis of authority, and date delivery is required, immediately below description of machine.

g. Group parts required under group headings as shown in manufacturer's parts catalogs.

h. State manufacturers' parts numbers and nomenclature descriptions accurately and completely. Do not use abbreviations.

i. Double space between items.

j. Emergency requisitions sent by telephone, telegraph, or radio must always be confirmed immediately with requisition marked: "*Confirming* (state identifying data)."

k. Nonexpendable items must be accounted for.

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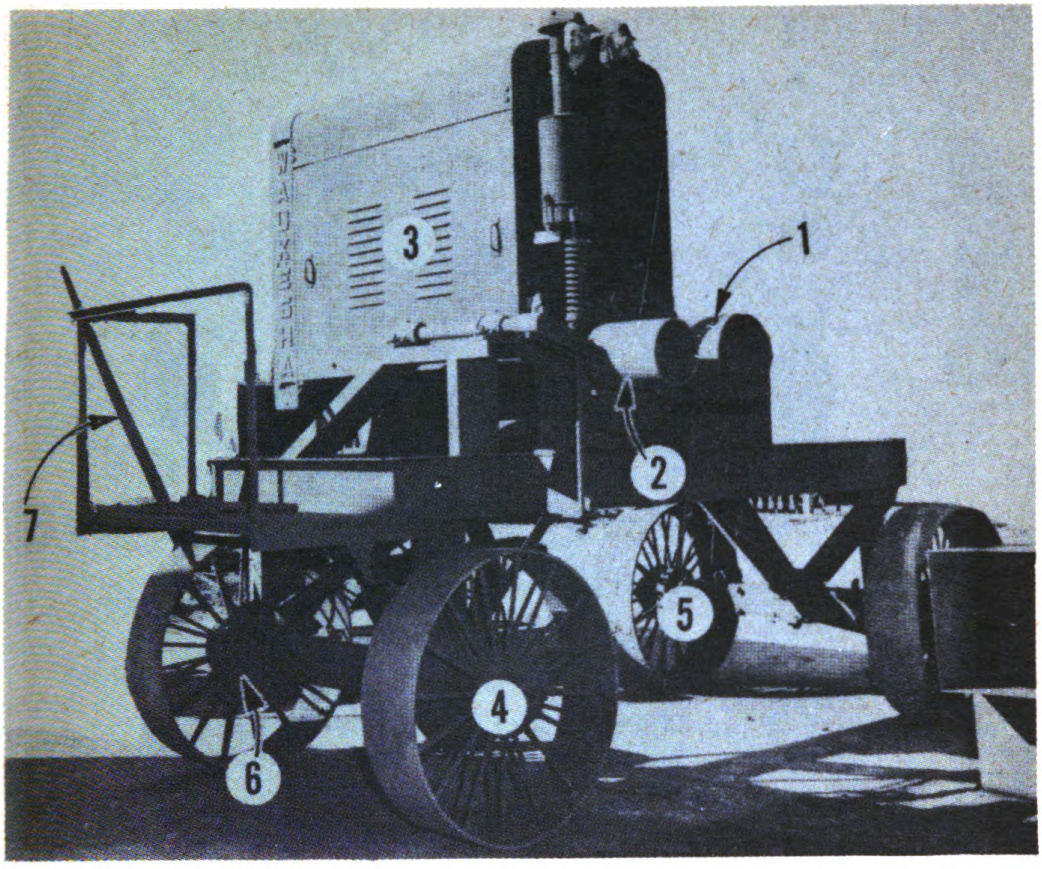
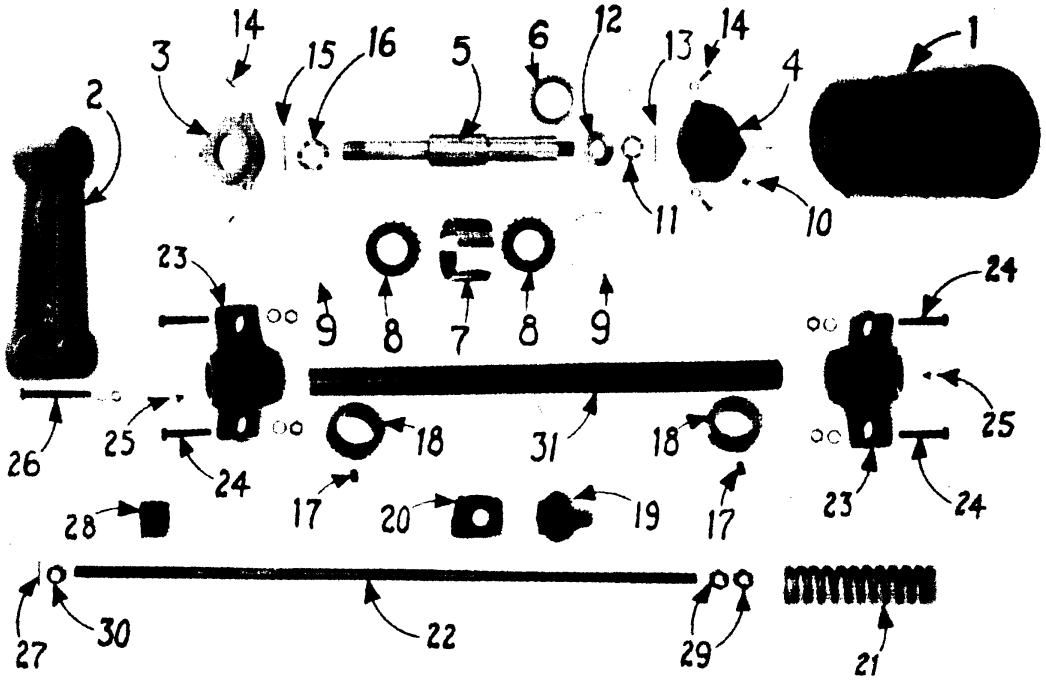


GENERAL VIEW

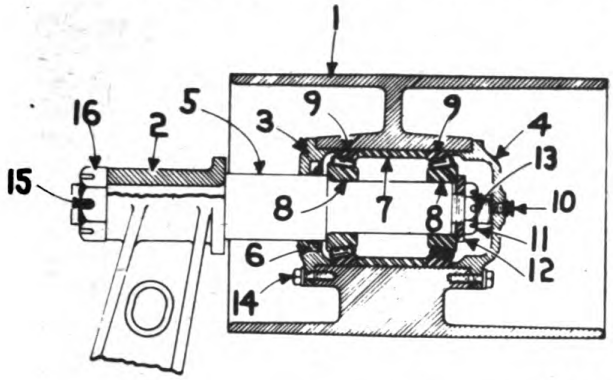
Cut No.	Description	Part No.	Qty.
1	Neverslip pulley, 14" diameter x 15" face, 3-15/16" bore, 1" x 1/2" tapered keyway . .	PA-198	1
	Gib key, for Item 1	No. 89	1
	3/4" x 1" Socket head set screw, for pulley .	. . . . .	1
2	Belt tightener assembly (See Section 3 for individual parts) . . .	CPEP-2648	1
3	Power unit - Waukesha 6WAKU (See separate division of this manual for individual parts)	. . . . .	...
4	Rear wheel and axle group (See Section 6)	. . . . .	...
5	Front wheel and axle group (See Section 5)	. . . . .	...
6	Brakes (See Section 8, 9, and 10)	. . . . .	...
7	Controls for brakes (See Section 7)	. . . . .	...

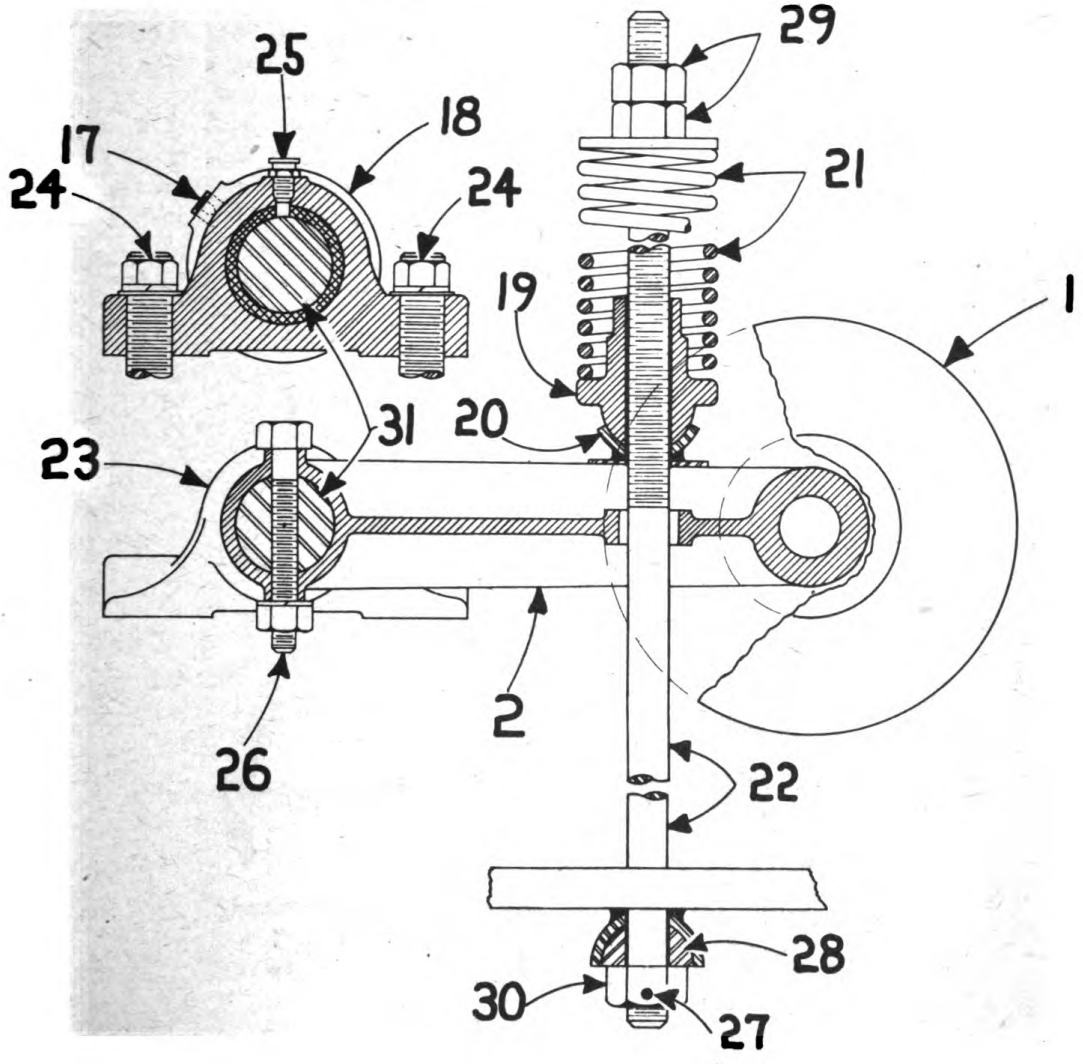


CPEP-2648 BELT TIGHTENER

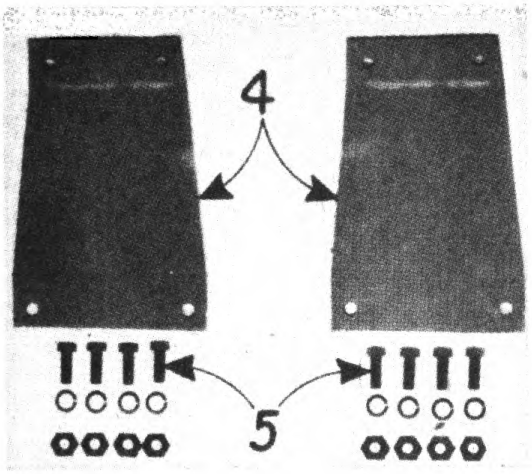
Cut No.	Description	Part No.	Qty.
1	Pulley	L-1809	1
2	Arm	L-1817	1
3	Open cover, with seal	L-1410	1
4	Closed cover	L-1409	1
5	Idler stud	CP-12956	1
6	Victor oil seal, only, for Item 3	60907	1
7	Bearing spacer	CP-12112	1
8	Timken cone	No. 3975	2
9	Timken cup	No. 3920	2
10	1/4" Alemite fitting	A-1186	1
11	Inner lock nut	No. 1	1
12	Retaining washer	CP-12109	1
13	3/16" x 2" Cotter pin	. . . . .	1
14	3/8" x 1" Cap screw, for covers	. . . . .	6
	3/8" Lock washer, for above screw	. . . . .	6
15	3/16" x 2-1/2" Cotter pin	. . . . .	1
16	Outer lock nut	K-8111	1
17	5/8" x 5/8" Socket head set screw	. . . . .	2
18	Set collar, 2-7/16" bore	L-719	2
19	Rocker casting	L-1600	1
20	Bracket, for rocker casting	CPEP-2666	1
21	Spring	CP-3722-X	1
22	Tension rod, 1" x 51"	CP-25495	1
23	Pillow block, 2-7/16"	L-831	2
24	5/8" x 3-1/4" SAE Bolt, with nut	. . . . .	4
	5/8" Lock washer, for above bolt	. . . . .	4
	5/8" Cut washer, for above bolt	. . . . .	4

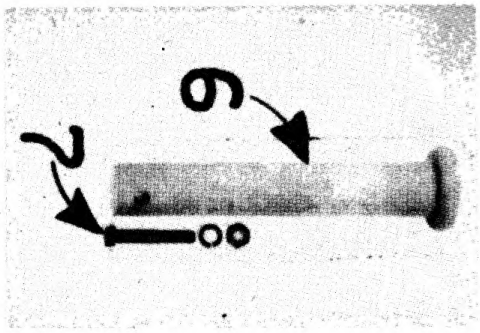
25	1/4" Alemite fitting	A-1186	2
26	1/2" x 4-1/2" Machine bolt, with nut	. . . . .	1
	1/2" Lock washer, for above bolt	. . . . .	1
27	3/16" x 2" Cotter pin	. . . . .	1
28	Rocker block	CP-13193	1
29	1" USS Nut	. . . . .	2
30	1" USS Drilled nut	CP-25716	1
31	Pivot shaft, 2-7/16" x 38"	CP-22717	1

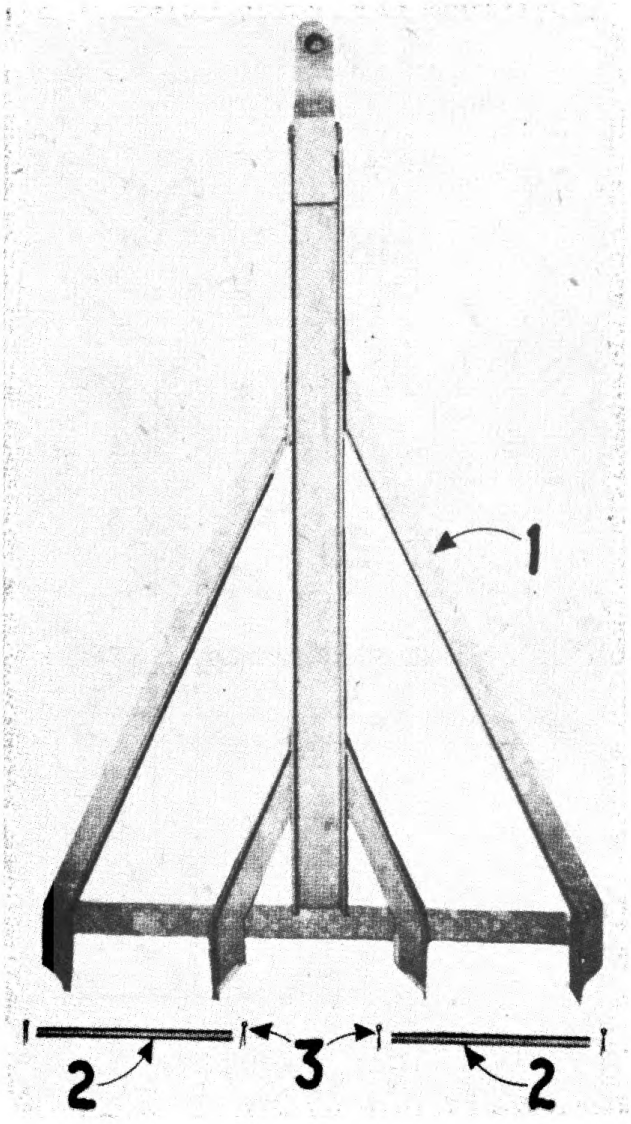




SECTION 4.

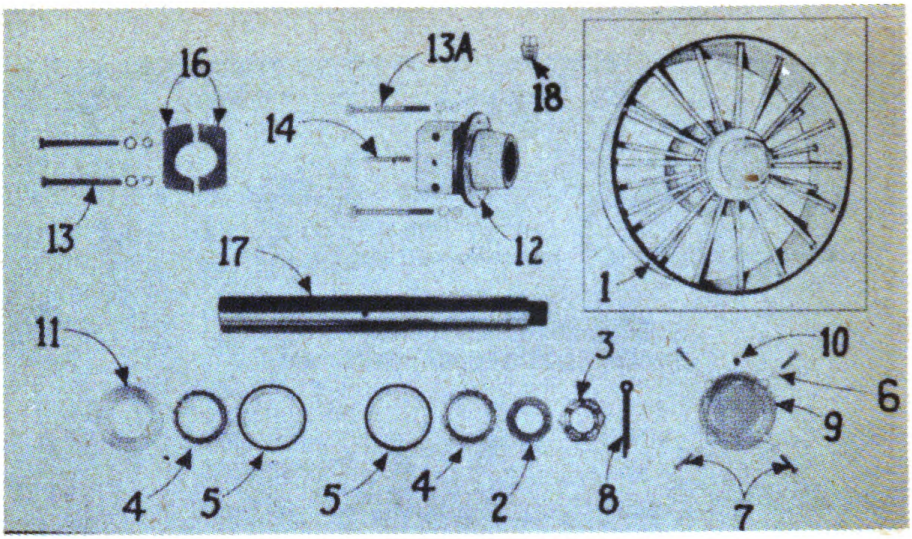


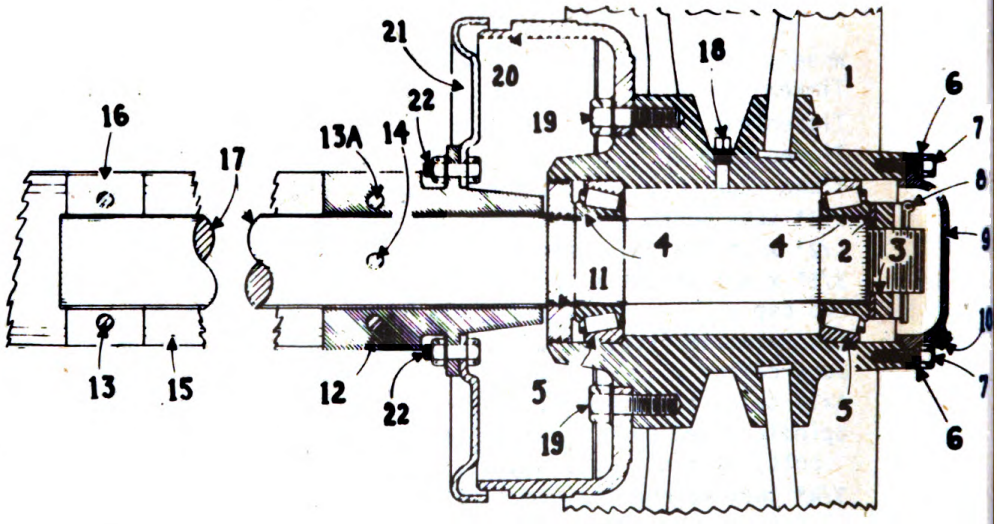




MISCELLANEOUS PARTS

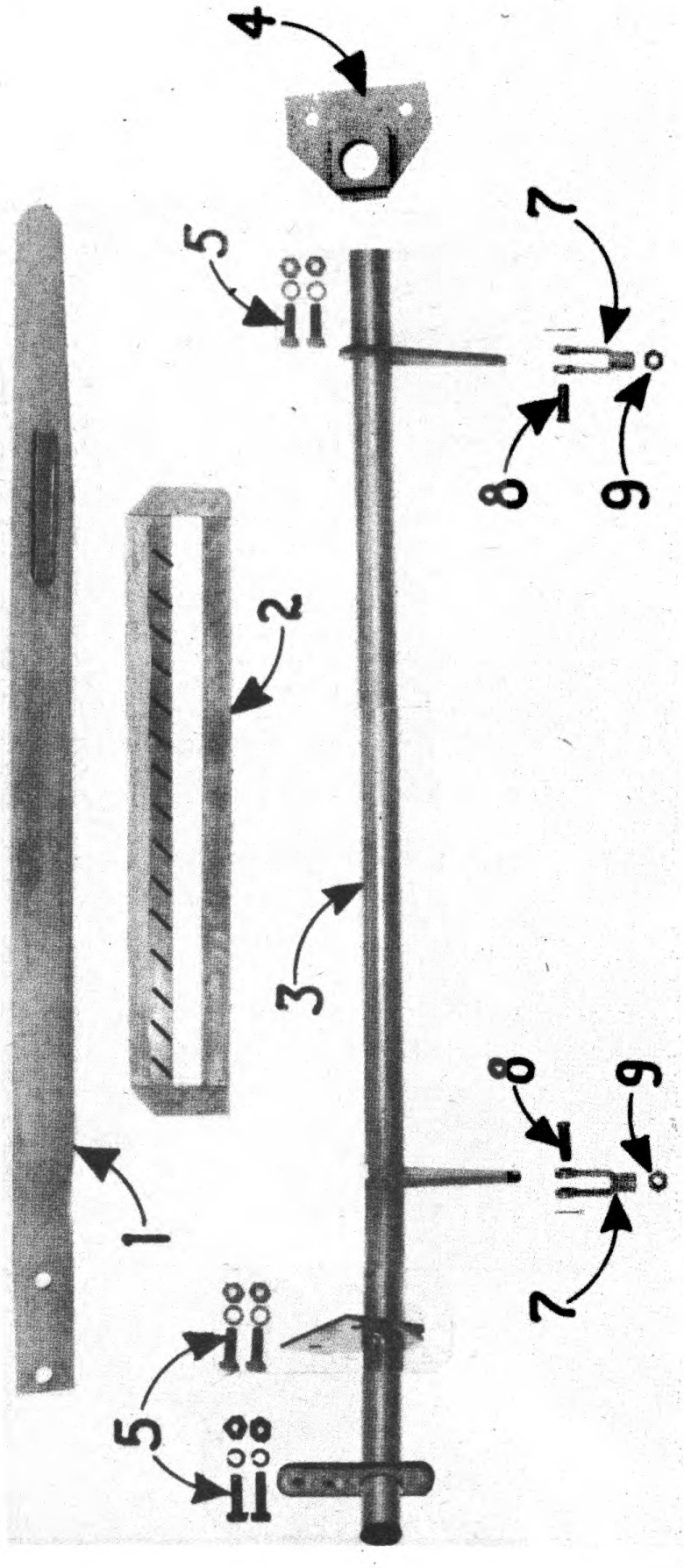
Cut No.	Description	Part No.	Qty.
1	Pole	CPEP-1859	1
2	Pin, 1" diameter x 13"	CP-9689	2
3	1/4" x 1-3/4" Cotter pin	.....	4
4	Anchor plate	CP-22551	2
5	5/8" x 1-1/2" USS Machine bolt, with nut, for Item 4	.....	8
	5/8" Lock washer, for Item 5	.....	8
6	King pin	CP-23091	1
7	1/2" x 2-1/4" USS Machine bolt, with nut, for Item 6	.....	1
	1/2" Lock washer, for Item 7	.....	1
	THE FOLLOWING PARTS ARE NOT ILLUSTRATED		
	Exhaust hood for Waukesha Power Unit	CP-25657	1
	Gas tank assembly	CPEP-2624	1
	1/2" x 1-1/2" USS Machine bolt, with nut, for mounting above gas tank	.....	3
	1/2" Lock washer, for above bolt	.....	3
	1/2" x 2" USS Machine bolt, with nut, for mounting above gas tank	.....	3
	1/2" Bevel washer, for above bolt	CP-3861-009	3
	1/2" Lock washer, for above bolt	.....	3
	1/4" x 3/8" Male elbow, for copper tubing, connection to tank	.....	1
	3/8" SAE flared nut, for above elbow	.....	1
	3/8" x 44" Copper tubing, connecting to tank	.....	1
	3/8" Compression union, for copper tubing	.....	1
	3/8" x 56" Copper tubing, connecting to power unit	.....	1
	3/8" SAE flared nut, connection to power unit	.....	1





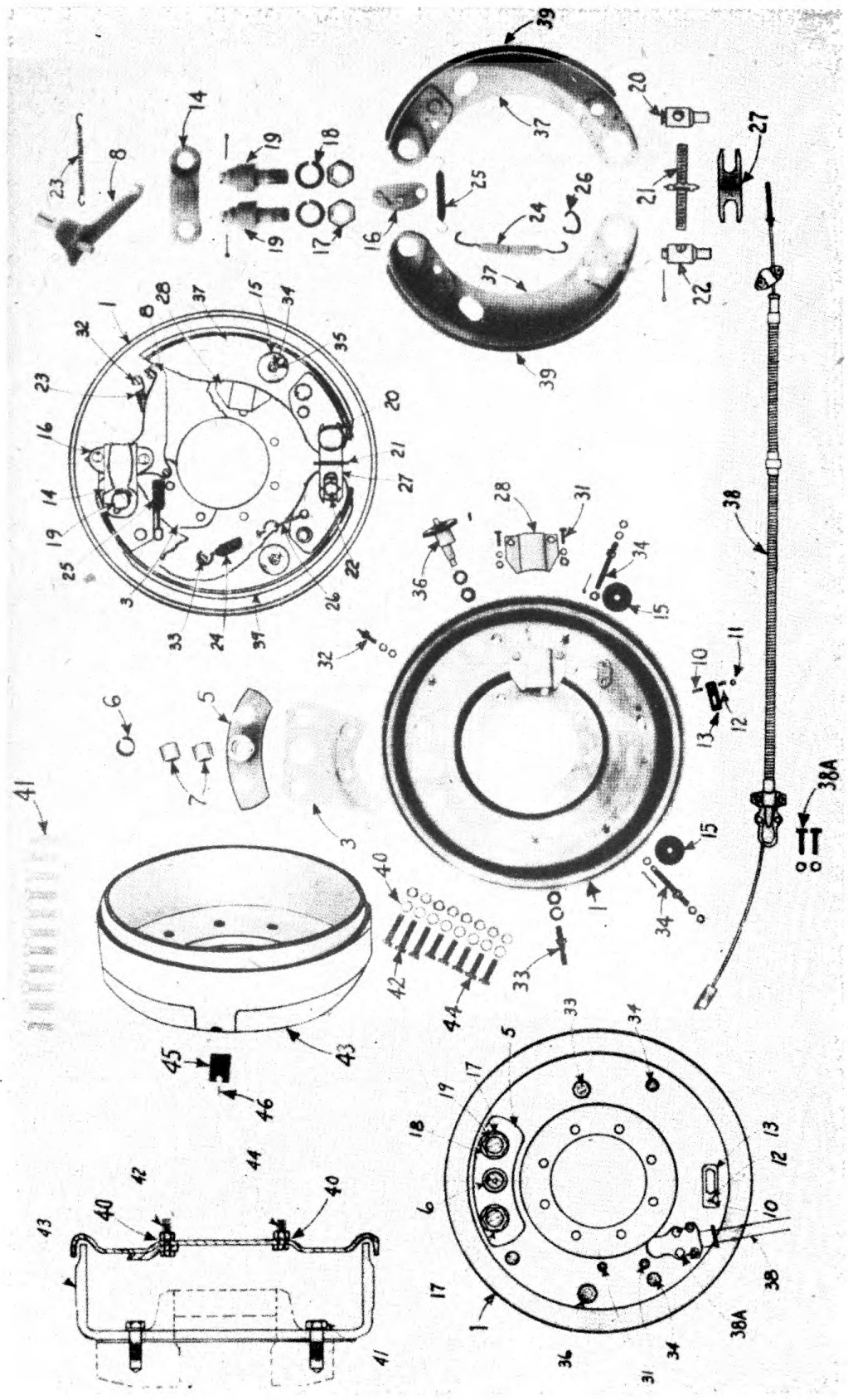
REAR WHEEL AND AXLE GROUP

Cut No.	Description	Part No.
1	Wheel, 44" x 12" steel	PA-223
2	Timken washers	No. 10438
3	Timken nut	No. 10340
4	Timken cone	No. 759
5	Timken cup	No. 752
6	Lock washer, 1/2" standard, for Item 7	. . . . .
7	1/2" x 2" USS Cap screw	. . . . .
8	3/8" x 4-1/4" Cotter pin	. . . . .
9	Hub cap	L-1051
10	1/4" Alemite fitting	A-1186
11	Dust collar	L-1773
12	Axle spindle bracket	L-1782
13	Spindle clamp bolt, 3/4" x 8-1/2" machine bolt, with nut	. . . . .
	3/4" Lock washer for above bolt	. . . . .
13A	Spindle bracket bolt, 3/4" x 9-1/2" machine bolt, with nut	. . . . .
	3/4" Lock washer for above bolt	. . . . .
14	Spindle pin, 5/8" x 5"	CP-178
15	Axle channel (part of frame)	. . . . .
16	Axle spindle clamp	L-689
17	Axle spindle	CP-21905
18	3/8" Pipe plug	. . . . .
19	)	
20	) See Sections 8, 9, and 10 for brakes.	
21	)	
22	)	



BRAKE CONTROLS

Cut No.	Description	Part No.	Qty.
1	Brake lever	CPEP-2687	1
2	Brake lever ratchet bar	CPEP-2655	1
3	Pivot shaft assembly	CPEP-2698	1
4	Pivot bracket	CPEP-2697	2
5	1/2" x 2" USS Machine bolt, with nut, for Items 3 and 4	.....	6
	1/2" Lock washer, for above bolt	.....	6
7	Buckeye yoke, 3/8"	No. 4	2
8	Pin for yoke, with cotter pin	No. 34	2
9	3/8" SAE Nut for yoke	.....	2



Cut No.	Description	Part No.	Qty.
	Mechanical controls for brakes (See Section 7 for individual parts) . . .	. . . . .	...
	Bendix Products Co. right hand brake assembly (See Section 9 for individual parts)	26770	1
	Bendix Products Co. left hand brake assembly (See Section 10 for individual parts)	26771	1
39	Bendix brake lining, only, with rivets . . .	46402	1
	NOTE: Part No. 46402 describes sufficient brake lining and rivets to equip one right hand brake assembly 26770 and one left hand brake assembly 26771.		
40	1/2" Lock washer for Items 42 and 44	. . . . .	16
41	3/4" x 2" USS Cap screw for drums, Items 43	. . . . .	16
42	1/2" x 2" USS Machine bolt, with nut, for back plate assembly, Items 1 (See Sections 9 and 10)	. . . . .	6
43	Brake drum (G-3215B)	L-1828	2
44	1/2" x 1-1/2" USS Machine bolt, with nut, for back plate assembly, Item 1 (See Sections 9 and 10)	. . . . .	10
45	Cover plate for inspection hole, for Items 43	CP-25028	2
46	1/4" x 5/8" Button head cap screw, for Item 45	. . . . .	2

BENDIX PRODUCTS CO. BRAKES

26770 RIGHT HAND BRAKE ASSEMBLY

Cut No.	Description	Part No.	Qty.
	NOTE: Quantities listed are for one right hand brake assembly.		
1	Backing plate assembly, right	28565	1
	NOTE: This item includes Items 28, 31, 32, 33, and 34 plus backing plate itself.		
3	Reinforcement plate	20799	1
5	Anchor bracket, with bushings	15218	1
6	Crank retaining washer	12835	2
7	Bronze bushing, only, for Item 5	12837	2
9	Cam for right hand operating lever	26123	1
10	Pin for Item 13	15813	1
	Cotter pin for Item 10, 1/16" x 1/2" . . .	50-S-3	1
11	Washer for Item 13	15652	1
12	Spring for Item 10	15651	1
13	Cover plate	15814	1
14	Strut for Item 19	13454	1
15	Washer for Item 34	13156	2
16	Cam block	45884	1
17	Hex nut for Item 19	28752	2
18	Lock washer for Item 19	28868	2
19	Anchor pin and shoe guide	15812	2
	Cotter pin, 5/32" x 1-1/2" for Item 19 . .	50-S-23	2
20	Pivot nut, left hand thread	12790	1
21	Adjusting screw	12843	1
22	Pivot nut, right hand thread	12791	1
	Cotter pin, 1/8" x 1-1/8", for Item 22 . .	50-S-15	1
23	Spring for cable return	26101	1
24	Spring (from Item 33 to 37)	37834	1
25	Spring (to connect Items 37)	12323	1
26	Clip for Item 24	12834	1
27	Spring clip for adjusting screw, Item 21 .	12348	1
28	Cable ramp	25811	1
31	5/16" x 1-1/2" SAE Bolt for Item 28	25-S-4	2
	5/16" Lock washer for above bolt	40-S-32	2
	5/16" SAE Nut for Item 31	30-S-2	2
32	Anchor for Item 23	23791	1
	3/8" SAE Nut for Item 32	30-S-3	1
	3/8" Lock washer for above bolt	40-S-33	1
33	Steady rest pin	23505	1
	1/2" SAE Hex nut for Item 33	30-S-5	1
	1/2" Lock washer for above bolt	40-S-35	1
34	Spacer pin	23043	2
	3/8" SAE Hex nut for Item 34	30-S-3	2
	3/8" Lock washer for above spacer	40-S-33	2
	Cotter pin, 3/32" x 7/8" for Item 34 . . .	50-S-10	2

Cut No.	Description	Part No.	Qty.
35	Castellated hex nut, 3/8", for Item 34 . . .	12346	2
36	Eccentric assembly	28657	1
	5/8" Lock washer for Item 36	40-S-37	1
	5/8" SAE Nut for Item 36	30-S-7	1
37	Brake shoe, with lining attached	1188-S-3	2
38	Cable and conduit	39647	1
38A	5/16" x 1" SAE Cap screw for Item 38	. . . . .	2
	5/16" Lock washer for Item 38A	40-S-32	2

NOTE: Refer to Section 8 for photographic piece layout.

644168 O - 45 - 4

BENDIX PRODUCTS CO. BRAKES

26771 LEFT HAND BRAKE ASSEMBLY

Cut No.	Description	Part No.	Qty.
	NOTE: Quantities listed are for one left hand brake assembly.		
	Backing plate assembly, left (Made opposite from Item 1)	28564	1
	NOTE: This item includes left hand cable ramp and Items 31, 32, 33, and 34 plus backing plate itself.		
	Reinforcement plate (Made opposite from Item 3	20798	1
5	Anchor bracket, with bushings	15218	1
6	Crank retaining washer	12835	2
7	Bronze bushing, only, for Item 5	12837	2
	Cam for left hand operating lever (Made opposite from Item 9)	26122	1
10	Pin for Item 13	15813	1
	Cotter pin for Item 10, 1/16" x 1/2" . . .	50-S-3	1
11	Washer for Item 13	15652	1
12	Spring for Item 10	15651	1
13	Cover plate	15814	1
14	Strut for Item 19	13454	1
15	Washer for Item 34	13156	2
16	Cam block	45884	1
17	Hex nut for Item 19	28752	2
18	Lock washer for Item 19	28868	2
19	Anchor pin and shoe guide	15812	2
	Cotter pin, 5/32" x 1-1/2", for Item 19 . .	50-S-23	2
20	Pivot nut, left hand thread	12790	1
21	Adjusting screw	12843	1
22	Pivot nut, right hand thread	12791	1
	Cotter pin, 1/8" x 1-1/8", for Item 22 . .	50-S-15	1
23	Spring for cable return	26101	1
24	Spring (from Item 33 to 37)	37834	1
25	Spring (to connect Items 37)	12323	1
26	Clip for Item 24	12834	1
27	Spring clip for adjusting screw, Item 21 .	12348	1
	Cable ramp (Made opposite from Item 28)	25810	1
31	5/16" x 1-1/2" SA_E Bolt for Item 28	25-S-4	2
	5/16" Lock washer for above bolt	40-S-32	2
	5/16" SAE Nut for Item 31	30-S-2	2
32	Anchor for Item 23	23791	1
	3/8" SAE Nut for Item 32	30-S-3	1
	3/8" Lock washer for above bolt	40-S-33	1

Cut No.	Description	Part No.	Qty.
33	Steady rest pin	23505	1
	1/2" SAE Hex nut for Item 33	30-S-5	1
	1/2" Lock washer for above bolt	40-S-35	1
34	Spacer pin	23043	2
	3/8" SAE Hex nut for Item 34	30-S-3	2
	3/8" Lock washer for above spacer pin	40-S-33	2
	Cotter pin, 3/32" x 7/8", for Item 34	50-S-10	2
35	Castellated hex nut, 3/8", for Item 34 . . .	12346	2
36	Eccentric assembly	28657	1
	5/8" Lock washer for Item 36	40-S-37	1
	5/8" SAE Nut for Item 36	30-S-7	1
37	Brake shoe, with lining attached	1188-S-3	2
38	Cable and conduit	39647	1
38A	5/16" x 1" SAE Cap screw for Item 38	. . . . .	2
	5/16" Lock washer for Item 38A	40-S-32	2

NOTE: Refer to Section 8 for photographic piece layout.

SECTION II

NUMERICAL LIST

FOR

POWER UNIT TRUCK

Under the column headed "Manufacturer" are listed abbreviated titles of companies manufacturing parts identified in the part number column.

Complete titles and addresses of these companies, together with abbreviated titles, are given in the following list.

ALEMITE

Division of Stewart-Warner Corp.
1828 Diversey Parkway
Chicago, Illinois

BENDIX

Bendix Products Corp.
401 Bendix Drive
South Bend, Indiana

BUCKEYE

Buckeye Forging Co.
10015 Harvard Ave.
Cleveland, Ohio

PIONEER

Pioneer Engineering Works, Inc.
1515 Central Ave.
Minneapolis, Minn.

TIMKEN BRG.

Timken Roller Bearing Co.
Canton, Ohio

VICTOR

Victor Sealing Products Co., Inc.
5750 Roosevelt Road
Chicago, Illinois

POWER UNIT TRUCK — PARTS PRICE LIST

PART NO.	DESCRIPTION	MANUFACTURER	APPROX. WEIGHT	PRICE
No. 1	Nut	Pioneer	0.1	.20
No. 4	Clevis	Buckeye	0.1	.20
25-S-4	Bolt	Bendix	0.1	.02
30-S-2	Nut	"	0.2	.01
30-S-3	Nut	"	0.2	.02
30-S-5	Nut	"	0.5	.03
30-S-7	Nut	"	0.9	.05
No. 34	Pin	Buckeye	0.2	.02
40-S-32	Washer	Bendix	0.1	.01
40-S-33	Washer	"	0.1	.01
40-S-35	Washer	"	0.1	.01
40-S-37	Washer	"	0.1	.01
50-S-3	Cotter pin	"	0.1	.01
50-S-10	Cotter pin	"	0.1	.01
50-S-15	Cotter pin	"	0.1	.01
50-S-23	Cotter pin	"	0.2	.01
No. 89	Key	"	2.0	1.20
CP-178	Pin	Pioneer	0.5	.20
PA-198	Pulley	"	40.0	19.25
PA-223	Wheel	"	630.0	81.50
L-688	Bracket	"	33.0	7.20
L-689	Clamp	"	9.0	1.55
L-719	Collar	"	2.0	2.15
No. 752	Cup	Timken Brg.	3.8	6.62
No. 759	Cone	"	5.5	9.65
L-831	Pillow block	Pioneer	13.0	4.90
L-1051	Cap	"	6.0	3.65
A-1186	Fitting	Alemite	0.1	.14
1188-S-3	Shoe	Bendix	20.0	12.50
L-1409	Cover	Pioneer	4.0	1.30
L-1410	Cover	"	4.3	2.75
L-1600	Rocker	"	3.6	.50
L-1773	Collar	"	9.6	4.85
L-1782	Bracket	"	55.0	22.75
L-1809	Pulley	"	100.0	32.00
L-1817	Arm	"	25.2	11.50
L-1828	Drum	"	100.0	22.50
CPEP-1859	Pole	"	155.0	22.00
CP-2180	Spindle	"	100.0	27.45
CPEP-2624	Tank	"	160.0	58.50
CPEP-2648	Belt Tightener	"	315.0	54.00
CPEP-2655	Bar	"	4.4	.90
CPEP-2666	Bracket	"	2.0	2.00
CPEP-2687	Lever	"	13.9	2.80
CPEP-2697	Bracket	"	2.6	.50
CPEP-2698	Shaft	"	18.9	4.00
CP-3722-X	Spring	"	9.2	2.20
CP-3861-009	Washer	"	0.3	.20
No. 3920	Cup	Timken Brg.	1.0	1.17
No. 3975	Cone	"	0.8	1.76
K-8111	Nut	"	1.0	.50

POWER UNIT TRUCK — PARTS PRICE LIST

PART NO.	DESCRIPTION	MANUFACTURER	APPROX. WEIGHT	PRICE
CP-9689	Pin	Pioneer	2.9	.40
K-10340	Nut	Timken Brg.	2.7	1.30
K-10438	Washer	"	0.5	.23
CP-12109	Washer	Pioneer	0.3	.45
CP-12112	Spacer	"	0.3	2.70
12323	Spring	Bendix	0.1	.85
12346	Nut	"	0.1	.05
12348	Clip	"	0.1	.20
12790	Nut	"	0.8	2.20
12791	Nut	"	0.8	2.20
12834	Clip	"	0.1	.25
12835	Washer	"	0.2	.05
12837	Bushing	"	0.2	.15
12843	Screw	"	0.8	2.35
CP-12956	Stud	Pioneer	22.0	9.50
13156	Washer	Bendix	0.2	.10
CP-13193	Block	Pioneer	3.3	1.90
13454	Strut	Bendix	0.8	.50
15218	Bracket	"	2.2	3.85
15651	Spring	"	0.1	.05
15652	Washer	"	0.1	.01
15812	Guide	"	2.0	3.65
15813	Pin	"	0.1	.05
15814	Plate	"	0.2	.10
20798	Plate	"	3.2	3.50
20799	Plate	"	3.3	3.50
CP-21905	Spindle	Pioneer	110.0	16.65
CP-22436	Spindle	"	165.0	28.00
CP-22551	Plate	"	18.3	3.60
CP-22717	Shaft	"	51.0	9.75
23043	Pin	Bendix	0.1	.15
CP-23091	Pin	Pioneer	8.4	2.00
23505	Pin	Bendix	0.3	.50
23791	Anchor	"	0.2	.15
CP-25028	Plate	Pioneer	0.1	.10
CP-25495	Rod	"	11.3	2.25
CP-25657	Hood	"	12.5	2.85
CP-25716	Nut	"	0.2	.25
25810	Ramp	Bendix	0.5	.10
25811	Ramp	"	0.5	.10
26101	Spring	"	0.1	.20
26122	Cam	"	2.0	4.95
26123	Cam	"	1.9	4.95
26770	Brake assembly	"	62.0	27.75
26771	Brake assembly	"	62.0	27.75
28564	Plate assembly	"	15.0	16.00
28565	Plate assembly	"	15.0	16.00
28657	Eccentric assembly	"	0.8	1.45

POWER UNIT TRUCK PARTS PRICE LIST

PART NO.	DESCRIPTION	MANUFACTURER	APPROX. WEIGHT	PRICE
28752	Nut	Bendix	0.3	.50
28868	Washer	"	0.1	.15
37834	Spring	"	0.4	.25
39647	Cable and conduit	"	3.0	4.85
45884	Block	"	0.8	2.25
46402	Lining	"	6.0	18.50
60907	Seal	Victor	0.3	.75

WAUKESHA POWER UNIT

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MODEL 6-"WAKU"

WITH MODEL "ICK" STARTER

OPERATOR'S MANUAL

MAINTENANCE MANUAL

PARTS PRICE LIST

WAUKESHA POWER UNIT

•

OPERATOR'S MANUAL

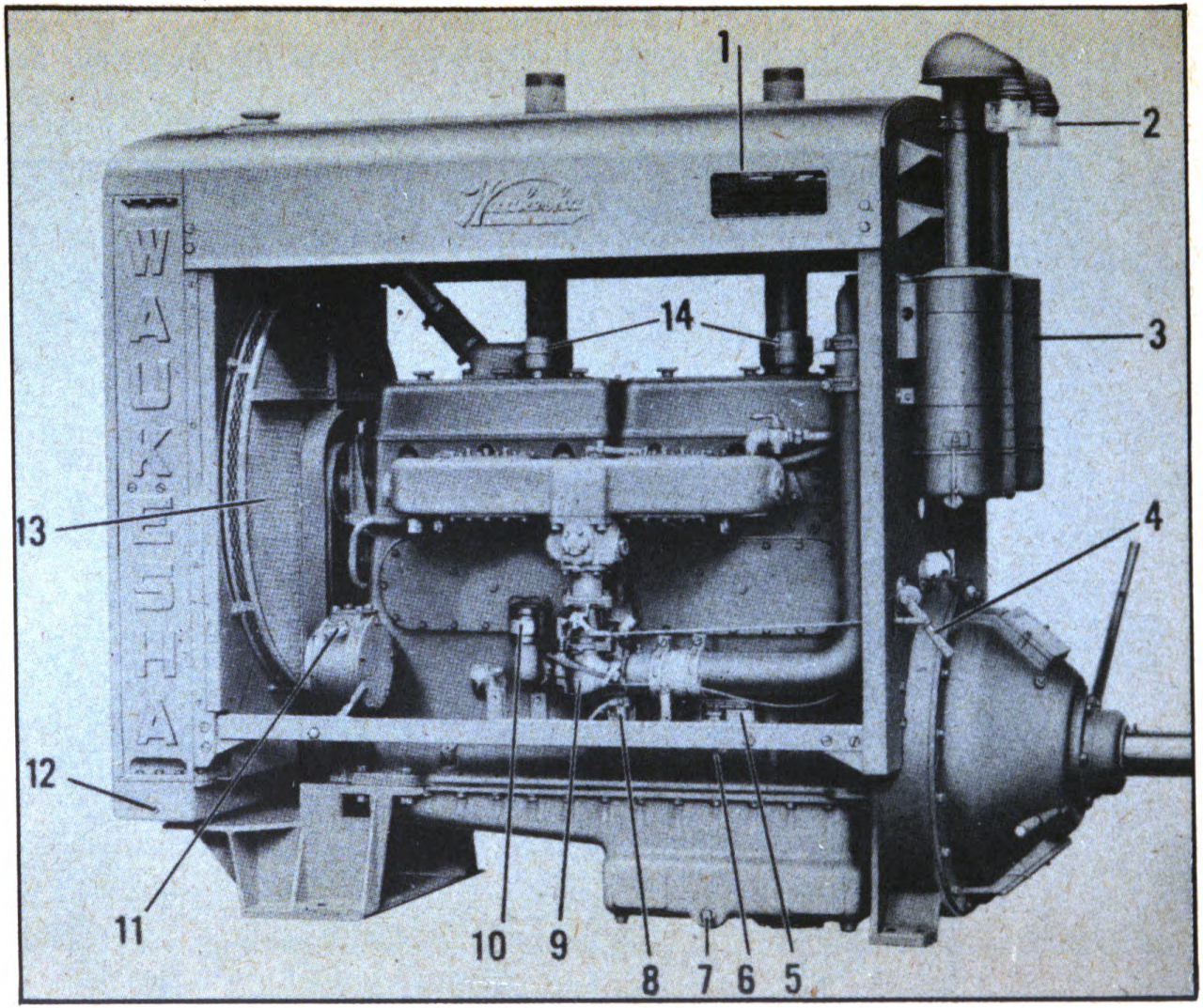
OPERATOR'S MANUAL

INDEX TO OPERATORS MANUAL

FIGURE 1

INTAKE SIDE OF UNIT

1. Unit instruction plate.
2. Pre-cleaner.
3. Oil bath air cleaner.
4. Throttle control, wide open position.
5. Engine name plate.
6. Oil level gauge.
7. Pipe plug to drain oil from pan.
8. Fuel supply pump.
9. Carburetor.
10. Crankcase breather cap.
11. Oil filler opening.
12. Radiator drain pipe plug.
13. Fan guard.
14. Rocker arm breather.



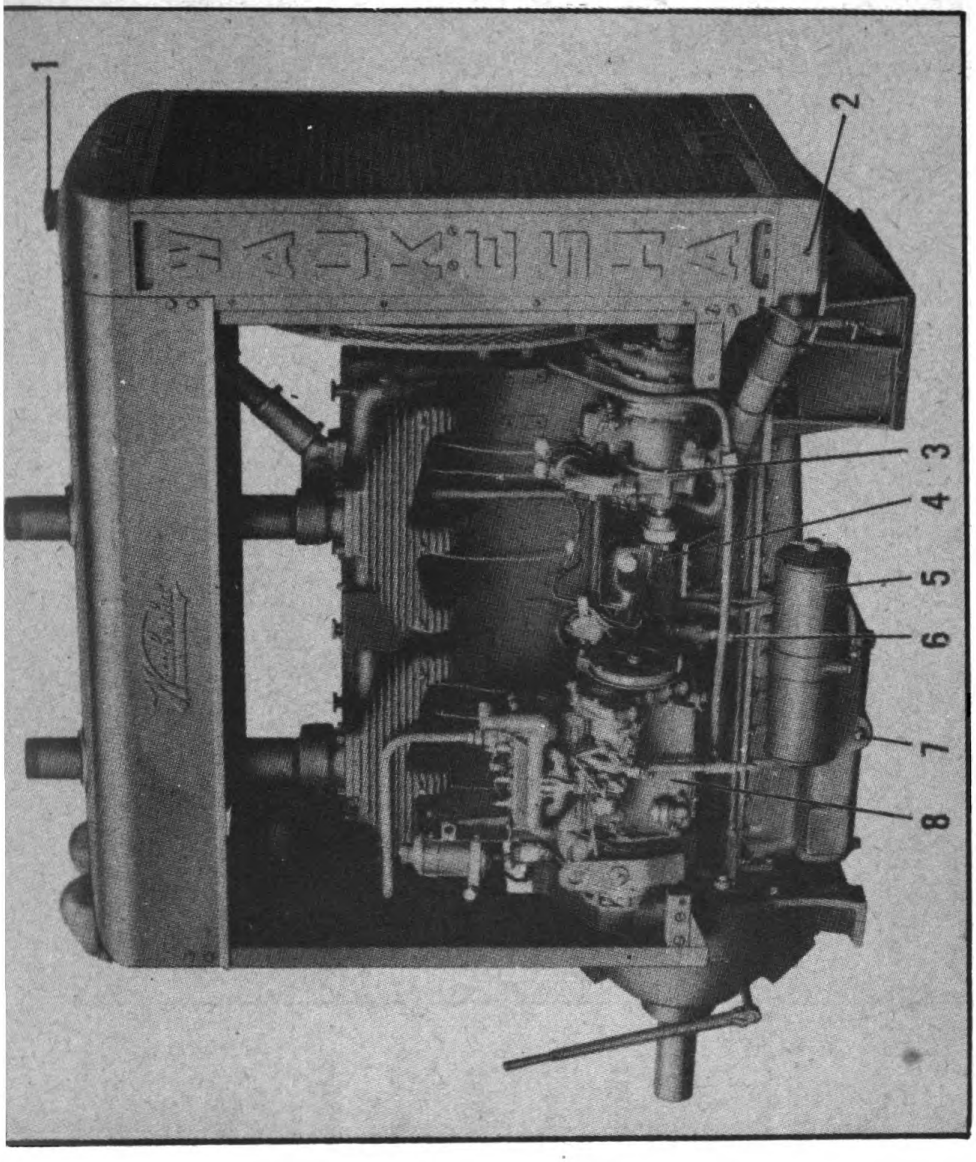


FIGURE 2 - EXHAUST SIDE OF UNIT

1. Radiator filler opening. 2. Pipe plug drain at base of radiator. 3. Governor and water pump. 4. Magneto. 5. Horizontal type oil filter. 6. Oil relief valve. 7. Pipe plug drain in oil pan. 8. Starting engine.

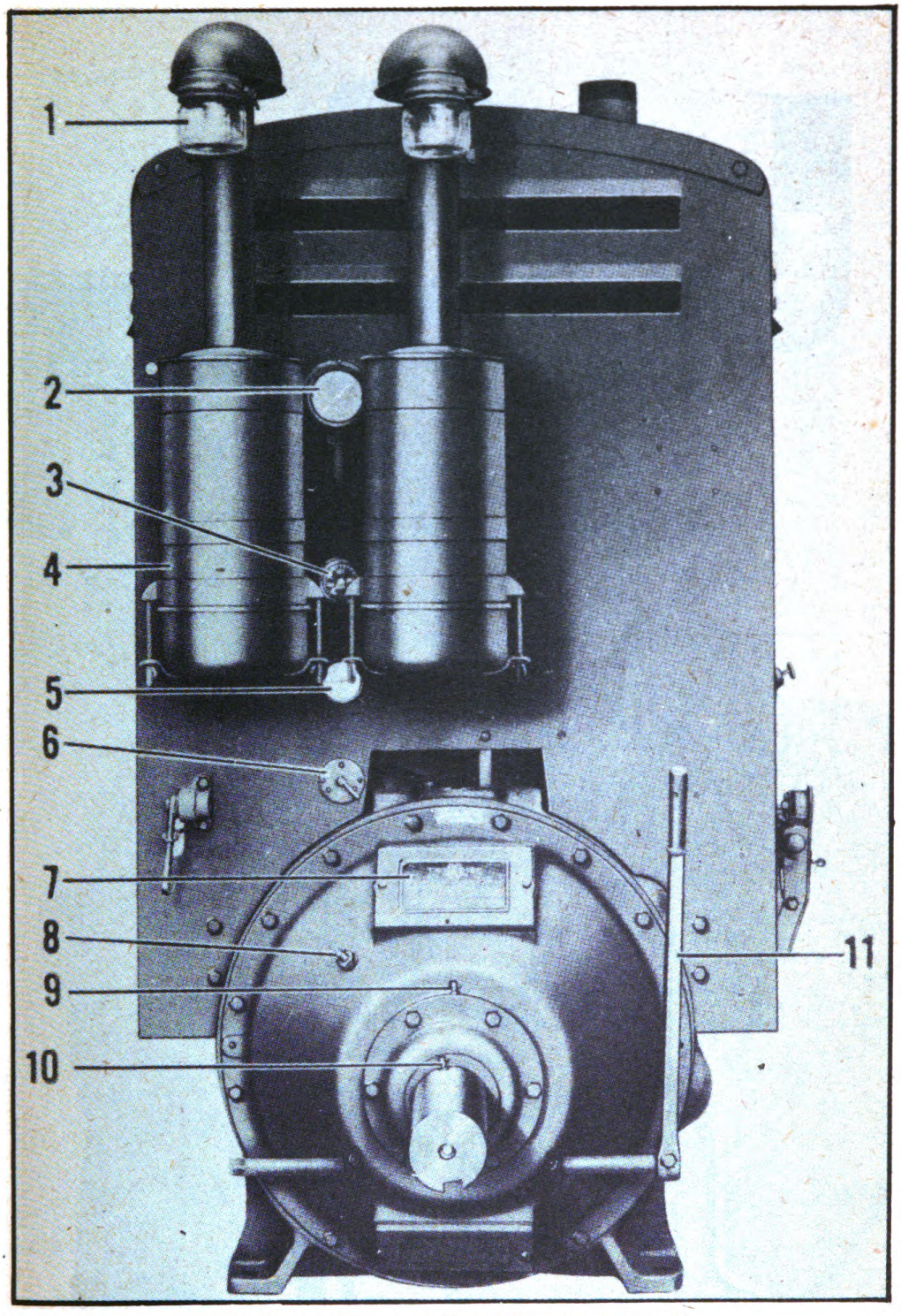


FIGURE 3 - REAR VIEW OF ENGINE

1. Pre-cleaner. 2. Vacuum gauge. 3. Coolant temperature gauge. 4. Oil bath air cleaner. 5. Oil pressure gauge. 6. Ignition switch. 7. Clutch instruction plate. 8. Alemite fitting for lubrication of clutch throwout collar. 9. Alemite fitting for lubrication of clutch shaft bearing. 10. Alemite fitting lubrication of clutch pilot bearing. 11. Clutch handle.

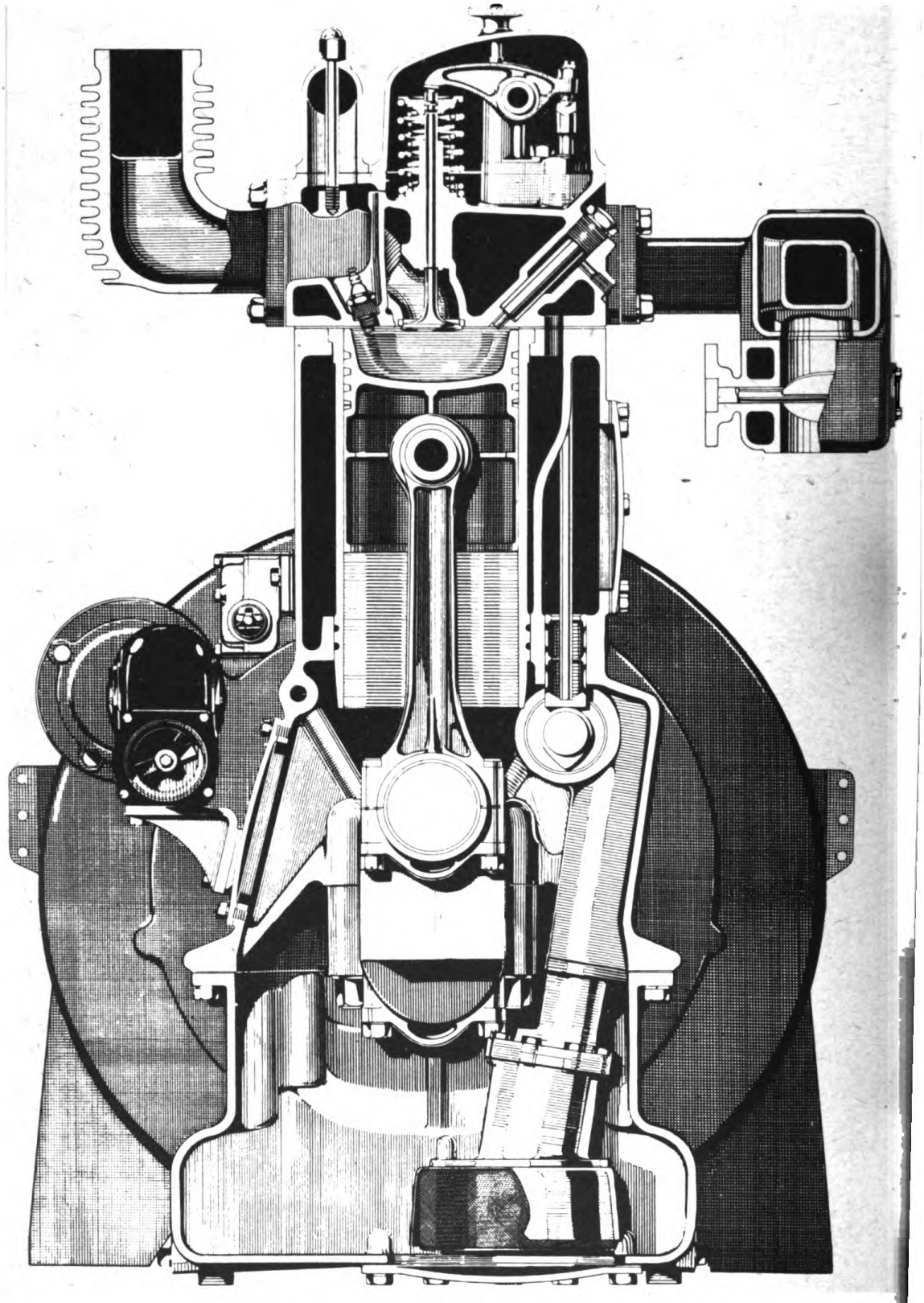


FIGURE 4 - CROSS SECTION OF MAIN ENGINE

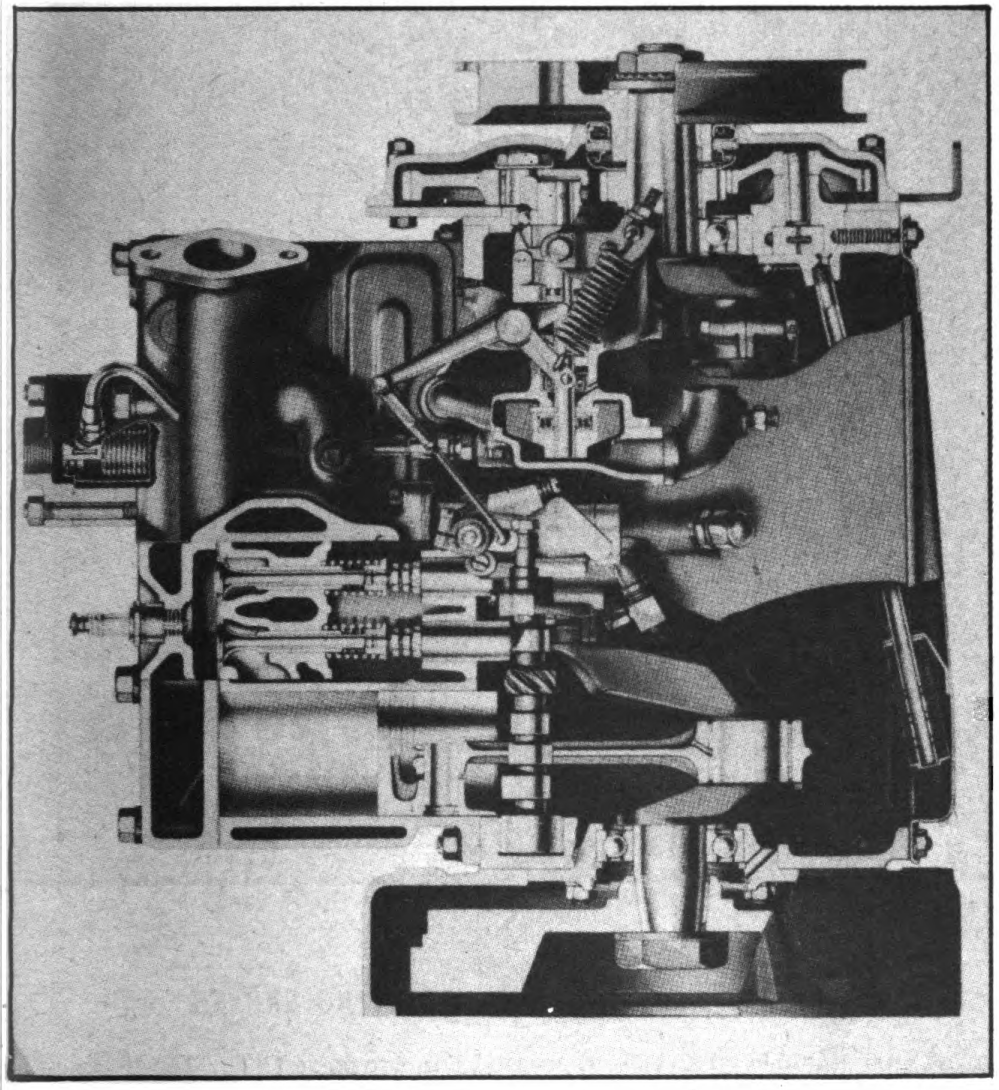


FIGURE 5 - SIDE SECTION OF STARTING ENGINE

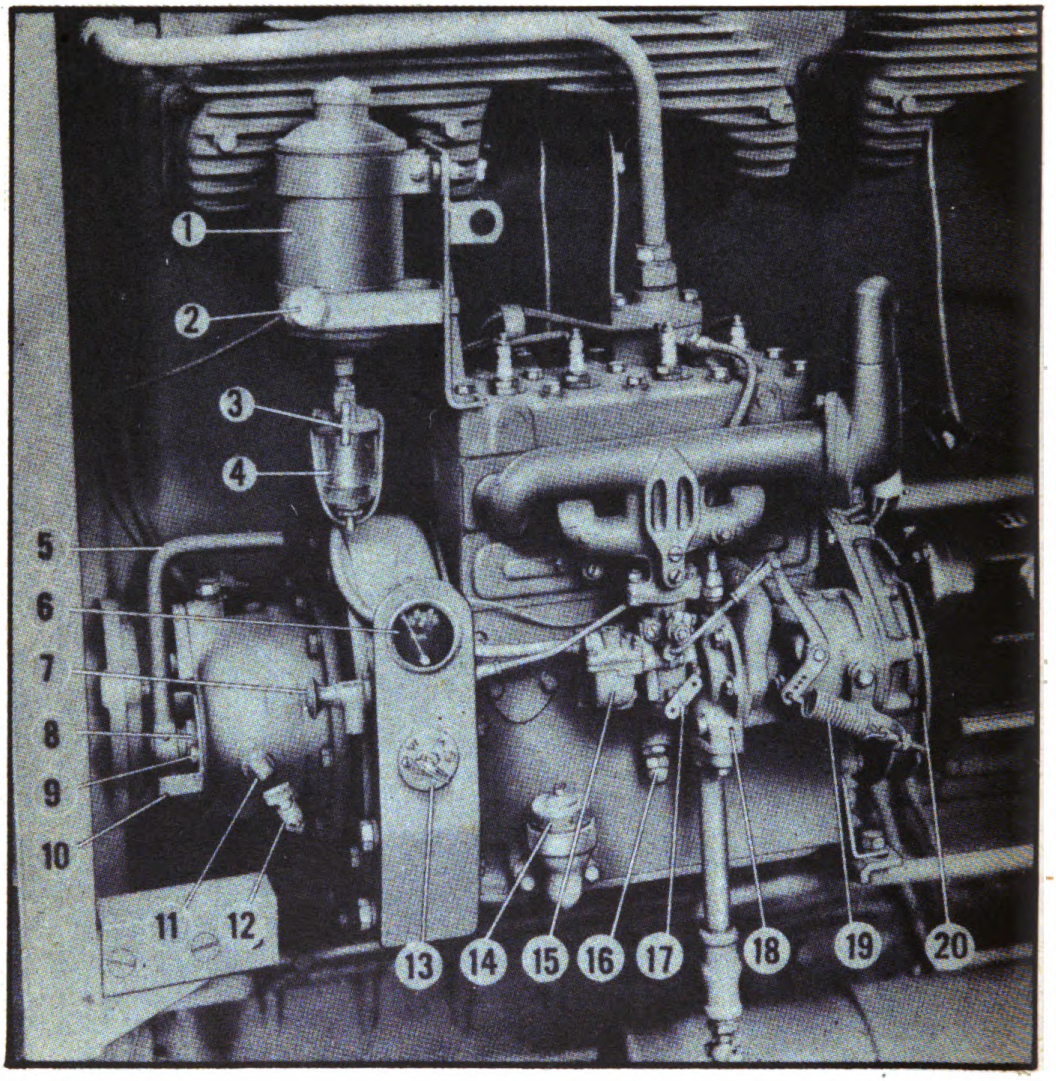


FIGURE 6 - CLOSE-UP OF STARTING ENGINE

1. Gasoline supply tank - one gallon capacity. 2. Main engine choke control. 3. Pet cock on fuel strainer. 4. Fuel strainer glass bowl. 5. Starter unit clutch handle. 6. Oil pressure. 7. Throttle control. 8. Adjusting nut. 9. Clutch handle stop cap screw. 10. Clutch handle stop. 11. Oil filter pipe plug. 12. Oil level pet cock. 13. Ignition key. 14. Oil filter and level gauge. 15. Carburetor. 16. Oil relief valve. 17. Choke lever. 18. Water pump. 19. Governor spring. 20. Starter pulley.

