CLASSIFICATION
N.B.C. 35

MINISTÈRE DE L'AIR
SERVICE
DU MATÉRIEL

NOTICE TECHNIQUE POUR MOTEUR RENAULT 4P

TOME II

FASCICULE 4

DÉMONTAGE, MONTAGE ET RÉPARATIONS

(Approuvée par D. M. N° 32.036 STA/Mo du 17 Février 1947)

NOMBRE D'EXEMPLAIRES : 750

ÉDITION 1948

Classification

NBC 35

Minister of the Air

Service information

TECHNICAL INFORMATION FOR ENGINE RENAULT 4 P

Volume II

Section 4

DISSASEMBLY, REASSEMBLY AND REPAIRS

(Aproved by O. M. Number 32,036 STA/Month of Feb 17, 1942)

1948 Edition

Number of copies: 750

CHAPTER XIII

TOOLS

In addition to the tools a mechanic has, it is necessary to have special tools for the performing of certain dissasemblies, reassembljes, and checks on the engine.

The use of each tool is specially designed for a given operation, and it is recommend to follow the instructions exactly. To see which tool is for what, the following pages contain illustrations, as well as numbers for each one.

Marking	NUMBERS: Piece #	Designation
1	190, 009	19 mm Socket for Spark plugs
2	190, 039	22 mm Socket for Spark plugs
3	190, 137	Ring removing pliers.
4	190, 179	Ring compressor
5	170.032	6 mm pin
6	170.040	8 mm Pin
7	170.023	10 mm Pin
8	49.251	12 mm Pin
9	170.497	18 mm wrench (to remove air compressor)
10	170, 547	Strainer shut off wrench.
11	190, 014	10 mm Socket with drive extention with universal joint
12	170, 466	wrench for carborator securing bolts
13	170, 469	Short 18 mm wrench for AM connections
14	170. 460	wrench for cylinder head bolts
15	190. 166	wrench for air distributor connections
16	170, 465	wrench for stopping (switch) the [illegible] (Rocker box supports)

17	179, 461	wrench for Cylender head stop bolts
18	170, 458	wrench for rocker shaft stop bolt.
19	170, 537	Centering ~~socket~~ collar for the propeller hub retaining bolt wrench
20	170, 534	Propeller hub retaining bolt wrench
21	190, 007	Extention with universal for removing spark plugs
22	190, 160	Valve puller
23	190, 195	centering wrench for mixture control.
24	—	Sockets
25	—	Sockets
26	190, 178	Wrench for the emulsion casting (Jet in the venturi) of the carburator
27	190, 181	Gauge for setting magneto advance at 3/100
28	170, 459	Rocker gap feeler gauge.
29	190, 187	Valve grinder.
30	190, 188	Piston wrist pin ~~remover and inserter~~ handle
31	170. 476	32 mm wrench for Air compressor (Vict) ~~plug~~ bolt.
32	190, 177	Carbureator Jet wrench.
33	190 199	Piston wrist pin extractor
34	190, 163	wrench for rocker support bolt

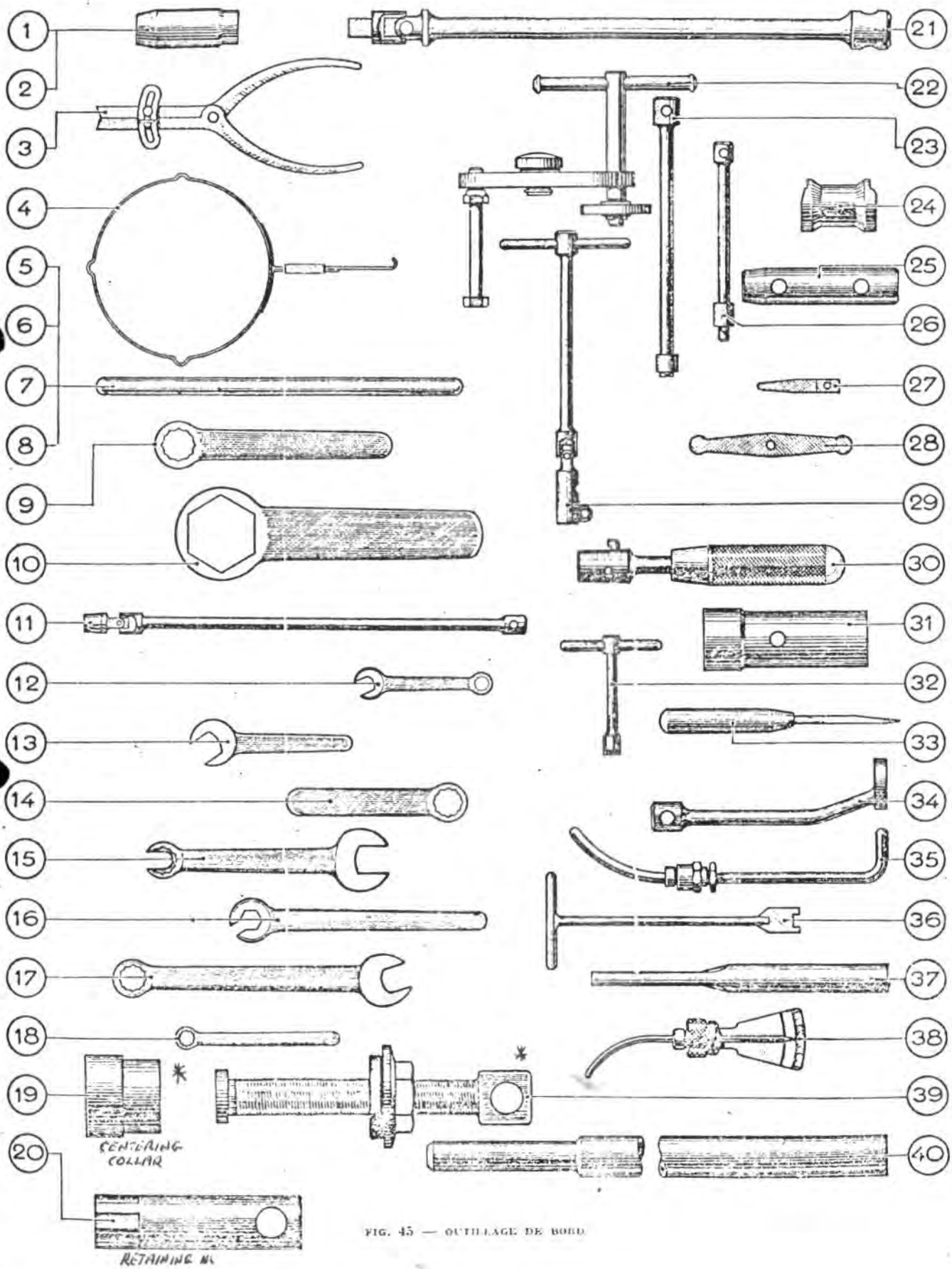


FIG. 45 — OUTILLAGE DE BORD

Marking	Numbers Piece #	Designation.
35	190, 211	valve supporting hook
36	190, 165	~~stron~~ driver for gauging magneto at full advance.
37	170, 646	Extention for ~~rocker~~ cylinder head bolt wrench. (14, 17)
38	190, 176	Indicator of top ~~ded~~ dead center
39	190, 186	Propeller hub extractor
40	190, 194	Propeller hub extractor lever rod.
41	190, 209	forward bearing ~~support~~ puller
42	170, 632	wrench for Oil pump drive bolt
43	170, 633	bent double wrench for oil piping.
44	170, 634	Wrench for ~~main drive~~ pinion gear in rear gear train (engines without vaccume pump
45	—	Socket
46	190, 221	wrench for locking (immobilizing) the magneto drive shaft.
47	170, 641	wrench to bolt on intermediate pinion gear shaft.
48	170, 56	wrench to forward bearing NUT.
49	190, 227	bent tool for ~~plung~~ oil pipes.
50	170, 560	wrench to bolt on distrabution gear in drive train (with drive to vaccume pump)
51	—	Socket
52	190, 222	tool for installing oil piping.
53	190, 228	Ring for installing the 6205 Bearing
54	—	Socket

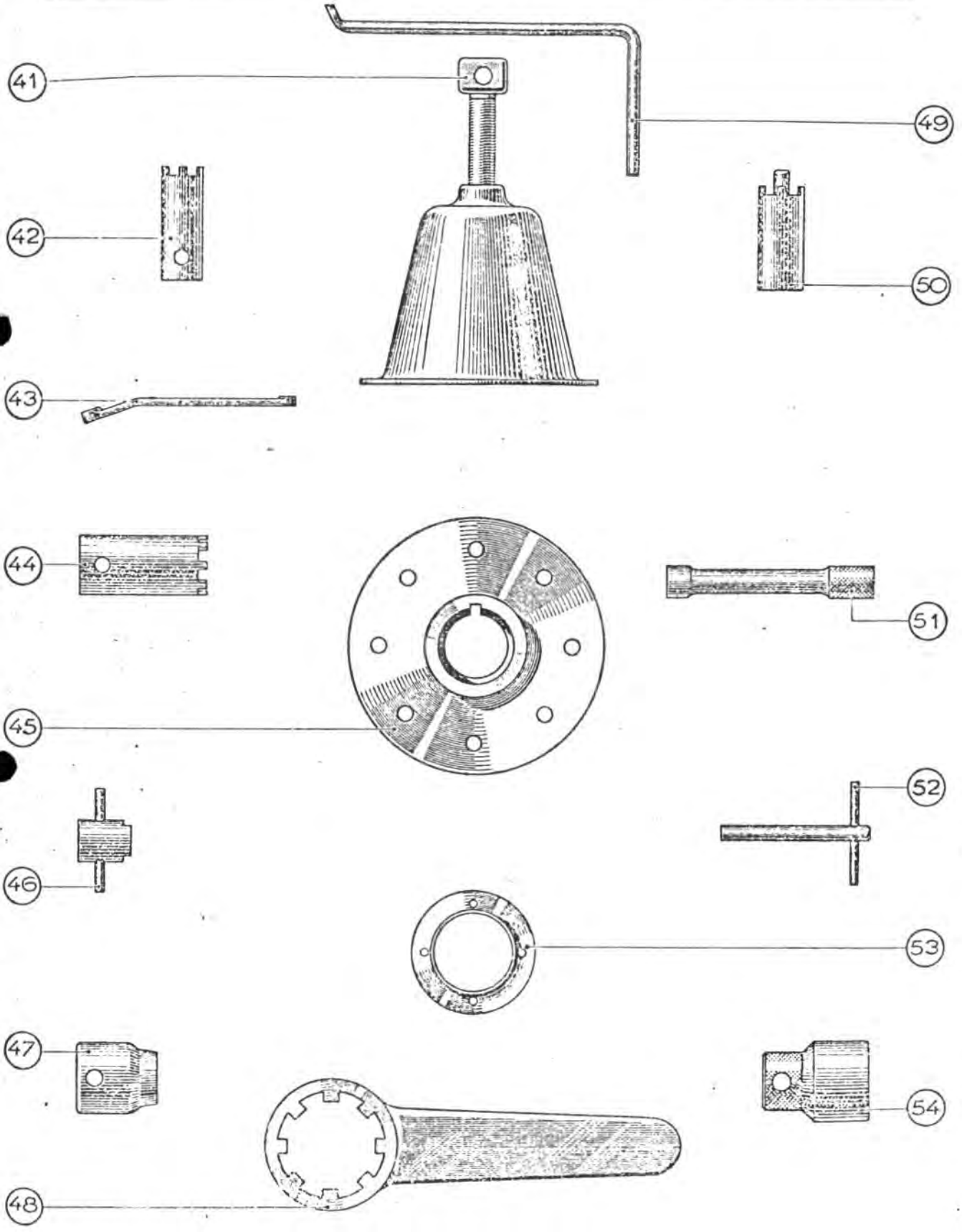


FIG. 16 — OUTILLAGE DE PARC

NUMBERS		Designation
Marking	Piece Number	
55	190.231	8 mm wrench for securing counter boared bolts
56	190.232	9 mm wrench for securing counter boared bolts
57	190.233	10 mm wrench for securing counter boared bolts
58	190.234	12 mm wrench for securing counter boared bolts
59	190.235	14 mm wrench for securing counter boared bolts
60	190.217	aparatus for removing the propellor hub.
61	190.184	Screening wrench? keyway guide for the propellor hub.
62	—	"~~Supprimé~~ Supprimé suppressor
63	190,219	Retaining ring ~~remover for~~ Remover for on rocker shaft
64	—	"Supprimé"
65	190.202	Aparatus for removing values - consists of.
		flat plate
		base with a bolt and washers
		Lever
		axel
		Aparatus for ~~pulling~~ gaging the springs and the assembly above them
		Weights for the ~~anterior~~ spring
		weights for the experior spring
		weight of 1750 kg.
		Support stem for the weights
		washers
		knurled ~~bolt~~ nut
66	190.214	Regulating scale

Marking	Numbers Piece	Designation
67	190. 182	Pliers for shielded tubing
68	190. 210	Tubular wrench for the bolt on the ~~pushrod~~ connecting rod large end
69	190. 226	tubular wrench for the bearing cover
70	190. 220	9 mm wrench for fuel pump casing
	190. 185	Magneto regulating wrench. (not shown on drawing)

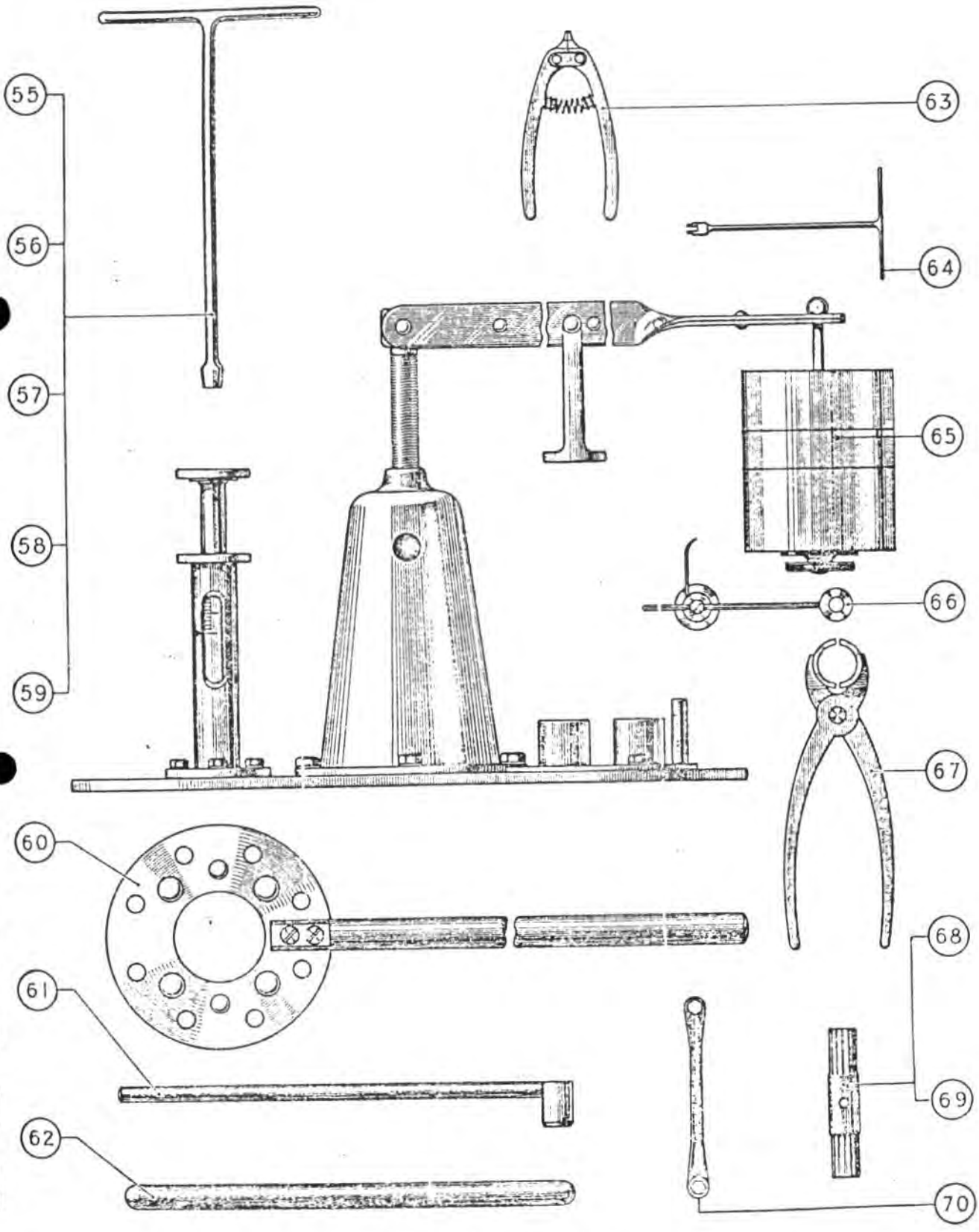


FIG. 47 — OUTILLAGE DE PARC

CHAPTER XIV

DISSASEMBLY.

RECOMENDATIONS

When starting to dissasemble an engine, make an inventory of those parts which need to be rebuilt. Proceeding in this manner allows one to carry out the work according to the order which is best, and most efficient.

Great precautions must be taken in dissasembling especially concerning those parts where it will aid in reassembly, and avoid later questions and mistakes. In particular one should mark and set aside all screws and washers of any given piece or assemblies with those pieces. (if possible in the same order of dissasembly). For certain push rod screws, and bearing caps., the screws should be remounted enediately with their nuts or pins. ~~Some parts are presed in, when hot, stopped with pins, hammered in, riveted, machined after mount~~

Some parts are pressed in, placed in hot, stopped with pins, hammered in, rivetet machined after installation, etc. In principle, these parts ~~needn't~~ shouldn't be dismounted, regardless of wheather indors ~~or~~ or out, it will tend to deteriorate the parts. The following is a list of these parts.

BLOCK:

Studs,

Stop pins of the half bearings;

Bearing races AV and intermidiary ones on the cam shaft;

Push rod guides;

Starter gougeon pin bushings;

FOREWARD BEARING SUPPORT:

Gougeon pins

Thrust bearing casing

BLOCK COVER:

Centering pins;

Bronze fitting for the rear lifting ring.

Bushings for the ~~drive~~ bearings AV and AR for the Magnetoes drives.

ROCKER ARMS:

The roller.

CYLINDER HEADS

Centering pins.

Bushing (insert) for the sparke plugs

Inserts for the rocker support screws.

Body of the starter valve.

The valve seats

Valve guides

Upper half of the ~~valve casing~~ rocker cover.

~~CONNECTING Rods~~ CONNECTING RODS

Bushing in the foot of the rod (small end)

securing pin for the half bearings at the head of the connecting rods.

OIL PUMPS:

Bushings around the pinion gears.

PINION GEARS:

The bushings pressed into the pingons should never be removed.

ORDER OF DISSASEMBLY.

The following table is an example of the process of dissassembling the engine with two mechanics. This order of actions eliminates the possibility of problems & repetitions, the mechanics should, in principle, go from one point to the next.

TABLE OF DISSASEMBLY ORDER

First Mechanic	Second Mechanic
The engine is secured to a bench mount in the normal Position (cylinders underneath)	
Drain the engine	Remove the rocker covers.
Disconnect the magneto wires, and remove the spark plugs and the magnetoes.	
Remove the nuts which secure the crank case cover	Remove:
	- The Hub (Propellor)
	- The forward bearing casing.
	- The AR cover to the engine
	- The filter
Remove the crank case cover	
Mark and save the nuts	
Turn over the engine. (The cylinders facing up.)	
Disconnect the carburator controls	Remove the casing around the starter tubes
Remove the intake manifold with the carburator connected	Disconnect the starter tubes
Remove the spark plug wire carriers	Remove the compressor-distributor
	Remove the valve rockers
	Remove the ~~pushrods~~ valve tappets

Remove the Cylinder Heads

Remove the Pistons

Remove the oil pump casing.

Remove the AV sump cover

Pull out the AV bearing casing.

Remove the cylinders.

Prepare the parts for cleaning.

Dismount and arrange the valves.

Mark and set asside all bolts and nuts

Turn the engine over

(The cylinders facing down)

Un pin, and remove the stops on the screws and nuts to the connecting rods and bearing caps

Dismount ~~Take apart~~ the bearing ~~cap and~~ with the half bearing.

Disassemble the connecting rod caps and pull the rods out.

Remove the ~~half~~ connecting rod half bearing and the connecting rod bearing caps

Remove the crankshaft.

Remove the oil jets (nozles

Remove the fuel and oil pumps

Remove the pinions which drive the oil pumps and cam shaft.

Remove the push rods

Remove the intermidiate pinion gear

Mark and set asside the nuts

INSTALLATION OF A DISMOUNTED ENGINE ON ITS SUPPORT

To make the work easier, it is preferable to remove the air intake cowl, as well as the intake manifold and exhaust pipes, the latter of which are still on the airplane

The engine is then transported to the workshop where it is mounted on a stand permitting the engine to be turned, which permits acces to all aspects of dissasembly (heavy equipment)

Do not forget a pan to catch the oil which drips from the engine after the oil has been drained, during the rebuilding proceedure.

Here we describe the order of dissasembly, However, most of the operations can be done simultaneously by two mechanics, by following the instructions given on pg 88.

If the number of engines to be overhauled is large enough. The dissasembly of certain units (Pg 89-101) might require extra mechanics. The numbers in the right hand collum refer to the tool number for the given operation

When using a wrench, one should always use a box wrench or open end wrench

Many accessories, and mounts are provided by the aircraft manufacturer which will be present on the dissasembled engine (vaccume pump, etc), These should be noted before the total rebu

Place the engine on its mount in the normal position, THE ENGINE WITH THE CYLINDER HEADS FACING DOWN

REMOVE THE ROCKER COVERS:

- Remove the safety wire from the knerled thumb bolt nuts which secure the rocker covers
- Unscrew the knerled thumb nuts 3,300,488;
- Pull down the rocker covers 3,009,795. and drain into the tank on the floor, the oil in the rocker covers.
- Gather up the caps and washers to the thumb screws 3.012.012 and the rubber rounda gaskets 3.012 013

Engine 4P05 DISCONNECT THE LUBRICATING ~~PIPE~~ JET (NOZZLE) TO THE AUXILIARY PUMP.

- Unscrew the top of the nozzle 3, 306, 305
- Take down the two aluminum fittings.
- disengage the lubricating tube.

REMOVING THE CRANKCASE COVER.

- Remove the safety wire from the castle nuts
- ~~Remove~~ Unscrew the castle nuts 7, 028, 602 — 10 mm wrench — 57
- Remove the nuts and washers 3, 450, 621;
- ~~Rem~~ Unscrew the lifting ring 3, 306, 998
- Remove the lifting ring and washer.
- Use the engine mounts as a fulcrum, to get leverage against the ~~part~~ protrusion in the crankcase cover and ~~cover~~ gasket 3, 008, 697
- Lift off the cover 3, 007, 126

Engine 4P05

- unscrew the lifting rings 3, 306, 997
- Lift off the cover 3, 011, 930.

REMOVING THE PROPELLOR HUB.

- Unscrew the screws 3, 010, 111 ~~from the pins~~, which will remain until after the propellor is off — 17 mm wrench — 61
- Remove the safety wire from the four stop screws 3, 009, 704 to the safety cone
- Unscrew the stop screws — Screw driver
- Remove the safety cone 3, 102, 381 with the propellor ~~hub tightening~~ cone stop screw

- Remove the ~~block~~ forward disk 3,010,124 of the hub

- Put in the special wrench, with its centering collar to dismount the hub locking screw — wrench 20, collar 19

- Keeping the ~~pump~~ crankshaft still, put the leverage bar in place, parallel to the ground and move in the direction towards the compressor, distributor, VIET — 60, 62

- Put the end of the lever arm (breaker bar) in the hole of the hub wrench — 62

- With moderate force unscrew the bolt by pushing on the end of the breaker bar in the direction of the arrows (not to the Left.);

- Remove the breaker bar, the wrench and centering collar, the stopping screw. 3,100,116, of the hub.

- Put back the forward disk to the hub.

- Screw in the screws

- Screw in the propeller hub remover, with the center bolt unscrewed — 39

- Hold it with an open wrench

- Screw in the center bolt, and place the breaker bar end into the head of the screw. — 40

- Turn with moderate force the breaker bar in the direction of the arrows, with the operator facing the engine.

- After the hub has come free, unscrew the screws, remove the hub puller, the plate 3,010,124, the breaker bar, and the hub 3,011,978

- Put all parts to the hub back together.

REMOUVING THE VENT (crankcase vent)

- Unscrew the vent 7,121,093, and pull it out with its fittings 3,005,367	Special wrench	10
Motec 4P05 On this engine there is no vent, and the opening is filled with a plug 3,012,041. After having removed the safety wire, unscrew it with the special wrench		10
- Remove the plug and its fittings 3,012,040		

REMOVING THE SPARK PLUGS:

- Disconnect the ignition wires		
- Unscrew the spark plugs	Socket	1
- Pull the plugs and their washers out 3,008,350	Special Wrench	21

REMOUVING THE FORWARD BEARING COUER. ON THE BLOCK

- Cut and pull out the safety wire from the screws		
- Unscrew the 6 ~~screws~~ bolts 3,450,819.	10 mm wrench	5
- Remove the bolts, the 4 washers 7,030 316 and the regulating plate (shims) 3,015,488		
- Remove the screw stopper 3,452,416 (Piano wire)		
- Pull off the forward bearing ~~cover~~ support cover 3,100,068, as well as the metaloplastic gasget 3,200,119.		
- In order to loosen the locking screw 3,102,382 of the bearing (not to the left) take, for example) a mallet and place it between a crankshaft crank and the crank case such that the shaft ~~won't~~ can't turn		
- Unscrew the locking bolt to the jet (turbine) and remove it.	Special Wrench	48

REMOVING THE FORWARD BEARING CASING

- Remove the safety wires		
- Unscrew the bolts 3,000,677	17 mm wrench	17

II 4. 90 (3rd page Continued) RENAULT 4P NBC 35

- Remove the bolts and washers 7, 030, 304;
- Put in place the apparatus for ~~supporting~~ dismounting the forward bearing 3, 015, 479;
- Screw the previously removed bolts back in.

- Screw in the central bolt of the removal unit until a breaker bar is needed - 41
- When the forward bearing puller ~~shuts~~ pulls out (extracts), unscrew the bolts, and pull off the bearing puller:
- Check ~~th~~ near the forward exterior surface of the bearing for a bronze or aluminum casting to see if the bearings are 6212 C (SKF or SRO)
- Gather up the ~~washer~~ regulating (shim) washer 3,008,078, as well as the bearing casing, 3,015,478 or 3,102,100 (following material) and the oil seal 3,300,950
- Put together the assembly of the bearing, washers (shims) bearing casing and seal so as to be ready for reassembly

REMOVING THE TOP SUPPORT TO THE CARBURATOR

- Remove the safety wire.
- Unscrew the two bolts 7,028, 543 — 9 mm wrench — 56
- Remove the bolts and washers 3,451,069
- Remove the steel support 3,102,058, and the fittings (gasget) 3,010,909.

The engine is now free of all parts which are possible to remove in the normal position. The other disassemblies are only the first of those which are done with the engine turned upside down

REMOVING THE AIR COMPRESSOR-DISTRIBUTOR "VIET":

- Remove the safety wires
- Unscrew the four bolt assemblies 7,028.601 — 8 mm wrench — 56
- Remove the bolts and washers 7,030,301

(see the continuation on Pg 92)

REMOVING THE REAR CASING

- Pull out the cotter pins
- Unscrew the bolt assemblies 7,028,602 — 10 mm wrench — 12, 1
- Remove the bolts and washers 7,030,302

(See the continuation on page 92)

REMOVING THE MAGNETOES:

- Unscrew 3 of the bolts 3,005,612 which secure the magnetos, and pull them and their washers 7,030,304, out. — 17 mm wrench — 17

(see the continuation on page 92)

- Remove the four dialf distributors of the magnetoes (wire outlets?)
- Remove the center top screw which secures the ~~ign~~ spark plug wires — screwdriver
- Remove the wires.
- Remount the 4 half distributor plates to the magnetoes.

TURN THE ENGINE SUCH THAT THE CYLENDER HEADS FACE UP.

REMOVING THE SHEET METAL MAGNETO SHIELD.

- Remove the safety wire.
- Unscrew the 4 bolts 3,450,886 which secure the shield on the base support do the magneto. — 8 mm wrench — 55
- Remove the bolts and washers 7,030,307 — 43
- Unscrew the bolts 7,028,601 which secure the shield to the screw collumn on the oil pump. — 9 mm wrench — 56
- Remove the bolts and the two large washers 3,015,554
- Remove the sheet metal magneto shields 3,308,879

Dissasembling the SUPPORT ASSEMBLY FOR THE FUELPUMPS, FUEL VALVE AND TACHOMETER DRIVE.		
- Remove the safety wire from the four bolts 7,028,602, which secure the fuel pumps to the drive train casing.		
- Unscrew the bolts	10 mm wrench	57
- Remove the bolts and washers 7,030,302.		
DISMANTLING THE MAGNETOES (continued from Page 91)		
- Unscrew the rear support bolt 3,005,612 from each magneto	17mm wrench	17
- Remove the bolts and washers 7,050,304		
- Remove the magnetos.		
Dissassembling THE REAR CASING (continued from page 91)		
- Unscrew the bolts which fix the gear case in place	10mm wrench	57
- Remove the bolts and washers		
- Remove (using a mallet if necessary) the gear case.		
Pull the gear case away.		
REMOVING THE INTAKE MANIFOLD WITH THE CARBURATOR.		
- Remove the safety wires		
- Unscrew the bolts 7,028,602	10 mm wrench	11,
- Remove the bolts and "Grower W7" washers		
- Lift out the manifold 3,010,531 with the carburator and its support		
- Take up the old gaskets 3,008,809		
REMOVING THE CARBURATOR.		
- Remove the safety wires.		
- Unscrew the 4 bolts 7,029,544	10mm wrench	12

- Pull out the bolts and washers 7,030,314

- Pull off the Carburator Zenith 60 IGS, and remove the Reinz gasget. 3,010,916

Motors 4PC3 and 4PO5

- Pull off the Zenith 60IGSA Carburator.

DISSASEMBLING THE SPARK PLUG WIRE HARNESS

-Unscrew the ~~bolts~~ screws 3,450,047 which secure the harness support collars. screwdriver

- Pull out the ~~screws~~ wire harnesses.

- Put the screws back in place.

DISSASEMBLING ~~FROM~~ THE ~~BLOCK~~ casing over THE STARTING PIPES.

- Pull out the cotter pins from the 3 bolts.

- Unscrew the bolts 7,028,607 8mm wrench 5

- Pull out the bolts and washers 7,030,307

- Remove the safety wire from the heads of the 4 ~~screws~~ Hex nuts 3,450,928 which secure the steel to the block.

- Unscrew these screws 8mm wrench 4

- Remove the screws and the casing 3,016,901

DISSASEMBLING THE STARTING PIPES

- ~~Remove the cotter pins from the 3 bolts~~

- ~~Unscrew the bolts 7,028,607~~

- Unscrew the 5 flat head screws 3,450,067 which secure the tube supports screwdriver

- Remove the tops of the supports

- Unscrew the fittings at the compressor and check valve ends. 18 mm wrench 15

- Remove the tubes from cylenders 1(3,050,772) #2 (3,050,773) #3 (3,016,902) and #4 (3,010,846)

- Remove the supports as well as the forward 3,301,125 middle and rear 3,306,126 braces of the case which are secured on the pins of the starter tube cover

DISSASEMBLING THE COMPRESSOR DISTRIBUTOR (continued from pg 91)

- Remove the safety wires
- Unscrew the two bolts which are still accessible — 9mm wrench — 5
- Remove the bolts and their washers.
- Tap with a mallet to aid the removal of the compressor-distributor
- pull off the paper gasget with it. 3,008,242

REMOVING THE AIR DUCTING.

- Unhook the spring clamps and remove the air duck work

REMOVING THE LOWER COWL SUPPORTS (Cooling Cowl)

- Unscrew the nuts 3,451,197 (Securing the lower support which is the hinge of the cowl) while holding the screws 7,028,542 with the aid of a flat wrench. — 8mm wrench — 18
- Remove the bolt, nut, washers 7,030,312 and "Grower" washers
- Pull out the lower supports on cylenders #1 (3,007,478) #2 (3,007,475) #3 (3,007,474) and #4 (3,007,487)

REMOVING THE CYLENDER HEADS AND CYLENDERS

- Pull the cotter pins out of the cylender Head bolts:
- Unscrew the castle nuts 3,007.627 which are installed in two fashions
  a) nuts under the head cooling fins. — 12mm wrench — 1
  b) uncovered nuts
- Remove the nuts, 8 washers 3,010,372, cylender heads, ~~and cylenders~~ and cylenders which, once disconnected, permits the removal of the metaloplastic gasget 3,006,737 from heads 1,3 (3,016,377) and 2,4 (3,016,379) and cylenders 3,010,092
- Remove the rubber gasget ~~between~~ 3 008,710 between the Cylenders and the Block

REMOVING THE PISTONS

- This process is done with the pair of pistons 1-4 and 2-3 being put

at the highest point on the crank shaft, where acces is better.

- Extract the stop ring 3,011,485 of the wrist pin. — Extractor — 33, 6
- Remove the wrist pin 3,013,117 and the piston 3,050,320
- Extract the other stop ring.
- Do the same for the other pistons.

REMOVING THE ~~BLOCK OIL FILTRE~~ OIL PRESSURE SENDER (from the block)

- Unscrew the connector to the pressure sender 3,452.410 — 24 mm wrench
- Remove the sender and its metaloplastic gasget 7,033,086

REMOVING THE FORWARD SUMP COVER

- Remove the safety wire.
- Unscrew the 10 nuts 7,028,601 — 9 mm wrench — 56
- Remove the screws and washers 7,030,301
- Loosen and remove the sump cover 3,007,066 and its gasget 3,008,241

REMOVING THE ROCKER SUPPORTS, PUSHRODS, AND PUSH ROD TUBES

- Remove the safety wire from the 2 nuts and the Hex head bolts
- Unscrew the nuts which secure them 3,451,062 — Special wrench — 34
- Remove the nuts

(to use the special wrench, one must put the opening of the wrench near one of the push rods, engage it, turn it around the push rod, disengage it, and then engage it on the nut to be unscrewed.

- Unscrew the Hex headded bolts 3,451,061 — 14 mm wrench — 59
- Put out the screws and rocker supports 3,100,345 (number of the stripped piece) and the rockers as a complete unit.

- Lift out the push rods 3,006,754
- Remove the push rod tubes by lifting from the end of the ~~exter~~ interior sleve 3,003,143 near the tappet, to dissengage it from the clip which holds the push rod guides. The exterior push rod tube 3,003,142 is done ~~as follows~~ afterwards; | Special wrench 67

Motor 4P 05 On this engine, the push rod tubes are special, the interior sleve, 3,012,046, and exterior sleve 3,012,045, The seal is made by:

On the inside: with to gaskets ~~at~~ 3,012,043 at the ends, and one gasket 3,012,044 in the ringed throat on the inside of the larger tube.

On the Outside: With three sleves 3,012,053 which gaurantee a seal at the two ends, and the joint between the tubes.

PARTIAL DISSASEMBLY OF THE MOTOR SUPPORT CLAMPS

- Break off the stops 3,300,695 from the nuts
- Unscrew the nuts which are accessible 3,450,858 | 14 mm wrench 59
- Remove the nuts and safety plate.

(see Pg 96 for continuation)

TURN THE ENGINE BACK TO THE NORMAL POSITION

REMOVING THE CONNECTING RODS

- Turn the crankshaft to get the connecting rod up to the top.
- Pull the cotter pins from the nuts 3,151,195 of the connecting rod bolts
- Unscrew the nuts from the two connecting rods | 14 mm wrench 68
- Remove the nuts and washers 3,451,196., and place them, for example in position for each connecting rod, on the block studs
- Lift off the ~~bearing~~ connecting rod cap. 3,002,293, as well as the half bearings 3,301,735
- Remove the connecting rod 3,002,292, as well as its half bearing 2,002,285

- Put back together the connecting rods, caps, half bearings, and their respective nuts and bolts
- The same operation should be repeated for the other connecting rods

REMOVING THE CRANKSHAFT

- Remove the cotter pins from the nuts that secure the main bearings.
- Unscrew the nuts:

3,450,833 (The center bearing has 16 mm studs) — 22 mm wrench

3,450,731 (The others have 12 mm studs) — 21 mm wrench

- Remove the nuts, washers 16 mm 3,459 854, 12 mm 3,450,909. bearing caps: (1,2,4,5) 3,100 042, (3) 3,100,039 with their upper half bearings (1,2,4) 3,002,391, (3) 3,009,412, and (5) 3,009,399.

Motor 4P05: on the 4P05 model, there's a special bearing cap on the #5 bearing 3,100,049.

- Pull out the crankshaft 3.007, 271
- Remove the lower half bearings (1, 2, 4) 3,009400 (3) 3,002.392, (5) 3,005,325
- Unscrew the oiling jets (nozzles) 3,008,751 for the bearings, and for lubricating the thrust bearing 3.001, 210. — Screw driver.

~~Removing~~ REMOVING THE CAMSHAFT DRIVE GEAR

- Remove the safety wire

- Unscrew the 5 bolts 3,004,950 — 12 mm wrench — 5
- Remove the gear 3,007,390.

REMOVING THE CAMSHAFT

- Remove the (cotter) pin from the NUts on the rear camshaft bearing.
- Unscrew the nuts 7,028,601 — 9 mm wrench — 5
- Remove the nuts and washers 7,030,301
- Draw the camshaft 3,011,132, and the two half bearings 3,007,169. out the rear while lightly tapping with a mallet on the forward end of the camshaft.

REMOVING THE INTERMEDIATE IDLER GEAR OF THE DRIVE TRAIN.

- Remove the safety pin from the pinion retaining nut.
- Unscrew the nut. 3,005,296 — 26 mm wrench — 4
- Remove the nut, the washer 3,005,316, the pinion gear 3,007,156 sleeve

REMOVING THE PINION GEAR SHAFT.

- Unpin the securing nut on the axel ~~for~~ the block.
- Unscrew the nut 3,005,296.
- Remove the nut, washer 3,005,316, shaft 3,007,155, and key 3,005,340.

AFTER THIS DISSASEMBLY IT IS VERY IMPORTANT TO MAKE CERTAIN THE OIL LINES TO THE BEARINGS, AND PINION GEAR ARE CLEAN AND UNOBSTRUCTED

Leave the bare block on the mounts

- Unscrew the nuts to the "U" bolts securing the motor mounts to the dismantling stand.
- Lift out the block 3,007,036

DISSASEMBIY OF THE COMPONENTS

The component dissasemblies consist of the drive train case, including the idler gear to the magnetos, fuel pump drives, tachometer drive, which have already been

removal from the engine, but now await their own dissusembly

CRANKCASE COVER

Motor 4P05 REMOVING THE FILTER

- Remove the safety wire from the nuts
- Unscrew the nuts 7,028,601 — 9mm wrench — 5
- Remove the nuts and washers 7,030,301
- Lift out the filter (screen) 3,011,979

REMOVING THE INTAKE PIPE

- Remove the safety ~~wires~~ from the, securing nuts to the bolts and clamps
- Unscrew the nuts 7,028,601 — 9mm wrench — 5
- Remove the nuts and washers 7,030,301
- Remove the oil Line 3,011,980, with its clamps (collars) 3,011,961
- Remove the Reinz gasget (joint) 3,012,092

REMOVING THE AUXILLIARY OIL PUMP IN THE CRANKCASE COVER.

- Remove the safety wires
- Unscrew the nuts 7,028,602 — 10mm wrench — 57
- Remove the nuts and washers 7,030,302
- Lift out the entire auxilliary pump
- Remove the paper gaskets 3,306,428 (side near the intake) and 3,306,429

II 4. 96

RENAULT 4/P

NBC 35

Motor 4P05- Dissasembling THE AUXILLIARY OIL PUMP

- ~~Break off~~ Bend down the safety to the drive gear retaining nut.
- Unscrew the nut. 3,450,168 — 20mm wrench
- Remove the nut and steel safety. 3,452,307
- Remove the pinion gear 3,011,972
- Remove the key 3,011,956
- Remove the safety wires from the oil pump assembly nuts
- Unscrew the nuts 7,028,607 — 8mm wrench 4:
- Remove the nuts and washers 7,030,307
- Remove the rear cover 3,011,937, and then the pinion 3,011,973
- Remove the axels 3,011,967 of the pinions
- Remove the pinion 3,011,971 as well as the key 3,011,955
- Remove the pump shaft to the drive pinion 3,011,970 from the pump case

REMOVING THE ~~SEEP~~ flanged SUPPORT FITTING

- Remove the safety wire
- Unscrew the nuts 7,028,601 — 9mm wrench 56
- Remove the nuts . pins. 3,451,406, and flanges (clamps) 3,306,306.
- Remove the paper gasget 3,306,309.

MAIN CRANKCASE (BLOCK)

REMOVING THE MOTOR MOUNTS (continued from Pg 94)

- Bend back the safeties 3,300,695 from the restraining nuts
- Unscrew the nuts 3,450,868 — 14mm flat wrench
- Remove the two nuts and the safety plate
- Remove the motor mounts 3,008,486

REAR CASING

THE REAR CASING IS CLAMPED IN A VICE. THE FILTER COVER IS FACE DOWN

REMOVING THE FUEL VALVE AND TACHOMETER DRIVE

- Remove the safety wire
- Unscrew the 2 nuts 7,028,601 (1-2) from the tubing support studs — 9mm wrench — 5
- Remove the nuts and washers 7,030,301
- Unscrew the nut 7,028,607 (3) from the bolt 5,452,306 (on the washer 7,030,301) — 9mm wrench, 8mm Flat wrench — 5
- Remove the nut, washer, screw and complete forward support # 3592 B
- Pull out the gear 3,016,075, the pinion gear 3,007,341 which drives the Tachometer
- Remove the paper gasget 3,008,700

Motors 4P01, 4P03, 4P04 with a vaccume pump. On These engines, the fuel valve, and tachometer drive (AM # 3592B) is replaced with the cover 3,102,137 which contains only the tachometer drive.

DISSMANTLING THE TACHOMETER DRIVE SUPPORT

- Unscrew the nut 7,028,601, which is above, and is the only support for the tachometer drive — 9mm wrench — 5

a) Dismount the vaccume pump (if it is still in place)

- Unscrew the four ~~bolts~~ nuts 3,400,603 — 12 mm wrench — 5
- Remove the nuts and washers 7,030,303
- Lift off the "AIR EQUIPMENT Vaccume pump type 21,170 with its gasget 3,012,795

b) Disconnecting the drive pinion from the vaccume pump.

- Remove the Circular Clips 21e
- Remove the ~~thrust~~ Lock washer 3,4152,291
- Pull the pinion 3,306,276 from the casing 3,102,135

REMOVING THE DRIVE GEAR FROM THE CRANKSHAFT AND ITS BEARING

- Bend back the stop plate 3,007,201 from the nut.
- Hold the pinion still from the rear, and unscrew the nut 3,007,211 — Special wrench — 4
- Remove the nut and stopper
- ~~Lock~~ Drive out near the front of the pinion 3,007,199 and near the rear of the bearing 6.205 SKF or SRO as well as on the casing 3,007,202 — "Jet"
- Lift off the paper gasget 3,006,695

DISMANTLING THE DRIVE PINION FROM THE CRANKSHAFT AND ITS BEARING

Engines 4P01, 4P03, 4P05 - Bend back the stop 3,452,286

Equiped with vaccume pumps - Hold the pinion still from the rear and unscrew the nut 3,452,287 — Special wrench 5

- Remove the ~~stop~~ nut, the stop, and the pinion 3,306,275
- Lift out the shiming washer 3,306,495
- Drive out from the front of the pinion, 3,102,134, and the rear of the bearing 6.304 (SRO or SKF) as well as the casing 3,007,202
- Lift out the paper gasget 3,008,695 (between the casing and the block).

REMOVING THE OIL PIPES.

- Remove the safety wire from the 2 Hex head bolts 3,452,411 which secure the brace to the magneto drive gear oil jet.
- Unscrew the two bolts and remove them — 8 mm wrench 5
- Remove the safety wire from the screws and nuts which secure the clamps
- ~~Remove~~ Unscrew the four nuts 7,028,601 — 9 mm wrench 5½
- Remove the nuts, and washers 7,030,301
- Unscrew the 4 Square headed washer ~~nuts~~ bolts 3,452,412 — Special wrench 4
- Remove the nuts, bolts central pipe, and oil discharge pipe
- Collect the 2 gasgets 3,012,073 (for the screen clamp) and the 2 ~~filter~~ gasgets 3,012,074 (for the filter clamp)

REMOVING THE DRIVE GEAR FOR THE OIL CIRCULATION PUMP

- Bend back the stop tab 3,005,324
- Unscrew the nut 3,005,297 and then block the gear to keep it from turning — Special wrench 4.

- Remove the nut, and the safety
- Extract the gear 5,007,159 and collect the keys 3,007,154

If the removal is difficult, stop it for now; it will not make the following operations difficult.

DISASSEMBLING THE OIL PUMP.

- Bend back the safety 3,015,555, releasing the small collumn which ~~protects the~~ supports the magneto shields.
- Unscrew the collumn 3.015,556 — flat wrench 9 mm wrench
- Remove the collumn
- Remove the safety wire to the nuts and bend back second half of the safety plate 3,015,555
- Unscrew the 9 nuts (3 of which are recessed) 7,028,601 — 9 mm wrench — 5
- Remove the nuts and washers 7,030,501
- Unscrew the blind nut 3.452.262 — 9 mm wrench — 5
- Remove the ~~screw~~ nut, washer 3,008,420 and cover 3,010,843
- Tap lightly on the pinion to loosen (take apart) the oil pumps only drive it 1 mm maximum

Important: do not drive beyond 1 mm, the pinion securing key in the axel (shaft) will damage the bronze ring.

- Lift out the pinion 3,007,153, and the key 3,007,154
- Lift out the oil pump casing 3,010 857

- Remove the pinion gear, bein careful of the end with the coupling, it is mounted with a key, which, if dissasembled without care, can damage the ~~ring~~ shaft sleve.

CHANGE THE POSITION OF THE REAR CASING. THE ARM IN THE Vice WITH THE INTERIOR OF THE CASING FACING DOWN

DISMANTLING THE MAGNETO DRIVES.

- Hold steady the top of the locking pin of the drive gear — Special wrench 46
- Unscrew the nut 3,000.503. with — 14 mm wrench 68
- Remove the nut and the locking pin 3,005,302
- Remove the two magneto drives from the one which is adjustible
- Un pin the nuts securing the covers to, and the bearing cases.
- Unscrew these nuts 7,028.601
- Remove the screws and washers 7,030,301
- ~~Remove~~ Loosen the bearing castings by tapping on one side and then the other of the bearing
- Remove the cover to the bearing 3,005,503, the paper gasget. 3,006,435.
- Lift out the casing to the bearing 3,005,305 with the bearing (SRO 6004) and its paper gasget 3,006,436
- Collect ang shimming ~~whowashers~~, and ~~these corresponding attachments~~ attach then to their corresponding bearing casings.
- Remove the bearing spacers (cross braces) 3,005,501, with their legs 3,008,627 and take out the drive gears 3007,210 below the casing.
- Remove the bearings and their casings

REMOVING THE LIMITING PLUG (VALVE) or cap

- Remove the safety wire ~~from~~
- Unscrew the cap 3.305, 371 — 23 mm wrench

- Remove the gasget 3,451,260
- Unscrew the stop nut 3,306,378 and lift out with the regulating ~~screw nut~~ screw 3,306,380 and pin (U1 x 15) — 22 mm wrench 5
- Remove the spring 3.306,381
- Pull out the value 3,011,968

NOTE: The valve guide 3,306,377 is pressed into the casing, and should not be removed.

REMOVING THE OIL FILTER SCREEN

- Remove the safety wire
- Unscrew the blind nut 3,451,067 — 17mm wrench 17
- Lift out the nut, and copper-asbestos gasget 7,033,084
- Loosen and remove the stopper (flange) 3,010,921 of the screen
- Lift out the gasget (fitting) 3,007,181
- Remove the filter and the base ring of filter 3,010,919

Engines 4P01 and 4P03 with a vaccume pump.
- Unscrew the nut 3,452,288 — 14 mm wrench 5
- Remove the fitting (gasget) 3,451,262, and the piping 3,102,168 (The screw 3,452,299 securing the pipe to the vaccume pump casing is removed with the two gaskets 3,451,262
- Remove the second gasget 3,451,262

Engines 4P05 with a vaccume pump.
- For the 4P05 engines there are more greasing lines to the vaccume pump, one to the auxiliary oil pump 3,306,368 by means of a third washer between the two fittings.

VALVES

REMOVING THE VALVE SPRINGS

To replace the valve springs on an engine without removing the cylender heads and by consequence, without replacing, or grinding the valves.

- To prevent the cylender from falling into the cylender, put in through the spark plug hole the valve jam, and keep it in the head.
- Mount on the eye bolt 3,007,038 (the bolt which takes the rocker cover thum nut) the valve tool
- Push down on the lever of the valve remover, with the split part pushing down on the valve springs.
- Pull out the half Locks 3,010,066 and the valve spring cap. 3,011,631
- Remove the springs (interior 3,011,628 exterior 3,011,629)
- Proceed the same but in the oposite direction for remounting.

REMOVING THE VALVES

- Put the valves to be removed on the bosses of the dismanting plate, and keep the valves in their seats.
- Attach the stem of the valve remover to the base plate and hook to it the arm of the valve remover to it using an axel (pin)

Fig 48 REmoving the valves

CULASSES

Démontage de ressorts de soupapes seuls :

On peut avoir à remplacer les ressorts de soupapes sur un moteur sans effectuer le démontage des culasses et par conséquent, sans remplacer ou rôder les soupapes.

— Empêcher la soupape de tomber dans le cylindre en introduisant par le trou de bougie, le cale-soupape qui maintient la tête. 35

— Monter sur le boulon à œil 3.007.038 (sur lequel se visse le bouton moleté de fixation du couvercle de carter de culbuteurs) le démonte-soupape 22

— Faire pivoter la came du démonte-soupape au moyen d'une broche afin d'obtenir la compression des ressorts de soupapes ;

— Retirer les demi-bagues 3.010.066 et la calotte supérieure 3.011.631) ;

— Retirer les ressorts (intérieur 3.011.628, extérieur 3.011.629) ;

— Procéder aux mêmes opérations en sens inverse pour le remontage.

Démontage des soupapes :

— Poser la culasse à démonter sur le plateau dont les bossages maintiennent les soupapes sur leurs sièges respectifs 65

— L'arrache-support de moyeu AV étant fixé sur le plateau, présenter le bras de levier de montage des soupapes sur l'arrache-support et l'articuler à l'aide de l'axe. . . . . .

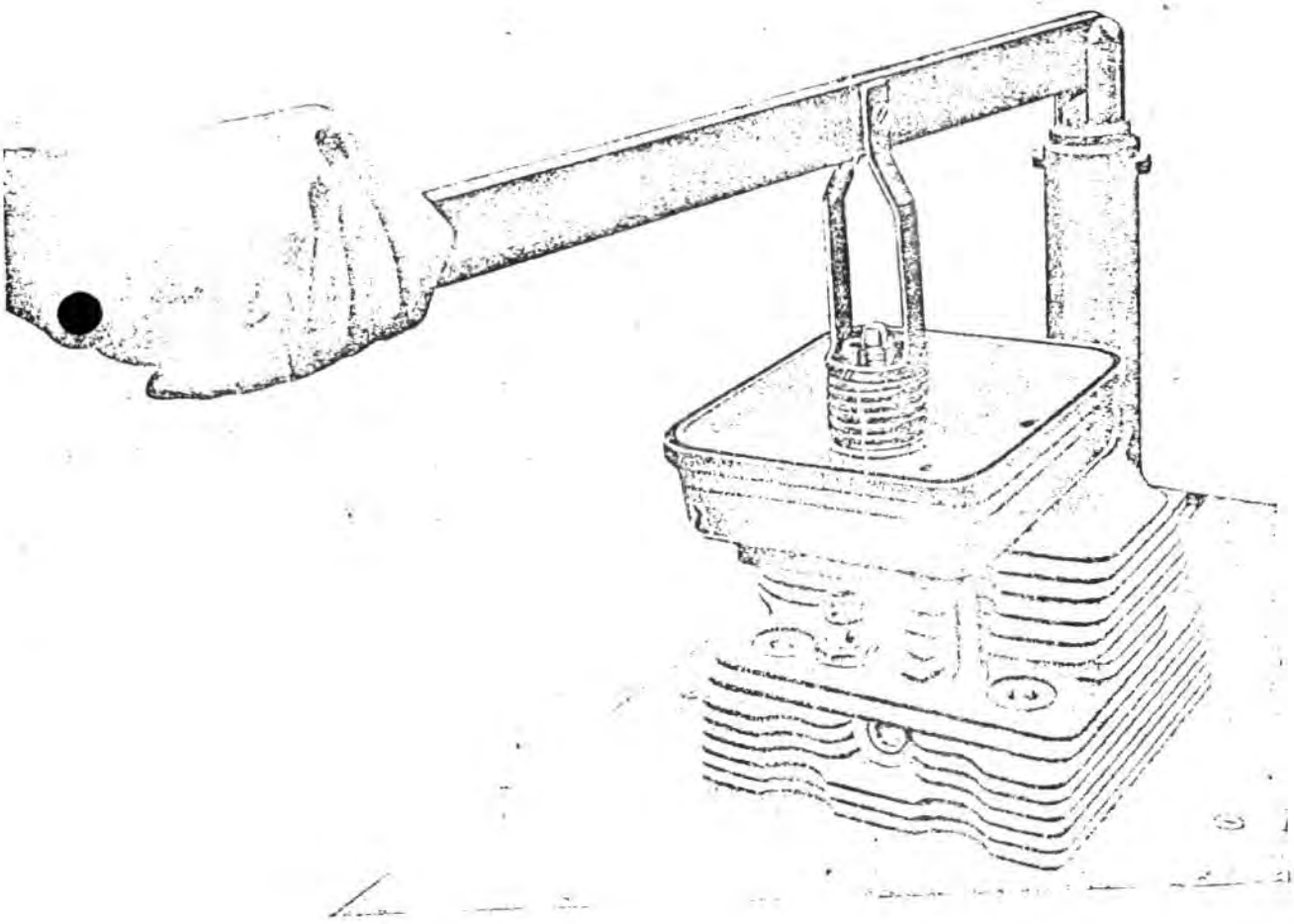


FIG. 48 — DÉMONTAGE DES SOUPAPES

- Push down on the valve spring cap 3,011,631 (retaining cap)
- ~~Remove~~ Disengage the valve spring cap retainers 3,010,066 while holding down the cap.
- Remove the cap retainers and the valve spring caps.
- Remove the exterior spring 3,001,629
- Remove the interior valve spring 3,001,628
- Remove the washer which supports the valve springs 3,301,768.
- Remove the intake valve 3,100,789 and exhaust valve 3,100,791

REMOVING THE STARTING CHECK VALVE

The cylender head should always rest on the valve removing plate

- Bend back the safety which is riveted to the cylender head
- Unscrew the nut which goes into the cylender head 3,007,052 — Special wrench 16
- Unscrew the tubing (collumn) 3,300,851 screwed into the check valve 3,300,056 — Special wrench 16
- Remove the tubing (collumn)
- Pull out the swiveling connection (movable joint)
- Keep the head of the valve in its seat.
- Drive in the ~~disk (bolt)~~ check valve chamber while holding the pin (cotter) — Screwdriver
- Remove the pin, the ~~bowl~~ valve ~~chamber~~ chamber and the spring
- Lift the cylender head off of the valve removing tool
- Remove the check valve

REMOVING THE ROCKERS.

- Pull out the ~~compass~~ retaining ring 3,002,430 — Ring Pliers — 63 33
- Remove the Rockers (nu 3,100,335
- Gather up the 25 needles (rollers) "Nadella" 2 x 15.8
- Proceed the same for the other rocker
- Unscrew the nut from the stop bolt (pin) 7,025,542 of the rocker shaft — 8 mm wrench — 55

- Remove the rocker shaft 3,007,037, which releases the securing bolt 3007,038.

CRANKSHAFT

REMOVING THE KEY

- Unscrew the screws 3,4152, 417 — Screwdriver
- Remove the screws and the key 3,003, 800

REMOVING THE PLUGS FROM THE ~~CRANKS~~ Bearing PINS AND CRANK PINS

a) Crank Pins.

- Remove the cotter pins
- Unscrew the nut 7,028, 603 — 12 mm wrench — 5
- Remve the nut & washer 7,030, 303 as well as the plug 3,007, 285 and its fittings (gasget) 3008, 701
- Remove the centering stem 3,005, 085 and the second plug as well as its gasget.
- Unscrew the second nut.

b) Bearing Pins

- Proceed the same for the bushings 3,007,286 in the bearing pins with a gasget 3,008 702, and centering pin 3,005, 086
- Check for the proper condition (holds) of the bushing AV 3,003. 795

Motors 4P 05 The bushing doesnt exist.

PISTONS

REMOVING THE RINGS

- Remove the rings with the ring remover — 3

CHAPTER XV

INSPECTIONS AFTER DISSASEMBLY

After the engine has been completely dissosembled, all the parts should be thoroughly washed and carefully examined. Taking into account the observations made while dissasembling, these can be a guide to closer examination of the parts

One should never reassemble a part if its condition is less than good or has more play than is allowed for reassembly (See the tables on pgs. 107 and 108)

After inspection, the parts which were washed shouldn't have any deposites if so they should be be cleaned and ~~scrubbed~~ scraped. Especially the pistons which should have the carbon scraped from and the face of the ~~polished~~ head polished. The cylender heads polished on the interior, the values should be polished and ground, as well as the starting check valve.

To make reassembly possible, the paper gasgets, and lines of seals should be cleane to make them ready to be put back.

INSPECTION OF THE ENGINE

The parts to the engine, when completely ~~dissasembled~~, should, before examination, be washed in soapy water, heated to about 80° Centegrade

After washing, each piece should be examined attentively, checking for defects which should be properly registered, and marked

CRANKSHAFT

The bearings pins of the crankshaft should be thoroughly cleaned and checked, as well as the crank pins; Check for roundness with the aid of calipers, calibrated in hundredths of a millimeter. Check the roundness of the bearings by comparrison. The crankshaft should be supported in 2 "V"s The forward thrust bearing should be checked

Check the half bearings on the main bearings, make sure that the white metal (Lead) is not cracked, and no ~~friction is produced~~ binding is evident

CONECTING RODS

The lead in the heads of the connecting rods shouldnt show any signs of binding or any signs of overheating, and should not be out of true (round)

Check the play in the rings at the foot of the connecting rods, and replace them if their wear is abnormal

Check closely the parallelism between the foot and head bearings which should be within a marimum of 4/100 at 150 mm from the ~~or~~ shaft at the base of the connecting rod

PISTONS

Check, with calipers, to see that the pistons are completely round. Examine the wrist pin an see that it isnt worn or out of round.

Check the ring grooves ~~for~~ which are blackened on the side which doesnt bear the load

CYLENDERS

Check the boare of the cylender, see that it is round, and not scored.

CYLENDER HEADS

Clean the heads of carbon with a scraper, between the valve seats

Check the condition of the studs to the intake manifold and exhaust pipes.

The threads to the spark plug holes should be checked as well as the valve seats; the push rod guides are checked when remounting.

Check for wear on the rolers, especially on their exterior, or their boare. Check closely the axel (shaft). Check to see that the regulating screws to the rockers are mached, and that the lock ~~nuts~~ pins are not damaged.

VALVES

Check the valve ports, and, if they are pitted, smoth them with a grinder.

Remove the grease and dirt from the stems, and the deposits which have formed on their bell (base).

Check the play between the valve stem and the guides

Check the tips of the valves, which should have a dull finnish.

Check the valve springs to see that they haven't become compressed, and aren't cracked.

Make sure the spring retainers are in good condition.

DRIVE TRAIN

With a fine file try to scratch the surface of the cams (teeth) to see if they retain their hardness

Examine the openings and see that there are no scores which could cause binding. With the help of two "V"s and a caliper (comparer), make sure the cam shaft is in good shape.

Make sure the gears and drive pinions of the drive train are free of flaked (chiped) or worn teeth.

Clean the feed and return oil pipes.

Make sure the magneto drive gears are free of chips and excessive wear. Examine the ball bearings, and the magneto drives with their ~~collars and~~ rubber collars.

OIL PUMP.

See that the case, and the embossed fittings with the hoses are not split or damaged.

Check to make sure the gears aren't pitted or chiped.

MANIFOLD.

Examine the tabs for the studs and nuts on the intake manifold; See that none of them are cracked.

MISCILANEOUS INSPECTIONS

Check the ignition harness.

Checks on the carburator, magnetoes, fuel pumps, air compresser-distributor; These inspections should be made by specialists

A general view of the ignition wires and their connections should be made.