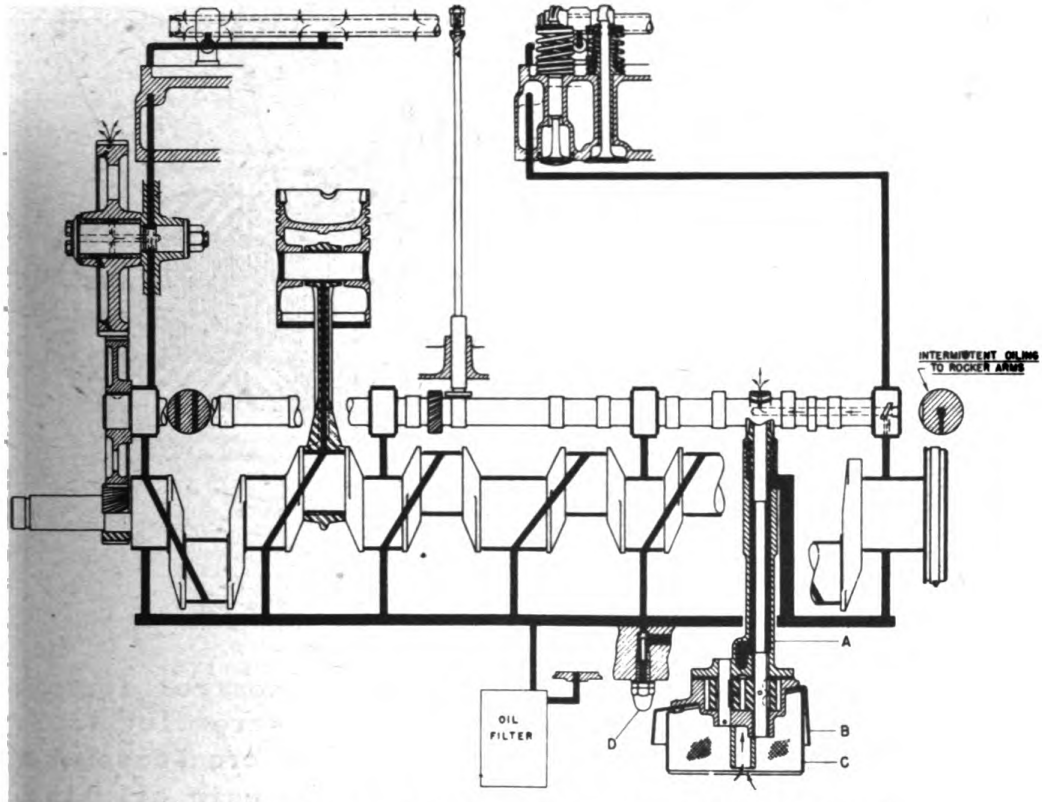


FIGURE 7 - MAIN ENGINE OILING SYSTEM

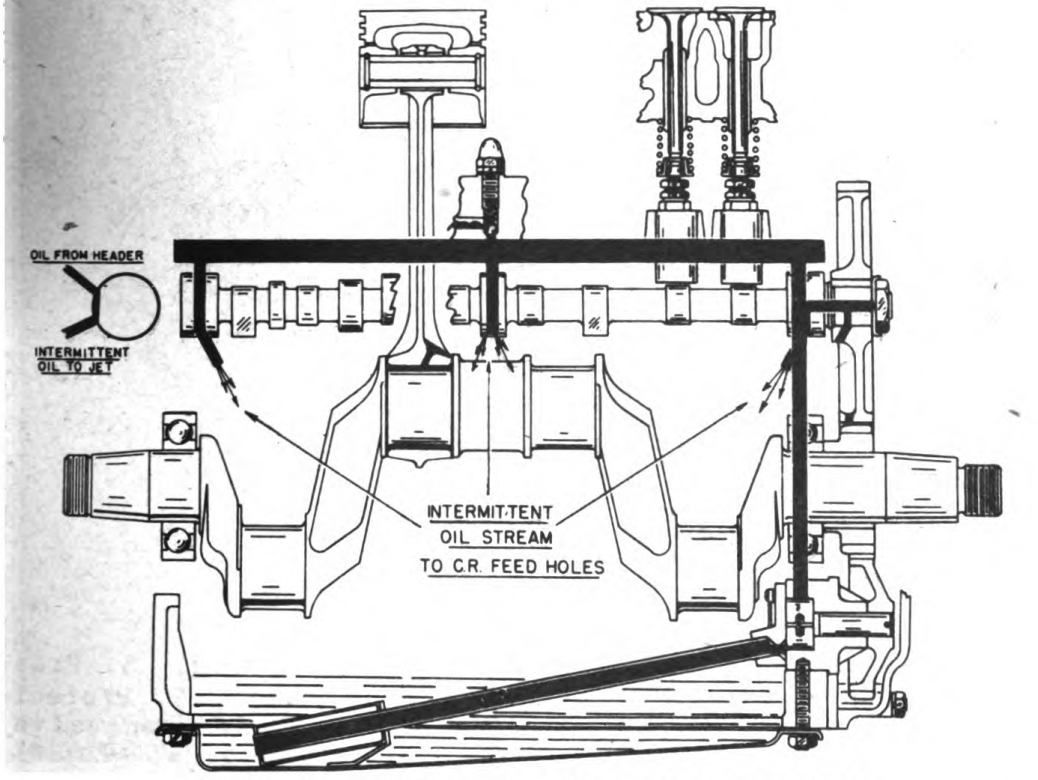
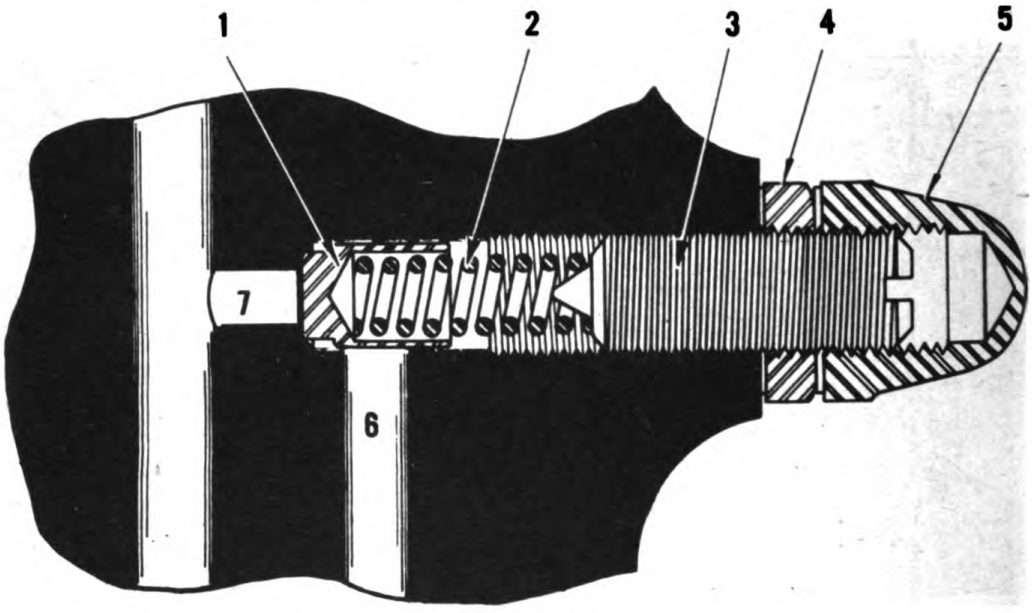
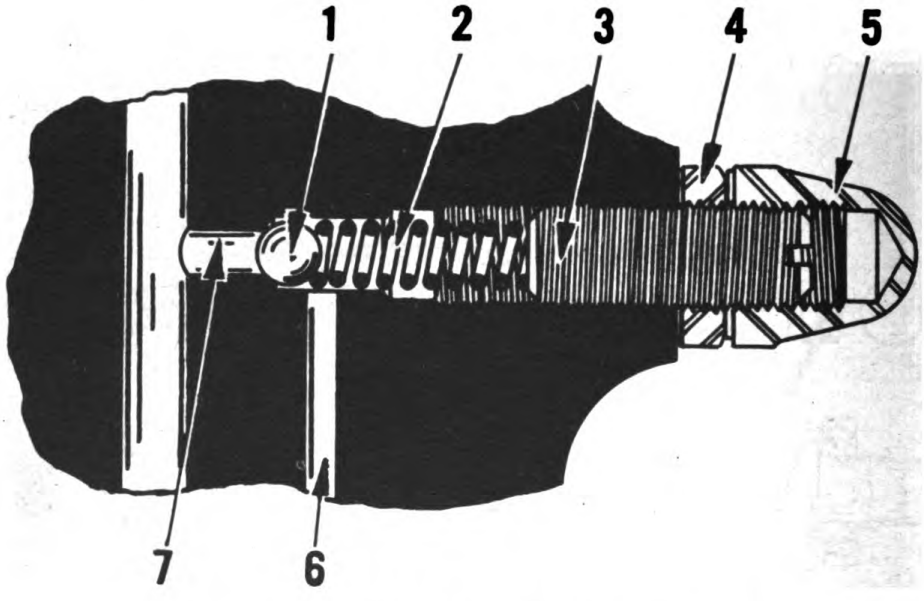


FIGURE 8 - STARTING ENGINE OILING SYSTEM



MAIN ENGINE RELIEF VALVE

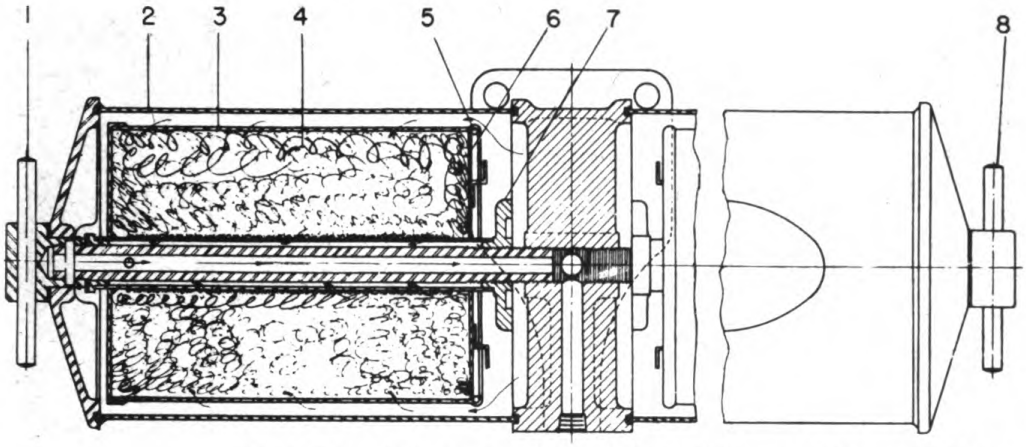
1. Cylindrical valve plunger. 2. Pressure control spring. 3. Pressure adjusting screw. 4. Adjusting screw lock. 5. Protecting cap. 6. Passages for overflow to crankcase when valve, 1, opens. 7. Oil pressure ducts from main oil line.

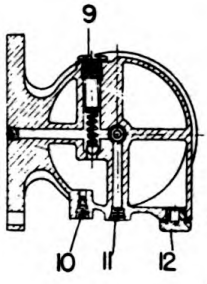


STARTING ENGINE RELIEF VALVE

1. Ball check valve. 2. Pressure control spring. 3. Pressure adjusting screw. 4. Adjusting screw lock. 5. Protecting cap. 6. Passage for overflow to crankcase when valve, 1, opens. 7. Oil pressure duct from main oil line.

FIGURE 9 - OIL RELIEF VALVES





1. T-Handled screw which holds filter shell assemblies to body casting. 2. Filter shell integral with head. 3. Perforated cage holds filtering element. 4. White cotton machinists' waste--wool waste must not be used. 5. Spring ring holds head of element cage. 6. Head of element cage. 7. Brass wing nut holds loaded element cage on supporting tube. 8. T-Handled screw same as 1. 9. Relief valve, prevents clogged filter from bursting. 10. Connection from main oil header in engine supplying oil to be filtered. 11. Cleaned oil returns to crankcase. 12. Drain plug; this must be removed first in SERVICING filter.

FIGURE 10 - LUBRICATING OIL FILTER

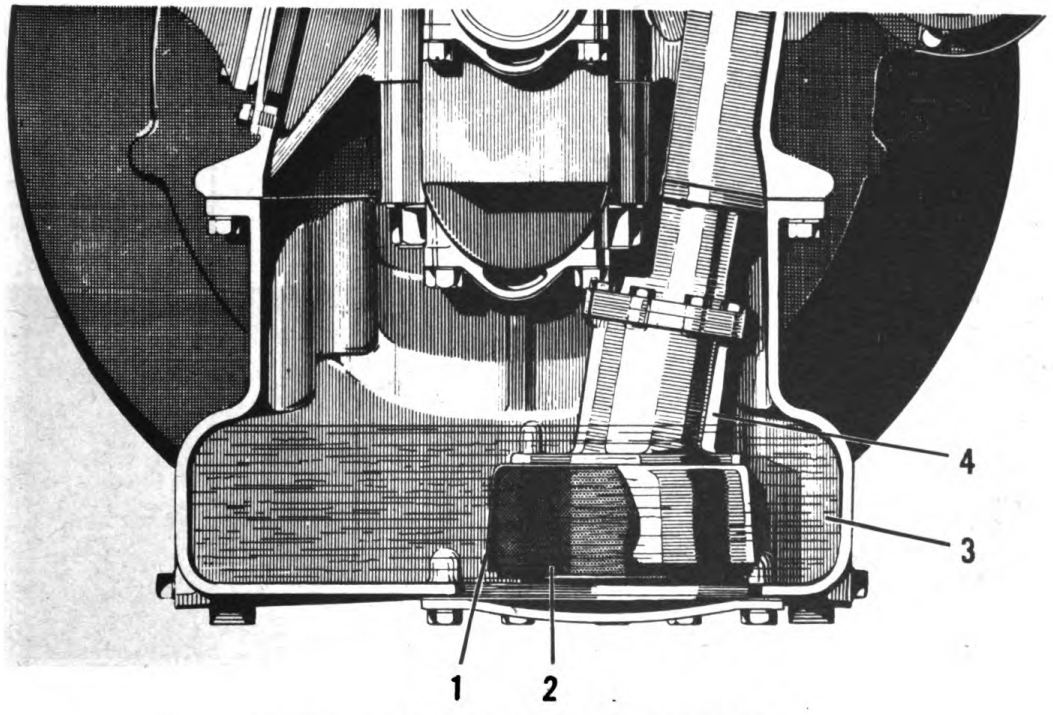
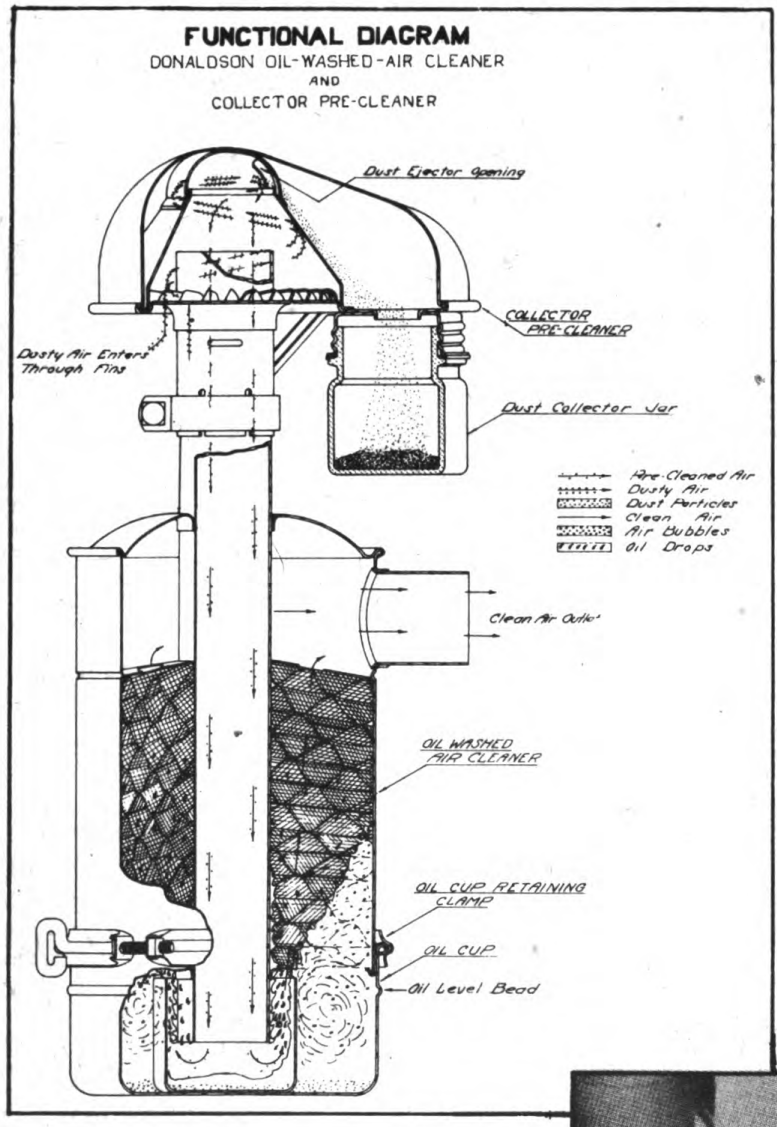


FIGURE 11 - OIL PUMP AND SUMP

1. Oil level equalizer; inverted cup prevents air-bound intake at low oil levels. 2. Oil pump screen removed through hand hole directly below. 3. Oil supply shown at "Full Level." 4. Gear type oil pump.



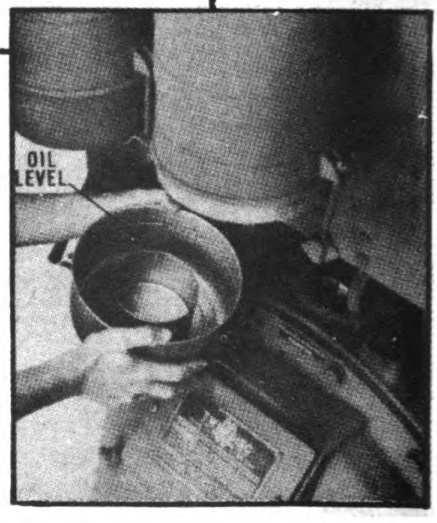


FIGURE 12 - AIR CLEANER SERVICING

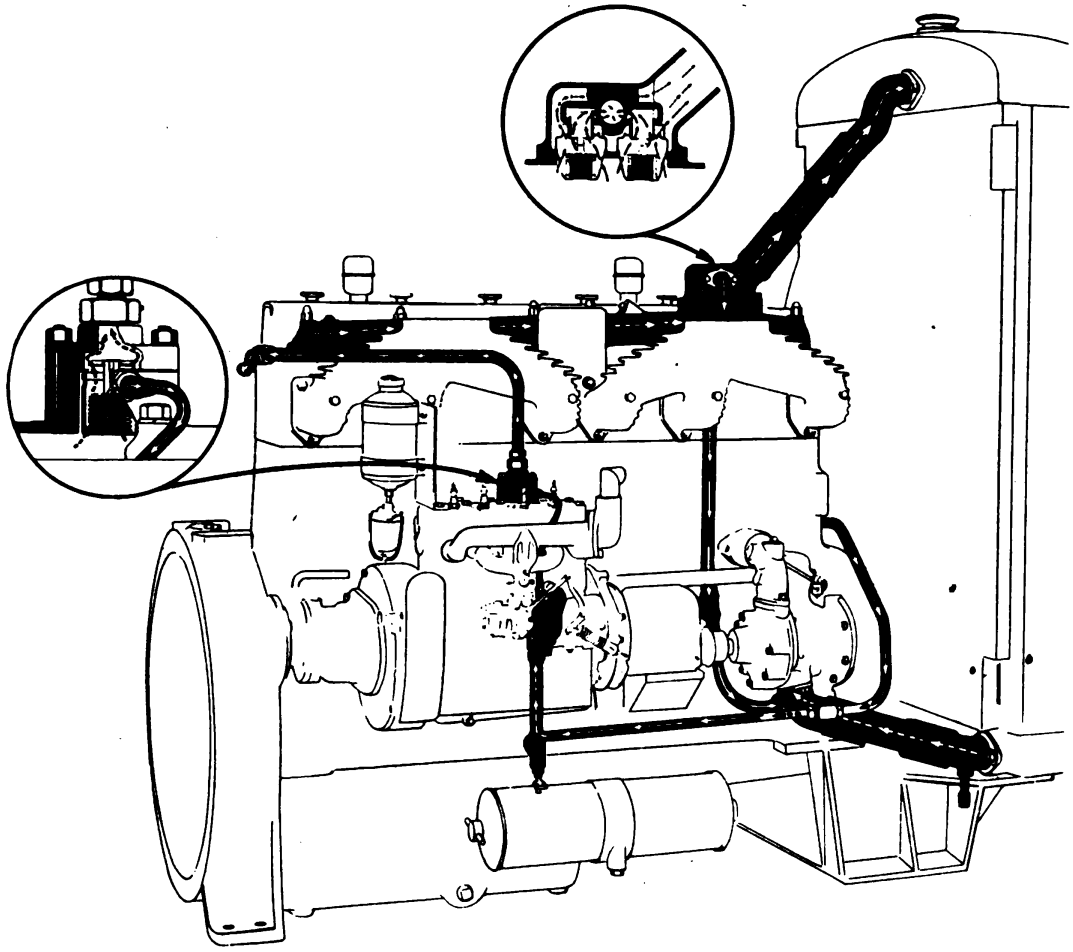


FIGURE 13 - COOLING SYSTEM DETAILS

Dotted arrows indicate normal water flow when engine is up to temperature. Solid arrows indicate cold water flow through by-pass lines for re-circulation.

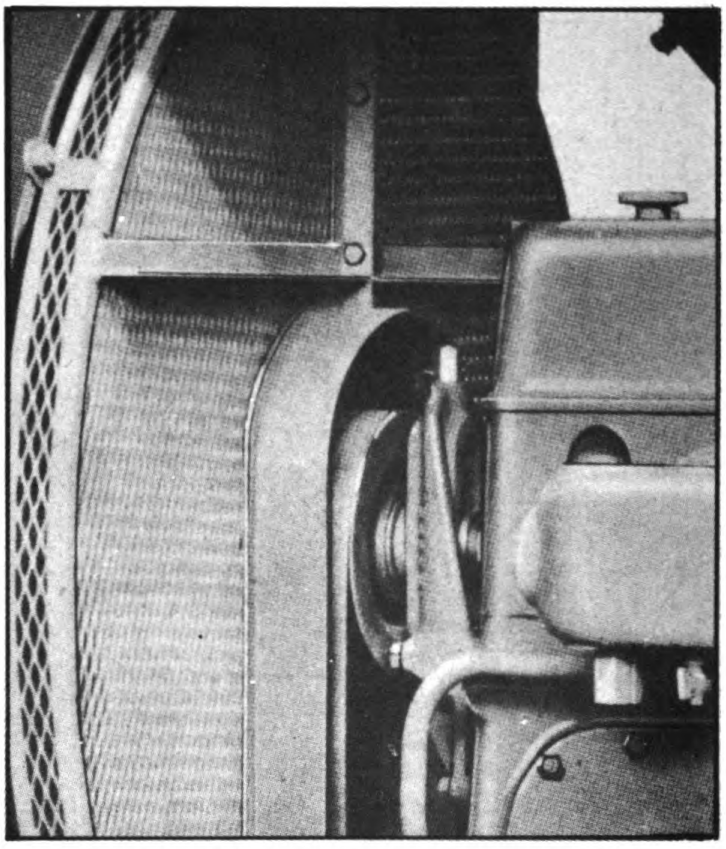


FIGURE 14 - CLOSE-UP OF FAN HUB

1. Adjusting stud for belt tightening. 2. Fan guard, remove this to get at pipe plug in fan hub.

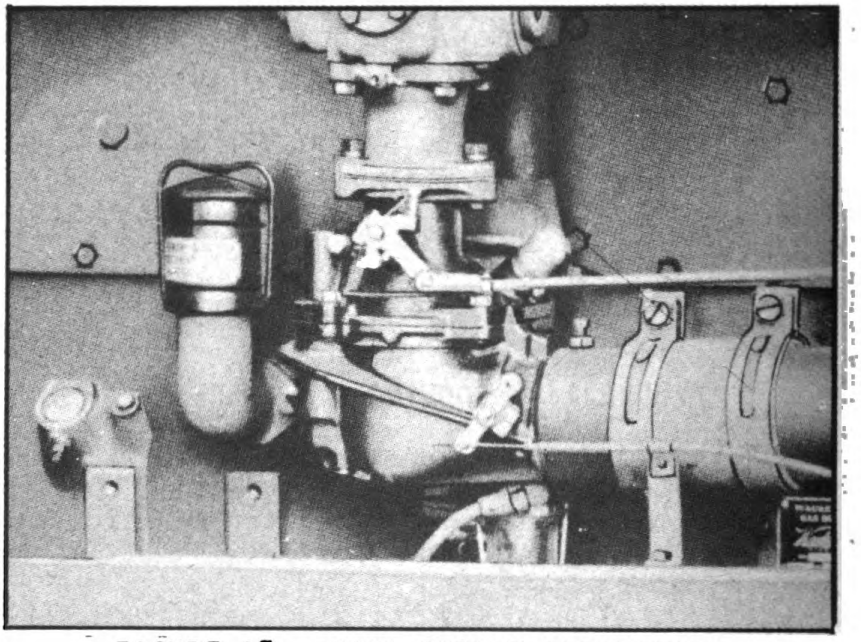


FIGURE 15 - MAIN ENGINE CARBURETOR

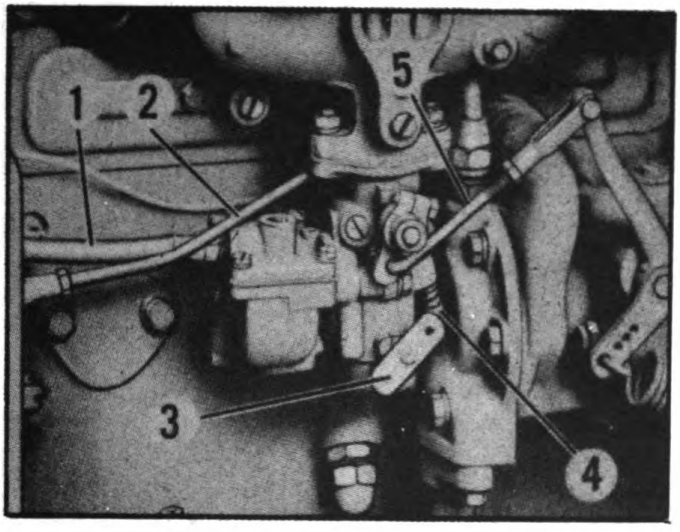


FIGURE 16 - STARTING ENGINE CARBURETOR

1. Gasoline inlet. 2. Throttle control. 3. Choke. 4. Idle adjustment. 5. Governor rod.

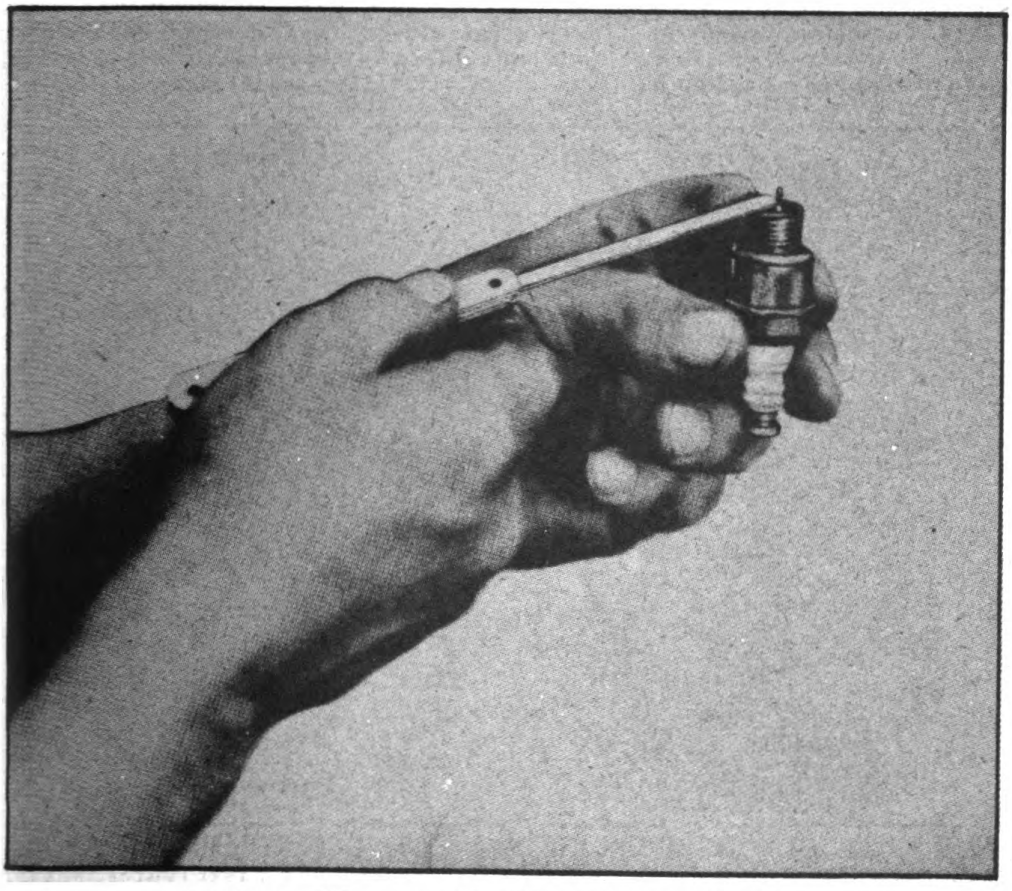


FIGURE 17 - CHECKING SPARK PLUG GAP

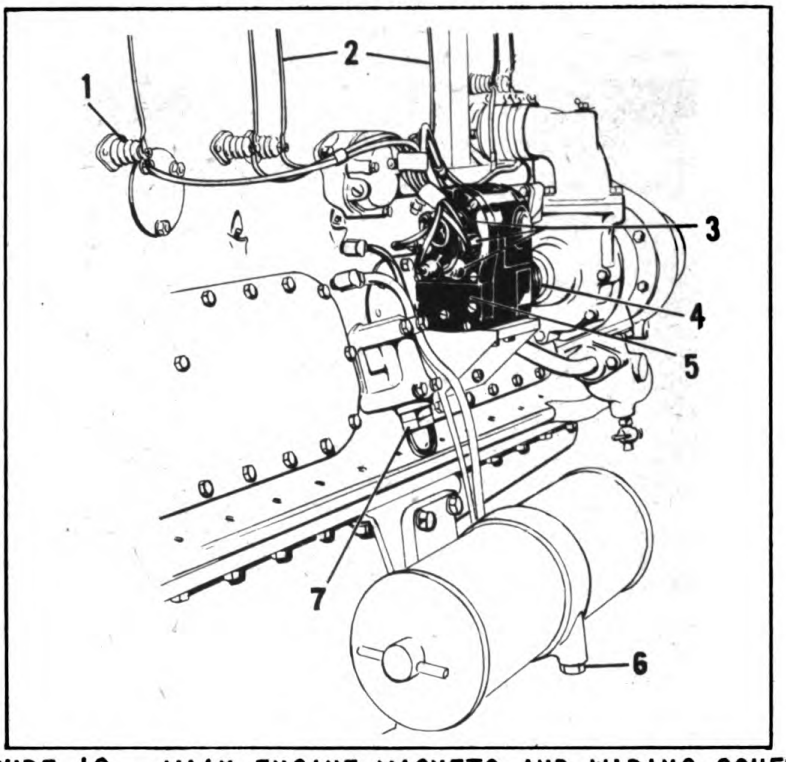


FIGURE 18 - MAIN ENGINE MAGNETO AND WIRING SCHEME

1. Porcelain binding posts for ignition cables. 2. Spark plug connectors. 3. Distributor block terminals for ignition cables. 4. Magneto timing coupling. 5. Magneto breaker box cover. 6. Lubricating oil filter drain plug. 7. Lubricating oil pressure regulator.

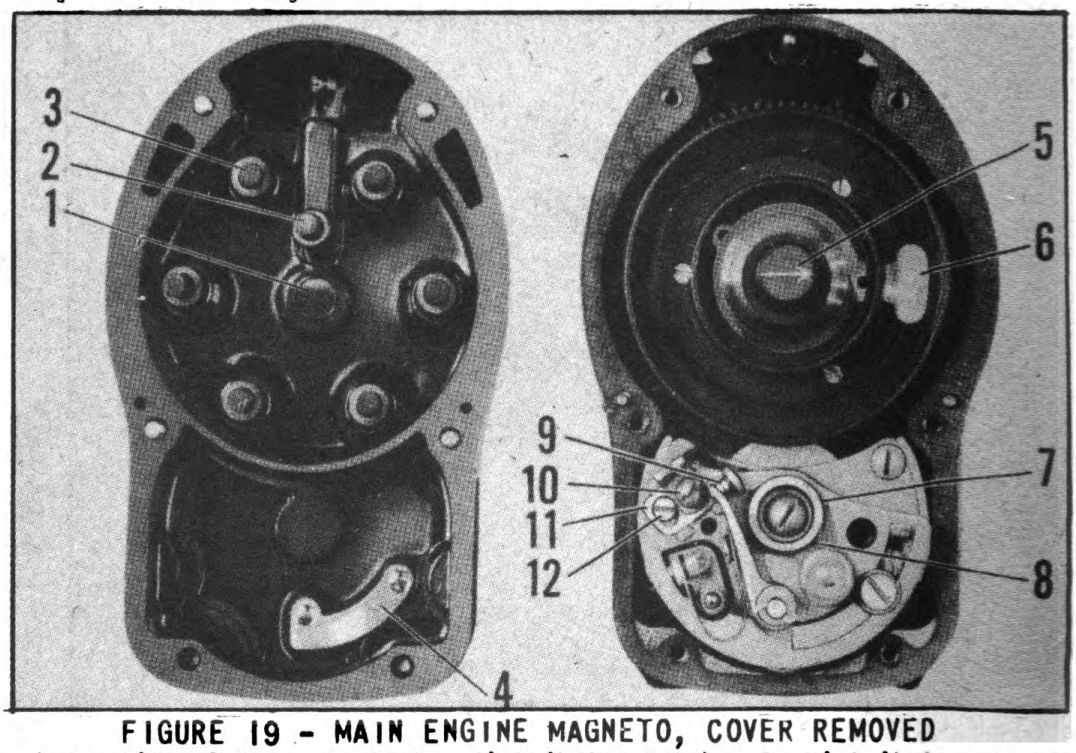


FIGURE 19 - MAIN ENGINE MAGNETO, COVER REMOVED

1. Inspection window. 2. Center distributor brush. 3. Distributor brush. 4. Grounding plate. 5. Indicator arrow - shows position of distributor rotor segment. 6. Distributor rotor segment. 7. Interrupter cam. 8. Cam lubricating felt wick. 9. Contact points. 10. Contact bracket fastening screw. 11. Contact bracket. 12. Adjusting screw.

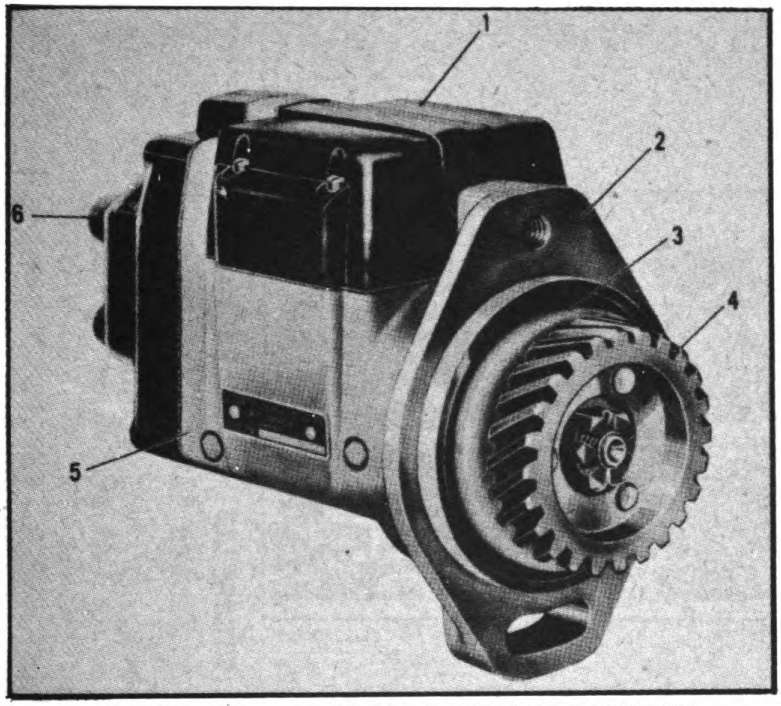


FIGURE 20 - STARTING ENGINE MAGNETO

1. Magneto cover. 2. Mounting flange. 3. Impulse coupling. 4. Gear. 5. Frame. 6. Number 1 terminal on distributor block.

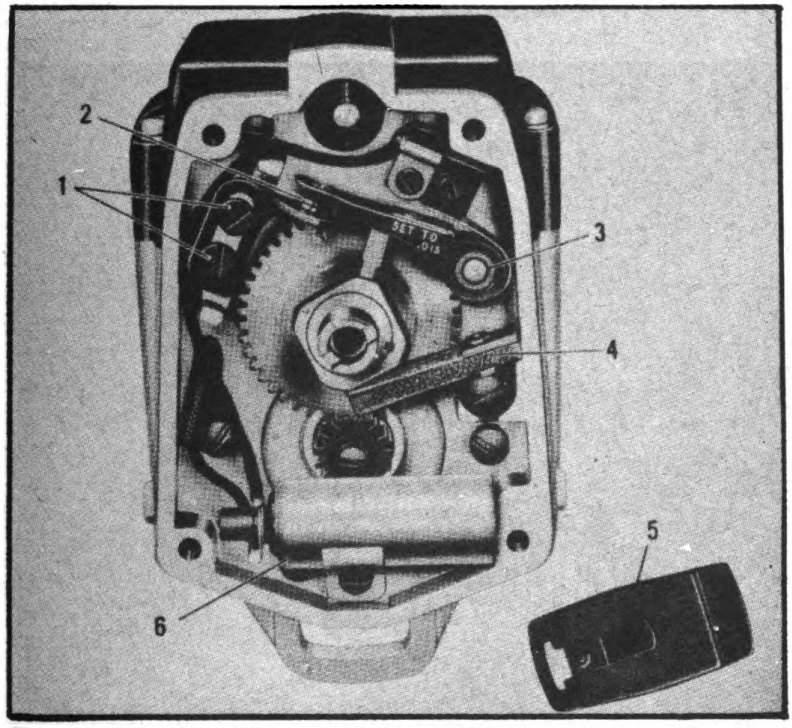


FIGURE 21 - STARTING ENGINE MAGNETO, COVER REMOVED.

1. Adjustable contact screws. 2. Contact points. 3. Breaker bar bearing. 4. Cam lubricating felt wick. 5. Distributor spool.

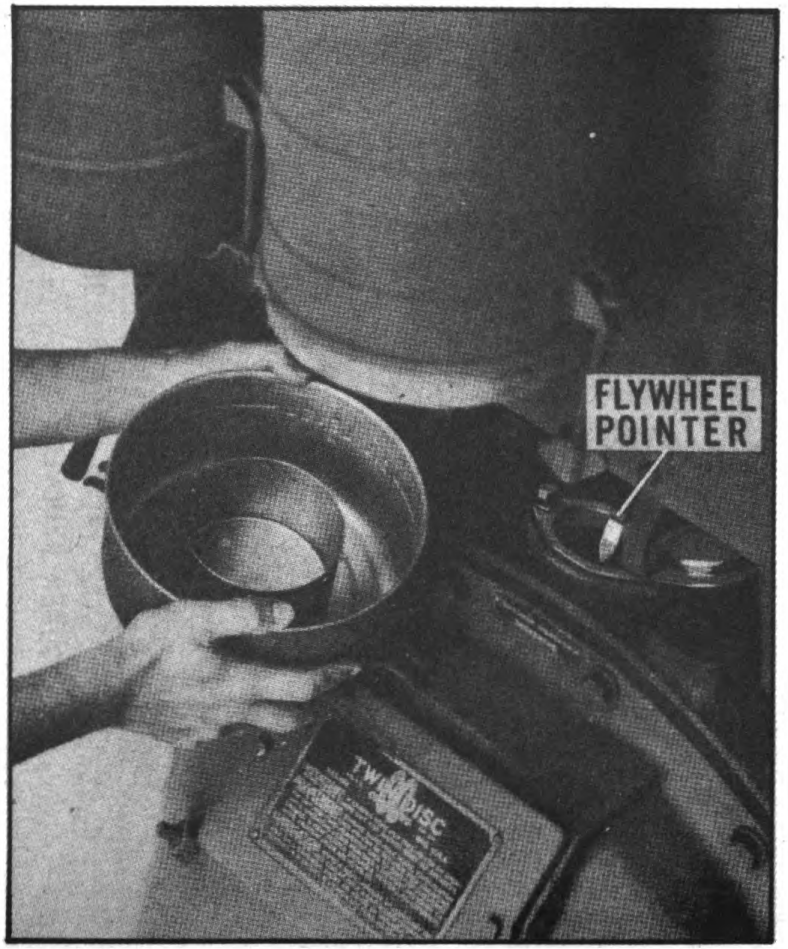


FIGURE 22 - MAIN ENGINE FLYWHEEL POINTER

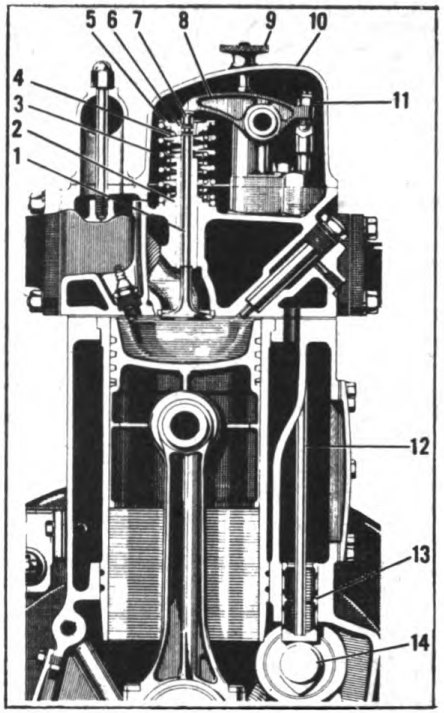


FIGURE 23 - MAIN ENGINE VALVE AND TAPPET ASSEMBLY

1. Valve. 2. Valve guide. 3. Outer valve spring. 4. Inner valve spring. 5. Valve spring retainer. 6. Valve spring taper. 7. Check tappet clearance here. 8. Rocker arm. 9. Rocker arm cover retaining nut. 10. Rocker arm cover. 11. Lock nut for tappet adjusting screw. 12. Push rod. 13. Valve lifter (tappet). 14. Camshaft.

OPERATOR'S MANUAL

PART I

DESCRIPTION

100 - GENERAL - The Waukesha 6-WAKU is a complete power unit consisting principally of a rugged, six cylinder, overhead valve engine with a small gasoline engine starting unit mounted directly upon its side, and a protective sheet steel enclosure. The parts making up the enclosure include the radiator, roof, rear panel and the removable side panels. The main engine is governed to operate at a speed of 900 rpm or 1000 rpm when loaded (see engine name plate) at which speeds it delivers 143 and 156 horsepower respectively. This power is applied and transmitted by means of the clutch. Figures 1, 2 and 3 show the "intake" side, "exhaust" side, and "rear" of the unit respectively. Note these illustrations and terms carefully as frequent reference will be made to them throughout the book. The "front" of the engine, not illustrated, always means the radiator end. Rotation of shafts and accessories is always described in such terms as: "clockwise when looking at the rear of the unit", "counter-clockwise" when looking at the front of the unit", etc; thus it is important that these terms be understood too.

101 - MAIN ENGINE CONSTRUCTION - The principal features of the main engine construction are as follows:

a. Crankcase and cylinder frame - Cast in a single piece, a well braced unit which gives rigidity to the entire structure. Baffles and ribs are incorporated to direct the water circulation in definite paths.

b. Cylinders - Removable, wet type, sleeve castings held in place in the frame by the cylinder heads and sealed at the bottom by rubber rings.

c. Cylinder Heads - Twin castings, interchangeable front or rear, which carry the valve and rocker arm mechanism and upon which are mounted the manifolds. Hardened alloy inserts in exhaust valve seats.

d. Manifolds - The updraft intake manifold is water heated and provided with a water shut-off in case the unit is ever converted to natural gas operation. The exhaust manifold consists of two separate finned castings, one for each cylinder head.

e. Oil Pan - Rear sump type, provided with a bottom cover plate to permit servicing of the oil pump screen.

f. Pistons - Cast iron, heavily ribbed, with four wedge-type, non-sticking piston rings all located above the bearing bosses. The piston pin is full floating.

g. Connecting Rods - Heat treated steel forgings, rifle drilled to permit pressure oiling of piston pin bushing. Large ends ground to receive replaceable, steel-backed babbitt-lined, precision bearings. The finished rods are matched in sets to one-quarter ounce.

h. Crankshaft - Drop-forged, heat-treated steel. The crankshaft rides in seven, four-inch, main bearings all of the removable precision type, steel-backed, babbitt-lined.

i. Camshaft - Drop-forged, heat-treated steel. Gear driven.

j. Valve Tappets - Mushroom type. Screw and lock nut adjustment is provided on rocker arm.

k. Timing Gears - Helical cut gears of mild steel throughout.

l. Lubrication - Full pressure lubrication by means of a gear type pump, gear driven from the camshaft. Oil is forced through large drilled passages to each main, camshaft, connecting rod, piston pin, rocker arm, oil pump and water pump drive shaft bearing and to idler gear stud and gears. Valve mechanism and cylinder walls are drenched by oil mist. Oil pressure is controlled by means of a relief valve adjustable from the outside.

m. Cooling - Water pump which is built in combination with governor and gear driven, delivers a large volume of water through directed paths in cylinder and block. Thermostat by-pass assures quick warm up.

n. Ignition - Bosch MJA-6-C magneto, Champion #62 spark plugs and ignition cables.

102 - MAIN ENGINE SPECIFICATIONS

(Unless otherwise specified, the following dimensions are given in inches)

a. General

Model	6WAK
Bore & Stroke	6 1/4 x 6 1/2
Number of Cylinders	6
Piston displacement, cu. in	1197
Governed speed, fully loaded	900 or 1000
Horsepower at governed speed	143 or 156
Weight, engine only, lbs.	3050
Weight, complete unit, lbs.	5420

b. Oiling System

Capacity qts. (not including filter)	32
Maximum oil pressure, lbs. per sq. in. at governed speed	40
Minimum oil pressure, lbs. per sq. in. at idling speed	15

c. Cooling System

Water capacity, gals. (includes radiator and small starter engine)	29
Water capacity, engine only, gals.	10 3/4

d. Ignition System

Firing order	1-5-3-6-2-4
Maximum spark advance at full load governed speed, flywheel degrees	18°
Spark plug setting (spark gap)	.025-.030

e. Valve Mechanism

Tappet setting, cold (Intake, running clearance)	.013-.015
(Exhaust, running clearance)	.022-.024
Valve timing checking clearance (Intake)	.012
(Exhaust)	.016

f. Piston-Cylinder Data

Skirt clearance, new pistons	.007
Piston ring gap	.020-.030
Piston ring groove clearance, Dimension "X"	.005-.010

g. Bearing Clearances

Main crankshaft bearings, running clearance	.0025-.0045
Large end connecting rods, running clearance	.0015-.003
Connecting rod side clearance (sum of both sides)	.008-.014
Thrust bearing, side clearance	.004-.007
Side clearance, all other crankshaft bearings (sum of both sides)	.065-.075

103 - STARTING ENGINE CONSTRUCTION - The principal construction features of the starting engine are as follows:

a. Crankcase - Box type case of cast iron.

b. Cylinder Block - Separate from case, an alloy iron casting.

c. Cylinder Heads - Detachable, with controlled turbulence combustion chambers.

d. Manifold - Combination intake and exhaust, mounted on cylinder block.

e. Pistons - Cast iron, with floating piston pins.

f. Connecting Rods - Heat-treated, drop-forged steel with large end ground to receive removable steel-backed babbitt-lined, precision bearings. Hardened bronze bushing in upper end.

g. Crankshaft - Heat-treated, drop-forged steel. Shaft rides in deep groove, ball bearings at front and rear.

h. Camshaft - Proferal, cast alloy, rides in three precision babbitt bearings.

i. Timing Gears - Helical type, of mild steel throughout.

j. Governor - Built-in, centrifugal governor. Built in combination with water pump, lubricated by engine oiling system.

k. Lubrication - A gear driven pump forces oil under pressure to camshaft and timing gears. The camshaft distributes oil under pressure to connecting rod crank pin jets, drilled in the crankcase, which direct intermittent oil streams into countersunk holes drilled in the large end of each connecting rod. Oil mist lubricates the main ball bearings, pistons and cylinders. Oil pressure is adjustable from the outside.

l. Cooling - Water from the main engine radiator is piped to the gear driven, centrifugal water pump which forces it through the engine jackets and, when up to temperature, to the top water manifold of the large engine. The starter engine has its own thermostat by-pass system, which re-circulates water through the jackets until the proper temperature has been reached.

m. Ignition - Edison Splitdorf R. M. magneto, ignition cables and Champion J-9 14 m.m. spark plugs.

n. Starter Drive Transmission and Clutch - Bendix transmission and clutch. After starting engine is warmed up, Bendix is engaged by pulling clutch lever. Bendix pinion is automatically disengaged from flywheel ring gear when main engine starts to fire.

104 - STARTING ENGINE SPECIFICATIONS

(Unless otherwise specified, the following dimensions are given in inches)

a. General

Model	ICK
Bore & Stroke	2 1/2 x 3 1/8
Number of Cylinders	4
Piston displacement, cu.in.	61
Compression ratio	5.7 to 1
Governed speed, idle, r.p.m.	2300

644168 O - 45 - 6

b. Oiling System

Capacity, qts.	3
Maximum oil pressure, lbs. per sq. in. at governed speed. . .	15
Minimum oil pressure, lbs. per sq. in. at idling speed. . . .	5

c. Cooling System

Water Capacity, qts.	1 1/2

d. Ignition System

Firing order.	1-2-4-3
Maximum spark advance at full load, governed speed, flywheel degrees.	22°
Spark plug setting, (spark gap) .	.025-.030

e. Valve Mechanism

Tappet setting cold (Intake, running clearance). .	.005-.007
(Exhaust running clearance). .	.007-.009
Valve timing checking clearance (Intake)	.003
(Exhaust).	.005

f. Piston - Cylinder Data

Skirt clearance, new pistons. . .	.0025
Piston ring gap	.007-.017
Piston ring groove clearance (Top ring)	.0015-.003
(Other rings).	.001-.0025

g. Bearing Clearances

Large end connecting rod, running clearance.	.0005-.0025
Connecting rod side clearance, sum of both sides.	.006-.010

OPERATOR'S MANUAL

PART II

STARTING A NEW ENGINE

(200) - GENERAL - Both the main engine and starting unit were thoroughly tested and left the factory in good condition. Nevertheless, as a precautionary measure, it is strongly recommended that you inspect both thoroughly before starting. Then, make the following preparations in the order named:

(201) - LUBRICATION - The most important precaution with any engine is to make sure that it has proper lubrication at all times. See that the crankcase of each engine is filled with the proper grade of oil, following the lubrication instructions given in Paragraphs 405-407. Fill at 11 Figure 1, and 14 Figure 6.

(202) - COOLING - Next to proper lubrication, proper cooling of an engine is most important. Be sure that the cooling system is full and that it does not leak. See that none of the hose connections have collapsed or become obstructed and that the piping to the small engine and top water manifold, and by-pass connections are all tight. Refer to the cooling system diagram, Figure 13. Wherever possible, use soft or distilled water in the cooling system; avoid hard or alkaline waters. (See Paragraph 510.)

(203) - FUEL - See that there is gasoline in the main engine tank and the starter engine tank 1 Figure 6. These engines are designed to operate efficiently on 60 octane gasoline. Gasolines of higher octane may be used without harm, but they will not better the performance sufficiently to justify their added cost. Always use the cleanest fuel obtainable and keep the fuel lines tight and free from sand, lint and water.

(204) - IGNITION - Check the ignition cables and make sure they are connected to the proper spark plugs and the magneto. The cables are all numbered and each should be attached to the cylinder of corresponding number. Number 1 cylinder is the one closest to the front.

(205) - SAFE ENGINE SPEEDS - Overspeeding has ruined more engines than hard work. Overspeeding voids our guarantee. The large engine is equipped with a built-in governor which limits maximum loaded speed to the speed shown on the engine name plate (900 or 1000 r.p.m.); the small engine has a governor which limits idling speed to 2200 r.p.m. Under no condition should these maximum permissible speeds be exceeded.

(206) - AIR CLEANERS - The Air Cleaners 3, Figure 1, and breather 10, Figure 1 are essential to long engine life. To insure efficient operation, make sure that all the air entering the machine must pass through the cleaners. Keep the cleaners clean and in full working order. A fouled carburetor air cleaner cuts the engine's power and will shorten engine life. A clogged breather induces oil pumping and leaks.

(207) - OTHER PREPARATIONS - See that governor, throttle and choke connections are all secure.

(208) - SPECIAL PRECAUTIONS

(a) Put lubricating oil in the fuel tanks--use about one pint of light cylinder oil to every three to five gallons of fuel during the first fifty hours of service.

(b) Remove the spark plugs and squirt a teaspoonful of light cylinder oil in each cylinder of each engine to insure lubrication of the pistons and cylinders when the engine first starts.

(209) - GENERAL STARTING PROCEDURE

(a) Check lubrication, cooling and fuel as directed in the preceding paragraphs.

(b) **Throttle Setting.** Set starter engine throttle about one quarter open. The control 7, Figure 6 is shown in the closed position. Pull out to open throttle.

(c) **Ignition Switches.** Turn "on" starter engine ignition switch at 13, Figure 6.

(d) Wind the starting rope around the pulley 20, Figure 6 hooking the knot in one of the notches and winding so that, when cranked, the rotation will be clockwise as viewed from the front.

(e) **Crank.** Crank by pulling the rope. The engine should start with the third or fourth cranking. In cold weather it will start easier if the ignition is left "off" at first and the engine cranked a few times while the choke valve 17, Figure 6 is held closed. This fills the cylinders with mixture. Then open the choke, turn on the ignition and crank again.

(f) **Warm Up.** Allow the starter engine to warm up for a couple of minutes before applying any load. Check the oil pressure. When the engine is warm and running at governed speed, oil pressure should be 15 lbs. per square inch.

(g) **Throttle Setting.** Set main engine throttle about one quarter open. The control 4, Figure 1, is shown in the wide open position, in idling position it is pushed way in.

(h) **Ignition Switch.** Turn "on" ignition switch 6, Figure 3.

(i) **Choke.** Close choke valve by pulling out the control 2, Figure 6.

(j) **Crank.** Now open the small engine throttle wide and engage the starter Bendix by pulling out on the clutch handle. Hold the handle in this position until the main engine begins to fire. The Bendix pinion will be automatically disengaged from the flywheel ring gear at this time and the clutch handle may be returned to its original position.

(k) Turn off the starter engine ignition switch.

(210) - AFTER STARTING MAIN ENGINE

(a) **Open Choke.** As soon as possible after starting, open the choke by pushing in the control 2, Figure 6.

(b) Idle the Engine. Idle the engine for a short period, at least long enough to make sure that a sufficient quantity of oil reaches the bearings and all other moving parts. Then, if conditions permit, continue to run the engine idle or under light load for a few hours. While the engine has been "broken in" by the test run at the factory, this additional limbering period is good insurance for better operation.

(c) Stop Water Leaks. After the engine gets warmed up, check for water leaks and stop any that may occur.

(d) Tighten External Nuts. After the engine is hot, check the tightness of all external nuts on heads, side panels, inspection openings, oil pan, etc.

(e) Check Oil Pressure. The oil pressure may not build up at once, especially in cold weather, so a short period of idling will be necessary to fill the lines and build up the pressure before the engine is ready to be put under load. After sufficient idling time has elapsed, check the pressure at the gauge 5, Figure 3. It should be 40 pounds when the engine is running at governed speed.

(f) Check Manifold Vacuum. When the engine is running under load, check the vacuum gauge 2, Figure 3. It should read not less than 5 inches.

(211) - STOPPING THE ENGINE - Stopping the engine involves merely turning "off" the ignition switch 6, Figure 3.

PART III

INSPECTION

(300) - GENERAL - Regular, systematic inspection and maintenance will insure good performance and prolong the life of your engine. Follow a schedule that will reveal any necessary attention or repairs before it becomes serious, and that will enable you to perform these operations at a time when no delay will be occasioned and at a place where facilities are available. The following schedule, if followed, will keep your engine in good condition, saving you time and money in the long run.

(301) - DAILY INSPECTION - (Based on 8 hours of operation.)

(a) Check oil level in both main and starter engine. Add oil of proper grade if necessary.

(b) Check oil pressure of both engines.

(c) Check water supply.

(d) Check fuel supply in main tank and starting engine tank.

(e) Clean air cleaners and breather.

(f) Inspect joints and connections in fuel, cooling, and ignition systems.

(g) Grease clutch throwout collar.

(h) When the engine is in operation, check water temperature, oil pressure and vacuum gauge.

(302) - WEEKLY INSPECTION - (Based on 50 hours of operation)

(a) Clean both engines thoroughly on the outside, using kerosene and a brush to remove all the accumulated grease and dirt.

(b) Clean all spark plugs and check spark gap--it should be .025"- .030". See that spark plug gaskets are tight. See that wiring is tight and clean. Clean oil and dirt from terminals and replace chafed wires.

(c) Check for water leaks at the cylinder head gasket, water manifold flanges, water pump tell tale holes and hose and pipe connections. Stop any leaks.

(d) Drain oil filter sediment trap. Replace filter element if necessary.

(e) Check the condition of the main engine crankcase oil by inspection of the sample that clings to the boyonet oil gauge. If it is badly discolored or has lost its oiliness, change it. When the oil is drained, drain the filter and replace the filter element, and clean the oil pump intake screen.

(f) Grease clutch pilot bearing and shaft bearings.

(g) Test the compression in the cylinders. If it is weak it may be necessary to inspect tappet clearance, grind valves or replace some of the piston rings.

(h) Empty the fuel sediment traps--one beneath the starting engine supply tank and the other on the main engine fuel supply pump.

(303) MONTHLY INSPECTION - (Based on 200 hours of operation.)

(a) Check valve tappet clearance and adjust if necessary.

(b) Clean magneto breaker points and adjust gap. Check spark timing after cleaning points.

(c) Tighten fan belt.

(d) Grease fan hub.

(e) Remove the top water manifold fitting (both engines) which houses the thermostat and clean any scale or deposit that prevents its operating fully. Test the thermostat bellows by immersing it in hot water to see that it does not stick.

(f) Make all tests outlined in Paragraph 301 and 302 and decide whether to regrind valves, take up bearings, or make other major repairs.

PART IV

OILING SYSTEM AND ACCESSORY LUBRICATION

400 - GENERAL - Both the main and starting engines employ pressure oiling. Figures 7 and 8 illustrate the systems diagrammatically. In each case, operation of the system is entirely automatic; oil will reach all moving parts as long as the engine is in operation, the system unobstructed, and the oil supply maintained. When the engine stops, the surplus oil on the internal parts drains down to the main reservoir in the oil pan.

401 - MAIN ENGINE OILING SYSTEM - As shown in Figure 7, oil is sucked up by the oil pump and delivered to the main oil header, a drilled passage running the entire length of the crankcase. There are two main passages leading this oil to the outside--one to the oil filter which returns clean oil to the crankcase, and the other to the adjustable pressure relief valve which returns overflow oil to the crankcase when the pressure exceeds the set amount. Seven passages lead oil from the main header to the main bearings, each of which may be reached from the outside by removal of a pipe plug in the side of the crankcase; and, from these the oil passes through drilled holes in the crankshaft to the connecting rod bearings and through the rifle drilled passages in the connecting rods to the piston pins. From numbers 1, 3, 5, and 7, main bearings, oil is directed through drilled passages in the crankcase to the camshaft bushings. From number 1 and 7 camshaft bushings, oil is forced intermittently to the rocker arm mechanism through drilled passages in the crankcase and cylinder head, and copper tubing. The intermittent stream from the front camshaft bushing is also directed to the idler gear stud from which it passes through a drilled hole in the gear web and thus provides an oil spray to lubricate the entire gear train, and water pump and governor assemblies.

402 - STARTING ENGINE OILING SYSTEM - As shown in Figure 8, a valve type pump mounted at the front end of the crankcase and driven from the camshaft gear sucks up oil from the oil pan and forces it through a rifle

drilled header in the crankcase and thence through drilled passages to the three bushings supporting the camshaft. A flat ground in each camshaft journal acts as a distributing valve and releases the oil under pressure through drilled passages to jets which direct the intermittent oil streams into countersunk feed holes drilled in the large end of each connecting rod. A drilled hole in the front of the crankcase permits oil from the pan to flow into the bottom of the gear compartment where it is whipped up by the oil pump gear so that the entire gear train receives lubrication. Added lubrication to the gears is provided by means of drilled passages in the camshaft which direct oil from the front camshaft bushing to a hole in the idler gear hub to provide an intermittent stream. The pistons, cylinders, valve tappets, and main bearings are lubricated by crankcase oil mist.

403 - OIL PRESSURE - The proper operation of the oiling systems of these engines is indicated by the oil pressure gauges 5, Figure 3, and 6, Figure 6. Proper operating pressures for the main and starting engines are 40 and 15 pounds per square inch, respectively. It is important that the engine be up to normal operating temperature and running at governed speed when the pressure is checked. In cold weather, the pressure may not develop immediately because it takes a little time for the thick oil to become warm and flow freely. At low idling speeds, oil pressures will be much lower--as low as 15 pounds for the large engine, and as low as 5 for the starting engine. If the pressure drops to zero suddenly or fluctuates violently while the engine is under load, stop the engine and investigate. If the bayonet gauge shows that the oil supply is adequate, it may be that it has been used too long and thinned by dilution. The obvious remedy is to drain the crankcase and replace the old oil with new oil of the proper grade. At this time, also, clean the oil pump screen as directed in Paragraph 410, for a clogged screen will also cause a drop in oil pressure. If this does not correct the trouble, it is possible that dirt has lodged under the relief valve or the oil line to the pressure gauge is disconnected. In either case, the cause should be removed before starting the engine.

404 - CLEANING THE RELIEF VALVES - The main engine relief valve, 6, Figure 2, is shown in section in Figure 9. This can be cleaned easily by removing the protecting cap, 5, Figure 9, and then removing in turn the adjusting screw lock, 4; the adjusting screw, 3; the pressure control spring, 2; and the cylindrical valve plunger, 1. Wash all parts thoroughly in gasoline, including the valve seat in the crankcase. Scrape away any hardened carbon.

The starter engine relief valve is cleaned in a similar manner. Notice that it utilizes a ball check valve instead of a plunger. Be sure that the valve seat, ball and spring are all clean.

405 - OIL CHANGING, MAIN ENGINE - The quantity of oil required to fill the main engine is 32 quarts. This includes the quantity to fill the oil filters, which should be cleaned and emptied each time the crankcase is drained. The oil level should be inspected before starting each day and oil added, if necessary, to bring the level up to the "full" mark on the bayonet gauge, 6, Figure 1. At the same time the oil level is checked, inspect the sample which clings to the bayonet gauge; if it has broken down, become badly thinned out, or thick and sludgy, it is time to drain and refill. A good rule is to change the oil at least every fifty hours of service until experience proves that the particular oil will remain serviceable for a longer time. Never use any oil longer than 100 hours of active duty. This is the maximum life that should be expected from a single change of oil. Not all oils in every type of engine will give maximum service, therefore, be careful to examine the oil after the first draining to determine whether it is standing up in service. Through the drain plug, or an inspection plate, see if it has formed sludge and coated the interior of the engine, or whipped up into a thick froth. If it has, oil changes should be more frequent or a different oil should be used. It is especially important to watch this in wintertime as an engine operating below 160 degrees F. (180 degrees F. (82 degrees C.) is the proper temperature) will have a tendency to form sludge and emulsion rapidly. If necessary, add a radiator shutter to bring the engine up to temperature.

406 - OIL CHANGING, STARTING UNIT - The starting unit is not subjected to rigorous service---as a result, complete oil changes should be necessary only infrequently - every six months or longer. However, it is a good plan to check the oil level weekly and examine the sample that clings to the gauge. The oil may deteriorate even without frequent use--dirt may get in due to condensation or dusty operating conditions. The quantity required to fill the engine to the "full" mark is 3 quarts; S.A.E. #10 is suitable the year round.

407 - LUBRICATION RECOMMENDATIONS - MAIN ENGINE - This company does not attempt to recommend either by name or brand all the lubricating oils which are suitable for use. The viscosity or body of the oil is the only property specified. Quality -- life, heat resistance, acid forming, and sludging tendencies, as well as other commonly specified physical properties -- should be the supplier's responsibility. The following table was prepared in accordance with U.S.Army Specification #2-104-A and recommends proper lubricating oil grades for various ambient (surrounding) air temperature ranges.

Engine Model 6-WAK

Ambient Air Temperature	S.A.E. Grade
0° to 10° F.	10
10° to 32° F.	10
32° to 90° F.	50
Over 90° F.	50

In extreme sub zero weather keep the oil pan covered with burlap or blanketing to prevent the oil from chilling even while the engine is running.

408 - COLD WEATHER STARTING - Following the chart recommendations will give you the lightest grade of oil that it is practical to use at all times and even for winter operating conditions. In some cases, even these oils when chilled by standing overnight in sub-freezing temperatures may not permit easy starting. Under such

conditions, a lighter oil is permissible, but since the lighter oils may over-heat after the engine gets under load, an oil cooler must be added to prevent this. With engines operated outdoors in severe winter weather, it is often advisable to drain the oil from the engine each night and keep it warm indoors until the next starting time. Do not place it near an open flame or stove. It might start an explosion.

409 - OIL STRAINER SCREEN - The first strainer through which the lubricating oil passes is a 1/16 inch (1.6 mm) mesh brass screen which surrounds the intake of the lubricating oil pump. This prevents coarse particles of foreign matter from entering the pump gears. Surrounding the screen is an inverted cup, the lower edge of which extends below the screen level. This is known as the baffle, Figure 11, and prevents the pump from sucking air when the level of the oil is low or when it is cold and stiff.

410 - CLEANING THE OIL PUMP STRAINER SCREEN - The wire strainer screen surrounding the intake of the lubricating oil pump may become stopped with carbon and sludge if it is not cleaned every time the lubricating oil is changed. The strainer screen can be reached and removed by removing the cover plate on the bottom of the oil pan. The screen will fall down as soon as the cover plate is removed, for the plate holds it in place at the bottom of the pump. It is best to remove the screen entirely and allow it to stand in fuel oil or gasoline long enough to soften the carbon, which is usually hard and tough. A putty knife is the best tool for removing it. A blunt stick requires too much pressure and is likely to break through the screen itself while a sharp instrument might cut through. BE SURE TO CLEAN THIS SCREEN EVERY TIME THE OIL IS CHANGED, or oftener, if experience shows it to be necessary.

In replacing the screen be sure it is placed properly so as to fit into the baffle.

411 - OIL FILTER - The oil filter is shown in Figure 10. Specific instructions for servicing are given in Paragraph 412; however, the following general rules, if

followed, will enable you to get better filter performance:

(1)--Be sure that the oil reaching the filter is warm enough; 160° - 180° Fahrenheit is the recommended range. Cold oil is usually too heavy to readily liberate the dirt it picks up as it travels through the engine; thus the filter element cannot function properly. The most common causes for low oil temperatures are: low engine operating temperatures, long leads from engine to filter, and use of oil of too high viscosity. Engine temperature can be brought up to normal (See Paragraph 501) by the use of thermostats, shutters or covers on the radiator or the use of a smaller pan. If this does not remedy the situation, it may be necessary in extreme cases to insulate the oil pan, arrange a by-pass from the exhaust along the oil pan or by-pass the oil in coils or a tube near the exhaust manifold. Frequently the shortening of oil leads will remedy the situation. And, if the cause is oil of too high a viscosity, the instructions for selecting the proper grade of oil given in Paragraph 407 have not been followed.

(2)--Renew the filter element or elements each time the oil is changed. Not only does this assure clean fresh oil throughout the system, but it is usually the most convenient time for renewing elements.

(3)--Whenever replacing or repacking filter elements, renew all gaskets to prevent loss of oil

412 - OIL FILTER SERVICING - Before dismantling the lubricating oil filter, secure a pail of at least two gallon capacity to receive the sludge and muck caught in the filter shell. Hold the pail under the filter, and remove the drain plug, 12, Figure 10. After the case has been drained, unscrew the T-handled nut, 1, which is pinned to the central tube which screws out of the support casting, and permits the removal of the entire casing with the filter element, 3. Unscrew the brass wing nut, 7, and withdraw the complete filter element, 3. Wash out the shell with gasoline, then by compressing the spring ring, 5, the head of the element

cage may be removed and the old waste packing, 4, withdrawn. Now wash the cage in gasoline and repack with 18 ounces of clean white COTTON machinist's waste. Wool waste must not be used as it will not retain the impurities which are to be removed by filtering. At this time, it is a good plan to inspect the metering bushing at the fitting, 10, and clean it if there is any obstruction. In re-assembling the unit, take care that the Vellumoid gasket at the base of the filter shell is not damaged and be sure the nut, 1, is drawn tightly to prevent leaks. Both units should be serviced at the same time. Where filters are serviced between crankcase drains, be sure to add 4 or 5 quarts of oil to replenish the contents of the filter which have been withdrawn.

ACCESSORY LUBRICATION

413 - STARTER UNIT TRANSMISSION - The starting unit transmission utilizes splash oiling. Oil is carried in the transmission case and can be added by removing the plug, 8, Figure 6. Use about a half pint of light cylinder oil (S.A.E. #10), opening the oil level pet cock, 12, Figure 6, so that the level will not go above this point. This is important since, if the oil is at too high a level, it may get into the flywheel housing and onto the clutch surfaces.

414 - FAN LUBRICATION - The fan is lubricated at the pipe plug in the fan hub, Figure 14. It will be found that this point is not particularly accessible so the easiest way is to remove one-half the fan guard. Fill with #2 long fibre, soda soap grease. Frequency of servicing depends on the rigors of the service--ordinarily every 200 hours is sufficient. Always check fan lubrication if the unit has been idle for a long time during which water or dirt may have worked into the grease.

415 - CLUTCH LUBRICATION - The clutch has three lubrication points, 8, 9, and 10, Figure 3, for the throwout collar, main bearing and pilot bearing respectively. Grease the pilot bearing and throwout bearing every 24 hours of running time and the main bearing at least every fifty hours of operation. These are all alemite

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fittings and require the use of a pressure gun. Any high grade, soda base, short fibre, grease gun lubricant may be used which is recommended for use with anti-friction bearings having operating temperatures of 200° F.

416 - CARE OF THE AIR CLEANERS - Service of the air cleaners involves removal of the oil cups as illustrated in Figure 12, emptying the oil and scraping out any dirt that may have accumulated. Then refill the cup to the level mark, making certain that both the outer and inner cups are filled to the same level. Use an oil of the same grade used in the engine crankcase. At temperatures below 10° F. it is advisable to dilute the oil with one-third kerosene. Never allow more than one half inch of dirt to collect in the outer cup before servicing. The depth of dirt at the bottom can be measured with a stick, screw driver, or whatever is convenient. Service the air cleaner when the oil appears too thick or heavy to flow freely. In extremely dusty conditions this might be several times daily.

CARE OF LOWER SCREENS - Ordinarily, if the correct oil level is maintained, using the proper oil, the wire screen condensing element will need very little attention. However, the bottom of the screen element should be inspected whenever the cleaner is serviced, and any accumulation of dirt or foreign matter removed.

CARE OF CENTER INLET TUBE - Periodic attention must be given to the center inlet tube of the air cleaner. Any coating of dirt on the walls of the tube should be removed so that the flow of air to the engine will not be restricted. This is most easily done when the oil cup and pre-cleaner are removed by ramming a cloth through the tube.

CARE OF SCREEN ELEMENT - The entire air cleaner should be removed from the engine and the wire screen condensing element thoroughly flushed out with gasoline or kerosene at least once each season, more often if dust conditions are severe.

ALL CONNECTIONS between the air cleaner and engine should be inspected at frequent intervals and MUST BE KEPT AIR TIGHT.

The operator is charged with the responsibility of giving the air cleaner regular and proper attention according to these instructions. Maximum engine life cannot be obtained without proper care of the air-cleaner.

417 - COLLECTOR PRE-CLEANERS - The pre-cleaners are the dry centrifugal type, each having a glass Mason jar for a dust receptacle. As the dusty air passes through the pre-cleaner, it is given a whirling motion and a large percentage of the dust is thrown out through a slot in the upper inner portion from where it settles into the Mason jar. Keep the jar screwed on tight. Empty it whenever it becomes about one-half full. Do not use any oil in the pre-cleaner jar.

418 - MAGNETO LUBRICATION - Whenever the magneto cover is removed, inspect the cam lubricating felt wick and if it has become dry or hard, re-lubricate with a few drops of S.A.E. 50 motor oil. Read Paragraphs 705, 706.

PART V

COOLING SYSTEM

(500) - GENERAL - Both of these engines utilize pump systems, the two systems being connected. Figure 13 diagrams the direction of water flow throughout the combined systems. From the bottom of the radiator, water is led to the inlet of the main engine water pump and, by a smaller line, to the inlet of the starting engine water pump. When the starting engine has just started and until it reaches operating temperature, water from the outlet at the top of the engine is by-passed directly back to the water pump to provide a recirculation that enables it to warm up in a hurry. When the outlet water reaches operating temperature, the bellows of the thermostat begins to expand so that only part of the water is sent through the by-pass. At 190 degrees F. the bellows is fully expanded so that the full volume of water flows through the outlet pipe. As soon as the large engine starts to run and the small engine is stopped, the circulation in the small engine water system is practically stopped. The main engine water pump forces water through the engine jacket and into the top water manifold. Part of the water from the water manifold is directed through the water passages of the intake manifold and then is returned to the pump inlet. The major portion of the water is directed to the thermostat which functions in a manner somewhat similar to the thermostat on the small engine. When the engine is cold, the entire volume of water reaching the thermostat is by-passed back to the pump inlet for recirculation. When the water reaches proper operating temperature, the bellows expands to allow some of the water to flow to the radiator. When the outlet water reaches 190 degrees F. the bellows expands to allow full volume to be directed to the radiator.

(501) - WATER TEMPERATURES - Water temperatures are indicated by the thermometer 3, Figure 3. Proper operating temperature is 160° F. to 190° F.; however the unit will operate satisfactorily at temperatures between 190° F. and 212° F. Do not take the temperature when the engine has just been started; give it a chance to

warm up and reach a stabilized condition. The addition of a small amount of water each day is a fair indication that the engine is operating at an efficient temperature. If the engine is to be idled for long periods of time, it may be necessary to cover all or part of the radiator, to make sure that proper operating temperatures are maintained. Over-cooling causes condensation and crankcase dilution which usually results in excessive wear.