Check the fuel lines, filters and fittings (joints) on the fuel pumps

SIZE OF THE VALUE SPRINGS

Spring.	Pressure	Length under pressure	Length Free
Outside	28.6 kg	30.73 MM	50mm
Inside	14.2 kg	28.73 MM	48mm
Mounted together	42.8 kg		

These forces are the ones which should be used during the test when assembled.

use the ~~setting~~ pressure range against each spring down to the proper length (tool - assemb of 65)

MEASUREMENT

I CRANK CASE (BLOCK)

~~Take the diameter~~ Tappets ~~Push rods~~ and their Guides.

Take the diameter at the two points A and B in the cross patterns 1 and 2.

~~Setup~~ Note the play, and compare it with the figures in the table of play, and near, Pages 107 and 108, which are also referred to in the following paragraphs

Fig 49 Measurement of the tappets and their guides

II CYLENDERS, PISTONS AND WRIST PINS (PISTON PINS)

a) Bore of the Cylenders

Take the diameter in three positions:

- at C, Near the head
- at M, at the middle
- at E, 20mm from the end.

At each of these positions, take the diameter in the following two directions:

*1° parallel to the axis of the Engine

*2 perpendicular to the axis of the engine

Set the gauge to 0 for comparrason at 20°C.

b) Diameter of Pistons

Take the diameter of the pistons at the extreme ends, in the following two directions:

*1 Parallel to the engines' axis

*2 Perpndicular to the engines' axis

Fig 50 Measurements of the Eylenders and Pistons

Check the grooves for the rings.

c) Bore of the Wrist Pin Hole

Look at two diameters:

- At A, Parallel to the axis of the piston
- At B, Perpindicular to the pistons axis

In both positions, Take the diameter of ~~both~~ each of the basses (bores)

d) Diameter of the WRIST PIN (Piston Pin)

Fig 51 Measurements of the pistons and piston pins (wrist pins)

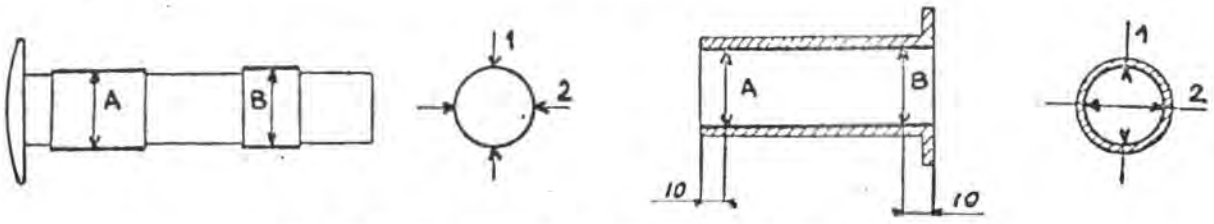


FIG. 49 — MENSURATIONS DES POUSSOIRS ET DE LEURS GUIDES

II. — CYLINDRES, PISTONS ET AXES DE PISTON

a) *Alésage des cylindres.*

Prendre le diamètre en trois endroits :

— en C, près de la culasse ;
— en M, au milieu de sa longueur ;
— en E, à 20 mm. de son extrémité.

En chacun de ses endroits, prendre le diamètre suivant deux directions :

1° Parallèlement à l'axe du moyeur ;
2° Perpendiculairement à l'axe du moteur.

Régler le comparateur de la jauge à zéro, à 20° centigrades.

b) *Diamètre des pistons.*

Prendre le diamètre aux deux extrémités, suivant deux directions :

1° Parallèlement à l'axe du moteur ;
2° Perpendiculairement à l'axe du moteur.

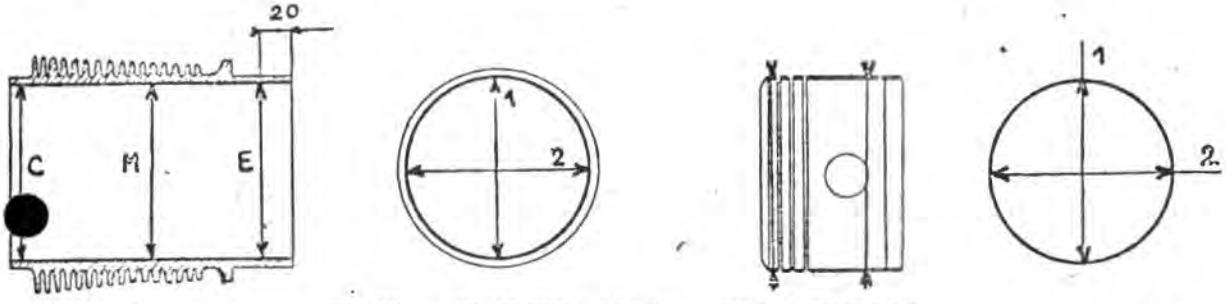


FIG. 50 — MENSURATIONS DES CYLINDRES ET DES PISTONS

Vérifier les portées des segments.

c) *Alésage des bossages de piston.*

Relever deux diamètres :

— en A, parallèlement à l'axe du cylindre ;
— en B, perpendiculairement à l'axe du cylindre.

En ces deux endroits, prendre le diamètre dans chacun des bossages.

d) *Diamètre des axes de piston.*

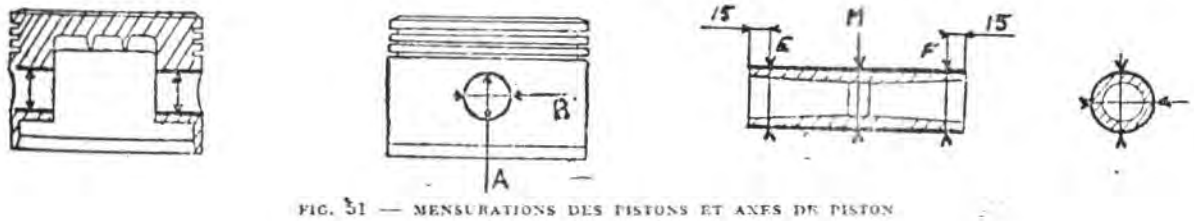


FIG. 51 — MENSURATIONS DES PISTONS ET AXES DE PISTON

Take two measurements of the diameter, perpindicular to each other at three diferent Locations

- At E and F. 15mm in from the ends
- At M, In the middle.

I CONNECTING RODS.

a) Bore at the Connecting Rod Bearing.

Take measurements of the diameter in the middle of the bearings from the following 3 angles:

Through the vertical plane of the engine (vertical axis of connecting rod) Direction V (in fig)
At a 60° angle left and right to the vertical plane (or conrod axis) direction D & G.
Relieve the lateral play at the head of the connecting rod.

Fig 52 Measurements of the Connecting Rod.

b) Boss at the base of the Connecting Rod.

Take the diameter at each end, A and B, at perpindicular angles, folowing directions 1 and 2

CRANKSHAFT AND BEARING BLOCKS.

a) Boring of the Bearing BLOCKS

Same method is used as in measuring the connecting rod bearings.

Fig 53 Measurements of the Crankshaft and Bearing Blocks.

b) Diameter of the Crank Pins and Bearing Pins

Take the diameter following the perpindicular directions (1 and 2) at the middle of ~~the~~ each crank pin and bearing pin

VALUE GUIDES AND VALVES

a) Boore of the Value Guides

Take a measurement of the diameter at the two ends of the guides (1 and 2)
Take (a survey) readings of the guides to the intake and exhaust valves.

Prendre deux diamètres perpendiculaires aux trois endroits :

— en E et F, à 15 mm. des extrémités ;
— en M, au milieu.

III. — BIELLES

a) *Alésage des coussinets de bielles.*

Prendre le diamètre de chaque coussinet au milieu de la portée et suivant trois directions :

Dans le plan médian du moteur (ou l'axe de la bielle), direction V (sur figure).
Obliquement à droite et à gauche, à 60° de ce plan (ou de cet axe), direction D et G.
Relever le jeu latéral de la tête de bielle.

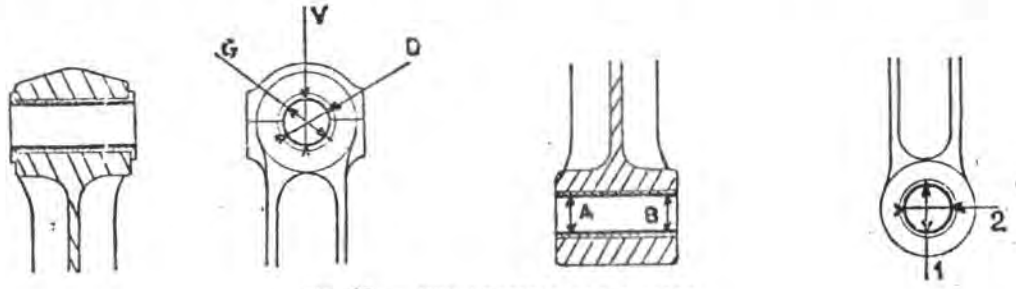


FIG. 52 — MENSURATIONS DES BIELLES

b) *Douille de pied de bielle.*

Prendre le diamètre à chaque extrémité en A et B, suivant deux directions perpendiculaires (1 et 2)

IV. — VILEBREQUIN ET COUSSINETS DE PALIERS

a) *Alésage des coussinets de paliers.*

Même méthode que pour coussinets de bielle.

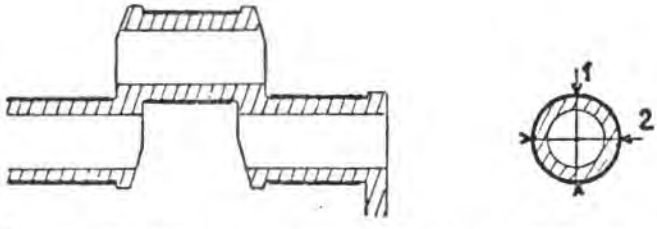


FIG. 53 — MENSURATIONS DU VILEBREQUIN ET DES COUSSINETS DE PALIERS

b) *Diamètre des manetons et tourillons de vilebrequin.*

Prendre le diamètre suivant deux directions perpendiculaires (1 et 2) au milieu de chaque maneton et tourillon.

V. — GUIDES DE SOUPAPES ET SOUPAPES

a) *Alésage des guides de soupapes.*

Prendre le diamètre aux deux extrémités du guide (1 et 2).
Faire le relevé pour les guides d'admission et d'échappement.

Fig 54 Measurements of valve guides and valves.

b) Diameter of the Valve Stems.

Take the diameter at:

- 1: at 30 mm from the end
- 2: at 95 mm from the end.

Operate (work with) on the intake and exhaust valves.

OIL PUMP

#1 Pinion Shafts and Their Bearing Surfaces

Take the diameter in two perpindicular directions per 1 and 2. Make note of the play, and see the table

Fig. 55 Measurements of the oil pump case and pinion gears

#2 Pinions and Oil Pump Case.

a) Take the diameter in the three directions (1, 2, 3) in each casing, and for each pinion. Make note of the play, and review the table.

b) Make note of the play between the pinion and case, using a Johnson gauge.

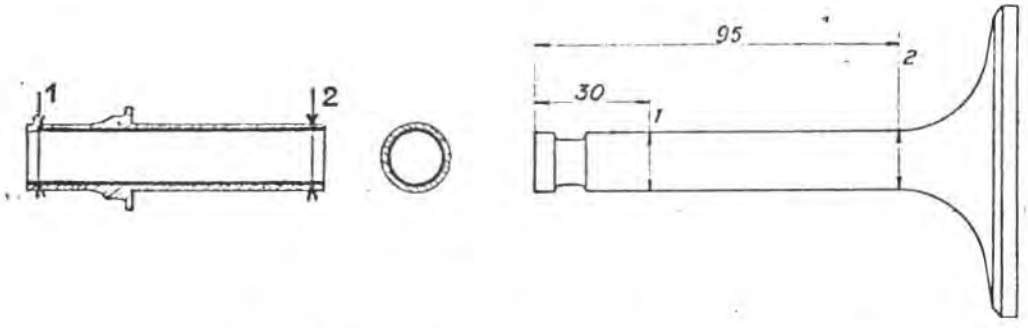


FIG. 51 — MENSURATIONS DES GUIDES DE SOUPAPES ET SOUPAPES

b) *Diamètres des tiges de soupapes.*

Prendre le diamètre :

— 1 : à 30 mm. de l'extrémité ;

— 2 : à 95 mm. de l'extrémité.

Opérer sur les soupapes d'admission et d'échappement.

VI. — POMPE A HUILE

1° *Axe des pignons et leurs portées.*

Prendre le diamètre suivant deux directions perpendiculaires 1 et 2. Relever le jeu et voir tableau.

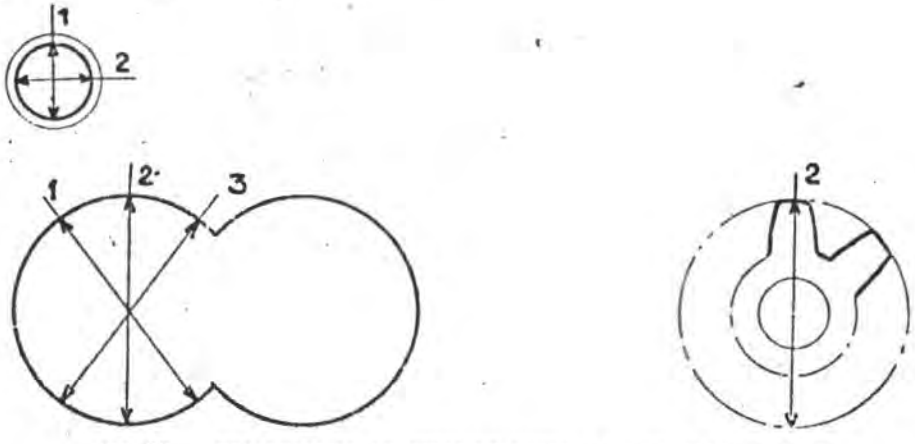


FIG. 55 — MENSURATIONS DU CORPS DE POMPE A HUILE ET DES PIGNONS

2° *Pignons et corps de pompe.*

a) Prendre le diamètre suivant trois directions (1, 2, 3) dans chaque corps et sur chaque pignon. Relever le jeu et voir tableau.

b) On relèvera le jeu latéral des pignons dans le corps de pompe à l'aide des cales Johnson.

TABLE OF PLAY AND ~~WEAR~~ WEAR

Number of Piece	Designation.	Nominal Size in mm	New Part in MM Limits Small	Large	Used piece size of max wear in MM
	CYLENDER				
,007,036 016.377 ,016,379	Radial play between Cylender & Block	———	+0.100	+0.180	———
	Adjustment between Cylender & Head	-----	+0.050	+0.140	-----
,010,092	Bore when new	120	-0.000	+0.035	+0.050
,012,790	After 1st re grinding (oversize)	120.2	-0.000	+0.040	+0.150
,012,791	After 2nd oversize	120.4	-0.000	+0.040	+0.150
	Maximum Out of Round.	-----	-----	-------	0.050
	Maximum taper of bore over entire length of cylender	------	------	-------	0.080
	PISTON				
3,050,320	Size at the top at the first chord (ring) when new	119.1	-0.035	+.000	-.050
3,050,808	After First regrinding (oversize)	119.3	-0.035	+0.000	-0.050
3,050,809	After 2nd resurfacing (oversize)	119.5	-0.035	+0.000	-0.050
3,050,320	Size near the top of the 4th cord (ring) when (new)	119.15	-0.040	+0.000	-0.050
3,050,808	After the 1st Oversize	119.35	-0.040	+0.000	-0.050
3,050,809	After The 2nd Oversize	119.55	-0.040	+0.000	-0.050
3,050,320	Maximum out of round	-----	-----	-------	0.050
3,050,320	Size at the top of the skirting. (New)	119.45	-0.035	+0.000	-0.060
3,050,808	After the 1st Oversize	119.65	-0.035	+0.000	-0.060
3,050,809	After the 2nd oversize	119.85	-0.035	+0.000	-0.060
3,050,320	Size at the bottom of the skirting (New)	119.70	-0.035	+0.000	-0.060
3,050,808	After The first oversize	119.90	-0.035	+0.000	-0.060

Part Number	Designation	Nominal size in mm	Limits of New Parts in mm Small	Large	Max Use of used Pieses in
,050,804	After the second oversize	120.1	-0.035	+ 0.000	-0.060
	Maximum Radial Play in the Cylender (with the max diameter of the piston)	.....	+0,300	+0.370	----
,301,877 ,301,878 301,880	Play in the ring grooves (in place in the cylender)	.....	+0.300	+0.500	+1,000
,013,117	Radial play between Piston Pin and ~~Wrist~~ Piston	.....	+0.007	+0,031	+0,045
,011,495	Axial play between Piston Pin and Stop rings	.....	+0,143	+0,590	.....
,013,117	Diameter of the Piston pin (wrist pin)	26	-0.016	-0.007	.....
-----	Maximum out of round	-----	---	---	0.020
	Distribution ~~DRIVE TRAIN~~.				
,100,789	Radial play between Intake valve stem & guide	----	+0.050	+0.086	+0,15
,100,791	Radial play between Exhaust valve and guide	.....	+0.100	+0.136	+0.200
	Play of valve when cold	+,300	---	---	.....

Part Number	Designation.	Nominal size in mm	New Piece size in mm (Limits) smallest	largest	Max wear on used piece in
,016,377 } ,016,379 }	diameter of bore for valve guide :				
	New	16	-0.000	+0,018	------
	After first replacement	16.2	-0,000	+0.018	------
	Diameter of the exterior of the guides				
,014,451 } ,014,836 }	New	16	+0,060	+0,078	- - - -
[illegible],566 } ,506,567 }	After first replacement	16,2	+0.060	+0,078	-----
,016,377 } ,016,379 }	Fitting ~~Fitting~~ between the opening and guide	----	-0,042	-0,078	-----
3,014,449 } 3,014,450 }	Valves seats are usable until down to a depth ~~height~~ of Batter (use) of	----	----	----	0.500
,010,516 } 3,011,039 }	Play between tappets and tappetguides	------	+0,016	+0,045	+0,100
3,007,306 } 3,010,516 }	Fit of ~~pin~~ tappet guide and crank case	------	-0,006	-0,048	------
	CONNECTING ROD				
3,007,810	Play between Con rod bearing in the bottom, and wrist pin (Piston Pin)	-----	+0,037	+0,067	+0,120

CHAPTER XVI

REPAIRS

After examining the engine, it is recomended to undertake the repairs in the following orde

CONNECTING RODS

To dissasemble the bushings in the foot of the connecting rods, it is necessary to use a screw press or screw jack. After removing the stoppins, by drilling them out, place the head of the connecting rod in a horse shoe shaped support, whose thickness is greater than the length of the bushing and has an opening wide enough to take the thrust from the head and the body, and still allow the free passage of the boss (bushing). Remove the boss (sleeve) with a punch.

Position the new sleeve, which has a slight bevel on one end requiring a single direction of entry, which makes correct entry into the exact length allong the axis. It should be orriented in such a way that one of the three turn downs (tabs?) is facing the foot of the connecting rod and in the longitudinal axis. Use ~~Horny~~ a press, and stop as soon as the sleeve has been pushed all the way to the position it should permonent re Then place the stop pin ~~through the~~ in place

Bore out the connecting rods so as to set up the proper gap for lubrication between the coresponding shafts

This operation must be done with a hone, or other equipment which will maintain a bore paralell to the shaft axis.

It is imperative for proper ~~op~~ engine operation to have the bores parralell to the Piston wrist pin, and the crankshaft crank. (see page 115)

Reinstall the connecting rod bearings which have been ~~redon~~ reconditioned after polishing them.

Reject all the half bearings which are worn (bad) and replace them with new ones which will need to be fitted in the connecting rod, and con rod cap.

Smear a fair amount of an oil and lamp black mixture on the crank shaft. Adjust the half bearings, and then remove them after each test. Remove the

lamp black mixture from the crankshaft bearing, with the connecting rod half bearings still covered. Remount the connecting rods, turn them around a couple ~~turn~~ revolutions and remove them. The ovalness of the crankshaft will show by the traces of lamp black which remain; remove these defects with a fine stone (file). This long and tedious opperation ~~which~~ requires a special lathe (it is best when corrected by machine)

After having verified that the crank pin is cylendrical, make final adjustments to the half bearings, pollish them, oil them and remount them. The bolts should be screwed in tight, the connecting rod should turn freely although not fall under its own weight when pushed lightly.

CRANKSHAFT

Place the crankshaft horisontally on a support which carries the crankshaft by its Ends.

Exchange the bearing near the propellor if it has exess play.

Then adjust the trueness (line) of the shaft, This delicate operation should only be performed by an qualified mechanic.

Place the block on the support in the normal operating position, and secure it

Lay out the half bearings in their positions, and adjust them with the crankshaft and lamp black, the same way as with the connecting rods. Make sure all the lubricating holes which feed the grease channels are open

When the crankshaft is fully supported by all of the surface of the ~~half bearings~~ lower half bearings, place the upper half bearings on, and make adjustments similar to those above, but with the aid of the bearing caps.

The crankshaft should turn freely without requiring much force. Remove the half bearings, clean them and pollish them. Then clean them with gasoline.

CHECKING THE OUT-OF-ROUND OF A CRANKSHAFT MOUNTED IN THE ENGINE

FRONT END

For this check, it is sufficient to mount, under the forward bearing cover securing screw (bolt), a plate to support the gauges

The maximum out of round at the extreem end of the crankshaft should not exeed 5/100 mm = .0019685"

CAM SHAFT

Using a mild file or soft emery cloth, smooth the cams, and lightly scored bearing surfaces. also, bevel any chipped edges on the cam shaft. If there are large scores on the cams or bearings, replace the cam shaft.

PISTONS

Remove the rings, and replace them with ones which aren't shouldered, or ones which don't have excessive play. (more than 1 mm) at the break. Remove the carbon from the ton head with a scraper.

The pistons should be cleaned and checked, none should be more than 3/10 mm out of round, scored or, cracked or with enlarged wrist pin holes. If so discard them

Install the wrist pin in the piston. The new pins should be well lubricated before fitting them into the pistons. If there is excess play, these should be replaced.

Install the new rings in their slots making shure a play of ~~3.5~~ 3/10 mm exists which, after weaning in by hand in their respective cylenders will become 4/10 mm.

CYLINDERS

Check the bore of the cylenders, make shure they are round and not scored Check the measurements following any repairs.

VALVE COVERS AND HEADS

Replace any worn valve or pushrod guides.

? → Check the gudgeon pins with a lead hammer: change those which are loose.

ROCKER ARMS

All scored or chipped rollers must be replaced as well as ~~along with~~ their axels, which must be riveted with care

Check the rocker shafts and the rocker needles.

Valves

Clean the valves, replace those which have deformed, or whose stems have ovalized. When one needs to be replaced (when replacing valves), be sure to mark it (do not omit the reference marks). Grind all valves (lap all valves). Lap them in the following manner: garnish the seat (valve seat) of the valve with a past composed of water and "rodovite" and, with a special tool, attatch it to the valve, and place the valve in its valve guide, and seat Then while pushing on the valve, rotate it back and forth. From time to time lift up the valve, while continuing to turn it ~~in alternating directions~~ so that it doesn't continue to grind at only one point. A good valve grinding job will leave a ~~clear~~ seat with a uniform surface, free of all circular scores. When finnished grinding the valves, wash the valves and heads with Mineral oil, then remount the valves, and lubricate them.

Test the valves by pooring mineral oil around them to check for a good se

In case a change is needed in altering either the valve port (valve seat) or the valve, all repairs should be done with the appropriate machine.

MANIFOLDS

Replace the manifolds which are cracked. Thes cracks orrigionate at the holes where the bolts which attatch to the head pass through. Check the air tightness of the manifold with water under a pressure of 1 kilogram.

CHAPTER XVII

ASSEMBLY.

PRECAUTIONS FOR REASSEMBLY.

In the same manner in which the engine is dissassembled prior to taking the "partial assemblys" apart, reassembling the engine is preceeded by assembling the partial assemblies first, permitting the reassembly of the engine without any unnessecary stops.

In all cases, of prime importance is the cleanliness of all parts to be assembled, ie. all contacting surfaces, all adjoining surfaces, all plumbing lines, etc

It is allways these precautions, and the care used in rebuilding the engine which for the most part, gives the proper operation and long life of an engine

It is reccomended if one has access to an air compressor, to blow all dust out of the bores, or difficult to reach areas while assembling parts.

For wiping parts, never use worn or woolen rags which deposite flufs or strings as these are allways harmful

Oil all moving parts prior to reassembling.

SAFETY ALL SCREWS AND NUTS

All nuts or screws should be safetied using cotter pins or with galvanised iron, or cadmium wire of diameter not less than 8/10 mm. In some cases, the saftying is done by bending a piece of steel up against a face of the bolt or nut, thereby imobilizing it.

REASSEMBLING THE PARTIAL ASSEMBLIES.

CYLINDER HEAD.

Mounting the Valves.

- Grease the valve stems;
- Slide the stems to the intake valves 3.100.789, and Exhaust valves 3.100.791 into ther respective guides.;
- Turn the head right side up, while holding the valves in their guides

Fig 56 Assembly of the Valves and the half stop rings

- Place the valve on the plateau (valve spring compression tool base) 7.120.274 such that the bosses (spacers) hold the valves against their respective seats
- Attach the forward support bearing 7.120.257 to the plateau. Introduce the arm of the valve spring compressing arm into the forward support bearing and secure it with the pin 3.303.657. 6

CHAPITRE XVII

MONTAGE

PRÉCAUTIONS A OBSERVER AU MONTAGE

Au même titre que le démontage du moteur a été suivi du démontage des « Ensembles partiels », le montage du moteur est précédé d'une série de « Montages partiels préparatoires » qui permettent de procéder sans interruption à l'assemblage proprement dit du moteur.

Dans tous les cas, on ne saurait trop attirer l'attention des mécaniciens qui assurent le montage, sur l'importance primordiale de la propreté des pièces à assembler, des surfaces en contact, des plans de joint, des canalisations, etc.

C'est toujours des précautions et du soin apporté au montage que dépendent pour une grande part le bon fonctionnement et la durée d'un moteur.

Il est recommandé, si on dispose d'air comprimé, de s'en servir pour chasser les poussières qui peuvent se trouver au moment du montage dans des alésages ou des endroits difficilement accessibles.

Pour essuyer les pièces, ne jamais employer de chiffons laineux qui pourraient laisser des peluches toujours nuisibles.

Avant montage, huiler les pièces en mouvement.

FREINAGE DES ÉCROUS OU VIS

Tous les écrous ou vis doivent être freinés, les uns à l'aide de goupilles, les autres à l'aide de fil de fer zingué ou cadmié dont le diamètre doit être de 8/10 de mm. Dans certains cas, le freinage est réalisé en relevant une partie des freins en tôle et en l'appliquant contre une face de la pièce à immobiliser.

MONTAGES PARTIELS PRÉPARATOIRES

CULASSES

Montage des soupapes :

— Graisser les queues de soupapes ;

— Introduire les queues de soupapes d'admission 3.100.789 et d'échappement 3.100.791 dans les guides de soupapes correspondants ;

— Retourner la culasse en maintenant les soupapes par leur queue

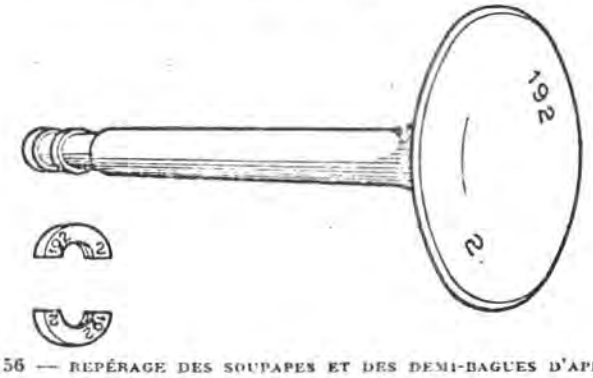


FIG. 56 — REPÉRAGE DES SOUPAPES ET DES DEMI-BAGUES D'APPUI

— Poser la culasse sur le plateau 7.120.274 dont les bossages maintiennent les soupapes sur leur siège respectif 65

— L'arrache-support de roulement avant 7.120.257 étant fixé sur le plateau, présenter le bras de levier de montage de soupape sur l'arrache-support et l'articuler à l'aide de l'axe 3.303.657 65

- Position: The support washer 3.301.768, The interior springs 3.011628 and exterior springs 3.011.629, and upper cap 3.011.631;
- Press down on the upper cap with the valve spring compressing tool
- Engage the half stop rings separately 3.010.066 into the groove in the valve stem.;
- Remove the valve spring compressor briskly, making certain the valve stop rings are properly seated.
- Proceed with the second valve, using the same proceedure

Reassembling the Starting Check Valve:

- Slide the check valve stem into its guide;
- Turn the head right side up, while maintaining the head of the valve in its seat.;
- Place the head on the base of the valve spring compressor (Plateau)

Fig. 57 Starter Check Valve Dissasembled

- Place the spring and the spring cap (Coupelle) in the proper manner
- Push down on the spring cap (coupelle) and compress the spring ... } screwdriver
- Place the key in its slot.
- Replace the cap (safety) which prevents the key from dropping out of place.

Reassembling the Rocker Arms, on the Rocker Arm Supports.

- Place the eye bolt 3.007.038 between the two support arms for the rockers, 3.100.345, and insert the pivot shaft 3.007.037;
- Put in place the two pivot shaft locking bolts 3.450.888 which run through the slots (grooves) corresponding to their proper location;
- Tighten down the nuts 7.028.542 on the stop bolts. Place washers 7.030.312. under the nuts ..... } 8mm wrench } 55
- Safety the nuts with cotter pins
- Apply a thick oil to the bearing on the rocker arm shaft, and add the 25 "Nadella" rollers 2 x 15.8.;
- Place the shim washers 3.002,432 or 3.300.648 on the shaft.
- Place the rocker arm 3.100.335 with its rollers on the shaft with the rocker arm end carrying the push rod adjustment facing

Towards the side of the rocker arm support which has the two holes for securing the support to the head.

- Put the second washer in place 3.002.431
- Install the stop ring.
- Proceed as above with the second rocker arm.

Mounting The Rocker Arm Assembly in the Head:

- Place the swiveling connector, Viet 4.994 on the starter check valve on the casing of the valve and between two washers 3.007.051 (copper or aluminum)
- Place the end of the short collumn 3.300.851 (with the seaze securing nut 3.007.052 screwed to the bottom) in the hole corresponding to the hole in the rocker box casing.
- Engage and screw into the valve casing the opposite end of the tube (the bell shaped end) } special wrench } 16

(1) This part permanently secured in the head do not dissasemble.

— Placer : la rondelle d'appui 3.301.768 des ressorts intérieurs 3.011.628 et extérieurs 3.011.629, la calotte supérieure 3.011.631 ;
— Appuyer sur la calotte supérieure avec le levier de montage des soupapes;
— Engager les deux demi-bagues d'appui de coupelle 3.010.066 sur le cordon de la queue de soupape ;
— Laisser remonter brusquement et vérifier que les demi-bagues sont bien à leur place;
— Procéder de même pour la deuxième soupape.

Montage du clapet de démarrage :

— Introduire la queue du clapet de démarrage dans son guide;
— Retourner la culasse en maintenant la tête de clapet sur son siège ;
— Poser la culasse sur le plateau de démontage ;

FIG. 57 — CLAPET DE DÉMARRAGE DÉMONTÉ

— Placer le ressort et la coupelle dans le sens convenable ;
— Faire coulisser la coupelle en comprimant le ressort . . . . . Tournevis
— Introduire la clavette dans son logement ;
— Laisser remonter la coupelle qui empêche la clavette de sortir de son logement.

Montage des culbuteurs sur le support de culbuteurs :

— Intercaler le boulon à œil 3.007.038 entre les deux bras du support de culbuteur 3.100.345 puis monter l'axe 3.007.037 ;
— Mettre en place les deux boulons 3.450.888 de serrage de l'axe, qui se trouve centré par les deux encoches correspondant à la position des deux boulons ;
— Serrer les écrous 7.023.542 des boulons d'arrêt de l'axe sur rondelles 7.030.312. . . . . Clé de 8 | 55
— Goupiller ;
— Garnir le logement de l'axe du culbuteur d'huile épaisse et placer les 25 aiguilles Nadella de 2×15,8 ;
— Engager la rondelle de réglage 3.002.432 ou 3.300.648 sur l'axe ;
— Engager le culbuteur 3.100.335 avec ses aiguilles sur l'axe, l'extrémité portant la rotule réglable se trouvant dirigée côté des deux trous de fixation du support de culbuteurs ;
— Mettre la seconde rondelle 3.002.431 ;
— Placer le jonc 3.002.430 ;
— Procéder de même pour le deuxième culbuteur.

Montage des supports de culbuteurs sur la culasse :

— Placer le raccord orientable Viet 4.994 de clapet de démarrage sur le corps de ce clapet et entre deux rondelles 3.007.051 (cuivre ou aluminium ;
— Introduire l'extrémité de la colonnette 3.300.851 (portant l'écrou 3.007.052 appui de carter, vissé à fond) dans le trou correspondant du carter de culbuteur ;
— Engager et visser l'extrémité opposée (en forme de cloche) sur le corps du clapet . . . . . Clé spéciale | 16

(1) Cette partie fixée définitivement dans la culasse, ne peut être démontée.

- Place the ~~tube~~ shielded tube (pushrod tube) into its slot in the rocker casing, bringing it within 1 mm approximately of the flexible coupling.
- Unscrew the nut 3.007.052 to put it up against the exterior face of the rocker box — special wrench 16
- Pick up the complete rocker assembly support;
- Screw in the ~~bolts~~ nuts 3.451.062 ~~Through~~ (on to) the two small collumns — special wrench 34
- Screw in the hex headed screws 3.451.061. which are secured and safety them. — 14mm wrench 59
- ~~Safety~~ Tighten the nuts on the collumns ~~By securing them~~ directly to the head — special wrench 16
- Tighten without forcing the nut 3.007.052 — special wrench 16
- Reinstall the ~~safety (the~~ stop 3007.054
- ~~Safety~~ Tighten the nut on the collumn over the starter check valve — special wrench 16
- Safety all screws and nuts

Reassembling the ~~exterior~~ Lower ~~Cover~~ Air Duct Supports (see page 131, Mounting the cylinder heads)

- locate the supports on the heads for the cylinders #1 (3.007.478) #2 (3.007.475) #3 (3.007.477) and #4 (3.007.487)
- Put in place the bolts 3.451.197, nuts 7.028.542, on ~~washers~~ lock washers, and washers 7.030.312 without tightening so as to permit later adjustments — 8mm wrench 18

PISTONS

Installing Stop Rings, and Piston Rings:

- Install a stop ring 3.001.485 in each piston on the side opposite the side of the piston head which carries the cylinder number (each piston

cylinder number
Part number
Piston weight
Bore
Top or outside

Engine Number
Cylinder number
Bottom or inside

Fig. 58 Markings on Pistons

is marked with the number of its corresponding cylinder, repeated on the interior of the piston on the wrist pin boss, and on the outside on the head of the piston);

- Place the rings in their respective grooves, beginning with ring 3.301.880 (oil ring) which rests in the groove pierced with holes. Install it with the ring expanding pliers.
- Place the two conical (beveled) compression rings 3.301.878 one with the cut facing right, the other with the cut facing left. Install them according to the following, in order to avoid any errors, the rings are engraved with a "O" or "HAUT" on one side near the break. This face corresponds to the side which is the narrower of the two (due to the beveled, or conical edge of the ring), and is the side which should face the piston head.
- Place the flat (cylindrical) compression ring 3.301.877 on the piston

3

— Engager un tube-gaine dans son logement du carter et en approcher à 1 mm. environ le raccord orientable ;		
— Dévisser l'écrou 3.007.052 pour obtenir son application sur la face extérieure du carter.	Clé spéciale	16
— Présenter le support de culbuteurs complet ;		
— Visser les écrous 3.451.062 sur les deux colonnettes	Clé spéciale	34
— Visser la vis six pans 3.451.061 et la bloquer	Clé de 14	59
— Bloquer l'écrou *de la colonnette fixée directement dans la culasse* . .	Clé spéciale	16
— Serrer *sans forcer* l'écrou 3.007.052	Clé spéciale	16
— Relever le frein 3.007.054 ;		
— Bloquer l'écrou de la colonnette sur clapet de démarrage.	Clé spéciale	16
— Freiner vis et écrous.		
Montage des supports inférieurs de capot (*voir suite page 131. Montage des culasses*) :		
— Présenter les différents supports sur culasses des cylindres n° 1 (3.007.478), n° 2 (3.007.475), n° 3 (3.007.474) et n° 4 (3.007.487) ;		
— Mettre en place les boulons 3.451.197, écrous 7.028.542 sur rondelles Grower et rondelles 7.030.312 sans bloquer pour permettre leur alignement ultérieur	Clé de 8	18

PISTONS

Montage d'un jonc et des segments :

— Introduire un jonc d'arrêt 3.011.485 dans chaque piston du côté opposé au repérage du piston par son numéro de cylindre (chaque piston a son repérage de numéro de cylindre correspondant, répété deux fois, à l'intérieur sur le bossage d'axe de piston, à l'extérieur sur la tête du piston) ;

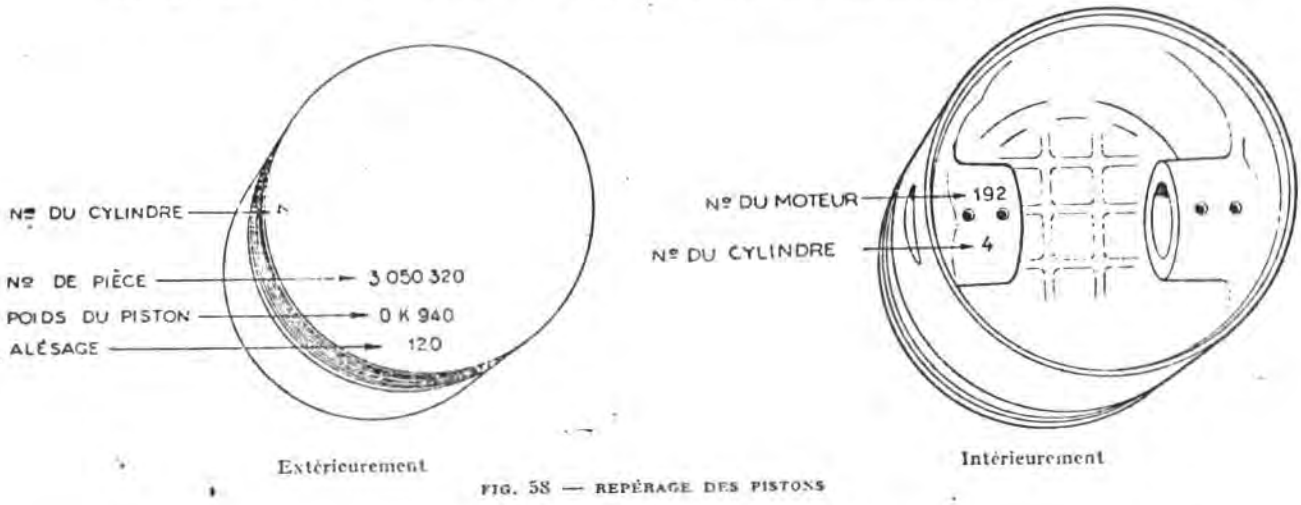


FIG. 58 — REPÉRAGE DES PISTONS

— Placer les segments dans leur gorge respective en commençant par le segment 3.301.880 qui se trouve dans la gorge percée de trous et en se servant de la pince.		3
— Placer les deux segments d'étanchéité côniques 3.301.878, l'un coupé à droite, l'autre coupé à gauche, suivant les indications suivantes ; pour éviter toute erreur, ces segments portent soit un O, soit l'indication HAUT gravée sur une face près de la coupe. Cette face correspondant à la face la plus étroite du segment cônique doit être placée de manière à se trouver dirigée vers la tête du piston ;		
— Placer le segment d'étanchéité cylindrique 3.301.877.		

Fig. 59 Markings and Installation of Piston Rings.

CRANK SHAFT

Installing The Propellor Hub Key.

- Place The key 3.003.800 in The groove (locate The engine number and type markings) on The tapered end of The crankshaft;
- Screw in The securing screw 3.452.417 | Screwdriver

Fig. 60. Markings on The Crankshaft and key.

Installing The Bushings on The Crankshaft.

a) Crank Pins

- Heat The entire area around The bushings 3.007.285 as well as The gasket area 3.008.701 on The crankshaft.
- Put The paper gasket in place.
- Install into The bushing The securing pin 3.005.085 which had previously been pushed Through washer 7.030.303

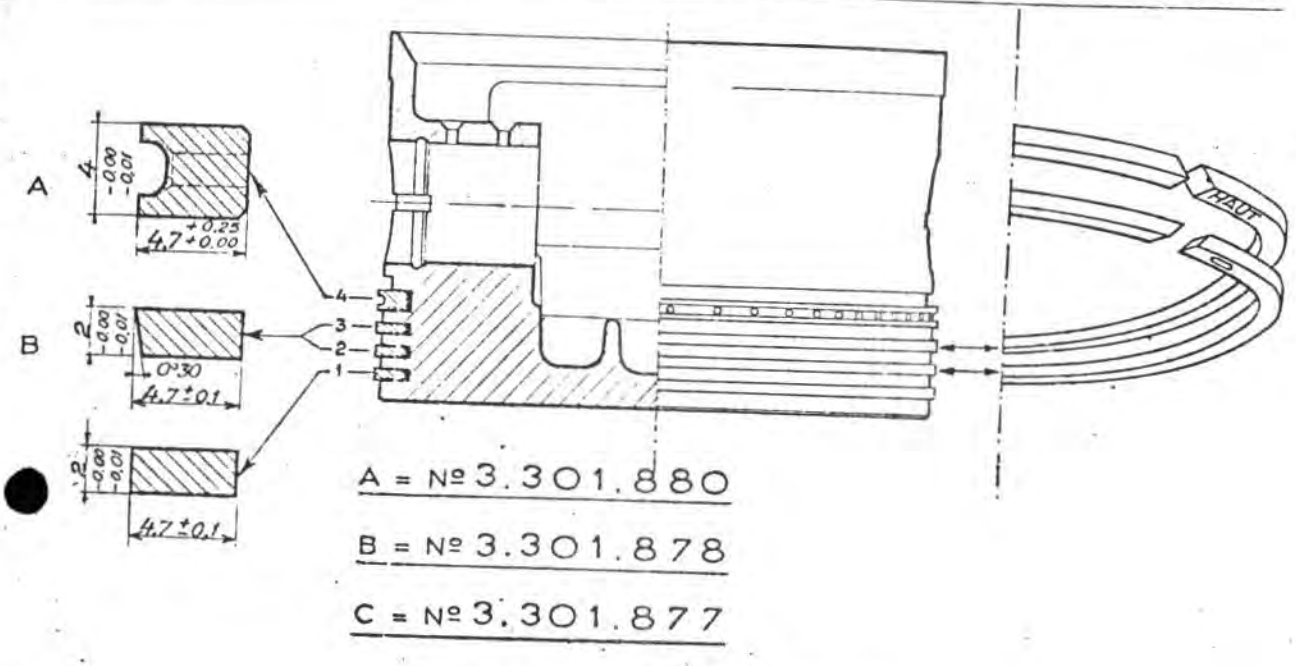


FIG. 59 — REPÉRAGE ET MONTAGE DES SEGMENTS

VILEBREQUIN

Montage de la clavette :

— Mettre en place la clavette (repérée au type et numéro de moteur) 3.003.800 dans son logement sur le cône du vilebrequin ;
— Visser la vis 3.452.417. . . . . } Tournevis

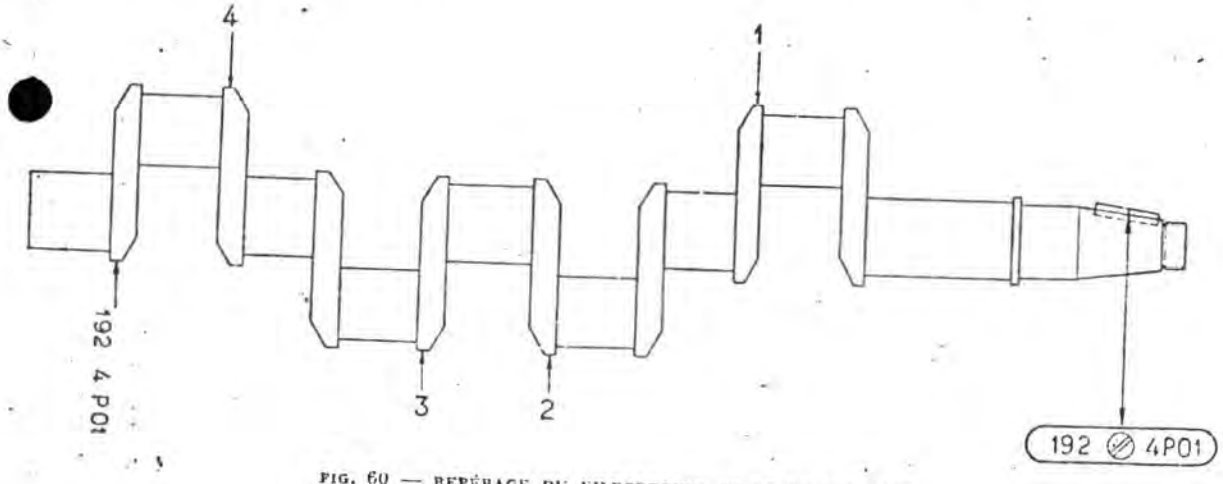


FIG. 60 — REPÉRAGE DU VILEBREQUIN ET DE LA CLAVETTE

Montage des bouchons sur vilebrequin :

a) *Maneton*

— Enduire d'hermétic les faces d'appui des bouchons 3.007.285 et l'emplacement du joint 3.008.701 sur le vilebrequin 3.007.271 ;
— Mettre en place les joints-papier ;
— Introduire dans un bouchon la tige de fixation 3.005.085 préalablement passée dans la rondelle 7.030.303 ;

(make certain) (To check the oil tightness at the passage (area where the rod passes through) of the rod (crank pin), take a small asbestos string and ~~wrap~~ wrap two turns around the washer and the bushing
- Put the assembly in its place
- Install the opposite bushing.
(Make certain of)
- Check the oil tightness by installing the asbestos string.
- Install the washer 7.030.303.
- Screw in the bolt 7.028.603 } 12 mm wrench } 58
- Cotter Pin ⅛.

b) Crankshaft Bearings (rod portion)
- Proceed with the bushings for the crankshaft bearings 9.007.286 as with the crank pin bushings except using gasket 3.008.702 and securing pin 3.005.086.

Test of Oil Circulation.
- Introduce (feed) oil into the bearing surfaces of the crank shaft at the second (2) and fourth (4) main bearings on the crankshaft and check for a free flow of oil at crank pin locations 1-2, and 3-4
- Check ~~the proper~~ for leaks at the joint to all bushings in the crank pin, and crank shaft bearings.

Mounting of Connecting Rods on the Crankshaft
a) Markings on the connecting rods.
- At the front, ~~and~~ on the ~~bearing cap~~ key. is the type of engine and ~~cylinder~~ engine number
- AT the rear, on the rear arm of the fourth (4th) crank pin and fifth (5th) bearing pin, on each arm (crank) near each crank pin the cylinder number as well as the engine type and engine number

Cylinder Number

Number of Engine	Type & Engine Number	Weight of total Push rod (mounted)	Engine number	Engine Type

Fig 61 Markings on Connecting Rod and Bearing Halfs

b) Marking On Connecting Rods

- On each bearing cap on one side near the bearing joint is the cylinder number, Engine number and type is located near the bulge (along the edge, but centered between bearing ends).
- On each connecting rod, on one side only near the bearing joint is the cylinder number, Engine number, Engine type are marked along the inside of the I section (The connecting rod bushings (bearings) remain fixed on the connecting rod even when dissasembled

c) Markings on Connecting rod end half bearings.
Markings of the cylinder number and engine number and type are seen on that portion of the bearing halves which extends beyond connecting rod, when mounted. These are the same as on the connecting rod.

(Pour assurer l'étanchéité au passage de la tige, prendre du petit fil d'amiante avec lequel on fera deux tours entre rondelle et bouchon).
— Mettre l'ensemble en place ;
— Présenter le bouchon opposé ;
— Assurer l'étanchéité avec le fil d'amiante ;
— Mettre la rondelle 7.030.303 ;
— Visser l'écrou 7.028.603 . . . . . Clé de 12 58
— Goupiller.

b) *Tourillons*
— Procéder de même pour les bouchons 3.007.286 de tourillons avec joint 3.008.702 et tige de fixation 3.005.086.

Essai de circulation d'huile :
— Introduire de l'huile dans les tourillons des paliers 2 et 4 du vilebrequin et s'assurer que l'huile coule librement aux manetons 1-2 et 3-4 ;
— Vérifier l'étanchéité des bouchons de tourillons et manetons.

Montage des bielles sur le vilebrequin :

a) *Repérage du vilebrequin*
— *A l'avant*, sur la clavette, type de moteur et son numéro ;.
— *A l'arrière*, sur le dernier bras reliant le quatrième maneton au cinquième tourillon, sur un seul bras vers chaque maneton le numéro du cylindre correspondant ainsi que le numéro et type de moteur.

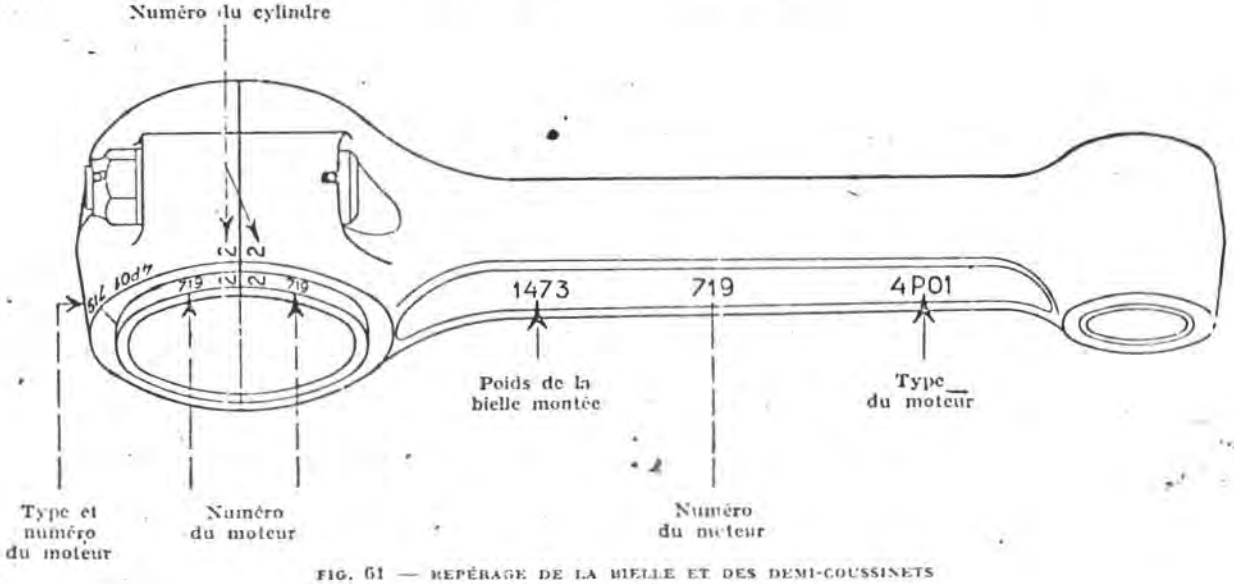


FIG. 61 — REPÉRAGE DE LA BIELLE ET DES DEMI-COUSSINETS

b) *Repérage des bielle*
— Sur chaque chapeau de bielle et d'un seul côté, numéro du cylindre vers le plan de joint, numéro de moteur et type sur la partie bombée du chapeau ;
— Sur chaque corps de bielle et d'un seul côté, numéro de cylindre vers le plan de joint, numéro de moteur et type vers le milieu de la section I du corps de bielle (les boulons de bielles restent emmanchés sur la bielle lors du démontage).

c) *Repérage des demi-coussinets de bielles*
— Sur la partie des demi-coussinets qui dépasse la tête de bielle une fois montée, en regard du repérage porté sur la bielle elle-même, numéro de cylindre, numéro de moteur et type en suivant.

d) Assembly

- Support the crankshaft by its two ends to allow the mounting of the connecting rods
- Begin mounting the connecting rods on the crankshaft, while making certain the bearing halves, connecting rod, and rod cap, and crankshaft numbers match, including the cylinder numbers
- Crank pins 1-2 are marked on the rear ~~of the~~ arms (cranks) and 3-4 on the ~~forward~~ forward arms (cranks) of the crank pin
- ~~Attach~~ Place the connecting rod 3.002.292 complete with bushings 3.002.331 and half bearing ~~to the bearing cap~~ 3.002.285 to the proper numbered crank ping on the crankshaft.
- ~~Attach~~ Place the connecting rod bearing cap 3.002.293 complete with half bearing on crankshaft.
- Bolt two halves together with bolt 3.451.195 and washer 3.451.196 and tighten down } 14mm wrench } 68
- Cotter pin it.

MAIN CASE (ENGINE BLOCK)

Mounting Engine Support on BLOCK.

- Place on the block the 4 engine supports 3.008.481
- Place safeties for the nuts 3.300.695 in place on all groupes of two nuts except for the pair at the front right.

Mounting the Arm, and Starter Tube Supports

- Put in place the support to the Starter tubes 3.008.684
- Screw down the nuts 3.450.858 } 14mm wrench 14mm flat wrench } 59
- Bend up the safeties
- Mount (keeping in mind the pipe from the compressor to the resevoir as well as the pipe from the resevoir to the distributor) on the mounting arm the two (2) clamp supports 3.008.685 with the bolt 3.019.176, washer 7.030.301 and nut 7.028.601 } 9mm wrench 56

Fig. 62. Supporting Rear Case in a Vice. (1st view)

REAR CASE

SUPPORT THE REAR CASE WITH THE INTERIOR FACING DOWN USING THE REAR CASE SUPPORT TOOL IN A VICE.

Mounting the Oil Pumps

a) Scavenging Pumps (removes oil from casing)

- Insert the already oiled, oil pump drive shaft 3.007.157 into the pump casing. The (fiber) wired portion goes into the rear casing.

d) *Assemblage*

— Maintenir le vilebrequin 3.007.271 à ses deux extrémités pour permettre le montage des bielles ;
— Commencer le montage des bielles en ayant soin de faire coïncider les repères des demi-coussinets, corps et chapeau de bielle, avec celui du vilebrequin, *tous les repères* se trouvant groupés du côté où le numéro de cylindre est lui-même repéré sur le vilebrequin ;
— Les manetons 1-2 sont repérés sur le bras arrière et 3-4 sur le bras avant ;
— Présenter le corps de bielle 3.002.292 avec ses boulons 3.002.331, muni du demi-coussinet de corps de bielle 3.002.285 sur le maneton correspondant du vilebrequin ;
— Mettre en place le chapeau de bielle 3.002.293 muni du demi-coussinet de chapeau de bielle 3.301.735 ;
— Visser sur rondelles 3.451.196 les écrous 3.451.195. . . . . | Clé de 14 | 68
— Goupiller.

CARTER PRINCIPAL

Montage des pattes support-moteur sur carter

— Mettre en place les 4 pattes support-moteur 3.008.486 ;
— Mettre les freins d'écrous 3.300.695 en place sur tous les groupes de deux écrous, sauf sur ceux du bas de la patte AV droite.

Montage de la patte et des supports des tubes de démarreur :

— Mettre en place la patte-support 3.008.684 des tubes de démarreur ;
— Visser les écrous 3.450.858. . . . . | Clé de 14 | 59
— Relever les freins ; | Clé plate de 14 |
— Monter (en attente des tubes de départ du compresseur vers le réservoir et du réservoir vers le distributeur) sur la patte-support, les deux supports de serrage 3.008.685 avec le boulon 3.019.176, la rondelle 7.030.301 et l'écrou 7.028.601 . . . . . | Clé de 9 | 56

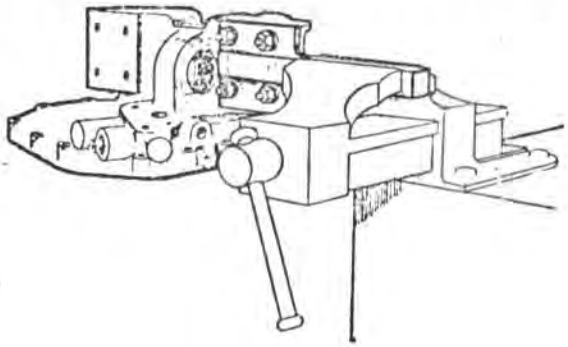


FIG. 62 — FIXATION DU CARTER ARRIÈRE DANS L'ÉTAU (1re VUE)

CARTER ARRIERE

SERRER LE BRAS-SUPPORT DE CARTER DANS L'ÉTAU, LA PARTIE INTÉRIEURE DU CARTER ÉTANT DIRIGÉE VERS LE SOL.

Montage des pompes à huile :

a) *Pompes de vidange*

— Introduire dans son logement du carter de pompe, l'arbre de commande 3.007.157. de la pompe préalablement huilée, la partie filetée allant à l'intérieur du carter arrière ;

- Put in place on their shafts, the pinions 3.007.151 and sleves in accordance with the respective timing marks (The reference marks on the top edge of the center gear (Teeth) should be engaged between teeth next to the dot on th face of the outer gears, resulting in a strait line between the 4 dots on the three gears).
- Hermetically seal (tightly seal) the face to the casing (corps) of the pump. 3.010.557;
- Place the pump core in its proper location.

Fig. 63 Markings on the oil pump gears.

b) Pressure Pump.

- Place in position on the drive shaft, according to the markings, the key 3.007.154 which drives the pinion gear.
- Install the pinion 3.007.153
- Install the idler pinion 3.007.152 and sleeve making certain that the timing marks on the gear face coincide., as with the scavenging pump; 3.010.843
- ~~Seal the lid onto the casing, using the gasget~~
- ~~Place on the lid the 7 washers 7.030.301~~
- Put a sealer on the flat of the cover gasket 3.010.843
- Put in place the cover and the seven washers 7.030.301
- Screw down the 7 nuts 7.028.601 and nut 7.028.501 — 9 mm wrench — 5
- Put the gasget in place 3.008.420
- Screw down the blind nut 3.452.262 — 9 mm wrench — 56
- Place the double (two) lugs (stops or catches) on the gudgeons facing the connection to the oil marked "E", then screw the collumn ~~onto~~ 3.015.556 onto the gudgeon which is to the right of the coupling drive — flat wrench 9 mm

Fig. 64 Mounting Rear case in a Vise (2nd view)

— Mettre en place sur leurs axes les pignons fous 3.007.151 bagués, en ayant soin de respecter les repères d'engrènement (les points de repères qui se trouvent sur une face de l'extrémité d'une dent doivent coïncider avec ceux qui se trouvent sur une face vers le fond des deux dents dans lesquelles elle engrène ; le montage terminé, les 4 points doivent se trouver sur une ligne droite) ;		
— Enduire d'hermétic la face d'appui du corps de pompe 3.010.857 ;		
— Mettre en place le corps de pompe.		