(502) - COOLING FAN - The cooling fan is mounted on a bracket on the front of the cylinder block and lubricated at the pipe plug in the fan hub. It is necessary to remove one half of the fan guard in order to reach the pipe plug. Now remove the pipe plug and fill the hub with No. 2 long fibre, soda soap grease. This should be done monthly in average service - more often if experience shows it to be necessary. Every week or so, check the fan belts to make sure they are tight enough. It should not be possible to pull either belt more than an inch out of line at a point midway between the drive pulley and the fan hub. The fan belt is tightened at the adjusting stud 1, Figure 14; it must always be tight enough to positively drive the fan without slippage.

(503) - RADIATOR - The radiator should require no attention except yearly flushing when the system is cleaned. (See Paragraph 514.) It is large enough to meet all normal loads. It may be necessary to cover part or all of the radiator to maintain proper operating temperatures, especially if the engine is idled much of the time or operated at part load and reduced speeds. Over-cooling must be avoided as much as overheating.

(504) - COLD WEATHER SUGGESTIONS - For efficient winter operation and to avoid excessive wear, covering part or all of the radiator is imperative. Temperatures given in Paragraph 501 should be maintained winter and summer. To avoid cooling system freeze-ups, a solution of denatured alcohol and water or ethylene glycol is recommended, because it is non-corrosive and will not damage the radiator, pump, or other parts. The following table gives freezing temperatures of various solutions:

Pure Methyl Wood Alcohol	De-natured Wood Alcohol	Ethy-lene Glycol ("Pres-tone")	Radi-ator Glycer-ine (G.P.A.)	Freezes at Degrees F.	C.
13%	17%	16%	37%	120	-7
20%	26%	25%	55%	110	-12
27%	34%	33%	70%	0	-18
32%	40%	39%	81%	-10	-23
37%	46%	44%	92%	-20	-29
40%	53%	48%	100%	-30	-35

To prevent rust with straight alcohol and water solutions, add two ounces of soluble oil for every gallon of solution in the system.

(505) - ALCOHOL EVAPORATION - When alcohol is used as anti-freeze, add a small amount from time to time to take care of evaporation. A hydrometer should be used daily during cold weather to keep the solution up to proper strength.

(506) - OVERHEATING - When an engine overheats, it is due to eitner one of two conditions; inadequate cooling capacity for peculiar conditions under which it is operated, or some internal change in the engine or cooling system itself. The first trouble, unless it is due to clogged or restricted air passages, is usually beyond the control of the operator, the second, directly in his hands. The following paragraphs (507-512) give some suggestions for correcting this trouble:

(507) - CHECK OIL & WATER FIRST - This is a universal rule for safety.

(508) - LACK OF CIRCULATION - If the system is full of water, the agitation observed through the radiator filler opening will indicate the amount and character of the circulation. If there is no agitation, it indicates complete stoppage of the system somewhere. If light weight hose is used, it is possible for the lower hose, connecting the radiator and engine to collapse, and thus shut off water circulation. New hose or a brass spring slipped inside the hose will correct this trouble. After an engine has been in service for a long time, it is possible for the inner lining of the hose connec-

tions to come loose, and shut off or restrict the flow of cooling water. Lack of circulation may also be caused by obstructions in the radiator due to deposits from the water used, or to oatmeal, bran or similar material used to remedy a water leak.

(509) - LEAK STOPPERS CAUSE OVERHEATING - Don't use oatmeal, bran or similar remedies to stop a leak. Such substances are likely to obstruct the water passages. This will cause serious overheating.

(510) - ALKALI WATER COMMON CAUSE - When the engine is used in a country where there is much alkali or lime in the water, it should be cooled with rain or distilled water if possible. Otherwise the cylinders will soon lime up, and when the scale becomes thick enough, the cylinders will overheat and crack. When alkali water must be used, it is advisable to use a softening treatment such as "Scalina" made by the Rathbun Company of El Paso, Texas, "Quick Solvent" made by Quick Products of San Antonio, Texas, or the Solvent manufactured by D. W. Haering & Company, Chicago, Illinois. If this is not practical, fill the system once a season, and then never change the water, and add only what is necessary to keep the system full. In this way, the minimum quantity of alkali is added, and scaling is reduced to a minimum.

(511) - FAN BELT SLIPPING - A belt stretches as it is used, and unless it is adjusted to take up the slack, it will not drive the fan fast enough to properly cool the engine. The fan belt is easily tightened as described in Paragraph 502, so there should be no excuse for running with a slack belt.

(512) - OTHER CAUSES OF OVERHEATING - (Carburetor Choke) - The choke should never be left closed or partially closed when an engine is running. The closing of the choke increases the richness of the mixture. Rich mixtures always heat up the engine, waste fuel and burn the exhaust valves. Always see that the choke valve is wide open when the engine is running. If the carburetor is improperly adjusted, it will cause heating like a partially closed choke valve.

(Leaky Valves) - Leaky valves, especially the exhaust valves, will cause an engine to overheat. They become very hot due to the gas leaking past them, and then cause pre-ignition which further aggravates the trouble.

(Leaky Piston Rings) - Piston rings which leak, permit the hot gases of the explosion to blow by, and heat up the pistons. This carries or burns the lubricant from the cylinder and piston walls. Heating the piston causes it to expand, thus reducing the clearance between it and the cylinder wall. This increases the piston friction; and with reduced lubrication, it not only causes overheating, but seriously damages the cylinders and pistons.

(Improper Spark Timing) - Do not run with a retarded spark. On the other hand, the engine should not be run with too much spark advance. When pre-ignition takes place, overheating follows. The bearings will also be unduly punished by the severity of the explosion. See Magneto Timing, paragraph 707.

(513) - DRAINING THE COOLING SYSTEM - Drain cocks are located at 12, Figure 1 and 2, Figure 2; and in addition there are two on the bottom of each end of the intake manifold and one just above the main oil filter. In draining the systems, be sure to open all of these, to avoid the possibility of leaving water pocketed in some part of the system. In cold weather, if no anti-freeze solution is used, the entire system must be drained every time the engine is stopped for a prolonged period.

(514) - CLEANING THE COOLING SYSTEM - At least once a year the cooling system should be cleaned. The first step is to drain the system completely. Then open the pipe plugs on either side and at the base of the radiator, insert a hose in one side and flush away any sludge or sediment that may have accumulated. Then replace the pipe plugs and pour 14½ gallons of fresh water in at the radiator cap. Now bring an equal amount to a boil and add all the common washing soda that it will dissolve. While it is still hot, add it to the cooling system - it should completely fill it. Run the engine as usual for 24 hours, then drain, flush thoroughly and refill with clean water.

(515) - CLEANING WITH ACID - It will sometimes be found more convenient to shut down the engine, and dissolve the scale and sludge with an acid solution which works quicker but must be handled with greater care. A solution of hydrochloric (commercially known as Muriatic) acid mixed with equal parts of water can be introduced into the system after it has been drained, and thoroughly flushed with clear water. This should be allowed to stand in the cooling system as long as any foaming occurs. When the foaming has stopped, drain the system thoroughly, flush it with clear water, and repeat the treatment. When no foaming is observed with the fresh acid solution, it indicates that the scale has completely dissolved, and the system is clean. The acid can then be drained, the system again flushed with clear water when it is once more ready for service. Be sure to check all water connections and tighten them against water leaks after the engine has been running long enough to bring it up to temperature.

PART VI

FUEL SYSTEM

600 - GENERAL - The main and starting engines have separate fuel systems. Fuel for the starting system is contained in the one gallon tank 1, Figure 6; it flows by gravity through the strainer 4, and thence to the carburetor inlet. The main engine fuel supply is outside the engine. The fuel pump 8, Figure 1, draws fuel from the supply tank and forces it to the carburetor inlet. The function of the carburetor is to mix fuel and air in proper proportions for most efficient combustion. The fuel-air mixture is then sucked into the intake manifold and distributed equally to the cylinders.

601 - STARTING ENGINE GASOLINE STRAINER - Directly beneath the starting engine supply tank, at 4; Figure 6, is the strainer. Due to the relatively slight use of the starting unit, the strainer will require very little attention. When dirt begins to collect in the bottom of the glass bowl, close the shut-off cock, 3, unscrew the thumb screw retainer and remove and clean the glass bowl. Be sure that it seats properly and that the gasket is not damaged.

602 - FUEL SUPPLY PUMP - The fuel pump 8, Figure 1, is of the diaphragm type. It is driven by an eccentric on the camshaft which activates the rocker arm and thus moves the diaphragm. This unit requires very little care; ordinarily all that will be required is periodic cleaning of the sediment bowl. When dirt begins to collect on the bottom of the bowl, unscrew the thumb screw retainer, remove and clean the bowl and replace it. Be careful to see that it is seated properly and that the gasket on which it seats is not damaged.

603 - THE CARBURETOR - The carburetor measures out fuel and air in definite proportions, and prepares the mixture for burning in the cylinder. If too much air is admitted, the mixture burns so slowly that it continues to burn through the exhaust stroke, and ignites the next incoming charge which pops back through the carburetor. If too little air is used, it cannot produce

complete combustion, consequently part of the fuel is wasted. From this, it is evident that the air and fuel proportions must be accurate within very close limits. The engine is shipped with the carburetor correctly set, and as long as it runs well, don't disturb the carburetor adjustments.

604 - FUEL SYSTEM CHECK-UP - Before making any adjustments of either carburetor, make sure they are needed. Check the fuel supply, the fuel lines and fuel strainers to make sure the flow has not been obstructed. Drain the carburetor by opening the plugged hole at the bottom of the float chamber to remove any water that may have collected there. If fuel does not flow freely from this opening, the fuel line is clogged.

605 - STARTING ENGINE CARBURETOR - IDLE ADJUSTMENT - The only adjustment possible with this carburetor is for idling; a fixed jet is used for high speed operation. The idle adjustment is at 4, Figure 16, and should not be touched unless the engine idles unevenly. If the engine loads up or seems logy, it is an indication that the mixture is too rich. If the engine slows down and pops in the carburetor, the mixture is too lean. Make the idle adjustment with the throttle control, 7, Figure 6, pulled out all the way. Adjust at 4, Figure 16, until the motor runs smoothly.

606 - MAIN ENGINE CARBURETOR - IDLE ADJUSTMENT - The idle adjustment should be made with the throttle control 4, Figure 1, pushed in all the way. The idle adjustment is shown in Figure 15; screw it in until the engine slows down and pops in the carburetor; then unscrew it until the engine idles evenly. Leave it at that point.

607 - HIGH SPEED ADJUSTMENT - In making the high speed adjustment, set the gas throttle, 4, Figure 1, about one-fourth open, that is, one-fourth away from the closed position. The high speed adjustment should then be turned either right or left, depending on which way it gives the desired effect, until the engine runs smoothly. If possible make this adjustment with the engine under load, so that the governor will not be affecting the adjustment. Just as soon as the desired

results are thus obtained, retard the throttle control, and allow the engine to idle for at least one minute. When this is done, quickly open the throttle about one-third and then quickly close it. If the mixture is too lean, it will pop back through the carburetor indicating that the high speed fuel feed adjustment must be opened slightly, or if an air adjustment is used, the air flow slightly decreased. If the mixture is too rich, a popping noise will come from the muffler or exhaust outlet, and the high speed fuel feed adjustment should be closed slightly or the air adjustment opened to the desired position. A little experience and careful attention will make possible all carburetor adjustments which may be necessary, but if the engine is working well, <u>don't experiment.</u> The best pulling power will be obtained with a mixture slightly richer than the leanest mixture that will give smooth running.

PART VII

IGNITION SYSTEM

700 - GENERAL - Both the main and starter engines utilize magneto ignition, each system consisting of a magneto, cables, and spark plugs. In either case, no outside source of electric energy is required; the magneto is self-energizing and produces a spark by current which is generated within it. The order in which the spark plugs fire is as follows:

Main engine. 1-5-3-6-2-4
Starter engine 1-2-4-3

Number 1 cylinder is the one nearest the front of the engine (see Paragraph 100).

701 - SPARK PLUGS - One spark plug per cylinder is used; and it is essential that they be maintained in proper working order. Fouled or defective spark plugs are the most frequent cause of missing. Fouled spark plugs may be cleaned either by scraping or brushing them with gasoline - if badly carbonized, they can be cleaned by burning the carbon off with a blow torch or even a gas burner. Do not use emery or sandpaper to clean the porcelains as it removes the glaze and ruins the plug. If the porcelain is broken or cracked, it may cause missing, and it is advisable to replace the plug.

702 - SPARK PLUG GAP - It is very important that the spark plug points be set about 1/32 inch apart, .025 - .030 inch, with a feeler gauge. Figure 17 shows the proper method of checking spark gap, an operation which should be performed weekly when the engine is in regular service. Some spark plug gaps will not stay adjusted properly under full load temperatures; and as a result, missing will occur under full load when the engine becomes well heated. If the gaps are too wide, the engine will miss at low speeds; if too close, the engine will miss at high speeds. Much of this trouble can be avoided by always using plugs like those originally supplied with the engine.

703 - MAGNETO - The main engine magneto is illustrated in Figure 18 and the starting engine magneto in Figure

20. Both of these are correctly timed and adjusted at the factory. Outside of routine checking and cleaning of the distributor brush and breaker contact points, they probably need not be disturbed unless it is certain that the ignition spark produced is not satisfactory or that the timing is off.

704 - TESTING THE MAGNETO SPARK - The simplest test of spark that can be made is to turn on the ignition switch, disconnect the ignition cables from the spark plugs, and check each in turn by holding the terminal 1/8" away from the metal part of the plug and cranking the engine. If a spark is observed, the magneto is functioning properly, and the spark plugs and gap should be inspected as described in Paragraphs 701 and 702. If no spark is observed, pull the ignition cables out of the end cap sockets of the magneto and insert a short, stiff wire in one socket. Bend this wire to within 1/8" of the engine block. Turn the engine over slowly and watch carefully for the spark which should occur at the instant the impulse coupling releases. Try this in all the sockets. If a spark occurs with each trial, it indicates that the trouble will be found in the wiring. Check all connections and cables carefully. Be sure that all terminals are clean and making good contact, as the electric current will not carry through loose or corroded wires or terminals. Be sure that no wires have been rubbing against some metallic part of the unit so that the insulation is worn off at some point, causing a "short circuit." Oil saturated and dirty wires cause missing. However, if the wiring is in good condition, the ignition switch "on" (pulled out), and no spark occurs, the magneto should be replaced or repaired by an experienced magneto service man.

705 - MAIN ENGINE MAGNETO MAINTENANCE - Always keep the outside of the magneto clean and dry. Once a month, in heavy service, remove the breaker box cover plate. (It is not necessary to remove the complete cover except to inspect and clean distributor brushes and points.) Check the interruptor contacts; see that they are free from oil or grease and in proper alignment so that the full surfaces of both contacts meet squarely. Re-surface with a fine stone (do not use a file) if there is evidence of pitting or pyramiding and adjust

to a maximum opening of .012" - .016". This is done by means of the adjustable contact bracket 11, which can be shifted by the eccentric screw 12, Figure 19, until the correct opening has been reached. Then tighten the locking screw 10. The cam lubricating felt wick should be examined at this time and, if it is dry, it should be re-lubricated with a drop or so of S.A.E. 50 motor oil. Be careful not to get oil on the contact points; and in replacing the cover plate see that the gasket is not damaged and the cover is tightened securely in place.

706 - STARTING ENGINE MAGNETO MAINTENANCE - Unless the unit is operating under extremely dusty conditions, the starting engine magneto should require no regular service beyond keeping it clean and dry. Under dirty operating conditions, it may be advisable to remove the distributor block every month or so and wipe or brush out the breaker compartment and mechanism and clean the distributor block. Also, pull out the rotating distributor spool, wipe it off, and see that all the carbon brushes work freely and have a little spring tension. Check the contact points and re-surface with a fine stone if there is evidence of pitting and adjust to a maximum opening of .014" - .016". The only lubrication required can be done at the same time. Apply three or four drops of S.A.E. 50 oil to the cam wick 4, Figure 21, and one drop to the breaker bar bearing, 3. Do not get oil on the breaker points or allow oil to flow over the interior of the magneto.

707 - MAIN ENGINE - MAGNETO TIMING - The magneto is correctly timed at the factory and will not require timing unless it has been removed from the engine or the coupling lock nut has slipped. In retiming, after the magneto has been mounted on its support bracket, make sure that the screws holding the adjustable part of the coupling are released so that the magneto is positively disconnected from the drive shaft. Now crank the engine until number one piston is coming up on the compression stroke. This can be determined by removing the number one spark plug and holding a finger over the opening while the engine is being cranked slowly. When the air pressure from the rising piston is noticeable, it is on the compression stroke. Now watch the flywheel housing opening (see Figure 22) carefully, while the engine is still being cranked slowly. Watch for the

"fire" mark on the flywheel and when it appears, see that it lines up directly beneath the pointer. Keep the engine in this position. Now remove the breaker box cover plate and rotate the impulse coupling at least a half turn in the opposite direction to which it is driven (Driven rotation of the magneto shaft is the same as the crankshaft, clockwise when viewed from the front of the engine). Turn the coupling thus until the arrow in the observation window points to the cable outlet which is to be connected to number one cylinder. Now insert a piece of thin tissue paper (cigarette paper is satisfactory) between the contact points at 9, Figure 19, and turn the coupling slowly in the direction of operating rotation, (clockwise), until the points have just started to open, at which point the tissue paper can be slipped out. Make sure that none of the other adjustments is disturbed; then locate the two holes of the shaft side of the coupling which line up with two holes on the driven member, insert the coupling cap screws, and tighten. Now connect the ignition cables in proper firing order: 1-5-3-6-2-4. Note that the rotation of the distributor arm (as indicated by the arrow) is opposite to the rotation of the coupling and drive shaft. Follow this rotation in making cable connections.

708 - STARTING ENGINE MAGNETO TIMING - It is unlikely that the starting engine magneto will require timing except when the entire engine is torn down for overhaul. However, should it be necessary to replace the magneto in the field, the following timing procedure is recommended:

Crank the engine until number one piston is approaching top dead center on the compression stroke. Open the inspection opening plate on the flywheel housing and watch as the engine is cranked slowly until the "TDC" mark on the flywheel is directly beneath the cast mark on the housing. Keep the engine in this position. Now connect a short length of cable to the number one terminal of the magneto. (Actually any terminal can be used as number one, but when the engines are timed at the factory, the terminal in the upper right hand corner is considered number one.) Bring the free end of this cable close to the magneto housing and turn the magneto shaft by hand (the drive gear should be assembled to the impulse coupling at this time so it will be easy to

turn) until the impulse snaps and a spark occurs between this cable and the magneto. This indicates that the internal parts of the magneto are in approximate position for firing number one cylinder. Hold the shaft and gear as close to this position as possible, and place the magneto on the mounting pad so that the mounting holes and slots line up. At this point the magneto and engine are in only approximate fire position so it is still necessary to determine the exact fire position. (The position at which the contact points are just beginning to open). The simplest way is to turn the body of the magneto in the direction of normal shaft rotation (clockwise, looking at the front) for about 90 degrees and then bring it back until the impulse just snaps. If the previous steps have been done carefully, the mounting holes and slots will line up so that the magneto can be locked in this position. If not, it may be necessary to shift the position of the gears one or two teeth until the impulse just snaps when the body of the magneto is in a position that permits it to be locked at that point.

OPERATOR'S MANUAL

PART VIII

MECHANICAL ADJUSTMENTS

800 - GENERAL - Most of the mechanical adjustments are included in the Maintenance section of this book. Day-to-day operation includes only a few minor adjustments and checks for signs that this or that part or assembly is not up to par. Usually it is merely necessary for the operator to recognize the need for overhaul; so that the unit is sent to the shop for repairs before severe damage is done.

801 - TESTING COMPRESSION - To secure the best power and economy and to avoid missing and overheating, the valves must seat fully and the rings must be in good condition. Test compression at least once a month during heavy service, by means of a compression gauge. Start the starting engine and allow it to run at governed speed. Ground the main engine magneto by turning "off" the ignition switch. Now remove the large engine spark plugs one at a time and each time connect the pressure gauge to the cylinder at the spark plug opening and engage the clutch. See that the main engine throttle lever is in the wide open position (the governor throttle will be in this position automatically). At normal cranking speed the compression gauge should register 95 pounds per square inch for a new engine. If it falls below 85 or if there is a great discrepancy between any one cylinder and the rest, it indicates the need of further check-up to locate the cause and correct it. It may be a broken cylinder head gasket, a leaking valve or worn piston rings. In any case, the trouble should be corrected.

802 - TAPPET CLEARANCE - Tappet clearance is important and should be checked monthly at 7 Figure 23. The only preliminary to this operation is removal of the rocker arm covers 10, Figure 23. Intake valve tappet clearance should be .013 - .015 inches and exhaust clearance should be .022 - .024 inches. These clearances should be checked with the engine cold, <u>not</u> when it is at operating temperature. If the tappets have any clearance at all when the engine is operating, the valves are seating. When checking, always make sure that the

lower end of the tappet is resting on the base of the cam as indicated by the valve side of the rocker arm being at its highest point.

803 - ADJUSTING TAPPET CLEARANCE - Tappet clearance is adjusted by means of the adjusting screw on the valve side of the rocker arm. When the proper clearance has been made, hold the adjusting screw in that position and tighten the locking nut 11, Figure 23.

804 - STARTING ENGINE - TAPPET CLEARANCE - Starting engine valves and tappets will require no attention except at overhaul. The Maintenance section describes this in detail.

805 - CLUTCH - A new clutch generally requires several adjustments until the friction surfaces are worn in. This necessitates removal of the hand hole plate on the top of the housing to give access to the adjusting pin. Pull back the adjusting pin and turn the adjusting yoke to the right, one notch at a time, to tighten the clutch. The clutch should be adjusted just tightly enough to pull the load; if it is too tight the engaging mechanism will not snap over center. If the clutch is too loose, it will not pull the load and eventually the friction discs will burn out.

806 - STARTER DRIVE CLUTCH - When in correct adjustment, the clutch should begin to engage when the handle has moved approximately one-third of its total travel. Should adjustment be necessary, proceed as follows: Remove the cap screws that hold the clutch handle stop plate to the transmission housing. Hold the operating handle in desired engaging position (one-third of total travel) and press in on the end of the clutch shaft. With your free hand, turn the adjusting screw to the left until it stops with a distinct set against the inside of the transmission case. Ease pressure on the end of the shaft and turn the adjusting block further to the left until the first pair of tapped holes in the adjusting nut registers with the drilled holes in the transmission housing. Place the clutch lever stop in place over the pilot of the clutch adjusting block and line it up with the holes through the transmission housing and the adjusting block. The clutch lever stop must

be put back with the ears in the same location as before to insure correct distribution of travel of the clutch handle after adjustment. Secure the clutch lever stop and adjusting block together with cap screws and lock washers. The clutch is now in adjustment but will have to be adjusted several times when new until friction surfaces become well seated. In extremely cold weather when breaking loose a cold engine, the clutch will slip even though it is in correct adjustment since it has a safety spring built into the hub which prevents overloading. Always determine the need for adjustment under normal conditions.

807 - BEARINGS - BEARING LOOSENESS - In general, any bearing that is loose will cause an abnormal knock that increases with use. The heavier the thump, the greater the need for prompt attention. A loose connecting rod bearing may be located by running the engine slowly, and short circuiting each spark plug in turn. If any connecting rod bearing is loose, the knock will disappear when that particular cylinder is cut out. A knock in a main bearing is harder to locate, and after all other possible causes of the knock have been investigated and eliminated, remove the spark plugs to prevent the engine from rocking over on compression and injuring your hand, and then remove the oil pan and try the adjustment of the main bearings.

808 - LAY UP AND STORAGE - If the engines are to be laid up or stored for any period of time, considerable damage may be done unless the following suggestions are carried out:

1. Drain all water from the radiator and the entire cooling system.
2. Drain all fuel from the fuel pump, carburetor and fuel lines. Drain the starting engine fuel tank, strainer, carburetor and lines.
3. Remove the spark plugs and through each opening pour at least one ounce of S.A.E. No. 10 cylinder oil. Then replace the spark plugs or store them and plug up the openings.

4. Uncouple the Magnetos from the main and starting engines, remove them from their mountings and store in a warm, dry place. Cover the mounting pad opening on the starting engine.
5. Cover all finished parts with a rust preventing compound, slushing grease or transmission oil.
6. Cover all openings - exhaust, carburetor intake, breather - with waterproof fabric or gasket material to keep out moisture and foreign objects and thus prevent internal damage.

PART IX

TROUBLE CHART

Trouble	Possible Cause	Probable Cure	Read Paragraph
Hard- Starting	Fouled or cracked spark plugs	Clean or replace plugs	701
	Loose or defective wiring	Tighten and clean connections	704
	Improper timing	Re-time	707, 708
	Defective magneto	Replace magneto	704
	Gasoline flow obstructed	Check fuel lines	604
	Valve seats badly	Grind valves	Maintenance Manual
	Valve tappets improperly adjusted	Adjust tappet clearance	803
	Leaky intake manifold	Replace gasket	---
	Water in fuel supply	Drain sediment trap	601,602,604
Missing	Fouled or cracked spark plugs	Clean or replace plugs	701
	Wrong spark gap	Adjust gap	702
	Defective wiring	Tighten connections, clean	704
	Breaker points stick	Clean points	705, 706
	Cylinder head gasket leaking	Replace gasket	---
	Maiifold gasket leaking	Replace gasket	---
	Valves stuck, or broken	Inspect, replace or grind	Maintenance Manual
	Wrong tappet clearance	Adjust tappet clearance	803
Over-heating	Lack of oil or oil diluted	Drain and refill	405
	Lack of water	Fill radiator	---

TROUBLE CHART (Continued)

Trouble	Possible Cure	Probable Cure	Read Paragraph
	Cooling system obstructed	Clean system, install new hose	514
	Lime coated cylinders	Clean system, use softener	514
	Choke valve partly closed	Open choke valve	210a
	Valves leaking	Grind valves	Maintenance Manual
	Fan belt slipping	Tighten fan belt	502
	Improper timing	Re-time magneto	707, 708
Lack of Power	Valves leaking	Grind valves	Maintenance Manual
	Piston rings stuck or weak	Clean rings and grooves or replace rings	Maintenance Manual
	Improper timing	Re-time magneto	707, 708
	Muffler clogged	Remove muffler, repair or replace	---
	Governor or throttle loose	Check linkage	Maintenance Manual
	Air cleaner clogged	Clean air cleaner	416
Excessive Smoke From Exhaust	Too much oil	Check level and adjust	405
	Carburetor float sticking or leaking	Have carburetor man repair	Maintenance Manual
	Using too light oil	Drain and refill	405
	Rich mixture	Make high speed adjustment	607
Explosion in Muffler	Late ignition	Check carburetor and magneto timing	704, 707, 708
	Weak spark	Check magneto	704
	Exhaust valves leaking	Adjust tappets or grind Valves	803

WAUKESHA POWER UNIT

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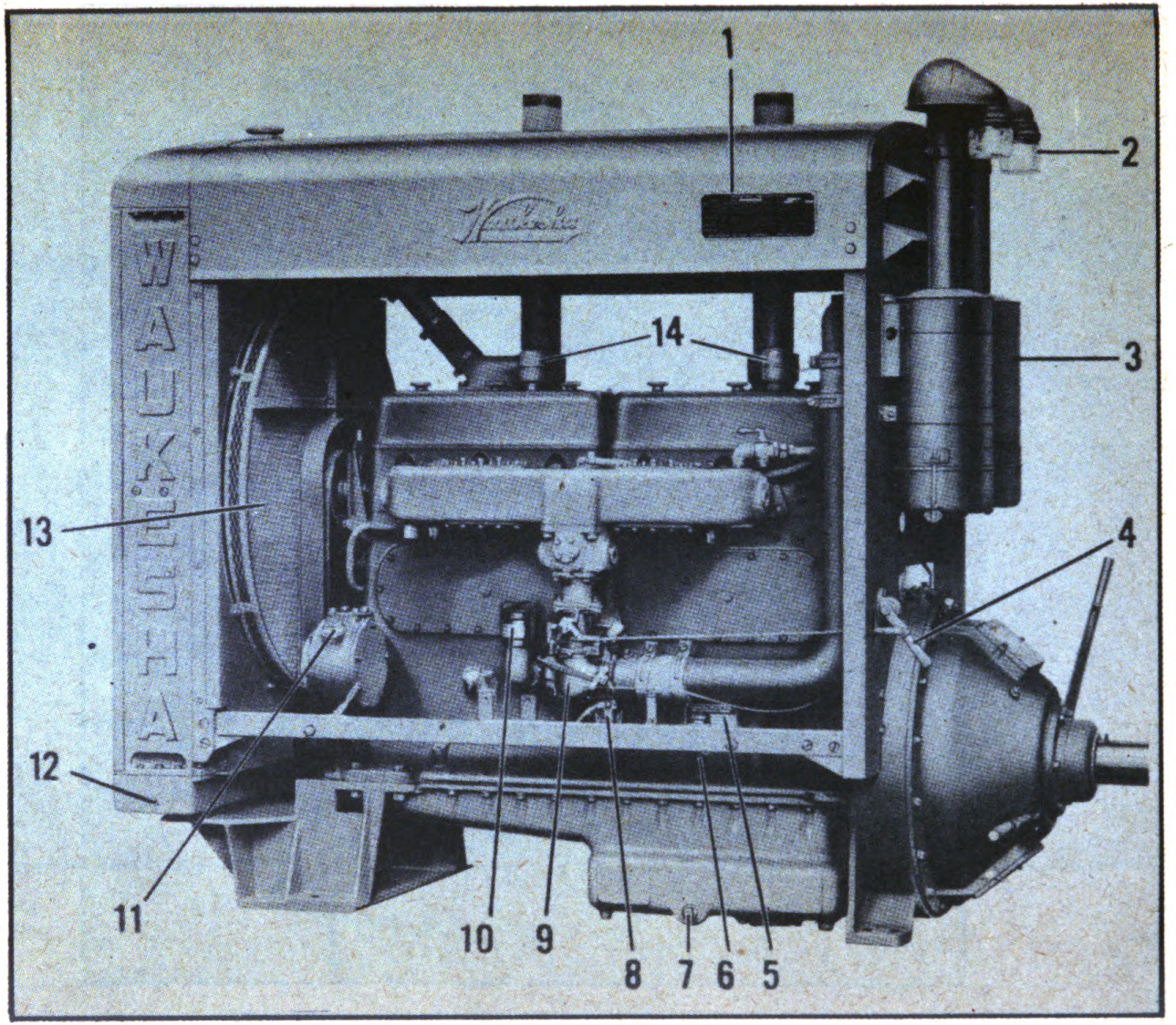
MAINTENANCE MANUAL

INDEX TO MAINTENANCE MANUAL

FIGURE 1

INTAKE SIDE OF UNIT

1. Unit instruction plate.
2. Pre-cleaner.
3. Oil bath air cleaner.
4. Throttle control, wide open position.
5. Engine name plate.
6. Oil level gauge.
7. Pipe plug to drain oil from pan.
8. Fuel supply pump.
9. Carburetor.
10. Crankcase breather cap.
11. Oil filler opening.
12. Radiator drain pipe plug.
13. Fan guard.
14. Rocker arm breather.



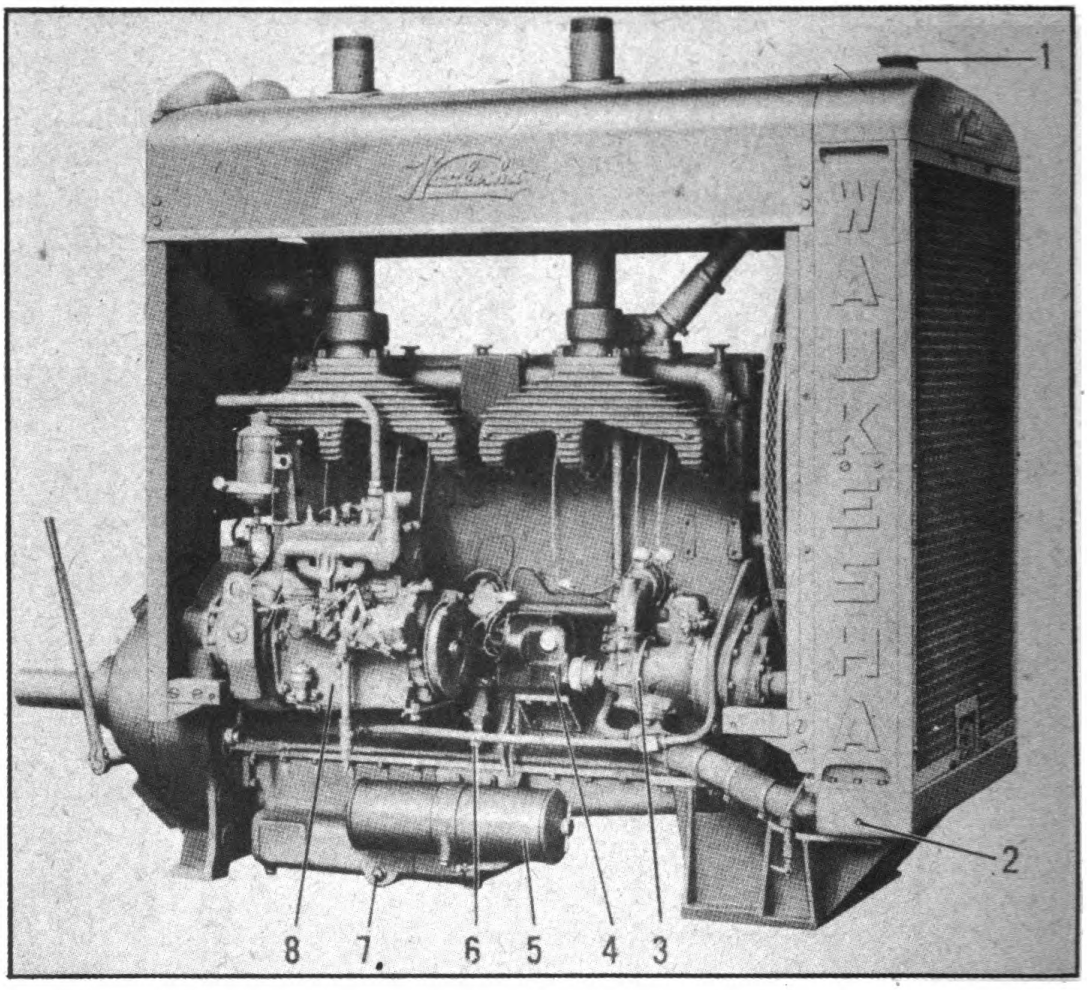


FIGURE 2 - EXHAUST SIDE OF UNIT

1. Radiator filler opening. 2. Pipe plug drain at base of radiator. 3. Governor and water pump. 4. Magneto. 5. Horizontal type oil filter. 6. Oil relief valve. 7. Pipe plug drain in oil pan. 8. Starting engine.

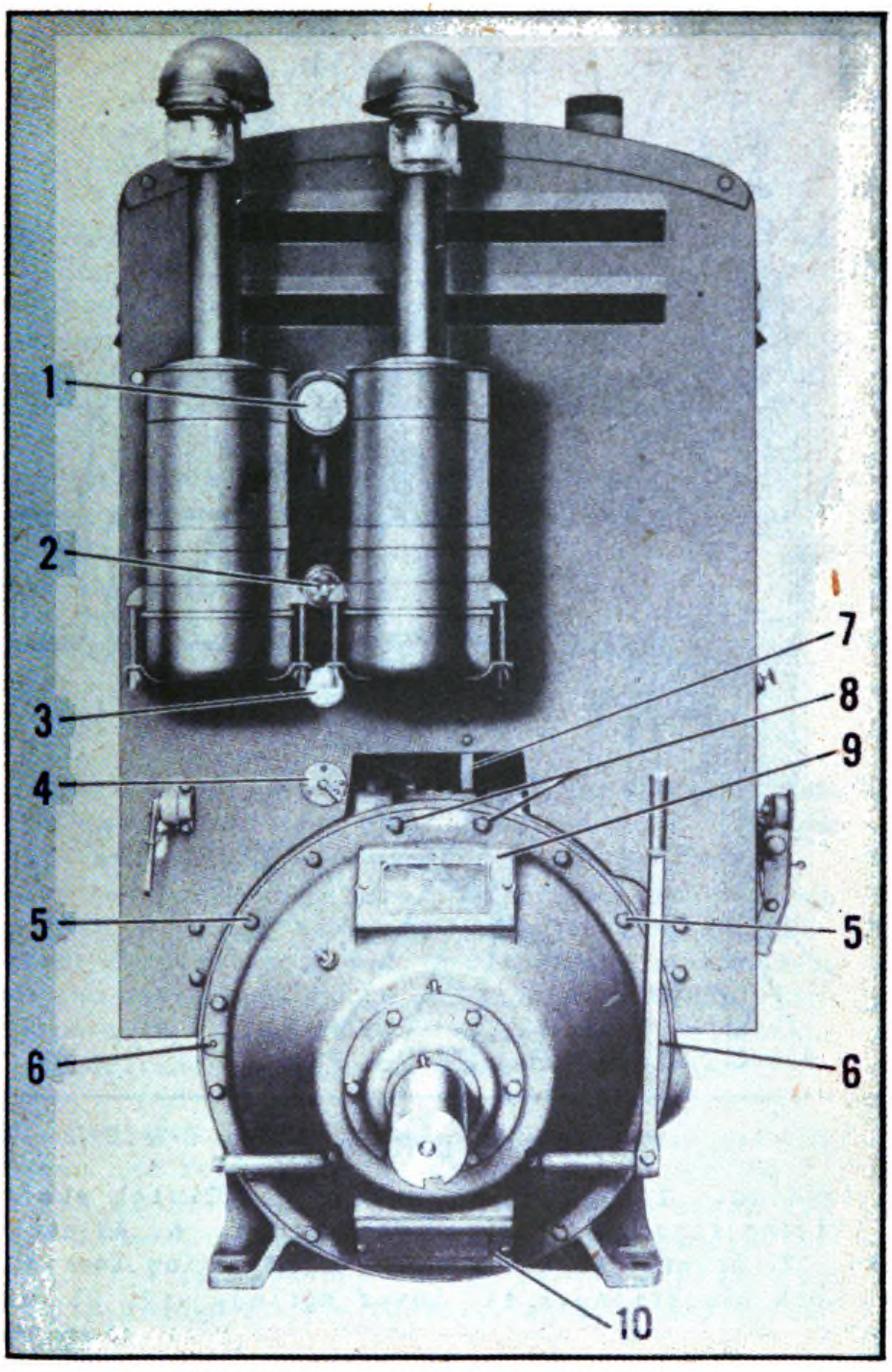


FIGURE 3 - REAR VIEW OF UNIT

1. Vacuum gauge. 2. Coolant temperature gauge. 3. Oil pressure gauge. 4. Ignition switch. 5. Position of long cap screws in installing clutch. 6. Cap screw holes for clutch removal. 7. Rear panel brace. 8. Position of long cap screws for clutch removal. 9. Inspection plate. 10. Clutch bottom cover plate.

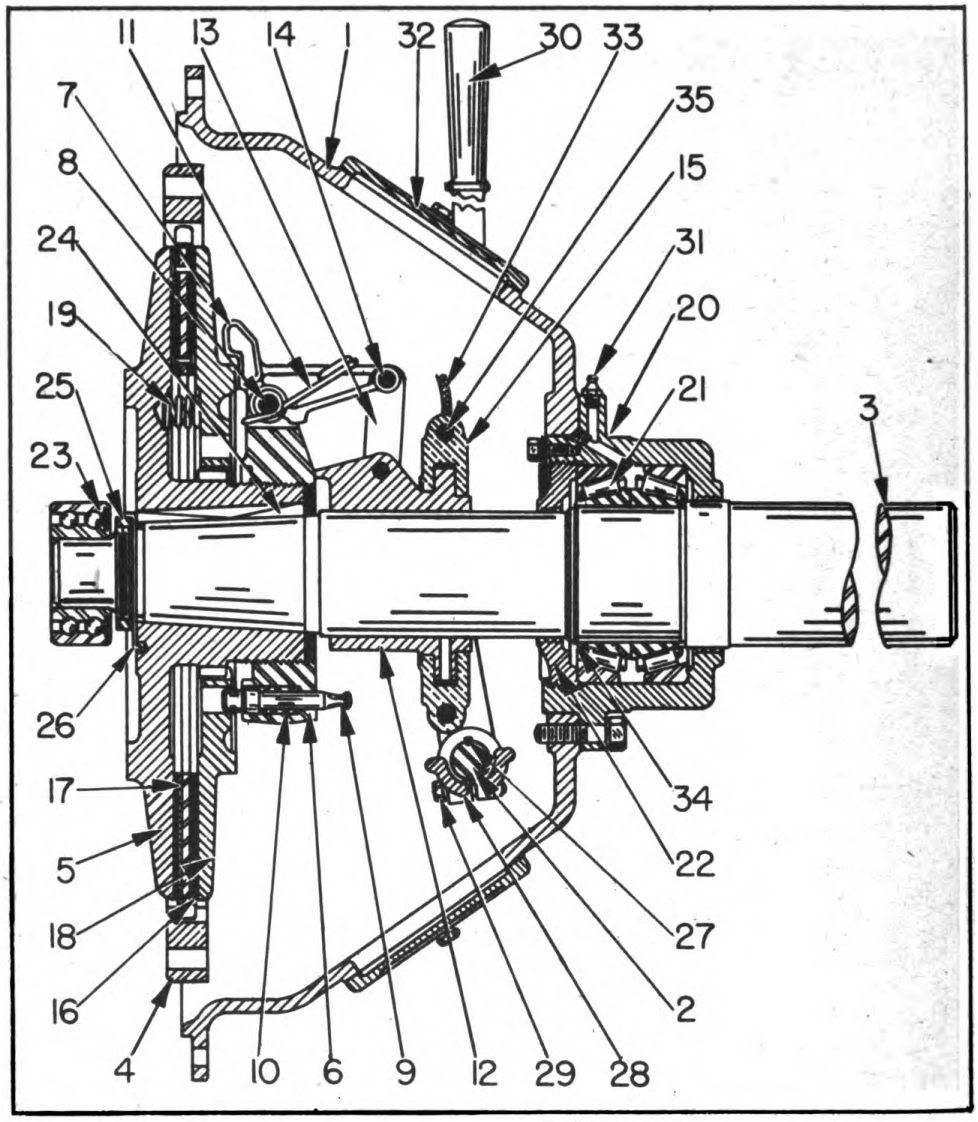


FIGURE 4 - CLUTCH ASSEMBLY

1. Housing. 2. Operating shaft. 3. Clutch shaft. 4. Driving ring. 5. Hub and back plate. 6. Adjusting yoke. 7. Lever. 8. Lever pin. 9. Adjusting lock pin. 10. Lock pin spring. 11. Lever spring. 12. Sliding sleeve. 13. Lever link. 14. Lever link pin. 15. Sleeve collar pin assembly. 16. Driving plate. 17. Friction discs. 18. Floating plate. 19. Release springs. 20. Bearing carrier. 21. Timken bearings. 22. Bearing retainer. 23. Ball bearing. 24. Key. 25. Shaft nut. 26. Lock washer. 27. Woodruff key. 28. Clutch yoke. 29. Cap screw. 30. Hand lever. 31. Alemite fittings. 32. Hand hole plate. 33. Flexible hose 34. Snap ring. 35. Sleeve collar pin.

MAINTENANCE MANUAL

PART I

UNIT BREAKDOWN

100 - **GENERAL** - Overhaul and maintenance involves the breakdown of many engine assemblies which are not accessible until unit and accessory parts are removed. This section deals with the unit parts: roof, rear panel and gauges, radiator, air cleaners, clutch, and starting motor assembly.

101- **DRAIN FUEL, OIL AND WATER** - If the contemplated repairs or adjustments involve the fuel, oil, or cooling systems of either engine, it is a good plan to drain these immediately.

102 - **ROOF** - The unit roof is supported by the radiator and the rear panel. Its removal involves merely unbolting from these members.

103 - **REAR PANEL** - Before the rear panel can be removed, it is necessary that the lines to the oil pressure, water temperature and vacuum gauges be broken. Also remove the air intake hose connection, the wires to the ignition switch, the clevis pin joining the throttle control and the reach rod, and the side rails. Now remove the rear panel brace and unbolt the panel from the ears on either side of the flywheel housing. The panel and air cleaners may then be removed together.

104 - **RADIATOR** - Prior to removing the radiator, arrange a crane and rope sling so that the unit may be lifted off the front support when free. Then break the top and bottom water hose connections and remove the fan guard. The fan guard consists of two halves, mounted on bolts welded to the radiator shrouds and bolted together above the fan hub. When the guard has been removed, remove the two nuts holding the radiator to the front support so that the unit may be lifted free.

105 - **AIR CLEANERS** - The air cleaners are bolted to a mounting pad on the rear panel and secured further by straps across the bottom of each. Complete service and

644168 O - 45 - 9

maintenance information for these units is given in Paragraphs 416 and 417 of the Operator's Manual.

106 - REMOVING CLUTCH - Be sure that the clutch is in the engaged position and remove the cover plate so that internal parts can be watched as the clutch is removed. Then remove the cap screws 8, Figure 3, and replace them with two 1/2 - 13 x 6 studs. Remove all the other cap screws and place two 1/2 - 13 x 2-1/4 cap screws in the holes 6, Figure 3. Tighten these screws alternately until the clutch pilot bearing is free of the flywheel and the gear driving plate 16, Figure 4, disengaged. Use a crane and rope sling in removing the clutch for the unit weighs about 460 pounds.

107 - CLUTCH DISASSEMBLY - Disassembly and replacement of clutch parts is all accomplished from the front end. First pull the pilot bearing off the shaft and then remove the lock nut. This permits removal of the cross shaft that holds the throwout yoke in position. Disconnect the grease line. Now the entire clutch can be pulled off the shaft; the hubs are a taper fit and are usually easily loosened if a brass drift is used. After the clutch has been removed from the shaft, it can be disassembled by turning the adjusting yoke to the left until it is free of its thread, which will then allow the front plate, drive plate and other component parts to be removed and replaced if necessary.

108 - INSTALLING CLUTCH - Prior to re-installing the clutch, make sure that the driving ring 4 is secure on the flywheel, the clutch in engaged position, and the inspection opening plate removed. Now turn the clutch shaft, watching the driving plate 16 carefully. It is probably not exactly concentric with the shaft, consequently it will appear higher in one position. See that this high point is up when the clutch is installed. Now install the two 1/2 - 13 x 6 studs in the same holes 8, Figure 3, used when the clutch was removed, and place the clutch in position on the studs. Place two 1/2 - 13 x 2-1/4 cap screws in the holes 5, Figure 3, and tighten alternately. The studs will pilot the

clutch pilot bearing into position as the cap screws are tightened, and the position of the gears can be viewed through the inspection opening and shifted slightly if necessary. As soon as the long cap screws have pulled the clutch close enough to the flywheel housing for the regular mounting screws to take hold, install these. When the clutch housing is snug against the flywheel housing, pull the cap screws tight with a torque wrench. Tighten the screws in pairs, one opposite the other, so that neither the flywheel housing nor the clutch housing will be distorted.

109 - REMOVING THE STARTING UNIT - It is advisable to remove the complete starting unit - engine, clutch and transmission - if any replacements or repairs are contemplated. The unit is relatively light and can then be removed to a work bench to facilitate operations. Prior to removal, the cooling, fuel and oiling systems should be drained. Then break the top and bottom water connections, remove the choke wire bracket and disconnect the fuel supply line at the carburetor intake. Unscrew the two cap screws which hold the starter bendix housing to the flywheel housing of the large engine and remove the bolts which hold the front support of the starting unit to the mounting bracket. Now lift and remove the entire starting unit, being careful in withdrawing the bendix assembly from the flywheel housing. Two men can lift the starting unit, although if crane facilities are available it is well to make use of them. Instructions for disassembly and assembly of the starting unit are given in Part V.

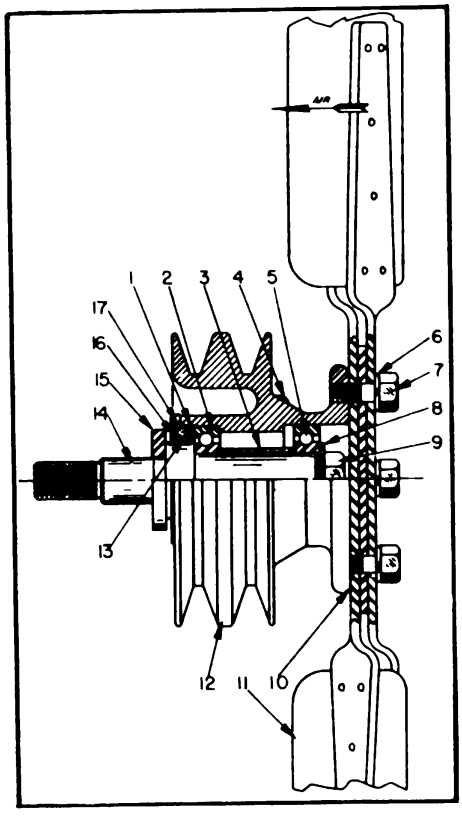


FIGURE 5
FAN AND HUB ASSEMBLY

1. Cork retaining washer. 2. Rear ball bearing. 3. Bearing spacer. 4. Oil plug. 5. Front ball bearing. 6. Lock washer. 7. Cap screw. 8. Clamp washer. 9. Slotted nut. 10. Gasket. 11. Fan blade. 12. Hub. 13. Cork washer. 14. Spindle. 15. Clamp washer. 16. Retainer. 17. Lock wire.

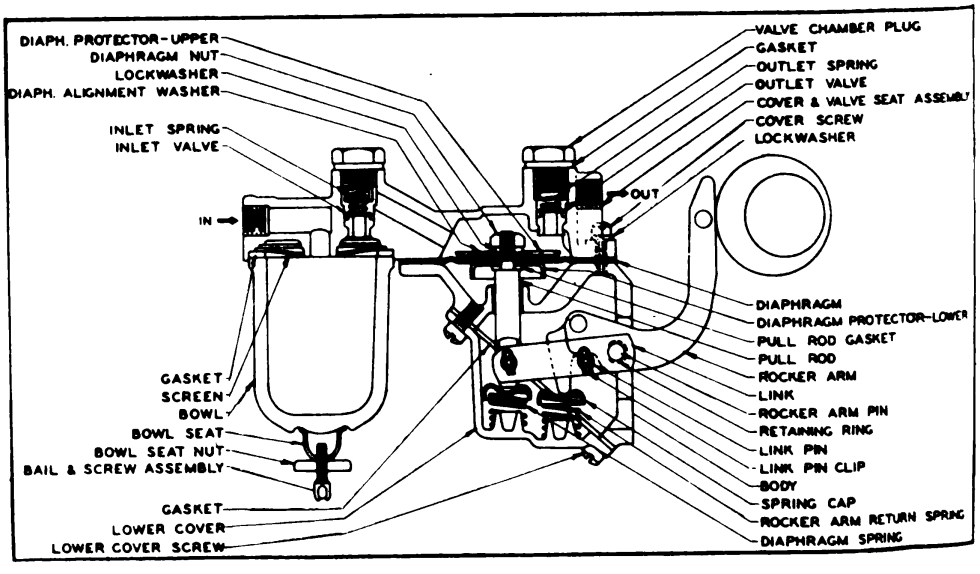


FIGURE 6 - FUEL PUMP

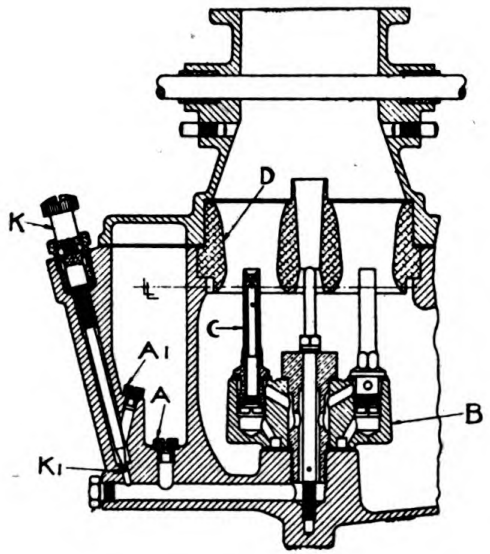


FIGURE 7A

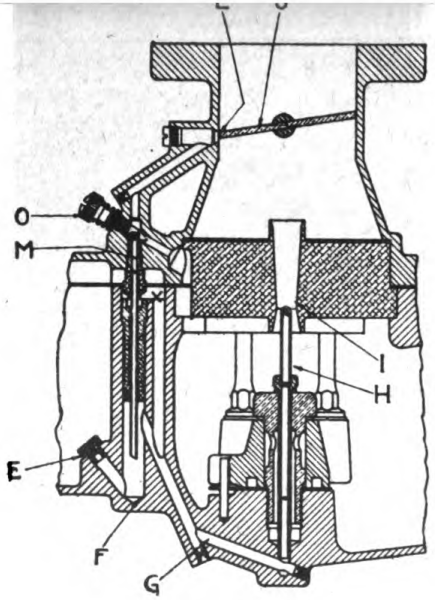


FIGURE 7B

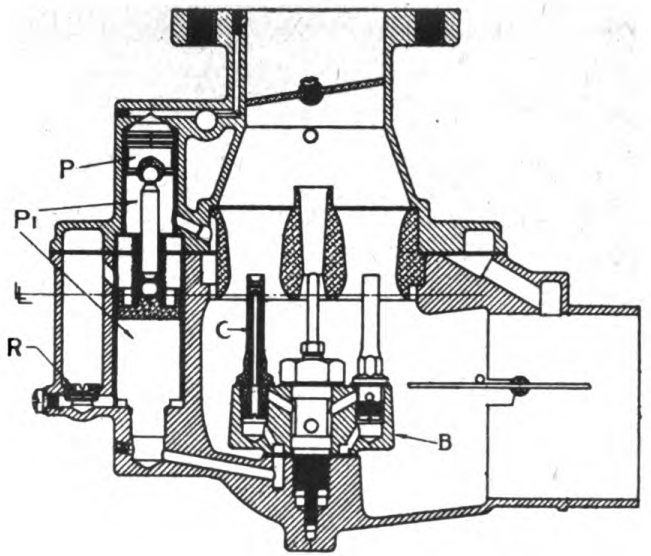


FIGURE 7C

FIGURE 7 - CARBURETOR CROSS SECTION

A. Main jet. B. Jet holder. C. Discharge tube. D. Venturi throat. E. Compensator. F. Well. X. Air Chamber at top of well. G. Compensator channels. H. Cap jet. I. Throat of small central venturi. J. Throttle butterfly. L. Priming hole. M. Idling jet. O. Idling adjusting needle. P. Accelerating pump piston. P-1 Pump well. R. Check valve.

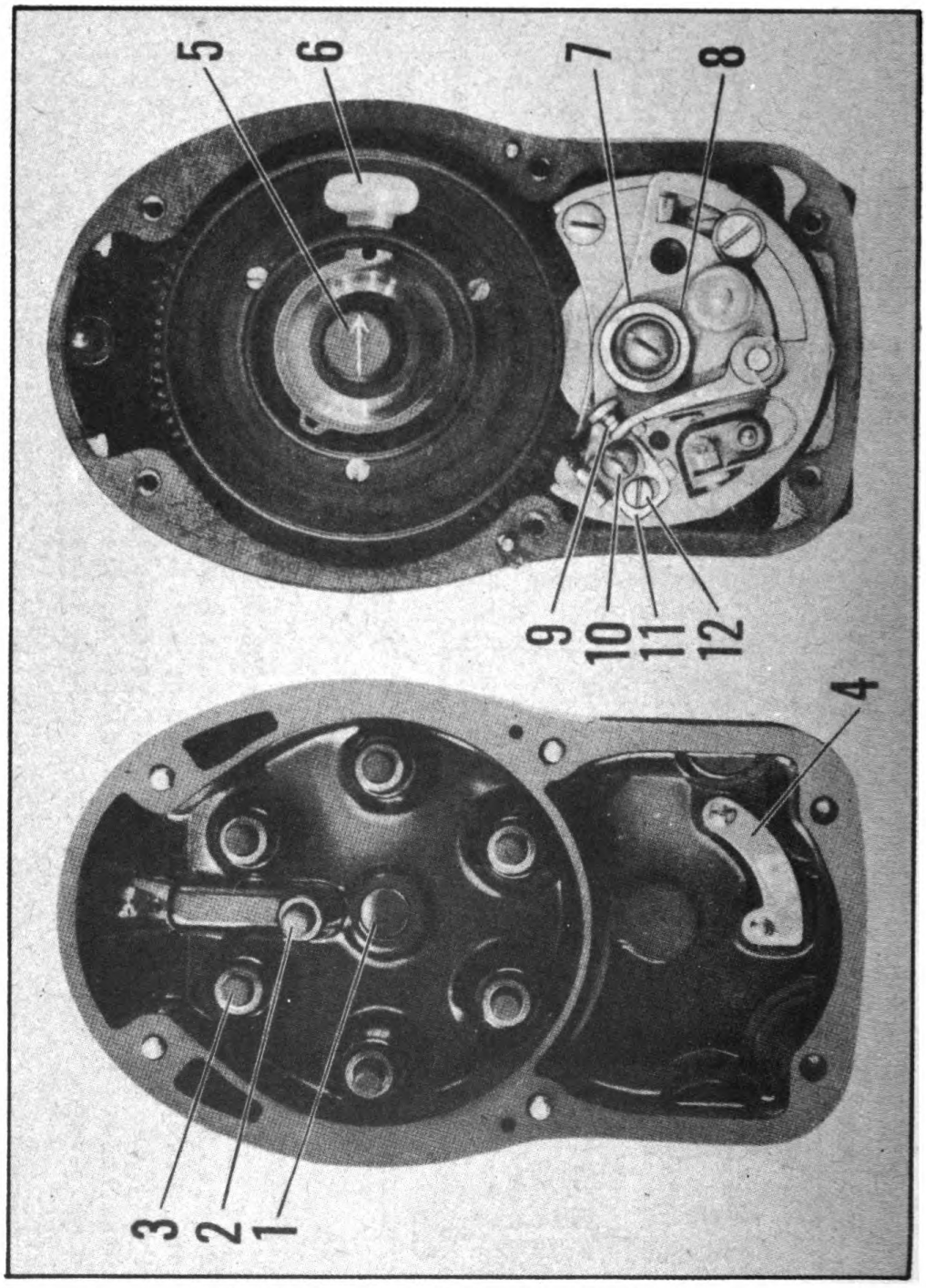


FIGURE 8 - MAGNETO, COVER REMOVED

1. Inspection window. 2. Center distributor brush. 3. Distributor brush. 4. Grounding plate. 5. Indicator arrow - shows position of distributor rotor segment. 6. Distributor rotor segment. 7. Interrupter cam. 8. Cam lubricating felt wick. 9. Contact points. 10. Contact bracket fastening screw. 11. Contact bracket. 12. Adjusting screw.

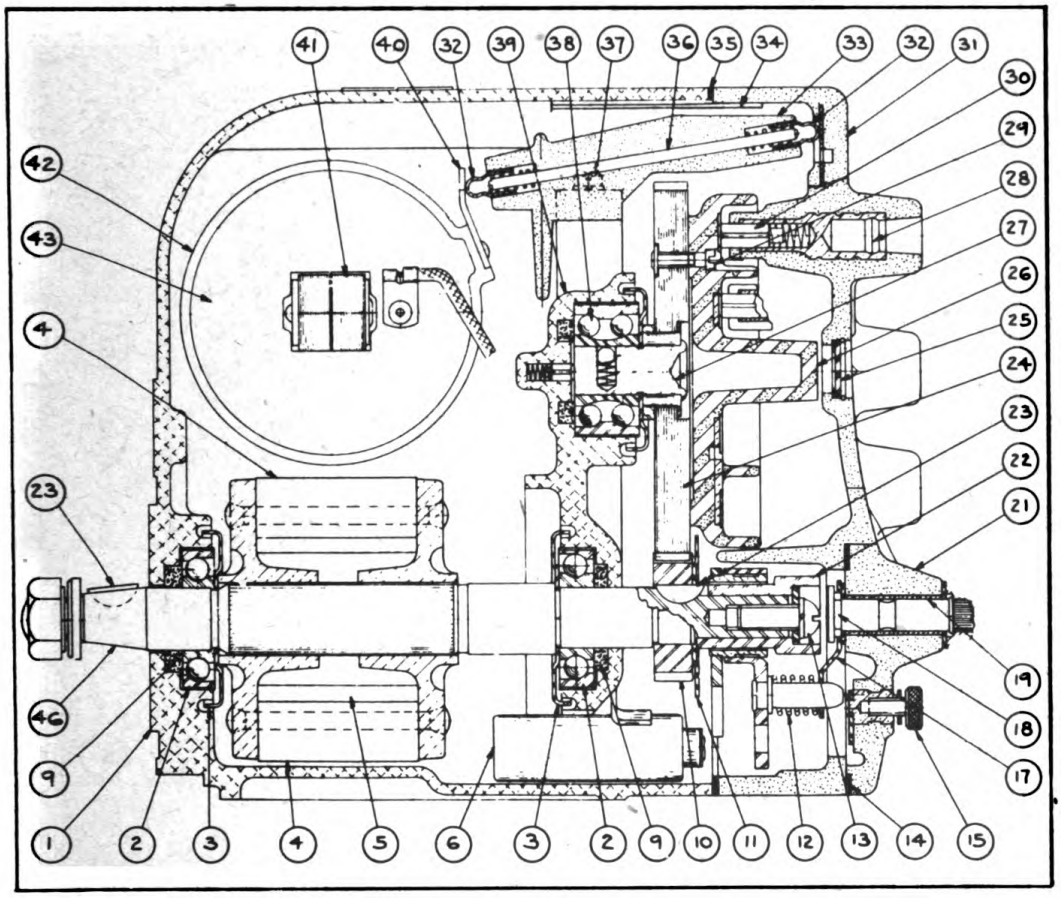


FIGURE 9 - MAGNETO SECTION VIEWS

1. Magneto housing. 2. Ball bearings. 3. Washer (grease retaining). 4. Magneto rotor. 5. Cast magnets. 6. Condenser. 9. Felt sealing washer. 10. Magnet rotor gear. 11. Indicating washer. 12. Interrupter assy. tension spring. 13. Cam fastening screw. 14. End cap gasket. 15. Thumb screw terminal. 17. "U" shaped timing lever. 18. Key stud for "U" bracket. 19. Lever shaft bearing. 21. Control arm cap. 22. Cam. 23. Woodruff key. 24. Distributor gear. 25. Observation window. 26. Distributor rotor. 27. Distributor gear shaft. 28. Cable clip. 29. Rotor fastening screw. 30. High-tension brush. 31. Distributor plate. 32. Contact terminal. 33. High-tension conductor. 34. Insulation. 35. Dist. plate gasket. 36. Conducting rod. 37. Conductor fastening screw. 38. Distributor gear ball bearings. 39. Distributor gear bracket. 40. Brass electrode. 41. Coil core. 42. Coil housing. 43. High-tension coil. 44. Cam lubricating felt wick. 46. Magnet rotor shaft. 47. Pole piece. 48. Edge distance hole screw. 49. Interrupter operating spring. 50. Interrupter lever. 51. Interrupter assembly complete. 52. Stop angle plate. 53. Support plate fast. screw. 54. Stud on inter. assembly. 55. Inter. support plate. 57. Dist. bracket screw. 58. Dist. plate fast screw. 59. Indicating marks. 60. Interrupter contacts. 61. Adjustable contact bracket. 62. Insulated bracket. 63. End cap fastening screw. 64. Coil mounting screw. 65. Ventilator. 66. Ventilator fast. screw.

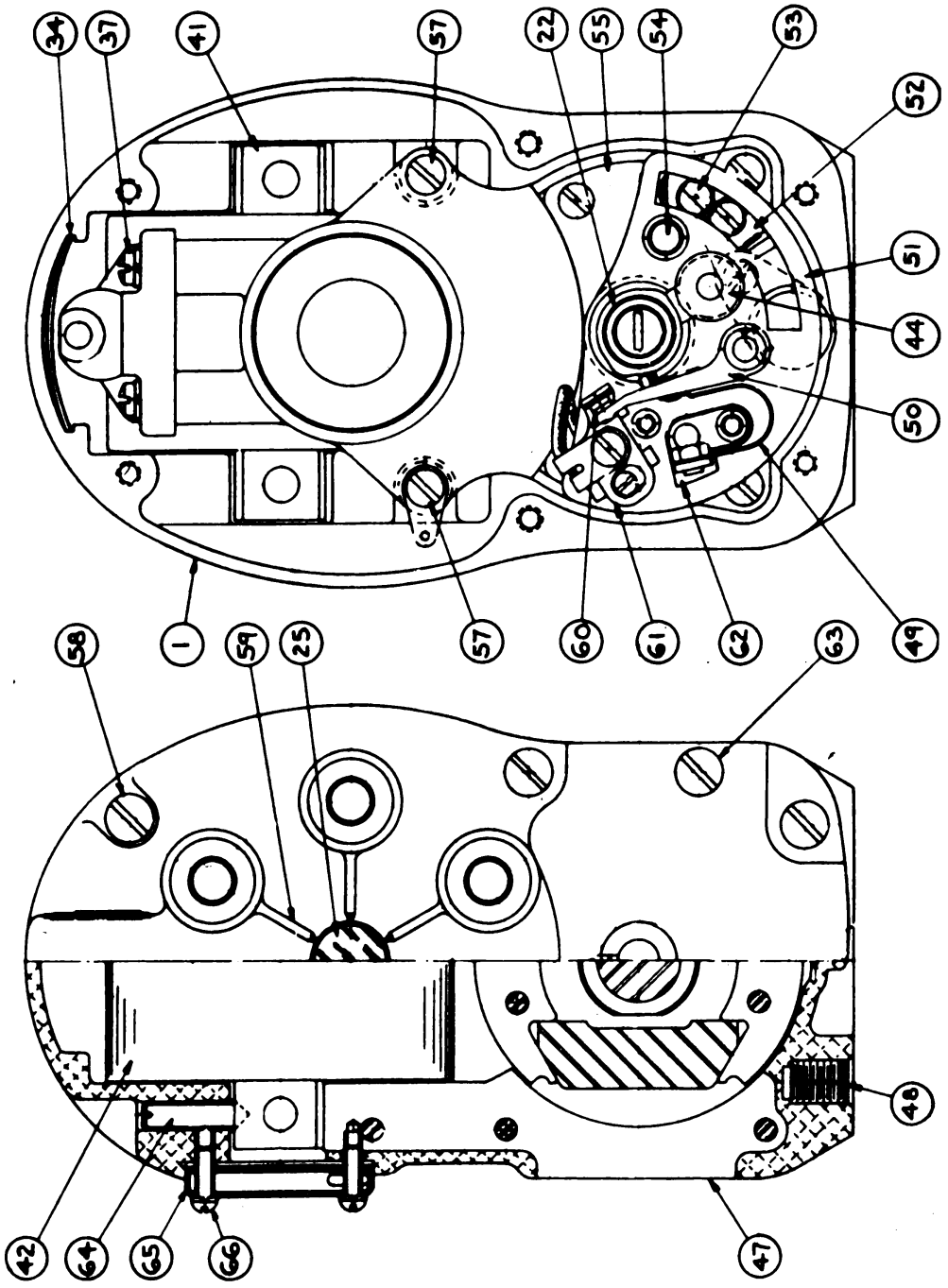
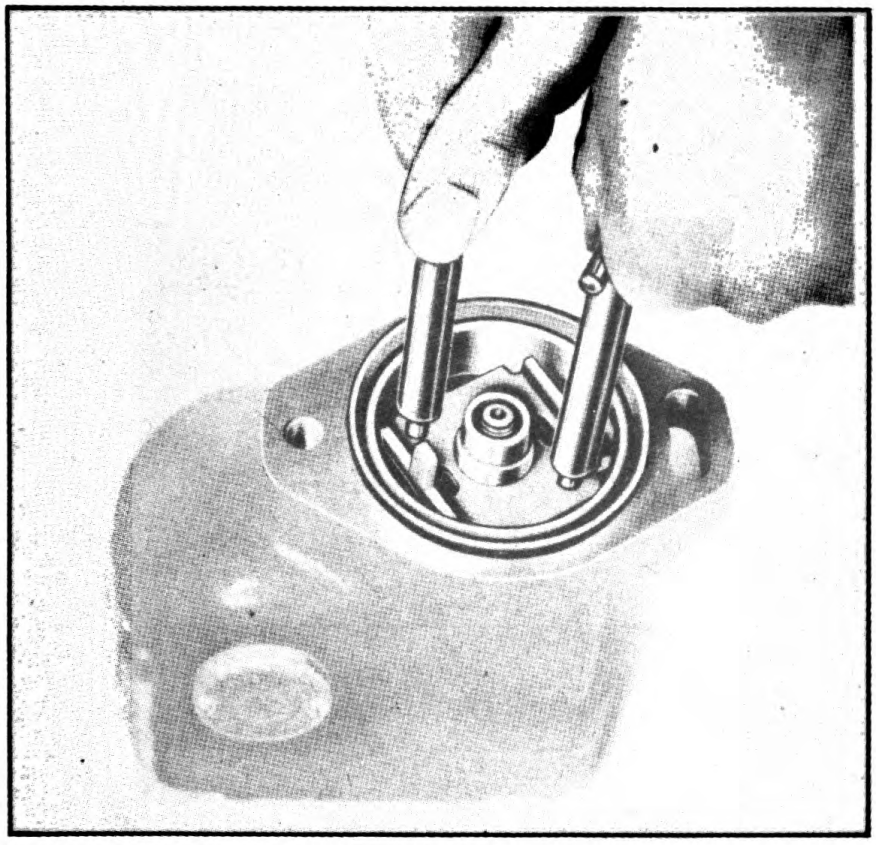


FIGURE 9 - MAGNETO SECTION VIEWS (Cont.)