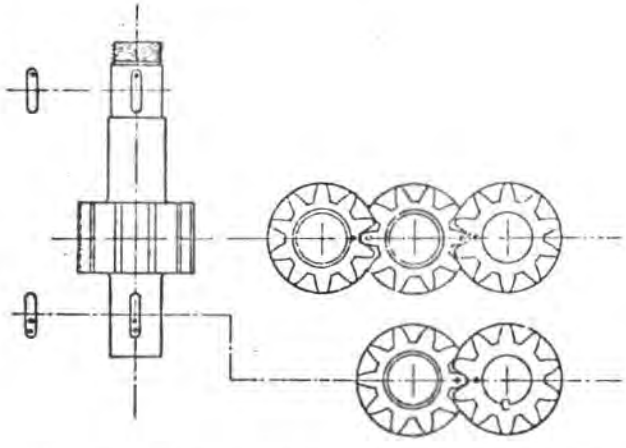


FIG. 63 — REPÉRAGE DES PIGNONS DE POMPES A HUILE

b) Pompe de pression		
— Mettre dans son logement sur l'arbre de commande et en respectant les repères, la clavette 3.007.154 d'entraînement du pignon marquée d'un point ;		
— Placer le pignon 3.007.153 ;		
— Placer le pignon fou 3.007.152 bagué en ayant soin de faire coïncider les points de repères, comme pour les pignons de la pompe de vidange ;		
— Mettre de l'hermétic sur le plan de joint du couvercle 3.010.843 ;		
— Mettre en place le couvercle, les 7 rondelles 7.030.301 ;		
— Visser les 7 écrous 7.028.601 et l'écrou 7.028.501	Clé de 9	56
— Mettre en place le joint 3.008.420 ;		
— Visser l'écrou borgne 3.452.262.	Clé de 9	56
— Mettre en place sur les goujons face au raccord d'entrée d'huile marqué E, l'arrêtoir double 3.015.555, puis visser la colonnette 3.015.556 sur le goujon qui se trouve à droite de l'axe du raccord	Clé plate de 9	

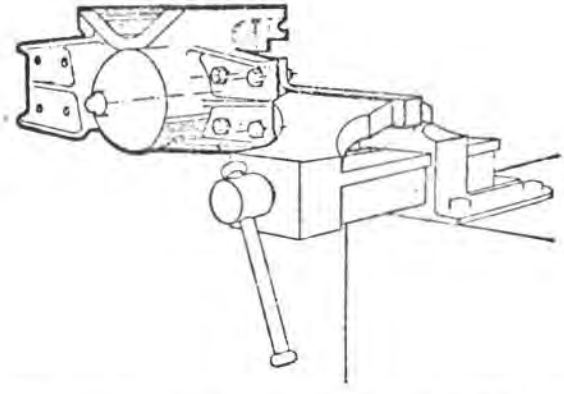


FIG. 64 — FIXATION DU CALTER ARRIÈRE DANS L'ÉTAU (2e VUE)

TURN THE CASING UPSIDE DOWN (SUCH THAT THE INERIOR FACES UP)

Installing The Oil Pump Drive Gears

- Check The markings on The side of The pinion gear and be sure They contain. The engine number and type
- Put in place The key 3.007.154 which contains 2 Dots (marks)

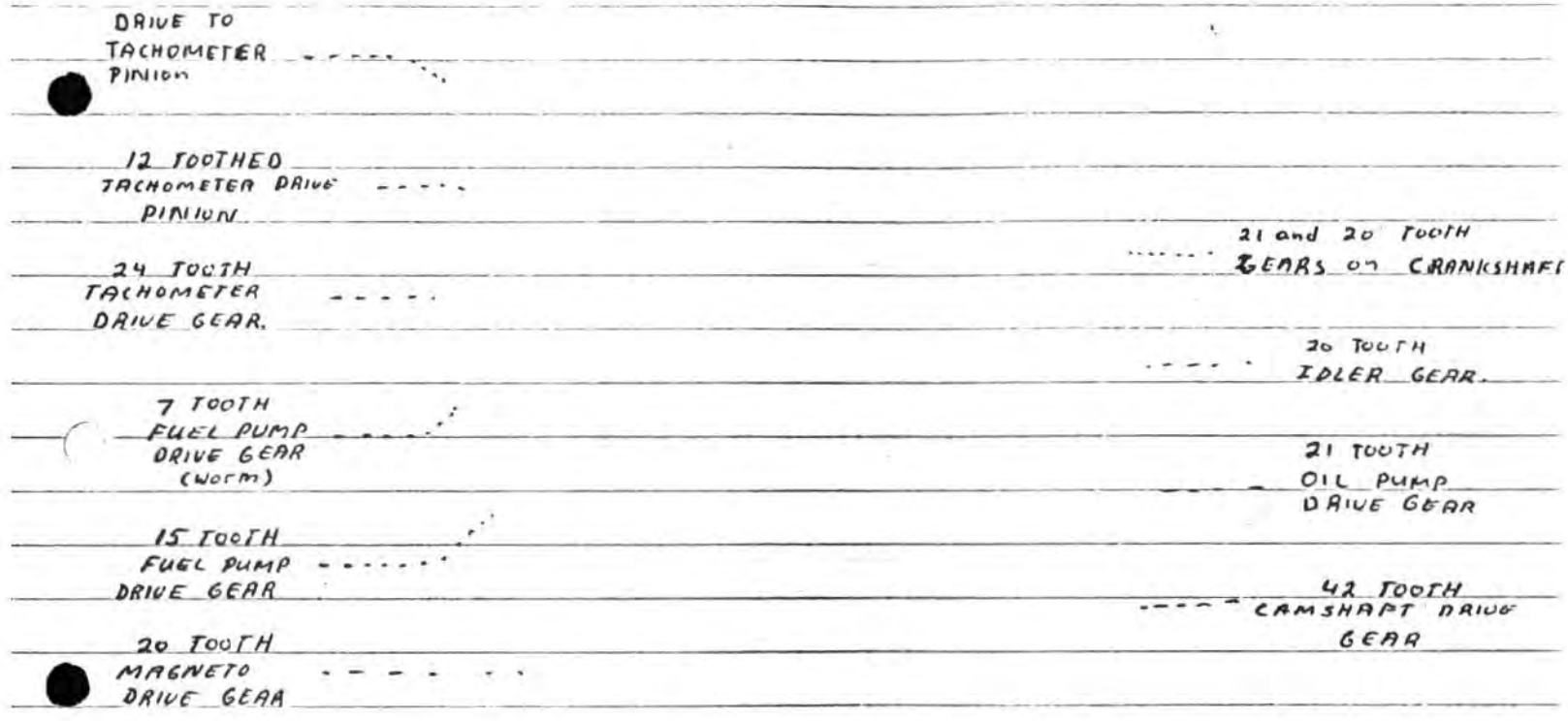


Fig 45 Schematic of Drive Train

- Install gear 3.007.159 with The shouldered section facing The casing
- Install The long portion of the coupling (catch or stop) 3.005.324 into the hole (groove) leading to the gear, and push The stop (coupling) into place
- Screw down The nut 3.005.297
- Block The nut ~~and immobilize The pinion gear~~ and secure The pinion gear on the shaft.

} Stamped wrench (Crowned socket) } 42

RETOURNER LE CARTER (L'INTÉRIEUR SE TROUVE DIRIGÉ VERS LE HAUT).

Montage de la roue de commande des pompes à huile :

— Vérifier le repérage du pignon qui comprend sur une face latérale l'indication des type et numéro de moteur ;
— Mettre en place la clavette 3.007.154 marquée de 2 points ;

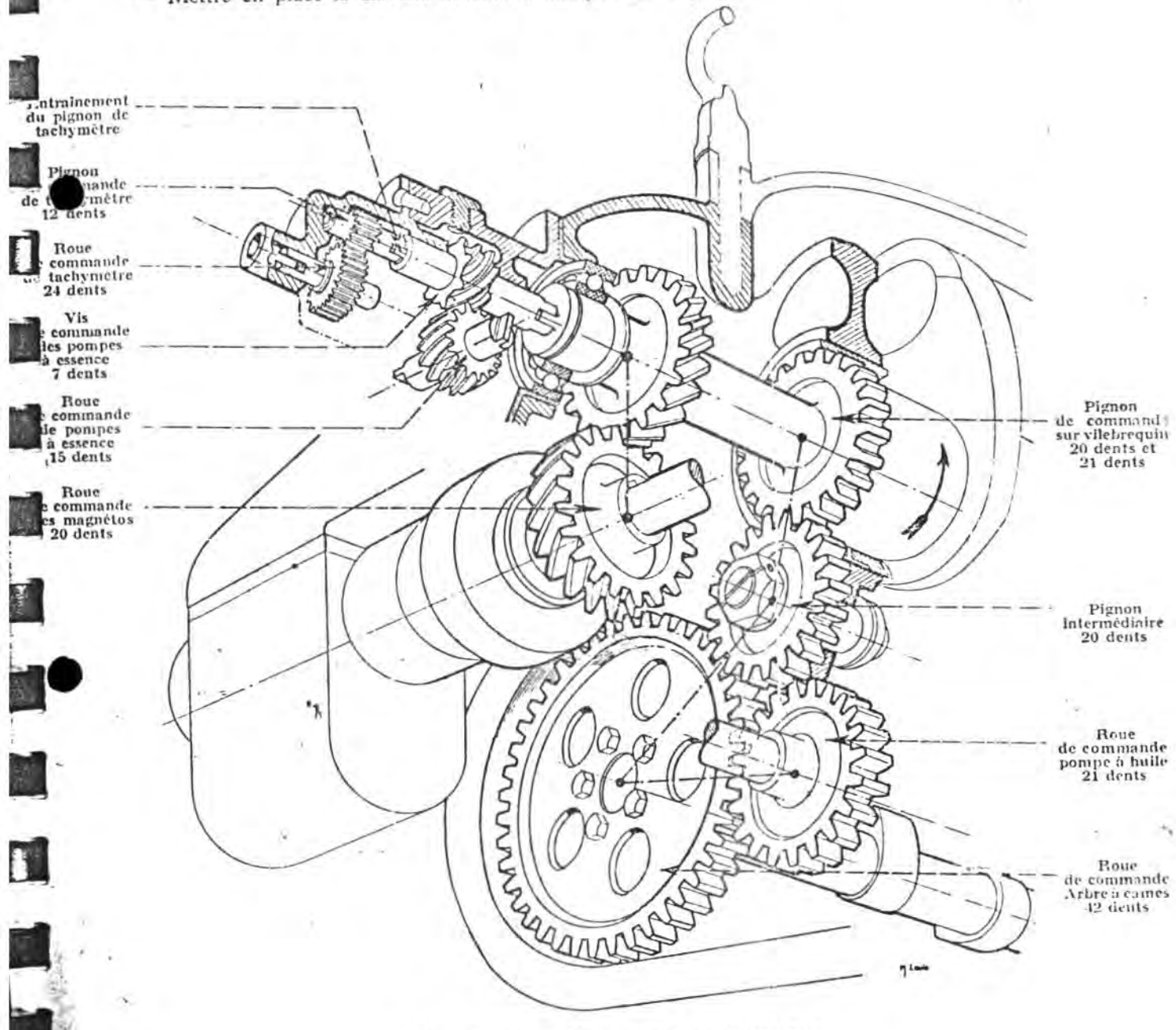


FIG. 65 — SCHÉMA DE L'ENSEMBLE DE LA DISTRIBUTION

— Mettre la roue 3.007.159 en place, la partie épaulée étant dirigée vers le carter ;
— Introduire la partie la plus longue de l'arrêtoir 3.005.324 dans le trou qui se trouve sur le pignon et mettre l'arrêtoir en place ;
— Visser l'écrou 3.005.297 ;
— Bloquer l'écrou en immobilisant le pignon. . . . . Clé à empreinte 42

- Check the freedom of movement of the assembly.
- Release the stop (catch pawl)

TURN THE CASING OVER (SUCH THAT THE INTERIOR IS FACING DOWN)

Fig 66 Location of Rear Case in Vice (3rd view)

- Complete the ~~tightening~~ process of progressively tightening the nuts, the blind nut, and small collumn (stud) (torquing all evenly, running around to all the nuts a number of times) and then check for the freedom of movement of the assembly — 9mm wrench, 9mm flat wrench
- Bend the lower tab of the stop ring against the case, bend the upper tab against the ~~her~~ next side of the collumn (stud)
- Next, safety the two nuts in sequence., with the third being safetied at the same time as the limiting bushing.

MOUNT THE CASE SUPPORT ARM IN THE VICE SUCH THAT THE CASE RESTS WITH THE OIL ~~REED~~ INTAKE AND DISCHARGE OUTLETS ARE AT THE TOP.

Fig 67 Location of Rear Casing in Vice (4th view)

Installing the Magneto Drives

- Install the gasket 3.006.436, after having coated the facing surfaces with gasket sealer.
- Place the bearings SRO 6004 in their casing (races) 3,005.305 (The casings are marked with the engine number and the letters D (right) or G (left) corresponding to the letters on the openings in the rear casing.).
- Install the casing (bearing race) in its slot in the rear case.
- Install the drive gear 3,007.210 (Also, if needed, one or more washers may be added as shims)

— Vérifier le libre fonctionnement de l'ensemble
— Relever l'arrêtoir.

RETOURNER LE CARTER (L'INTÉRIEUR SE TROUVE DIRIGÉ VERS LE SOL).

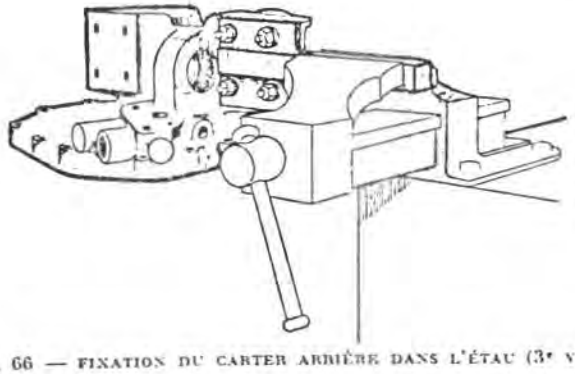


FIG. 66 — FIXATION DU CARTER ARRIÈRE DANS L'ÉTAU (3e VUE)

— Terminer le serrage progressif des écrous, écrou borgne et colonnette, en vérifiant le libre fonctionnement de l'ensemble . . . . . Clé de 9 / Clé plate de 9 — 56
— Freiner en rabattant l'arrêtoir double : vers le bas, sur le carter du côté de l'écrou ; vers le haut, sur le six pans de la colonnette ;
— Freiner les écrous en commençant par celui serrant l'arrêtoir double et en continuant dans le sens des aiguilles d'une montre jusqu'à la colonnette ;
— Freiner ensuite deux des écrous qui se trouvent en contrebas (en bas), le troisième n'étant freiné qu'en même temps que le bouchon du limiteur.

SERRER LE BRAS-SUPPORT DANS L'ÉTAU, LES ENTRÉE ET SORTIE D'HUILE DIRIGÉES VERS LE HAUT.

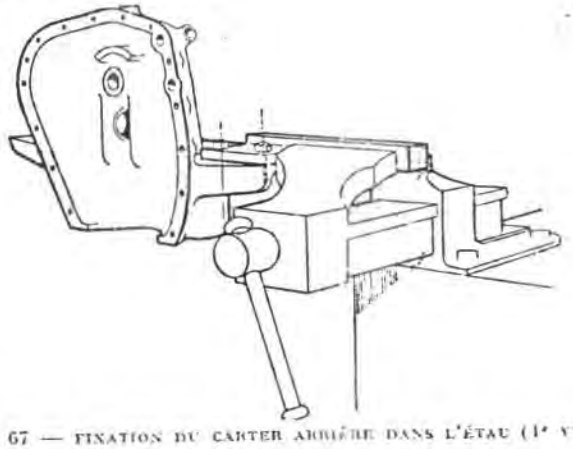


FIG. 67 — FIXATION DU CARTER ARRIÈRE DANS L'ÉTAU (1e VUE)

Montage de l'entraînement des magnétos :

— Mettre en place les joints 3.006.436 après avoir enduit d'hermétic les faces d'appui ;
— Mettre les roulements SRO 6004 dans leurs cages 3.005.305 ;
(Les cages sont marquées des numéros de moteur et des lettres D ou G correspondant respectivement aux mêmes indications portées sur le carter) ;
— Introduire une cage avec roulement dans son logement ;
— Mettre en place la roue de commande 3.007.210 (avec, s'il y a lieu la ou les rondelles de réglage à répartir de chaque côté, lorsqu'il y a plusieurs rondelles) ;

- Install the key 3.008.627 ~~which is marked~~ into its slot on the cross shaft (3.005.301) which is marked with a D (right) and G (left) at its respective ends.
- Install the pinion gear onto the keyed cross shaft, with respect to the proper D-D and G-G alligment between gear and cross shaft.
- Install the second bearing and casing (race) assembly.
- Make sure the gear turns freely.
- Adjust (center) the ~~roller~~ bearing-rod assembly before installing the bearing covers 3.005.303 and gaskets 3.006.435;
- Install the gaskets to the bearing cases and covers after coating the gaskets with gasket sealer
- Place the bearing covers over the bearings
- Install the washers, and screw in the ~~bolts~~ 7.028.601 } 9mm wrench } 5
- Check the centering (alligment) of the shaft in the bearings.
- Cotter pin it.

INSTALL THE REAR CASE SUPPORT IN A VICE SUCH THAT THE OIL OUTLETS FACE DOWN.

Fig 68 Location of Rear Case in Vice. (5th view)

- Put in place the Right ? drive flange - 3,007,274 (no adjustment on this side) and the adjustible left drive ? flange (plate) 3.007.287 with the drive portion 3.005.310 on the magneto shaft.
- Introduce the Tightenning ? rod (wrench) {3.005.302} for the drive gear into the drive flange, the head of the rod should be facing to the right.
- Screw down (to the left) the nut 3.000.503 while holding the head still with the special wrench } 14mm wrench } 6 4
- Check for free movement of the drive line

Fig 69 Location of Rear Case in vice (6th view)

— Mettre dans son logement sur la bague entretoise 3.005.301, la clavette 3.008.627 repérée respectivement à chaque extrémité, G et D ; — Introduire la bague clavetée dans le pignon en respectant les repères G et D ; — Mettre en place la deuxième cage avec son roulement ; — Vérifier le libre fonctionnement de la roue ; — Centrer l'ensemble Axe-Roulements avant de mettre en place les couvercles 3.005.303 des roulements avec leurs joints 3.006.435 ; — Mettre en place les joints après avoir enduit d'hermétic les faces d'appui des cages et couvercles de cages ; — Poser les couvercles de roulement ; — Mettre les rondelles 7.030.301, visser les écrous 7.028.601.	Clé de 9	56
— Vérifier le centrage de l'axe dans les roulements ; — Goupiller. METTRE LE BRAS-SUPPORT DE CARTER DANS L'ÉTAU, LES ENTRÉE ET SORTIE D'HUILE ÉTANT DIRIGÉES VERS LE BAS.		

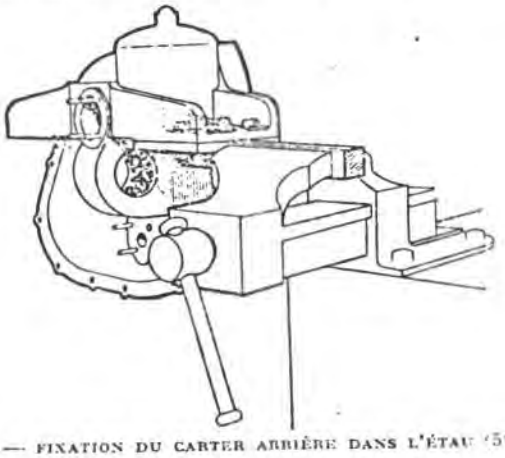


FIG. 68 — FIXATION DU CARTER ARRIÈRE DANS L'ÉTAU (5e VUE)

— Mettre en place le plateau d'entraînement DROIT 3.007.274 (ne comportant pas de réglage) et le plateau d'entraînement réglable GAUCHE 3.007.287 avec la pièce d'entraînement 3.005.310, sur arbre de la magnéto ; — Introduire la tige de serrage 3.005.302 de la roue de commande dans les plateaux d'entraînement, la tête de la tige étant du côté droit ; — Visser (côté gauche) l'écrou 3.000.503 en ayant soin de maintenir la tête à l'aide de la clé spéciale	Clé de 14	68 46
— Vérifier le libre fonctionnement de l'entraînement.		

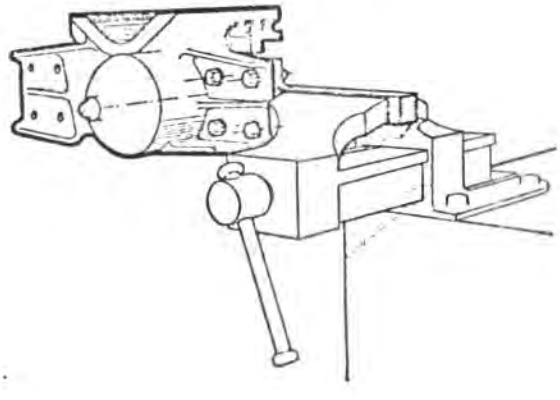


FIG. 69 — FIXATION DU CARTER ARRIÈRE DANS L'ÉTAU (5e VUE)

TOURNER LE CARTER, L'INTÉRIEUR DU CARTER ÉTANT DIRIGER VERS LE HAUT.

Montage des tuyauteries de graissage :

a) *Tube d'arrivée d'huile au filtre et ajutage de graissage de la roue de commande des magnétos :*

— Mettre en place les joints 3.012.073 (des brides de crépine) et 3.012.074 (des brides de filtre) ;
— Visser les écrous 7.028.601 sur rondelles 7.030.301 côté limiteur. . | Clé de 9 | 49
— Visser les vis 3.452.412 (tête carrée) côté crépine d'huile. . . . . | Clé spéciale | 52
— Freiner ;
— Visser les vis 3.425.411 (six pans) de l'entretoise d'ajutage de graissage de roue de magnéto. . . . . | Clé de 8 | 55
— Freiner.

b) *Tube de départ d'huile :*

— Mettre en place les joints 3.012.073 (des brides de crépine) et 3.012.074 (des brides de filtre) ;
— Visser les vis 3.452.412 (tête carrée) côté limiteur . . . . . | Clé spéciale | 43
— Visser sur rondelle 7.030.301 les écrous 7.028.601 côté crépine . . . | Clé de 9 | 56
— Freiner.

RETOURNER LE CARTER ARRIÈRE DONT L'INTÉRIEUR EST MAINTENANT VERS LE SOL.

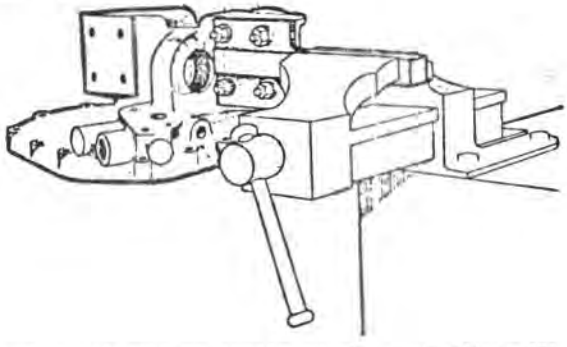


FIG. 70 — FIXATION DU CARTER ARRIÈRE DANS L'ÉTAU (7e VUE)

Montage sur le carter support des magnétos, du pignon de commande sur vilebrequin :

— Introduire le roulement 6.205 SKF ou SRO dans la cage 3.007.202.

Moteurs 4 P 01, 4 P 03, 4 P 05, munis de pompe à vide — Introduire le roulement 6.304 SKF dans la cage 3.007.202 ;

— Mettre de l'hermétic sur les plans de joint du carter et de la cage du roulement ;
— Mettre en place le joint papier 3.008.695 ;
— Mettre en place la cage portant le roulement dans son logement ;
— Visser provisoirement deux écrous 7.028.602 diamétralement opposés sur la bague de retenue du roulement remplaçant l'épaisseur de la bride qui est montée ensuite . . . . . | Bague | 53 | Clé de 10 | 57

Ce montage est obligatoire afin d'éviter, une fois le montage du pignon terminé, que le jeu du roulement non maintenu dans sa cage permette le cisaillement du tuyau alimentant le gicleur, par la face de la roue de commande du pignon intermédiaire.

RETOURNER LE CARTER DE DISTRIBUTION DONT L'INTÉRIEUR SE TROUVE DIRIGÉ VERS LE HAUT.

TURN THE CASING SUCH THAT THE INTERIOR IS FACING UP

Mounting The Lubricating Pipes

a) filter feed pipe and oil nozzle to the magneto drive gears

? - Install the gasket 3.012.073 (~~compred~~ ties (straps?) to the strainer) and 3.012.074 (ties of the filter)

- Screw down the nuts 7.028.601 onto the washers 7.030.301 onto the safetys (safeties on the side of washers - a tabs) | 9mm wrench | 4

? - Screw in the bolts (square heads) on the oil strainer ~~bar (straps)~~ | Special wrench | 5

- Safty them

- Screw down the (hex head) bolts 3.425.411 of the cross shaft for the ~~oil~~ lubrication nozzle (port) for the magneto drive gear. | 8mm wrench | 5

- Safety them

b) Return Oil line (to Resevoir)

? - Install the gaskets {3.012.073} (ties to the strainer) and 3.012.074 (ties to the filter)

- Screw the (square head) bolt 3.452.412 down to the safety (limiter) | special wrench |

- Screw the ~~nuts~~ bolts 7.028.601 down over the washers 7.030.301

? and against the strainer | 9mm wrench | 5

- Safety it

TURN THE REAR CASING SO THAT THE INTERIOR FACES DOWN

Fig. 70 Location of case in vice (7th view)

Mounting of The Magneto Supports, and crankshaft Driven Pinion Gears

- Install the 6.205 SKF, or SRO bearing in the casing (race) 3.007.202.

Engines 4P01, 4P03, 4P05 equiped with vaccum pump - Install 6.304 SKF Bearing in casing (race) 3.007.202

(- Put gasket seal on the flat which accepts the gasket, and on the bearing case

- Put the paper gasket in place 3.008.695
- Install the casing which contains the bearing.
- Temporarily install the two diametrically opposed bolts 7028 602

Fig 71 Location of Rear Case In Vice (8th view)

- Notice the markings on the helical drive gear (arrows marked on the ~~face~~ sides of two teeth) ~~and~~ as well as those on the drive gear (hash marks on the face of one tooth). When assembling the gears, they should be engaged such that the tooth with the marks on the drive gear should go between the two teeth with arrows on the pinion gear

View of the Front

Markings on crankshaft mounted pinion gear and magneto drive gear

Markings on bearing casings.

Markings on carry Through ring and magneto drive gear shaft.

Fig. 72. Markings on Magneto Drive Train

Engines 4P 01, 4P 03, 4P 05 equiped with vaccum pump.

- Insert the end of shaft 3.102.134 into the bearing.
- Insert the end of shaft 3.007.199 into the bearing.

TURN THE CASING SUCH THAT THE INTERIOR IS FACING DOWN. WITH THE EXTERIOR GROOVES OF THE PINION GEAR IN THE JAWS OF THE VICE.

- Put the crankshaft pinion drive gear nut ~~safety~~ stop plate 3.007.201 in place.
- Screw down the nut 3.007.211 and then safety it.
- Release the stop plate

{ Articulated socket } 4

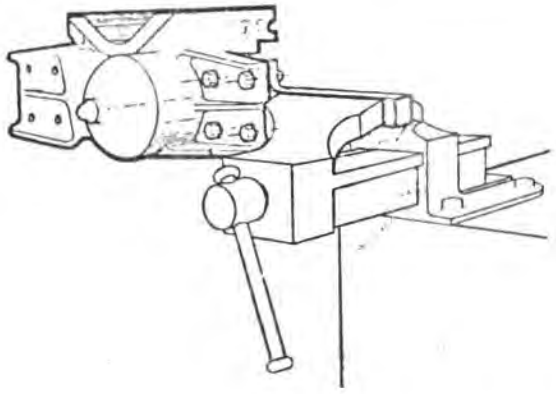


FIG. 71 — FIXATION DU CARTER ARRIÈRE DANS L'ÉTAU (8e VUE)

— Voir le repérage du pignon hélicoïdal d'entraînement (faces de deux dents voisines marquées d'une flèche) et celui du pignon de commande (extrémité d'une dent hachurée). Au montage il y aura lieu d'engrener les deux pignons suivant les repères ci-dessus, la dent hachurée entre les deux dents fléchées ;

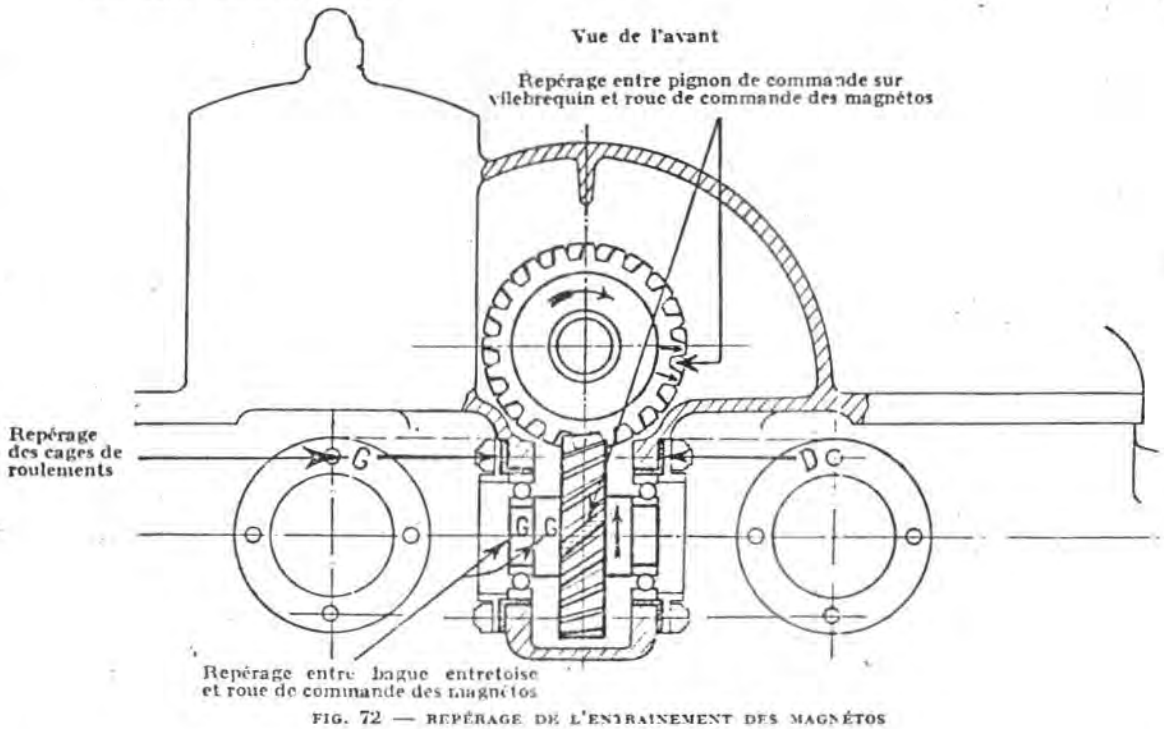


FIG. 72 — REPÉRAGE DE L'ENTRAINEMENT DES MAGNÉTOS

Mot. 4 P 01, 4 P 03, 4 P 05, munis de pompe à vide

— Introduire l'extrémité de l'arbre 3.102.134 dans le roulement.
— Introduire l'extrémité de l'arbre 3.007.199 dans le roulement.

RETOURNER LE CARTER ARRIÈRE DONT L'INTÉRIEUR EST DIRIGÉ VERS LE SOL, LES CANNELURES EXTÉRIEURES DU PIGNON ÉTANT SERRÉES DANS LES MORS DE L'ÉTAU.

— Mettre en place l'arrêtoir 3.007.201 de l'écrou du pignon de commande sur vilebrequin ;
— Visser l'écrou 3.007.211 puis le bloquer . . . . . Clé à empreinte 44
— Relever l'arrêtoir.

Fig 73 Location of Casing in Vice (9th View)

Engines 4P 01, 4P 03, 4P 05 with vaccume pump.

- Mount the drive pinion adjustment washer 3.306.485 on the shaft.
- Install the ~~pu~~ vaccume pump drive pinion 3.306.275 on the crankshaft drive gear shaft.
- Install the stop paul 3.452.286
- Screw down the nut. } castelated wrench 5
- After safetying, release the stop paul

Installing the Oil Pressure Limiter (Relief valve)

- Make certain the check valve guide 3.306.377 is properly installed in the case
- Install the check valve 3.011.968 and spring 3.306.381
- Screw down the stop nut 3.306.378 } 12 mm wrench 5
- Screw in the adjusting screw 3.306.380 } Screwdriver
- Safety with a 1 x 15mm split pin The adjustment is done.
- Lay in place the gasget 3.451.260
- Screw in the cap 3.306.379
- Safety (stop) with a nut from the oil pump (the one further down by the blind nut) (safety wire between them)

Installing the Strainer

- Install in their lodging, the ring to th strainer base 3.010.919 and the strainer.
- Install the "Hercule" gasget 3.007.181 and strainer bushing (cap) 3.010.921.
- Install the copper-asbestos gasket 7.033.054
- Screw down the blind nut. 3.451.067 } 17 mm wrench 1
- Safety this to the two nearest nuts on the ~~crankcase~~ cover

Engines 4P 01 and 4P 03 with vaccume Pumps

After installing the cover to the strainer, one should

- install the gasket (coupling) 3.451.262, the tube 3 102.168 and a second gasket (~~gasket~~ coupling) 3.451.262

- Screw down the blind nut 3.452.288 } 14 mm wrench 5

Engine 4P. 05 After installing the strainer cover,
with vaccume pump. one should;

- Put in place the gasket (coupling) 3.451.262, tubing 3.102.168 for lubrication to the vaccume pump, a second gasket (coupling) 3.451.262, oil piping to the auxilliary oil pump 3.306.308 and a third gasket (coupling) 3.451.262.
- Screw down the blind nut. 3.452.288 } 14 mm wrench 5

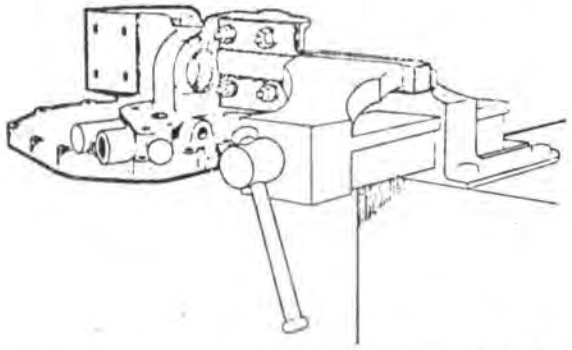


FIG. 73 — FIXATION DU CARTER ARRIÈRE DANS L'ÉTAU (9e VUE)

Mot. 4 P 01, 4 P 03, 4 P 05, munis de pompe à vide	— Monter la rondelle de réglage 3.306.485 du pignon de commande sur l'arbre ; — Mettre sur l'arbre du pignon de commande sur vilebrequin, le pignon 3.306.275 de commande de la pompe à vide ; — Mettre en place l'arrêtoir 3.452.286 ; — Visser l'écrou 3.452.287	Clé à empreinte	50
	— Après blocage, relever l'arrêtoir.		
Montage du limiteur de pression d'huile :			
	— Vérifier que le guide 3.306.377 du clapet est bien en place dans le carter ; — Introduire le clapet 3.011.968, le ressort 3.306.381 ; — Visser l'écrou de blocage 3.306.378.	Clé de 12	58
	— Visser la vis de réglage 3.306.380.	Tournevis	
	— Freiner avec goupille fendue de 1×15 *sitôt réglage effectué* ; — Placer le joint 3.451.260 ; — Visser le bouchon 3.306.379	Clé de 23	
	— Freiner avec un écrou de la pompe à huile (celui en contrebas près de l'écrou borgne).		
Montage de la crépine :			
	— Introduire dans leur logement, la bague de fond de crépine 3.010.919 et la crépine ; — Mettre en place le joint Hercule 3.007.181 et le bouchon 3.010.921 de la crépine ; — Placer le joint cuivre-amiante 7.033.084 ; — Visser l'écrou borgne 3.451.067.	Clé de 17	17
	— Freiner avec les 2 écrous les plus proches fixant le couvercle.		
Moteurs 4 P 01, 4 P 03, munis de pompe à vide	Après la mise en place du couvercle de crépine, il y a lieu de : — Mettre en place le joint 3.451.262, la tuyauterie 3.102.168 puis un deuxième joint 3.451.262 ; — Visser l'écrou borgne 3.452.288.	Clé de 14	59
Moteurs 4 P 05, munis de pompe à vide	Après la mise en place du couvercle de crépine, il y a lieu de : — Mettre en place le joint 3.451.262, la tuyauterie 3.102.168 de graissage de la pompe à vide, un deuxième joint 3.451.262, la tuyauterie 3.306.308 de graissage de la pompe à huile auxiliaire, un troisième joint 3.451.262 ; — Visser l'écrou borgne 3.452.288	Clé de 14	59

Mounting The Support to The Tachometer Drive, and Fuel Cut Out Valve.

- Secure The fuel pump support casing 3.010.842 in a vice.
- Oil The pump drive screw (gear) and insert it into The support casing.
- Spread gasket sealer on The surfaces between The pump support casing and The tachometer drive support casing 3.007.337.
- Put The paper gasket in place 3.008.699.
- Mount The pin (stud) 3 452.306 in the hole securing the tachometer which is inside The pinion axel.
- Put The tachometer drive support 3.007.337 in position (plain)
- Spread gasket sealer on the surfaces between the tachometer drive support, and fuel cut out valve A.M. 3592 B.
- After oiling, place the pinion, ~~and gear in~~ 3.007.341, and gear 3.016.075 in their proper locations (tachometer pinion & gear)
- Install The paper gasket 3.008-700 as well as The fuel cut out valve A.M. 3592 B. and Then

Engines 4P01, 4P03, 4P05 with vaccume pump. The fuel cut out valve AM 3592 B is replaced by a "counter geared" Tachometer drive 3.102.137

- Screw The nut Z.028.607 down against The washer 7.030.307 over The pin (stud) while holding The head stationary with a flat wrench — 8mm wrench, 8mm flat wrench — 5
- Tighten The remaining nuts 7.028.601 down over washers 7.030.301 — 8mm wrench — 5

Mounting The Fuel Pumps.

- Spread gasket sealer over The flat surfaces of the joint receiving The support ring. as well as The flat surfaces on The support ring.
- Install The paper gasket 3.008.698

Markings on ~~Left~~ Right pump and pump support ring

Markings on left pump and pump support ring

Fig 74 Markings on Fuel pumps Fuel pump support rings and Support casing.

- Install in the casing The gear (wheel) 3.007.212 in the proper direction as shown on the fuel pump drive blade (screwdriver)
- Install the bearing support collars (marked Right or left) such that their markings coincide with the markings on the casing (drive gear shaft bearings). D = 3.007.130, and G = 3.007.132.

Montage du support de commande de tachymètre et du robinet d'essence :

— Fixer le carter support 3.010.842 des pompes à essence dans l'étau ;
— Huiler la vis 3.012.280 de commande des pompes et l'introduire dans le support ;
— Mettre de l'hermétic sur les faces d'appui, du carter support et du support de commande de tachymètre 3.007.337 ;
— Mettre en place le joint papier 3.008.699 ;
— Monter le boulon 3.452.306 dans le trou de fixation du support de tachymètre qui se trouve dans l'axe des pignons ;
— Mettre en place le support de commande de tachymètre 3.007.337 ;
— Mettre de l'hermétic sur les faces d'appui du support de commande de tachymètre et du robinet d'essence AM n° 3592 B ;
— Introduire dans leurs logements le pignon 3.007.341 et la roue 3.016.075 de tachymètre préalablement huilés ;
— Mettre en place le joint papier 3.008.700 puis le robinet d'essence AM n° 3592 B.

Mot. 4 P 01, 4 P 03, 4 P 05, munis de pompe à vide — Le robinet d'essence AM n° 3592 B est remplacé par le support de renvoi de commande de tachymètre 3.102.137.

— Visser sur rondelle 7.030.307, l'écrou 7.028.607 du boulon en tenant la tête du boulon avec une clé plate . . . . . — Clé de 8 / Clé plate de 8 — 55
— Visser sur rondelles 7.030.301, les autres écrous 7.028.601. . . . . — Clé de 9 — 56
— Vérifier le libre fonctionnement de la vis de commande ;

Montage des pompes à essence :

— Mettre de l'hermétic sur les plans de joint recevant les bagues support et sur les plans de joints des bagues support elles-mêmes ;
— Mettre en place les joints papier 3.008.698 ;

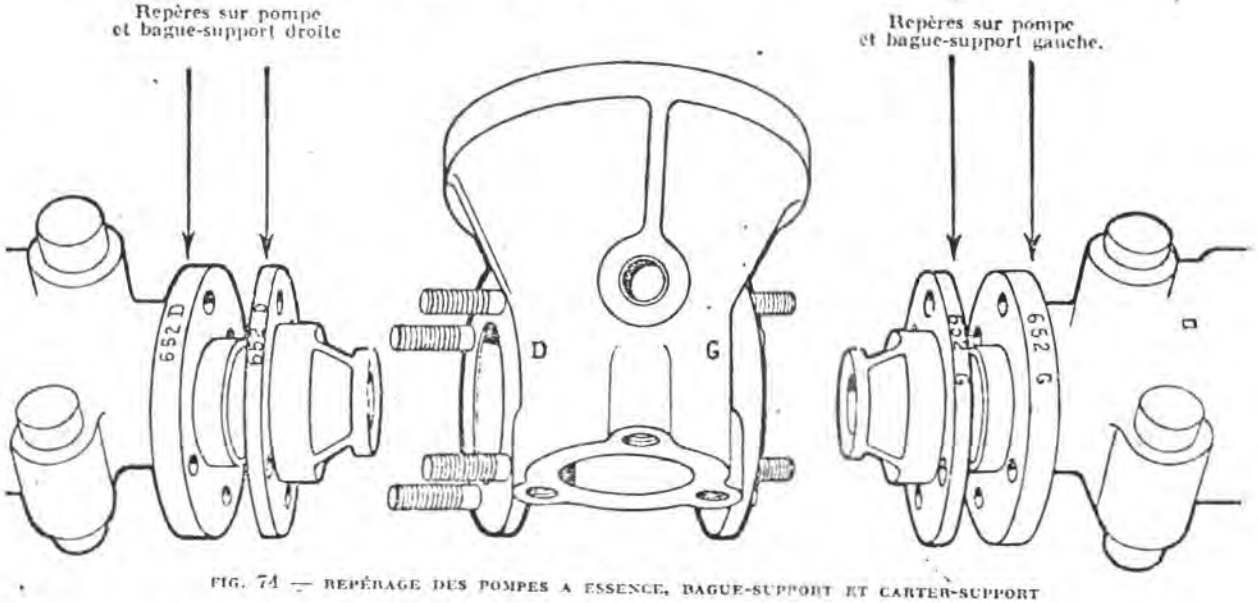


FIG. 74 — REPÉRAGE DES POMPES A ESSENCE, BAGUE-SUPPORT ET CARTER-SUPPORT

— Introduire dans son logement la roue 3.007.212 dans le sens convenable déterminé par les indications D et G marquées sur les tournevis d'entraînement des pompes à essence ;
— Placer une bague palier support de pignon de commande (repérée D ou G) à faire coïncider avec les mêmes indications figurant sur le carter-support des pompes D=3.007.130 et G=3.007.132 ;

- Install The second support collar.
- Spread gasket sealer on the joining surfaces of the fuel pumps and support collars
- Put The paper gaskets 3.008.698 in place, and then install The AM 900 fuel pumps according to their respective locations (marked D-right, and G left)
- Put washers 7.030.301 over the studs
- Screw down The nuts 7.028.601 } 9 mm wrench } 7.
- Safety with "iron wire"

NOTE: This assembly should only be done after The drive train has been properly timed, and The magneto shields installed.

~~Motor 4P 05~~ (see pages 134 and 139)

4P 05 Engines For This engine type only, It would be best to prepare The upper block cover, which contains The oil pump for inverted flight, The inverted oil sump, and the oil screen

Installing The O.I Pump For Inverted Flight:

The cover and pump casing are marked with the engine number.

- Mount in The casing of the pump 3.011.933 The shaft which (drives) includes a pinion gear 3.011.970 such that The Threaded end of the shaft is near the extreem rear of the casing, as seen from The Flange
- Put The key 3.011.955 in place.
- Install The pinion 3.011.971 in its slot, on The shaft;
- Install The Pump gears (idler) 3.011.967 shaft in their place
- Place the pinion 3.011.973 such that The marks 1 is together with That on the other pinion already installed (The other side is partially Threaded)
- Spread gasket seal on The joining surfaces of The "blind" cover 3.011-936 and the pump casing
- Apply The blind cover to the pump casing.
- The Reamed coupling (ring) receives The end of the drive pinion
- Turn over The pump, and install The pinion marked 2 (3.011.973), beside The other pinion, which is similarly marked with a 2.

- Place gasket seal on the rear cover 3.011.937 (which is drilled to allow the drive shaft to pass through) and on the joining surface of the pump case.
- Place the cover over the case.
- Install the 8 bolts 3.450.184, with the heads on the side of the axel which enters the pinion
- Tighten the nuts 7.028.607 down over the washers 7.030.307 } 8 mm wrench }
- Safety it.
- Put the key 3.011.956 in the groove of the tapered shaft end;
- Install the pinion 3.011.972 (with the shoulder facing outwards).
- Install the steel safety 3.452.307 with one side bent down into the groove in the shoulder of the pinion
- Screw down the nut 3.450.168 } 20mm wrench.
- Make sure the pump turns freely.
- Release the brakes

4P 05 Engine Installing The Pump In The Crankcase Cover

- Spread gasket seal on the paper gaskets 3.306.428 (the Flange side connected to the intake pipe) and 3.306.429
- Install the gasket, and then the pump
- Put on the 4 washers 7.030.302
- Screw down the 4 nuts 7.028.602 } 10 mm wrench } 5
- Safety the nuts, 2 by 2.
- Screw in the 5th nut (in cross direction) on a washer (it is to be safeties at the same time as the nuts which secure the intake pipe. } 10 mm wrench } 5

Mounting The Flanged (strap) Support for the Nozzle

- Place the crankcase cover 3.011.930 on a work bench for mounting the nozzle support and also the auxiliary oil pump (inverted flight oil pump).
- Spread gasket seal on both sides of the paper gasket 3.306.309
- Install the 2 bolts 3.451.406 which secure the flange (strap) from the inside of the crankcase cover.
- Install the gasket paper
- Install the flanged nozzle 3.306.306 such that the shoulder (flange) is flush with the interior of the crankshaft case cover
- Tighten down the nuts. 7.028.601 } 9 mm wrench } 5

Installing the Oil Pick up Tube.

- Insert the tube 3.011.980 into the three securing collars 3.011.961.
- Spread gasket seal on the flange and support surfaces.
- Install the "Reinz" gasket 3.012.092
- Install the oil ramp (sloped sheet) with its ~~return~~ collars.
- Screw the 5 nuts 7.028.601 and washers 7.030.301 down which secures the oil ramp, ~~as well as the~~ (collars and flange-strap) } 9mm wrench } 5
- Safety the three (3) nuts to the collars
- Safety the two (2) nuts to the flange (strap) as well as

II 4.126 (continued) RENAULT 4P

The fifth (5) nut securing the inverted flight oil pump.

Installing the Metal Oil Shield (sump shield)

- Put the steel shield 3.011.979 in place
- Screw the eight (8) nuts 7.028.601 down over the washers 7.030.301 } 9mm wrench } 56
- Safety the nuts 2 by 2, with the wires running from 1 side to the other (transversal) so as to avoid having the connecting rods catch on them.

~~Installation of the Oil pick up pipe To the~~

Installing the Pipe which Feeds lubrication to the Oil Nozzle

- Place an aluminum gasket 3.451.262 on the lubrication nozzle 3.306.305
- Introduce the "nozzle" into the banjo fitting of the lubrication tube 3.306.307, which should be located such that the opposite end will fit onto the hollow stud on the oil screen.
- Install the second aluminum gasket 3.451.262.
- Screw down but do not safety (It will be safetied at the same time as the other end, which is used to secure the oil filter cover } 14 mm wrench } 59

ASSEMBLING THE ENGINE

Secure the crankcase in a pivoting support. While assembling the engine, an oil pan should be placed underneath to catch the oil used in testing the oil passages, as well as ~~dirted~~ oil used to lubricate parts as they are installed. All parts which move should be lubricated liberally during the installation process.

SUPPORT THE CRANK CASE WITH THE CYLINDER STUDS FACING DOWN.

Mounting The Oil Nozzles

- Bolt (Screw) down into their locations, in the ~~cur~~ bearing blocks, the 6 lubrication nozzles 3.008.751 } Screw driver.
- Screw the oil nozzle 3.001.210 down into the Thrust bearing.

4P 05 Engine. The securing stirrup (socket) for the tappet guides 3.012.047 are spetial (unique) and recieve the couplings 3.012.052 for the push rod shield tubes.

Installing The Valve Tappets

- Install the previously oiled ~~push rods~~ tappets 3.011.039 in their proper slots, according to the markings 1 through 8, as marked on the tappet. The # 1 slot being at the front of the engine (Tappet markings are in the groove within the tappet and include Engine type, Engine number, and position in engine.

← Type of Engine
Engine Number → Number of Tappet (from 1 to 8)

Fig. 75. Markings on Tappets.

Installing the Idler Pinion Shaft

- Put the idler pinion Shaft 3.007.155 and its key 3.005.340 in position
- Position the washer 3.005.316
- Screw down the nut } 26 mm wrench } 4
- Cotter pin it

Installing The Camshaft.

- Fill The camshaft with oil and make certain there is free flowing of oil Through all The orifices at The bearings.
- Drain The oil
- Install The camshaft 3.011.132 from The rear into its location in The crank case. The gear end which drives the air compressor/distributor should go in first
- Install The Two half bearings 3.007.169 making sure they are properly lined on The pins, which keep them from rotating.
- Install The washers 7.030.301
- Screw down The nuts 7.028.601 } 9mm wrench } 5
- Check to make certain The camshaft turns freely
- Cotter pin it

MONTAGE DU MOTEUR

Présenter et fixer le carter du moteur sur le support pivotant employé pour le démontage. Comme pour ce dernier, le montage doit être effectué au-dessus d'un bac qui recueillera l'huile s'écoulant du moteur après essai des canalisations de graissage, ou provenant du montage des pièces. Il est en effet indispensable de graisser abondamment toutes les pièces en mouvement lors des opérations de montage.

LE CARTER SE TROUVE LES GOUJONS DE FIXATION DE CYLINDRES DIRIGÉS VERS LE BAS.

Montage des ajutages :

— Visser dans leurs logements des paliers, les 6 ajutages de graissage 3.008.751. . . . . Tournevis

— Visser dans son logement au palier avant, l'ajutage 3.001.210 du roulement butée. . . . . Tournevis

Moteur 4 P 05 Les étriers de fixation des guides de poussoir sont spéciaux 3.012.047 et reçoivent les raccords 3.012.052 pour tubes-gaines.

Montage des poussoirs :

— Mettre en place les poussoirs 3.011.039 préalablement huilés en respectant les repères 1 à 8, le n° 1 partant de l'avant du moteur (repères dans la gorge du poussoir, type de moteur, numéro de moteur et numéro positionnant le poussoir).

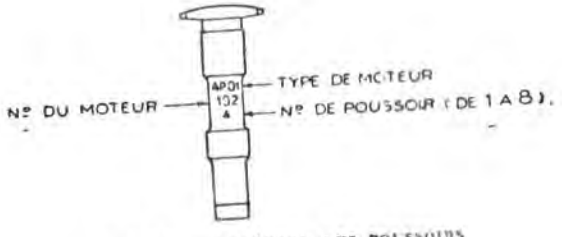


FIG. 75 — REPÉRAGE DES POUSSOIRS

Montage de l'axe du pignon intermédiaire de distribution :

— Mettre en place l'arbre 3.007.155 et sa clavette 3.005.340 ;

— Placer la rondelle 3.005.316 ;

— Visser l'écrou 3.005.296 . . . . . Clé de 26 47

— Goupiller.

Montage de l'arbre à cames :

— Emplir l'arbre à cames d'huile et s'assurer de son libre écoulement par les orifices des portées ;

— Vider l'huile ;

— Introduire l'arbre à cames 3.011.132 dans son logement par l'arrière du carter, la denture d'entraînement du compresseur distributeur d'air comprimé de démarrage étant dirigée vers l'avant ;

— Mettre en place les deux demi-paliers 3.007.169 en ayant soin de les présenter dans la position qu'ils doivent occuper pour faire entrer les goujons sans tourner les demi-paliers ;

— Mettre les rondelles 7.030.301 ;

— Visser les écrous 7.028.601. . . . . Clé de 9 56

— S'assurer du libre fonctionnement de l'arbre à cames ;

— Goupiller.

Installing The Camshaft Drive Gear

- Install The camshaft drive gear 3.007.340 on The camshaft, while making certain That The timing mark engraved in The rear, outside of The cam shaft coincides with The mark engraved in The drive gear
- Screw in The 5 bolts 3.004.950 } 12 mm wrench } 5E
- Safety The heads.

Installing The Crankshaft.

- Install The half bearings in bearings (1, 2, 4) (Bathed in oil on The side opposite The cam shaft. 3.009.400, (3) 3.002.392, and (5) 3.005.325
- The bearing number is marked on The bearing support (divider) and represents The cylinder number. The number on the half bearing should match in number, and be on The same side of The ~~half~~ bearing, ~~as~~ (bearing cap) as it is in The block.

3rd bearing 4th bearing

Fig. 76 Markings on Crankshaft Bearings

- Install The crankshaft-connecting rod assembly.
- Place The half bearings Tops ~~and caps on the~~ (1-2-4) 3.002.391, (3) 3.009.412 and (5) 3.009.399 on The crankshaft.
- Install The bearing caps (1-2-4-5) 3.100.042, (3) 3.100.039.

4P-05 Engine - Install The special ~~half~~ bearing #5 cap 3.100.049.

- Place The washers 3.450.834 (Ø.16) and 3.450.909 (Ø 12)
- Screw down The nuts 3.450.833 (central bearing) and Tighten them ~~only~~ in a progressive manner, ~~starting from The center and working out~~ only! } 22 mm wrench } 6
- Do The same for The nuts 3.450.731 (other bearings) } 21 mm wrench
- Make sure the crankshaft turns freely.
- Cotter pin (use 2.5 x 40 mm pins)

4P 05 ENGINE Installation of intermediate drive gear for Auxiliary Oil Pump.

- Install The intermediate (idler) gear shaft 3.011.959 Through The bore (hole) in the intermediate (idler) gear 3.011.969

- Install the Thrust collar 3.011.957 and then the key 3.005.340
- Insert the end of the shaft in the bearing 3.100.049
- Slip on the nut stopper 3.011.960.
- Screw down the nut 3.450.168 } 20mm wrench
- Check the Idler gear and be certain it can turn freely.
- Bend up the safety.

Mounting the Foreward Bearing support

- Position the "Vellumoid" gasket. 3.100.074
- Install the case support 3.015.479.

Montage de la roue de commande de l'arbre à cames :

— Emmancher la roue 3.007.390 d'entraînement d'arbre à cames en s'assurant que le trait gravé sur l'extrémité arrière de l'arbre à cames coïncide avec le trait gravé sur le pignon ;

— Visser les cinq vis 3.004.950. . . . . Clé de 12 | 58

— Freiner les têtes.

Montage du vilebrequin :

— Mettre en place les demi-coussinets de paliers (1-2-4) (bain d'huile, côté opposé à l'arbre à cames) 3.009.400, (3) 3.002.392 et (5) 3.005.325 ;

— Le numéro de palier porté sur la cloison correspondant au numéro de cylindre, doit se trouver en regard et du même côté que le repère du demi-coussinet ;

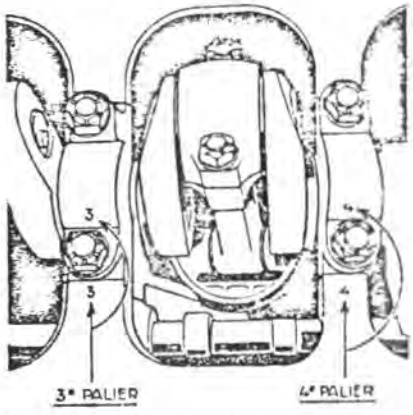


FIG. 76 — REPÉRAGE DES PALIERS DE VILEBREQUIN

— Mettre le vilebrequin monté avec ses bielles en place ;

— Placer les demi-coussinets de chapeaux de paliers (1-2-4) 3.002.391, (3) 3.009.412 et (5) 3.009.399 ;

— Monter les chapeaux de paliers (1-2-4-5) 3.100.042, (3) 3.100.059 ;

Moteur 4 P 05 — Monter le chapeau de palier n° 5 spécial 3.100.049.

— Placer les rondelles 3.450.834 (Ø 16) et 3.450.909 (Ø 12) ;

— Visser les écrous 3.450.833 (palier central) et ne les serrer que progressivement . . . . . Clé de 22

— Opérer de même pour les écrous 3.450.731 (autres paliers) . . . . Clé de 21 | 69

— S'assurer que le vilebrequin tourne librement ;

— Goupiller (goupille de 2,5×40).

Moteur 4 P 05 **Montage du pignon intermédiaire de commande de pompe à huile auxiliaire :**

— Introduire l'axe du pignon intermédiaire 3.011.959 dans l'alésage du pignon intermédiaire 3.011.969 ;

— Mettre en place la bague butée 3.011.957 puis la clavette 3.005.340 ;

— Introduire l'extrémité de l'axe dans son logement du palier 3.100.049 ;

— Placer l'arrêtoir 3.011.960 de l'écrou ;

— Visser l'écrou 3.450.168. . . . . Clé de 20

— Vérifier le libre fonctionnement du pignon ;

— Relever l'arrêtoir.

Montage du support de roulement avant :

— Placer le joint Vellumoïd 3.100.074 ;

— Mettre en place le carter support 3.015.479 ;

- Install washers 7.030.304
- Screw down nuts 3.600.677 — 17mm wrench — 1
- Safety it
- Install the grlubrication cutter (limiter or fitting) 3.300 950, the bearing housing 3.015.478 or 3.102.100 (following material), shim washers 3.008.078 (check for foreward or rear position) and bearing SKF, or SRO 6212 C.
- Block the crankshaft, with, for example a mallet, between crankcase and crank arm, such that it can not rotate.
- Screw down the stop nut 3.102.382 (left hand Thread) for the bearing, and safety it. — Special wrench — 4
- Install safety stop 3.4152.416.
- Remove the mallet
- Install the "metale plastic" gasket 3.200.119 between the support cover, and the support.

Install the cover 3.100.068.

- Place the foot of the ~~rectangular~~ adjustment (timing) indicator 3.015.468 on the two pins near the bottom
- Tighten the Six (6) nuts 3.450.819 onto four (4) washers 7.030.316 and the base of the timing indicator — 17 mm wrench — 1

Installing the Vent.

- Put gasket 3.005.367 in place
- Screw the vent ~~on~~ 7.121.093 in — 44 mm wrench — 1

4P 06 Engine This vent is not used, and the opening is blocked with the plug 3.012.041 which is tightened down on the same gasket 3.005.376 — 44 mm wrench — 1

TURN THE MAIN CRANKCASE SUCH THAT THE CYLINDER STUDS FACE UPWARDS.

Installing the Foreward Sump Cover

- Install gasket 3.008.241, preferably covering both surfaces with gasket seal.
- Put the cover 3.007.066 in place
- Put on the washers 7.030.201
- Screw down nuts 7.028.601 — 9 mm wrench — 5

- Safety Them.

Mounting The Starting Compressor - Distributor "Viet" - Air Equipment

- Remove the cap from the compressed air ~~outlet~~ intake pipe on the compressor
- Put gasket seal on The gasket.
- Put The gasket in place
- Put The compressor - distributor in position.
- Install washers 7.030.301
- Screw down nuts 7.028.601 } 9mm wrench } 5
- Safety

Mounting Pistons on Connecting Rods

- Install The pistons in pairs 1-4, and 2-3 according to their markings (see page 115);
- Position The first piston, which should be complete with rings and wrist pin, on The connecting rod.
- Lubricate The wrist pin 3.013.117 (grease)
- Push The wrist pin Through The boss in the piston, Through The rod end of the connecting rod, and into The boss on The other side of the piston
- Install The second snap ring, using a snap ring tool 3.011.485 } 2
- Install The other pistons in The same manner
- Be sure all snap rings are properly seated in their channels

MOUNTING THE CYLINDERS

- Each cylinder ~~no~~ 3.010.092 is marked on the round portion which is ~~toggled~~ lodged in the crankcase.
- Carefully turn the crank shaft. making certain the rings dont scratch the cylinder studs (cylinder head) The mounting order is 1-4, then 2-3.
- Lubricate, and ~~co~~ arrange the rings such that none of the breaks in the rings line up. (stagger the ring gaps)
- Place the gasket 3.008.710 on the cylinder seat

← Engine Number

Cylinder Number →

Fig 77 Cylinder Markings.

- Place the ring compressor over the rings and compress the rings
- Put the head of the piston in the cylinder, and progressively slide the piston through the ring compressor, and into the cylinder
- Push piston all the way into cylinder
- Push the cylinder into the crank case.
- Proceed with the remaining cylinders, following the above order and installation proceedures.

Mounting the Heads.

- Mount the gaskets 3.006.737 in the head. Near the intake port on the head, are markings indicating: the type and number of the engine, the cylinder number, and the head part number (1-3) 3.016.377 and (2-4) 3.016.379
- Put the head over the cylinder (check for proper cylinder number, and verify that the gasket 3.006.732 is properly seated
- Install the washers 3.010.372 on the cylinder-head studs (side opposite carburator)
- Screw down the nuts 3007.627 { down under on the cooling fins of the head - uncovered nuts) in a progressive manner - don't tighten one down all the way before proceeding to others } 17mm wrench }

Montage des cylindres :

— Chaque cylindre 3.010.092 est repéré sur la partie cylindrique lisse qui s'encastre dans le carter ;
— Tourner le vilebrequin avec précaution pour éviter que les segments garnissant les pistons ne viennent râcler les goujons de fixation de l'ensemble « culasse-cylindre ». L'ordre de montage est le suivant : 1-4, 2-3 ;
— Graisser et disposer les segments de manière à ce que les coupes ne soient pas en regard les unes des autres ;
— Mettre le joint 3.008.710 sur l'embase du cylindre ;

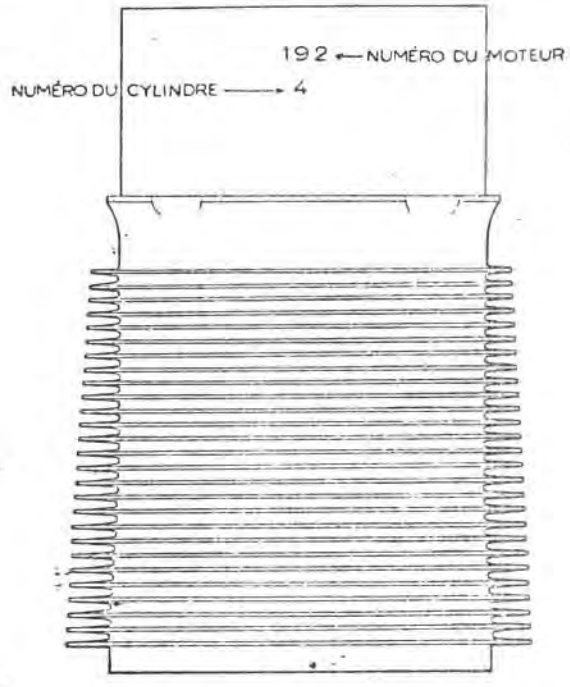


FIG. 77 — REPÉRAGE DES CYLINDRES

— Mettre en place le collier à segments pour maintenir ces derniers dans leurs gorges ;
— Introduire la tête du piston dans le cylindre et faire glisser la sangle du collier au fur et à mesure de l'emmanchement du cylindre ;
— Retirer le collier à segments ;
— Mettre en place le cylindre dans le carter ;
— Procéder de même pour chaque cylindre en répétant l'opération ci-dessus.