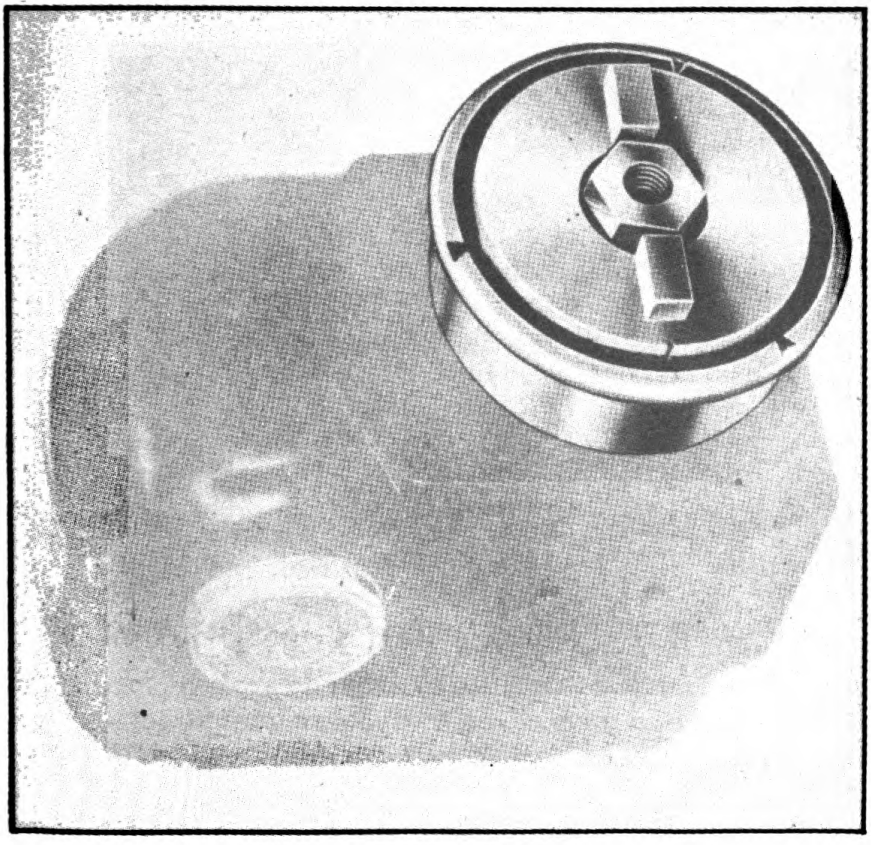


FIGURE 10 - MAGNETO IMPULSE COUPLING, REMOVAL

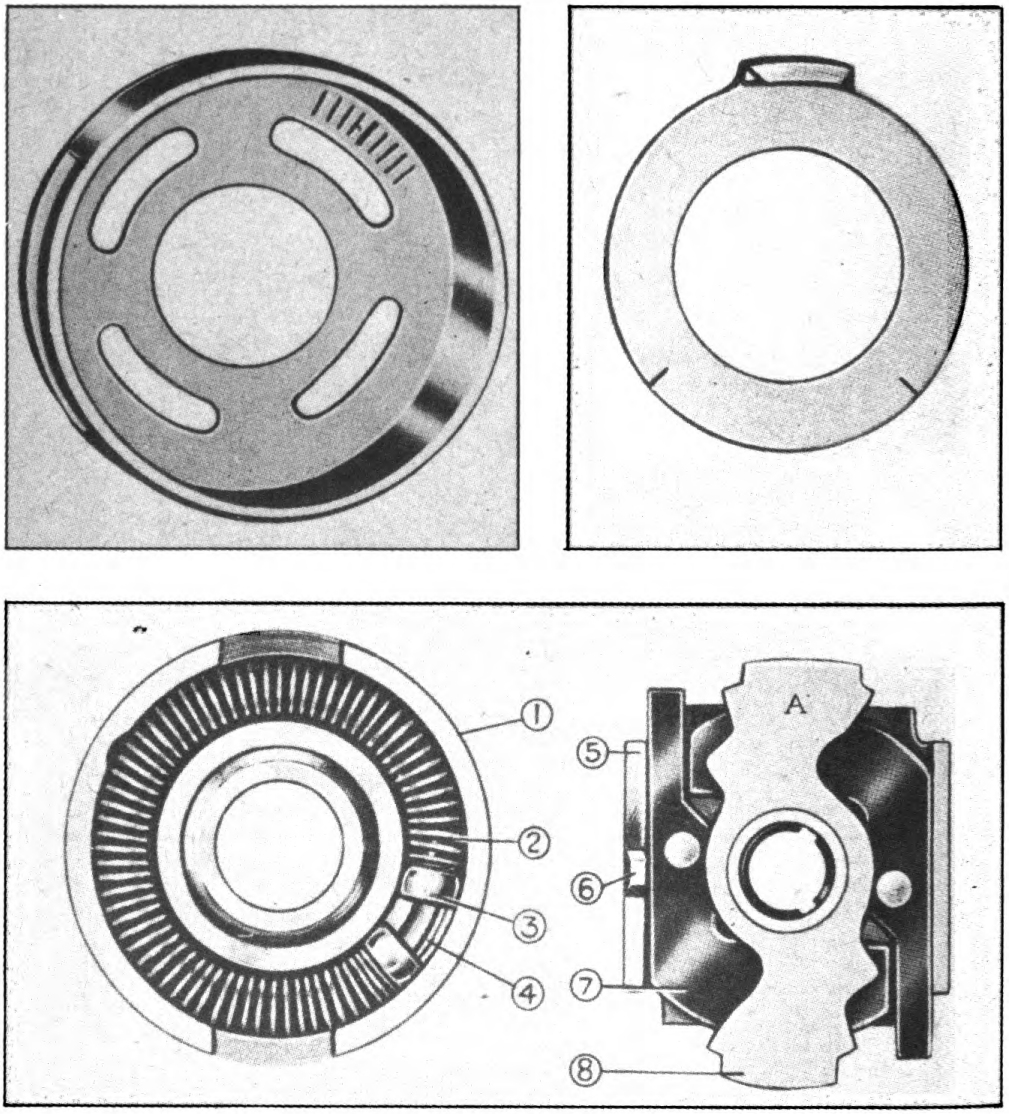


FIGURE 11 - MAGNETO IMPULSE COUPLING ASSEMBLY VIEWS

1. Coupling housing. 2. Felt wick inside spiral spring. 3. Spiral spring head pins. 4. Groove in housing channel. 5. Coupling hub. 6. Ear of coupling hub. 7. Weights. 8. Cam.

PART II

MAIN ENGINE ACCESSORIES

200 - GENERAL - The material in this section describing the magneto, carburetor and fuel pump, is taken largely from the accessory manufacturers' instructions. When repairs or replacement of parts are necessary, it will generally be found advantageous to secure these from the accessory manufacturer's service station or direct from his factory.

201 - FAN AND HUB - Figure 5 is a section view of the fan and hub. This assembly can be easily detached from the fan bracket by unscrewing the adjusting stud and retaining nut. Further disassembly is accomplished by removing the cap screws, 7, which hold the fan blades, 11, to the hub, 12. The entire spindle assembly may then be removed from the hub by removing the slotted nut, 9, and clamp washer, 8, and pressing the spindle through the front ball bearing, 5. The rear ball bearing, 2, may be pressed from the spindle after removing the clamp washer, 15; retainer, 16; lock wire, 17; cork washer, 13; and retainer washer, 1.

202 - FUEL PUMP - The fuel pump is an A-C Type D. It is shown in section in Figure 9, which illustrates clearly its assembly and disassembly. Ordinarily the only attention it will require is occasional cleaning of the sediment bowl. This is released by unscrewing the bowl seat nut. In replacing, be sure that the gasket at the top is in good condition.

203 - CARBURETOR, GENERAL DESCRIPTION - The carburetor is a Zenith 158 MV, multi-venturi type. The fuel bowl is on the side of the carburetor with all fuel passages at the lowest points so that the tipping of the carburetor in any direction will not tend to lower or raise the level of fuel in the jets. Fuel cannot accumulate from condensation or overchoking because it drains into the specially designed sump in the air intake from where it is drained by means of piping.

The primary duty of a carburetor is to supply a combustible mixture of fuel and air to the engine. It must supply a sufficient amount of mixture to develop the full power of the engine, and it must mix the cor-

rect proportions of fuel and air to meet all demands of the engine.

Five venturii are used for the purpose of insuring the very best atomization and mixing of fuel and air. The air is measured through the venturii and the fuel through calibrated jets. In order that the fuel be completely atomized, the tips of the jets are located at the throats of the venturii where, due to the constriction of area, the air velocity is highest. The finer the particles into which the fuel is broken, the better the mixture of fuel and air will be. As equal distribution to the cylinders, efficiency and explosive force depend on the fuel-air mixture, it is obvious that fine atomization is very important.

The carburetor embodies the Baverey Compound Nozzle principle. A single jet carburetor tends to run rich as speed and suction increase because the flow of fuel will increase faster than the flow of air under increasing suction. One of the jets (the main jet) in this carburetor acts the same way. Another jet (the compensator) is added, which is unaffected by suction and accordingly delivers the same amount of fuel at all suctions and so leans out with increasing suction and air flow. The two, one rich, the other lean, flowing in combination, produce a mixture of correct proportions at all suctions.

In the Multi-Venturi carburetor the main jet is shown at (A) in Fig. 7a. Fuel measured through the jet flows through the main jet channel to the jet holder (B) and through passages therein to the four discharge tubes (C) which terminate at the throat of the four venturii (D).

The compensator (E) Fig. 7b, empties into a well (F) which is open to the air at its top (X). Air entering this well breaks suction on the compensator so it flows only by gravity from the head of fuel in the fuel bowl which is kept at a constant height by the float mechanism.

From the well (F) the fuel fed to it by the compensator passes through the compensator channels (G) to the cap

jet (H) which terminates at the throat of the small central venturi (I).

Thus the fuel measured through the main jet and compensator is picked off the discharge tubes and cap jet by the air traveling at high velocity through the venturii, thoroughly mixed and carried on to the manifold and cylinders in an amount determined by the position of the throttle butterfly (J).

204 - CARBURETOR, IDLING - See Fig. 7b. In this type of Zenith carburetor, slow running is accomplished by a complete idling system that is independent of other adjustments.

When the throttle butterfly is just cracked open in slow running position, there is a strong suction above it but practically none under it. This suction works on the priming hole (L) and draws the fuel from the idling jet (M) and air from the idling adjusting needle (O). Opening the needle leans the mixture and closing enriches it. This mixture is rather rich when it enters the carburetor barrel through priming hole (L) but is diluted to the proper value by air that passes around the slightly open throttle plate (J).

205 - CARBURETOR, ACCELERATION - See Fig. 7c. Because of its greater weight, the fuel does not start to flow as soon as the air when the throttle is thrown wide open from low or medium speed positions. To supply fuel at the same instant as air flow, the accelerating pump is used. In Fig. 7c is shown the accelerating system. When the throttle is only partly open the suction above it is strong enough to hold piston (P) at the top of pump well (P-1). Fuel is then measured through the main jet and compensator as explained before. When the throttle is wide open or nearly so the suction falls--and so does the piston. The falling piston builds up a pressure in the well below it which closes check valve (R), preventing fuel being forced back into the fuel bowl, thus causing it to flow through the passages shown to the jet block (B) and through that to the four power jets which are inside of discharge tubes (C) and, like them, terminate in the throats of the venturii.

This additional fuel joins the regular supply and augments it to the full power mixture strength, the amount being limited by the calibrated holes in the tips of the power jets. Quick or slow opening of the throttle which causes the piston to drop thus supplies an accelerating charge under pressure. When the throttle is closed part way, the suction increase lifts the piston to a position ready for the next acceleration demand.

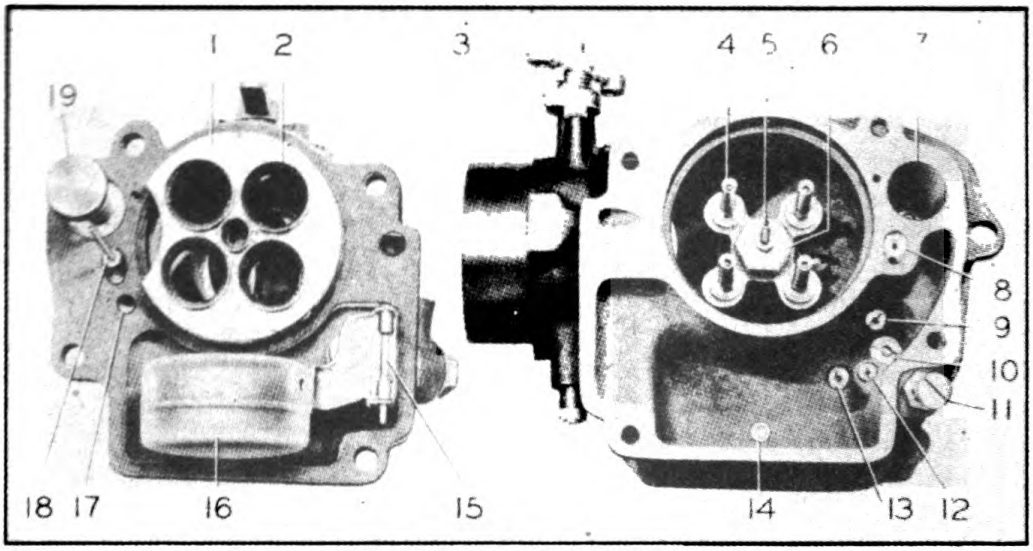


FIGURE A

1. Venturi holder. 2. Venturi. 3. Throttle stop lever. 4. Power and accelerating jet assembly. 5. Cap jet. 6. Jet holder retaining plug. 7. Accelerating pump well. 8. Idling jet channel. 9. Compensator jet 10. Check valve. 11. Main jet adjustment needle. 12. Regulator jet. 13. Main jet. 14. Drain plug. 15. Float axle. 16. Float. 17. Channel to maintain atmospheric pressure on float chamber. 18. Idling jet assembly. 19. Accelerating pump.

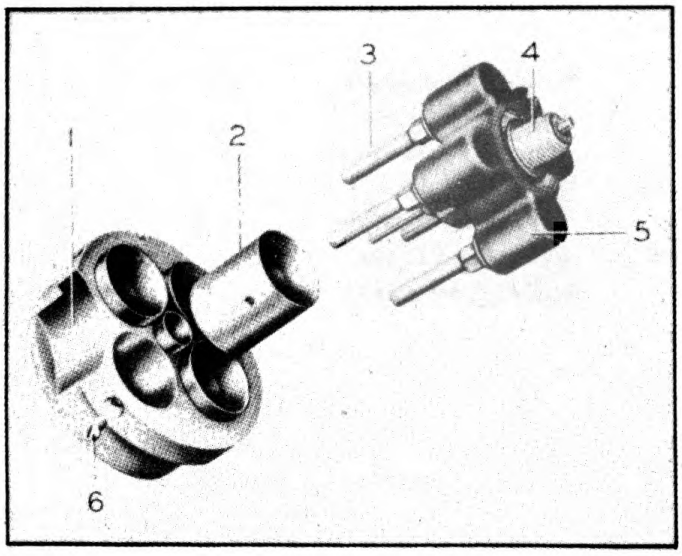


FIGURE B

1. Venturi holder.
2. Venturi.
3. Discharge tube.
4. Jet holder retaining plug.
5. Jet holder.
6. Venturi holding screw.

205-A - REMOVAL OF THE CARBURETOR - As a preliminary to removal, shut off the fuel supply and remove the 7/16" bottom screw plug to drain the float chamber. Unscrew the fuel line fitting from the brass union and disconnect the choke wire and throttle rod. Remove the air horn and while supporting the carburetor, take out the two cap screws holding the flange to the pipe from the manifold. Take the carburetor to a clean bench for disassembly.

205-B - DISASSEMBLY OF THE CARBURETOR - If it is necessary to completely dismantle the carburetor, follow this procedure:

1. Make sure that tools, bench and pan for washing parts are clean.

2. Remove the fuel union body, gaskets and screen using a 3/4" wrench to turn out the hexagonal head filter plug.

3. Turn out the four assembly cap screws and washers with a 9/16" wrench, and separate the upper and lower bodies. Be careful of the float assembly and long idling jet. The aluminum venturi holder may come out at the same time.

4. Lift out the accelerating pump assembly. This should not be taken apart. It consists of upper brass piston, brass spring retainer cup, brass spring, lower brass piston, and a steel connecting rod, ball shaped at both ends. These seat in the pistons which are rolled over the ball-ends forming semi-universal swivel connections.

5. Remove the float axle, using a screwdriver or pliers. The bracket is riveted to the body. Lift out the float.

6. Shake the triangular needle valve out of its seat and turn out the seat and gasket with 5/8" wrench.

7. Unscrew the long idling jet with a 9/32" wrench. Do not attempt to remove the brass liners in the accelerating pump well.

8. The idling jet adjusting screw and throttle stop lever adjusting screw should be removed with 1/4" screwdriver. The locking springs pull off the screws.

9. The channel plug cap screw at the upper end of the accelerating well can be taken out with a 13/32" wrench.

10. Screw out the three throttle plate holding screws and lift out the plate.

11. Loosen the throttle clamp lever screw and pull the lever off the stop lever hub.

12. Drive out the taper pin and pull off the stop lever.

13. Draw the throttle shaft through the body. Drive out the taper pin through the shaft bushing and pull off the bushing, the shaft packing ring and washer.

14. Do not remove the stop pins just under the shaft holes.

15. The brass channel screw plug above the idle adjusting screw can be taken out with a 1/4" screwdriver.

16. Do not attempt to remove the three small steel channel plugs driven into the body.

17. A very small screw plug closes the upper end of the vacuum channel in the upper flange. Remove it with a 1/16" screwdriver.

18. The four large venturi are held in the holder by 7/32" brass set screws. Remove these with a small screwdriver and lift out the venturi.

19. In the bottom of the float chamber are four jets. The uppermost of these is the high speed regulator Located an inch away and slightly lower on the opposite wall of the narrow end of the float chamber is the compensating jet. The main jet is set at an angle on the bottom of the chamber. Flat on the bottom and twice the size of the other three jets is the check valve. A flat brass disc lies loosely in the valve. Use a 1/4" screwdriver for removing the small jets and a 1/2" size for the check valve.

20. Turn out the main jet needle adjustment by hand. The ratchet stud can be turned out of the body with a 9/16" wrench. The brass packing bushing ring and felt packing will remain in the body. They can be picked out, or the needle can be re-screwed through the packing and then pulled out.

21. Remove the economizer valve at the bottom of the accelerator well with a half inch screwdriver with a 1/8" slot about 3/16" deep filed in the center. Lift out the mushroom shaped economizer valve center and spring.

22. The four discharge tubes are screwed out of the jet holder with Zenith tool #15284. This is a pipe, shaped at the end to grip a 5/16" hexagonal nut and fitted with a handle.

23. Hold the tubes with the Zenith tool or a 5/16" wrench and screw out the power and accelerating jets with a 1/4" screwdriver. Lift off the washers.

24. Screw out the center cap jet with 5/16" wrench.

25. Screw out the jet holder retaining plug and washer with a 7/8" deep socket wrench and lift out the jet holder and washer. Do not attempt to remove the jet holder and washer positioning pin.

26. Remove the two air shutter plate screws and lift out the shutter plate.

27. Drive the taper pin through the air shutter shaft thrust washer and draw off the washer.

28. Remove the shaft and drive taper pin out of the air shutter lever hub and pull it off the shaft with the coil spring.

29. Loosen the screw in the brass spring retainer and draw off the spring spacer and the retainer.

30. Do not remove the shutter plate stop pin or venturi holder positioning pin.

31. Do not remove the channel plugs driven into the lower body.

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32. Clean the housing castings with gasoline and blow out all the channels with compressed air. Replace damaged parts. If the carburetor has been in service for some time, it is advisable to replace all gaskets, fuel intake needle valve and seat, and throttle and air shutter shafts if they show any wear.

205-C - ASSEMBLY OF THE CARBURETOR - Every part must be clean and in perfect working condition.

1. Insert the air shutter shaft and pin on the thrust washer.

2. Push the brass spring retainer on the body and tighten the screw.

3. Slip on the spring spacer, spring and air shutter lever. Insert the spring end in the hole in the retainer. Put one shank of the lever in loop of the spring and turn the lever on the shaft against the spring tension. Pin the lever to the shaft.

4. Insert the shutter plate, center it and tighten down the two shutter plate screws. Turn the plate to the closed position to make certain of a good fit with no binding.

5. Put the jet holder gasket in place and set in the holder with the positioning pin in the slot cut in the holder. Insert the jet holder retaining plug and washer and turn it down tightly.

6. Insert the power and accelerating jets and washers in the discharge tubes and tighten with a screwdriver.

7. Screw the discharge tube assemblies and washer into the holder and tighten them. Insert the cap jet and washer through the hole in the center of the retaining plug and screw it into the base of the carburetor body.

8. Screw the main jet, regulator jet, compensating jet and check valve assemblies into their respective positions in the bottom of the float chamber.

9. Set the venturi in position in the venturi holder and turn in the four brass set screws.

10. Place the holder above the five jets, positioning it with the pin driven in the body.

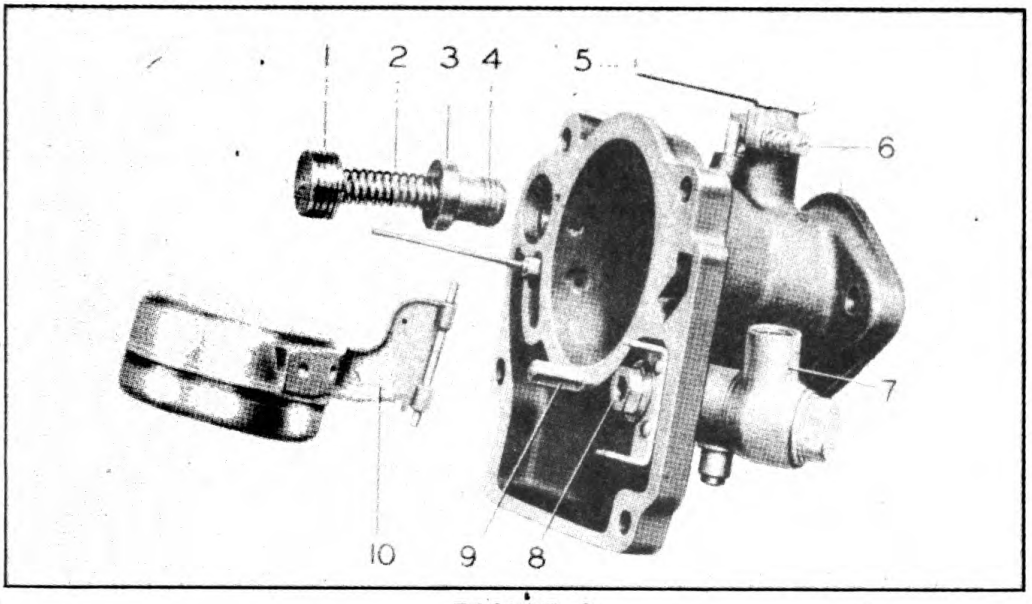

FIGURE C

1. Lower accelerating pump piston. 2. Accelerating pump spring. 3. Spring retainer. 4. Upper piston. 5. Throttle shaft clamp lever. 6. Throttle stop lever adjusting screw. 7. Fuel line union. 8. Fuel intake valve seat. 9. Fuel intake needle valve. 10. Float hinge.

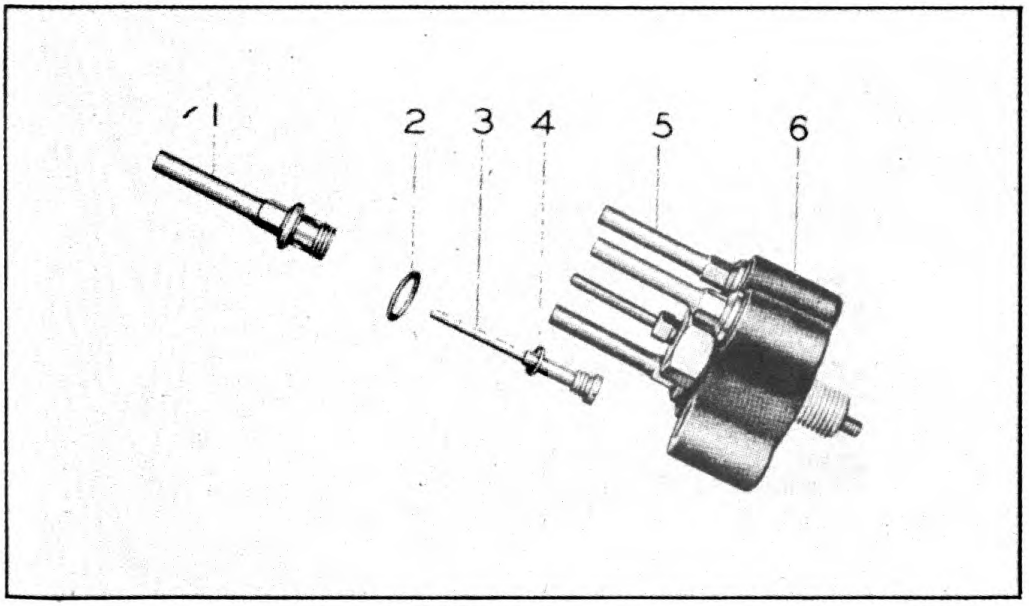

FIGURE D

1. Discharge tube. 2. Discharge tube gasket. 3. Power and accelerating jet. 4. Jet gasket. 5. Discharge tube. 6. Jet holder.

11. Place the packing washer and brass packing ring in the main jet regulator hole.

12. Turn in the ratchet stud and screw the long needle into position.

13. Place the gasket on the lower body and insert the accelerating pump assembly in the pump well.

14. Screw the idling jet into the upper body; no gasket is necessary.

15. Install new fuel intake valve seat, washer and needle valve.

16. Place the float hinge in the bracket and insert the hinge axle.

17. Fit together the upper and lower bodies, being careful of the float assembly and idling jet. Guide the upper accelerating pump piston and spring retainer into position.

18. Screw in assembly studs and lock washers and tighten them.

19. Insert the throttle shaft and place the shaft packing washer, the packing ring and bushing on the shaft. Pin the bushing with a taper pin.

20. Fasten the throttle plate in position with the three plate screws. It is extremely important to center the plate so that it will make a tight seal without binding and so that the upper edge of the plate meets exactly with the top of the triangular priming hole when the plate is in the closed position.

21. Push on the throttle stop lever and pin it to the shaft with a taper pin.

22. Push on the throttle stop clamp lever and tighten the screw.

23. Screw in the stop lever adjusting screw and spring and the idle adjusting screw and spring.

24. Put the gasket and brass union body in position, drop the cylindrical screen into the union body, put on the top gasket, insert the filter plug and turn down the plug to tighten the whole assembly.

25. Screw in all channel plugs and the small vacuum line plug in the top flange.

26. Install the carburetor on the engine, tightening the holding studs and hooking up the throttle rod and choke wire.

27. Set the idling adjusting screw and the main jet regulator adjusting screw at one full turn open as a preliminary adjustment. Set the throttle stop screw to hold the throttle just slightly open.

206 - **MAGNETO, GENERAL DESCRIPTION** - The main engine magneto is a Bosch MJA-6C, 102, Figure 9 shows various section views. This magneto employs the induction principle of current generation, the coil windings (43) being stationary and the magnets (5) rotated between laminated pole shoes (47). The condenser (6) and interrupter (51) are also stationary. Brush (30) and rotating track combinations are confined solely to the high-tension distributor (31). Screened ventilators (65) are mounted on either side of the housing (1) and the action of the magnet rotor (4) insures constant change of air throughout the interior of the magneto. A single casting (1), the open end of which is covered by the distributor plate (31) encloses the magneto. An observation window (25) in the distributor plate (31) and an arrow on the rotor (26) facilitate timing the magneto to the engine. IT IS UNNECESSARY TO REMOVE THE DISTRIBUTOR PLATE (31) WHEN TIMING THE MÁGNETO TO THE ENGINE. The magneto, producing an ignition spark only at certain definite points in the rotation of the magnet rotor (4), must be connected to the engine in such a manner that the spark is available always at the instant when required in the cylinder.

207 - **MAGNETO, DISASSEMBLY** - To disassemble the magneto, proceed as follows:

1. Loosen the distributor plate fastening screws.
2. Remove the distributor plate and gasket.
3. Unscrew the cam fastening screw.
4. Remove cam.
5. Unscrew the interrupter assembly fastening screws.
6. Remove the complete interrupter assembly.

7. Remove distributor rotor and gear assembly, along with the indicating washer.
8. Unscrew condenser bracket fastening screws and remove the condenser.
9. Pull rotor gear with gear puller ST425-1 and ST425-3 jaws.
10. Remove Woodruff Key from magnet rotor shaft.
11. Unscrew the distributor bracket fastening screws.
12. Remove the distributor bracket.
13. After the Woodruff Key in the drive end of the rotor shaft has been removed, the magnet rotor can be withdrawn from the magneto housing.
14. Upon loosening the high tension coil mounting screws, the coil can be removed from the housing.

The distributor gear bearing can be removed with puller TSE 5261. The magnet rotor bearing inner race is pulled with Bosch puller No. TSE 5265 with TSE-76108 jaws, while the outer race is removed with Bosch puller No. TSE 76102.

208 - INSPECTION AFTER DISASSEMBLY - Visually inspect the rotor gear, distributor gear and carbon brush for possible wear. Check the distributor plate for current leakage as well as any damage by means of a high voltage test outfit. If the distributor plate has no carbonized track, it is only necessary to wipe out the inside of the plate with a cloth dampened with a suitable cleaner such as acetone, alcohol, etc. However, if the plate has a carbonized track, the track should be scraped clean and the entire plate wiped out with a cloth dampened with alcohol.

The interrupter contacts should be checked. Pitted points can be dressed on a suitable stone; the use of a file is NOT recommended. If point renewal is necessary, always replace both the interrupter lever and contact bracket at the same time. Check the condenser for short circuit, leakage or damage. Examine the high tension coil for cracked housing, loose core, loose primary cable connection. Inspect all soldered connections. Check continuity of secondary winding on a condensocope, neon light or other similar testing device. Inspect ball bearing inner and outer race rings for scores and

excessive wear. Inner and outer race tracks should not be discolored and should have a mirror finish.

209 - REASSEMBLY OF MAGNETO - To replace the high tension coil:

1. Slide coil into magneto housing. Each end of the coil core is to rest on top of the magneto pole shoes in the magneto housing. The counter-sunk holes at either end of the coil core should be upright so as to allow the tapered end of the coil securing screws to engage the counter-sunk holes. Drive screws, into holes provided on the outside top of the magneto housing. Securely tighten screws so as to assure a good electrical connection between the coil core, and pole shoes. Apply a coat of shellac to the protruding end of each screw to prevent the entrance of moisture.

2. Insert the magnet rotor and replace the distributor gear bracket. Tighten the distributor gear bracket fastening screws tightly. After the Woodruff Key has been returned to its slot, the rotor gear can be pressed on with proper pressing tool and Arbor press. The condenser can then be replaced and the condenser bracket fastening screws securely tightened. The distributor rotor and gear assembly can then be inserted along with the indicating washer in such a manner that the slot in the indicating washer lines up with the Woodruff Key. The interrupter assembly can next be replaced and the fastening screw tightened securely. The cam notches which engage the Woodruff Key at the interrupter end of the magnet rotor shaft have the letters "A" and "C" stamped adjacent to them; "A" for anti-clockwise and "C" for clockwise. Assemble the cam to the magnet rotor shaft so that the notch marked in accordance with the rotation of the magneto, engages the Woodruff Key. Replace the cam fastening screw. The distributor plate and gasket is then assembled and the fastening screws tightened.

210 - REMAGNETIZING THE MAGNETO - The permanent magnet used in this instrument does not generally require remagnetizing. However, if it is deemed absolutely

necessary to remagnetize one of these units, use American Bosch magnetizer No. TSE 5210 for this purpose. The "Alnico" magnet used in this magneto is a special magnet with a great amount of magnetic strength, and a magnetizer with sufficient strength to fully saturate the magnet must be used. Therefore, make certain your magnetizer has strength equal to the above mentioned unit before remagnetizing an American Bosch magneto. The following procedure is to be followed when remagnetizing an MJA magneto on an American Bosch magnetizer No. TSE 5210. Remove magnet rotor from magneto and place rotor and jaws TSE 5237 on magnetizing stand. The magnet rotor shaft must be placed in such a position so that the keyway of the shaft is located at the left in a horizontal position when looking at the shaft from the drive end. After the rotor has been magnetized, reassemble the magneto and place the complete unit on the magnetizer making certain that the magnet rotor shaft is in the same position as outlined above. Using the flat ends of the jaws magnetize complete magneto after it has been assembled. (NOTE: WHEN REMAGNETIZING A COMPLETE MAGNETO, THE IMPULSE COUPLING SHOULD ALWAYS BE REMOVED.)

211 - EDGE DISTANCE - It is important, from the standpoint of efficiency, to interrupt the primary circuit in the high tension coil at the time when the magnet rotor is in its most favorable position for maximum magnetic disturbances or change of flux. This position of the magnet rotor in relation to the pole shoe is expressed in terms of a mechanical measurement called "edge distance". The edge distance is ALWAYS determined as the magnet rotor leaves the pole shoe; never when the magnet rotor approaches it. The proper edge distance for this magneto is 2 mm minimum and 3 mm maximum, an average of 2.5 mm. To measure the edge distance, an edge distance gauge or a mere piece of drill rod (2.5 mm) is inserted in one of the holes provided for this purpose in the bottom of the magneto housing. When the gauge has been inserted and located at the point where the magnet rotor just leaves the pole shoe, the interrupter contact points should be adjusted so that they have just started to open. In view of the fact that the most rapid flux reversal takes place when the contact points open at the proper edge distance position

of the rotor, this adjustment is important. After the contact bracket fastening screws have been loosened and proper adjustment obtained by turning the eccentric screw, do not forget to tighten the contact bracket fastening screws. Since the contact points and fibre block on the interrupter lever wear, it is recommended that the edge distance be checked periodically in order to assure maximum efficiency at all times.

212 - LUBRICATION SPECIFICATIONS - Ball Bearings: Repack ball bearings with American Bosch high temperature grease No. US 508 at least once a year. Interrupter: The cam lubricating felt wick is saturated with Mobile Grease No. 2 at the factory and should be relubricated periodically with a small quantity of SAE 50 or 60 oil. A small lump of US 508 should be placed on the leading side of the interrupter lever fibre block. Distributor Gear: The distributor gear bearing is packed with American Bosch high temperature US 508 grease and requires no additional lubrication between overhauls.

213 - IMPULSE COUPLING, GENERAL DESCRIPTION - The purpose of an impulse coupling is to facilitate the starting of an engine without the aid of an auxiliary ignition system. The coupling is so designed that, when attached to the magneto, it gives the rotor a short quick turn regardless of how slow the engine is cranked. It automatically disengages when the magneto attains a speed of approximately 180 RPM and then acts as a positive drive only. The coupling employs sliding "L" shaped weights and a coil type spring which absorbs the shock after impulsing. The vertical movement of the sliding "L" shaped weights is guided by the ears of the impulse member hub which engages the housing into which are assembled the spiral spring and cam. The coupling is released by the arrester plate mounted at the shaft end of the magneto frame. The majority of parts are so designed that they can readily be assembled for either clockwise or anti-clockwise rotation.

214 - IMPULSE COUPLING, REMOVAL AND REASSEMBLY - When disassembling the coupling to check parts for wear or damage, use puller ST 413 to remove the coupling hub from the magneto shaft--see Figure 10. Damaged or worn parts must be replaced. Refer to Figure 11 when re-

assembling. Reassemble pins (3) and spiral spring with felt wick (2) to coupling housing (1). Pins (3) must rest against groove (4) in housing channel. With ear (6) of coupling hub facing you, locate weights (7) in elongated hub slots. IMPORTANT: If the coupling is being assembled for clockwise rotation, letter "C" stamped on weights (7) must be face up; for anti-clockwise rotation letter "A" must be face up. Place cam (8) on coupling hub with letter "A" or "C" facing upward as required. Engage ear (6) of coupling hub (5) between pins (3) in housing (1) and mesh the two assemblies.

215 - INSTALLING THE COUPLING ON A MAGNETO - NOTE: To provide accurate setting of the coupling retard, marks spaced 5° apart have been placed adjacent to the upper left-hand slot of the arrester plate. When the heavy center mark lines up with the fastening hole in the magneto housing, the automatic retard or lag angle of coupling is approximately 30° for either clockwise or anti-clockwise rotation.

Turning the arrester plate in a clockwise direction increases the automatic retard or lag angle and turning it in an anti-clockwise direction decreases the automatic retard or lag angle for clockwise magnetos. The opposite is true if the magneto operates in an anti-clockwise rotation. The coupling arrester plate has only two marks indicating coupling rotation when the plate is assembled to a magneto. Graduation marks spaced 5° apart are on the face of the magneto flange. Retards of from 10° to 50° are obtained by moving the arrester plate as outlined above. Fasten the arrester plate to the magneto frame. Adjust plate to required retard and securely fasten in place. Locate impulse member assembly on magneto drive shaft and fasten in place with rotor shaft nut and lock washer. NOTE: Hub (5) of the impulse member assembly is provided with two keyways -- one for clockwise rotation marked "C", the other for anti-clockwise rotation marked "A". Be sure to select the proper keyway.

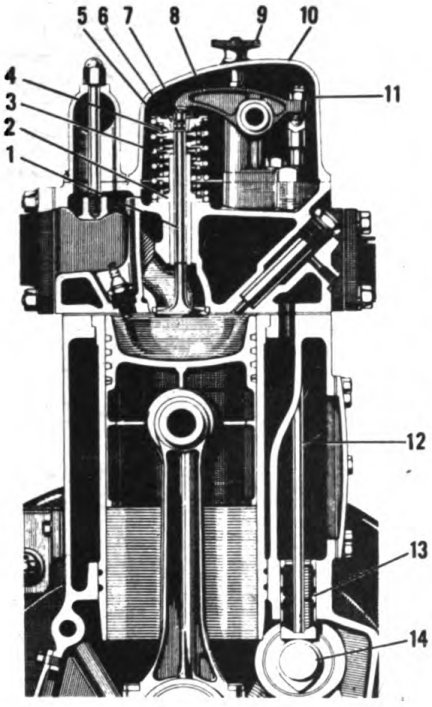

FIGURE 12
SECTION THROUGH HEAD

1. Valve. 2. Valve guide. 3. Outer valve spring. 4. Inner valve spring. 5. Valve spring retainer. 6. Valve spring taper. 7. Check tappet clearance here. 8. Rocker arm. 9. Rocker arm cover retaining nut. 10. Rocker arm cover. 11. Lock nut for tappet adjusting screw. 12. Push rod. 13. Valve lifter (tappet). 14. Camshaft.

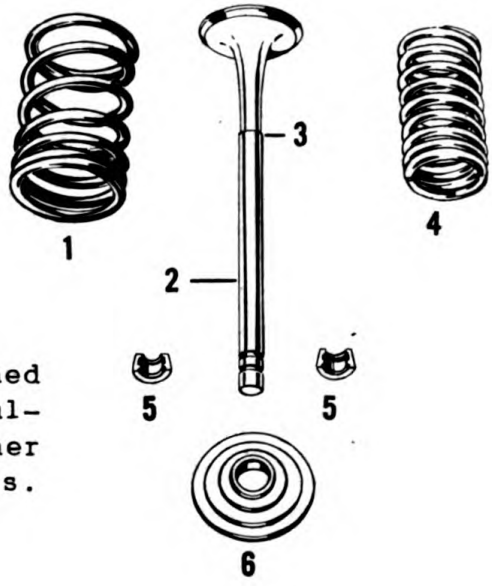

FIGURE 13
VALVE AND SPRING ASSEMBLY

1. Outer valve spring. 2. Hardened end of valve stem. 3. Shear shoulder of exhaust valve stem. 4. Inner valve spring. 5. Taper blocks. 6. Retaining Washer.

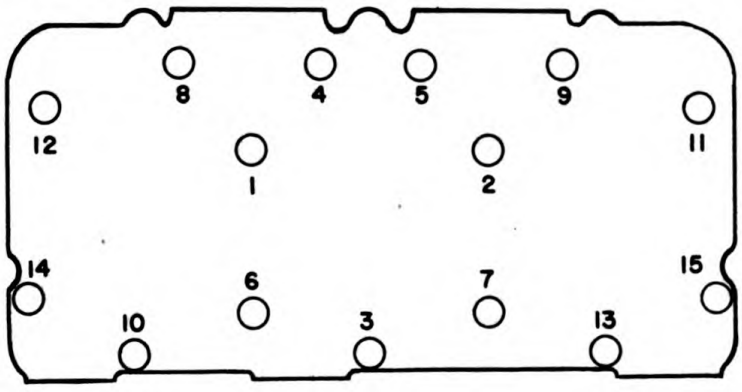

FIGURE 14

ORDER OF TIGHTENING CYLINDER HEAD NUTS.

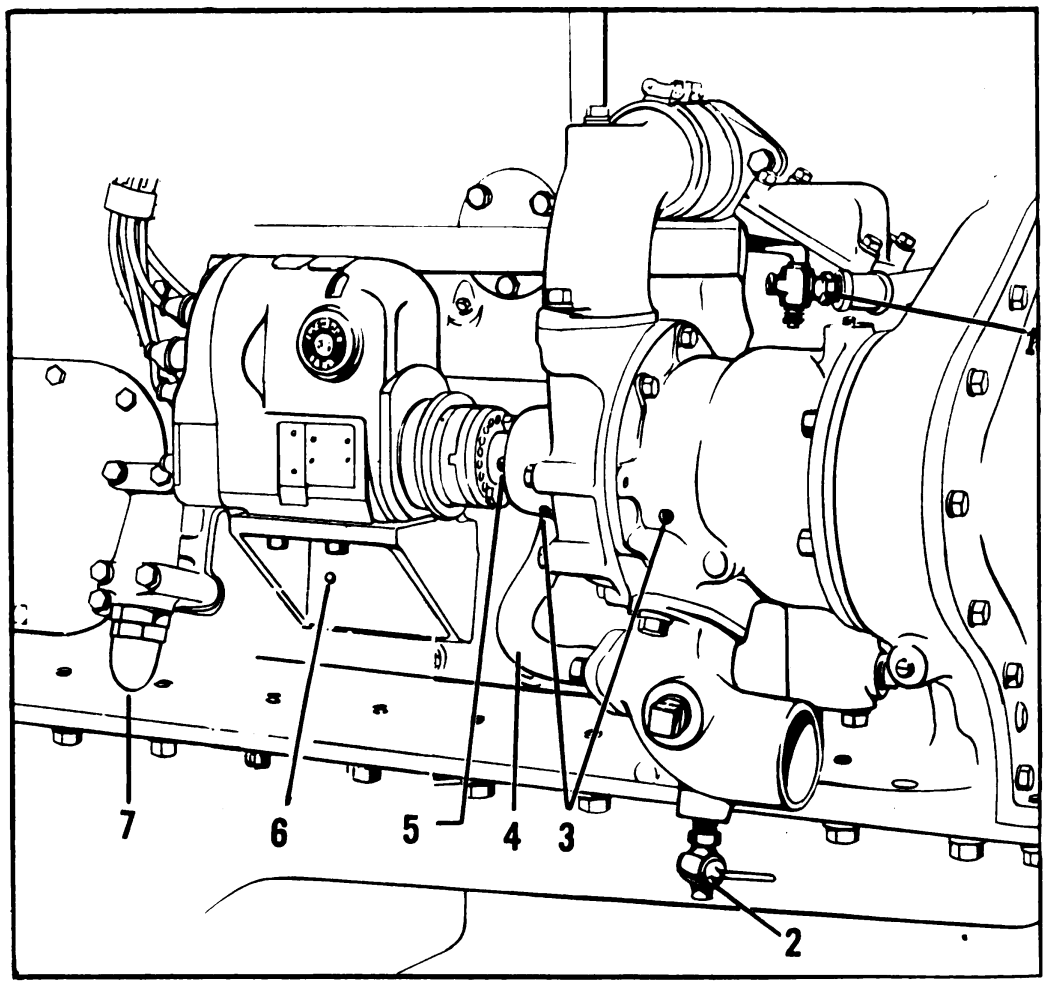

FIGURE 15 - GOVERNOR, WATER PUMP AND MAGNETO CLOSE-UP

1. Front cylinder drain cock; a similar cock is at rear of engine block. 2. Water pump drain cock. 3. Tell tale holes which indicate if water pump seals are leaking. 4. Thermostat by-pass connection. 5. Magneto coupling. 6. Magneto bracket doweled for location. 7. Oil pressure relief valve.

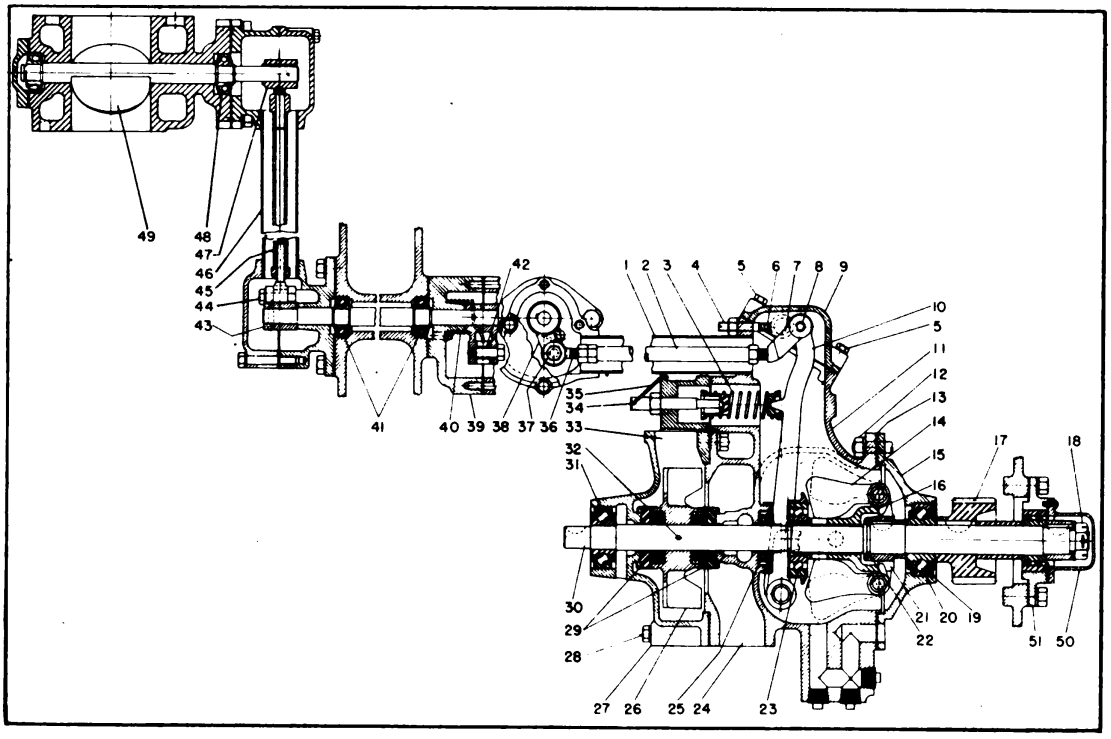

FIGURE 16 - GOVERNOR AND WATER PUMP ASSEMBLY

1. Housing tube for reach rod. 2. Reach rod; adjustable for length. 3. Speed regulating spring. 4. Adjustable bumper; controls minimum governed speed. 5. Cap screws holding housing cover plate. 6. Low speed bumper spring. 7. Low speed position of main operating lever. 8. Cap screw and bushing clevis pin. 9. Governor housing cover plate. 10. Main operating lever. 11. Main governor housing. 12. Bolts holding governor and pump assembly to engine gear case. 13. Gasket between front bearing bracket and governor-pump assembly housing. 14. Governor weights. 15. Front bearing bracket. 16. Governor shifter sleeve. 17. Governor-water pump-magneto drive pinion. 18. Shaft nut. 19. Snap ring - holds center ball bearing in bracket. 20. Center ball bearing. 21. Weight support bracket keyed to shaft. 22. Snap ring - holds weight support bracket from end movement. 23. Ball thrust on shifter sleeve. 24. Water pump inlet. 25. Oil seal - keeps oil in governor chamber. 26. Water pump impeller. 27. Water pump housing and rear bearing bracket. 28. Cap screws holding water pump housing to governor housing. 29. Water pump seals, spring loaded. 30. Shaft extension for magneto coupling. 31. Pre-lubricated ball bearing. 32. Shear pin, No. 5 taper-drives water pump impeller. 33. Water pump outlet. 34. Governor speed adjusting screw. 35. Adjusting screw seal. 36. Reach rod adjustable clevis. 37. Clevis pin and bushings. 38. Bell crank on governor cross shaft. 39. Bell crank housing on governor side of engine. 40. Back lash spring on cross shaft and reach rod system. 41. Cross shaft ball bearings. 42. Clevis Pin and bushing on governor side of engine. 43. Bell crank on cross shaft; throttle side of engine. 44. Clevis pin and bushing. 45. Adjustment in vertical reach rod. 46. Slip joint under spring tension permits manual operation of throttle independently of Governor. 47. Bell crank on throttle shaft. 48. Throttle shaft ball bearings. 49. Butterfly throttle.

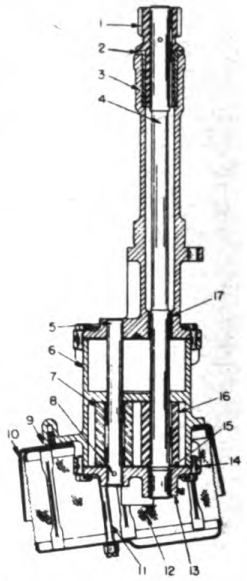

FIGURE 17 - OIL PUMP ASSEMBLY

1. Drive gear. 2. Bushing. 3. Drive housing. 4. Drive shaft. 5. Idler gear shaft. 6. Oil pump body. 7. Idler gear. 8. Idler shaft pin. 9. Gasket. 10. Baffle. 11. Oil screen stud. 12. Oil screen. 13. Cover. 14. Gasket. 15. Snap ring. 16. Driver gear. 17. Drive shaft bushing.

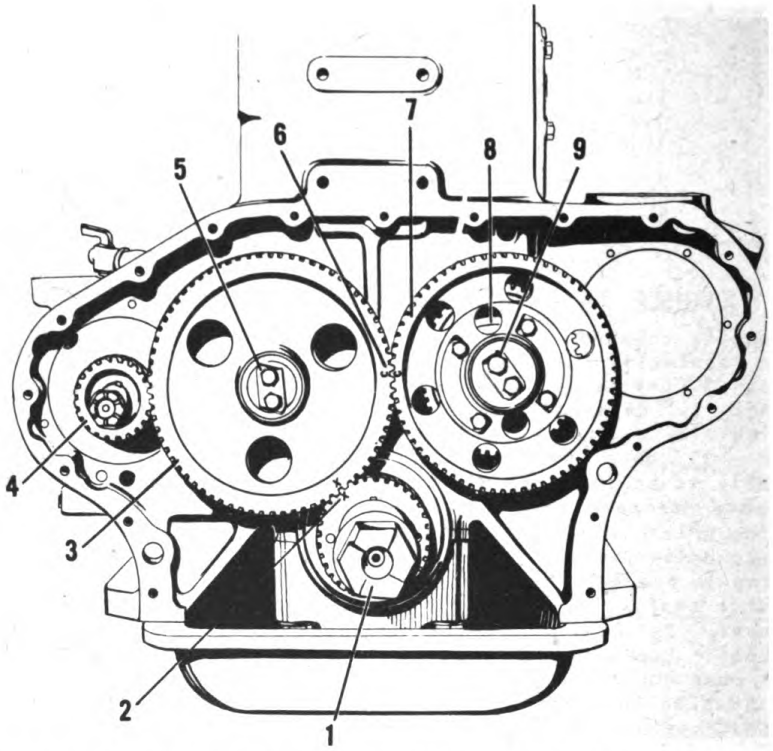

FIGURE 18 - FRONT END SHOWING GEAR LAYOUT

1. Cranking jaw. 2. Crankshaft gear with timing mark "X". 3. Idler gear with timing mark "X". 4. Magneto, water pump and governor pinion. 5. Lock plate on idler gear. 6. Timing mark "C" on idler gear. 7. Camshaft gear, meshed with idler at mark "C". 8. Holes in camshaft gear web through which screws holding camshaft thrust plate may be removed. 9. Lock plate on camshaft gear.

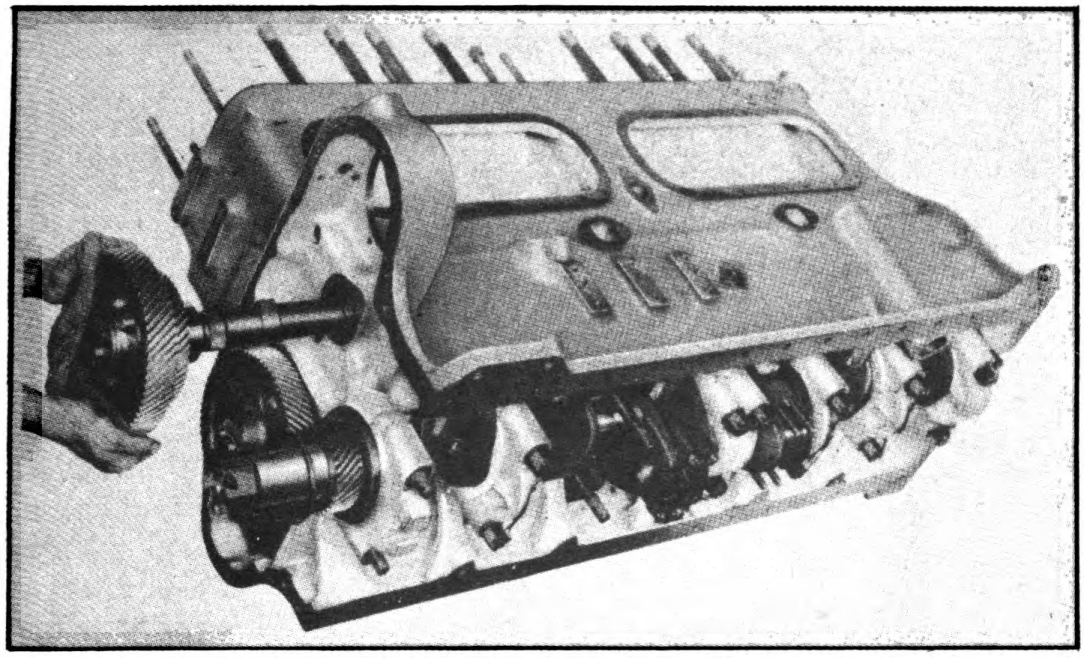

FIGURE 19 - REMOVING CAMSHAFT

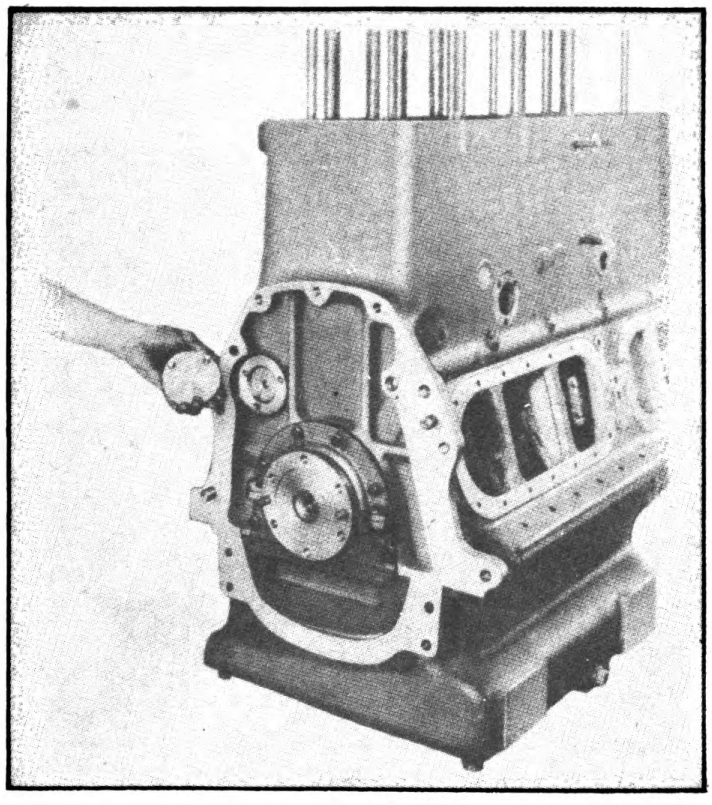

FIGURE 20 - REAR VIEW, FLYWHEEL REMOVED FROM CRANKSHAFT

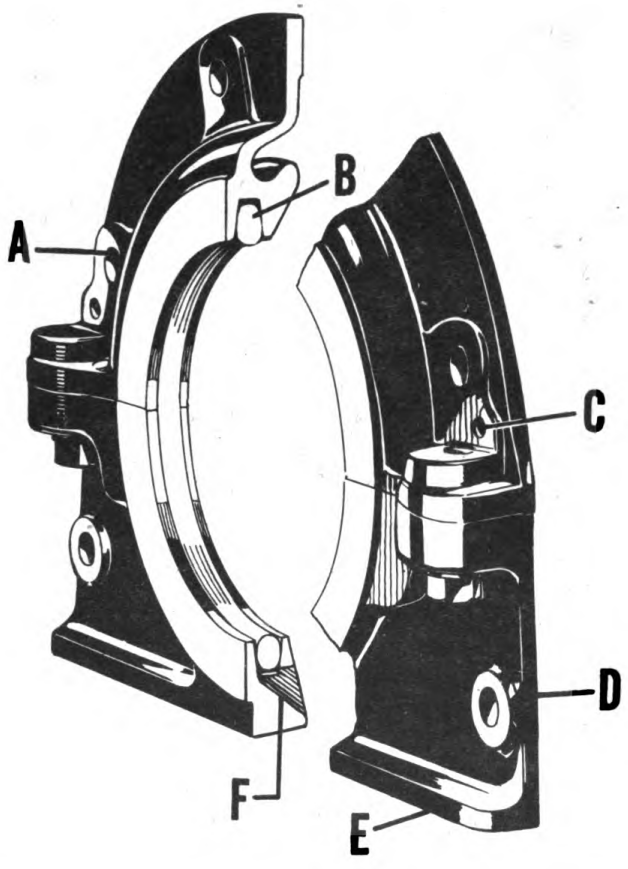

FIGURE 21
REAR OIL RETAINER

A. Upper section containing four drilled holes for cap screws. B. graphited wick packing. C. Drilled and reamed dowel pin hole. D. Lower section containing drilled cap screw holes. Gasket between upper and lower sections. E. Oil pan contact surface. F. Return vent for excess oil.

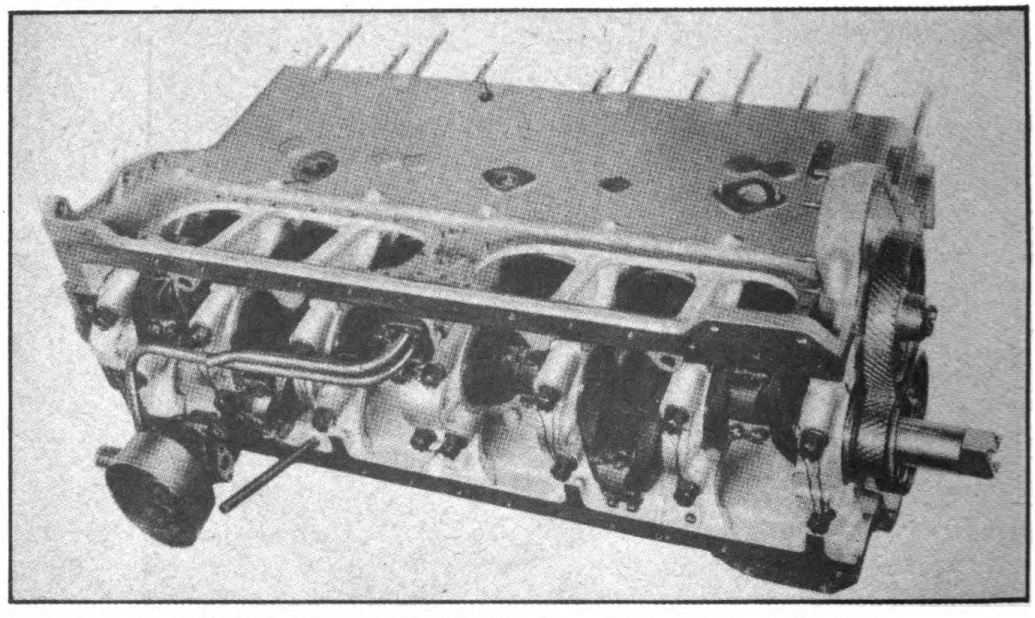

FIGURE 22 - BOTTOM VIEW, OIL PAN REMOVED

Notice pipe plugs in side of case which may be removed to clean oil passages from oil header to main bearings.

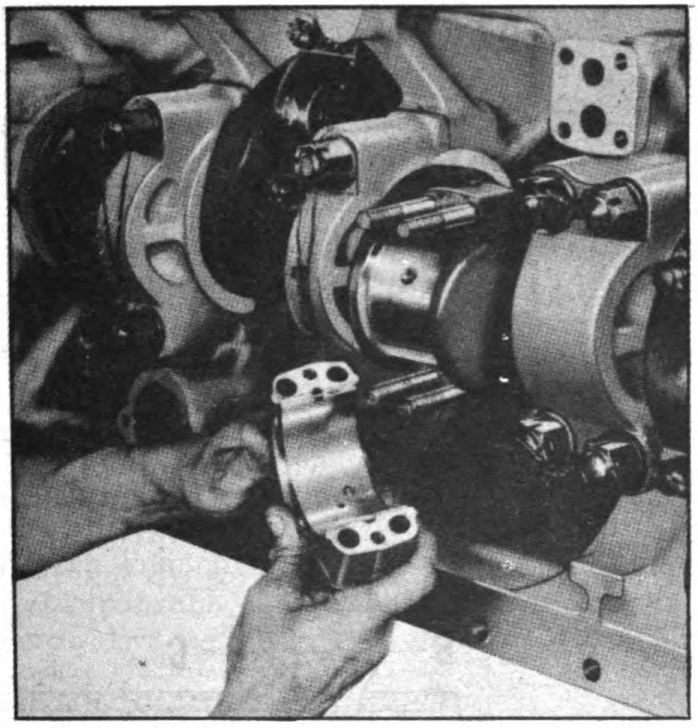

FIGURE 23 - REMOVING CONNECTING ROD BEARING

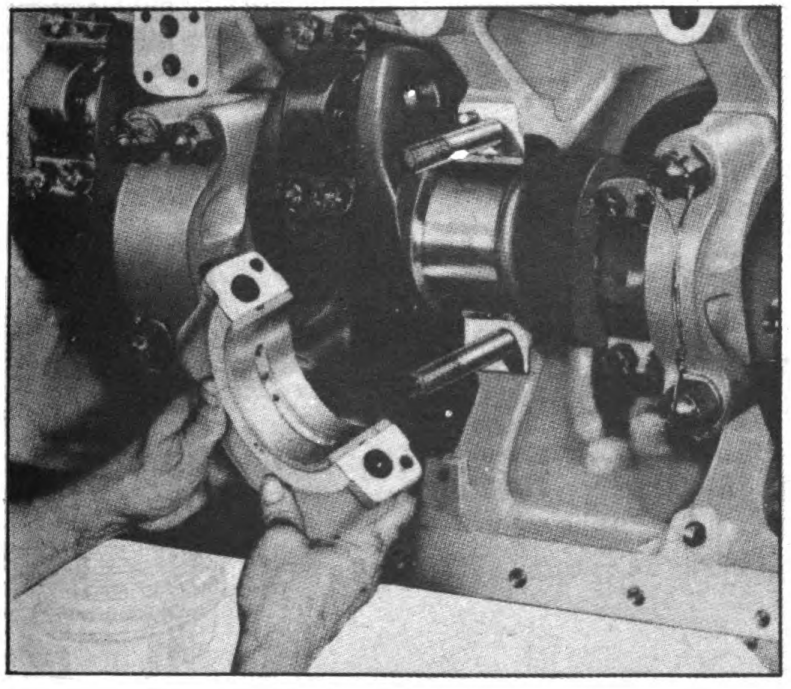

FIGURE 24 - REMOVING MAIN BEARING

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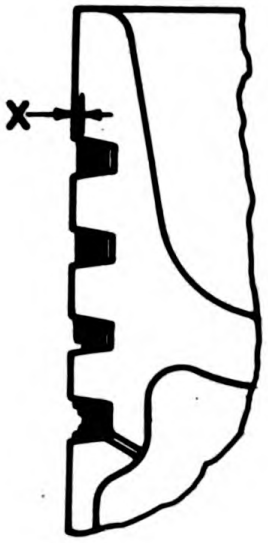

FIGURE 25
WEDGE RINGS.
SHOWING
DIMENSION "X"

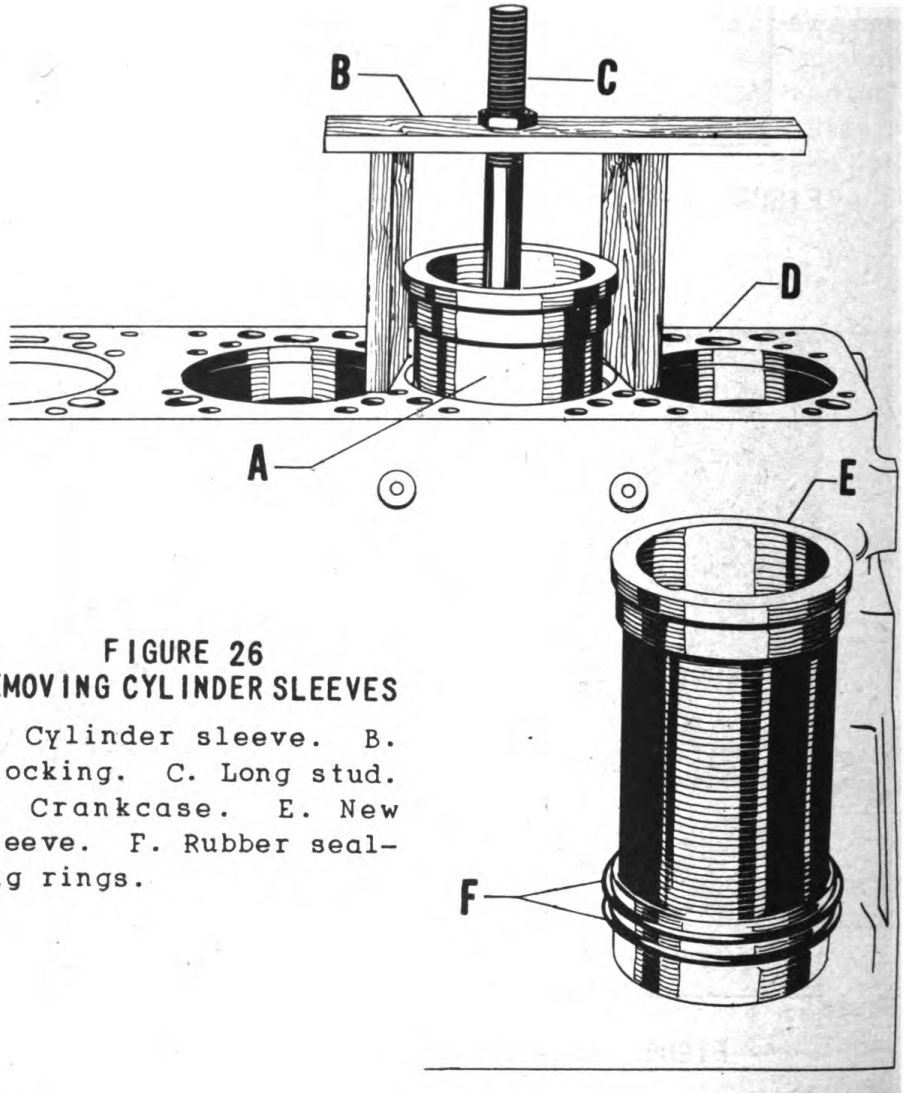

FIGURE 26
REMOVING CYLINDER SLEEVES

A. Cylinder sleeve. B. Blocking. C. Long stud. D. Crankcase. E. New sleeve. F. Rubber sealing rings.

MAINTENANCE MANUAL

PART III

MAIN ENGINE OVERHAUL AND MECHANICAL ADJUSTMENTS

Valve Mechanism

300 - **WHEN TO GRIND VALVES** - Valves need grinding when they begin to leak, a condition which can be easily detected by means of a compression gauge. Testing compression is described in Paragraph 801 of the Operator's Manual. Leaking is usually due to the valves becoming pitted or burned or the valve seat in the cylinder head becoming corroded. The only remedy is to grind the valves and resurface the seats.

301 - **PREPARING FOR GRINDING** - Remove the unit roof as described in Paragraph 102, remove the spark plugs, and drain the cooling system. Then make the following preparations:

1. Remove the exhaust manifolds and pipes.

2. Disconnect top water connection, by-pass line, lines at both ends of the water heated intake manifold, and the T connection at the rear end of the top water manifold.

3. Disconnect the choke wire, throttle connection, fuel line from fuel pump to carburetor inlet, and the intake elbow at the carburetor end. Unscrew the two cap screws which hold the carburetor and remove the carburetor.

4. With the carburetor removed, it is easy to remove the cover from the bell crank housing and to remove the clevis pin, 44, Figure 16. Then disconnect the vacuum line from the intake manifold to the vacuum gauge and remove the intake manifold and butterfly valve housing.

5. Remove rocker arm breathers and rocker arm covers.

6. Remove the rocker arm supports, shafts, and rocker arms.

7. Withdraw the push rods and mark or tag them so that each rod may be replaced in its own tappet

8. Remove the cylinder head nuts and carefully lift the heads off the cylinder block and studs.

302 - REMOVING VALVES - The end of each valve stem is fitted with a shallow steel cup that surrounds the end of the valve spring, and is held to the stem by a pair of wedge blocks as shown in Figure 13. The wedge blocks must be removed before the valve can be withdrawn. To release the blocks from the recess in the spring retainer, it is necessary only to compress the valve spring (use a "C" type valve spring compressor) until they fall away from the valve stem. Weak or cocked springs should be discarded and new ones installed when re-assembling.

303 - EXAMINE VALVES AND SEATS - Upon removing each valve examine it carefully. Remove all carbon and burned oil and check the valve stem and its fit in the guide. Excessive wear in either the stem or guide will make it impossible to secure a tight seat by grinding unless the valve or guide, and possibly both, are replaced. Special notice of the exhaust valve guide and valve stem shoulder should be taken to make sure the guide does not project into the valve gas passage, and that the shoulder on the valve stem is sharp. This shoulder should be 1/32" to 1/16" below the top of the valve guide when the valve is seated. Thus, any accumulation of carbon around the guide and stem will be sheared off each time the valve is lifted, and in this way reduce the danger of valve sticking.

304 - EXAMINE VALVE GUIDES - Worn valve guides should be replaced with new ones. They are a pressed fit in the head casting, and service guides are specially machined to press in place, and give proper stem clearance

without further machining. However, the valve seat in the block MUST be re-cut concentric with the new guide, as explained in Paragraph 305, whenever new guides are installed.

305 - GRINDING EQUIPMENT - If the valve seats have worn a ridge or there are deep pits burned in them, it will be necessary to restore the seat to a normally smooth surface with a valve seat reamer or fine grinding wheel with 30° face (for intake) and 45° face (for exhaust) which is held in a true position by a mandrel fitted snugly in the valve stem guide. If the guide is worn so that the mandrel is not held firmly, replace the guide or use an oversize mandrel, and then proceed to reface the seat. Valves should also be trued up in a truing lathe before grinding. To facilitate grinding, a light spring should be slipped on the valve stem which will serve to lift the valve off the seat when changing its grinding position. Any good commercial grinding compound may be used provided it is not too coarse.

306 - GRINDING THE VALVES - Apply the grinding compound sparingly around the entire valve seat, slip the light lifting spring over the stem, lubricate the stem, and drop the valve into its original place in the cylinder block. The spring should just barely hold the valve off its seat. Exhaust valves can be identified from the intake valves by their size. Exhaust valves are always smaller than intake valves, and have a sharp shoulder on the stem about an inch below the head.

307 - OSCILLATING MOTION - Place the grinding tool in the two holes in the head of the valve to be ground. Press down until the valve is seated. Turn the valve a quarter turn, first in one direction, then in the other. Do this three or four times. Release the pressure on the valve, and the little spring will lift it off its seat. Now turn the valve about 10 or 15 degrees to another position, and repeat the grinding. Do this until all the compound is rubbed off the valve seat. Withdraw the valve, and put on some fresh compound. Repeat the grinding operation.