Montage des culasses :

— Mettre les joints 3.006.737 dans la culasse. Chaque culasse porte les indications suivantes sur la bride d'admission : type et numéro du moteur, numéro du cylindre et numéro de la culasse (1-3) 3.016.377 et (2-4) 3.016.379 ;
— Mettre en place les culasses sur leurs cylindres respectifs en vérifiant que le joint 3.006.737 est bien dans son logement ;
— Mettre les rondelles 3.010.372 sur les goujons fixant cylindres et culasses (côté opposé au carburateur) ;
— Visser les écrous 3.007.627 (écrous sous ailettes de culasses, écrous découverts) de façon à les approcher progressivement et simultanément. Clé de 17 17

- Straiten the heads by allignment the adjustment by setting the flats of the air intake port all vertical- and horizontally level
- Tighten two diagonal nuts, and then the two other diagonal ones for each head
- Check to be certain the head stays properly alligned.
- Safety the nuts with 2 mm cotterpins

Engine Type
Engine Number
Part number
Cylender Number

Fig 78. Markings on Cylinder Heads.

- Alignment of Lower Air Duct Supports (see page 113)
- Align the lower air duct supports by inserting the hinge pins in the hinge groove.
- Block (secure) the nuts 7.028.542. while making certain that the bolt heads 9.454.197 are held steady with a flat wrench } 8mm Wrench 5. } 8mm flat wrench 4

Installing The Push Rods and Push Rod Tubes. 3.003.143

- Prepare the Interior (upper) and exterior (lower) 3.003.142 push rod tubes, complete with spring 3.003.721
- Install pushrod no 3,006.754 in the push rod tubes
- Install the push rod in to the opening in the rocker casing.
- Install the push rod tube ~~units~~ (lower) (exterior) in its position (head side of rocker casing)
- Place the ball ~~end~~ socket of the push rod ~~of the push rod~~ in the adjustible cap 3.306.798 of the rocker arm
- Compress the valve spring by pushing on the rocker arm.
- Put the ball end on the opposite end of the push rod in the socket of the tuppet.
- Install the upper end (interior) of the push rod tube in its proper position. } special wrench 6

4P05 Engine For these engines, the push rod tubes are specialized. The Upper, interior pipe 3.012.046, and lower exterior tube, 3.012.045 are kept sealed (coil tight) by.

Inside
~~Inner (upper)~~ tube by two gaskets 3.012.043 located on the ~~outside~~ extremeties, and one gasket 3.012.044 located in the ring grouve on the inside of the push rod tube exterior
Outside (~~lower~~) tube by 3 sleves 3.012.053 which assure the oil tightness on the exterior of the tubes and at the connection between tube sections.

Checking the Push Rod Adjustment.

- Adjust the play in the rockers in the first cylinder to 74/100 } gauge
- Secure an index (pointer mark) on the casing of the foreward bearing } gauge

— Dégauchir les culasses en les alignant à la règle d'après les plans de joints des brides d'admission ;
— Serrer deux écrous en diagonale, puis les deux autres pour chaque culasse;
— Vérifier l'alignement et corriger s'il y a lieu ;
— Arrêter les écrous avec goupilles de 2 mm.

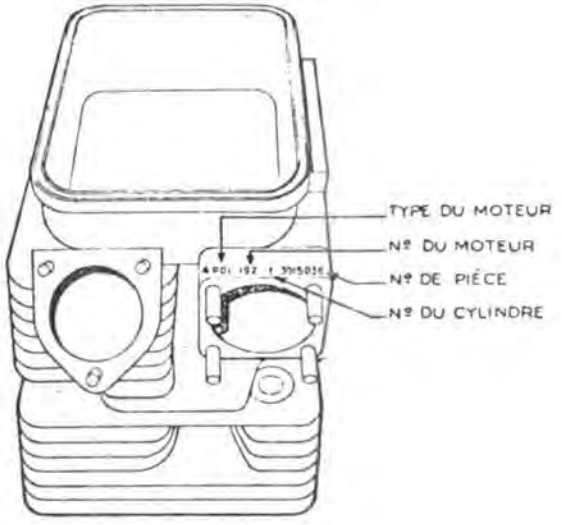


FIG. 78 — REPÉRAGE DES CULASSES

Alignement des supports inférieurs de capot (*suite de la page 113*) :
— Aligner les supports inférieurs de capot en utilisant la tringle et la charnière de capotage ;
— Bloquer les écrous 7.028.542 en ayant soin de maintenir les têtes des boulons 3.454.197 à l'aide d'une clé plate. . . . . | Clé de 8 55 | Clé plate de 8 43

Montage des gaines et tiges de culbuteurs :
— Préparer les tubes-gaines intérieurs 3.003.143 et extérieurs 3.003.142 avec ressort 3.003.721 monté ;
— Introduire la tige de culbuteur 3.006.754 dans les gaines ;
— Introduire la tige de culbuteur dans l'orifice du carter de culbuteur ;
— Mettre le tube-gaine extérieur dans son logement (côté culasse) ;
— Placer la rotule dans la cuvette réglable 3.306.798 de culbuteur ;
— Faire pression sur le culbuteur pour ouvrir la soupape ;
— Mettre la rotule de l'autre extrémité de la tige du culbuteur dans la cuvette de poussoir ;
— Mettre en place le tube-gaine intérieur dans son logement. | Clé spéciale 67

Moteur 4 P 05 Pour ces moteurs, les tubes-gaines sont spéciaux, tube intérieur 3.012.046, tube extérieur 3.012.045. L'étanchéité du raccordement est assurée :
— *intérieurement* par deux joints 3.012.043 disposés aux extrémités et un joint 3.012.044 placé dans la gorge annulaire qui se trouve à l'intérieur du tube-gaine extérieur ;
— *extérieurement* par trois manchons 3.012.053 qui assurent l'étanchéité des extrémités des tubes-gaines et du raccordement des deux gaines.

Vérification du réglage :
— Régler les jeux des culbuteurs du premier cylindre à 74/100 . . . . | Cale 28
— Fixer un index sur le carter de roulement avant. . . . . | 66

- Mount an adjustment wheel (timing ~~indicator~~ wheel) on the crankshaft
- Find the point at which the first cylinder is at top dead center, using the ~~dead~~ tool designed for this purpose - Install it in through the Spark plug hole on the side opposite the carburator
- Mark this position (top dead center) on the timing wheel
- Check the valve timing to be sure the intake and exhaust valves open and close according to the timing required on the chart on Page 139.

Install the Rear Air Duct Pannel

- Install the lower metal piece 3.050.771
- Screw in the two screws 3.450.846 } 7mm wrench

Timing the Drive Train, and Mounting the Rear Case.

a) Markings.

- The Camshaft drive gear has ~~two~~ one marks ingraved into each of two consecutive Teeth. These marked teeth should be on each side of a similarly

Markings between Cam shaft and its drive gear

Markings between Camshaft gear and idler gear.

Markings between Idler gear, its axel, and nut.

Markings between crankshaft and magneeto drive arbor.

Fig. 79 Markings on Drive Train Gears.

marked tooth on the idler gear. The Idler gear is also marked on the center shoulder, as well as on the axel, and securing nut. The extrem rear face of the crankshaft contains a mark, which when the number 1 cylinder is at top dead center, should be on the left side, and in line with the split between the Main bearing halfs (an imaginary line - horizontally through the crankshaft) A mark is engraved on one of the extended flutes on the splined portion of the crankshaft (magneto) drive pinion. This mark should line up with the mark on the crankshaft.

— Monter un disque de réglage sur le vilebrequin ;
— Prendre le point mort haut du premier cylindre à l'aide de la pige, l'introduire dans ce cylindre par le trou de bougie *côté opposé au carburateur* ; | 38
— Reporter la position du point mort haut sur le disque ;
— Vérifier que les ouvertures et fermetures admission et échappement sont conformes aux indications du tableau de réglage figurant page 139.

Montage du panneau arrière de capotage :
— Mettre en place la tôle de fond 3.050.771 ;
— Visser les deux vis 3.450.846. . . . . | Clé de 7

Réglage de la distribution et montage du carter arrière :
a) *Repérage*
— La roue d'entraînement de l'arbre à cames présente des flèches gravées sur deux dents. Ces deux flèches devront se trouver de part et d'autre

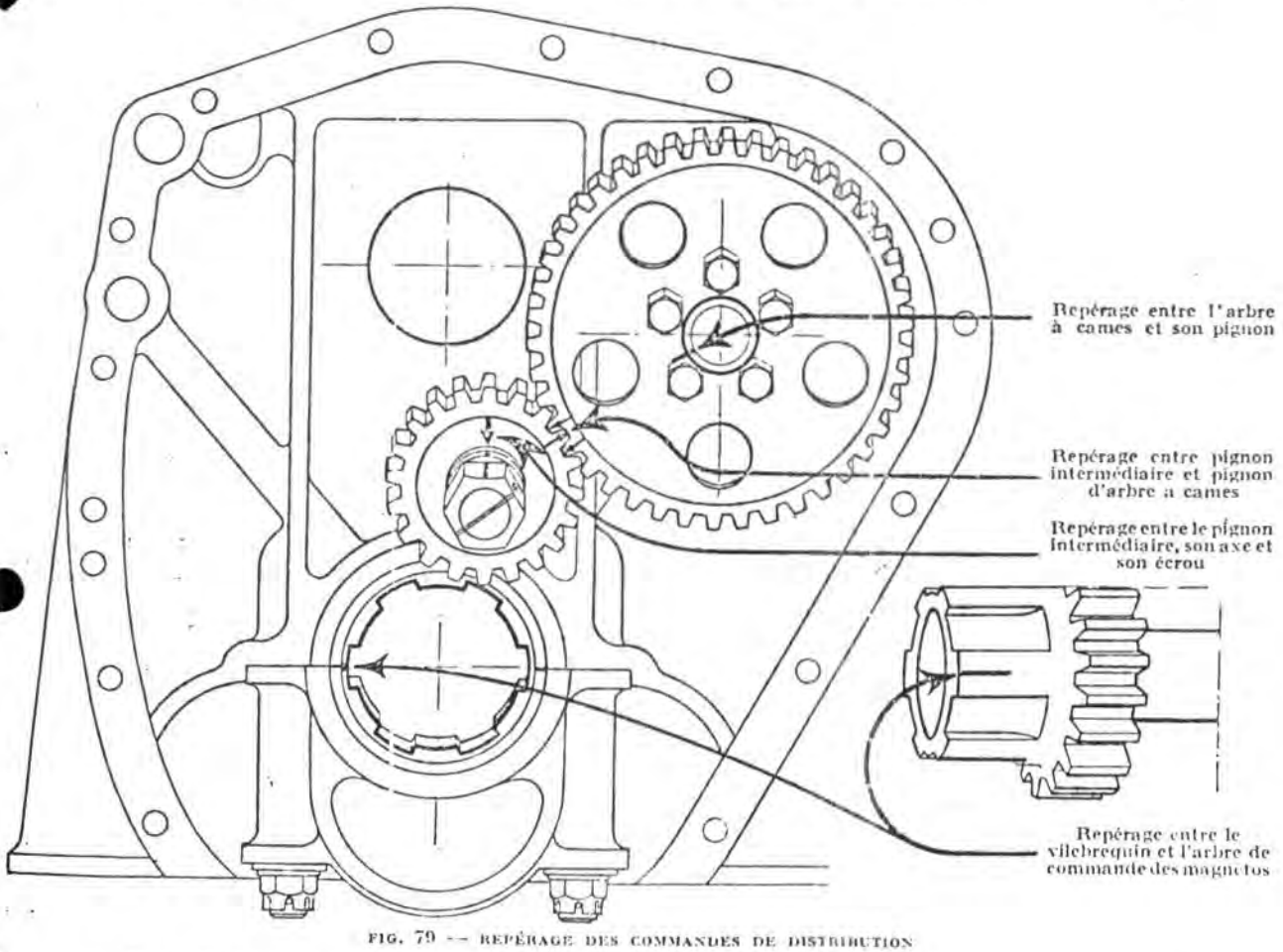


FIG. 79 — REPÉRAGE DES COMMANDES DE DISTRIBUTION

d'une flèche gravée elle-même sur une dent du pignon intermédiaire, ce dernier est d'ailleurs repéré également d'un trait gravé sur l'épaulement du pignon et sur l'écrou. La face de l'extrémité arrière du vilebrequin porte, gravé du côté gauche, un trait qui au point mort haut se trouve dans le prolongement de la ligne formée par les faces d'appui des deux demi-coussinets de palier. Une cannelure du pignon de commande sur vilebrequin est également gravée d'un trait. Ce trait doit se trouver, lors de l'emmanchement, en regard de celui qui se trouve à l'extrémité arrière du vilebrequin.

b) Timing.

- Bring the first cylinder to Top dead Center (PMH). The two valves should have a clearance (play) of 74/100. All markings should coincide. (To make the operation of adding the rear case easier, it is recomended to install a similar crankshaft pinion in the crankshaft, and lign up all the gears with thas one. Then the rear case, which contains the pinion gear can be gengerly (carefully) mounted).
- Spread gasket sealer on the joining surfaces between the Crank case and the rear case.
- Put in place the gasket 3.008.244 (paper gasket)
- Screw the nuts 7.028.602 down over the washers 7.030.302 } 10mm wrench } S
- Safety the nuts.

Adjusting the Rocker Arms.

- Adjust the play to 30/100, using the adjustible bolt. } gauge } 2
- Block the securing bolts 3.450.587, and nuts 7.028.542 } 8mm wrench 8mm flat wrench } 1 4
- Safety (cotter pin) them
- Spread grease on the rollers, and rocker assemblies.

Installing Rocker Covers.

- Put rubber gasket 3.009.793 in cover groove
- Fill the cover with oil up to the top of the central tube
- Install the cover, with the over flow pipe facing the side away from the carburetor.
- Install the rubber washer 3.012.013 on the bolt which passes through the cover.
- Put the ~~bole~~ bowl shaped washer 3.012.012 with the hollowed out side against the rubber washer.
- Screw on the knurled nut. 3.300.458
- Safety the 4 nuts.

4P 05 Engine: A piece of felt 3.012.289 is added on the bottom of each cover to retain oil when the aircraft is in inverted flight.

Mounting and Timing the Magnetos

- Right side - Use SEV Type DA 4 211 Magneto without

impulse, on left side use SEV Type D.A. 4 210 Magneto with impulse

- Pivot the breaker cover retaining spring out of the way.
- Remove the breaker cover
- Remove the cotter pin from the magneto drive gear stop nut 3.4152.4106
- Unscrew it sufficiently to allow the ~~gear~~ teeth to be rotated } 8mm wrench
- Position the distributor arm such that it is centered on the number 1 cylinder stud, and adjust the input drive such that the timing is adjusted to fire 35° before Top dead center (PMH)
- Adjust (bring into contact) the platinum screws until they make contact while turning the magneto, and then release (back off) lightly
- Install the rubber drive connection (gasket) 3.010.750, and the mounting collar 3.010.799 to the drive end of magneto (side towards the engine case)
- Without touching the shaft, turn the magneto such that the drive line matches up with the rubber drive ~~gp~~ coupling.
- Install the magneto and secure it with the 4 screws 3.0065.612 and washers 7.030.304 } 17 mm wrench

Checking The Timing.

- Gingerly (lightly) turn The crank shaft in the opposite direction to normal (over backwards), until the platinum screws make contact.
- Disengage the ~~p~~ platinum screws (back them of) by hand and put a 2/100th thick steel gauge between the two contacts
- Install a Forked (Y shaped) wrench in the channels (grooves) of the cam Stop nut, and turn the shaft in the normal direction of rotation for the magneto, to gain the full advance — adjustment wrench 3
- Turn the crank shaft in the normal direction until the points (platinum screws) just (break) open, while holding the full advance (always holding magneto at full advance)
- Check the point on the timing disk (on the crankshaft) at which the points open.
- If necessary, The magneto can be twisted by ~~post~~ repositioning The magneto Through as many of the 64 notches on The coupling flanges as necessary to get exactly 35° advance before Top Dead Center (PMH) - check with the timing disk.
- Remove Uncouple the magneto, and block the nut 3.452.406 — 8mm wrench
- Safety with a cotter pin
- Put The magneto back in place
- Screw down The 4 ~~nuts~~ screws 3.005.612 over washers 7.030.304 — 7mm wrench — 17
- Make a final check of the timing.
- Put The breaker cover back on
- Put The breaker cover spring back against The cap.

Mounting The Metal Magneto Shield.

- Place washer 3.015.554 on The stud from the oil pumps.
- Install The metal shield 3.008.879
- Put The second washer 3.015.554 on the stud.
- Screw down nut 7.028.601. — 9mm wrench — 5
- Screw down over washers 7.030.307 The 4, hex head nuts 3.452.886 — 8mm wrench — 5
- Safety.

Mounting The Fuel Pump Valve, and Tachometer Drive Support.

- Take The previously built up assembly (See pages 124 and 125)
- Remove The bearing retaining collar

4P01, 4P03, 4P05 Engines with vaccume pump.

- Mount the fuel pump drive shaft 3.306.274 on the crankshaft drive gear 3.102.134.
- Spread gasket seal on the joining surfaces between the fuel pump support and vaccume pump. support
- Mount the vaccume support 3.102.135 complete with its drive gear on the 4 pins. (studs)
- Spread gasket sealer on the surfaces between the fuel pump casings and the magneto support casing.
- Install the paper gasket 3.008.696.
- Install the fuel pump, valve and tachometer drive support.
- Install washers 7.030.302
- Screw down nuts 7.028.602 } 10mm wrench } 57 12
- Safety.

4P01, 4P03, 4P05 Engines equiped with vaccume pump.

- Secure the vaccume pump on its support
- Screw down nuts 3.400.603 } 12mm wrench } 58
- Install the vaccume pumps lubricating pipe.

- Install The gasket 3.451.262
- Bring up The Pipe 3.002.168 with The end containing a hole for a screw (bunjo ~~bot~~ fitting?)
- Mount gasket 3.451.862 on The screw
- Screw bolt 3.452290 into pump } 12mm wrench } 58

Timing Air Distributor-Compressor for Viet Type Air Starter.

- Turn the crankshaft to 5° after Top dead center (PMH). With The gasket of the distributor cover (raised) removed, the air passage through to the 1st cylinder should be visible.
- ~~Using The plate on~~ Turn The distributor plate in ~~a manner which allows The turning in~~ the normal direction (The same as the crankshaft) such that The air opening to the first cylinder, marked 1 on The flat of the gasket should have an opening of 1 mm;
- Introduce The intermediate casing (bushing) which contains internal and external drive splines such that The corresponding splines line up yet keeping The distributor plate opening with the first cylinder tube at 1 mm.
- Compress the casing (bushing) spring
- Introduce The ~~conical~~ cylindrical pin into the distributor shaft.
- Turn The crankshaft over a number of revolutions to verify that The oil is flowing freely, and properly to the distributor.
- Screw in the cover. (bushing) } 26 mm wrench
- Cotter pin it.
- Check The timing
- Install The gasket and The distributor casing.
- Screw in The hex headed bolts over the "Grower" washers (locks) } 10mm wrench } 12 68

Installing The Starter Piping

- Put The cross braces 3.306.126 on The studs (pins) which are located on The 4th cylinder, and between cylinders 2 and 3;

(To make mounting The tubes easier The countersunk bolts should be replaced with studs of identical thickness whose exterior end is cut to facilitate its installation with a screwdriver. Once The studs are installed, The inner tube supports, Tubes, and outer supports can be slid in place, and when all of these have been installed,

The studs can be removed and replaced with the final (proper) bolts

- Install the Tubes into the bushings and rubber "O" rings (Protective rings) in the following manner. beginning at the distributor end:

~~For~~ In	The Tube	3.050.772 To the first cylinder:
	1 ring.	3.009.537
	1 bushing.	3.007.799
~~For~~ In	The Tube	3.050.773 To the Second cylinder
	1 ring	3.009.537
	2 bushings	3.007.799
~~For~~ In	The Tube	3.046.902 leading to the Third cylinder
	1 ring	3.009.537
	3 bushings	3.007.799
In	The Tube	3.010.846 leading to the fourth cylinder
	5 bushings	3.007.799

- Install (in the following way) The 6 Tube supports with regard to The cylinders
  #4 support 3.007.797, containing one tube channel
  #3 support 3.007.801 containing two tube channels
  #2 (near the cylinders) support 3.007.797 containing 1 tube channel, and (near The crankcase) support 3.007.801 containing two tube channels.
  #1 Two supports 3.007.801 containing two channels each.
- Connect The starter plumbing to the distributor in the order of Cylinder distribution of, from bottom to top Cylinder 1, 2, 4 and 3, putting them in snugly, but leaving The final tightening (at the distributor end) till later. - Do not tighten The cylinder end of #4 cylender (tighten The cylander ends on cylinders 1, 2, 3)
- Tighten all couplings. } 18 mm wrench

Fig. 80. Mounting The Starter Tubing

- Install The Tube support caps in the following Cylindrical order.
  #4 Support cap 3.007.798 containing one tube channel
  #3 Support cap 3.007.802 containing two tube channels
  #2 (near The cylinders) Support cap 3007.798 containing one tube channel, and (near The crankcase) support cap 3.007.802 containing 2 tube Channels
  #1 (near The cylinders) Support cap 3.007.802 containing ~~one~~ Two tube channel, and (near The crankcase) support cap 3.007.801 containing two tube channels
- Screw in The countersunk head (flathead) screws 3.450.067 Through The supports, into cylinders #4, 3, 2 (2 screws) and 1, The support near The cylinder.
- Place The brace (clip) 3.306.125 on the stud which supports The tubing support clamp on The crankcase side of The #1 cylinder.

Mounting The Starter tube Metal Shield.

Put casing 3.016.901 in place, after having installed The three rubber rings 3.009.537 which are on The starting tubes leading to cylinders 1, 2, and 3.

— Mettre en place (comme précisé ci-devant) les 6 supports de tubes en regard des cylindres : N° 4, un support 3.007.797 une empreinte ; N° 3, un support 3.007.801 deux empreintes ; N° 2 (vers les cylindres) un support 3.007.797 une empreinte, (vers le carter) un support 3.007.801 deux empreintes ; N° 1, deux supports 3.007.801 deux empreintes. — Raccorder dans l'ordre les tubes d'alimentation des cylindres 1, 2, 4 et 3 en ayant soin pour faciliter le serrage définitif ultérieur des raccords de tubes côté démarreur, de ne pas serrer le raccord côté cylindre du tube alimentant le quatrième cylindre ;		
— Serrer les raccords	Clé plate de 18	13

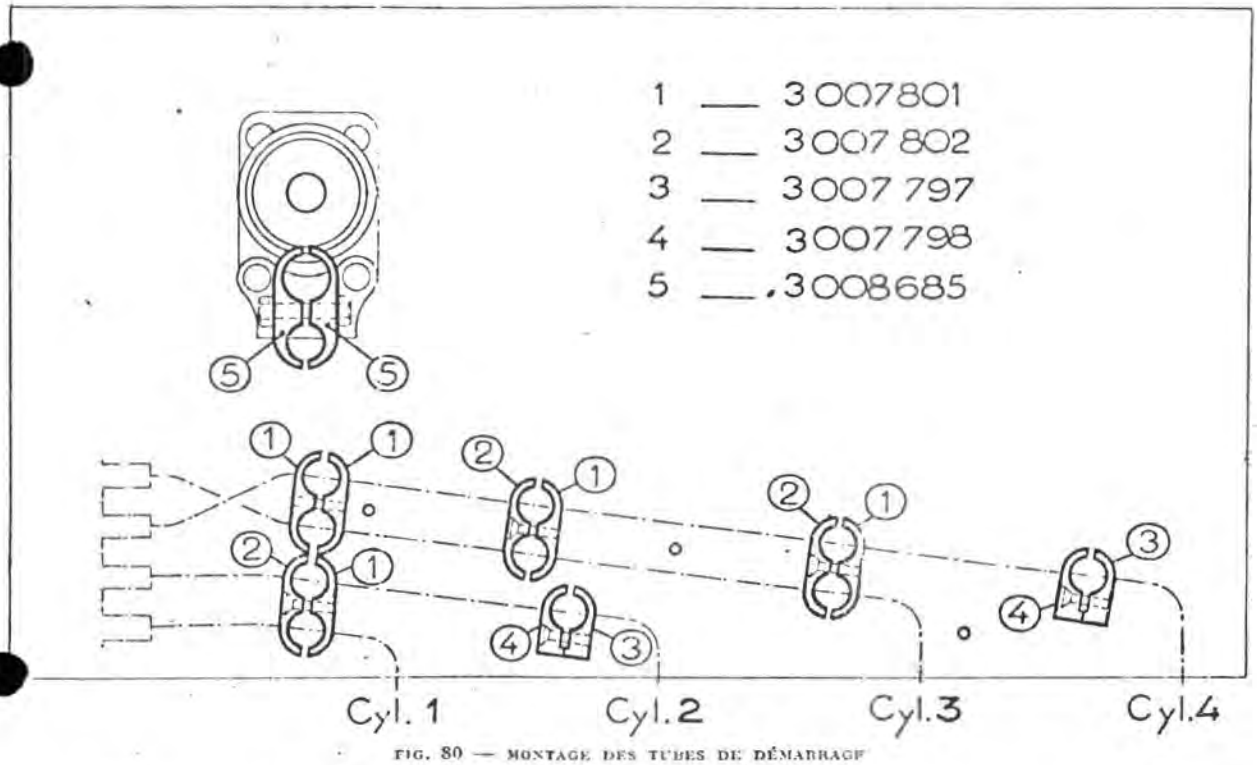


FIG. 80 — MONTAGE DES TUBES DE DÉMARRAGE

— Mettre en place les chapeaux des supports de tubes en regard des cylindres : N° 4, un chapeau 3.007.798 une empreinte ; N° 3, un chapeau 3.007.802 deux empreintes ; N° 2 (vers les cylindres) un chapeau 3.007.798 une empreinte, (vers le carter) un chapeau 3.007.802 deux empreintes ; N° 1, (vers les cylindres), un chapeau 3.007.802 deux empreintes, (vers le carter), un support 3.007.801, formant chapeau deux empreintes. — Mettre en place les vis tête fraisée 3.450.067 en regard des cylindres n° 4, n° 3, n° 2 (2 vis), n° 1 vers le cylindre ; — Mettre en place sur le goujon qui se trouve vers le carter en regard du cylindre n° 1 et qui maintient les supports et chapeau deux empreintes, l'entretoise 3.306.125.		

Montage de la tôle de protection des tubes de démarrage :

— Mettre en place le carter 3.016.901 en ayant soin de faire entrer dans leurs logements les trois anneaux caoutchouc 3.009.537 montés sur les tubes alimentant les cylindres 1, 2, 3 :		

- Place Washers 7.030.307 on the 3 lateral securing studs } 8mm wrench } 5
- Screw down nuts 7.028.607
- Cotter Pin them.
- Screw down the 4, hex headed bolts 3.450.928 over washers 7.030.307 (securing to the crankcase near the cylinders } 8mm wrench } 4
- Safety.

Installing The Air Deflectors.

- Install the deflector 7.121.083 (between cylinders 1 and 2) using the upper ~~and lower~~ 3.200.026 and lower 3.200.025 pull cords (dampers) (springs) which are installed on opposite sides.
- Install the deflector 7.121.081 (between cylinders 2 and 3) complete with upper 3.200.027, and lower 3.303.560, pull cords (dampers) (springs), placing them on opposite sides
- Install deflector 7.121.081 complete with upper 3.200.026, and lower 3.200.025 pull cords (dampers) (springs) placing them on opposite sides

Securing The Ignition Harness

Carburator Side

- Install the harness in the collars mounted on the foreward and rearward metal deflectors
- Screw down screws 3.450.047 to tighten the collars } screwdriver

Side Opposite The Carburator.

- Install the harness in the collars (clamps) mounted to push rod tubes # 3, and 7.
- Screw down screws 3.450.047 to tighten the collars } screwdriver.

Assembly of Intake Manifold with Carrburator, and its Support

- Mount the "Reinz" 3.010.916 gasket, and then the Zenith 60IGS carburator on the intake manifold.

Filters 4P 03, 4P 05 ZENITH 60 IGSA Carburator

- Install washers 7.030.314
- Screw down nuts 7.028.544 } 10mm flat wrench } 1
- Safety.

Mounting Carburator Manifold Assembly on The Engine

- Place the 4 gaskets ~~and~~ 3.008 509 on the head
- Install the [illegible] manifold carburator assembly

- Screw nuts 7.028.602 down over "Cover W7" washers (lock washers)	10 mm wrench	11
- Safety.		
- Install the metal support 3.102.058, with the gasket 3.010.909 between the carburetor and the support		
- Screw the two nuts 7.028.543 down over washers 3.451.069	9mm wrench	5
- Safety.		
Mounting the Crankcase Cover on the Crankcase:		
- Spread gasket sealer on mating surfaces of the cover and crankcase		
- Install the gasket (paper) 3.008.697		
- Install the crankcase cover 3.007.126		
4PC5 Engines. Install crankcase cover 7.290.562.		
- Screw nuts 7.028.602 down over washers 3.450.621	10 mm wrench	5
- Screw lifting ring 3.301.064 onto washers		
- Safety.		

Mounting Propeller Hub

1° Lapping (polishing) of Fitting of The Hub to The Crank shaft

- Before remounting the propeller hub. It is necessary, after having (removed) replaced the key to proceed with a lapping (fitting) of the hub to the tapered end of the crankshaft. Emediately after cleaning all parts, the key should be placed on the crankshaft, and one can then proceed to mount the hub.

2° Mounting.