308 - DON'T OVER-DO THE GRINDING - Clean the valve and its seat occasionally to see how the grinding is progressing. When all pits and grooves have disappeared, clean the valve and valve seat, and place eight or ten equally spaced marks with a soft lead pencil on the seat. Then drop the valve in place, give it a quarter turn, and remove it. A perfect seat will be indicated if every pencil mark shows where the valve has rubbed it. If any pencil marks are left untouched, continue the grinding. If the valve refacing and reseating has been done with high speed, power driven tools, very little grinding will be required. When the grinding is completed, oil the valve stem, clean all traces of the grinding compound from the valve chamber and ports, and re-assemble each valve in its own opening.

309 - REPLACING CYLINDER HEAD AND ROCKER ARM ASSEMBLIES - There is a best way to replace cylinder heads that should always be followed to prevent trouble later. As shown in Figure 14, the hold-down stud nuts should be tightened in successive stages and in such order as will insure even pressure over the entire surface of the cylinder head and gasket. If the outside nuts are pulled up first instead of the center ones, the head will be cocked, and the gasket will not fit tight enough to prevent blowing out between cylinders. Full tension requires a 240-300 pound pull on a two-foot wrench. After the heads are tightened in position, replace the push rods. Examine the ball and socket fittings pushed into the ends of the rods and if any show signs of wear beyond the case hardening, new fittings must be installed. Sockets at the rocker arm end must not be used if they are worn so deep that the upper edge rides the adjusting lock nut or the rocker arm at any point. And if any of the push rods are bent, do not attempt to straighten them but replace with new rods. Also inspect the valve lifter cam contact surfaces, and replace the lifters if excessive wear has occurred. When the push rods are in place replace the rocker arm assembly. Be sure to connect the oil leads to the rocker arm shaft. Test them to be sure they are not clogged. Replace the intake manifold and butterfly valve housing, making

sure that the bell crank and butterfly valve are in exactly the same positions as when removed. Replace the clevis pin holding the vertical reach rod to the bell crank and replace the cover. Connect the vacuum line from the manifold to the gauge and replace the carburetor. Connect the air intake elbow, fuel line from fuel pump to carburetor intake, throttle and choke wires. Replace the top water manifold and connect the water lines just as indicated in Figure 13 of the Operator's Manual, and then replace the exhaust manifolds and pipes. Inspect all gaskets as these parts are reassembled and if any are damaged, use new ones.

310 - TAPPET CLEARANCE - After a regrind job, adjust the tappet clearance to .015" - .017" for the intake and .024" - .026" for the exhaust. This must be done without fail to avoid valve burning. After ten hours of operation, the tappets should be reset to the following clearances: Intake .013" - .015", exhaust .022" - .024". Never attempt to adjust the tappets without first releasing the lock nut, and always tighten the lock nut after adjusting tappet clearances. Tappet clearance dimensions are for valve setting at room temperatures and not after the engine is hot. If the tappets have any clearance at all when the engine is hot, the valves are seating. Always adjust and check tappets with the valve lifter on the base of the cam as indicated by the valve side of the rocker arm being at its highest point. After tappet clearance has been checked, replace the rocker arm covers and breathers.

WATER PUMP AND GOVERNOR

311 - WATER PUMP - The water pump is built in combination with the governor as Figures 15 and 16 indicate. It requires no lubrication attention, but after long service the spring loaded seals may need replacing. The holes, 3, Figure 15, are tell tales which will drip water if either of the seals, 29, Figure 16, is leaking. To renew the seals, first remove the upper and lower water connections from the pump housing, the water

by-pass connection from the top water manifold to the intake elbow of the pump, remove the magneto with its bracket, dismount the magneto coupling 5, Figure 15, and remove the key from the pump shaft. Now refer to Figure 16. Remove the pump case cap screws, 28, which will permit the pump housing to be slipped off the end of the pump shaft. Use care in this operation to avoid damage to the rear ball bearing, 31. This will expose the pump impeller, 26, and both seals, 29, each of which should be removed even though but one is leaking. Now withdraw the rear seal and remove all rust from the shaft with fine emery cloth and apply penetrating oil copiously to the shaft at both ends to free the impeller so that it may be pulled. Now drive out the No. 5 taper pin, 32, which holds the impeller to the shaft and with a good gear puller withdraw the impeller itself as well as the front seal assembly. Clean the shaft and the seal seat, install the new seal unit, and re-assemble the pump.

312 - GOVERNOR - The governor is designed to do two main things: 1--to prevent damage from overspeeding, and 2--to automatically maintain safe and economical speeds under varying loads. AS THE LIFE OF ANY MACHINE FALLS OFF RAPIDLY WHEN IT IS SPEEDED UP BEYOND SAFE LIMITS, the governor must be kept in operation at all times to protect the engine against damage and abuse.

313 - GOVERNOR ADJUSTING - The governor is adjusted for the correct speed at the factory, and should not be changed to a higher speed without consulting the Company. The rules given here apply only in those cases where it may be necessary to re-assemble the governor after the engine has been taken down or other work done which incidentally involves the governor mechanism.

314 - GOVERNOR AND PUMP EXCHANGE SERVICE - As shown in Figure 16, the weight and lever actuating mechanism of the governor is built in combination with the water pump and the entire pump-governor assembly may be removed as a unit for any major repair or adjustment. To facilitate field repairs when shop equipment is scarce,

special reconditioned units are available from factory stock on an exchange basis.

315 - GOVERNOR DESIGN - The governor is a fly-ball type, gear driven at 1-1/2 times engine speed from the timing gears. The shaft is mounted on two ball bearings. The entire governor mechanism is flood oiled from the timing gear oiling system, and the oil mist created by the revolving parts circulates through the reach rod enclosure and lubricates the bell cranks, clevis pins and bushings as well as the ball bearing cross shaft and throttle shaft.

316 - GOVERNOR OPERATION - The movement of the butterfly, 49, Figure 16, which controls the engine speed is effected by the vertical reach rod, 45, through the system of bell cranks, 47, and 43, a ball bearing cross shaft, 41, which passes through the cylinder block, and is fitted on the other side of the engine with the bell crank, 38. This bell crank is connected by the adjustable reach rod, 2, to the main operating lever, 10, which bears against the ball thrust, 23, on the end of the shifter sleeve, 16. This shifter sleeve moves freely on the governor shaft, 30, and in the position shown, the engine is at rest with the throttle wide open and the weights, 14, collapsed. They are held thus by the spring, 3, which always pushes against the lever, 10. When the engine starts, the weights, which are pivoted to the carrier, begin to revolve with the shaft, and as the speed increases, centrifugal force makes the weights fly out and away from the shaft until they reach the limit of travel as shown in the dotted outline. At the base of the weight where the line from 16 contacts the shifter sleeve is the trigger shaped lug which presses the shifter sleeve to the left, as the weights fly outward. When the weights fly out, the operating lever, 10, is moved against the spring, 3, through the ball thrust bearing, 23, on the shifter sleeve, and this motion is transmitted to the butterfly throttle to close it. The governed speed is controlled

by the tension of the spring, 3, which is varied by the plunger 34; pushing this plunger in increases the speed, and vice versa.

317 - DIS-ASSEMBLING THE GOVERNOR - It is impossible to renew any governor parts without dismounting the complete water-pump and governor assembly from the engine. The following operations should be done in the order given. Refer to Figure 16.

1. Remove the cap from the gear cover and then remove the screws which hold the ball bearing and oil seal retainer plate, 51, to the timing gear cover. Remove the plate and bearing assembly.

2. Remove the governor housing cover, 9, which is held to the main housing by the cap screws, 5, and remove the cap screw, 8, from the clevis, 7, on the end of the reach rod, 2. There is a small bronze bushing in the vertical operating lever - do not let this fall into the mechanism when the clevis pin and clevis are removed.

3. Remove the cover from the cross shaft bell crank housing, 39, and disconnect the reach rod from the cross shaft bell crank, 38. The eye in the reach rod also has a bronze bushing which must not be lost. The tube, 1, housing the reach rod can then be withdrawn, exposing the rod itself. It is important that this reach rod length be the same after reassembly so some marks should be made on the clevis, 7, to facilitate its replacement in exactly the same position as originally. Then unscrew the reach rod, 2, from the clevis, 7, which will permit removal of the clevis through the top opening of the governor operating lever housing.

4. Uncouple the magneto and unbolt the mounting bracket so that the magneto and bracket assembly

can be removed complete. All three members of the magneto coupling must be removed and the key in the shaft, 30, must be withdrawn.

5. Remove the water outlet elbow by disconnecting it from the water hose leading to the crankcase and by unscrewing the two cap screws which hold it to the top of the water pump case.

6. Remove the water inlet elbow from the pump and governor housing and then disconnect the by-pass line between the pump inlet and the top water manifold.

7. Unscrew the cap screws, 13, at the gear housing flange which will permit the removal of the complete assembly--governor, water pump and drive gear.

8. Governor parts can then be reached by removing the drive gear, 17, and its woodruff key and withdrawing the front bearing housing, 15.

9. To remove the entire governor assembly from the case, it will be necessary to remove the water pump from the opposite end of the shaft. Follow the instructions as given for renewing water pump seals in Paragraph 311.

318 - RESETTING THE GOVERNOR - If it should be necessary to dismantle the governor at any time for other adjustments--and it is only for that purpose that it should ever be necessary to disturb this mechanism--there are some basic requirements which should be observed. These requirements can all be met if the governor parts are carefully marked before they are removed so that they will be re-assembled with the same adjustment and in the same places from which they were removed. Most important, make sure that the operating rods, 2 and 45, Figure 16, with their adjusting nuts are accurately assembled exactly as before to prevent improper position

of the butterfly valve, 49. Also, be sure the lock nuts are in place and securely tightened to prevent change in the length of any of the linkage. Also notice carefully, and mark the position of the butterfly valve so that it goes back exactly as before. Close it, and with a pencil, mark the top side and the adjacent wall of the intake so that it is not re-assembled upside down, or backwards. If these precautions are followed, the governor should operate exactly as before when it is again put into service provided the tension of the governor spring and the length of the operating rods have not been changed. To secure the best operation, make sure that the length of the operating rods is adjusted so that the throttle, 49, stands a trifle towards the closing position when the engine is stopped. Variation from the proper speed can be corrected by tension of the regulating spring. Increasing the tension increases the maximum speed, and decreasing the tension decreases the maximum speed.

Timing Gears

319 - TIMING IN GENERAL - The engine has spiral cut timing gears which operate in a continuous bath of oil. The camshaft runs at one-half engine speed; the magneto and water pump run at 1-1/2 engine speed. Figure 18 shows the gear train with crankshaft pinion, 2, idler gear, 6, magneto and water pump pinion, 4, and camshaft gear, 7. The crankshaft, idler, and camshaft gears are all marked so that when they are removed, they may be replaced in the proper timing relation without difficulty. The crankshaft has a mark "X" on the face opposite the tooth which meshes in the SPACE marked "X" on the idler gear. There is also a mark on the idler opposite a SPACE "C" which indicates where the tooth, C, on the camshaft gear is meshed. As the magneto is fully adjustable for timing it is unnecessary to mark this gear. To make any adjustments involving the timing gears, it is necessary that the housing and radiator be removed as described in Paragraphs 102-104. Then remove the fan belts and cranking jaw and pull the belt pulley off the end of the crankshaft. Unscrew the cap screws

holding the gear cover to the crankcase and remove the gear cover. At this point the gears will be accessible as shown in Figure 18.

320- VALVE TIMING - The valve timing for this engine is as follows:

Intake opens.....Top Dead Center
Intake closes.....40° After Bottom Dead Center
Exhaust opens.....45° Before Bottom Dead Center
Exhaust closes.....10° After Top Dead Center

321 - HOW TO CHECK THE VALVE TIMING - The engine has overhead valves and valve timing must be checked with the valves adjusted to the base circle clearance, not running clearance. Set tappets for timing at .007" intake and .009" exhaust, and then use the timing marks on the flywheel which refer to the valve setting for No. 1 cylinder. With the valve tappet clearances properly set, crank the engine until the flywheel mark "IN-O" is directly beneath the pointer in the inspection opening on top of the flywheel housing. At this point, the intake valve should be just starting to open, and a very thin feeler placed between the rocker arm and the valve stem will be just pinched. If the feeler is not pinched, it is probably because the engine is on the power stroke, and it must be turned one complete revolution to the point where the intake stroke begins. Since all the cams are integral in one piece with the shaft, if one valve is checked, all the rest will be properly timed. If the timing is off, the only way it can be corrected is to release the camshaft as described in Paragraph 325. Then the camshaft and gear may be withdrawn enough to shift the gear one tooth or so. This should not be necessary unless the marks on the gears have become obliterated. Ordinarily, if the gears are arranged with the marks in the positions shown in Figure 18, the timing will be correct. When the valve timing of number one cylinder has been checked, it is not necessary to check further. All the rest will be properly timed since all the cams are forged integrally with the shaft. After timing, reset the tappets for

running clearance: intake .013" - .015", exhaust .022" - .024".

322 - IDLER GEAR - After considerable service, it is possible that excessive end play will develop in the idler gear. Check this with a feeler gauge inserted between the idler spindle washer and the edge of the gear hub. If it exceeds .006", unscrew the two cap screws which hold the washer to the idler spindle and remove a shim. Do not allow the gear hub to be cramped. Correct end play is .005".

Camshaft

323 - CAMSHAFT - The camshaft is a steel forging which is supported by four bushings pressed into the crankcase. End thrust is taken by a thrust plate held to the crankcase by two cap screws which can be reached through the holes in the cam gear web, 8, Figure 18.

324 - CAMSHAFT END PLAY - Check camshaft end play with a long feeler gauge inserted between the thrust plate and the vertical face of the front camshaft journal. If it exceeds .010 inches, replace the thrust plate as described in Paragraph 325.

325 - REMOVING THE CAMSHAFT - Figure 19 illustrates camshaft removal. In preparation for this operation, it is necessary that the oil pump, rocker arm mechanism, and push rods all be removed so that the valve lifters can all be lifted out of the way of the cams (read Paragraph 301). Then, through the holes in the gear web, 8, Figure 18, unscrew the two cap screws which hold the thrust plate to the crankcase. This will permit the entire gear, thrust plate and shaft to be withdrawn from the case. If the job entails replacement of the thrust plate, the gear must be removed from the shaft. The gear is keyed to the shaft and retained by a plate which is held to the shaft by two cap screws. (It will be noticed that a smaller gear is bolted to the inside of the cam gear web. This is utilized only

when the engine is converted for operation on fuel oil, in which case it drives the fuel pump gear.)

326 - CAMSHAFT BUSHINGS - The camshaft bushings are a press fit in the crankcase; and when new bushings are installed they must be align reamed in the case. Usually replacement is necessary when the clearance exceeds .004 inches, at which point it will be found impossible to maintain proper oil pressures. Align reaming requires that the flywheel and housing be removed as well as the cam rear end plate shown in Figure 20. When the rear end plate is replaced, be sure that the gasket is in good condition, otherwise oil may leak into the flywheel housing.

Bearing Adjustment

327 - PRECISION MAIN BEARINGS - Both main and connecting rod bearings of these engines are steel-backed, babbitt-lined precision bearings. This type of bearing is so closely machined, both as to the bushing and its mating seat, that no fitting, filing, scraping, or machining whatsoever is needed in replacing worn or damaged shells. Thus, complete bearing renewal is possible even by an inexperienced mechanic if the following precautions are observed. First: Replace both halves of each bearing that is damaged or worn. Service bearings of various undersized standards are available and should be ordered by giving the micrometered dimension of the shaft if the engine has seen service to any considerable extent. Second: Be sure that the bearing seat in the crankcase, and the new bearing shells are spotlessly clean--that no small particle of grit remains on either--to make certain that when the cap is pulled tightly to its seat, the "crush fit" of the shells is evenly distributed. A small piece of hard carbon will raise a minute high spot on the inside surface of the bearing, and when the engine is started, the load concentrated on this high spot will cause overheating and a quick burn-out. Third: The bearing cap nuts should be drawn down with a tension of 100 to 120 foot pounds. A torque wrench for this purpose is a valuable tool.

Fourth: NEVER UNDER ANY CIRCUMSTANCES, FILE, SCRAPE, OR MACHINE IN ANY MANNER WHATSOEVER the cap, seat, front or back face, or EDGES of ANY precision bearing which does NOT have shims. This applies to all the main bearings in this engine. The connecting rod bearings are shimmed, and are covered in the next paragraph.

328 - PRECISION ROD BEARINGS - Precision bearings with steel back and babbitt lining are also used for connecting rods in this engine, but unlike the main bearings, shims are provided for a small amount of take-up and wear adjustment. It will be observed that shims do not extend into the bearing shell itself, and are clamped only between the cap and the rod. In the precision machining of the rod, the cap and shims are assembled with the rod and the bearing seat is finished ground to exact size with the shims in place, so that the meeting edges of the precision shells will have the exact "crush fit" required to seat perfectly. It is apparent therefore that whenever a shim thickness is removed, it will be necessary to face the mating edges of the bearing shell by the EXACT amount of shim stock which is taken out. The shim used on each side is .008" thick, new, and each layer is .002" thick. An equal amount of shim must be removed from each side to secure a true seat for the cap. No inexpert person should attempt such an adjustment, but rather should he replace the entire bearing - both halves - together with new, full thickness shims. Follow the same procedure in this case as in replacing the main bearings as described in Paragraph 327 . The bolts must be pulled absolutely tight to a tension of 65 to 80 foot pounds.

329 - BEARING CLEARANCES - If it is necessary to replace the entire bearing in any case, the side clearances are important. Connecting rods should have side clearance of .010" - .016". Main crankshaft side clearances are .070" except the thrust bearing at the front, which should be adjusted to .004" - .006" end play. This is regulated by shims back of a hardened thrust plate on the crankshaft directly back of the crankshaft pinion. Two bronze rings, one on each side

of the front bearing cap take the end thrust. To reduce the end play removing one shim will take up .002".

330 - LOCATING A LOOSE BEARING - In general, any bearing that is loose will cause an obnormal knock that increases with use. The heavier the thump, the greater the need for prompt attention. A loose connecting rod bearing may be located by running the engine briskly, and then closing the throttle. If any connecting rod bearing is loose, it will rattle as the engine speed decreases. A knock in the main bearing is harder to locate, and after all other possible causes of the knock have been investigated and eliminated, remove the oil pan or the inspection plates on the side of the case and try the adjustment of all the bearings.

331 - INSPECTING MAIN BEARING CAPS - It is possible to make an inspection of the main crankshaft bearing caps one at a time without removing the crankshaft. If any trouble has been experienced it will be evident in the cap.

Cylinder Sleeves

332 - CYLINDER SLEEVE CHANGES - The top of each sleeve is held tightly to its seat around its entire circumference and sealed by the head and head gasket at the top, while two rubber packing rings fitted in recessed grooves at the bottom of the water jacket keep the lower end tight and permit longitudinal expansion as required. To remove the sleeve, simply insert a long bolt with a cross bar at the bottom and another at the top, supporting the latter on two blocks, as shown in Figure 26. Tightening the top nut will release the sleeve, as shown. Be sure that the two blocks supporting the top bar are wide enough to be supported across the entire width of the cylinder block. When replacing the sleeve, remove the old rubber packing rings at the bottom, and insert new ones each time, taking care that none of the old ring falls into the crankcase to clog the oiling system. The best sealing ring lubricant for pressing the cylinder and rings into the case is ordinary liquid carriage soap. Oil will disintegrate the rubber.

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Pistons and Rings

333 - FITTING PISTONS - When cylinder sleeves and pistons are ordered at the same time, they will be properly matched and no fitting is required, but when pistons alone are ordered either in the rough for local fitting or to fit reground sleeves, it will be necessary to fit the pistons on the job. This engine has cam-ground pistons and the sides which take the thrust from the connecting rod against the cylinder wall have the largest diameter, and are the points at which the clearance measurements should be checked. Check top and bottom clearance with dimensions given in the Tabulated Data.

334 - FITTING PISTON RINGS TO CYLINDERS - New rings should be fitted into the cylinders before trying to place them in the pistons. To fit a ring, first slip a piston without rings into the cylinder so that the top is about an inch below the top of the cylinder. Then push the ring to be fitted into the cylinder and press it against the top of the piston. This insures the ring being square with the bore and avoids the possibility of a false reading of gap clearance. If the ring is even slightly cocked in the bore the apparent gap measurement will be smaller than it really is. Proper ring gap is .020" - .030". Measure the gap with feeler gauges and if it is too small use a fine file and take off a small amount on one of the ring ends until it gauges within the above stated limits. A gap smaller than the low limit will cause ring seizure and cylinder scoring while a gap larger than the high limit will cause excessive blow-by, dilution and sometimes scuffing.

335 - FITTING RINGS TO PISTONS - After the gap clearance has been tested, be careful not to get the rings mixed and fitted to the piston for another cylinder. All cylinders do not wear alike; that is why this is so important. Now fit each set of rings to the proper piston. To do this place the ring in the groove, and check Dimension "X", Figure 25, by pressing the ring into the groove at one point only--not all around--and see that it can be buried below the adjacent lands at

least .005". Try it at four spots around the piston to make sure the ring can move freely at all points. When wear increases Dimension "X" to .012", the rings should be replaced. Do not mix up rings th ' have been fitted to one piston and cylinder--they will not run smoothly in any but their own places.

MAINTENANCE MANUAL

MODEL 6 WAK

MECHANICAL ADJUSTMENT - TECHNICAL DATA

VALVES

Intake Valve Head, Diameter.....	2-41/64
Exhaust Valve Head, Diameter.....	2-7/32
Valve Seat Angle, Intake, Degrees...	30
Valve Seat Angle, Exhaust, Degrees..	45
Valve Clearance in Guide, Intake....	.0015-.0035
Valve Clearance in Guide, Exhaust...	.0025-.0045
Tappet Running Clearance, Intake....	.013-.015
Tappet Running Clearance, Exhaust...	.022-.024
Tappet Clearance for Checking Valve Timing, Intake.....	.012
Tappet Clearance for Checking Valve Timing, Exhaust.....	.016

CAMSHAFT AND BEARINGS

Running Clearance.....	.002-.0035
End Play.....	.005

IDLER GEAR

End Play.....	.003-.005

CRANKSHAFT AND BEARINGS

Main Journals, Diameter.....	3.999-4.000
Crank Pins, Diameter.....	3.374-3.375
Running Clearance, Main Bearings on Crankshaft.....	.0025-.0045
Side Clearance Thrust Bearing.....	.0015-.003

PISTONS

Land Clearance, Top ring.....	.031-.035
Land Clearance, Second ring.....	.024-.028
Land Clearance, Third ring.....	.016-.019
Skirt Clearance, Top and Bottom (at max. dia.).....	.007 (Desired) .0075 (Tight) .006 (Loose)

PISTON RINGS

Top Three Rings, Width.....	1/4
Oil Ring, Width.....	5/16
Groove Clearance, Dimension "x"	.005-.010
Piston Ring Gap.....	.020-.030

PISTON PINS

Fit in Piston.....	.0002 - .0003 Selected
Fit in Rod Bushing.....	.0012-.0017

CONNECTING RODS AND BEARINGS

Running Clearance, Large End...	.0015-.003
Side Clearance, Large End.....	.008-.014

NOTE: Unless otherwise indicated, all dimensions are given in inches.

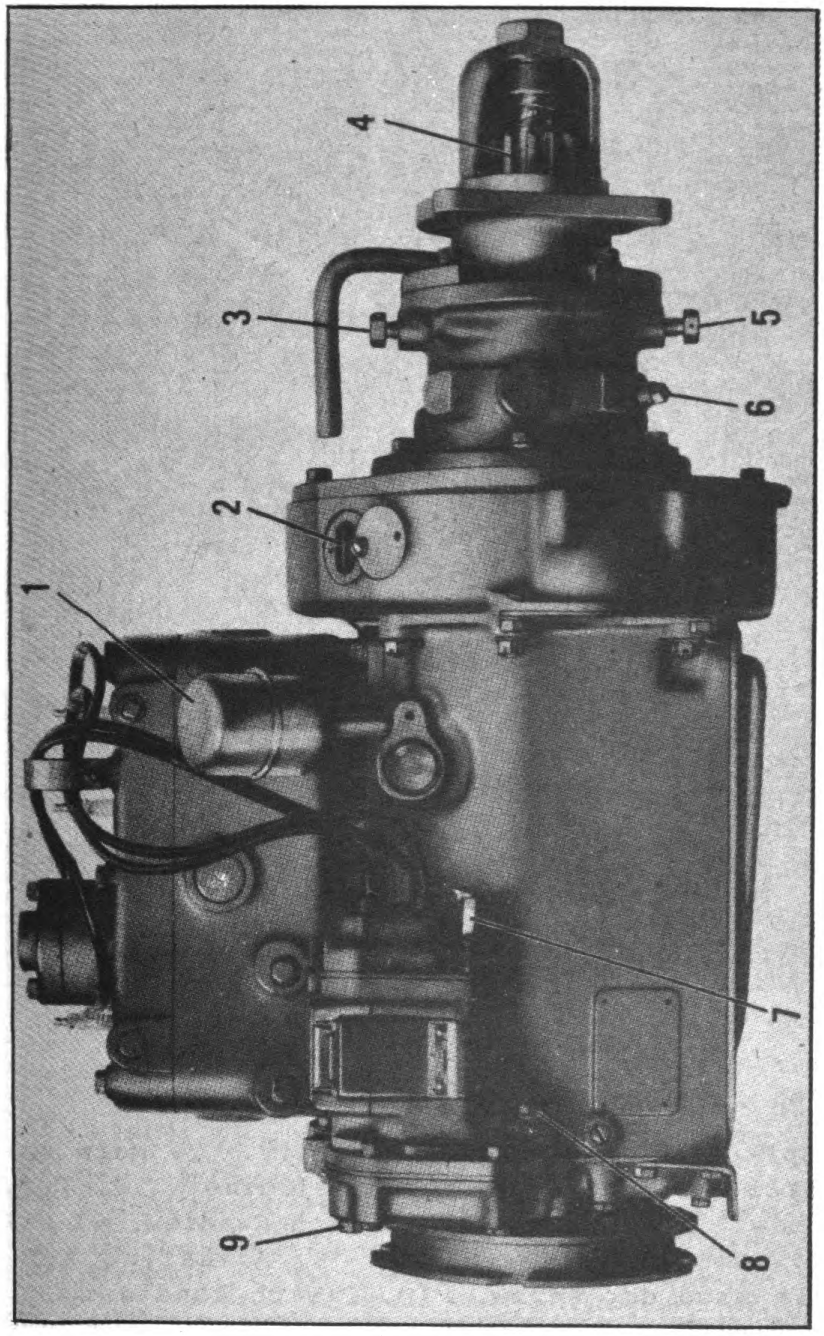


FIGURE 27 - MAGNETO SIDE OF STARTING UNIT

1. Breather cap. 2. Flywheel inspection opening. 3. Bendix housing lock screw. 4. Bendix assembly. 5. Bendix housing lock screw. 6. Drain plug. 7. Magneto grounding switch. 8. Cap screw. 9. Cap screw.

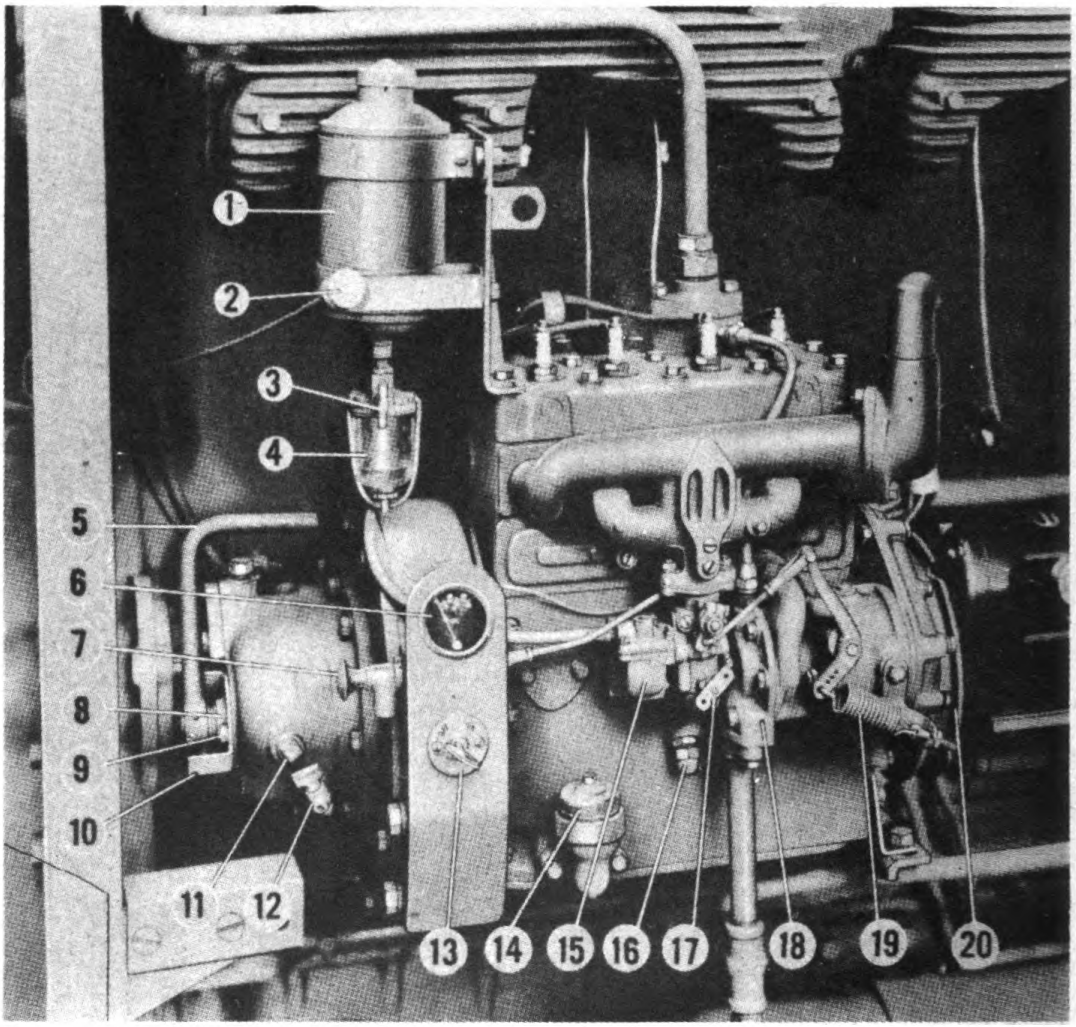
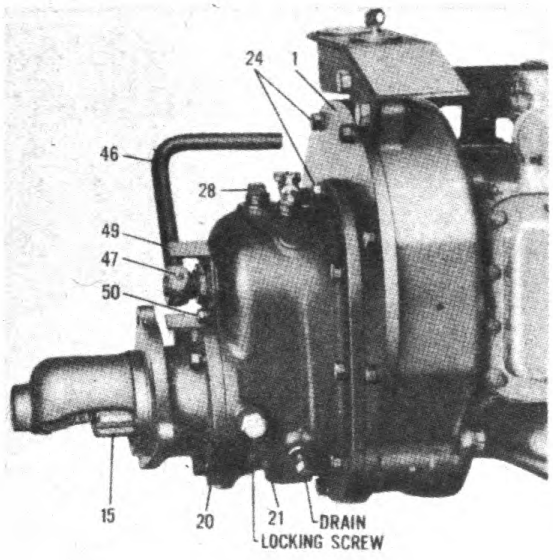
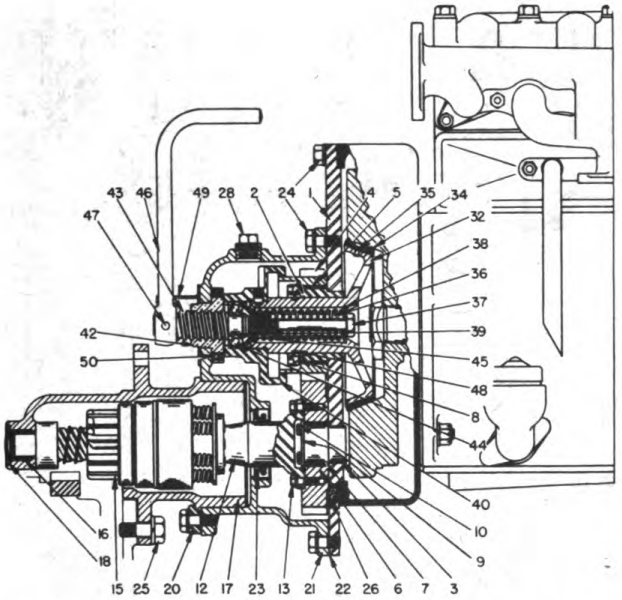


FIGURE 28 - CARBURETOR SIDE OF STARTING UNIT

1. Gasoline supply tank - one gallon capacity. 2. Main engine choke control. - 3. Pet cock on fuel strainer. 4. Fuel strainer glass bowl. 5. Starter unit clutch handle. 6. Oil pressure gauge. 7. Throttle control. 8. Adjusting nut. 9. Clutch handle stop cap screw. 10. Clutch handle stop. 11. Oil filter pipe plug. 12. Oil level pet cock. 13. Ignition key. 14. Oil filter and level gauge. 15. Carburetor. 16. Oil relief valve. 17. Choke lever. 18. Water pump. 19. Governor spring. 20. Starter pulley.

CLOSE-UP





CROSS SECTION

FIGURE 29 - STARTING UNIT TRANSMISSION ASSEMBLY

1. Plate. 2. Drive gear bearing stud. 3. Driven gear bearing stud. 4. Drive gear. 5. Drive gear bushing. 6. Driven gear. 7. Driven gear bushing. 8. Drive gear retaining nut. 9. Driven gear retaining washer. 10. Driven gear retaining washer cap screw. 12. Bendix drive shaft. 13. Bendix drive shaft cap screw. 15. Bendix assembly. 16. Bendix assembly needle bearing. 17. Bendix housing. 18. Bendix housing expansion plug (not used with new enclosed needle bearing). 20. Bendix housing clamping segment. 21. Transmission housing. 22. Transmission housing gasket. 23. Transmission housing oil seal. 24. Cap screw. 25. Cap screw (bendix housing to flywheel housing). 26. Flat head screw. 28. Pipe plug. 32. Clutch cone. 34. Clutch lining. 35. Clutch lining screw. 36. Clutch spring. 37. Clutch spring stud. 38. Clutch spring stud washer. 39. Clutch spring pad. 40. Drive flange. 42. Adjusting nut. 43. Thrust screw. 44. Thrust bearing. 45. Thrust bearing snap ring. 46. Hand lever. 47. Hand lever pin. 48. Oil ring. 49. Clutch handle stop. 50. Clutch handle stop cap screw.

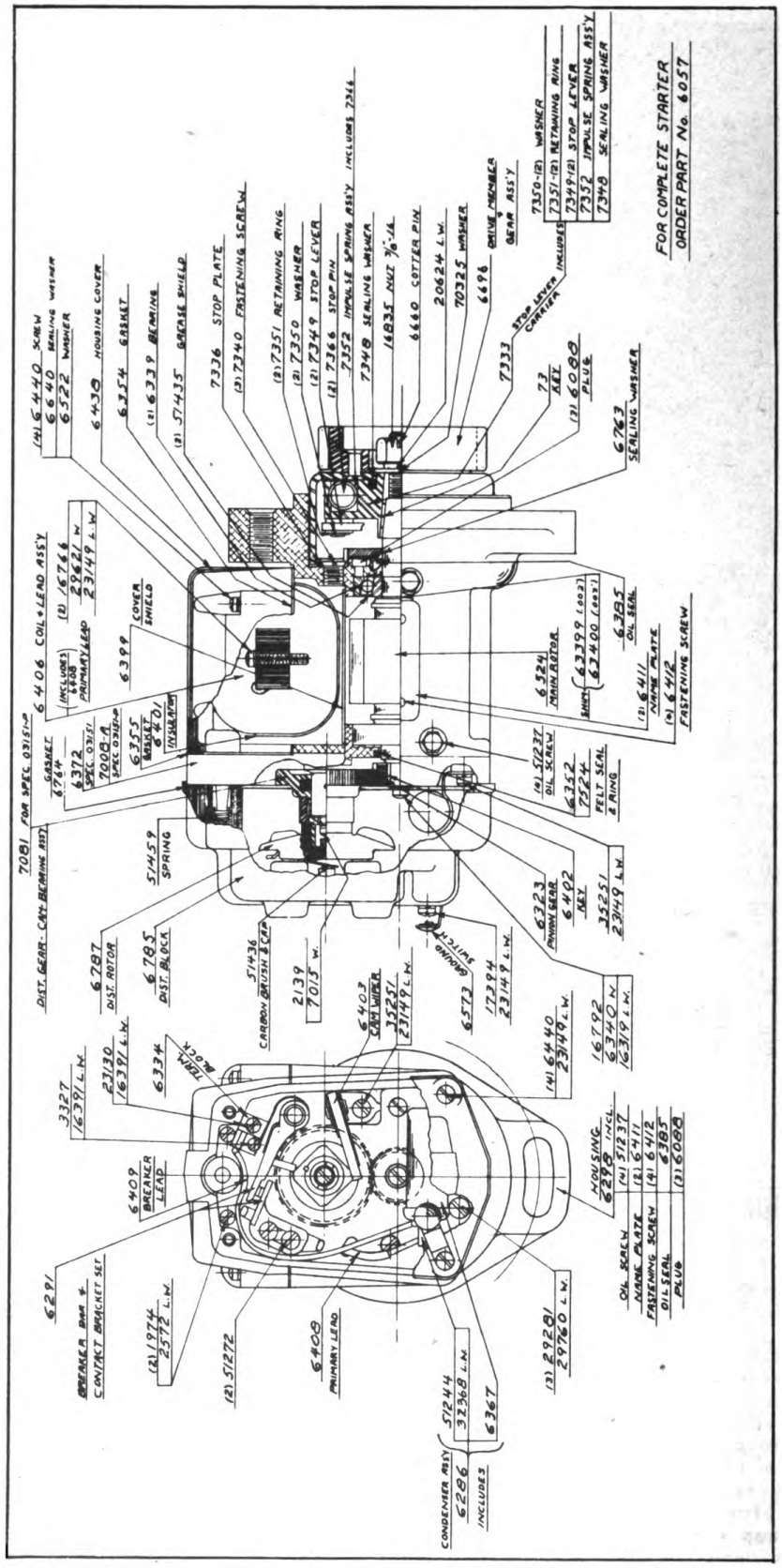


FIGURE 30 - MAGNETO CROSS SECTION

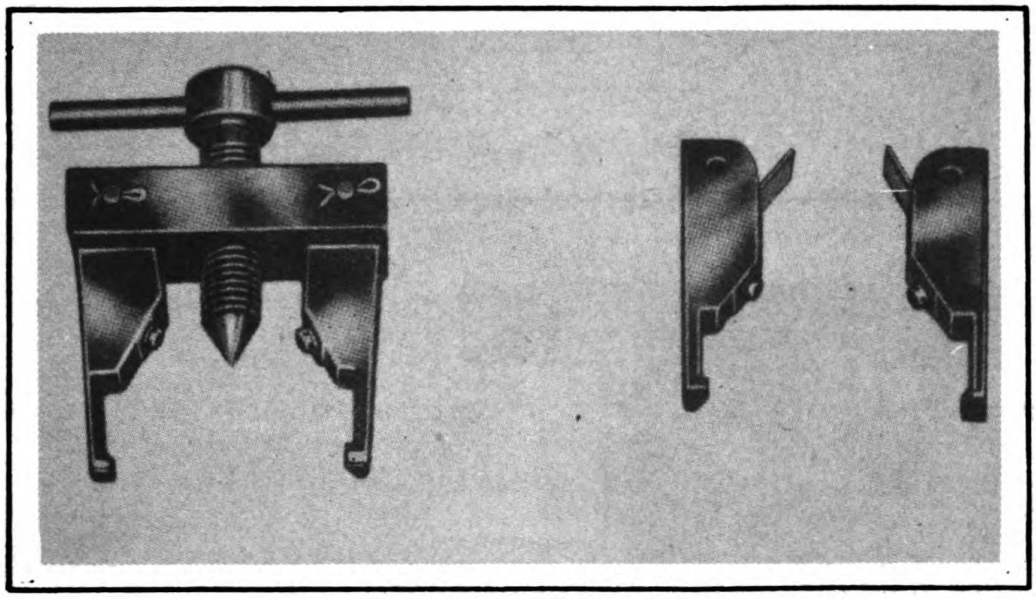


FIGURE 31 - MAGNETO TOOLS

Impulse starter puller with right hand and left hand jaws.

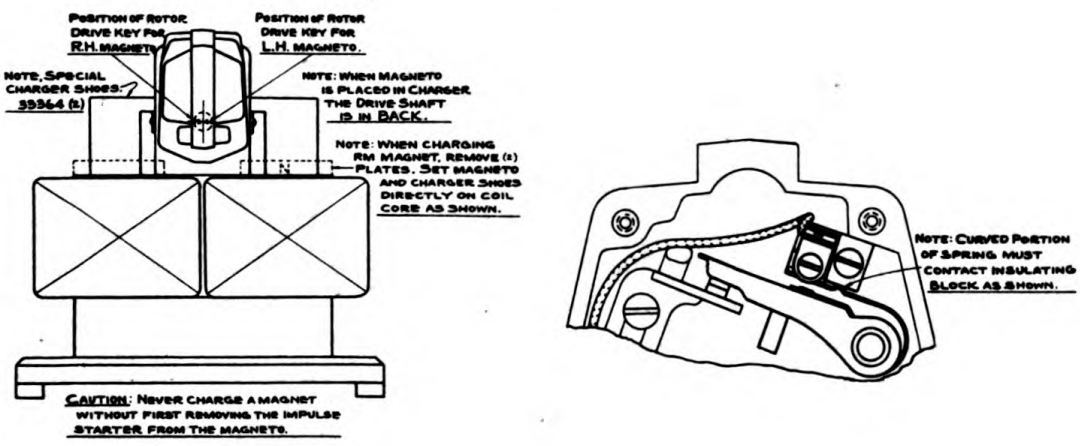


FIGURE 32 - MAGNETO ASSEMBLY DETAILS

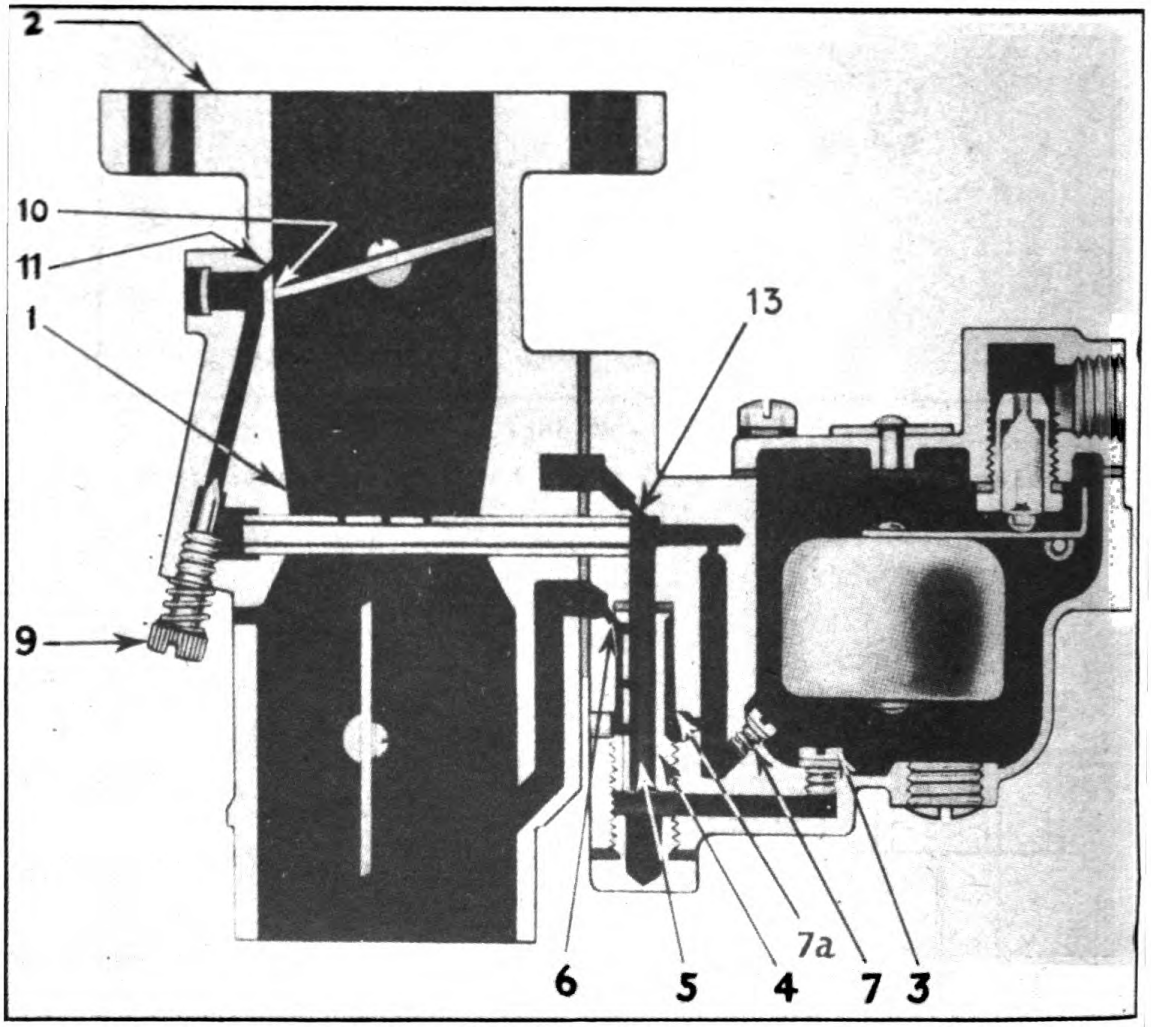


FIGURE 33 - CARBURETOR CROSS SECTION

1. Venturi 2. Mounting flange 3. Main jet 4. Metering well 5. Hole in metering well 6. High speed bleed channel 7. Well addition jet 7a. Well reservoir 9. Idling adjusting screw 10. Edge of throttle plate 11. Priming hole 13. Air channel for additional atomization.

MAINTENANCE MANUAL

PART IV

STARTING ENGINE ACCESSORIES

400 - GENERAL - The complete starting unit is removed from the main engine as described in Paragraph 109. Comparatively speaking, this unit gets very little use and should require little more than periodic inspection and tune-up.

401 - REMOVAL AND DISASSEMBLY OF THE TRANSMISSION AND CLUTCH - Figure 29 shows a cross section of this assembly as viewed from the bottom together with an outside view with the unit in a normal mounted position. The first step in disassembly is to unscrew the cap screws which hold the clamping segments, 20, and to loosen the Bendix housing lock screws. This will release the Bendix housing from the transmission housing, 21, and permit pulling it off the Bendix assembly, and removal of the entire Bendix assembly, 15, from the spline drive shaft, 12. Now drive out the pin, 47, remove the clutch handle, 46, unscrew the clutch handle stop screw, 50, and remove the clutch handle stop, 49. Unscrew the cap screws, 24, which hold the transmission housing, 21, to the plate, 1, and remove the transmission housing. At this time inspect the condition of the oil seal, 23, and if it is worn or shows evidence of leaking, replace it. Now remove the cap screws, 24, and flat head screws, 26, holding the plate, 1, to the flywheel housing, and remove the plate together with the clutch cone and drive flange assemblies. Lock the plate, 1, securely in a vise and unscrew the set screw which locks the flange, 40, to the clutch cone assembly. Clamp the clutch cone and unscrew the flange. The four cap screws, 13, may now be unwired and unscrewed and the Bendix drive shaft, 12, removed after which the driven gear retaining washer, 9, and cap screws, 10, may be removed as well as the driven gear bearing stud, 3, and gear, 6. Unscrew the hollow point Allen set screw through the hole in the drive gear, 4, unscrew the drive gear retaining nut, 8, and finally remove the drive gear, 4, bushing, 5, and stud, 2.

402 - ASSEMBLY OF THE TRANSMISSION AND CLUTCH - Reassembly of the starting unit transmission is practically the reverse of the procedure described in Paragraph 401;

however, the following points should be observed: Before assembling the gears, 4 and 6, to the plate, 1, be sure to insert the flat head screws, 26 in the proper holes. Then replace the gears and bushings. Replace the retaining nut, 8, (note that this has a left hand thread) install the set screw through the hole in the drive gear, and replace the driven gear retaining washer, 9. When the clutch cone assembly, 32, and drive flange, 40, are tightened, be sure that the flange is pulled snug against the shoulder of the clutch cone and that the hole in the flange registers with the hole in the shaft of the clutch cone so that the set screw will hold the two securely. When the drive plate is mounted on the flywheel housing, be sure that the flat head screws are tight to prevent the possibility of oil leakage from the transmission housing into the flywheel housing. Also, in assembling the transmission housing on the plate, make sure that the gasket, 22, is in good condition. The clutch lever adjusting nut, 42, must be tightened so that the clutch engages when the lever is in a convenient position. An inclination of about 15° off vertical toward the operator is best. The engaging point can be determined by tightening or loosening the nut and at the same time moving the lever back and forth. Hold the handle tightly so that the point of engagement can be determined more accurately. When the point has been determined, set the clutch handle stop, 49, in a position so that the handle is midway between the two ends. Then insert the cap screw, 50, move the adjusting nut a trifle till the cap screw finds one of the threaded holes in the inside flange of the adjusting nut, and tighten the cap screw.

403 - DISASSEMBLY OF THE MAGNETO - Before undertaking any repairs, remove all external dirt and provide a clean pan into which the parts may be placed as they are removed. The disassembly is accomplished as follows:

1. Impulse starter - See Paragraph 406.

2. Distributor block and rotor - Remove all attaching screws and draw the block straight forward. Draw distributor rotor straight forward.

3. Contact members - Remove adjustable contact by taking out two screws. Remove breaker bar and spring as an assembly, first disconnecting the end of the spring.

4. Condenser - Remove condenser by disconnecting leads and taking out attaching screw.

5. Distributor gear assembly - This assembly includes the distributor shaft, gear, and plain bearing and the circuit breaker cam, and is removed by taking out the screw cap in the center of the distributor shaft and loosening the screw lying behind the cap. This screw will not come out but will release the whole assembly which may then be drawn straight forward and off.

6. Distributor bearing - This is a plain bearing and together with the distributor gear and cam forms a unit assembly.

7. Pinion gear - Remove the holding screw and pull the pinion with Service Tool 33353.

8. Magneto top - Remove attaching screws and lift top straight up.

9. Coil - Remove loose insulators and two attaching screws. Lift coil up, being careful of the lead which passes through the front plate.

10. Rotor - Remove the main drive key. Remove front plate attaching screws. Tap the whole assembly lightly at the shaft drive end. That releases the front bearing plate and magneto rotor. CAUTION: The rotor is strongly magnetic and it will attract small steel chips readily. These are very difficult to remove. Keep the rotor clean and away from a dirty bench top.

11. Main bearings - Remove the metal grease seal from each bearing by hooking it out with Service Tool No. 33349. Do not attempt to preserve these seals.

They should be replaced by new ones. Remove the ball assemblies in ball retainers. NOTE: Examine all parts of the bearing for wear or other faults. If all parts are in good condition, they may be re-used and it will not be necessary to remove the outer races from the castings or the inner races from the shaft. If any part of either bearing is worn, replace both bearings entirely. To remove outer races, tap them gently out of the castings by the use of a small punch operated through three holes behind the race. These holes at the drive end are closed by three screws. To remove the inner races from the shaft use Puller 33274 and Jaw Group 33361.

12. Shaft seals - To remove felt seals at each end hook out the metal ring and felt with Service Tool 33349. Do not save these parts - replace them.

404 - INSPECTION AND RE-ASSEMBLY OF THE MAGNETO - Before inspecting and reassembling the parts, provide a pan of gasoline, clean rags and a stiff bristled brush for cleaning. Do not soak felt parts or moulded insulating material in gasoline. Subject insulating parts to electrical test before re-using them. Replace all gaskets.

1. Rotor and main bearings - Clean the housing and rotor thoroughly and blow out the oil holes front and back. The bearing parts must be clean whether the old ones are used or new ones installed. Guard constantly against picking up chips on the rotor. Press in the outer bearing races with Service Tool 33348 and the inner races with 33305. Before installing grease seal rings in the bearings or sealing felts in the bearing holders, the bearings should be fitted and trimmed if necessary. To do this, assemble the bearings, rotor and front plate. The shaft should turn freely without perceptible play. Shims should be added or removed to produce this condition. Shims go between the inner ball race and the shoulder of the shaft at the drive end. After the bearings are fitted, remove the

rotor to grease and seal the bearings. Pack each ball retainer with medium soft grease of high melting point. Place the grease packed ball assembly in place in the outer race. With Service Tool 33348 press in a metal grease retaining ring which will go down exactly flush with the rim of the outer race. Replace the gasket and apply the front bearing plate, line it up straight and fasten. Recheck the rotor for free-running without play. Apply felt seal moistened with oil at each end of the shaft and press in the felt retaining rings; two 3/32" felts at drive end and one 3/32" felt at front end, using Service Tool 33305. Fill the front bearing knock-out holes with grease.

2. Coil - Inspect the coil, the rigid insulating sheet for the bottom of the coil compartment, and the flexible insulating sheets which surround the coil. Apply the rigid insulator to the housing. Apply the bottom flexible insulator to the underside of the coil. Thread the coil lead through holes to the breaker compartment, seeing that the insulating sleeving protects the lead where it passes through the casting. Seat the coil on the housing shoes and fasten it down.

3. Top - Put the top flexible insulator in place. Replace the top gasket and apply the top. Always use a gasket washer under the head of the cover screws instead of a lock washer. Draw the top down only lightly until the distributor block is later applied.

4. Magnetize - The magnet should be charged with a Type G Magnet Charger using special shoes 33364 and with the magnet fully assembled in the housing. Never charge a magnet without first removing the impulse starter from the magneto. Place the magneto in the charger as shown in Figure 32, being careful that all the details are followed exactly. Otherwise, an inadequate charge or one of the wrong polarity may be obtained. Also the location and size of the charger shoes on the side of the magneto are important.

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5. Pinion - Install the pinion gear with marks facing out.

6. Distributor gear assembly - This assembly should be replaced if the bearing does not run smoothly or with any appreciable wobble. Apply the gear assembly to the attaching stud with the teeth meshed for correct rotation. Tighten in place with screw driver entered from the front of the shaft. Inspect for free rotation of all parts with not more than a faint trace of wobble in the shaft and grease the gear teeth lightly. Replace the screw plug in the shaft.

7. Condenser and switch -- Test the condenser and install it to rest horizontally on the bottom of the compartment and connect the lead which goes to the breaker bar and the lead from the coil. See that the condenser is positioned to stand out from the front edge of the front plate 11/16". The condenser can is one side of the safety gap and its position regulates the length of the gap.

8. Circuit breaker parts - Install the fixed contact bracket with two shouldered screws. The free end of the spring on the breaker bar, together with the primary lead terminal are fastened to the insulating block by a small screw and lock washer as shown in Figure 32. Note the exact position of lead wire and terminal. See that the spring has a little twisting tension tending to keep the bar from riding out on its bearing stud. Apply a drop of oil or a film of grease to the bearing stud.

9. Cam wiper - Moisten the cam wiping felt with 6 to 8 drops of oil and install it to engage the cam noses only to engage them lightly. Do not over-oil this wiper as this will cause oil to be thrown around the contacts.

10. Inspect and install the distributor rotor.

11. Inspect the distributor block and brushes. Replace all gaskets. Inspect the high tension spring connection where the coil quill enters. Install the block and tighten screws snug but not so tight as to ruin the gasket. Draw the magneto cover screws up snug after the distributor block is tightened. Note that a flat spring in the block makes contact with the condenser terminal when the block is in place.

405 - MAGNETO TESTS - Run the magneto at 1500 RPM for one hour before making tests. With the magneto running at 800 RPM and with the contacts held open, current measured across the contact points should be not less than 1.8 amperes, using a good quality AC meter. The magneto should spark regularly across 5/16", 3-point needle gaps at 200 RPM. Test to be sure that the integral switch or ground terminal is in operating condition. See paragraph 409 for impulse starter test.

406 - THE IMPULSE STARTER - The impulse starter is a spring mechanism at the drive end of the magneto to facilitate starting by causing the magneto rotor to be turned much faster than cranking speed. At the same time, it automatically retards the spark so that it will occur at top center or later, no matter whether the advance lever is advanced or retarded. In view of the operations performed by an impulse starter, it is obvious that it must be considered not only as a purely mechanical device for turning a magneto rotor, but also its timing must be taken into account. In order to understand the timing of an impulse starter it is necessary to trace its operation. When the magneto with the impulse starter is rotated, a latch operates to hold the magneto shaft from turning. Nevertheless, the driving member of the starter may continue to be turned since it is free to rotate on the magneto shaft. The continued turning of the driving member, while the magneto shaft remains latched fast, winds up a spring in the device. It is apparent that continued rotation eventually brings the drive member of the starter into a position where, if the machine is timed to the engine,

some one piston reaches top center and is ready for a starting spark. The drive member of the starter is fitted with a cam so designed that, when rotation has proceeded to the position where a starting spark is needed, the cam disengages the latch which has been holding the magneto shaft fast. Under the influence of the wound-up spring, the magneto shaft and rotor now turn at high speed until they catch up with the driving member which has been turned by cranking the motor. During this period of high speed, the magneto produces a hot spark. The spark is a retarded, or safe starting spark, because the magneto shaft was not released at all until the drive member (and of course, the engine crankshaft) had proceeded far enough around to be in the retarded position. It will be noted that the position of the advance lever has nothing to do with the case. The time of the spark is governed entirely by the time when the cam of the drive member releases the latch. Since these are both parts of the impulse starter, it is clear that the proper timing of the starting, or impulse, spark must be provided for in the impulse starter. The timing detail of an impulse starter is described as its "lag angle". The lag angle of an impulse starter is the number of degrees, measured at the impulse starter (or magneto shaft) between the time of the fully advanced spark with the magneto running at fair speed, and the time of the occurrence of the starting (or impulse) spark when the machine is turned slowly with the impulse starter in engagement.

407 - DISASSEMBLY OF THE IMPULSE STARTER - Remove the shaft nut, lock washer, and notched washer using shaft nut socket wrench 33318. Hold the starter lugs from turning with a monkey wrench. Draw the starter case straight forward. Remove the magneto member with puller 33274. Remove the felt seal, if there is one, by taking out two screws. Usually the stop pin plate need not be removed but if the pin has worked loose remove the plate by taking out three flat head screws.

408 - INSPECTION AND RE-ASSEMBLY OF THE STARTER - Check the stop pin for tightness, clean and oil the roller on

the stop pin, and see that the three flat head screws holding the stop plate are tight and staked. Apply a new sealing felt and ring assembly and oil the felt. Clean and inspect the magneto member. Note that all riveted studs are tight. Replace any worn parts. Apply a very small amount of grease to the hook of the fly weights and to the operative nose at the short end. Also, renew and oil the felt ring near the hub. Apply oil to the felt inside the spring sufficient to nearly saturate it, but not enough to leave the parts wet with oil.

409 - TESTING THE REASSEMBLED MAGNETO - Place the magneto on the power stand and connect all the cables to the rotary spark gap. Run the magneto slowly and starter should impulse regularly. Run at 1000 RPM and note where sparks occur with magneto fully advanced. Shut off the power and rotate the drive by hand through two impulses, noting where each impulse spark occurs. These impulse sparks should be later than the previous running sparks by as many degrees as the log angle stamped on the starter within a limit of plus or minus three degrees. Otherwise some of the operative parts are worn and should be replaced.

410 - SERVICE EQUIPMENT FOR THE MAGNETO - The equipment required to service the Edison Type RM magneto consists of:

1. Test stand having provision for driving magneto which is fitted with an impulse starter at any speed from 50 RPM to 4000 RPM.

2. Rotary spark gap for test stand. This is sometimes called a spark protractor.

3. Open spark gap panel with at least six adjustable 3-point open gaps.

4. Type GMagnet Charger (6 volt, 12 volt, or 110 volt).

5. Set of charger shoes to adapt above charger to RM Magneto; Part No. 33364.

6. Angle block of wood having a sloping top upon which to set the magneto when repairing it. Thus the magneto stands at an angle of about 30° from front to back.

7. Edison-Splitdorf Test Set No. 33259 (or its equivalent) comprising: coil test apparatus, condenser tester, rotor break test lamp, insulation tester, primary circuit testers.

8. Service tools:

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
33349	Main bearing grease seal hook	33353	Pinion gear puller
33348	Combination bearing tool, outer race and seal replacer	33352	Distributor block center brush and cap punch
33274	Impulse starter puller (includes RH and LH jaws)	33361	Special jaws, collar and clamp for puller No. 33274 to remove main bearing cone
33318	Shaft nut wrench	33366	Saddle block for flange mounted magneto
33319	Open end wrench 1/4" and 5/16"		

411 - LUBRICANTS FOR THE MAGNETO - Whenever oil is specified, use a good quality automobile oil, grade SAE 40, usually sold as "medium" or "medium heavy". Whenever grease is specified use a first quality medium soft clear grease of high melting point. Suitable greases are: Lubriko M-6, Master Lubricants Company, and Starfak No. 2, Texas Company. Usually a clear grease recommended for automobile front wheel bearings may be used safely.

412 - THE CARBURETOR - The carburetor measures out fuel and air in definite proportions, and prepares the mixture for burning in the cylinders. If too much air is admitted, the mixture burns so slowly that it continues to burn through the exhaust stroke, and ignites the next incoming charge which pops back through the carburetor. If too little air is used, it cannot produce complete combustion, consequently, part of the fuel is wasted. From this, it is evident that the air and fuel proportions must be accurate within very close limits. The starting engine is shipped with the carburetor correctly set, and as long as it runs well, do not disturb the adjustments.

413 - CARBURETOR ADJUSTMENT - Before starting any adjustments, make sure they are necessary. Check the fuel line, fuel supply, and sediment trap. Drain the carburetor by removing the slotted drain plug at the bottom of the float chamber. If fuel does not flow freely from this opening, the line from the tank entering at the top of the float chamber is plugged. The most important thing to remember in servicing a carburetor is to keep the interior clean, with all channels free from obstructions, and to always replace worn parts or gaskets. The only calibrating adjustment on the carburetor is the idling adjusting screw, 9, Figure 33. If the engine loads up or seems logy, it is an indication that the mixture is too rich. If the engine slows down and pops in the carburetor, the mixture is too lean. Adjust until the engine runs smoothly.

414 - CARBURETOR CONSTRUCTION - Figure 33 shows the construction of the carburetor used on the ICK starting engine. The Venturi (1) is cast integrally with the carburetor and measures the volume of air which is passed through the carburetor. The venturi size used is the smallest one which will permit full power development. The venturi size is indicated by figures stamped on the face of the carburetor flange (2). The Main Jet (3) and the Well Addition Jet (7) are the principal fuel metering jets. The Main Jet fuel feeds through a channel into the Metering Well (4). The Main Jet regulates the fuel supply at all but slow speeds. The Metering Well (4) controls the mixture characteristics

at all speeds except idling. The holes in the side of the well influence the flow of fuel from the Main Jet at low speeds. The diameter of the hole (5) in the Metering Well is selected to balance the Main Jet and venturi sizes. It regulates the suction transmitted to the Main Jet and influences the mixture ratio at all speeds except idling. Best performance is usually obtained by using a Metering Well which permits the use of a Main Jet preferably one size smaller than the size of the Venturi. The size of the High Speed Bleed (6) controls the rate of air flow into the Metering Well channels. This size is determined by test and once determined, should not be altered. Increasing the size of this hole would cause a lean mixture at high engine speeds. Decreasing its size would cause a rich mixture at high engine speeds. The hole (13) provides additional air for atomization and is not part of the calibration. The Well Addition Jet (7) controls the rate of fuel flow into the Well Reservoir (7a) and provides fuel for good idle recovery. The fuel in this reservoir provides a reserve which is available as an accelerating charge when the throttle is opened quickly. The size of the Well Addition Jet also has an effect on the mixture ratio at part throttle slow speed operation - just above the idling range. Too large a jet would cause a richness and too small a jet would cause a leanness at this point. The Idling System consists of the Idling Adjusting Screw (9) which controls the air and channels which carry the air and fuel to the edge of the Throttle Plate (10) at which point a high suction exists at idling speeds. This mixture of fuel and air for idling is discharged into the carburetor barrel through the Priming Hole (11). As the Idling Adjusting Screw controls the admission of air a richer mixture is obtained by turning the Idling Adjusting Screw clockwise (toward its seat) and a leaner mixture is obtained by turning the Idling Adjusting Screw counter clockwise. There will be little necessity for making changes in the calibration of the carburetor. The standard setting has been determined to give best possible results under normal operating conditions. About the only care required by the carburetor is that it be kept clean and that worn parts be replaced when necessary.

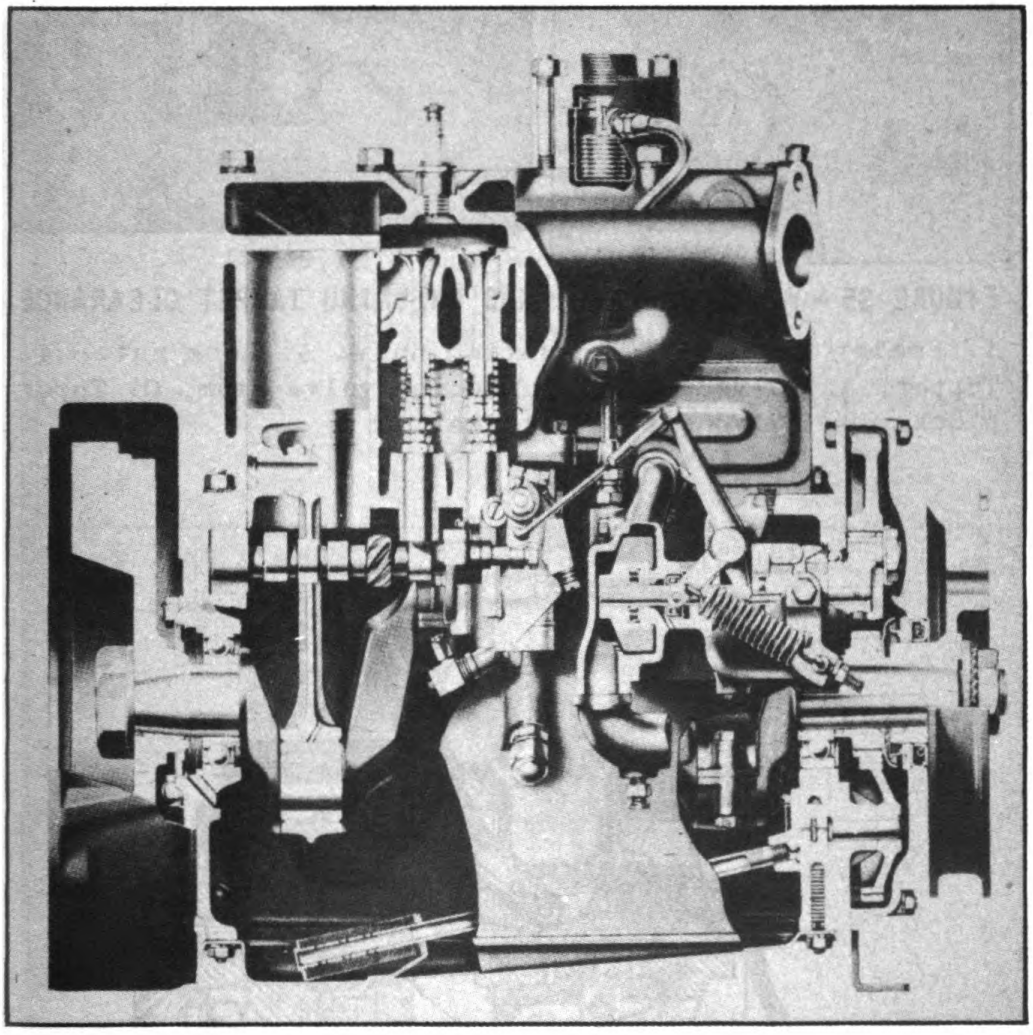

FIGURE 34 - SIDE SECTION OF STARTING ENGINE

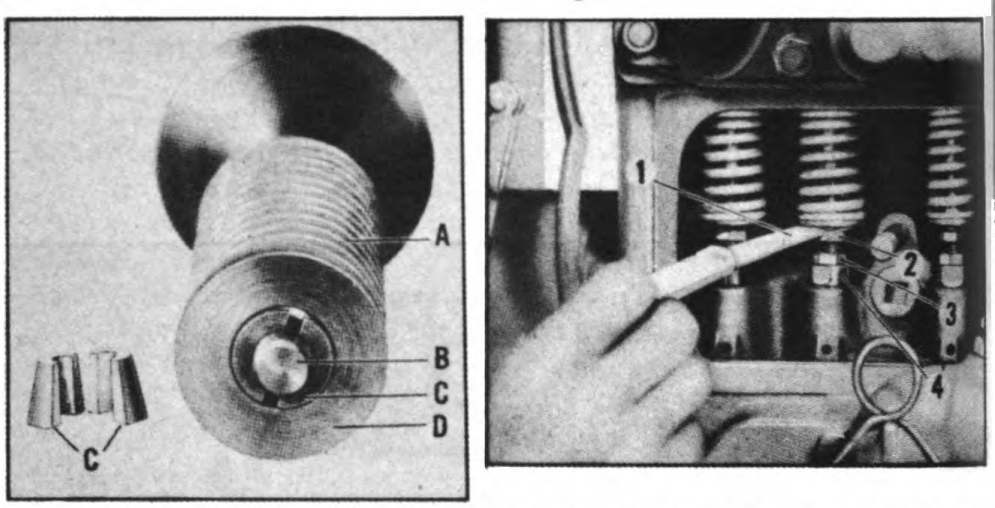

FIGURE 35 - VALVE ASSEMBLY AND CHECKING TAPPET CLEARANCE

1. Feeler gauge. 2. Adjusting nut. 3. Lock nut. 4. Tappet, A. Valve spring, B. End of valve stem, C. Taper blocks, D. Valve spring retainer.

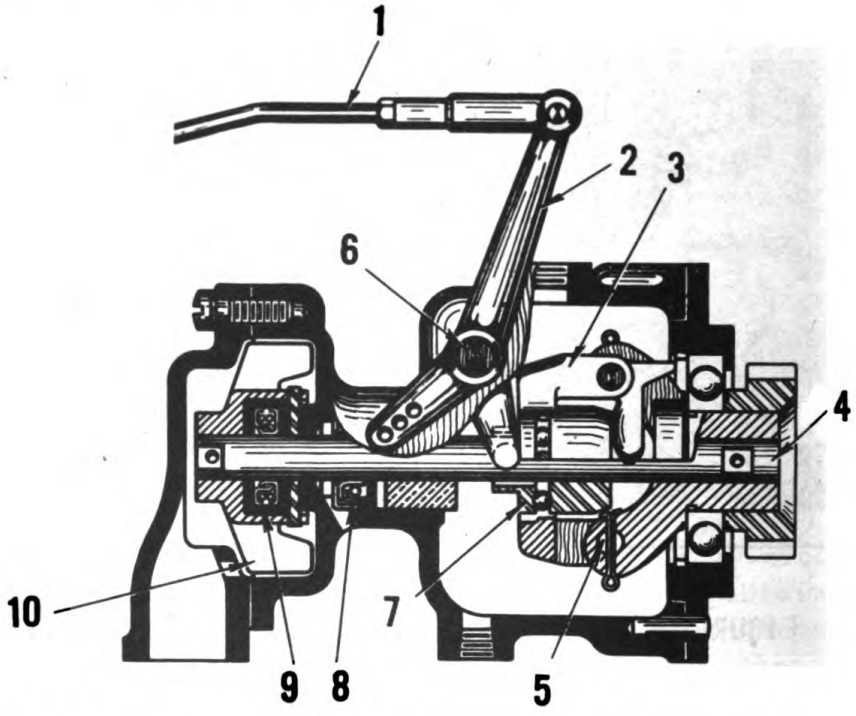

FIGURE 36 - GOVERNOR AND WATER PUMP ASSEMBLY

1. Governor throttle rod. 2. Governor lever. 3. Governor weights. 4. Governor drive shaft and gear. 5. Governor weight hinge pins. 6. Governor lever hinge pin. 7. Governor ball thrust shift plate. 8. Water pump seal. 9. Water pump seal. 10. Water pump impeller.

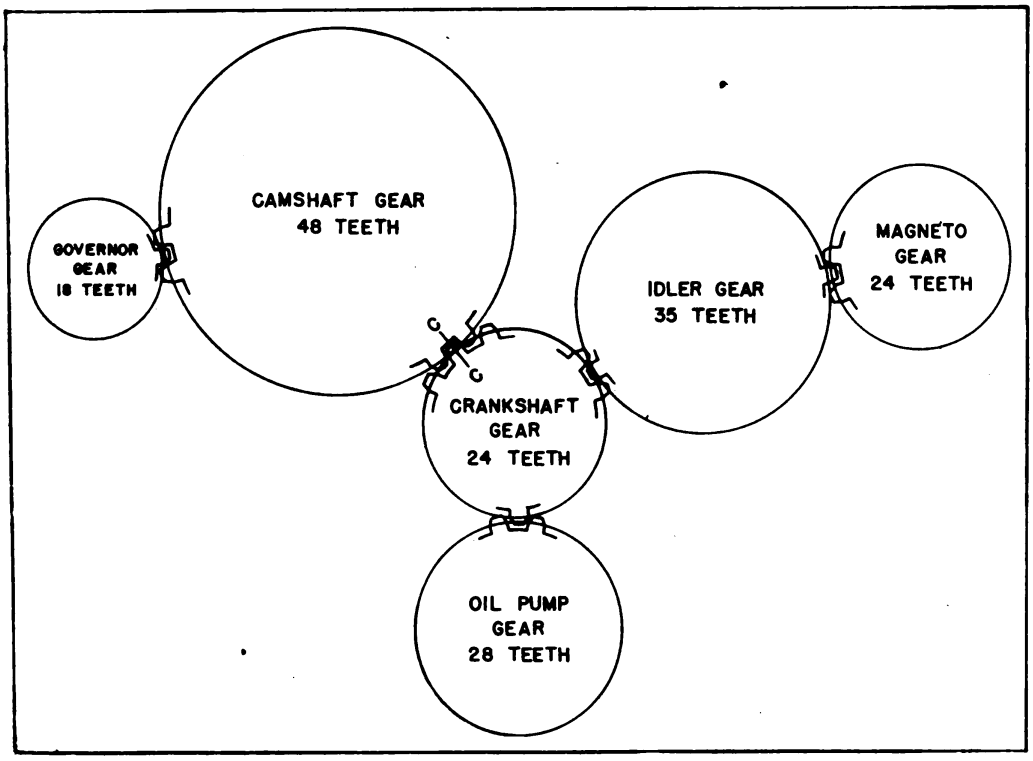

FIGURE 37 - LAYOUT OF TIMING GEARS

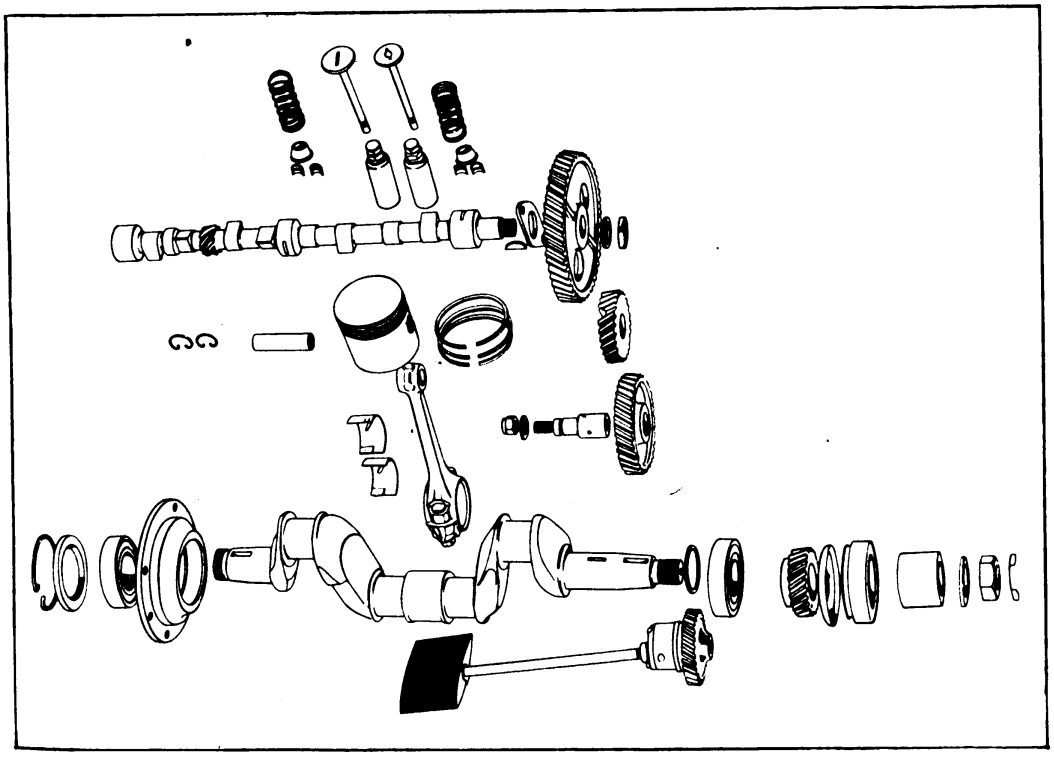

FIGURE 38 - EXPLOSION VIEW OF CRANKSHAFT, CAMSHAFT. GEAR AND OIL PUMP ASSEMBLIES

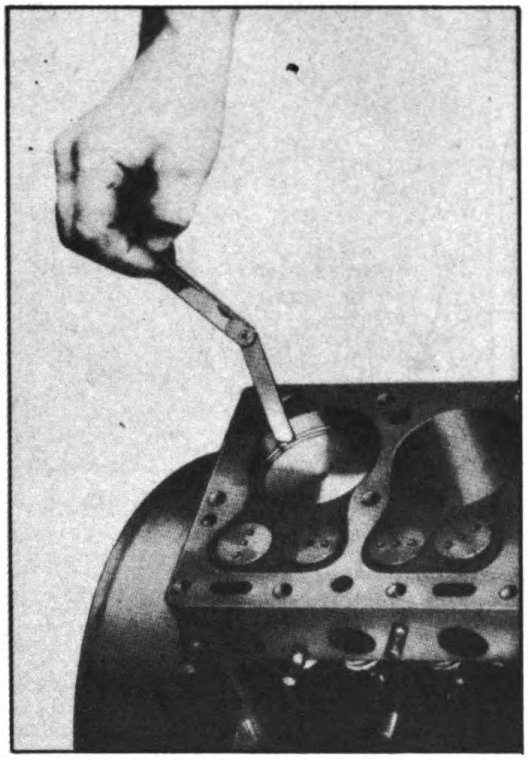

FIGURE 39
FITTING PISTON RINGS

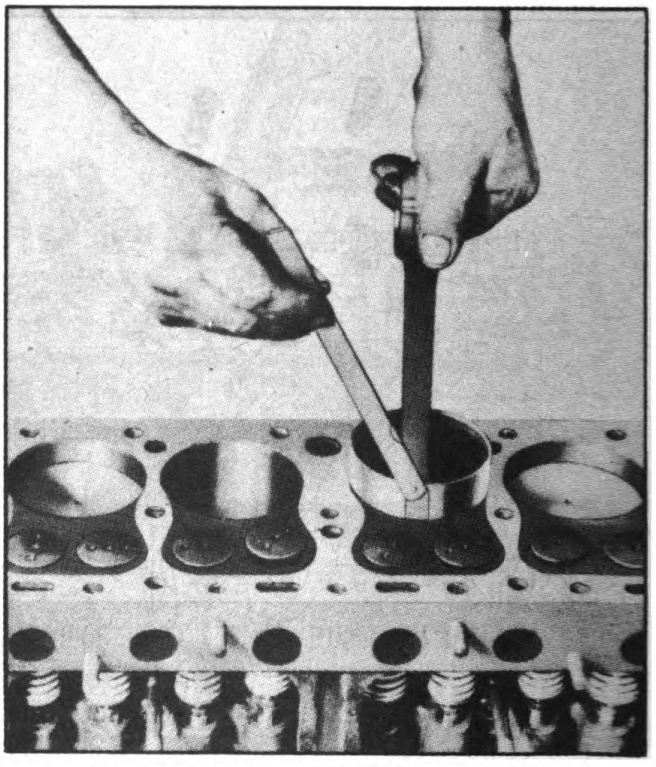

FIGURE 40 - FITTING PISTON
TO CYLINDER

PART V
STARTING ENGINE OVERHAUL AND MECHANICAL ADJUSTMENTS
Valve Mechanism

500 - PREPARING FOR GRINDING - Valves need regrinding when they begin to leak, a condition which can be easily discovered by cranking the engine on the compression stroke and listening for the hiss. To get at the valve mechanism, disconnect the ignition cables from the spark plugs and then remove the cylinder head. Now disconnect the throttle control, fuel line, and the governor operating rod; and unbolt and remove the entire manifold and carburetor as a unit. Remove the valve tappet cover plates.

501 - VALVE REMOVAL - As shown in Figure 35, the head of each valve stem is fitted with a shallow steel cup (retainer) that surrounds the end of the valve spring and is held to the stem by a pair of tapers. Before the valve can be removed, the spring must be compressed so that the tapers will fall away from the valve stem; after which, the retainer can be removed, the valve lifted out, and finally the spring can be removed.

502 - VALVE GRINDING - The general rules for valve grinding given in Paragraphs 306 - 308 should be observed. A valve grinding machine is much quicker and more accurate than hand grinding. Keep in mind, however, that the accuracy of this method depends entirely upon the condition of the valve guide and the pilot mandrel's fit both in the guide itself and the hub of the grinder stone. It must be a snug push fit in the valve guide so that it will not wobble at the upper end. If it does have any upper end movement, the seat will not be ground true. Grinders that are worn too much to give the mandrel solid support should be replaced before grinding is attempted.

503 - CYLINDER HEAD REPLACEMENT - In reassembling the cylinder head, the improper tightening of cylinder head

cap screws and stud nuts may pull the cylinder bores out of round, making it impossible for the piston rings to seat properly, causing excessive oil and gasoline consumption, cracked cylinder heads and, generally, poor performance. It is recommended that a tension indicating wrench be used to insure even tension. Any good supply house can furnish one, along with directions for its proper use with various sizes of bolts and nuts.

It is also recommended that a new head gasket be installed if for any reason the cylinder head is removed. Care should also be taken not to damage the gasket when placing gasket over the cylinder studs. After the head is in place, draw the cap screws and studs fairly tight with a speed wrench. Start with the center studs and work toward each end alternately. After this, tighten in the same order in two or three successive stages.

504 - TAPPET CLEARANCE - Tappet clearance should be checked as indicated in Figure 35. Add .002" to the dimensions given for the first ten hours of operation after a regrind job. This must be done without fail to avoid valve burning. Tappet clearance dimensions (intake: .005" - .007". Exhaust: .007" - .009") are for valve setting at room temperatures and NOT after the engine is hot. If the tappets have any clearance at all when the engine is hot, the valves are seating. Always adjust and check tappets with the lifter on the base of the cam.

505 - VALVE TIMING - The valve timing for this engine is as follows:

Intake opens ---- 5° after top dead center
Intake closes --- 45° after bottom dead center
Exhaust opens --- 45° before bottom dead center
Exhaust closes -- 10° after top dead center

Valve timing must be checked with the valve tappets of number one cylinder adjusted to the "Valve Timing Checking Clearance", (intake .003"; exhaust .005"). Then rotate the flywheel until the mark alongside the fly-

wheel inspection opening, 2, Figure 27, is directly opposite the "IN-O" mark on the flywheel. With the clearance set and the flywheel in this position, the intake valve of No. 1 cylinder should be just starting to open and a very thin feeler placed between the tappet and the end of the valve stem will be pinched. If the feeler is not pinched, it is probably because the engine is on the power stroke, and it must be turned one complete revolution to the point where the intake stroke begins. Since all the cams are forged integrally in one piece with the shaft, if one valve is checked, all the rest will be properly timed automatically. Before resuming operation, reset tappet clearance to the "running clearance" dimensions given in Paragraph 504.

506 - CAMSHAFT AND BUSHINGS - The camshaft is a steel forging supported by bronze bushings pressed into the crankcase. End thrust is taken by a thrust plate which is held to the crankcase by cap screws.

507 - REMOVING THE CAMSHAFT & GEAR - Camshaft removal entails removal of the manifold and carburetor assembly, valve tappet cover plate, gear cover, and front oil seal. In addition to this, it is also necessary to block up all the valve lifters so that the bottoms are clear of the cams, or remove the cylinder head and block up the valves with wooden blocks. In the latter method, the engine should be placed on end so that the lifters will not drop onto the cams. With the engine thus arranged, bend down the edges of the thrust plate screw lock, and remove the capscrews which hold the thrust plate and screw lock to the case. When these are removed, the camshaft, thrust plate, screw lock, and gear may all be withdrawn.

508 - CAMSHAFT END PLAY - Check camshaft end play with a long feeler gauge inserted between the thrust plate and the end of the front camshaft journal. If it exceeds .010 inch the thrust plate must be replaced.

509 - CAMSHAFT BUSHINGS - The camshaft bushings are a press fit in the crankcase, and if replaced, must be

align reamed in the case. Usually replacement is necessary when the clearance is .004" or more at which point oil pressure will drop below the recommended 15 pounds.

510 - OIL PUMP SCREEN - The oil pump screen assembly can be removed for thorough cleaning by removing the oil pan and then unscrewing the screen assembly from the pump. Put the screen in gasoline and allow it to stand long enough to soften any carbon which may have accumulated. Use a putty knife to remove it as a sharp edged tool may damage the screen.

511 - OIL PRESSURE - Low oil pressure may be caused by: low oil supply, a chip or flake holding the pressure relief valve open, clogged screen, diluted crankcase oil, or a sheared drive pin or key in the oil pump. The cure for low oil supply is obvious--refill. The relief valve parts can be easily removed, cleaned, and then re-assembled. Clean a clogged screen as described in Paragraph 510. Dilution is frequently due to the choke sticking and not likely since there is no linkage to stick on this engine. If the oil pressure fails to come up after all the foregoing have been tried, remove the pan and take off the back plate of the oil pump. Then crank the engine and if the pump rotor with its two sliding vanes does not rotate as the engine turns, it will be necessary to dismantle the front end, remove the pump and gear, and correct the pump drive failure.

GOVERNOR AND WATER PUMP

512 - GOVERNOR OPERATION - Figure 36 shows the governor assembly. Operation of the governor is as follows: It is gear driven from the camshaft gear and as speed increases, the weights, 3, move outward. The weights are pivoted on the weight carrier and their movement is transmitted by means of the shifter, 7, to the governor lever, 2. Here the "increased speed" movement is transmitted by the rod, 1, to turn the throttle valve toward a closed position. The governor spring, 19, Figure 28, opposes this movement, and its tension controls maximum speed - increased tension results in

increased maximum speed. Spring tension is set before the engine leaves the factory. Do not disturb it unless the governor adjustments have been disturbed.

513 - RESETTING THE GOVERNOR - If it should be necessary to dismantle the governor at any time for other adjustments - and it is only for that purpose it should ever be necessary to disturb this mechanism - there are some basic requirements which should be observed. These requirements can all be met if the governor parts are carefully marked before they are removed so that they will be re-assembled with the same adjustment and in the same places from which they were removed. Most important, make sure that the governor rod, 1, is accurately assembled exactly as before to prevent improper position of the butterfly valve. Also, be sure the lock nuts are in place and securely tightened to prevent change in length. Notice carefully, and mark the position of the throttle lever so that it goes back exactly as before. If these precautions are followed, the governor should operate exactly as before when it is again put into service provided the tension of the governor spring and the length of the operating rod have not been changed. To secure the best operation, make sure that the length of the operating rod is adjusted so that the throttle stands a trifle towards the closed position when the engine is stopped.

514 - WATER PUMP - The water pump requires no lubrication attention but may require replacement of the seals, 8 and 9, Figure 36, if leakage develops. This can be detected by means of the tell-tale hole just below 9. If replacement of the seals is found to be necessary, remove the entire water pump and governor assembly from the engine so that the work may be done on a bench. It is necessary to remove the carburetor first so that the water pump, governor and drive gears may be pulled free of the front plate. It is also necessary to remove the water inlet and outlet connections, the by-pass connection and to break the connection between the governor lever and throttle rod. Then remove the cap screws holding the assembly to the gear cover and front plate. Carefully disengage the gears and withdraw the unit.

644168 O - 45 - 14

515 - REPLACING SEALS - With the governor and water pump removed to a bench it is a simple matter to remove the pump cover disclosing the impeller. Then drive out the pin holding the impeller to the shaft being very careful not to distort the shaft. The impeller can be pulled from the shaft with a gear puller. Be careful not to damage the impeller. If it is stuck, place that portion of the assembly in penetrating oil and allow it to stand for a couple of hours. This should loosen the impeller and seal, 9, Figure 36, so that both may be removed, as well as the carbon disc and the seal, 8. Before installing new seals and replacing the impeller, clean the shaft with fine emery cloth.

PISTONS, RINGS AND PINS

516 - GENERAL DESCRIPTION - The pistons are cast iron. Three piston rings per piston are used, all being of the square O.D. type and all located above the piston pin. The top ring is a compression ring, the second is a scraper ring, which rides the oil film on the upstroke and scrapes excess oil down onto the third oil control ring on the downstroke. The oil scraped down passes through slots in the oil control ring and out the bottom of the ring. The third ring also acts as a scraper. The piston pin is full floating and held in place by snap rings at each end.

517 - FITTING PISTONS - The sides of the piston, which take the thrust from the connecting rod against the cylinder, are the points at which clearance measurements should be checked. Use a 1/2 inch feeler strip of .0025 inch thickness, lay it along the cylinder bore on one side and push the piston into the cylinder in the manner shown in Figure 40. A correct fit is obtained when the piston is a nice push fit with the feeler in place. A hard push fit is too tight, and if the weight of the piston will drop it through the cylinder, it is too loose. Pistons and rings in .010", .020" and .040" oversize are available for rebored cylinders.

518 - FITTING NEW RINGS - New rings should be fitted into the cylinders before trying to place them on the pistons. It is a wise precaution when fitting pistons in the cylinder to put the piston in the cylinder ahead of the rings as indicated in Figure 39. Push it in a half inch or so and then push the rings against the head of the piston to prevent their being out of square with the cylinder bore and to avoid the possibility of a false reading of the gap clearance. When the rings are square, the gap clearance should be .007" to .017". If the cylinder is worn to the extent that a distinct ledge is formed at the top, it is possible that this ledge will break new rings, and the best plan is to regrind the cylinders and install new, oversize pistons and rings. In any case it is advisable to dress down this ledge to avoid any possibility of damage to the new rings.

519 - INSTALLING NEW RINGS - After the gap clearance has been tested, be careful not to get the rings mixed and fitted to the piston for another cylinder. This is important since all cylinders do not wear alike. Now fit the rings to the proper grooves. Each should fit freely without binding so that it may be rolled all the way around the piston; and if this is not the case, rub the sides of the ring on a sheet of fine emery cloth which should be placed on some perfectly flat surface. Try the ring in the groove again and repeat the operation until the fit is satisfactory. Use a standard ring spread in removing and installing rings to avoid damage to the sides of the piston. Always remove the rings in order, the top one first and so on. In replacing, reverse the order. Before putting piston and rings in the cylinder, oil thoroughly and see that all parts are free from grit and dirt.

520 - PISTON PINS - When it is necessary to put in new pistons, new piston pins must be used. Always purchase new pistons with the pins fitted to avoid fitting of pistons and pins in the field.

BEARINGS

521 - CONNECTING ROD BEARINGS - In general, any connecting rod bearing that is loose will cause an abnormal knock that increases with use. The heavier the knock, the greater the need for prompt attention. A loose connecting rod bearing can be recognized by running the engine briskly and then closing the throttle. As the engine speed decreases, the loose bearing will rattle. In any case, the loose bearing must be definitely located by trying the adjustment by hand. If only a small amount of take-up is necessary, remove the cap, take out the shim from each side of the bearing, and replace the cap. During an engine overhaul it is advisable to make an accurate check of bearing clearance and not depend on trying them by hand. Take a 1-inch length #2 fuse wire and place it between the bearing shell and the shaft journal laying it parallel to the shaft. Tighten down the cap to the same tightness as for normal operation. Then remove the cap, take out the flattened wire and measure its thickness with a micrometer. If it exceeds .004" that bearing should be replaced.

522 - CONNECTING ROD BEARINGS - The rod bearings are precision type. There is a milled notch in the parting edge of both the cap and the rod into which is fitted the bent-out ear of the corresponding corner of the bearing shell. This holds each half of the shell from turning when the cap is pulled down. The bearings are fitted with one shim on each side to permit a small amount of takeup.

523 - REPLACING BEARING SHELL - New shells for connecting rod bearings are available for standard crankshaft undersizes as follows: .010", .020", .040" undersize. The micrometer dimensions of the shaft journal must be given when ordering so that the correct shells can be furnished. It is not necessary to file, scrape or manipulate either the cap or bushing. In replacing the shells, always be sure that the face of the bearing seat is absolutely clean and that no particles of grit or carbon are allowed to get between it and the back of

the bearing shell. Many failures of bearings which have just been installed are due to carelessness in this respect. Also, whenever a bearing is opened, flush the feed hole out with gasoline or kerosene. Notice that caps and rods are all numbered. Always replace a cap on the same rod from which it was removed and make sure that the numbers are on the same side.

524 - CONNECTING ROD SIDE CLEARANCE - Connecting rod side clearance is a factor to be considered only when rods are replaced. Side clearance is determined by crowding the rod tight against one side of the crank throw and using a feeler at the other. This should be not less than .006", nor more than .010".

525 - MAIN BEARINGS - These are deep groove ball bearings supported by the front and rear of the crankcase. Prior to removal, the accessories, spark plugs, cables, water connections, etc., should be removed so they are not damaged in turning the engine over. Also, to be removed are the cranking pulley, gear cover, idler and crankshaft gears, oil pan, oil pump, starting unit transmission, and flywheel. The connecting rod bearing caps should be removed and the upper halves moved out of the way. The rear main bearing is held in place by a retainer plate bolted to the crankcase. When this is removed the shaft and bearings can be withdrawn from the case. Use a lead hammer to pound the front end of the shaft until the bearings are free of the case. When the shaft and bearings have been withdrawn, the bearings can be removed from the shaft with a gear puller.

MAINTENANCE MANUAL

MODEL ICK

MECHANICAL ADJUSTMENTS - TECHNICAL DATA

VALVES

Intake Valve Head Diameter.....	1-1/8
Exhaust Valve Head, Diameter.....	15/16
Valve Seat Angle, Intake and Exhaust, Degrees.....	45
Valve Clearance in Guide, Intake and Exhaust.....	In. .001-.003 Ex. .002-.004
Tappet Running Clearance, Intake.....	.005-.007
Tappet Running Clearance, Exhaust....	.007-.009
Tappet Clearance for Checking Valve Timing, Intake.....	.003
Tappet Clearance for Checking Valve Timing, Exhaust.....	.005

CAMSHAFT AND BEARINGS

Running Clearance.....	.001-.0025
End Play.....	.002-.003

IDLER GEAR

End Play.....	.003-.005

CRANKSHAFT AND BEARINGS

Main Bearing...Single Row Deep Groove Non-Adjustable ball bearing type

Crank Pins, Diameter.....	1-9/16

PISTONS

Land Clearance, Top Ring.....	.010-.0135
Land Clearance, Second Ring.....	.010-.0135
Land Clearance, Third Ring.....	.010-.0135
Skirt Clearance, Top and Bottom.....	.0025

PISTON RINGS

Top Two Rings, Width.....	1/8
Oil Ring, Width.....	5/32"
Groove Clearance, Top Ring.....	.0015-.003
Groove Clearance, Other Rings.....	.001-.0025
Piston Ring Gap.....	.007-.017

PISTON PINS

Fit in Piston, Selected Fit.....	.0002-.0003
Fit in Rod Bushing.....	.0002-.0007

CONNECTING ROD AND BEARINGS

Running Clearance, Large End.....	.0005-.0025
Side Clearance, Large End.....	.006-.010

NOTE: Unless otherwise indicated, all dimensions are given in inches.

WAUKESHA POWER UNIT

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PARTS PRICE LIST

PARTS PRICE LIST

INDEX TO PARTS PRICE LIST

Always Give Engine Model and Number When Ordering Repairs

WAR DEPARTMENT
Q. M. C. Form No. 400
Revised Apr. 6, 1921

REQUISITION

To: Engineer Supply Officer, ... No. of Sheets 1 Sheet No. 1
Columbus Quartermaster Depot, COLUMBUS, OHIO.
Requisition No. E-531-3-43 Date April 1, 1943 Period Special

SHIP TO Engineer Property Officer, Pine Camp, New York
MARKED FOR: Engineer Supply Officer, 802nd Engr. Battalion, Pine Camp, N. Y.

REQUISITIONED BY (show Signature, Rank, Organization, Destination. If different from "SHIP TO" include address):

Robert E. Roe
Robert E. Roe,
Major, C. E.,
Engineer Property Officer

APPROVED ~~BXX~~ For the Commanding Officer:

John E. Doe
John E. Doe,
Col., C. E.,
Executive Officer

~~STOCK~~ Mfg. No.	ARTICLES	UNIT	ON HAND AND DUE	CONSUMED	REQUIRED	APPROVED
PARTS FOR	CRUSHER, ROCK, MOTORIZED, GASOLINE, PIONEER MODEL NO. 000000, SERIAL NO. 0000, MOTOR NO. 0000000, U. S. A. REG. NO. 00000000					
	Basis: Repair of Disabled Equipment. Delivery is requested by April 15, 1943.					
	WAUKESHA 6 WAKU ENGINE GROUP Cylinder Head Parts					
123000	CYLINDER HEAD GASKET	ea	0	2	2	
73497	VALVE SEAT INSERT (exhaust)	ea	0	6	6	
B4476	CYLINDER SLEEVE PACKING RING	ea	0	12	12	
	CONNECTING ROD & PISTON PARTS					
123004-B	PISTON (cast iron)	ea	0	6	6	
123006	PISTON PIN	ea	0	6	6	
	WAUKESHA ICK STARTING ENGINE GROUP					
73284	CRANKSHAFT OIL THROWER (front)	ea	0	1	1	
121012-A	CRANKSHAFT GEAR	ea	0	1	1	
	NONEXPENDABLE ARTICLES SHOWN HAVE BEEN PLACED ON I & I REPORT (REPORT OF SURVEY, ETC.)					

A Sample requisition in the correct form for submission by the Engineer Property Officer is shown on the preceding page.

THIS SHALL BE FOLLOWED IN MAKING OUT REQUISITIONS.

In order to eliminate duplication of work, Property Officers may authorize organizations to prepare requisitions in final form, leaving requisition number space blank for completion by Property Officer.

THE FOLLOWING RULES WILL BE OBSERVED CAREFULLY IN PREPARING REQUISITIONS FOR SPARE PARTS:

a. Prepare a separate requisition for each different machine.

b. Type "SPARE PARTS" in upper right hand corner of requisition form.

c. State PERIOD designation by use of one of the following terms:

(1) "INITIAL" - first requisition of authorized allowances.

(2) "REPLENISHMENT" - subsequent requisitions to maintain authorized allowances.

(3) 'SPECIAL" - requisitions for necessary repairs not covered by allowances.

d. Give complete shipping instructions.

e. State proper nomenclature of machine, and make, model, serial number and registration number.

f. State basis or authority, and date delivery is required, immediately below description of machine.

g. Group parts required under group headings as shown in manufacturers' parts catalogs.

h. State manufacturers' parts numbers and nomenclature descriptions accurately and completely. Do not use abbreviations.

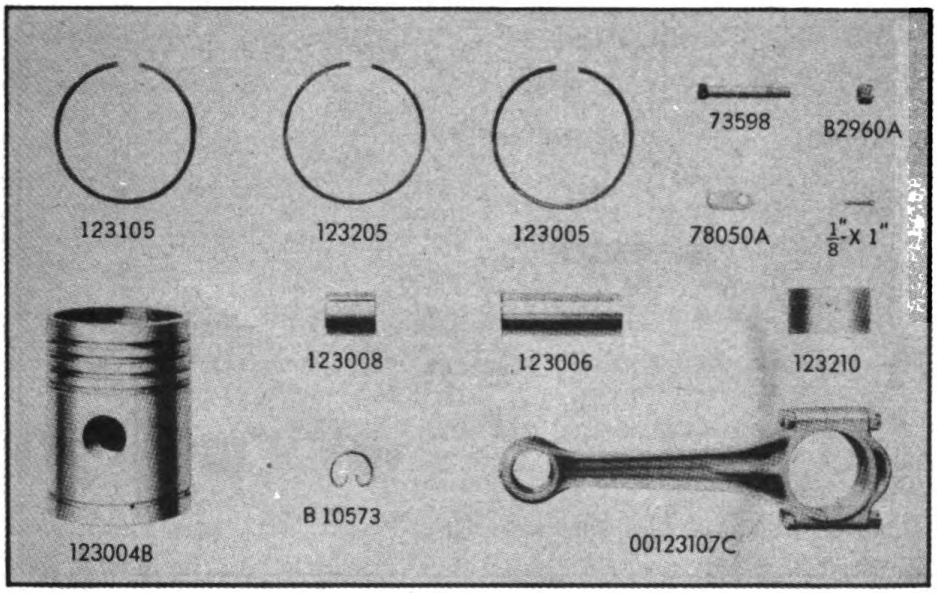
i. Double space between items.

j. Emergency requisitions sent by telephone, telegraph, or radio must always be confirmed immediately with requisition marked: "Confirming (state identifying data)".

k. Nonexpendable items must be accounted for.

PARTS PRICE LIST

"6-WAK" ENGINE PARTS



Connecting Rods and Piston Parts

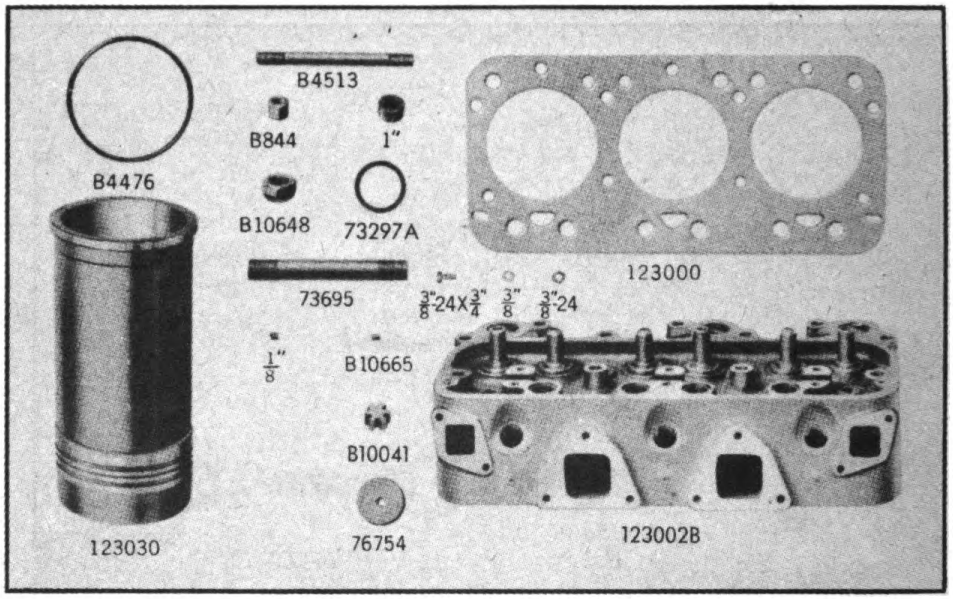
PART NO.	NAME	PER ENGINE	PRICE EACH
00123107-C	Connecting rod with bolt, nuts, pin bushings and bearings	6	23.50
73598	Connecting rod bolt	24	.60
B-2960-A	Connecting rod bolt nut	24	.15
1/8"x 1"	Cotter pin	24	.01
B-1842	Dowel	12	.05
123008	Piston pin bushing (in rod)	6	.50
123210-A	Connecting rod bearing	12	3.00
123210	Connecting rod bearing (.020 and .040 undersize)	12	3.50
123004-B	Piston (cast iron)	6	17.50
123006	Piston pin	6	3.50
B-10573	Piston pin retainer	12	.20
123005	Piston ring (compression)	6	1.50
123105	Piston ring (oil) type 85	6	1.80
123205	Piston ring type 70	12	1.50
78050-A	Connecting rod shim	12	.05

We are in a position to furnish Pistons and Piston Rings .010", .020", and .040" oversize for rebored cylinders. When ordering state what size is required.

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"6-WAK"



Cylinder Head Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
123002-B	Cylinder head assembled with valve guides	2	130.00
123000	Cylinder head gasket	2	3.25
73597	Valve seat insert (exhaust)	6	1.15
B-4513	Cylinder head stud	22	.20
B-844	Cylinder head stud nut	22	.10
73695	Cylinder head tube stud	8	1.00
B-10648	Cylinder head tube stud nut	8	.75
78280-A	Headless pipe plug in cylinder head (1/8")	2	.05
78283-C	Countersunk head pipe plug in cylinder head (1")	6	.10
B-10665	Fuse plug in cylinder head	2	1.25
123030	Cylinder sleeve	6	26.50
B-4476	Cylinder sleeve packing ring	12	.35
OB-10038	Cable support bracket assembly (not shown on photo) consists of:	1	.85
B-10038	Cable support bracket	1	.20
B-10041	Cable support block	1	.25
¼"-20x½"	Fillister head cap screw	2	.05
¼"-20	Square nut	2	.05
¼"	Lock washer	2	.02

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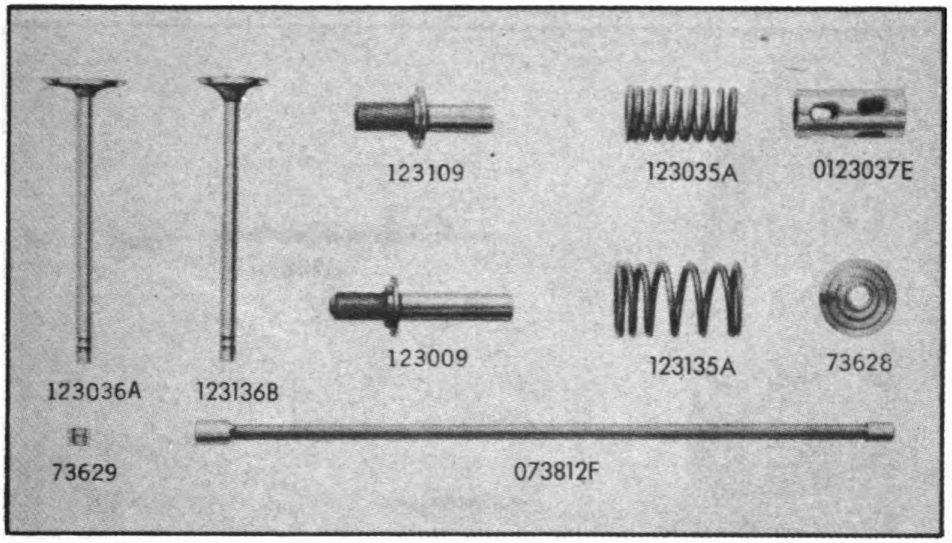

Valve and Push Rod Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
123036	Valve (intake)	6	5.50
123136-B	Valve (exhaust)	6	10.50
123035-A	Valve spring (inner)	12	1.00
123135-A	Valve spring (outer)	12	1.20
73628	Valve spring retainer	12	1.25
73629	Valve spring tapers	24	.20
123009	Valve guide (intake)	6	2.50
123109	Valve guide (exhaust)	6	2.50
073812-F	Push rod	12	3.25
0123037-E	Valve lifter	12	5.50

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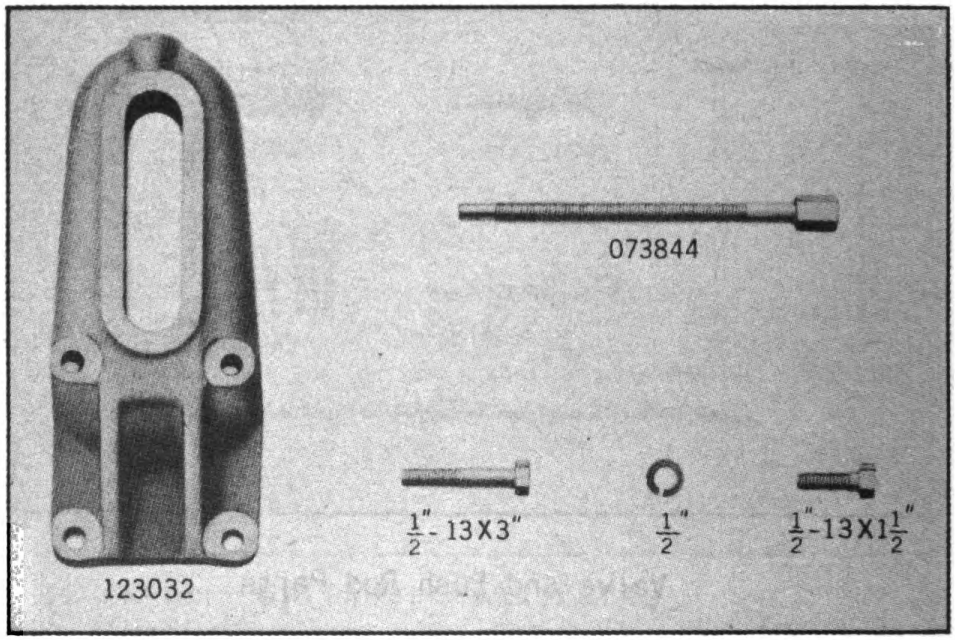

Fan Bracket Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
123032	Fan bracket	1	13.25
½"-13x1½"	Cap screw for 123032	2	.05
½"-13x3"	Cap screw for 123032	2	.05
½"	Lock washer	4	.02
073844	Fan adjusting stud assembly	1	1.10
#3x¾"	Taper pin	1	.04
1"-14	Hex. half nut	1	.15
1"	Lock washer	1	.02
48836	Washer	1	.20

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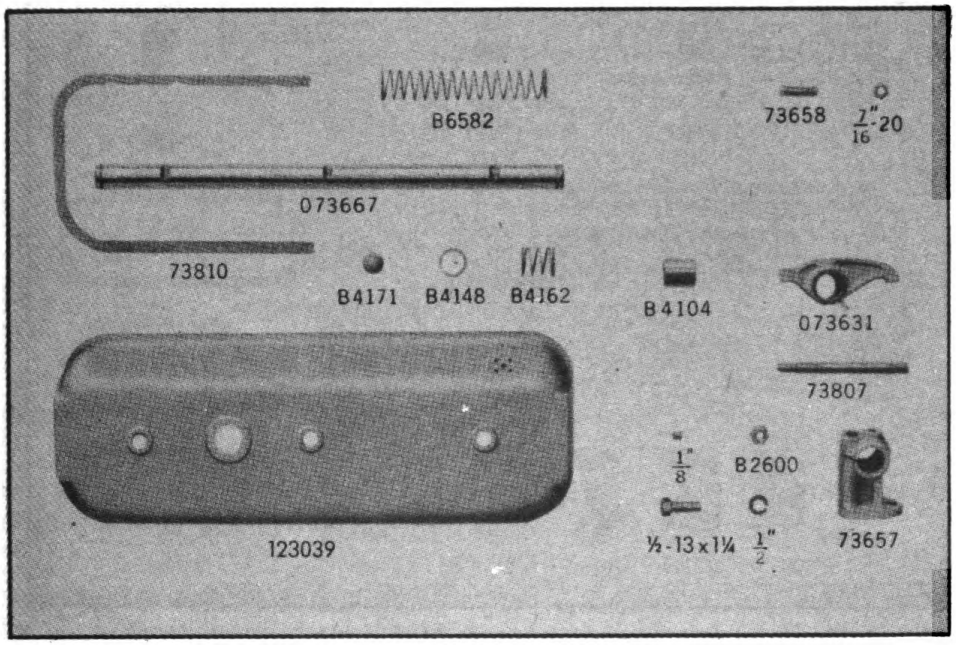

Rocker Arm Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
073631	Rocker arm (intake and exhaust).....	12	3.00
B-4104	Rocker arm bushing.....	12	.15
73658	Rocker arm adjusting screw.....	12	.25
7/16"-20	Hex nut for No. 73658 screw.....	12	.05
073667	Rocker arm shaft with B-4171 plug.....	2	7.50
B-4171	Expansion plug 1".....	4	.05
B-4148	Rocker arm snap ring.....	4	.10
B-4162	Rocker arm spring (short).....	4	.05
B-6582	Rocker arm spring (long).....	4	.25
73657	Rocker arm support.....	6	2.50
78280-A	Pipe plug (1/8") (slotted head) for No. 73657 support	4	.05
73807	Rocker arm support and cover stud.....	6	.30
B-2600	Hex nut for No. 73807 stud.....	6	.05
½"-13x1¼"	Cap screw for No. 73657 support.....	6	.05
½"	Lock washer	12	.02
123039	Rocker arm cover.....	2	8.00
73810	Rocker arm cover gasket.....	4	.25
B-8503	Rocker arm cover thumb nut.....	6	1.00
B-9037	Rocker arm cover breather cap.....	2	.75
73173	Rocker arm cover breather pipe.....	2	.45
8-32x3/8"	Round head machine screw for rocker arm...	6	.02
5/32"	Lock washer for rocker arm.....	6	.02

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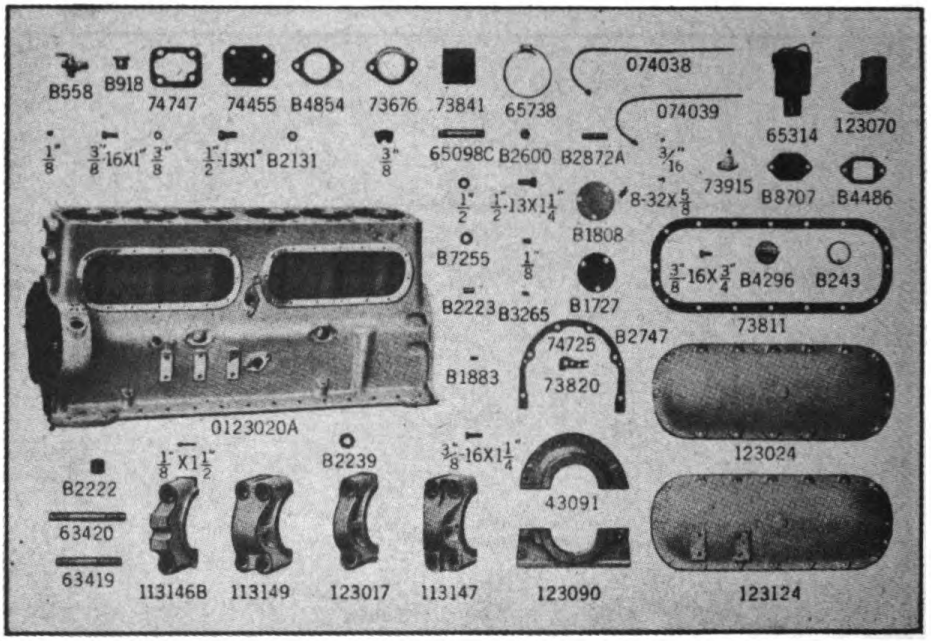
"6-WAK"



Crankcase Parts

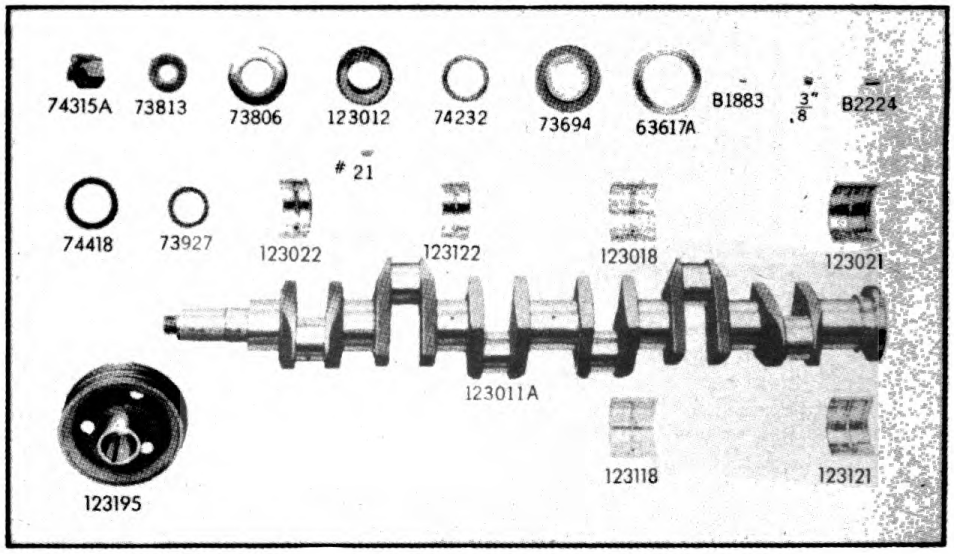
PART NO.	NAME	PER ENGINE	PRICE EACH
113146-B	Main bearing cap (front)	1	$7.00
113149	Main bearing cap (center)	1	8.25
113147	Main bearing cap (rear)	1	7.50
123017	Main bearing cap (intermediate)	4	4.75
63420	Main bearing cap stud	16	.50
B-2222	Main bearing cap castle nut	18	.40
B-2239	Main bearing cap washer	18	.20
63419	Main bearing cap stud (rear)	2	.50
123024	Crankcase door	3	5.50
123124	Crankcase door (with magneto pad)	1	6.25
B-2223	Dowel pin	2	.05
73811	Crankcase door gasket	4	.15
B-2747	Copper washer	64	.05
B-1808	Crankcase cleanout cover	2	.20
B-1727	Crankcase cleanout cover gasket	2	.05
3/8"-16x¾"	Cap screw for B-1808 and B-8707 cover	8	.05
B-558	Drain cock	2	.50
80118	Distributor hole cup plug	1	.10
43091	Oil retainer (upper)	1	2.75
74725	Oil retainer gasket for No. 43091	1	.10
B-1883	Dowel pin for oil retainer	4	.05
123090	Oil retainer (lower)	1	3.00
73820	Oil retainer gasket (upper to lower)	1	.05
3/8"-16x1¼"	Cap screw for retainer	6	.05
3/8"	Lock washer for retainer, 73676 flange and 74455, B-1808 and B-8707 covers	20	.02
74455	Compressor pad cover	1	.35
74747	Compressor pad cover gasket	1	.05

Always Give Engine Model and Number When Ordering Repairs

½"-13x1"	Cap screw for 74455 cover	4	.05
B-2131	Copper washer for compressor pad cover	2	.05
½"	Lock washer for compressor pad cover	2	.02
3/8"-16x1"	Cap screw for 123024 and 123124 doors and 73676 flange and 123070 body	67	.05
73676	Crankcase water inlet flange	1	.50
B-4854	Crankcase water inlet flange gasket	1	.05
73841	Hose	1	.35
65738	Hose clamp	3	.25
65098-C	Nipple 3/8"x4"	1	.15
78027-D	Elbow (3/8"x45 deg.)	1	.20
½"-13x1¼"	Cap screw for 073794 filter	2	.05
½"	Lock washer for 073794 and 073759-B	5	.02
B-2872-A	Stud for 073759-B filter	3	.20
B-2600	Hex nut for 073759-B filter	3	.05
65314	Breather filter	1	5.00
123070	Breather body	1	1.25
B-4486	Gasket for 123070 body	1	.05
B-4296	Oil filler cap	1	.40
B-243	Oil filler cap gasket	1	.05
B-8707	Breather body hole cover	1	.60
074038	Ignition conductor	4	.75
074039	Ignition conductor	2	.75
73915	Ignition cable insulator	6	.50
No. 8-32x5/8"	Machine screw for 73915 insulator	12	.02
3/16"	Lock washer for 73915 insulator	12	.02
074823	Ignition cable assembly (not shown on photo)	1 set	3.00
78280-A	Headless pipe plug (1/8")	1	.05
78282-A	Square head pipe plug (1/8")	9	.05
B-3265	Main bearing cap dowel	7	.10
1/8"x1½"	Cotter pin for 63419 and 63420 stud	18	.01
0123020-A	Crankcase assembled with main bearing caps and studs also cam bushings (reamed to size)	1	425.00
00123020-A	Crankcase assembled with main bearing caps and studs also cam bushings and main bearing bushings (reamed to size)	1	485.00
B-6634	Stud for No. 73676 flange	1	.10
B-2857	Oil gauge hole plug	1	.05
078134	Starting Unit Support	1	10.50

PARTS PRICE LIST

"6-WAK"



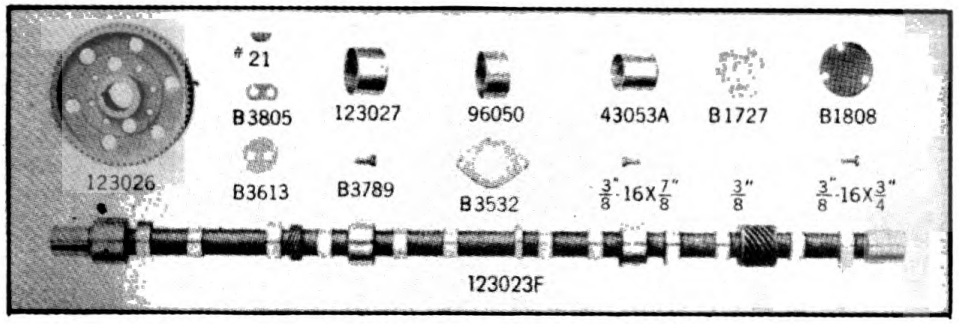
Crankshaft Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
123022	Main bearing (front and intermediate) upper..	5	$4.00
123022	Main bearing (front and intermediate) 3/32" undersize.....	5	4.50
123122	Main bearing (front and intermediate) lower..	5	4.00
123122	Main bearing (front and intermediate) 3/32" undersize.....	5	4.50
123018	Main bearing (center) upper.....	1	5.00
123018	Main bearing (center) 3/32" undersize.....	1	5.50
123118	Main bearing (center) lower.....	1	5.00
123118	Main bearing (center) 3/32" undersize.....	1	5.50
123021	Main bearing (rear) upper.....	1	4.75
123021	Main bearing (rear) 3/32" undersize.....	1	5.25
123121	Main bearing (rear) lower.....	1	4.75
123121	Main bearing (rear) 3/32" undersize.....	1	5.25
63617-A	Main bearing thrust ring.....	2	3.75
B-1883	Dowel pin for 63617-A ring.....	2	.05
63087-F	Crankshaft rear seal.....	2	.10
63087-E	Crankshaft rear seal.....	2	.10
123011-D	Crankshaft.....	1	325.00
123012	Crankshaft gear.....	1	7.75
No. 21	Woodruff key for 123012 gear and 123095 pulley.....	2	.06
73694	Crankshaft thrust washer.....	2	4.50
74232	Crankshaft thrust washer shim.....	5	.05
73806	Oil thrower.....	1	.15
123195	Fan Pulley.....	1	12.00
73927	Fan pulley gasket.....	2	.05
74315-A	Starting crank jaw	1	2.00
73813	Starting crank jaw washer.....	1	.15
B-2224	Dowel pin (shaft to flywheel).....	2	.10
74418	Crankshaft oil seal.....	1	2.50
B-5903	Slotted head pipe plug in crankshaft (3/8").....	1	.10

Always Give Engine Model and Number When Ordering Repairs

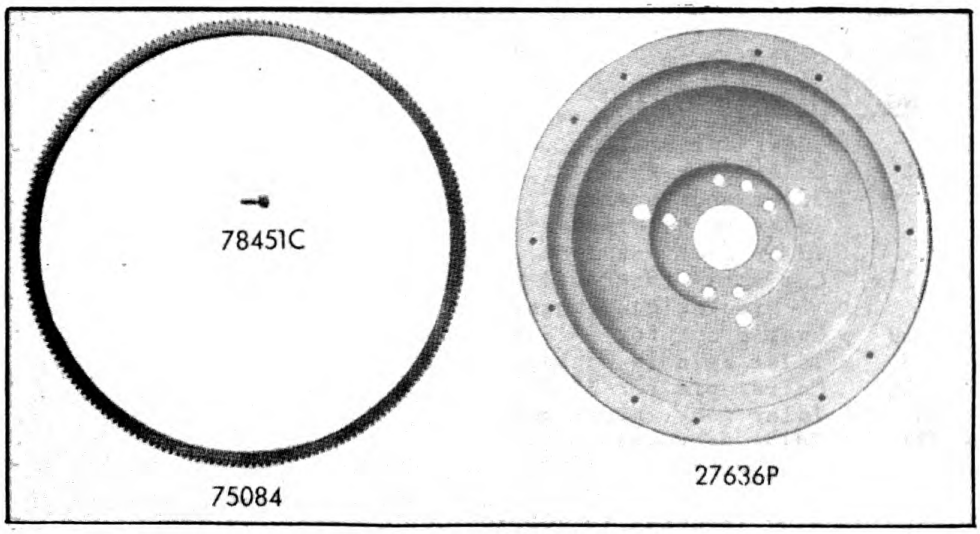
PARTS PRICE LIST

"6-WAK"



Camshaft Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
96050	Camshaft bushing (intermediate)	2	1.00
43053-A	Camshaft bushing (rear)	1	1.25
123027	Camshaft bushing (front)	1	1.50
123023-F	Camshaft	1	70.00
0123026	Camshaft gear	1	19.00
No. 21	Woodruff key for 123026 gear	1	.06
B-3532	Camshaft thrust plate	1	.80
3/8"-16x7/8"	Cap screw for B-3532 plate	2	.05
3/8"	Lock washer for B-3532 and B-1808 plate	5	.02
B-3613	Cam gear plate	1	.15
B-3805	Cam gear plate lock	1	.05
B-3789	Cap screw for B-3613 plate	2	.05
B-1808	Cam end plate (rear)	1	.20
B-1727	Cam end plate gasket	1	.05
3/8"-16x3/4"	Cap screw for B-1808	3	.05



Flywheel Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
27636-P	Flywheel	1	141.00
78451-C	Flywheel bolt	6	.25
75084	Flywheel ring gear	1	25.00

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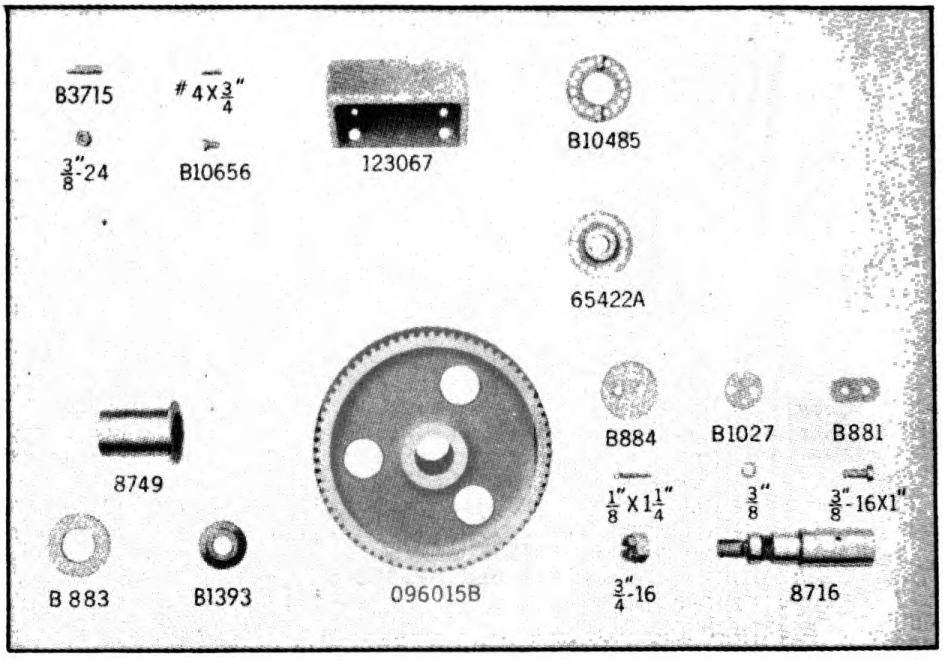
PARTS PRICE LIST

"6-WAK"



Idler Gear, Generator Bracket and Magneto Bracket and Coupling Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
8716	Idler spindle	1	5.00
096015-B	Idler gear (bushed)	1	18.00
8749	Idler gear bushing	1	1.75
B-884	Idler spindle washer	1	.75
B-881	Idler gear nut lock	1	.10
3/8"-16x1"	Cap screw for B-884 washer and 74847 bracket also magneto bracket to magneto.	11	.02
3/4"-16	Castle nut for 8716 spindle	1	.10
B-1393	Idler spindle washer	1	.35
1/8"x1¼"	Cotter pin for 8716 spindle	1	.01
B-883	Idler gear thrust washer	1	1.15
B-1027	Idler gear shim	3	.03
3/8"	Lock washer for 74847 and 123067 bracket	8	.02
123067	Magneto bracket	1	3.25
B-3715	Stud (bracket to door)	4	.10
No. 4x3/4"	Taper pin (bracket to door)	2	.04
3/8"-24	Hex nut for B-3715 stud	1	.05
B-10485	Magneto coupling (shaft end)	1	1.50
65422-A	Magneto coupling	1	1.75
78542	Magneto coupling center drive disc	1	1.00
B-10656	Magneto coupling cap screw (drilled head)	2	.10

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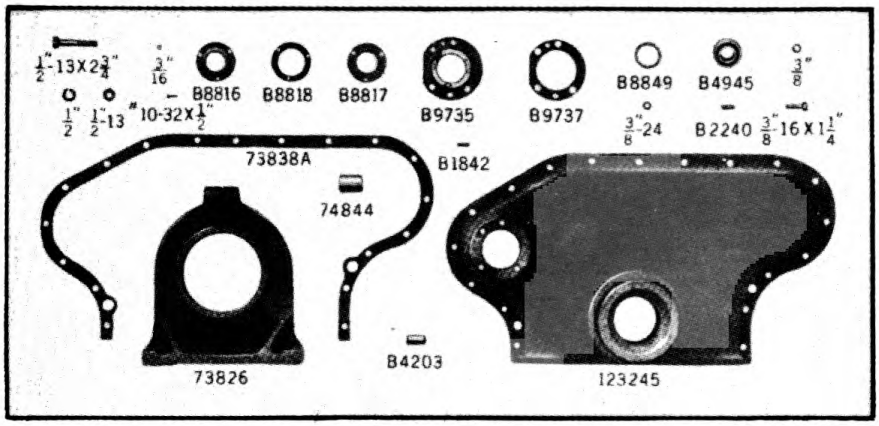
PARTS PRICE LIST

"6-WAK"



Gear Cover Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
123245-B	Gear Cover	1	24.50
73838-A	Gear cover gasket	1	.50
3/8"-16x1¼"	Cap screw for 123245	18	.05
3/8"	Lock washer for 123245	18	.02
B-4203	Dowel pin for gear cover	2	.15
73826	Front support	1	22.00
½"-13x2¾"	Cap screw for 73826 support	1	.05
½"-13	Hex nut for 73826 support	1	.05
½"	Lock washer for 73826 support	1	.02
B-9735	Water pump shaft support	1	2.25
B-9737	Gasket for B-9735	1	.10
No.10-32x½"	Round head machine screw for B-8816 retainer	3	.02
3/16"	Lock washer	3	.02
B-1842	Dowel pin for B-9735 support	2	.05
B-2240	Stud for B-9735 support	4	.06
3/8"-24	Half nut	4	.05
B-8816	Oil seal retainer	1	.10
B-8817	Oil seal retainer plate	1	.10
B-8818	Gasket for B-8817	2	.05
B-8849	Felt washer	1	.10
74844	Fan pulley spacer	1	.30
B-4945	Ball bearing	1	4.50
74418	Gear cover Oil Seal	1	2.50

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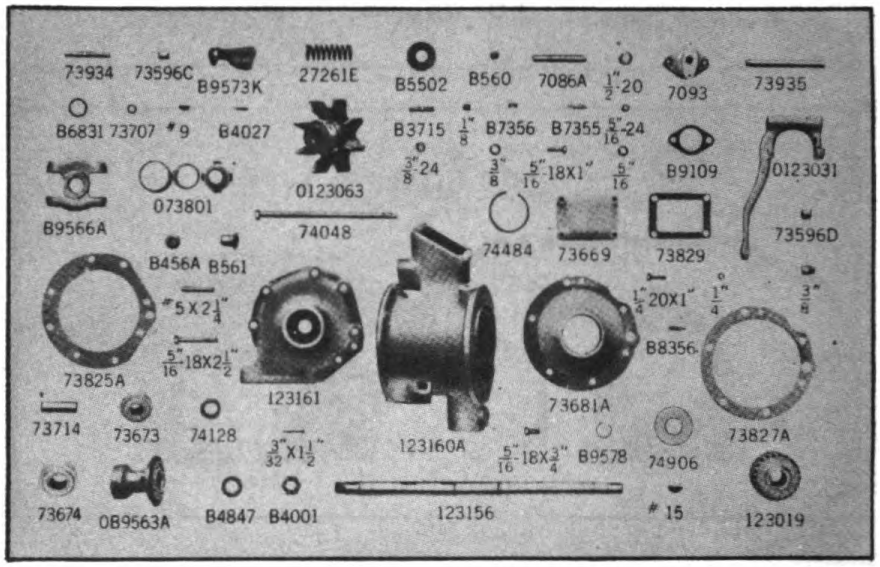
PARTS PRICE LIST

"6-WAK"



Water Pump and Governor Assembly

PART NO.	NAME	PER ENGINE	PRICE EACH
B-456-A	Governor spring support seat (Governor lever end)	1	.20
9735	Governor spring	1	.40
B-561	Governor spring support seat (screw end)	1	.25
7093	Governor spring housing	1	.75
7086-A	Governor spring adjusting screw	1	.50
½"-20	Governor spring adjusting screw nut	1	.05
B-9109	Governor spring housing gasket	1	.05
5/16"	Lock washer for 123161 cover and 7093 housing	10	.02
5/16"-18x¾"	Cap screw for 123161 cover	2	.05
B-5502	Oil seal for 123160-A body	1	1.00
073801	Water pump seal	2	2.25
0123063	Water pump impeller assembly with two 073801 seals	1	11.50
5/16"-18x1"	Cap screw for 7093 housing	2	.05
73673	Ball bearing	1	4.50
123156	Water pump and governor shaft	1	5.00
5/16"-18x2½"	Cap screw for 123161 cover	6	.05
No.5x2¼"	Taper pin	1	.05
123161	Water pump cover	1	10.00
73825-A	Water pump cover gasket	1	.10
123160-A	Water pump and governor housing	1	13.25
B-9578	Snap ring for 123156 shaft	1	.05
OB-9563-A	Governor weight shifter assem. consists of	1	12.25
B-8864-A	Governor thrust bearing sleeve	1	3.25
78028	Ball bearing	1	4.00
B-9572	Governor shifter bushing	1	.25
73827-A	Governor housing and pump gasket	2	.10
73681-A	Governor bearing carrier	1	2.75

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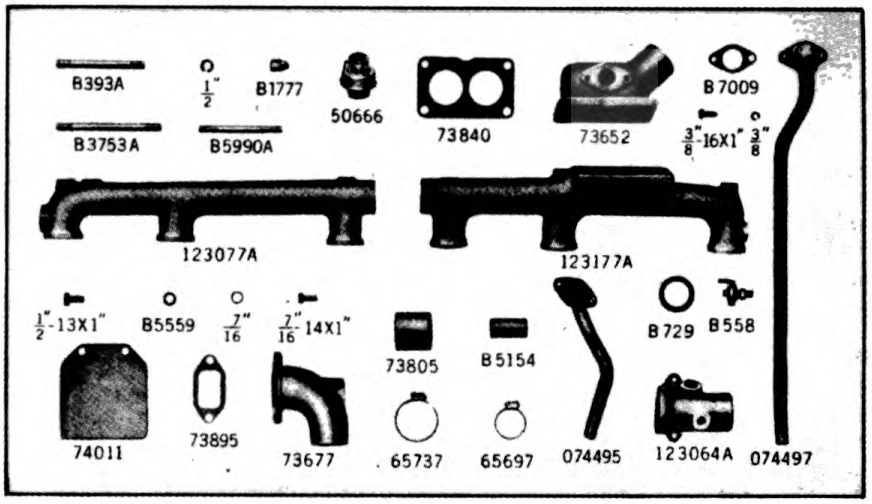
Always Give Engine Model and Number When Ordering Repairs

B-6831	Snap ring for B-9566-A carrier	1	.05
B-9566-A	Governor weight carrier	1	2.25
73674	Ball bearing	1	5.30
74484	Snap ring for 73681-A carrier	1	.30
73669	Governor housing cover	1	.35
¼"-20x1"	Cap screw for 73669 cover	4	.05
¼"	Lock washer for 73669 cover	4	.02
73829	Governor housing cover gasket	1	.05
B-7356	Bumper spring	1	.05
5/16"-24	Nut for B-7355 screw and 73935 shaft	2	.05
B-7355	Bumper screw	1	.25
No. 15	Woodruff key for 123019 gear	1	.06
123019	Magneto water pump and governor drive gear	1	4.75
73934	Governor weight shaft	2	.40
B-4027	Groove pin (Governor weight carrier to shaft)	2	.02
73596-C	Roller bearing	4	.75
73707	Roller bearing spacer	2	.25
73714	Roller bearing spacer	1	.30
73596-D	Governor lever roller bearing	2	.60
B-8356	Lock screw	1	.15
B-560	Expansion plug	2	.03
B-9573-K	Governor weight	2	2.00
73935	Governor lever shaft	1	.75
1/8"	Headless pipe plug	1	.05
0123031-C	Governor lever assembled with two B-3831 inserts	1	5.00
No. 9	Woodruff key	1	.04
78282-D	Pipe plug (3/8")	3	.05
74128	Bearing spacer	1	.45
74906	Oil thrower	1	.10
0123360-G	Water pump and governor assembly	1	96.00
B-4001	Castle nut for 123156 shaft	1	.15
B-4847	Plain washer for 123156 shaft	1	.05
3/32"x1½"	Cotter pin for 123156 shaft	1	.01
B-3715	Stud (pump to case)	5	.10
74048	Cap screw (pump to case)	1	.30
3/8"-24	Hex nut (pump to case)	6	.05
3/8"	Lock washer (pump to case)	6	.02
76575	Cover	1	1.00

"6-WAK"



Water Manifold and By Pass Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
123077-A	Top water manifold (rear).....	1	5.75
123177-A	Top water manifold (front).....	1	6.75
B-729	Top water manifold gasket.....	6	.05
73805	Hose connection.....	1	.35
65737	Hose clamp.....	3	.20
B-1777	Acorn nut for B-393-A, B-3753-A and B-5990-A studs.....	6	.50
B-5559	Copper washer for B.393-A, B-3753-A and B-5990-A studs.....	6	.05
B-10584-B	Stud for 123077-A and 123177-A manifold..	3	.30
B-3753-A	Stud for 123177-A manifold.....	1	.30
B-5990-A	Stud for 123077-A manifold.....	2	.20
74011	Top water manifold hose shield.....	1	.75
73652	Thermostat housing.....	1	3.50
73840	Thermostat housing gasket.....	1	.20
50666	Thermostat.....	2	2.00
1/2"-13x1"	Cap screw for 73652 housing.....	4	.05
1/2"	Lock washer for 73652 housing.....	4	.02
074497	Water by pass tube (upper).....	1	2.25
074495	Water by pass tube (lower).....	1	2.00
B-7009	Gasket for 074497 and 074495 tubes.....	2	.05
3/8"-16x1"	Cap screw for 074495 and 074497 tubes....	4	.05
3/8"	Lock washer.....	4	.02
B-5154	Hose connection.....	1	.15
65697	Hose clamp.....	2	.15
123264	Water pump inlet elbow.....	1	2.50
73895	Water pump inlet and outlet elbow gasket.	2	.10
7/16"-14x1"	Water pump inlet and outlet elbow cap screw.....	4	.05
7/16"	Water pump inlet and outlet lock washer..	4	.02
73677	Water pump outlet elbow.....	1	1.40
B-558	Drain cock for 123064-A elbow.....	1	.50

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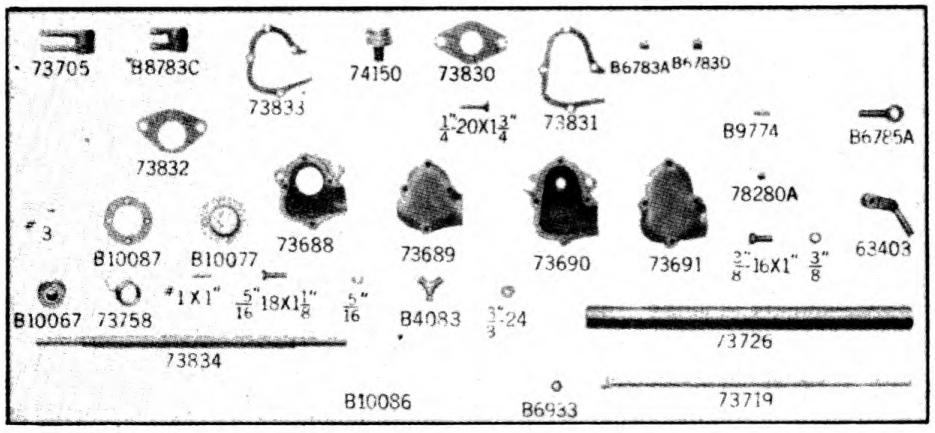
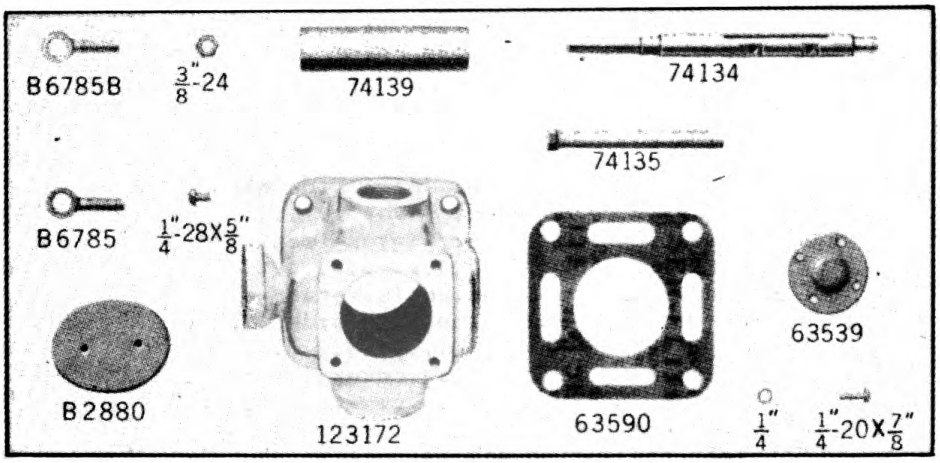
PARTS PRICE LIST

"6-WAK"





Governor Rod and Butterfly Valve Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
No. 3	Woodruff key for B-8783-C and 73705 lever..	2	.04
No.1x1"	Taper pin for B-8783-C and 73705 lever.....	2	.04
No.10-32x5/8"	Rd. head machine screw for B-10075 valve.....	2	.02
B-10067	Ball bearing.....	4	2.30
B-10077	Ball bearing end plate.....	1	1.75
B-10087	Ball bearing end plate gasket.....	1	.20
B-10086	Ball bearing snap ring.....	4	.50
B-10074	Butterfly control lever (fixed).....	1	2.00
74139	Governor rod housing (vertical).....	1	.75
074135	Governor rod (vertical)(not shown on photo)	1	4.25
74135	Governor rod with nut.....	1	.85
B-6785-B	Governor rod end.....	1	1.25
B-6785	Governor rod end.....	1	1.00
3/8"-24	Hex nut.....	2	.05
123172	Butterfly valve housing.....	1	21.00
63590	Butterfly valve housing gasket.....	1	.10
74134	Butterfly valve shaft.....	1	4.50
B-2880	Butterfly valve.....	1	.55
1/4"-28x5/8"	Round head machine screw for B-2880 valve	2	.02
63539	Ball bearing end plate.....	1	.60
1/4"-20x7/8"	Round head machine screw for 63539 plate.	4	.02
1/4"	Lock washer for 63539 plate.....	4	.02

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PARTS PRICE LIST

73726	Governor rod housing (horizontal).....	1	1.35
73719	Governor rod (horizontal).....	1	1.50
63403	Governor rod end (at governor lever) for 73719.....	1	1.50
B-6785-A	Governor rod end (at cross rod housing)....	1	1.00
3/8"-24	Hex nut for 63403 rod end.....	1	.05
B-6933	Hex nut for B-6785-A rod end.....	1	.20
78280-A	Headless pipe plug (1/8").....	1	.05
B-6783-D	Governor rod end bushing.....	3	.40
B-6783-A	Governor lever bushing.....	1	.30
5/16"-18x11/8"	Cap screw for gov. rod housing.....	4	.05
5/16"	Lock washer for governor rod housing.....	4	.02
73690	Governor cross rod housing (intake manifold side).....	1	1.75
73830	Governor cross rod housing gasket.....	1	.05
3/8"-16x1"	Cap screw for 73690 and 73688 housing.....	4	.05
3/8"	Lock washer for 73690 and 73688 housing....	4	.02
73691	Governor cross rod housing cover.....	1	1.00
73831	Governor cross rod housing cover gasket....	1	.10
¼"-20x1¼"	Cap screw for 73691 and 73689 cover.....	12	.05
73834	Governor cross rod.....	1	2.00
B-4083	Three way fitting (on butterfly valve housing).....	1	.40
B-8783-C	Governor cross rod lever (gov. side also butterfly valve shaft lever.....	2	1.30
73705	Governor cross rod lever (intake manifold side).....	1	1.00
73688	Governor cross rod housing (governor side) and butterfly valve housing side).....	2	1.50
73832	Gasket for 73688 housing.....	2	.05
73689	Governor cross rod housing cover.....	2	.75
73833	Gasket for 73689 cover.....	2	.05
73758	Governor rod spring.....	1	.30
B-9774	Governor rod spring pin.....	1	.05
74150	Breather for 73689 cover.....	1	1.00

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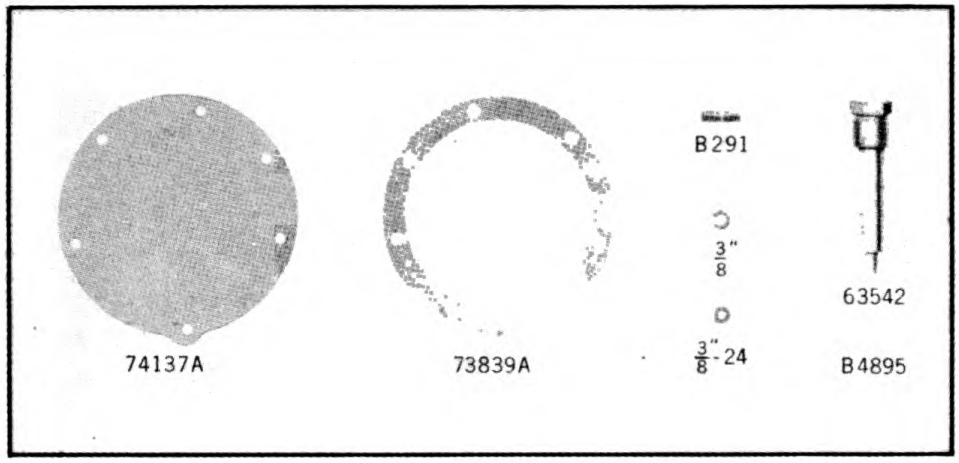
PARTS PRICE LIST

"6-WAK"



Fuel Injection Hole Cover Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
63542	Injection hole plug.....	6	4.50
B-4895	Injection hole plug washer.....	6	.02
74137-A	Fuel injection pump drive hole cover.....	1	2.00
73839-A	Fuel injection pump drive hole cover gasket.	1	.10
B-291	Stud for 74137-A cover.....	6	.08
3/8"-24	Hex nut for 74137-A cover.....	6	.05
3/8"	Lock washer for 74137-A cover.....	6	.02

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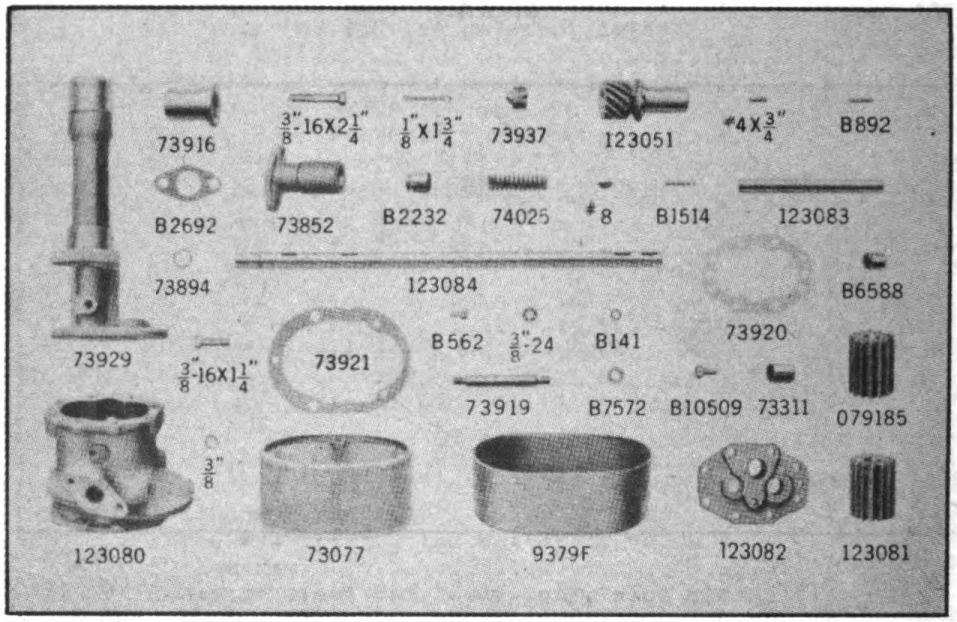
PARTS PRICE LIST

"6-WAK"



Oil Pump Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
0123080	Oil pump assembly	1	50.00
123080	Oil pump body	1	9.50
73929	Oil pump drive housing bushed with one 73916 and one 73311 bushing	1	6.50
73920	Gasket for 123080 body and 123082 cover	2	.15
B-10509	Cap screw (drilled head) for 123080 and 123082	16	.10
123082	Oil pump cover bushed with one 73311 bushing	1	2.50
73311	Bushing for 123082 cover and 73929 housing.	2	.30
No.4x¾"	Taper pin for 123082 cover and 73929 housing	4	.05
123084	Oil pump shaft	1	1.75
123051	Oil pump drive gear	1	6.75
73916	Bushing for 73929 housing	1	1.25
No. 8	Woodruff key for 123051 and 123081 gear	3	.04
B-1514	Pin for 123051 gear	1	.05
123081	Oil pump driven gear	1	5.00
079185	Idler gear bushed with two B-6588 bushings.	1	5.50
123083	Idler shaft	1	.75
B-892	Pin (Idler shaft to drive housing)	1	.05
73894	Snap ring for 123084 shaft	1	.40
3/8"-16x1¼"	Cap screw (drive housing to crankcase).	3	.05
3/8"	Lock washer (drive housing to crankcase)	5	.02
9379-F	Oil pump baffle	1	.95
73921	Oil pump baffle gasket	1	.15
B-562	Cap screw (drilled head for 9379-F baffle.	3	.10
B-141	Plain washer for 9379-F baffle	3	.02
73077	Oil screen and frame assembly	1	1.50
73919	Oil screen frame stud	2	.30
B-7572	Washer for 73919 stud	2	.10

Always Give Engine Model and Number When Ordering Repairs

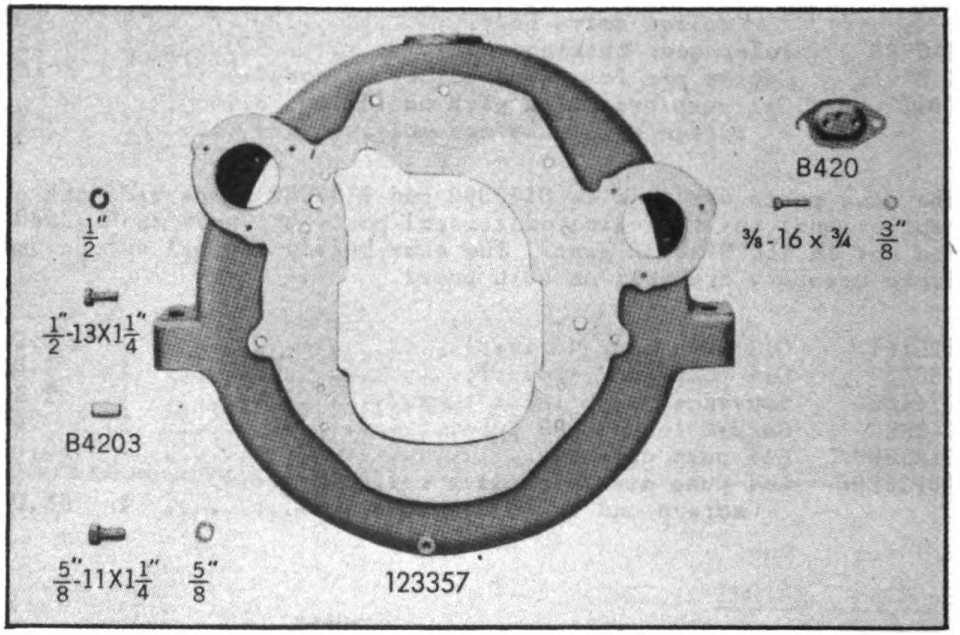
3/8"-24	Castle nut for 73919 stud.....	2	.05
73852	Relief valve body.....	1	1.25
B-2692	Relief valve body gasket.....	1	.05
73937	Relief Valve adjusting screw.....	1	.30
B-2232	Relief valve plunger.....	1	.70
74025	Relief valve spring.....	1	.50
3/8"-16x2¼"	Cap screw through flange and 73852 relief valve body.....	2	.05
B-6588	Idler gear bushing.....	2	.25
1/8"x1¼"	Cotter pin for 73937 adjusting screw.....	1	.01
00123080	Oil pump assembled with baffle and oil screen and frame assembly.....	1	55.00

The same parts are used in 0123080 and 0123280 pumps with the exception that the following additional parts are used in 0123280 and not in the 0123080 pump. The same baffle and oil screen and frame assembly are used on both pumps.

123181	Oil pump gear (driver).....	1	5.00
79085	Oil pump gear (idler).....	1	5.00
074408	Scavenger pump inlet tube.....	1	2.50
B-2692	Gasket for 074408 tube.....	1	.05
0123280	Oil pump assembly.....	1	60.00
00123280	Oil pump assembled with baffle and oil screen and frame assembly.....	1	65.00

PARTS PRICE LIST

"6-WAK"



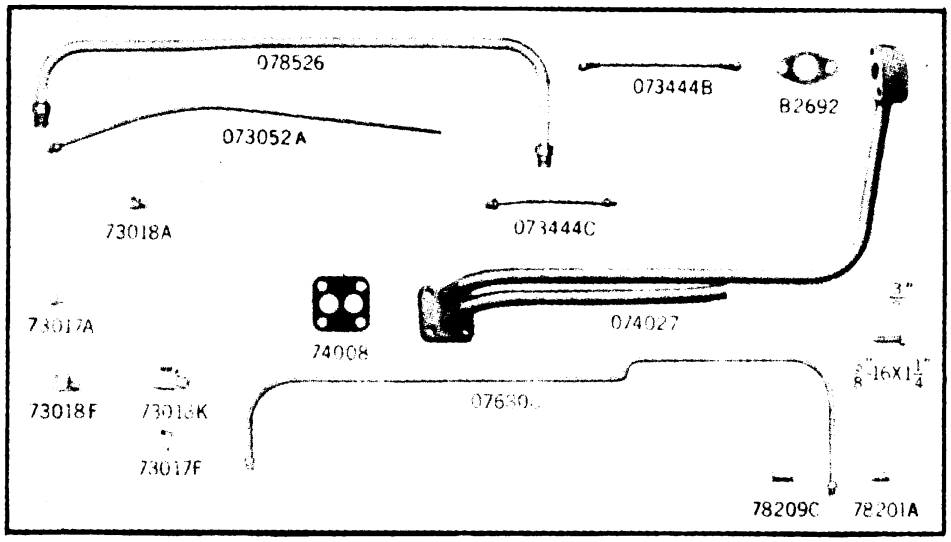
Flywheel Housing Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
123357	Flywheel housing	1	90.00
B-420	Flywheel pointer cover	1	.15
B-421	Flywheel pointer	1	.20
3/8"-16x¾"	Cap screw for B-421 pointer	2	.05
3/8"	Lock washer for B-421 pointer	2	.02
5/8"-11x1¼"	Cap screw (housing to case)	9	.05
5/8"	Lock washer (housing to case)	9	.02
B-4203	Dowel pin for 123157 housing	2	.15
½"-13x1¼"	Cap screw (housing to oil pan)	4	.05
½"	Lock washer (housing to oil pan)	4	.05

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"6-WAK"



Oiling System Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
073444-B	Oil line (to rocker arm).....	2	.25
73018	Inverted male elbow for 073444-B and 073444-C.....	3	.10
73017-A	Connector for 073444-C, 073023 and 073023-A.....	3	.10
B-2692	Gasket for 074027 oil line.....	1	.05
073444-C	Oil line (oil pump body to pump housing)..	1	.25
073052-A	Fuel pump vent line.....	1	.40
78526	Oil line (inlet) lubricating oil filter to case.....	1	1.25
73017-F	Inverted male connector.....	1	.20
73018-F	Inverted male elbow.....	1	.25
076808	Oil line (outlet) lubricating oil filter to case.....	1	.75
73018-K	Inverted male elbow.....	2	.50
78201-A	Close nipple (¼").....	1	.10
78209-C	Pipe coupling (¼"x1").....	1	.15
074027	Oil line (case to pump and sump).....	1	8.00
74008	Gasket for 074027 oil line.....	1	.05
3/8"-16x1¼"	Cap screw for 074027 oil line.....	4	.05
3/8"	Lock washer for 074027 oil line.....	4	.02

Always Give Engine Model and Number When Ordering Repairs

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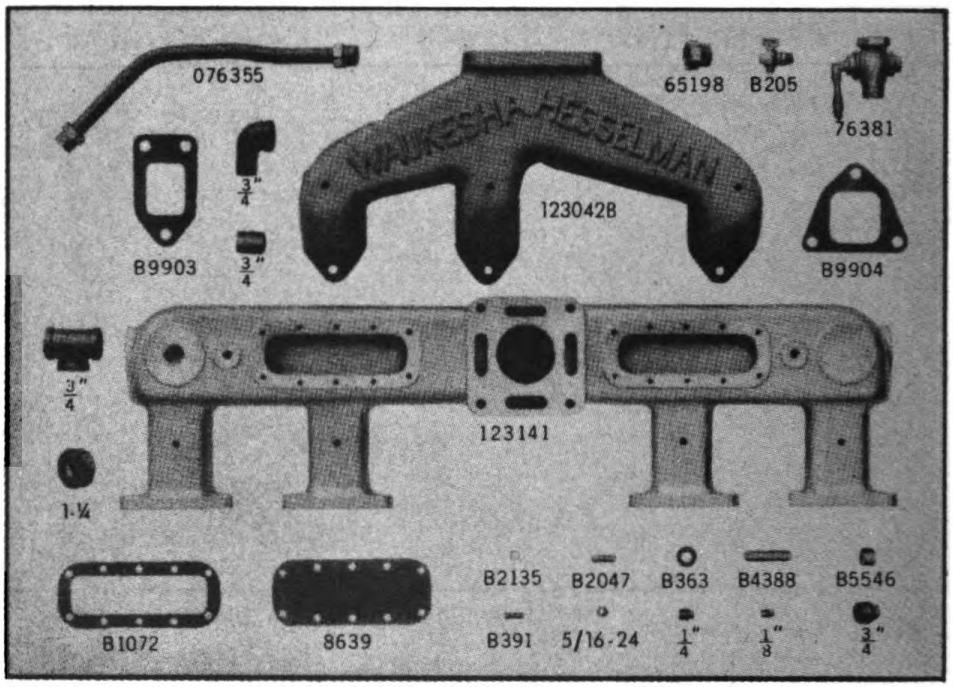
"6-WAK"



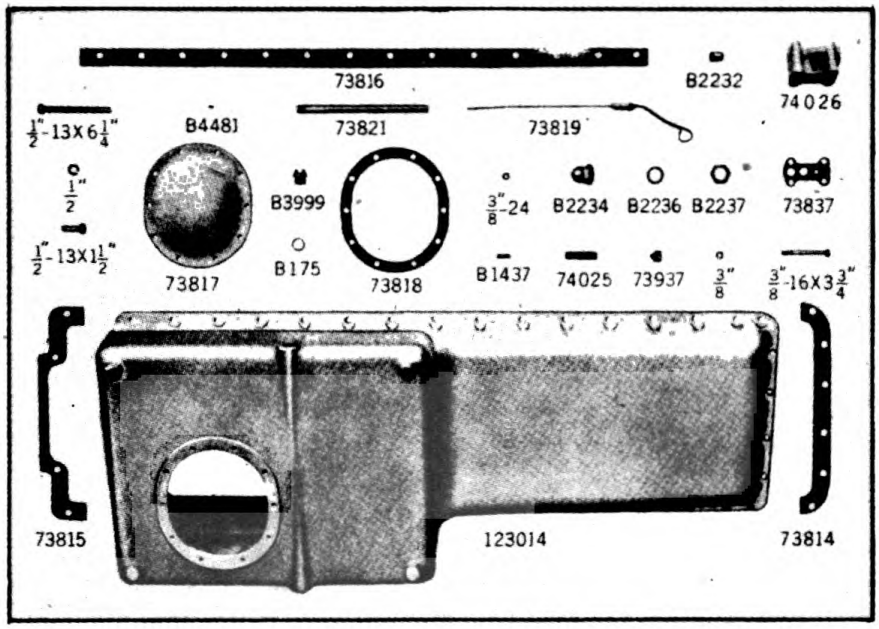
Intake and Exhaust Manifold Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
123141	Intake manifold (water heated)	1	77.50
B-9904	Intake manifold gasket	4	.15
B-4388	Intake and exhaust manifold stud	37	.10
B-5546	Intake and exhaust manifold nut	38	.20
B-363	Intake and exhaust manifold washer	38	.05
¼"	Pipe plug	2	.05
78283-D	Headless pipe plug (1¼")	4	.15
8639	Hand hole cover	4	1.25
B-1072	Hand hole cover gasket	4	.15
B-391	Hand hole cover stud	34	.05
5/16"-24	Hand hole cover nut	40	.05
B-2135	Hand hole cover washer	40	.02
B-2047	Hand hole cover stud	6	.10
074785	Water line (manifold to water pump) (not shown on photo)	1	3.00
076355	Water line (manifold to top water manifold)	1	1.65
65198	Straight fitting for 076355 water line	2	1.50
78208-E	Tee (¼")	1	.30
100832-Y	Close nipple (¼")	1	.10
78282-F	Pipe plug (¾")	1	.05
78280-A	Pipe plug (1/8")	9	.05
B-205	Drain cock	2	.35
78202-H	Street ell 90 degree (¾")	1	.30
76381	Shut off cock	1	3.50
B-9903	Exhaust manifold gasket	6	.15
123042-B	Exhaust manifold	2	30.00
74483	Exhaust manifold flange	2	6.50
78012	Exhaust manifold plugs	6	.15
B-2747	Copper washers for 78012 plugs	6	.05
B-1757-A	Stud	1	.10

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"6-WAK"



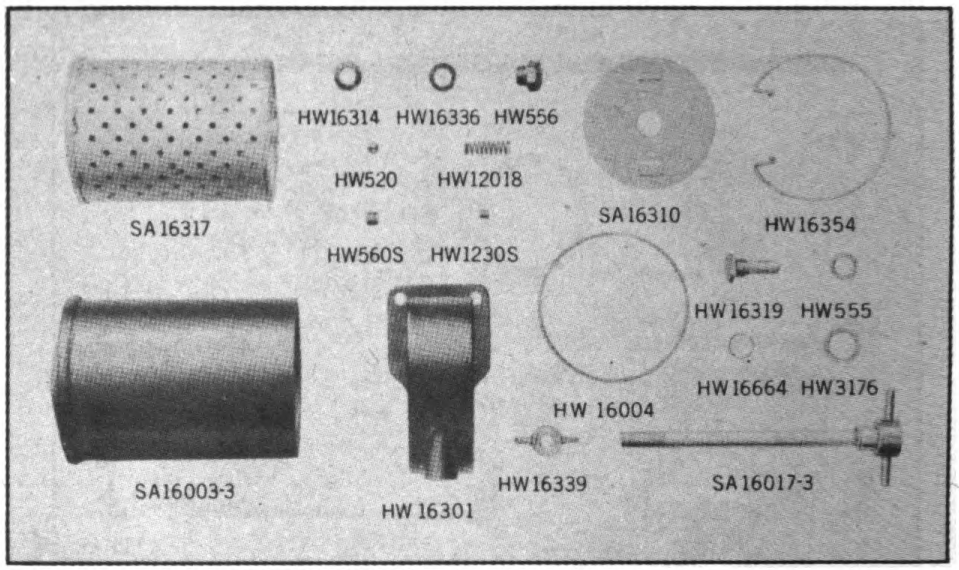
Oil Pan and Relief Valve Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
123014-D	Oil Pan	1	112.00
73814	Oil pan gasket (front)	1	.20
73815	Oil pan gasket (rear)	1	.20
73816	Oil pan gasket (side)	2	.20
½"-13x1½"	Cap screw for oil pan	36	.05
½"-13x6"	Cap screw for oil pan	2	.05
½"	Lock washer for oil pan	38	.02
78033	Oil pan cover	1	3.50
73818	Oil pan cover gasket	1	.25
B-1437	Stud for 78033 cover	10	.10
3/8"	Lock washer for 78033 cover, 74026 body and B-1437 stud	24	.02
74026	Relief valve body	1	2.75
73837	Relief valve body gasket	1	.05
73937	Relief valve adjusting screw	1	.30
B-2232	Relief valve plunger	1	.70
74025	Relief valve spring	1	.50
B-2236	Relief valve lock nut washer	2	.10
B-2237	Relief valve lock nut	1	.15
B-2234	Relief valve adjusting screw nut	1	1.90
3/8"-16x3¾"	Cap screw for 74026 body	4	.05
73819-B	Oil level gauge	1	.80
B-4481	Oil gauge locating pin	1	.03
73821	Oil gauge shield	1	.30
3/8"-24	Hex nut for B-1437 stud	10	.05
78282-G	Pipe plug (oil drain)	2	.10

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"6-WAK"

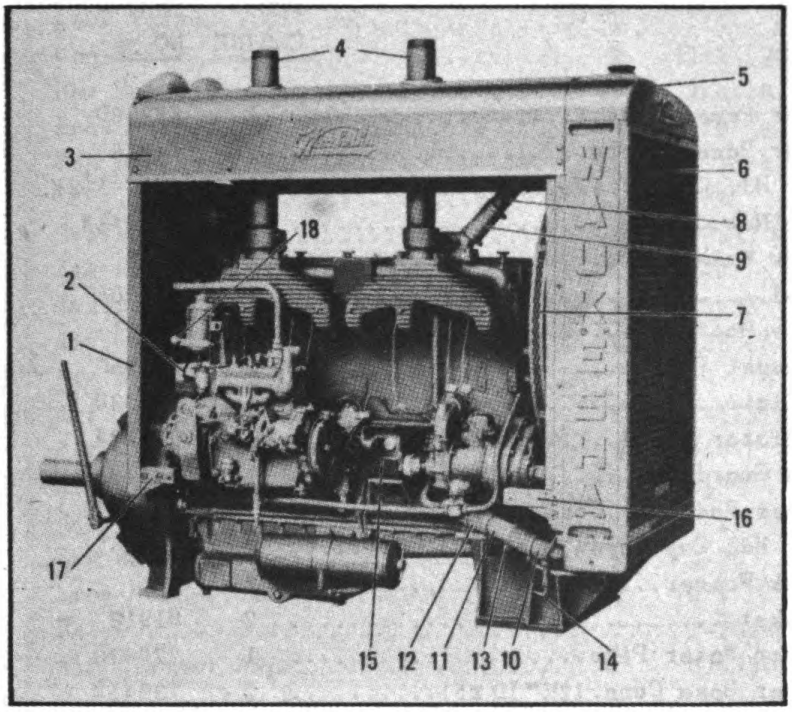


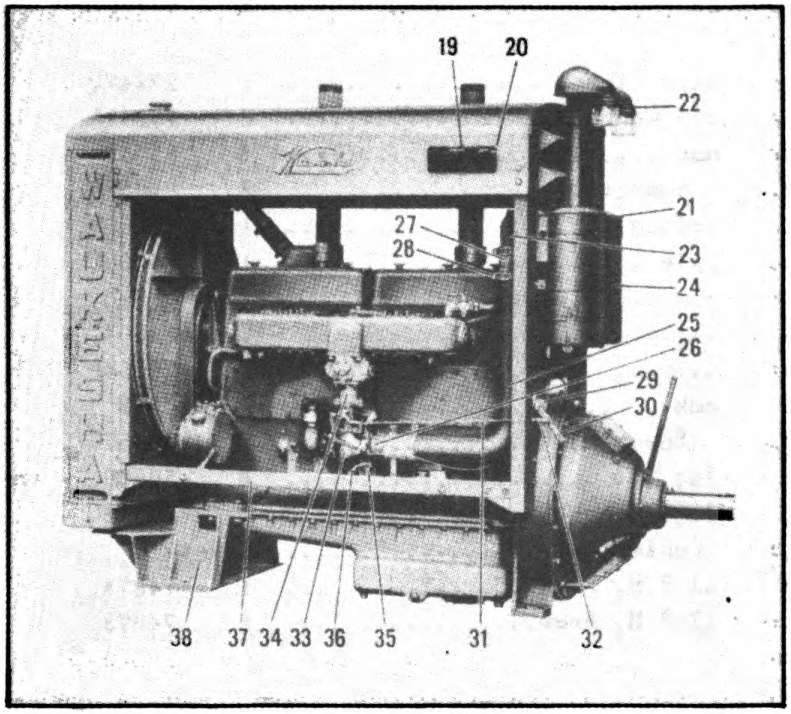
Lubricating Oil Filter Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
HW-16301	Oil filter base	1	9.60
SA-16003-3	Oil filter shell assembly	2	14.50
HW-16004	Oil filter gasket	2	.30
SA-16017-3	Oil filter center bolt assembly	2	3.75
HW-3176	Oil filter gasket	2	.20
HW-16664	Oil filter retaining wire	2	.06
HW-16336	Oil filter vellumoid washer	2	.06
HW-16314	Oil filter ferrule	2	.45
HW-16339	Oil filter wing nut	2	1.05
HW-560-S	Oil filter plug ¼" pipe	1	.06
HW-1230-S	Restriction 3/32" hole	1	.15
HW-555	Oil filter gasket	2	.06
HW-556	Oil filter drain plug	1	.75
HW-520	Oil filter ball	1	.15
HW-12018	Oil filter spring	1	.15
HW-16319	Oil filter plug	1	.75
SA-16317	Oil filter filtering element consists of following:	2	7.20
HW-16309	Oil filter wastex 19 oz. each element (Not shown on photo)	2	.90
SA-16310	Retaining washer	2	.45
HW-16354	Retaining spring	2	.30
073759-B	Lubricating oil filter	1	55.00
76439	Oil filter bracket	1	2.50
½"-13x2½"	Cap screw	3	.10
½"-13x1-1/8"	Cap screw	2	.05
½"-13x1½"	Cap screw	1	.10
½"-13	Hex nut	4	.05
½"	Lock Washer	6	.02

Always Give Engine Model and Number When Ordering Repairs

"6-WAKU"
Industrial Unit Parts





PARTS PRICE LIST

"6-WAKU"

Industrial Unit Parts

REF. NO.	NAME	PER ENGINE	PART NO.	PRICE EACH
1	Rear Panel	1	48206D	$0.40
2	Rear Panel Brace	1	74816	.40
	Hex Hd. Cap Screw	2	4/16-18x¾	.05
	Hex Nut	2	5/16-18	.05
	Lock Washer	2	5/16	.02
3	Hood	1	74480A	
	Side Door	2	74481	29.00
4	Exhaust Pipes	2	28005	6.00
5	Radiator	1	101330	375.00
6	Radiator Guard	1	078184	22.00
7	Fan Guard	1	74819A	27.00
	Upper Radiator Connection	1	74457	4.75
	Hex Hd. Cap Screw	2	¾-10-2	.15
	Lock Washer	2	¾	.02
	Gasket	2	B1916	.15
8	Upper Water Pipe	1	27647H	.75
9	Upper Hose Conn. (2½" ID x5)	2	73841B	
10	Lower Radiator Connection	1	78180	1.50
	Cap Screw	4	½-13x1¼	.05
	Lock Washer	4	1/2	.02
11	Lower Water Pipe	1	27647U	.70
12	Lower Hose Conn. (2½" IDx4)	2	73841A	.35
13	Hose Clamp	8	65738	.25
	Radiator Spacers	2	B10559	1.65
	Pipe coupling	1	78209D	.15
	Pipe Nipple	1	65098D	.10
	Stud	1	B5220	.15
	Shim	2	78504	.30
	Shim	2	78504A	.30
14	Drain Cock	1	B558	.50
15	Magneto (Bosch MJA6)	1	50357G	65.00
	Spark Plug	6	50900	(net) .65
	Spark Plug Wrench	1	24088G	1.75
	Magneto Cable	1 set		
16	Side Rail R.H. Front	1	74874	1.50
17	Side Rail R.H. Rear	1	74873	.75
18	Choke	1	100125N	2.75

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PARTS PRICE LIST

	Choke Control Support.....	1	48666A	.40
	Choke Bracket.....	1	48417	.30
	Clip.....	1	B1457	.15
	Clip.....	1	63744	.25
	Cap Screw.....	1	¼-20x½	.05
	Hex Nut.....	1	¼-20	.05
	Lock Washer.....	1	1/4	.02
	Cap Screw.....	2	3/8-16x1	.05
	Hex Nut.....	2	3/8-16	.05
	Lock Washer.....	2	3/8	.02
	Cap Screw.....	1	½-13x1	.05
	Lock Washer.....	1	1/2	.02
	Swivel.....	1	B8847	.40
19	Instruction Plate.....	1	8433	1.00
20	Instruction Plate Drive Screw.....	4	65435	.02
21	Air Cleaner.....	2	50806A	33.00
22	Air Pre-Cleaner.....	2	50807A	6.75
23	Air Cleaner Connection.....	1	74443-B	12.50
	Air Cleaner Gasket.....	4	B4855	.05
24	Air Cleaner Band Bracket.....	2	B5909A	
	Rd. Hd. Machine Screw.....	4	¼-20x3½	.05
	Hex Nut.....	6	¼-20	.05
	Lock Washer.....	4	1/4	.02
	Bolt.....	2	¼-20x5½	.15
25	Air Cleaner Pipe.....	1	076520A	21.00
26	Carburetor Air Horn.....	1	76974	4.50
	Felt Washer.....	1	78458	.30
	Sq. Hd. Cap Point Set Screw.....	2	5/16-18x1	.05
	Hex Hd. Cap Screw.....	8	3/8-16x1¼	.05
	Hex Nut.....	8	3/8-16	.05
	Lock Washer.....	8	3/8	.02
27	Hose Connection.....	2	78915	.55
28	Hose Clamp.....	4	B3039	.95
29	Throttle Control.....	1	B9266	2.00
30	Throttle Control Lever.....	1	B9267	1.60
	Hex Hd. Cap Screw.....	2	3/8-24x1	.05
	Hex Nuts.....	2	3/8-24	.05
	Lock Washer.....	2	3/8	.02
	Throttle Control Spring.....	1	B9269	.25
	Hex Hd. Cap Screw.....	1	3/8-16x1½	.05
	Hex Nut.....	1	3/8-16	.05
31	Throttle Rod.....	1	65517R	.35
32	Clevis (Large).....	1	B6649A	.50
	Clevis (Small).....	1	B3671	.25
	Pin (Clevis Large).....	1	B6667	.10
	Pin (Clevis Small).....	1	B3743	.05
	Hex Nut.....	2	1/4-28	.03

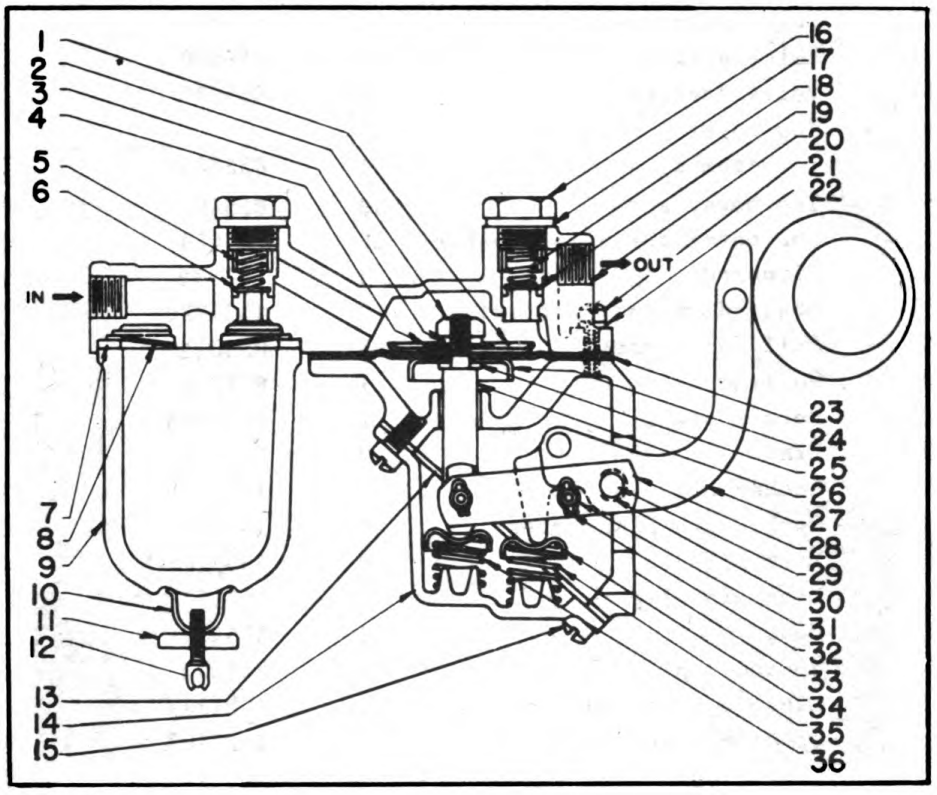
PARTS PRICE LIST

	Cotter Pin	2	1/16-1/2	.01
33	Carburetor (See Carb. Parts)	1	55045	90.00
	Carburetor Gasket	1	B2712	.30
34	Carburetor Adaptor	1	11256A	2.50
	Carburetor Adaptor Gasket	1	B73A	.20
	Cap Screw	4	3/8-16x1¼	.05
	Lock Washer	4	3/8	.02
35	Fuel Pump	1	73898	8.50
	Fuel Pump Gasket	1	B3605	.05
36	Gasoline Line	1	076692	.45
37	Side Rail L.H.	1	74482	4.25
38	Front Support	1	078175	60.00
	Cap Screw	2	3/4-10x1½	.15
	Lock Washer	2	3/4	.02
	Cap Screw	3	5/8-11x2	.10
	Lock Washer	3	5/8	.02
	Oil Gauge	1	63727	4.50
	Ignition Switch	1	8422C	3.75
	Rd. Hd. Mach. Screw	2	#8-32x5/8	.02
	Hex Nut	2	#8-32	.02
	Lock Washer	2	3/16	.02
	Vacuum Gauge	2	50588B	4.00
	Hose Coupling	1	B10096	.90
	Hose Clamp	2	85853	.10
	Hose	1	80183A	1.30
	Water Temperature Gauge	1	101133	7.50
	Side Rail Support	1	80168	.50
	Shim	1	65816	.05
	Shim	1	65817	.07
	Oil Line	1	50864D	1.50
	Elbow	1	B1686	.15
	Str. Fitting	1	B4094	.10
	Cap Screw	2	1/2-13x3/4	.05
	Cap Screw	12	1/2-13x1½	.10
	Cap Screw	4	1/2-13x1-3/4	.10
	Cap Screw	4	1/2-13x2	.10
	Cap Screw	8	1/2-13x1	.05
	Cap Screw (Ctsk. Head)	4	1/2-13x1¼	.05
	Hex Nut	30	1/2-13	.05
	Lock Washer	30	1/2	.02
	Cap Screw	3	3/8-16x½	.05
	Lock Washer	3	3/8	.02
	Hex Hd. Cap Screw	3	1/4-20x1	.05
	Hex Nut	3	1/4-20	.05
	Lock Washer	3	1/4	.02

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"6-WAKU" ACCESSORIES



FUEL PUMP

REF. NO.	NAME	PER ENGINE	PART NO.	PRICE EACH
1	Upper diaphragm protector	1	855274	2.50
2	Pull rod nut	1	855213	.10
3	Pull rod nut lock washer	1	855390	.02
4	Diaphragm alignment washer	1	855029	.02
5	Valve spring	2	856270	.01
6	Valve (inlet)	1	855279	.05
7	Bowl gasket	1	854003	.10
8	Screen	1	854009	.15
9	Bowl	1	854004	.20
10	Bowl seat	1	854005	.15
11	Bail thumb nut	1	855763	.15
12	Bail and screw	1	864016	.15
13	Bottom cover gasket	1	855585	.05

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

14	Bottom cover	1	855573	.25
15	Bottom cover screw	3	132108	.02
16	Valve plug	1	855281	.30
17	Valve plug gasket	2	855282	.05
18	Valve spring	2	856270	.01
19	Valve (outlet)	2	855279	.05
20	Top cover & valve seat assembly	1	855739	3.00
21	Top cover screw	10	855493	.02
22	Top cover screw lockwasher	10	855064	.02
23	Diaphragm (5 pieces)	1	855389	.75
24	Lower diaphragm protector	1	1521720	.15
25	Pull rod gasket	1	855012	.02
26	Pullrod	1	855250	.25
27	Rocker arm	1	1523955	7.50
28	Link	2	855574	.25
29	Rocker arm pin	1	1521289	.25
30	Rocker arm pin washer	1	1521288	.05
31	Link pin	2	855016	.05
32	Link pin clip	4	855017	.02
33	Body	1	855874	2.50
34	Spring cap	2	855532	.02
36	Diaphragm spring (lower)	1	1521187	.05
	Diaphragm spring (upper)	1	1522169	.60
	Pipe plug	1	103878	.10
	Priming lever	1	152280	.35
	Air dome	1	855918	.90
35	Rocker arm spring	1	855253	.10

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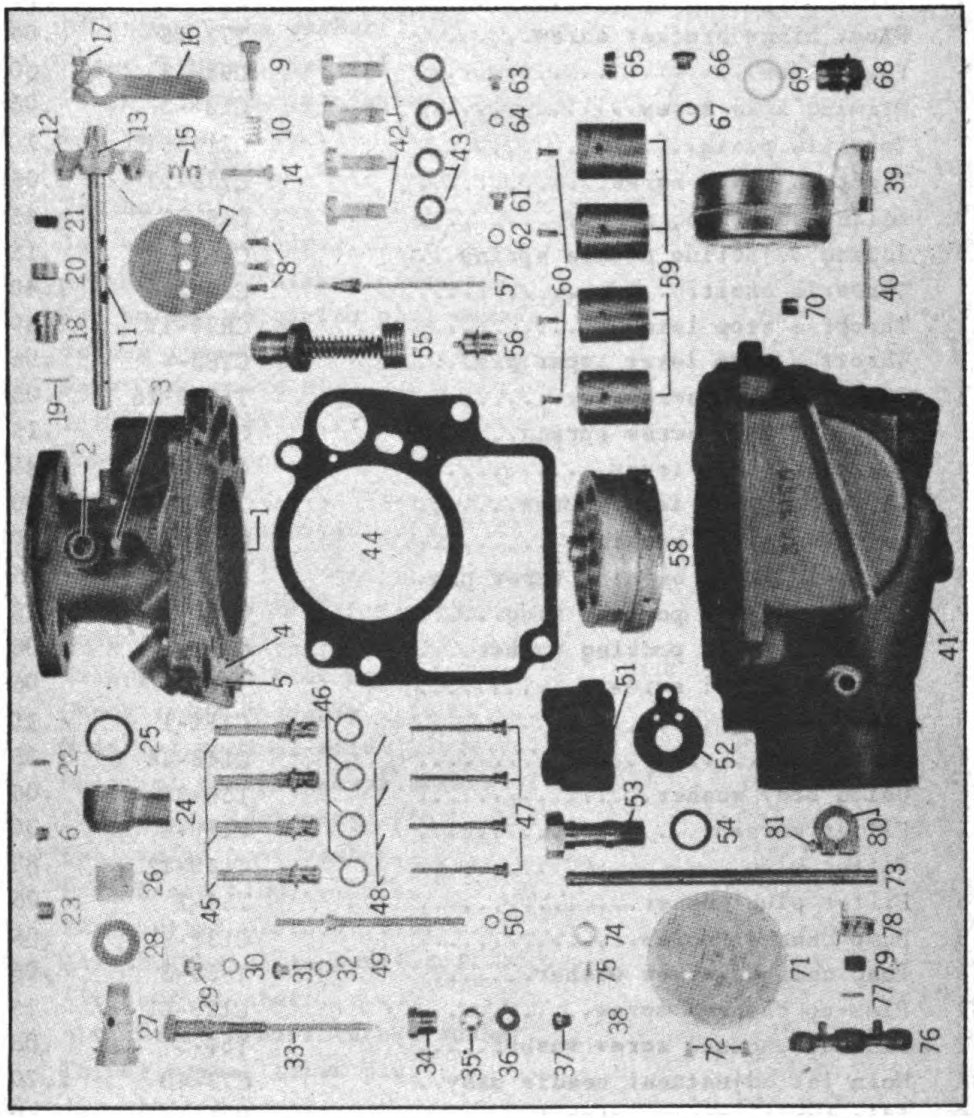
"6-WAKU"



Carburetor Parts

PARTS PRICE LIST

CARBURETOR PARTS

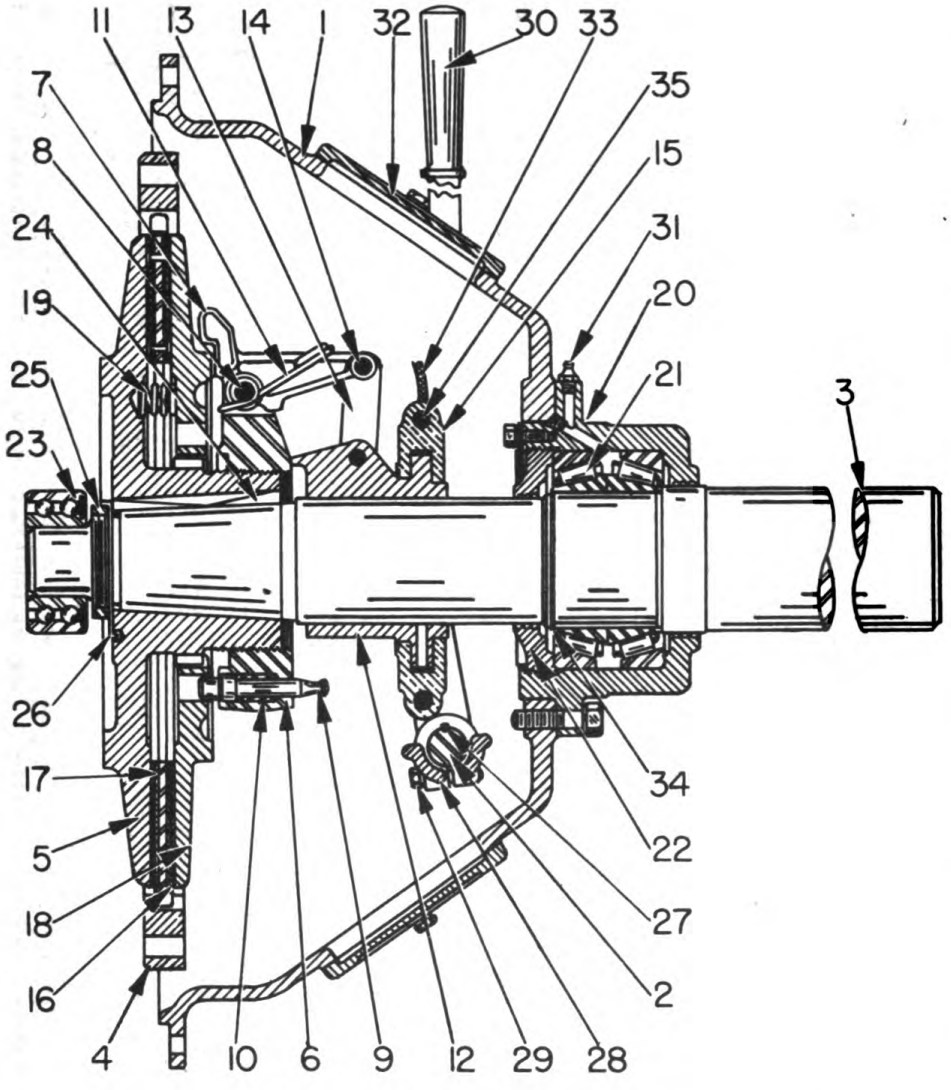
REF. NO.	NAME	PER ENGINE	PART NO.	PRICE EACH
1	Upper body assembly.....		A2-27	20.50
2	Throttle Shaft bushing.....		CR9-5	.15
3	Throttle stop pin.....		CR121-10	.06
4	Float hinge bracket.....		C88-13	.20
5	Float hinge bracket screw.....		T73-15	.06
	Pump liner.....		C68-13	.60
6	Priming hole screw.....		C138-3	.06
7	Throttle plate.....		C21-151	2.10
8	Throttle plate screw.....		C136-12	.06
9	Idling adjusting needle.....		C46-6	.45
10	Idling adjusting needle spring...		C111-17	.15
11	Throttle shaft.....		C23-216	1.40
12	Throttle stop lever.....		CR28-19	1.30
13	Throttle stop lever taper pin....		CT63-4	.06
14	Throttle stop screw.....		T8S10-15	.06
15	Throttle stop screw spring.....		C111-62	.15
16	Throttle clamp lever.....		C24-10x8	1.45
17	Throttle clamp lever screw.....		T8S10-9	.06
18	Throttle lever bushing.....		CR26-65	.30
19	Throttle lever bushing taper pin.		CT63-4	.06
20	Throttle shaft packing ring.....		C130-16	.15
21	Throttle shaft packing washer....		CT57-2	.06
22	Vacuum Channel screw.....		T10-3	.06
23	By-Pass plug.....		CT91-1	.15
24	Union body.....		C148-4A	1.35
25	Union body washer.....		T56-33	.06
26	Filter screen.....		C150-8	.30
27	Filter plug.....		C149-12	.80
28	Filter plug washer.....		T56-7	.06
29	Pump channel screw.....		C138-61	.06
30	Pump channel screw washer.....		T-56-5	.06
31	Pick-up channel screw.....		C138-61	.15
32	Pick-up channel screw washer.....		T56-5	.06
33	Main jet adjustment needle assy..		C73-40	1.70
34	Adjustment needle ratchet.....		C74-13	.70
35	Adjustment needle packing bushing		C26-69	.06
36	Adjustment needle packing washer.		CT57-17	.06
37	Main net #33.....		C52-22	.75
38	Main jet washer.....		T56-27	.06
39	Float assembly.....		C85-52	2.30
40	Float axle.....		C120-28	.15

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

41	Fuel bowl assembly.....	A1212x1	48.00
	Pump liner.....	C63-75	1.60
	Air shutter stop pin.....	T73-18	.06
42	Bowl to body assembly screw.....	T18S38-16	.06
43	Bowl to body lockwasher.....	T42-38	.06
44	Bowl to body gasket.....	B142-42	.30
45	Discharge tube.....	C66-41	.90
46	Discharge tube washer.....	T56-2	.06
47	Power & Accel. jet #11.....	C51-3	.90
48	Power & Accel. jet washer.....	T56-48	.06
49	Cap jet #45.....	C57-5	.80
50	Cap jet washer.....	T56-24	.06
51	Jet holder.....	CR190-21	9.00
52	Jet holder washer.....	C135-12	.25
53	Jet holder retaining plug.....	C149-23	1.05
54	Jet holder retaining plug washer..	T56-6	.06
55	Vacuum pump assembly.....	C36-21	2.10
56	Power jet valve #12.....	D7444	.90
57	Idling jet #15.....	C54-18	.90
58	Venturi holder.....	C39-16	15.00
59	Venturi #23.....	C38-49	5.00
60	Venturi set screw.....	C136-17	.06
61	Compensator #44.....	C52-5	.60
62	Compensator washer.....	T56-5	.06
63	Main jet regulator #37.....	C52-3	.55
64	Main jet regulator washer.....	T56-24	.06
65	Check valve assembly.....	C41-17	.50
66	Main jet channel screw.....	C138-53	.40
67	Main jet channel screw.washer.....	T56-12	.06
68	Fuel valve seat assy. #55.....	C81-33	1.80
69	Fuel valve seat washer.....	T56-3	.06
70	Bowl Drain plug.....	CT91-1	.15
71	Air shutter plate.....	C101-10	1.20
72	Air shutter plate screw.....	C136-6	.06
73	Air shutter shaft.....	D7220	1.05
74	Air shutter shaft thrust washer...	C130-17	.06
75	Thrust washer taper pin.....	CT63-2	.06
76	Air shutter lever.....	D3062x3	.85
77	Air shutter lever taper pin.....	CT63-2	.06
78	Air shutter lever spring.....	C117-28	.06
79	Air shutter lever spring spacer...	C130-14	.06
80	Air shutter lever spring retainer.	C109-4Cx9	1.10
81	Spring retainer clamp screw.....	T1S8-10	.06
	Complete gasket set.....	C181-80	1.30

"6-WAKU"



Power Take-off Parts

REF. NO.	NAME	PER ENGINE	PART NO.	PRICE EACH
	Power Take-Off (TD Spec. #13789).....		9693T	$333.00
1	Clutch Housing (#0 SAE).....	1	TD-8721	55.00
2	Clutch Operating Shaft.....	1	TD-1580A	2.20
3	Clutch Shaft.....	1	TD-A5191F	72.55
	Key (1 x 1 x 8½).....	1	TD-M1233	1.10
4	Driving Ring.....	1	TD-6924	21.45
5	Hub and Back Plate.....	1	TD-Z27258Q	31.00
	Adjusting Yoke Assembly.....	1	TD-A19	43.85
6	Adjusting Yoke.....	1	TD-5088	24.20
7	Lever.....	4	TD-4953	3.20
8	Lever Pin.....	4	TD-2128A	.40
9	Adjusting Lock Pin.....	1	TD-114B-18	.33
10	Adjusting Lock Pin Spring.....	1	TD-113	.11
	Cotter Pin 1/8 x 3/4.....	4	TD-M-231	.02
11	Lever Spring.....	4	TD-5676B	.60

(over)

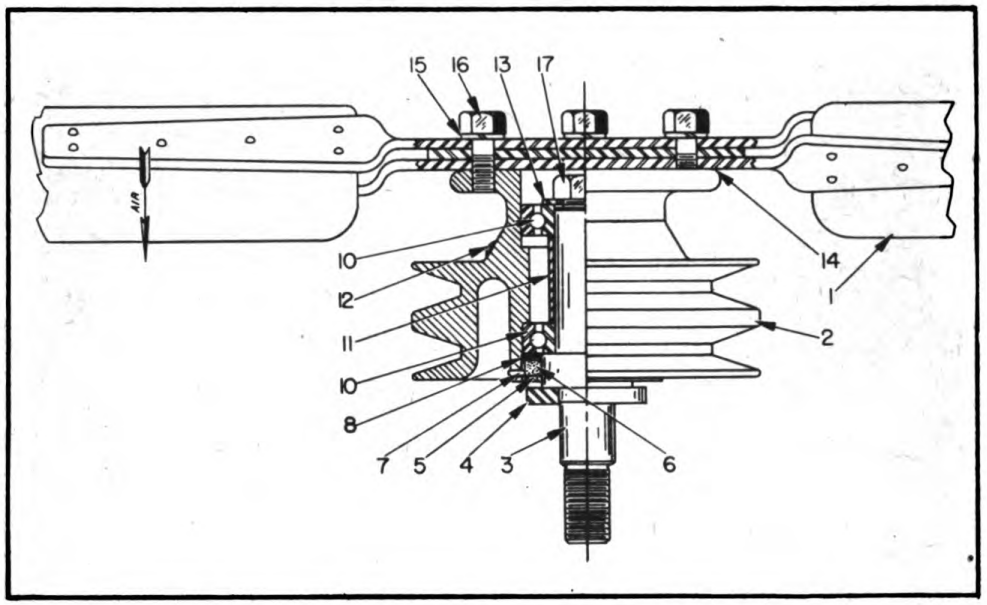
Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

	Sliding Sleeve Assembly.....			
12	Sliding Sleeve (Bore 3.506-3.504)...	1	TD-3391	14.70
13	Lever Link.....	8	TD-1345	.22
14	Lever Link Pin.....	8	TD-121B-18	.33
	Cotter Pin 1/8 x 3/4.....	8	TD-M-231	.02
15	Sleeve Collar Pin Assby.....	1	TD-117B-18	12.50
	Bolts.....	2	TD-M-1045	.25
	Shims.....	2	TD-120B-18	.24
	Nuts.....	2	TD-M-367	.04
	Cotters.....	2	TD-M-420	.01
	Driving Plate Assembly.....	1	TD-05619A	28.10
16	Driving Plate.....	1	TD-5619A	14.50
17	Friction Discs.....	2	TD-5098	5.50
	Tubular Rivets.....28		TD-M-118	.01
18	Floating Plate.....	1	TD-7259A	24.20
19	Release Springs.....	6	TD-113B-18	.33
20	Bearing Carrier.....	1	TD-A5194	13.50
	Hex Hd. Cap Screws (½ x 2 USS).....	6	TD-M-257	.10
21	Timken Bearings (592-A594).....	2	TD-M-215	20.31
22	Bearing Retainer.....	1	TD-A-3308	3.50
	Retainer Lock.....	1	TD-A-1983	.35
	Hex Hd. Cap Screw.....	1	TD-M-354	.02
23	Ball Bearing (5309F D.R.).....	1	TD-M-181	13.35
24	Key (5/8 x 5/8 x 4-3/8).....	1	TD-M-635	.20
25	Shaft Nut.....	1	TD-1442	8.25
26	Lock Washer.....	1	TD-A1590	.13
27	Woodruff Keys #15.....	2	TD-M291	.10
28	Clutch Yoke.....	1	TD-5270	3.85
29	Hex Hd. Cap Screw (3/8 x 1½).....	2	TD-M-258	.05
	Lock Washers (3/8).....	2	TD-M-256	.01
30	Hand Lever.....	1	TD-8215B	4.70
	Lock Washer (1/2).....	1	TD-M-241	.02
	Hex Hd. Cap Screw (1/2 x 2¼).....	1	TD-M-486	.10
31	Alemite Fittings.....	3	TD-1330	.33
	Lock Washers 1/2.....	6	TD-M-657	.02
	Instruction Plate.....	1	TD-1327	.33
	Escutcheon Pin.....	4	TD-1333	.01
	Hand Hole Plate.....	1	TD-3204A	1.10
	Nut (1/2).....	1	TD-M-425	.04
32	Hand Hole Plate.....	1	TD-3204	1.10
	Hex Hd. Cap Screws (1/4 x 3/4).....	4	TD-M-286	.15
	Lock Washers (1/4).....	4	TD-M-101	.01
33	Flexible Hose (12").....	1	TD-A1663	1.10
	Jam Nut (5/8 SAE).....	1	TD-M309	.05
	Lock Washer (5/8).....	1	TD-M236	.03
	Drive Pins.....	2	TD-M422	.01
	Oil Cups.....	2	TD-M102	.06
34	Snap Ring.....	1	TD-A-2044	.60
	Lock Washer.....	1	TD-M-255	.01
	Flush Pipe Plug.....	1	TD-M-482	.04
	Flush Pipe Plug.....	1	TD-M-426	.12
35	Sleeve Collar Pin.....	2	TD-118B-18	.35

PARTS PRICE LIST

"6-WAKU"

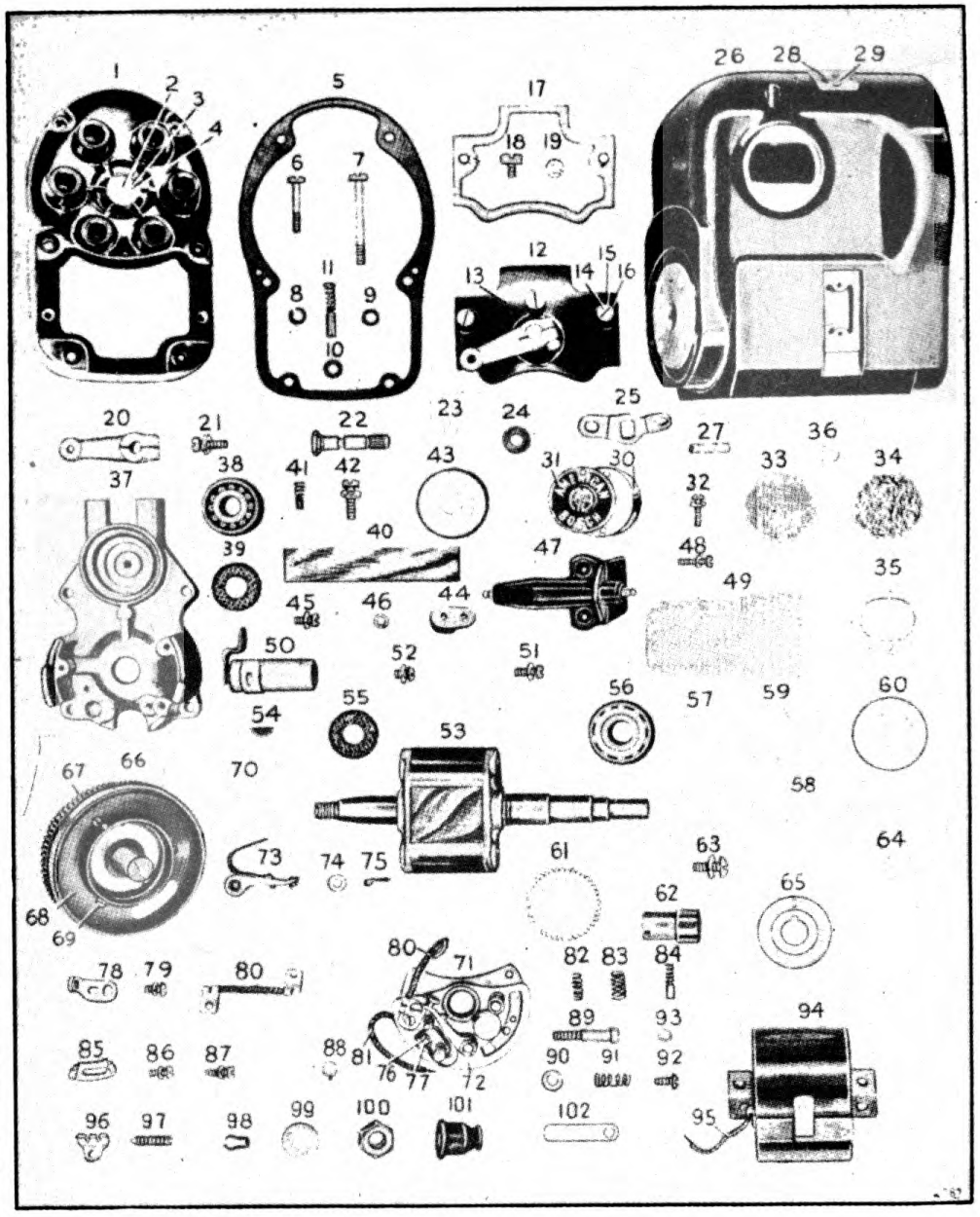


Fan and Hub Assembly

REF. NO.	NAME	PER ENGINE	PART NO.	PRICE EACH
	Fan assembly.....	1	F-36F	103.00
1	Blade assembly.....	1	F3012	63.00
2	Hub.....	1	A101576	26.25
3	Spindle.....	1	C107971	15.75
4	Clamp washer.....	1	C10173	.40
5	Retainer (for C6703).....	1	C6701	.40
6	Cork washer.....	1	C6703	.50
7	Lock wire.....	1	C-5000	.09
8	Cork retaining washer.....	1	C6702	.20
	Gasket.....	1	C5501	.06
10	Annular bearing (#1207).....	2	C3145	4.60
11	Bearing spacer.....	1	C101579	.90
12	Oil plug.....	1	C589	.06
13	Clamp washer.....	1	C16193	.20
14	Gasket.....	1	C5102	.15
15	Lock washer.....	4	C2693	.10
16	Cap screw.....	4	C5609	.40
17	Slotted Nut.....	1	C101578	.25
	Cotter.....	1	C11413	.03

Always Give Engine Model and Number When Ordering Repairs

"6-WAKU"



Magneto Parts

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

MJA 6C-102 MAGNETO WITH ICB 2A-20-37° IMPULSE COUPLING (WAUKESHA PART 50357-G)

ILL. NO.	PART NO.	DESCRIPTION	PRICE EACH
1	DP 52191	Distributor plate	4.65
2	WN 521	Observation window	.05
3	SP 1001 CA	Ring for window	.05
4	GA 1003	Window gasket	.05
5	GA 522	Distributor plate gasket	.15
6	SC 1002 CA	Plate fastening screw - short	.05
7	SC 1003 CA	Plate fastening screw - long	.05
8	WA 288	Fastening screw lock washer	.05
9	WA 98922	Fastening screw plain washer	.05
10	WA 5280	Sealing washer	.05
11a	SA 82736	Distributor plate center brush and spring	.10
11b	SA 82876	Distributor plate brush and spring	.10
12	CP 525	Cap assembly	1.60
13	CP 5214	Cap with gasket	1.35
14	SC 1001 CA	Cap fastening screw	.05
15	WA 98922	Fastening screw plain washer	.05
16	WA 288	Fastening screw lock washer	.05
17	GA 521	Control arm cap gasket	.05
18	SC 1006 CA	Cap grounding screw	.05
19	WA 45279	Grounding screw lock washer	.05
25	LE 526	"U" shaped timing lever	.25
26	HG 524	Magneto housing - drilled for coupling	12.75
27	FP 71561	Edge distance hole felt plug	.05
28	NP 521	Name plate for type designation	.10
29	SC 121-6 CA	Screw for name plate	.05
30	CV 52128	Ventilator cover	.10
31	NP 5222	Ventilator name plate	.10
32	SC 1173	Ventilator cover fastening screw & lock washer	.10
33	SN 526	Ventilator wire screen	.10
34	GA 5210	Ventilator felt gasket	.05
35	WA 5269	Ventilator screen reinforcing washer	.05
36	EC 1002	Cable holding clip	.05
37	BK 521	Distributor gear bracket	4.25
38	BB 1001	Distributor gear ball bearing	2.70
39	WA 81751	Felt washer under ball bearing	.05
40	IS 522	Bearing packing strip	.05
41	SA 63379	Distributor gear grounding brush and spring	.15
42	SC 1166	Bracket fastening screw and lock washer	.10
43	CV 523	Oil shield for ball bearing	.05
44	BL 522	Terminal block on gear bracket	.15
45	SC 1169	Block fastening screw and lock washer	.10
46	WA 72613	Fastening screw plain washer	.05
47	EC 5283	High tension conductor	.90
48	SC 1167	Conductor fastening screw and lock washer	.10
49	IS 5226	Conductor Insulator	.05
50	CW 5210	Condenser with bracket	.70
51	SC 1143	Condenser fastening screw and lock washer	.10
52	SC 1168	Screw and lock washer for condenser lead	.10
53	RT 5220	Magnet rotor only	15.25
54a	KY 11-4	Woodruff key - (drive end)	.05
54b	KY 11-3	Woodruff key - (gear end)	.05
55a	WA 1010	Felt washer for magnet rotor (drive end)	.05
55b	WA 81751	Felt washer for magnet rotor (inter. end)	.05
56	BB 60226	Ball bearing	1.55

Always Give Engine Model and Number When Ordering Repairs

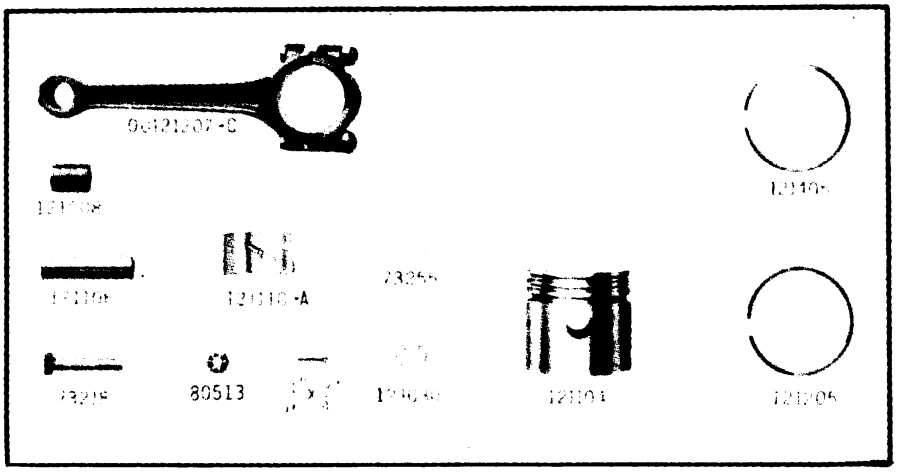
MJA 6C- 102 MAGNETO WITH ICB 2A-20-37° IMPULSE COUPLING (WAUKESHA PART 50357-G) (Cont'd)

ILL. NO.	PART NO.	DESCRIPTION	PRICE EACH
57a	WA 61	Bearing shim (.0126")	.05
57b	WA 106	Bearing shim (.0071")	.05
57c	WA 107	Bearing shim (.004")	.05
57d	WA 1009	Bearing shim (.0197")	.05
58	IS 504	Packing strip for magnet rotor ball bearing	.05
59	IS 522	Bearing paper washer	.05
60	CV 522	Oil thrower for bearing	.05
61	GE 5219	Magnet rotor gear	.85
62	GA 525	Cam	1.60
63	SC 1165	Cam fastening screw and lock washer	.10
64	WA 5241	Cam retaining washer	.05
65	WA 523	Indicating washer	.10
66	GE 5260	Distributor gear and rotor assembly	7.20
67	GE 5245	Distributor gear only	5.10
68	RT 5261	Distributor rotor only	3.90
69	SC 523	Distributor rotor fastening screw	.05
70	WA 1005 CA	Plain washer for screw	.05
71	IN 526	Interrupter	4.60
72	PL 52119	Interrupter plate with riveted parts	2.70
73	LE 522	Interrupter lever	.90
74	WA 86678	Plain washer for lever stud	.05
75	FP 84791	Interrupter lever cotter pin	.05
76	SC 1004 CA	Screw for lever spring	.05
77	WA 5-4	Fastening screw lock washer	.05
78	BK 525	Contact bracket	.60
79	SC 1149	Bracket fastening screw and lock washer	.10
80	CB 5227	Bracket grounding cable assemlby	.15
81	CB 5264	Cable - terminal block to interrupter	.05
82	SP 5213	Spring on interrupter (small)	.05
83	SP 5214	Spring on interrupter (large)	
84	BR 521	Interrupter grounding brush and spring	.15
85	PL 528	Stop plate	.15
87	SC 1143	Stop plate fastening screw and lock washer	.10
88	WA 72613	Fastening screw plain washer	.05
89	SD 1001 CA	Stop plate stud	.10
90	WA 98904	Plain washer for stud	.05
91	SP 525	Spring for stud	.05
92	SC 1029 CA	Interrupter support plate fastening screw	.05
93	WA 6-4 CA	Plate fastening screw lock washer	.05
94	CL 523	High tension coil	5.75
95	KL 100657	Cable for coil (specify length)	.05
96	EC 5214	Clip for cable	.05
97	SC 1060	Lock screw for mounting coil	.05
98	FP 81953	Terminal clip for distributor plate cable	.05
99	WA 2	Rotor shaft plain washer	.05
100	NT 67446	Rotor shaft hexagon nut	.05
101	IS 82927	Rubber nipple	.05
102	GG 522	Magneto gauge	.05

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"ICK" ENGINE PARTS



Connecting Rod and Piston Parts

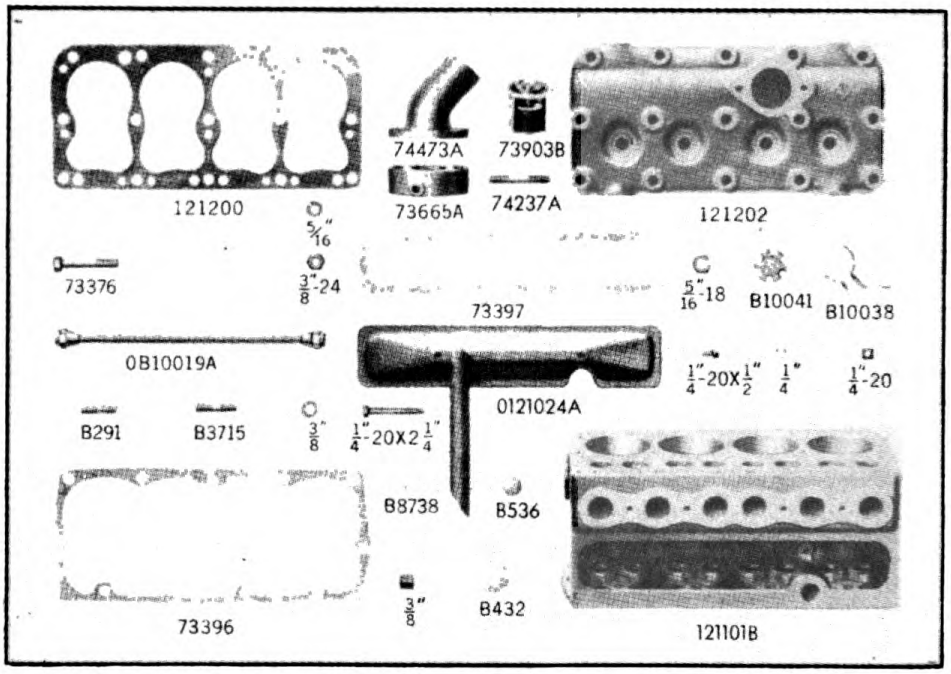
PART NO.	NAME	PER ENGINE	PRICE EACH
73218	Connecting rod bolt.....	8	$ .10
80513	Connecting rod bolt castle nut.....	8	.05
73255	Connecting rod shim.....	8	.05
121110-A	Connecting rod bearing.....	8	.40
00121207-C	Connecting rod assembled complete with bearings.....	4	4.25
121205	Piston ring (oil)	4	.25
121030	Piston pin retainer ring	8	.05
121008	Piston pin bushing in connecting rod.	4	.10
121405	Piston ring (type 70).....	8	.15
121104	Piston.....	4	2.75
121104	Piston (semi-finished).....	4	2.50
121106	Piston pin.....	4	.40
0121104	Piston assembled with 121106 pin.....	4	3.45
0121104	Piston (semi-finished) assembled with 121106 pin.....	4	3.20

We are in a position to furnish pistons and piston rings .010", .020", and .040" oversize for rebored cylinders. When ordering, please state what size is required. No extra charge is made for oversize pistons and piston rings.

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"ICK"



Cylinder, Head and Door Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121202	Cylinder head	1	$10.00
121200	Cylinder head gasket	1	.65
73376	Cylinder head cap screw	13	.05
121101-B	Cylinder assembled with 8 No. 121009 valve guides	1	39.00
73396	Cylinder base gasket	1	.15
B-3715	Cylinder to case stud (long)	4	.10
B-291	Cylinder to case stud (short)	7	.08
3/8"-24	Hex nut for B-3715, B-2031 and B-291 stud	13	.05
3/8"	Lock washer for B-3715, B-2031 and B-291 stud	13	.02
0121024-A	Cylinder door	1	.75
73397	Cylinder door gasket	1	.15
¼"-20x2¼"	Cylinder door cap screw	2	.05
B-8738	Copper washer for cylinder door	2	.05
B-10038	Cable support bracket	1	.20
B-10041	Cable support block	1	.25
¼"-20x½"	Fillister head cap screw for OB-10038 bracket	2	.05
¼"-20	Square nut for OB-10038 bracket	2	.05
¼"	Lock washer for OB-10038 bracket	2	.02
OB-10038	Cable support bracket assembly	1	.85
B-5581	Countersink pipe plug in cylinder (3/8)	1	.05

Always Give Engine Model and Number When Ordering Repairs

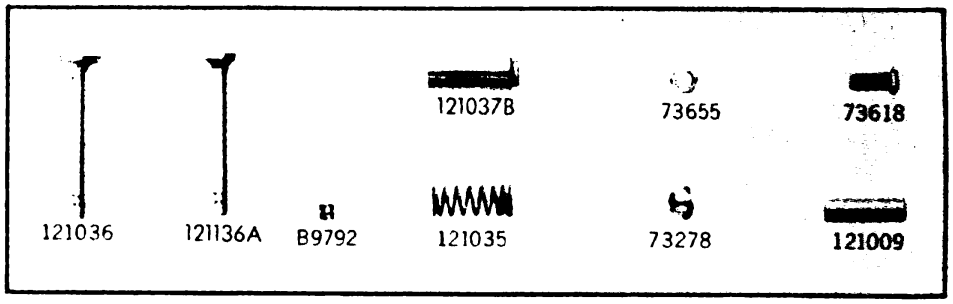
PARTS PRICE LIST

B-432	Expansion plug in cylinder.....	2	.05
B-536	Expansion plug in cylinder head.....	2	.03
OB-10019-A	Water by pass.....	1	.35
74473-A	Top water manifold.....	1	1.00
73903-B	Thermostat.....	1	1.50
73665-A	Thermostat housing spacer.....	1	.70
74237-A	Thermostat stud.....	2	.10
5/16"-18	Hex nut for 74237 stud.....	2	.05
5/16"	Lock washer for 74237 stud.....	2	.02
78077	Exhaust valve insert.....	4	.60
3/8"-16x2¼"	Cap screw (cyl. head).....	2	.05
1136	Shakeproof lock washer.....	2	.02

Always Give Engine Model and Number When Ordering Repairs

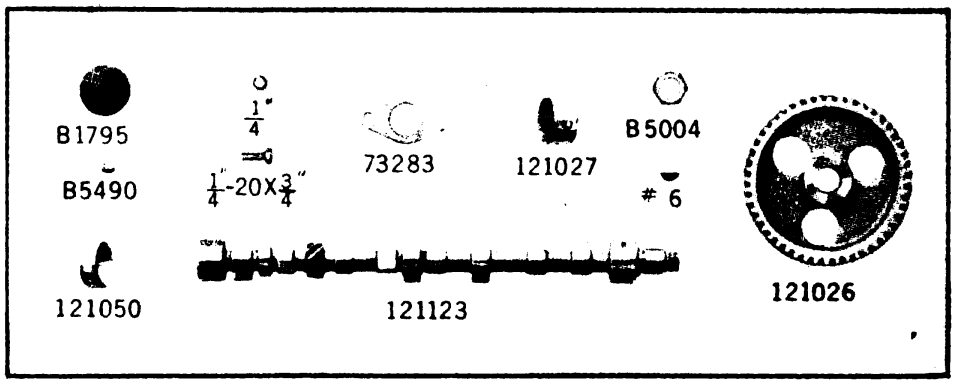
PARTS PRICE LIST

"ICK"



Valve and Valve Lifter Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121036	Valve (intake).....	4	$ .75
121136-A	Valve (exhaust).....	4	1.10
121035	Valve spring.....	8	.10
73278	Valve spring retainer.....	8	.10
B-9792	Valve spring taper.....8 pr.	per pr.	.10
121009	Valve guide.....	8	.25
0121037-B	Valve lifter assembly.....	8	.75
121037-B	Valve lifter.....	8	.60
73655	Valve lifter lock nut.....	8	.05
73618	Valve lifter adjusting screw.....	8	.10



Camshaft Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121123	Camshaft.....	1	$10.00
121026	Camshaft gear.....	1	2.00
No. 6	Woodruff key for 121026 gear.....	1	.04
B-5004	Camshaft gear lock nut.....	1	.10
73283	Camshaft thrust plate.....	1	.50
1/4"-20x3/4"	Cap screw for 73283 plate.....	2	.05
1/4"	Lock washer for 73283 plate.....	2	.02
B-1795	Camshaft end plate.....	1	.05
121027	Camshaft bushing (front and rear).....	2	.15
121050	Camshaft bushing (center).....	1	.15
B-5490	Camshaft lock screw on oil pump.....	1	.25

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PARTS PRICE LIST

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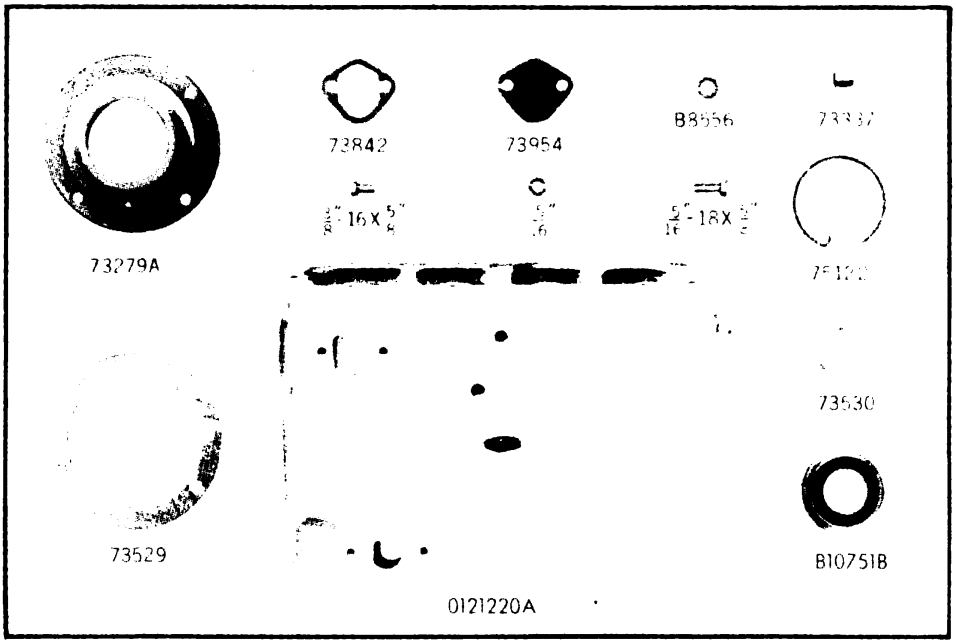

Crankcase Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
B-10751-B	Ball bearing.....	2	4.90
73530	Ball bearing spacer collar.....	2	.25
73279-A	Ball bearing retainer (rear).....	1	1.50
75122	Ball bearing retainer ring.....	1	.15
73529	Ball bearing retainer gasket (rear)	1	.10
5/16"-18x7/8"	Cap screw for 73279-A retainer.....	4	.05
5/16"	Lock washer for 73279-A retainer and 73954 cover.....	6	.02
73337	Distrubutor drive shaft bushing...	1	.20
73954	Fuel pump cover.....	1	.10
B-8556	Copper washer.....	2	.05
3/8"-16x5/8"	Cap screw.....	2	.05
73842	Fuel pump gasket.....	1	.03
5/16"-18x5/8"	Cap screw for 73954 cover.....	2	.05
B-536	Expansion plug.....	2	.03
0121220-A	Crankcase assembled with camshaft bushings, and distributor drive shaft bushing.....	1	34.00
00121220-A	Crankcase assembled with camshaft bushings, and distributor drive shaft bushing and roller bearings.....	1	47.00

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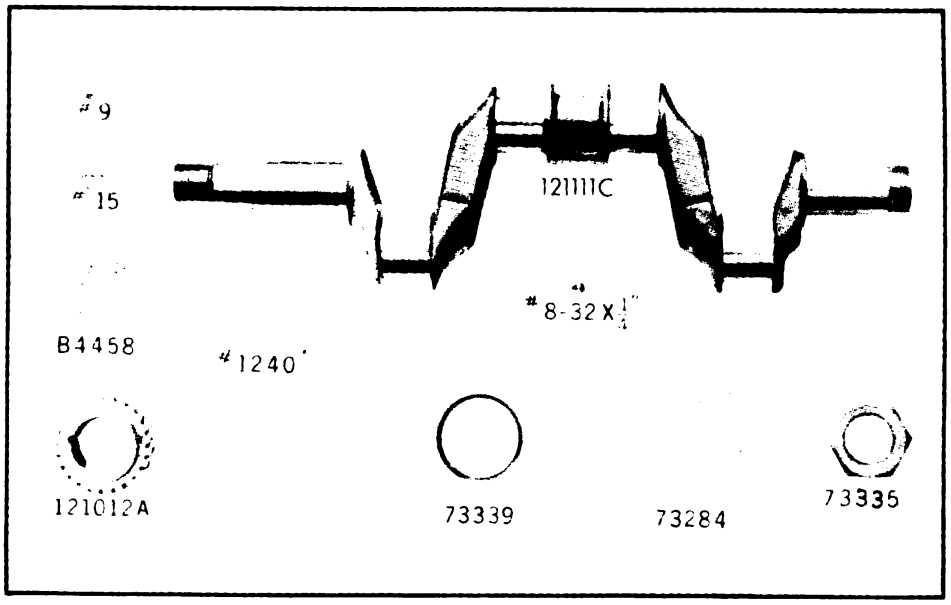

Crankshaft Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121111-C	Crankshaft	1	$20.00
121012-A	Crankshaft gear	1	2.25
B-4458	Crankshaft washer (front)	1	.10
73335	Crankshaft lock nut (rear)	1	.35
No. 9	Woodruff key for 121012-A gear	1	.04
73284	Crankshaft oil thrower (front)	1	.05
No. 8-32x¼"	Round head machine screw for 73284 oil thrower	3	.02
73339	Crankshaft oil seal (front and rear)	2	.55
No. 15	Woodruff key	2	.04
B-6034	Starting crank nut (on crankshaft)	1	.15
No. 1240	1¼" Shakeproof lock washer	1	.02

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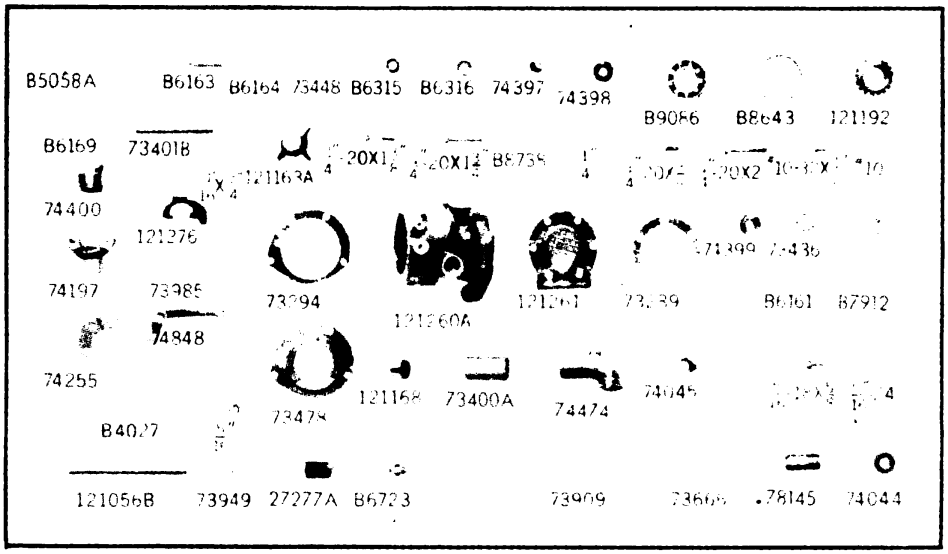
PARTS PRICE LIST

"ICK"



Water Pump and Governor Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121260-A	Water pump and governor housing bushed with 1 No. 121168 bushing	1	$5.25
121168	Water pump bushing	1	.50
121261	Water pump cover	1	1.25
73289	Water pump cover gasket	1	.10
121163-A	Water pump impeller	1	.60
¼"	Lock washer for 121261 cover	5	.02
121192	Water pump and governor gear	1	1.50
73478	Water pump governor spacer	1	1.50
73294	Water pump and governor housing gasket	1	.05
B-9086	Ball bearing	1	3.30
B-8643	Ball bearing retainer ring	1	.10
121276	Governor lever shifter	1	.55
73949	Governor shaft oil seal	1	.80
73448	Plain washer (governor to gear cover)	4	.05
¼"-20x1¾"	Cap screw (governor to gear cover)	2	.05
73400-A	Hose connection (3 ply)	1	.10
78145	Water inlet pipe (in crankcase)	1	.20
B-7912	Hose clamp	2	.25
¼"-20x1-3/8"	Hex head cap screw for 121261 cover	2	.05
¼"-20x⅜"	Hex head cap screw for 121261 cover and 121164 elbow	6	.05
B-6315	Oil seal washer	1	.03
74474	Water pump inlet elbow	1	.60
73909	Water pump inlet elbow gasket	1	.05
¼"-20x2"	Hex head cap screw (governor to gear cover)	2	.05
No.10-32x½"	Fillister head cap screw for 74255 bracket	1	.02
No.10	Lock washer for 74255 bracket	1	.02
B-5058-A	Groove pin for 121192 gear	1	.03
B-8738	Copper washer for 121261 cover	1	.05
No. 0x5/8"	Taper pin for 121276 shifter	1	.02
74045	Thrust washer for 121056-B shaft	1	.15
74044	Water pump seal	1	1.20
74848	Governor lever	1	.80
73401-B	Governor lever shaft	1	.30
74397	Bushing for 74398 bearing end	1	.40
74255	Governor spring bracket	1	.15

(Continued on Top of Next Page)

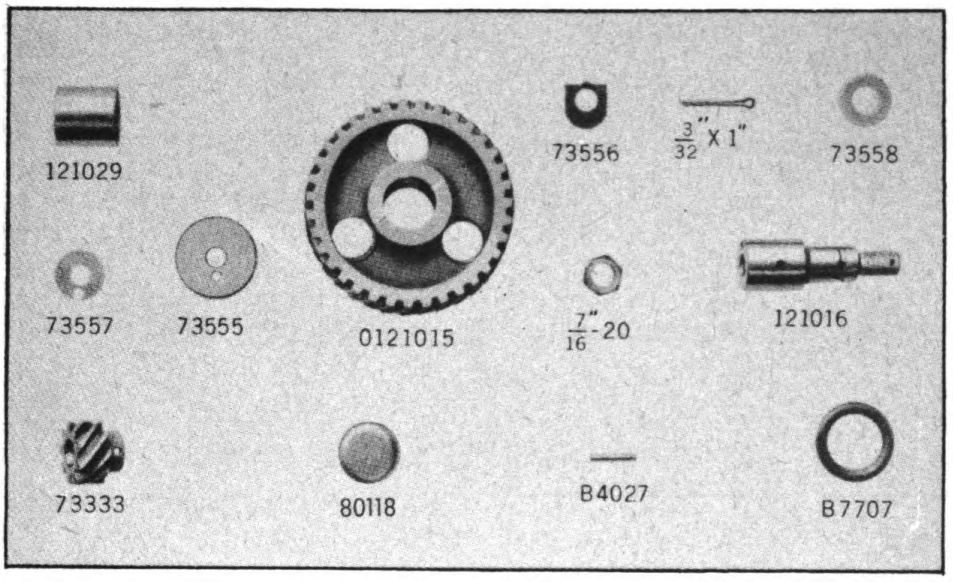
PARTS PRICE LIST

B-6164	Adjusting screw nut.....	1	.10
B-6163	Adjusting screw.....	1	.30
B-6169	Groove pin for 121163-A impeller.....	1	.03
B-4027	Groove pin for 74848 lever.....	1	.02
5/16"-18x5/8"	Cap screw for 74255 bracket.....	1	.05
5/16"	Lock washer for 74255 bracket.....	1	.02
080661	Bumper screw assembly.....	1	.30
80661	Bumper screw.....	1	.15
B-6161	Bumper screw spring.....	1	.15
5/16"-24	Hex nut for 74389 screw.....	1	.05
B-6316	Oil seal retainer.....	1	.10
074197-A	Governor weight carrier assembly.....	1	5.50
74197	Governor weight carrier.....	1	2.50
74400	Governor weight.....	2	1.35
73985	Governor weight pin.....	2	.15
1/16"x¾"	Cotter pin for 74197 carrier.....	2	.01
121056-B	Shaft.....	1	.60
73436	Bearing cage.....	1	.80
74399	Bearing end (long).....	1	.85
074398	Bearing end (short) bushed with 1 No. 74397 bushing.....	1	.80
B-6723	Straight fitting.....	2	.10
73666	Top water elbow gasket.....	2	.05
27277-A	Governor spring.....	1	.70
0121260-M	Water pump and governor assembly.....	1	38.50

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"ICK"



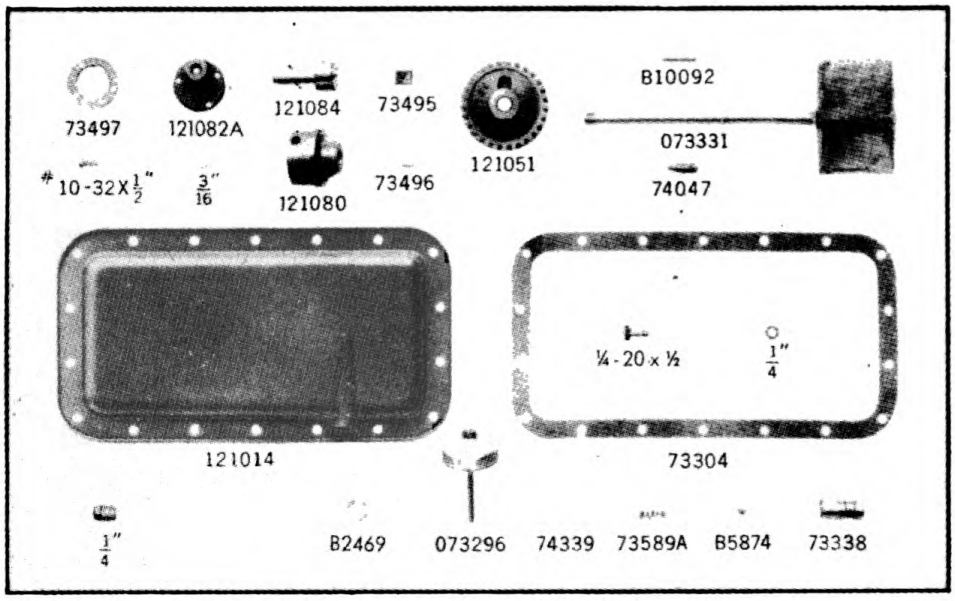
Idler Gear and Distributor Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
0121015	Idler gear (bushed).....	1	$2.00
121016	Idler gear spindle.....	1	1.10
73555	Idler gear spindle retaining washer..	1	.15
121029	Idler gear bushing.....	1	.30
73556	Idler gear nut lock.....	1	.05
73557	Idler gear shim.....	5	.02
73558	Idler gear plain washer.....	1	.05
7/16"-20	Idler gear spindle nut.....	1	.05
3/32"x1"	Idler gear spindle cotter pin.....	1	.01
73333	Distributor gear (driven).....	1	1.75
B-4027	Distributor gear pin.....	1	.02
B-7707	Distributor rubber ring oil seal.....	1	.40
80118	Distributor hole plug.....	1	.10

Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"ICK"

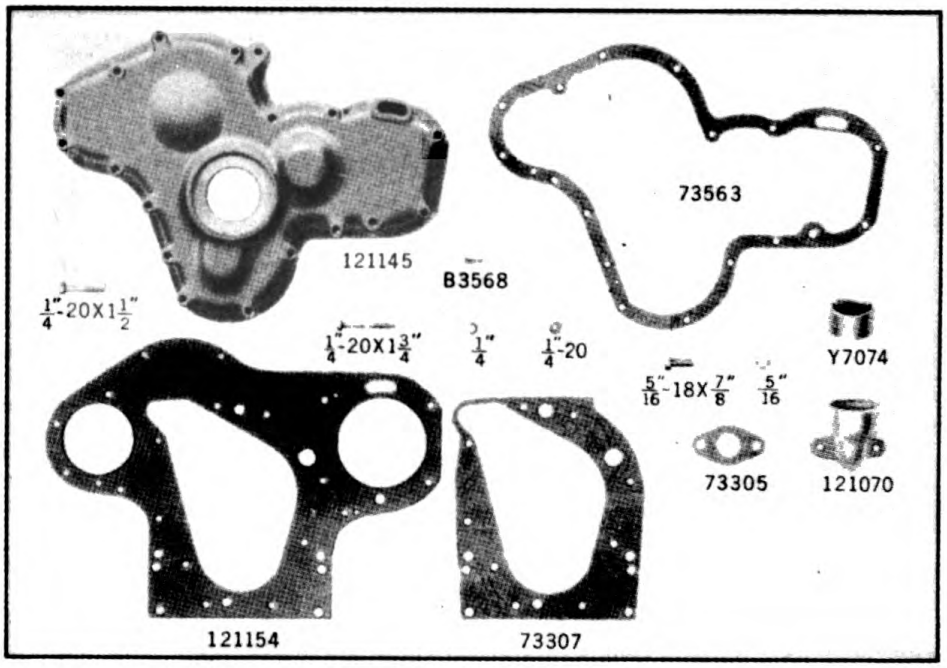


Oil Pump and Oil Pan Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121080	Oil pump body	1	$3.00
121082-A	Oil pump cover	1	.80
73497	Oil pump cover gasket	1	.10
121084	Oil pump shaft	1	1.50
121051	Oil pump gear	1	1.50
B-10092	Oil pump gear pin	1	.02
73495	Oil pump blade	2	.50
73496	Oil pump spring	1	.20
No.10-32x½"	Fillister head machine screw for 121082 cover	3	.02
3/16"	Lock washer for 121082 cover	3	.02
74047	Oil pump body set screw	1	.15
073331	Oil pump suction pipe and screen assembly	1	1.90
0121080-A	Oil pump assembly	1	8.25
00121080-A	Oil pump assembly with suction pipe and screen	1	10.25
121014	Oil pan	1	.80
73304	Oil pan gasket	1	.15
¼"-20x½"	Oil pan cap screw	18	.05
¼"	Oil pan lock washer	18	.02
78282-C	Oil pan pipe plug (square head) (¼").	1	.05
73338	Oil relief valve sleeve	1	.45
78117	Oil relief valve adjusting screw	1	.15
B-2469	Oil relief valve adjusting screw gasket	2	.05
73589-A	Oil relief valve spring	1	.05
B-5874	Oil relief valve ball	1	.10
073296	Oil level gauge	1	1.15
B-4028	Oil relief valve sleeve pin	1	.02
78118	Oil relief valve lock nut	1	.10
78119	Oil relief valve acorn nut	1	.10
5/8"x¼"x3/32"	Lock washer	1	.02

Always Give Engine Model and Number When Ordering Repairs

"ICK"

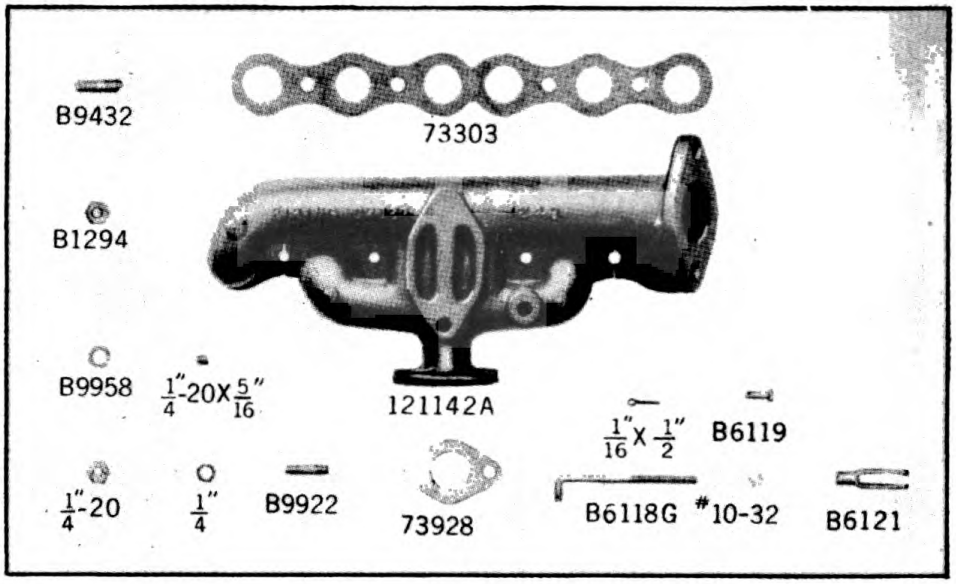


Gear Cover, Timing Gear Plate and Oil Filler Body Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121145	Gear Cover	1	$6.00
73563	Gear cover gasket	1	.20
121154	Timing gear plate	1	2.25
73307	Timing gear plate gasket	1	.10
¼"-20x1¾"	Gear cover cap screw	9	.05
¼"-20x¾"	Front motor support cap screw	6	.05
¼"-20x1½"	Gear cover cap screw	2	.05
¼"-20	Gear cover hex nut	2	.05
¼"	Lock washer	17	.02
121070	Oil filler body	1	.80
Y-7074	Oil filler body neck	1	.25
73305	Oil filler body gasket	2	.05
5/16"-18x7/8"	Oil filler body cap screw	2	.05
5/16"	Oil filler body lock washer	2	.02
73769	Front support L.H.	1	.50
B-3568	Dowel pin for gear cover	2	.05
73768	Front support R.H.	1	.50

Always Give Engine Model and Number When Ordering Repairs

"ICK"



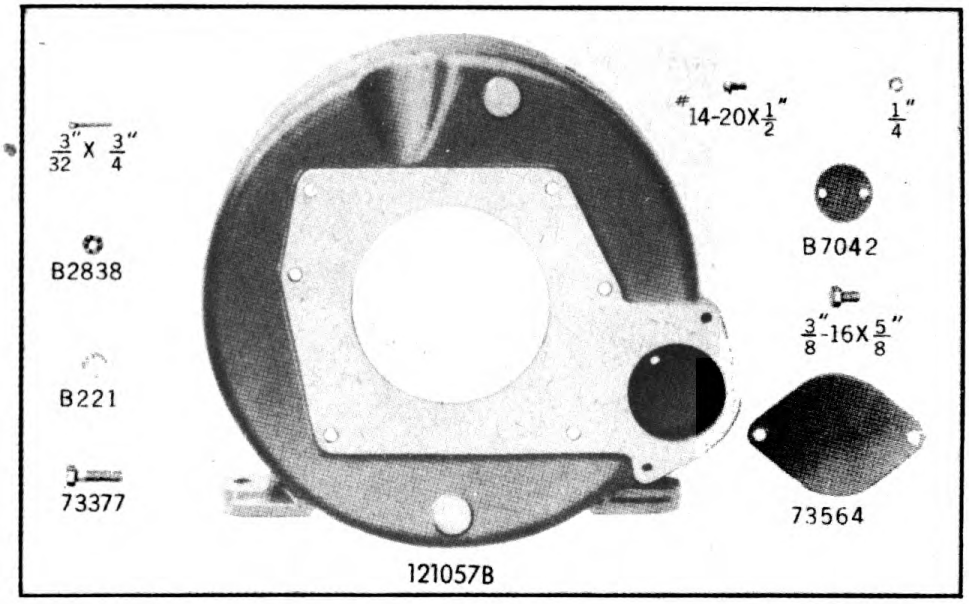
Combination Manifold and Carburetor Control Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121142-A	Combination manifold.....	1	$6.25
73303	Combination manifold gasket.....	1	.10
B-1294	Combination manifold stud nut.....	4	.08
B-9958	Combination manifold stud washer.....	2	.20
B-9432	Combination manifold stud.....	2	.15
¼"-20x5/16"	Headless set screw (manifold plug)....	2	.05
73928	Carburetor gasket.....	1	.10
B-9922	Carburetor stud.....	2	.10
¼"	Lock washer for carburetor stud.....	2	.02
B-6118-G	Carburetor control rod.....	1	.25
1/16"x½"	Carburetor control rod cotter pin.....	2	.01
B-6121	Carburetor control rod yoke end.....	1	.30
No.10-32	Carburetor control rod lock nut.....	1	.02
B-6119	Carburetor control rod yoke end pin...	1	.05
¼"-20	Hex nut for carburetor stud.....	2	.05
B-2047	Combination manifold stud.....	2	.10

Always Give Engine Model and Number When Ordering Repairs

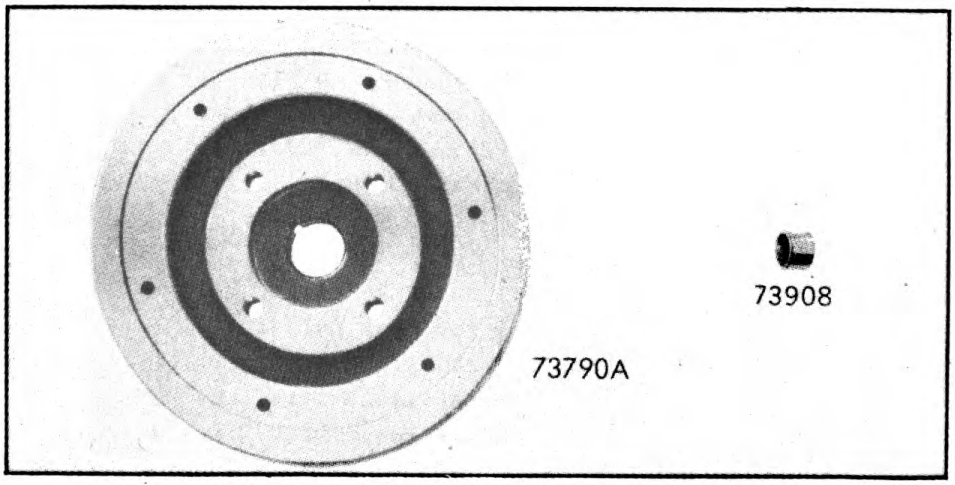
PARTS PRICE LIST

"ICK"



Flywheel Housing Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121057-B	Flywheel housing.....	1	$9.50
73377	Flywheel housing cap screw.....	6	.15
B-2838	Flywheel housing castle nut.....	6	.10
B-221	Flywheel housing washer.....	12	.02
3/32"x3/4"	Flywheel housing cotter pin.....	6	.01
B-7042	Flywheel timing hole cover.....	1	.10
No.14-20x1/2"	Round head machine screw for B-7042....	2	.02
1/4"	Lock washer for B-7042.....	2	.02
73564	Starter hole cover.....	1	.40
3/8"-16x5/8"	Starter hole cover cap screw.....	2	.05
65508-A	Name plate.....	1	.15
B-557-A	Escutcheon pins. Mount on flywheel housing.....	2	01

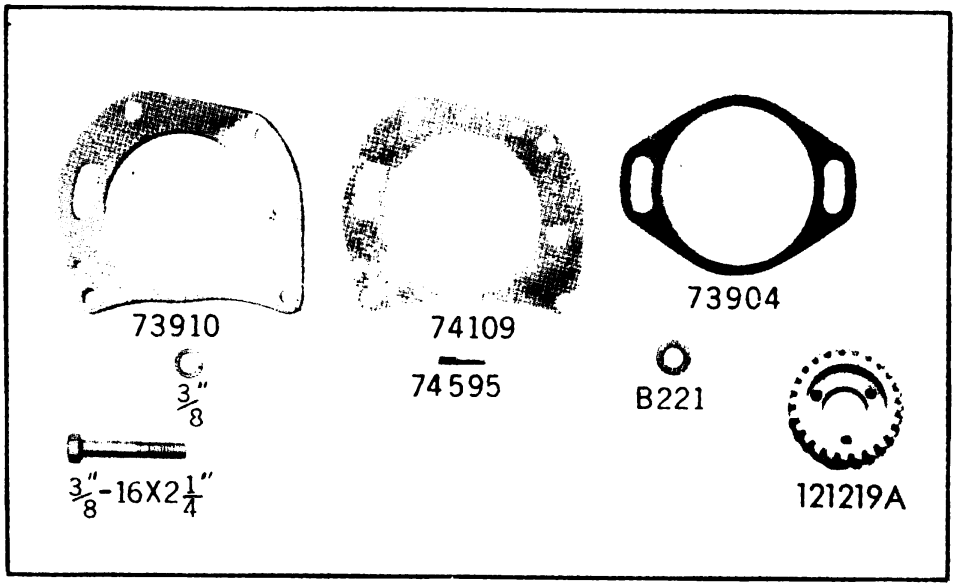


Flywheel Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
73790A	Flywheel.....	1	$15.00
73908	Clutch pilot bushing.....	1	.20

Always Give Engine Model and Number When Ordering Repairs

"ICK"

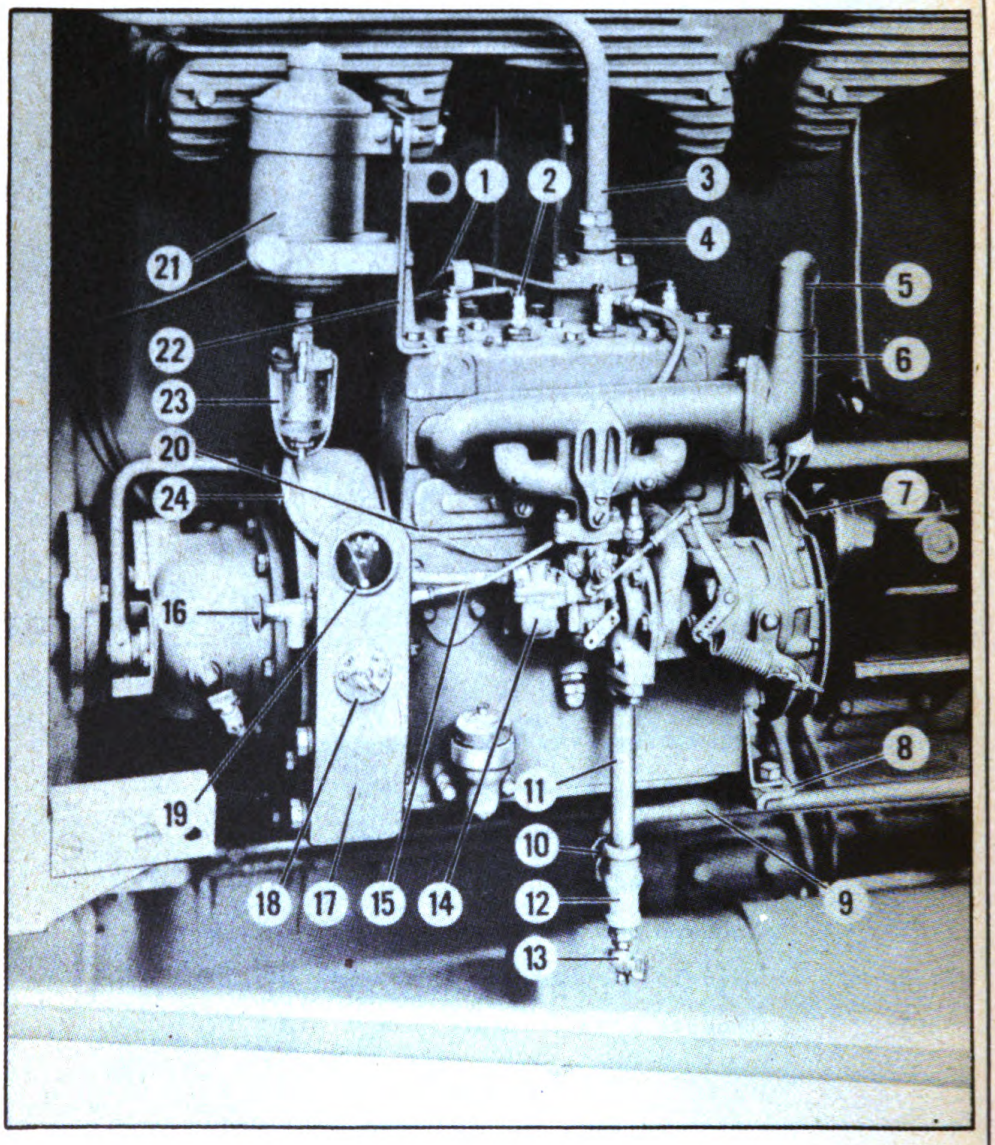


Generator Bracket and Magneto Drive Parts

PART NO.	NAME	PER ENGINE	PRICE EACH
121219-A	Magneto gear	1	$2.00
73904	Magneto gasket	1	.10
3/8"-16x2¼"	Cap screw for magneto	2	.05
3/8"	Lock washer for magneto	4	.02
B-221	Plain washer for magneto	2	.02
73910	Magneto adapter plate	1	1.00
74109	Magneto adapter plate gasket	1	.05
74595	Magneto adapter plate groove pin	2	.02

Always Give Engine Model and Number When Ordering Repairs

"ICKU"



Industrial Unit Parts

PARTS PRICE LIST

"ICKU"

Industrial unit Parts

REF. NO.	NAME	PER ENGINE	PART NO.	PRICE EACH
	Magneto (Splitdorf).....	1	50713	30.00
1	Magneto cable.....	1 set	074185	1.85
2	Spark plug.....	4	B10707A	.65
3	Water line assembly (upper).....	1	078276	3.75
4	Straight fitting.....	2	73017N	.90
5	Exhaust pipe.....	1	074649	2.50
6	Exhaust elbow.....	1	73863	1.25
	Start rope assembly.....	1	074306A	.65
7	Start rope pulley.....	1	73938A	4.00
8	Front support.....	1	078134	10.50
	Cap screw.....	2	3/8-16x1	.05
	Hex nut.....	2	3/8-16	.05
	Lock washer.....	2	3/8	.02
9	Water line assembly (lower).....	1	076352A	2.50
10	Straight fitting.....	2	65198	1.50
11	Pipe nipple.....	1	100831D	.20
12	Pipe tee.....	1	78202D	.20
	Reducing bushing.....	1	78212C	.15
13	Drain cock.....	1	B205	.35
	Pipe plug.....	1	78282E	.05
	Straight fitting.....	2	73017M	.45
14	Carburetor (Zenith).....	1	51042	10.00
	Carburetor gasket.....	1	73928	.10
	Carburetor Stud.....	2	B9922	.10
	Carburetor Hex nut.....	2	1/4-20	.05
	Carburetor lock washer.....	2	1/4	.02
15	Throttle rod.....	1	73883	.35
16	Throttle control assembly.....	1	073865	3.00
	Throttle clevis.....	1	B6121	.30
	Throttle Clevis pin.....	1	B6119	.05
	Cotter pin (throttle rod).....	1	B6589	.05
	Cotter pin (clevis).....	1	1/16x1/2	.01
	Hex nut.....	1	#10-32	.02
17	Instrument panel.....	1	73948	2.75
18	Ignition switch.....	1	50022B	2.25
	Cotton Covered wire.....	1	#10x20½	.02 net ft.
	Terminals.....	2	B10297	.05
	Rd. hd. mach. screw.....	2	#8-32x5/8	.02

(over)

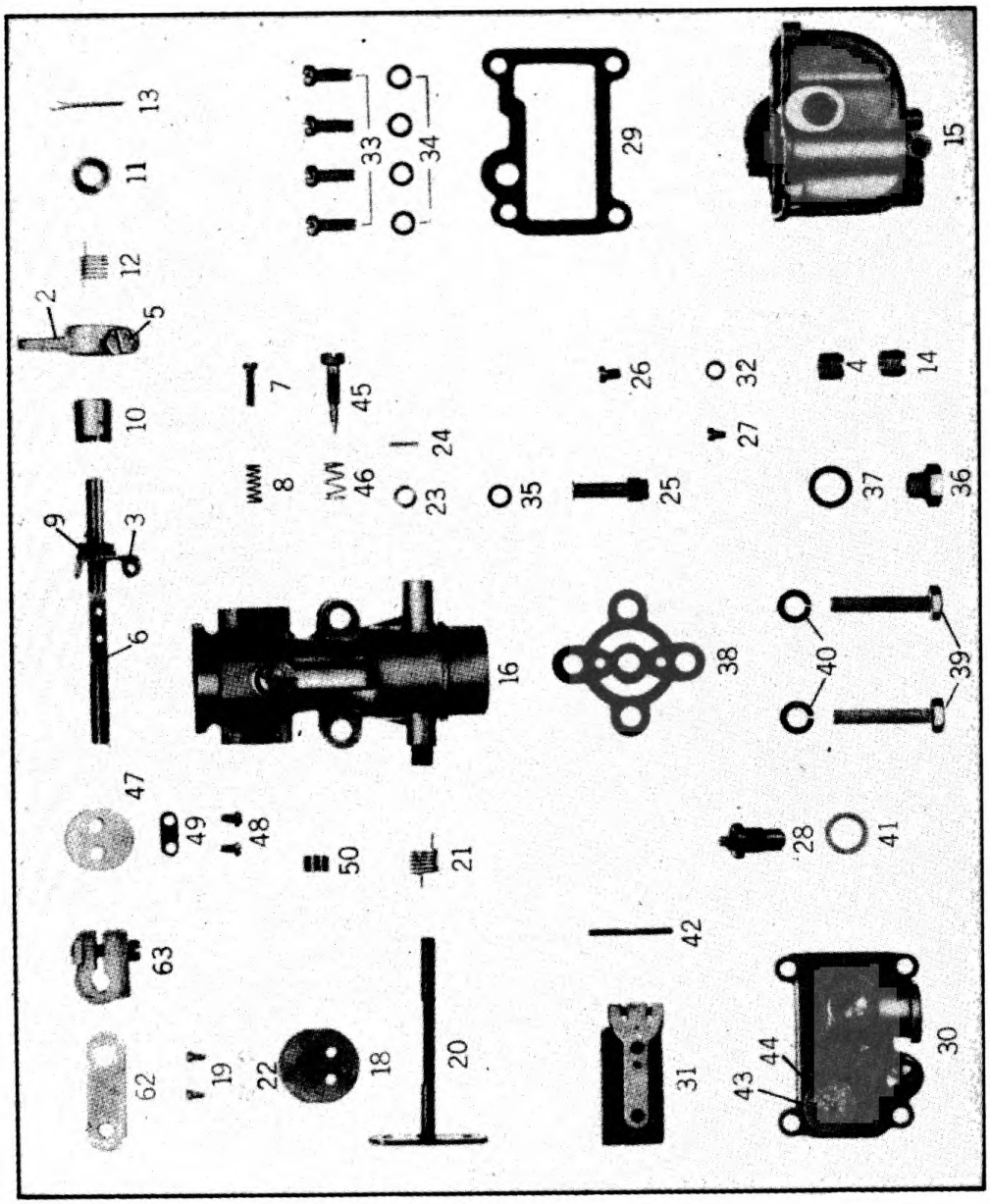
Always Give Engine Model and Number When Ordering Repairs

	Hex Nuts	2	#8-32	.02
	Lock Washers	2	3/16	.02
19	Oil gauge	1	50003E	2.25
20	Oil gauge tube	1	074390	.55
21	Gasoline tank	1	B8888	3.75
22	Gasoline tank bracket	1	76854	2.00
23	Gasoline strainer	1	74179A	1.25
	Close nipple 1/8"	1	B8678	.10
24	Gasoline line	1	50864D	1.50
	Tee fitting	1	76349	.25
	Shim (flywheel housing)	4	78460	1.00
	Cap screw	2	3/8-16x3/4	.05
	Cap screw	2	1/2-13x1-1/4	.05
	Hex nut	2	1/2-13	.05
	Lock washer	2	1/2"	.02
	Bolt	1	3/4"-10x3	.20
	Lock washer	1	3/4"	.02

PARTS PRICE LIST

"ICKU"

ACCESSORY PARTS



CARBURETOR PARTS

PARTS PRICE LIST

CARBURETOR PARTS

REF. NO.	NAME	PER ENGINE	PART NO.	PRICE EACH
1	*Throttle floating lever	1	C24-23x2	$ .90
2	Throttle clamp lever	1	C24-11x9	1.20
3	Throttle stop lever	1	CR28-60	.55
4	Pipe plug	1	CT91-5	.15
5	Throttle lever clamp screw	1	T8S10-9	.06
6	Throttle shaft assembly	1	C23-154	.75
7	Throttle stop screw	1	T11S-6-8	.06
8	Stop screw spring	1	C111-12	.15
9	Taper pin, throttle stop lever	1	CT63-2	.06
10	Throttle lever bushing	1	D6346	.20
11	Spring retainer	1	CR115-10	.30
12	Throttle lever spring	1	C117-27	.15
13	Cotter pin	1	T61-4	.06
14	Pipe plug	2	CT91-1	.15
15	Fuel bowl assembly	1	B3-4A	3.00
16	Throttle body assembly #16	1	B2-46D	3.30
17	Discharge nozzle	1	CR66-12-2	.45
18	Air shutter plate	1	C102-18	.15
19	Air shutter retaining screw	2	T11S3-3	.06
20	Air shutter shaft assembly	1	C108-45	.75
21	Air Shutter lever spring	1	C117-27	.15
22	Air shutter retaining screw lockwasher	2	T45-2	.06
23	Thrust washer	1	C130-6	.06
24	Taper pin, air shutter lever	1	CT63-3	.06
25	Metering Well #50	1	C76-11	.90
26	Main Jet #14	1	C52-1	.45
27	Comp. jet #18	1	C52-2	.45
28	Fuel valve assembly #22	1	C81-2	.90
29	*Bowl to Cover gasket	1	C144-2-1	.15
30	Bowl cover assembly	1	C6-2A	.90
31	Float assembly	1	C85-67	.90
32	*Main jet washer	1	T56-4	.06
33	Cover assembly screw	2	T1S10-8	.06
34	Assembly screw lockwasher	2	T41-10	.06
35	*Metering well gasket	1	T56-24	.06
36	Lower plug	1	C138-23	.45
37	*Lower plug washer	1	T56-23	.06
38	*Bowl to throttle body gasket	1	C142-2	.15
39	Bowl to body assembly screw	2	T2S25-20	.06
40	Assembly screw lockwasher	2	T44-25	.06
41	*Fuel valve washer	1	T56-23	.06
42	Float axle	1	C121-14	.15
43	Name plate	1	CR147-1	.06
44	Name plate pin	1	T73-9	.06
45	Idle adjusting screw	1	C46-25	.40
46	Adjusting screw spring	1	C111-9	.15
47	Throttle plate	1	C21-110	.40
48	Throttle plate screw	2	T15B5-3	.06
49	Lockwasher	1	CR22-1	.15
50	Throttle body channel plug	1	CT91-5	.15
	*Included in C181-44 Gasket set			.55
	*Item 1 includes the following:			
62	Floating lever	1	C25-18x2	.45
63	Floating lever stop assembly	1	C25-98x2	.50

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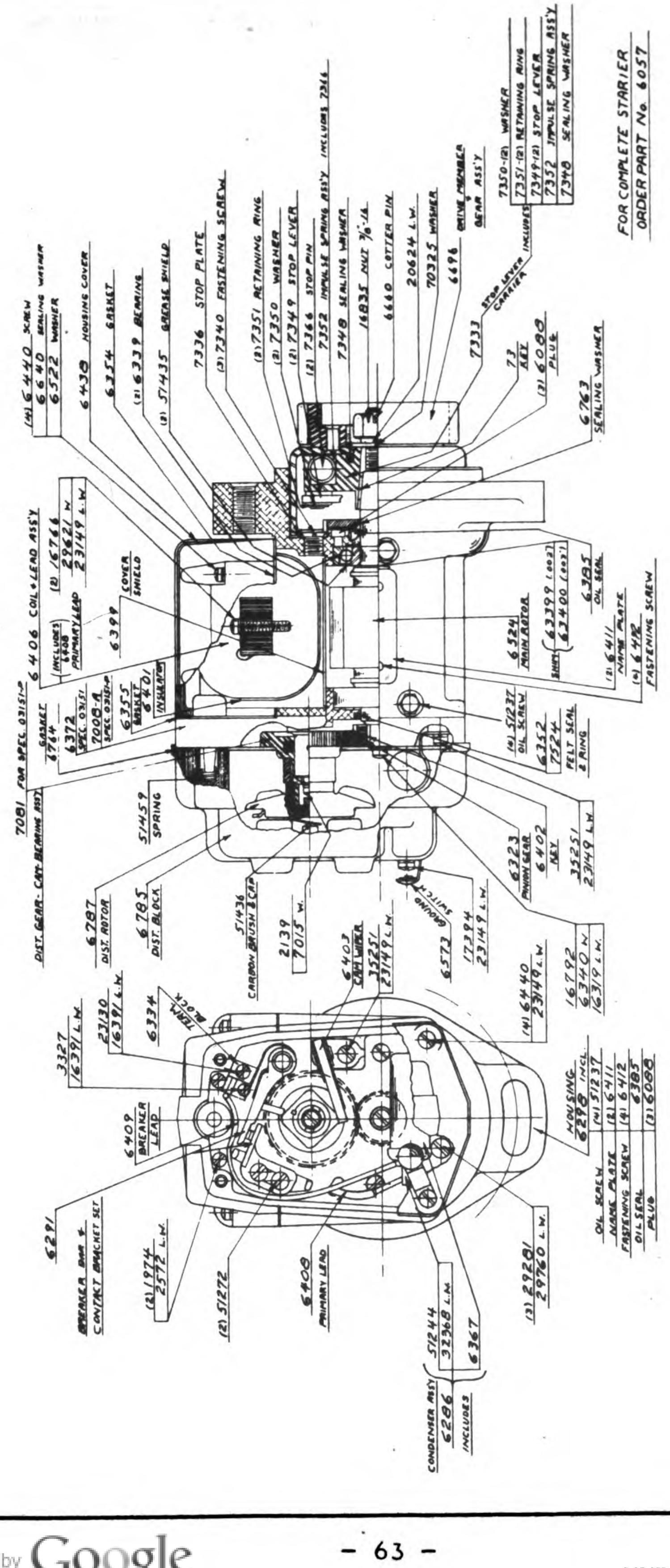
PARTS PRICE LIST



"ICKU" Magneto

PARTS PRICE LIST

PART NO.	NAME	PRICE EACH
	HOUSING PARTS	
6530	Housing--Standard vertical flange rawhide seal at drive end	$5.60
6385	Rawhide seal	.50
6399	Rotor tunnel cover	.10
6438	Housing Cover Assembly	1.00
6354	Housing Cover Gasket	.05
6440	Housing Cover Screw (4 used)	.05
6640	Housing Cover Screw Sealing Washer (4 used)	.05
6522	Brass Washer for 6640 Screw (4 used)	.05
	ROTOR AND MAIN BEARING PARTS	
6524	Rotor (Standard, including RM-4 Indian)	5.00
6969	Rotor RM G-2 R.H. and L.H. (Indian)	5.50
6339	Main Bearing (2 used)	1.50
51435	Main Bearing Grease Sealing Ring	.10
73	Main Drive Key	.05
63399	Rotor Shim--.002" approximately	.05
63400	Rotor Shim--.003" approximately	.05
16835	Shaft Nut, where no starter is used	.15
20624	Lockwasher for 2918 nut	.04
	FRONT PLATE PARTS	
7008A	Front Bearing Plate Assembly, with gasket	1.90
6355	Front Bearing Plate Gasket Cover Side	.05
29281	Front Bearing Plate Screw (3 used)	.05
6942	Front Bearing Plate Screw (2 used) (top RMG-2, RM-4 Indian)	.05
29760	Lockwasher for 29281 Screw (3 used)	.02
23149	Lockwasher for 6942 Screw (2 used)	.02
6334	Primary Connector Bracket	.02
23130	Primary Connector Bracket Attaching Screw	.05
6924	Primary Connector Bracket (RMG-2, RM-4 Indian)	.10
6958	Primary Connector Bracket Attaching Screw for 6924	.05
16391	Lockwasher for 23130 Screw	.02
6957	Ground Terminal Assembly (RM-4 Indian)	.25
6954	Ground Terminal Lead Assembly (RM-4 Indian)	.10
6291	Breaker Bar and Racket Set	1.00
6417	Breaker Bar Assembly	.75
6936	Breaker Bar Assembly (RMG-2, RM-4 Indian)	.75
6342	Contact Bracket Assembly	.50
51272	Contact Bracket attaching Screw (2 used)	.05
6403	Cam Wiper	.10
35251	Cam Wiper Screw	.05
23149	Lockwasher for 35251 and 6947 Screw	.02
3327	Breaker Bar Spring Screw	.05
16391	Lockwasher for 3327 Screw	.02
6409	Breaker Lead Assembly	.10
	COIL PARTS	
6406	Coil	6.00
16766	Coil Attaching Screw (2 used)	.05

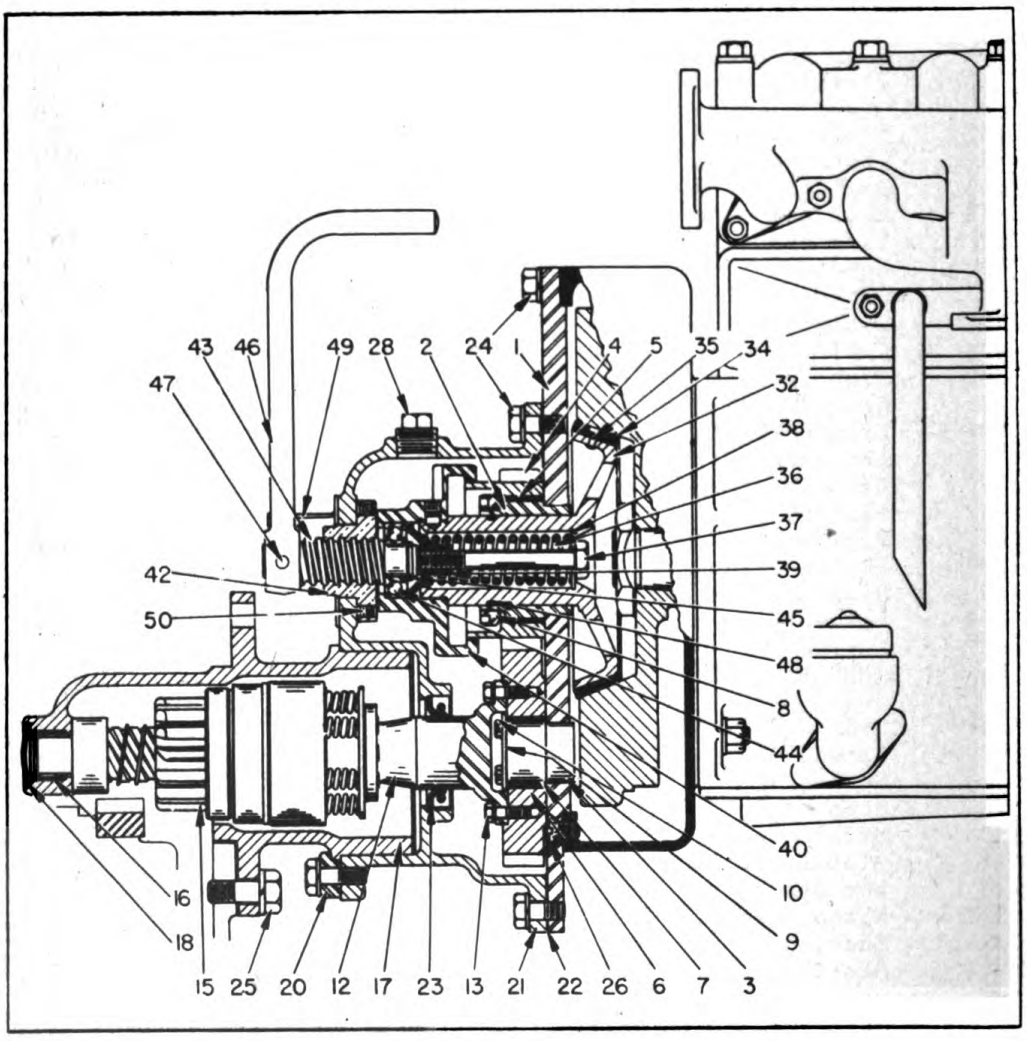
Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

PART NO.	NAME	PRICE EACH
23149	Lockwasher for 16766 Screw	$ .02
29621	Brass Washer for 16766 Screw	.05
6401	Coil Insulator	.05
6408	Primary Lead Assembly	.10
	CONDENSER PARTS	
6286	Condenser	1.00
51244	Condenser Slotted Nut	.05
23149	Lockwasher for 51244 and 35251 Screw	.02
35251	Condenser Attaching Screw	.05
	DISTRIBUTOR PARTS	
6785	Distributor Block 4 cylinder (Jump Spark Waukesha)	2.75
6356	Distributor Block Gasket	.05
6440	Distributor Block Screw	.05
23149	Lockwasher for 6440 Screw	.02
6787	Distributor Rotor (Jump Spark Waukesha)	1.00
6410	Headless Screw for Distributor Shaft	.05
7074	Plain Bearing Assembly & Distributor Gear Cam	3.00
51436	Center Brush and Cap Group	.10
51402	Cable Terminal (1 per cylinder)	.05
51459	High Tension Coil Spring	.10
6573	Ground Spring Switch	.10
17394	Ground Terminal Screw	.05
23149	Lockwasher for 17394 Screw	.02
6787	Distributor Rotor	1.00
6323	Pinion	.25
6402	Pinion Key	.05
16792	Pinion Attaching Screw	.05
6340	Plain Washer for 16762 Screw	.05
16319	Lockwasher for 16792 Screw	.02
	IMPULSE STARTER	
7340	Stop Pin Plate Attaching Screws (3 used)	.05
7352	Spring Assembly with Felt and Stop Pins	.50
7366	Spring Stop Pins (2 used)	.05
7349	Stop Levers (2 used)	.10
7350	Stop Lever Metal Washer (2 used)	.05
7351	Stop Lever Snap Rings (2 used)	.05
7348	Magneto Member Bearing Felt	.05
70325	Notched Washer	.05
16835	Shaft Nut	.15
20624	Shaft Lockwasher	.03
	AA STARTER WITH DRIVE GEAR ATTACHED AND SPECIAL PARTS	
7336	Stop Pin Plate with large hole for leather seal	1.00
6763	Leather Oil Seal	.05
6057	Complete Starter, 25° Lag angle, R.H. with gear attached (Waukesha)	8.00
6695	Complete Rotating Unit Assy., 25° Lag angle, R.H. with Gear Attached (Waukesha)	7.25
6696	Drive Member only, 25° Lag angle, R.H. with Gear Attached (Waukesha)	4.50

"ICK"

Starting Unit Transmission



Always Give Engine Model and Number When Ordering Repairs

PARTS PRICE LIST

"ICK"

Starting Unit Transmission

REF. NO.	NAME	PER ENGINE	PART NO.	PRICE EACH
1	Plate	1	073784	45.00
	Drive gear bearing stud	1	73782	2.00
3	Driven gear bearing stud	1	73777	1.25
4	Drive gear	1	073786	8.00
5	Drive gear bushing	1	73778	1.10
6	Driven gear	1	073787A	9.00
7	Driven gear bushing	1	73779	.55
8	Drive gear retaining nut	1	73776	1.40
9	Driven gear retaining washer	1	73780	.40
10	Driven gear retaining washer cap screw	1	B10656	.10
	Driven gear retaining washer lock washer	1	1/4	.02
12	Bendix drive shaft	1	73781	9.50
13	Bendix drive shaft cap screw	4	¼-20x3/4	.05
	Bendix drive shaft lock washer	4	1/4	.02
15	Bendix assembly	1	73795	66.00
16	Bendix assembly needle bearing (new style enclosed end)	1	85813	.85
17	Bendix housing	1	73588B	8.25
18	Bendix housing expansion plug (not used with new enclosed needle bearing)	1	B-482A	.10
	Bendix housing lock screw	2	73847	.45
20	Bendix housing clamping segment	2	73846	1.25
21	Transmission housing	1	73586A	10.00
22	Transmission housing gasket	1	73783	.20
23	Transmission housing oil seal	1	75107	11.00
24	Cap screw	18	3/8-16x1	.05
25	Cap screw (bendix housing to flywheel housing)	3	3/8-16x1¼	.05
26	Flat head screw	2	3/8-16x1	.05
	Lock washer	21	3/8	.02

Always Give Engine Model and Number When Ordering Repairs

28	Pipe plug (1/2 sq. head).....	1	78282E	.05
	Pipe plug (1/4 sq. head).....	1	78282-C	.05
	Oil level cock (1/4).....	1	B-205	.35
	Clutch assembly.....	1	73791	33.00
32	Clutch cone.....	1	FM-57101	9.00
	Clutch cone and lining assembly turned (recommended replacement).....	1	FM-571012A	13.00
34	Clutch lining.....	1	FM-57102A	3.75
35	Clutch lining screw.....	9	FM-57113	.05
36	Clutch spring.....	1	FM-57103	.75
37	Clutch spring stud.....	1	FM-57104	.75
38	Clutch spring stud washer.....	1	FM-57105	.20
39	Clutch spring pad.....	1	FM-57106	1.00
40	Drive flange.....	1	FM-57107	6.50
	Set screw.....	2	FM-57114	.25
42	Adjusting nut.....	1	FM-57108	4.50
43	Thrust screw.....	1	FM-57109	3.50
44	Thrust bearing.....	1	FM-57115	2.30
45	Thrust bearing snap ring.....	1	FM-57110	.20
46	Hand lever.....	1	FM-57111A	3.50
47	Hand lever pin.....	1	FM-57116	.25
48	Oil ring.....	1	FM-57112	.50
49	Clutch handle stop.....	1	73789A	1.25
50	Clutch handle stop cap screw.....	1	¼-28x7/8	.05
	Clutch handle stop lock washer.....	1	1/4	.02

PARTS PRICE LIST

"6-WAK 6-1/4" x 6-1/2" WRENCH SET

PART NO.	NAME	PRICE EACH
44225	(Heavy Duty 12 Point Socket 1-1/8" - 3/4" Drive)....	$ .75
44227	(Heavy Duty 12 Point Socket 1-1/2" 3/4" Drive) for Main Bearing Stud Nuts - Cylinder Head Tube Stud Nuts.....	1.25
44231	Slide Bar 18" (3/4" Square Drive) for Socket.....	2.00
44221	(Shallow 12 Point Socket 3/4" (1/2" Drive).....	.40
44223	(Shallow 12 Point Socket 15/16" (1/2" Drive).....	1.00
44222	(Shallow 12 Point Socket 7/8" (1/2" Drive).....	.50
44219	(Shallow 12 Point Socket 9/16" (1/2" Drive) for Connecting Rod Bolt Nut - Cylinder Head Bolt Nut - Flywheel Bolt - Flywheel Housing - Cylinder Door Bolt - Oil Retainer Bolt - Timing Cover Bolt - Top Water Pipe Stud Nut - Oil Pan Bolt.....	.35
44230	Flex Handle 15" (1/2" Square Drive) for Socket.....	2.20
44214	Combination Open End and Box 3/4" x 3/4" for Rocker Arm Support Stud Nuts.....	.70
44210	Combination Open End and Box 9/16" x 9/16" for Gear Cover Bolts - Thermostat By Pass Tube Bolts - Cover Plate Bolts - Water Pump Bolts - Magneto Bolts - Camshaft Cover Plate.....	.50
44212	Combination Open End and Box 5/8" x 5/°" for Rocker Arm Adjustment - Water Inlet Pipe Studs.....	.55
44211	Combination Box and Open End 1/2" x 1/2" for Fuel Pump Bolts - Water Pump and Governor Bolts - Covernor Housing Bolts.....	.45
44213	Combination Box and Open End 7/16" x 7/16" for Governor Bolts.....	.40
44204	Short Box 3/8" x 7/16" for Magneto Coupling Bolt.....	.40
44216	Crescent Adjustable 8" for Oil Line Fittings.....	1.10
44218	Thin Nose Slip Joint Pliers 6-1/2" General.....	.45
44235	Screw Driver 1/4" x 4" General.....	.60
		$13.60

"ICK" 2-1/2" x 3-1/8" WRENCH SET

44210	Combination Box and Open End 9/16" x 9/16" for Cylinder Head - Cylinder to Case - Fan Bracket - Manifold Flange - Flywheel Housing.....	$ .50
44211	Combination Box and Open End 1/2" x 1/2" for Connecting Rod - Manifold - Thermostat Housing - Rear Bearing Retainer - Governor Adjustment - Water Pump - Oil Filler Spout - Fan Bracket Starting Crank.....	.45
44213	Combination Box and Open End 7/16" x 7/16" for Cylinder Door - Camshaft Thrust Plate - Cable Tube - Governor - Gear Cover - Fan Bracket.....	.40
44214	Combination Box and Open End 3/4" x 3/4" for Oil Relief.....	.70

(over)

44212	Combination Box and Open End Wrench 5/8" x 5/8" for Idler Gear.....	.55
44209	Box Wrench 15/16" x 1" for Camshaft Gear.....	.90
78705	Socket 1-7/8" for Flywheel Nut.....	2.40
	Square Key Stock 5" long 3/4" x 3/4" for socket drive.....	.40
		$6.30

(The above prices are net f.o.b. Waukesha, Wisconsin)

VALVE SEAT GRINDING EQUIPMENT FOR MODEL 6WAK

QUANTITY	PART NO.	DESCRIPTION
1	K-48	Sioux Valve Seat Grinding Wheel (#3 hole) (Finisher) for exhaust valve seat 2-9/16" dia. 45°)
1	K-108	Sioux Valve Seat Grinding Wheel (#3 hole) (Rougher) for exhaust valve seat 2-9/16" dia. 45°)
1	K-51	Sioux Valve Seat Grinding Wheel (#3 hole) (Finisher) for intake valve seat 2-3/4" dia. 30°)
1	K-111	Sious Valve Seat Grinding Wheel (#3 hole) (Rougher) for intake valve seat 2-3/4" dia. 30°)
1	1703	Sioux Grinding Wheel Holder
1	1700	Sioux Grinding Wheel Driver (110-Volt - 4 amperes, AC or DC, 13000 RPM Spindle Speed, 11-1/2" overall length, net weight - 6-3/4 lbs.)
1	1714	Sioux Dressing Tool
1	1715	Diamond (Spare)
1	1717	Extension Base (for 3-5/8" to 4-1/2" dia. wheels)
1	1707	Sioux Pilot for dressing tool
1	T-502	Sioux Tapered Pilot (#3 upper end)

VALVE SEAT CUTTERS FOR MODEL 6WAK

Valve stem diameter - 1/2"
Intake Valve Head diameter - 2-41/64" - 30° angle
Exhaust valve head diameter - 2-7/32" - 45° angle

QUANTITY	PART NO.	DESCRIPTION
1	X-47	Sioux Valve seat reamer (#3 taper Sleeve) (Finisher) (for exhaust valve seat 2-17/32" dia. 45°)
1	X-107	Sioux Valve seat reamer (#3 taper Sleeve) (Rougher) (for exhaust valve seat 2-17/32" dia. 45°)
1	X-451	Sioux Valve seat reamer (#3 taper Sleeve) (Finisher) (for intake valve seat 2-3/4" dia. 30°)
1	X-521	Sioux Valve seat reamer (#3 taper Sleeve) (Rougher) (for intake valve seat 2-3/4" dia. 30°)
1	T-502	Sioux Tapered Pilot (#3 upper end)
1	X-803	Sioux #3 Tapered Sleeve (3/8" dia. hole)
1	X-830	Sioux wrench

VALVE SEAT GRINDING EQUIPMENT FOR MODEL "ICK"

Valve Stem Diameter - 5/16"
Intake Valve Head Diameter - 1-1/8"
Exhaust Valve Head Diameter - 15/16"

QUANTITY	PART NO.	DESCRIPTION
1	SK-3	Sioux Valve Seat Grinding Wheel (#2 Hole) (Finisher) (for intake and exhaust seat 1-5/16" - 45°)
1	SK-73	Sioux Valve Seat Grinding Wheel (#2 Hole) (Rougher) (for intake and exhaust seat 1-5/16" - 45°)
1	1702	Sioux Grinding Wheel Holder
1	T-313	Sioux Tapered Pilot (#2 upper end)
*1	1700	Sioux Grinding Wheel Driver (110 Volt - 4 Amperes, AC or DC, 13000 R.P.M. Spindle Speed, 11-1/2" Overall Length, Net Weight 6-3/4 lbs.
*1	1714	Sioux Dressing Tool
*1	1715	Sioux Diamond (Spare)

(*) Duplicated in listing of valve seat cutters for Model 6 WAK.

NOTE: Valve seat cutters are not commercially obtainable for model "ICK". Source of above valve seat cutting and grinding tools for Models "6WAK" and "ICK": Albertson and Company, Sioux City, Iowa.

ADDITIONAL VALVE TOOLS FOR MODELS "ICK" AND "6-W" SERIES

PART NO.	DESCRIPTION - (ICK)
74935	Valve Grinding Tool
74922	Valve Grinding Cup
	(Source: Waukesha Motor Company)

PART NO.	DESCRIPTION - (ICK)
116	Zim Type "C" Valve Lifter
	(Source: Zim Manufacturing Company 3047 West Carol Street Chicago, Illinois

PART NO.	DESCRIPTION - (6-WAK)
400	Sioux Valve Grinder

Always Give Engine Model and Number When Ordering Repairs