- Prior to mounting the hub, Set it in boiling water for a few minutes, then wipe it completely dry.
- Place the propellor hub 3.011.978 over the end of the crankshaft, while lining the key up with the keyway on the propeller hub.
- Introduce the stop nut 3.010.116 into the hub
- Tighten it down, and block it (safety it) } Special wrench
- Install the safety (stop) sleve 3.102.381.
- Install the Flask (spinner support) 3.010.124
- Screw in the 4 stop screws } Screwdriver
- Safety these screws with safety wire
- Screw in the ~~bolts~~ nuts 3.010.111, ~~the~~ on the ~~washers~~ 3.452.394, over the hub bolts } 17mm wrench
- NOTE !! After mounting the propeller these ~~bolts and~~ nuts should be safetied.
- Install the spinner 3.102.380 such that it rests against a flat surface of each of the propellers hub nuts.
- Screw down the nut 3.452.395 which secures the spinner. } 9mm wrench
- Safety with a 1.5 x 15 mm. cotter pin.

CHAPTER XVIII

TIMING

DISTRIBUTION (TIMING)

Dementions, Play, Operating Method

The timing adjustments are made easier when a graduated disk is used. This Timing wheel should be attached to the propeller hub, and a pointer should be secured under one of the securing bolts of the foreward bearing case.

1st Cycle — open intake — PMB - Bottom Dead Center — stroke 140 — PMH Top Dead Center

2nd Cycle — Intake Closed

3rd Cycle — Open Exhaust

4th Cycle — Exhaust closed

EXHAUST IN TAKE

Fig 81 Linear and Angular timings

Intake { Open at 14° before Top Dead Center / Close at 64° after Bottom Dead Center

Exhaust { Open at 64° before Top Dead Center / Close at 14° after Bottom Dead Center

with a play of 74/100 mm on the valves

The play realized when the engine is running is different from that during the adjustment process due to expansion in the cylinders, heads, rockers when the engine is running. It is therefore necessary to predict the angular adjustments of the cam shaft to get the play of 74/100. between the valves and rocker arm rollers. This play corresponds to that required of a warm engine.

When the angular adjustments ~~are~~ of the camshaft are realized a play of 74/100 is brought back to 30/100, which is the proper cold adjustment. This adjustment relates to a cold timing of approximately

Intake { open at 28° before top Dead Center / Close at 71° after Bottom Top Dead Center

Exhaust { Open at 71° before top dead center / Close at 28° after Bottom top dead center

CHAPITRE XVIII

RÉGLAGES

DISTRIBUTION

Cotes, jeux, méthode opératoire

Le réglage de la distribution peut se faire simplement avec un disque gradué. On engage ce disque sur le moyeu d'hélice ; une aiguille est fixée sur le couvercle du roulement avant au moyen d'un de ses écrous de fixation.

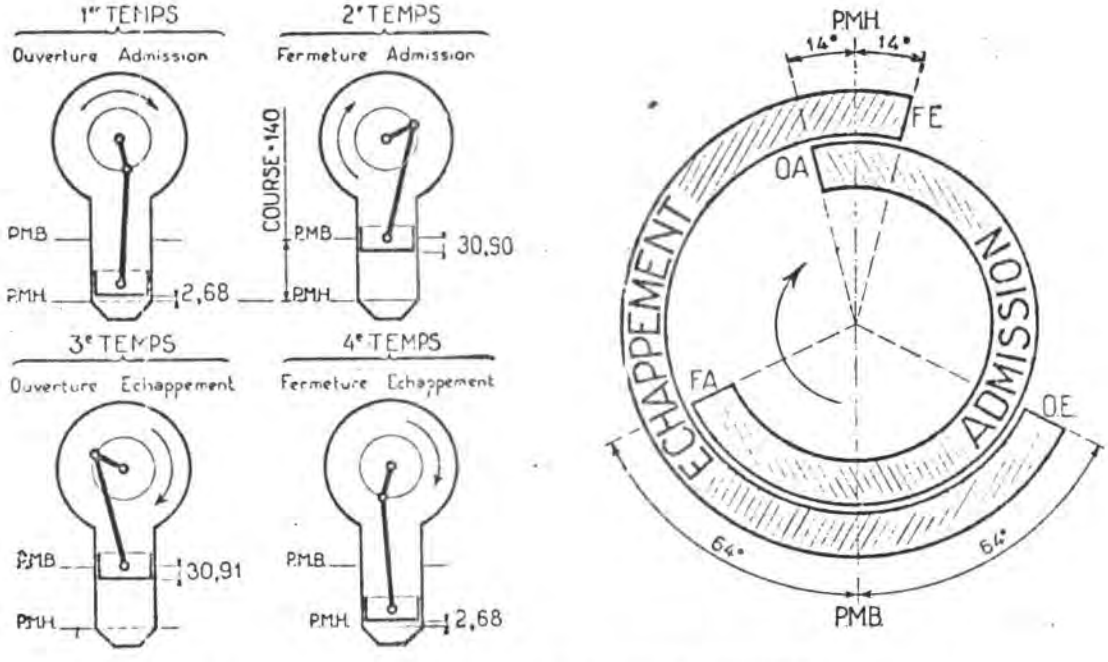


FIG. 81 — RÉGLAGES LINÉAIRES ET ANGULAIRES

Admission { O. A. 14° avant P. M. H. / F. A. 64° après P. M. B. — Échappement { O. E. 64° avant P. M. H. / F. E. 14° après P. M. H.

avec jeu de 74/100 à la soupape.

Les jeux de fonctionnement étant différents des jeux de réglage par suite des écarts dus à la dilatation des cylindres, culasses et éléments de la culbuterie lors du fonctionnement du moteur, il est nécessaire de prévoir pour le réglage angulaire de l'arbre à cames un jeu de 74/100 entre soupapes et galet de culbuteur. Ce jeu correspond au jeu réel à chaud.

Lorsque le réglage angulaire de l'arbre à cames est réalisé, le jeu de 74/100 est ramené à 30/100 qui correspond au jeu à froid et *ceci sans tenir compte du nouveau réglage angulaire obtenu* qui est environ :

Admission { O. A. 28° avant P. M. H. / F. A. 76° après P. M. B. — Échappement { O. E. 76° avant P. M. B. / F. E. 28° après P. M. H.

All timing marks on the drive pinions in the gear case require the first piston to be at top dead center.

In cases of installing pinion (idler) gears without timing markings, operate (install) them in the following manner.

- With the rear case unmounted, adjust valve play in the following manner.

? - ~~Turn~~ ~~Remove~~ Install after the intermediate gear (idler). During this process, make sure the camshaft is not turned (rotated).

- Turn the engine in the normal direction toward the position at which the first cylinder is at top dead center, and stop when (as soon as) the roller on the rocker arm contacts the valve stem.

- Turn the crankshaft such that the piston in cylinder #1, on which all engine timing is based, would be a distance from top dead center which corresponds to the intake opening advance of 14°, or 2.18mm before top dead center (This position is marked on the propeller hub).

- Place the intermediate gear back in position, engaging it with the crankshaft and camshaft gears, while making sure not to turn either the camshaft or crankshaft (a number of tries to install the idler gear).

IGNITION.

For the engine to produce at maximum efficiency, the ignition timing must be exactly in time with the piston movement. The timing of the magnetos must be done in a very exact fassion, and such that it will not shift while in ~~normal~~ operation.

- Before mounting the magnetoes, carefully check to ensure that the support and base of the magneto are completely clean.

Secure the timed magneto to the engine with the drive mechanism disposed (inserted) Tightly on the conical shaft, without being locked. The rocker arms should be free, and the piston is under compression (near top dead center.)

Timing The Magnetoes

1° Turn the crankshaft such that the piston in the #1 cylinder is near Top dead center, at the point corresponding to Igniting ~~which~~ should be 35° (full advanced). This advance should be verified with the mark on the timing wheel on the crankshaft.

2° Bring the mark engraved in the ~~sight (slit)~~ drive gear into sight in the slit, and then turn the magneto (always in the normal direction - never backwards) using the drive shaft.

Next, adjust the magnetoes to the point where the points (breaker contacts) just open. This point should not be done using a piece of paper, since small pieces of paper might be left in the points after the operation is completed.

If it is not possible to easily see the point of opening, you can use the 2/10 metal gauge. This gauge is found SEV adjusting wrench beside the 4/10 mm feeler gauge.

Never round (trim) the gauge while adjusting the breaker points

Assemble the magneto to the engine

Secure the magneto on its support

The mounting of the ignition wires will be done simply attaching the end to the spark plug at cylinder 1 to the contact for number 1 The remaining plugs should be connected following the firing order, remimbering that the distributor wheel rotates in the opposite direction from the magneto wheels. The ignition wires should be carefully secured in the half-distributor casing by screws whose end is pointed Make sure there is good contact.

Adjusting The Points in the Magneto

In normal operation, the platinum contacts should be ~~adjusted~~ adjusted such that the gap is maximum at the passage of the cam. The maximum breaker opening should be 4/10 to 5/10 mm which should be measured with a feeler gauge

CARBURATION

Adjustment

All adjustments should be tried on a test stand (on ground) and should be tested in flight, and after that it should not be changed.

NBC 35 RENAULT 4P.. II 4 141

ADJUSTMENT TABLE FOR ZENITH CARBURATOR "F10, 15L (NOVEMBER 1945) FOR 4P 01 4P 03, 4P 05 ENGINES

ADJUSTIBLE PARTS	ZENITH PART No.	ADJUSTMENT (CALLIBRATION	MODIFICAT
Venturi Throat (17 on Fig 22)	13428M	44 mm	
Main Jet (10, Fig 25)	10228P	270	
Main Jet Breather (13, Fig 22)	13431P	100	
Idle Jet	11345P	130	
Idle Breather	13358P	165	
Idle progression (travel) according to Drawings (from flat)	13430P	180	
Choke Jet	14522P	250-200	
Pump Jet	13448P	140	
Richening System - used at Full Throttle			
Richening jet	10228P	100	
Richening needle - only	14011M		
Richening needle assembly	15454M	100	
Butterfly plate opening - point of contact on valve		7mm $^{+0}_{-.5}$	
Richening control drive arm	14013P		
Richening control valve seat	14012P	lateral hole to Ø = 2.	
Adjustment according to Drawings (measured from flat)	15455M		
Mixture control valve seat	11655M		
Fixed Tube (hole) of Mixture Control	11321M.	200	
Mixture Control Needle Alone	13982P		
Mixture Control Needle Assembly	15456P		
Needle Adjustments	15453P		
Emulsifier Block	20966 9	Opening	14565
Float Valve Seat	11335P	3mm	
Float Valve (needle)	11339P		
Inverted Flight Needle (Jet)	11445P	150	
Side of Float (Fuel level) ~~Fuel level in~~ Below Face on top of Float bowl		15mm $^{+1.5}_{-0}$	
Float level (Fuel level) under pressure of		3 m	
Weight of Float	205383	48.5 gr	

Idle Adjustments.

To adjust the idle proceed as follows.

- With the stop bolt (116) all the way backed out, the throttle plate (butterfly valve) should be completely closed.
- The return to "Full Throttle" should be automatic, and is normal.
- Screw the stop bolt (116) two turns after it makes contact with the stop
- Set the mixture control at its midpoint
- Start the engine and let it run until it reaches its normal operating temperature.
- Once the engine is warm, bring the throttle back to idle, as the speed will be too high, reduce it by backing out the stop bolt until you reach 500 RPM, and watch the engine exhaust
- If it is too rich (black smoke, noise, red flames) push the Idle mixture lever (23) towards the rear.

If it is too lean (Engine Stalls, No Flame, irregular combustion), move the Idle mixture control towards the front.

Once a smooth running engine has been obtained, back out the idle adjustment nut to gain a speed of 400 RPM., and adjust the idle mixture control again until the engine runs smoothly.

Adjustment of the Float Level.

In the event of a change in one of the elements in the float level: Float, needle valve or seat; it will be necessary to readjust this level.

Remember that the fuel level in the bowl should be 15m $^{+1.5}_{-0}$ from below the gasket surface (without the gasket). One obtains this by the adaptation of a gasket under the seat. To avoid a number of trial runs, assume that the thickness of one gasket, 5/10mm, under the needle valve seat will change the float level by approximately 2.5mm. By increasing the gasket thickness, one raises the float level, and vice versa.

Adjusting the "Enrichener" (Full Throttle richener)

After dissassembly, it is prudent to inspect the (position) point of contact of the enrichener.

Open the Throttle plate (butterfly valve) slowly until the arm on the acceleration pump (33) touches the valve stem (34). One will noticed (Feel) the point of contact.

At this position, with either a caliper, or twist drill, measure the opening between the carburator body (Throat) and the Throttle plate (butterfly).

Adjust the contact point with the valve by bending the arm on the acceleration pump.

PLANCHE VII B

Perspective de la circulation d'huile du moteur 4 P 05

Vue 3/4 arrière

3/4 rear view of 4P05 oil circulation

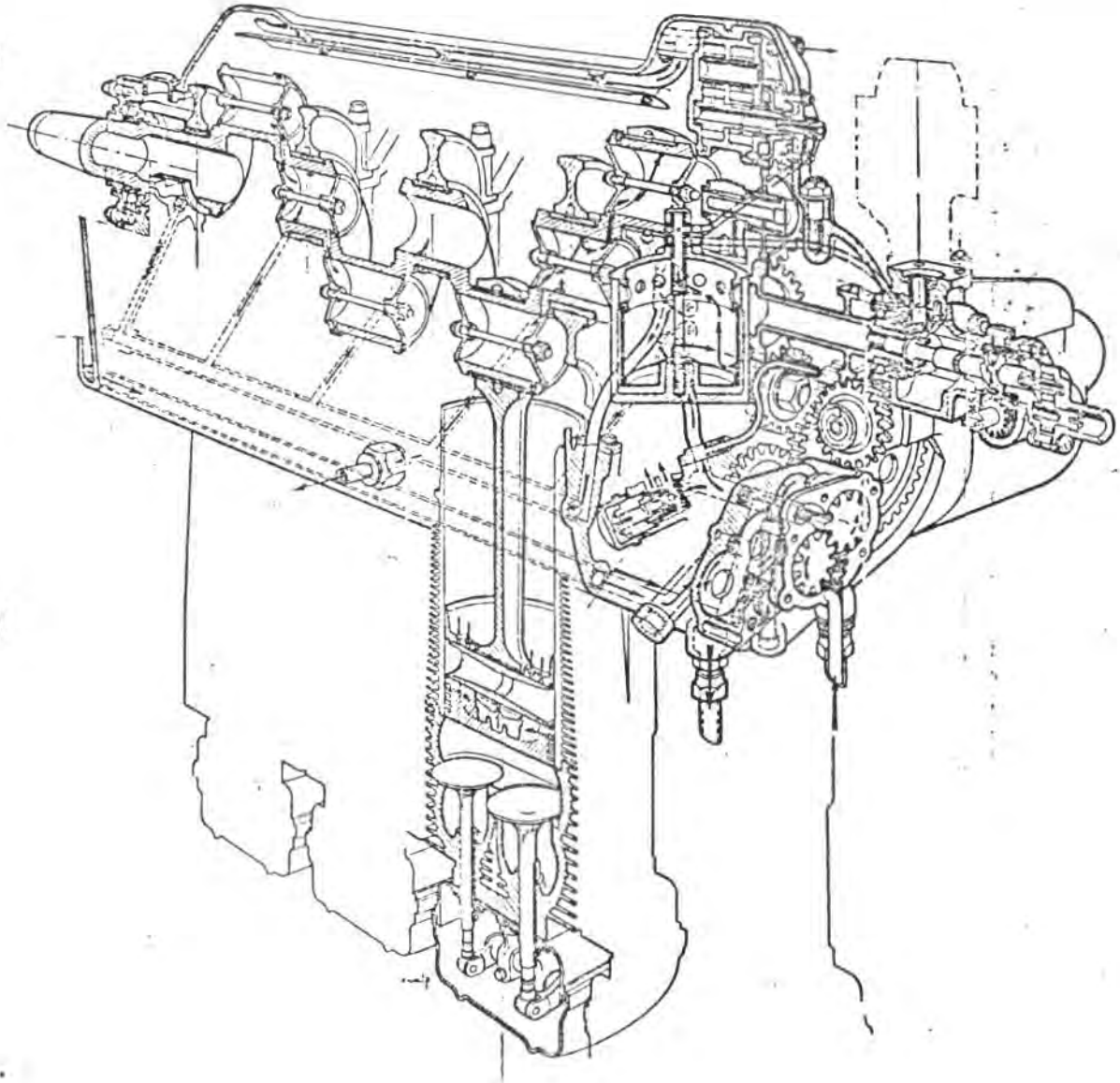
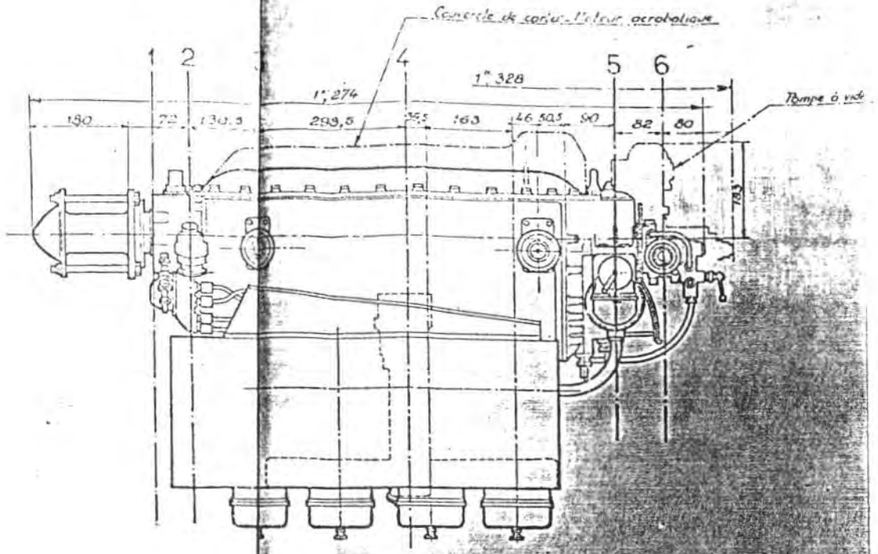
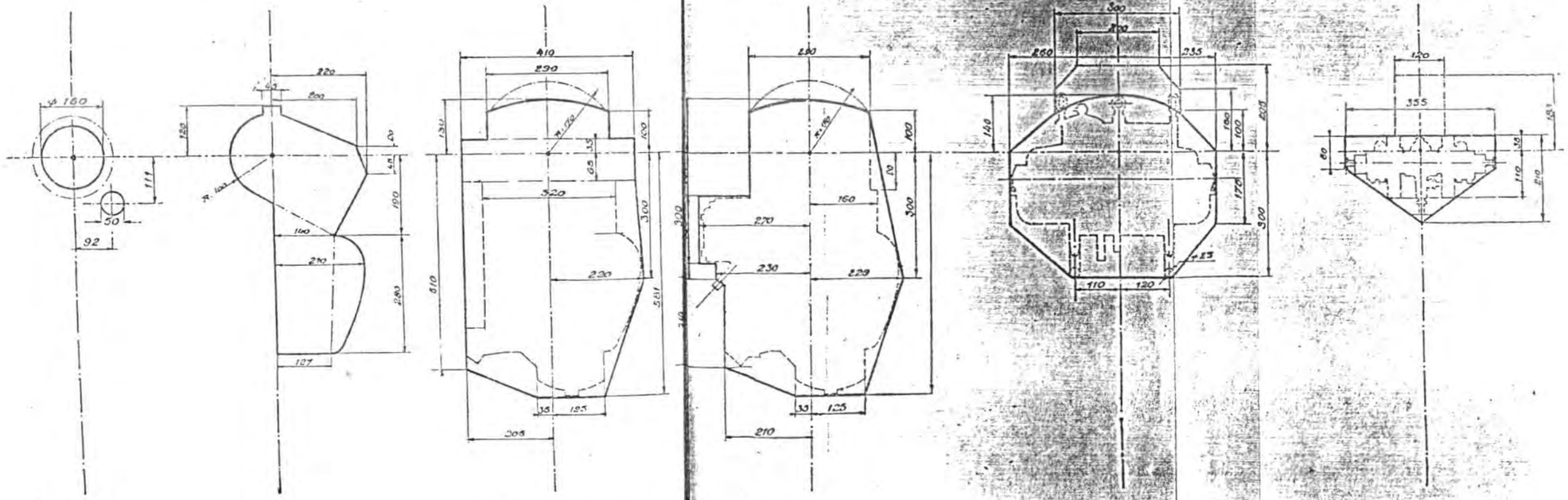


PLANCHE II
Planche 2
Volume enveloppe
des moteurs
4 P 01 et 4 P 05





COUPE 1 COUPE 2 COUPE 3 COUPE 4 COUPE 5 COUPE 6

nt reniflard.
a moyeu d'hélice.

d'arbre porte-hélice.
ge [redacted]ulement.

l'huile de récupération.

récupération.
à huile.

essence.
de tachymètre.
commande des magnétos.

on.
ment.
age des culbuteurs.
r [redacted]uteurs.

jeu des culbuteurs.
de cylindre.

rreur Air-Équipement, type Viet.

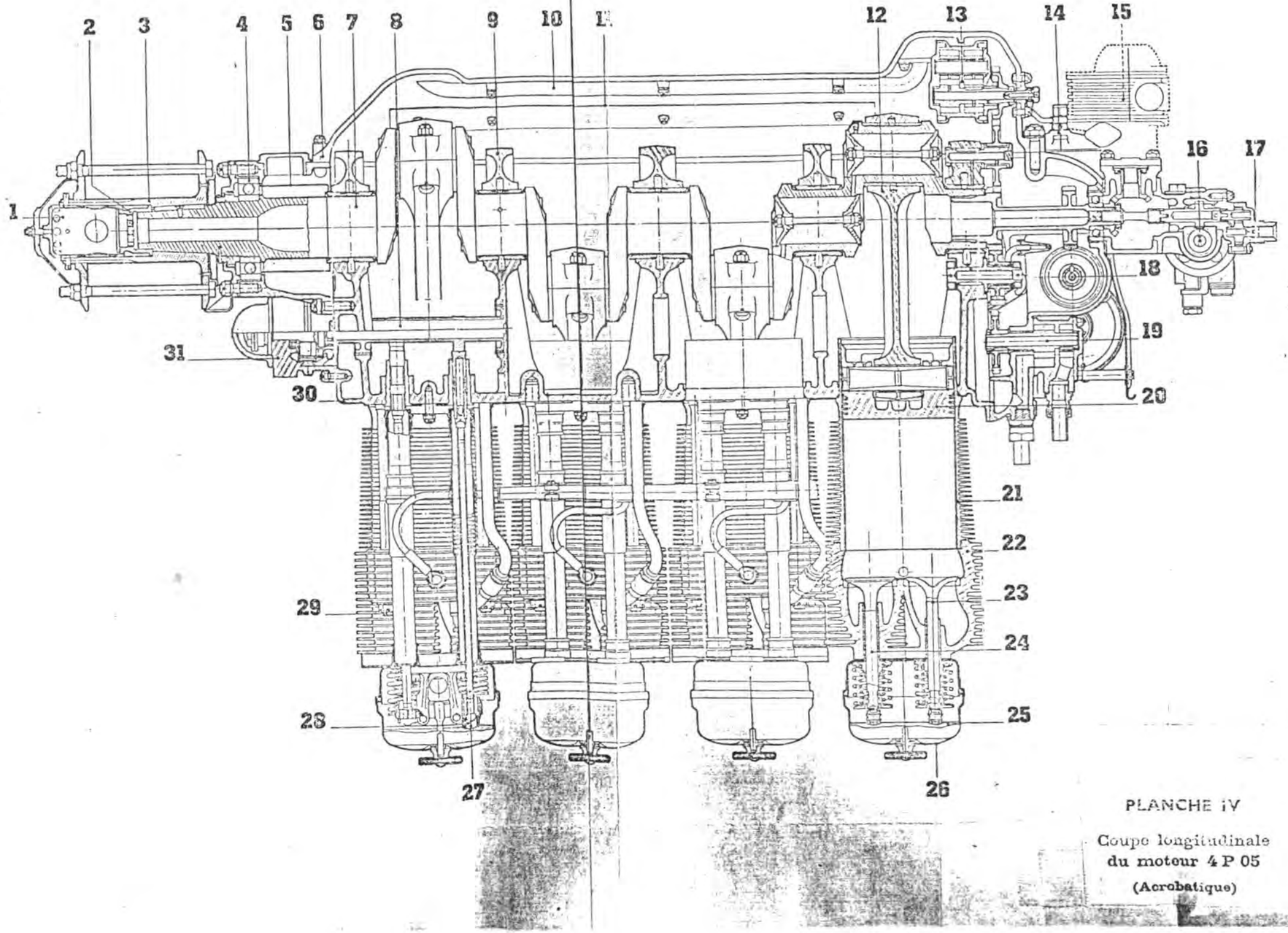


PLANCHE IV

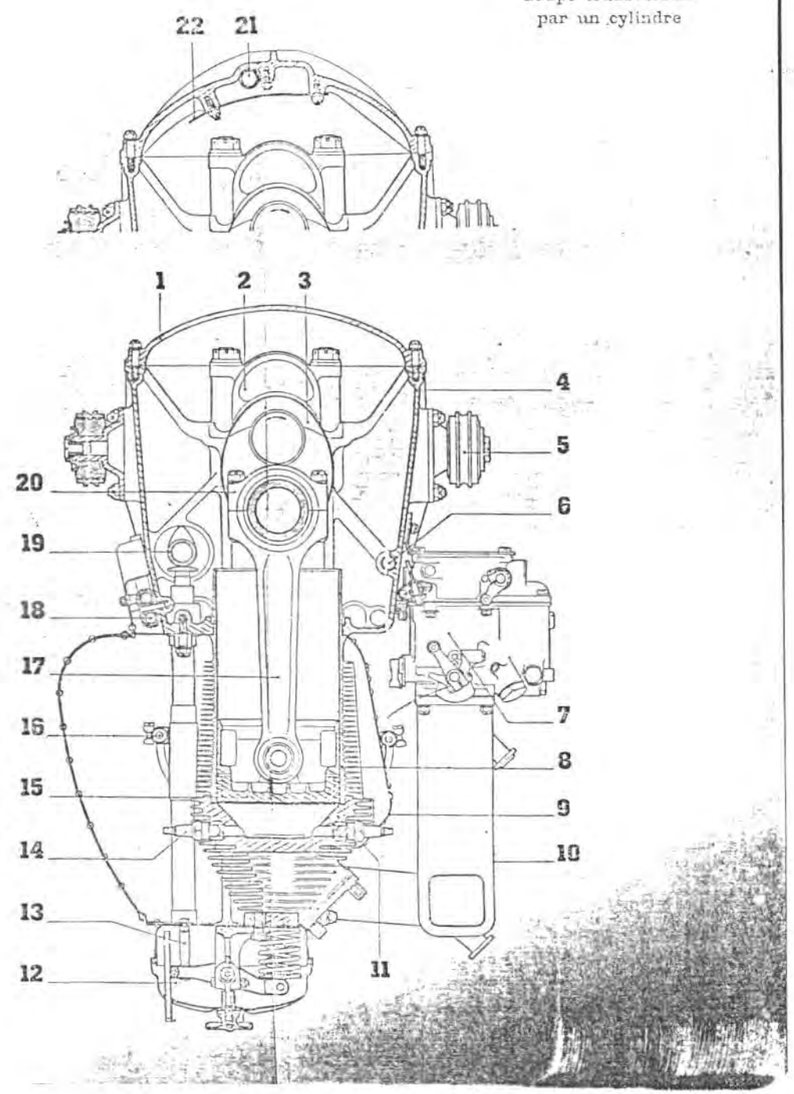
Coupe longitudinale
du moteur 4 P 05
(Acrobatique)

Plate IV
Internal view of
4 Po5 engine

1. Frein d'écrou formant reniflard. - Stop nut - a breather
2. Écrou de blocage du moyeu d'hélice. prop hub retaining nut
3. Moyeu d'hélice. prop hub
4. Roulement à billes d'arbre porte-hélice. front Thrust bearing
5. Coupelle de graissage du roulement. bearing lube cup
6. Couvercle de carter. cover
7. Vilebrequin. crankshaft
8. Arbre à cames. camshaft
9. Chapeau de palier. Bearing cap
10. Tube d'aspiration d'huile de récupération. oil pickup tube
11. Tôle pare-huile. metal oil shield
12. Bielle. connecting rod
13. Pompes à huile de récupération. oil recovery pumps
14. Couvercle du filtre à huile. oil filter cover
15. Pompe à vide. vacuume pump
16. Axe des pompes à essence. fuel pump shaft
17. Prise de commande de tachymètre. Tachometer drive
18. Axe du pignon de commande des magnétos. magneto drive shaft
19. Pompes à huile. oil pump
20. Piston.
21. Cylindre.
22. Culasse. head
23. Soupape d'admission. intake valve
24. Soupape d'échappement. exhaust valve
25. Feutre pour graissage des culbuteurs. felt to lubricate The rockers
26. Couvercle du carter des culbuteurs. rocker covers
27. Tige de culbuteur. pushrod
28. Vis de réglage de jeu des culbuteurs. rocker adjusting screw
29. Goujon de fixation de cylindre. cylender retaining nut
30. Carter. case
31. Compresseur-démarreur Air-Équipement, type Viet. air starter/compressor

1. Couvercle de carter. case cover
2. Chapeau de palier. bearing cap
3. Vilebrequin. crankshaft
4. Carter. case
5. Patte de fixation. engine mount
6. Canalisation de graissage des paliers. bearing oil supply passages
7. Carburateur.
8. Cylindre.
9. Tôle de sortie d'air. cooling air baffle
10. Collecteur d'admission. intake manifold
11. Culasse. head
12. Carter de culbuteur. rocker cover (case
13. Tige de culbuteur. push rod
14. Bougie. spark plug
15. Piston.
16. Fil d'allumage. ignition wire
17. Bielle. connecting rod
18. Tuyauterie de démarreur. starting tube
19. Arbre à cames. cam shaft
20. Chapeau de bielle. connecting rod bearing cap
21. Tube d'aspiration d'huile de récupération (4 P 05). oil recovery tube
22. Tôle pare-huile (4 P 05). metal oil shield

PLANCHE V
Plate V
Coupe transversale
par un cylindre



1. Couvercle de carter. cover of case
2. Pignon de commande de distribution. crankshaft drive gear
3. Pignon de renvoi de commande de distribution. idler gear
4. Pignon de commande de pompe à huile. oil pump drive gear
5. Carburateur. carburetor
6. Collecteur d'allumage. ignition wire harness
7. Bougie. spark plug
8. Collecteur d'admission. intake manifold
9. Carter de culbuteur. rocker box
10. Carter. case
11. Roue d'arbre à cames. cam shaft gear
12. Patte de fixation. engine mount.
13. Pignon de renvoi de commande de pompe à huile auxiliaire (4 P 05). auxiliary oil pump idler gear
14. Pignon de commande de pompe à huile auxiliaire (4 P 05). auxiliary oil pump gear
15. Anneau de levage (4 P 05). lifting eye

PLANCHE VI
Plate VI
Coupe transversale
par la distribution
Accessory Drive

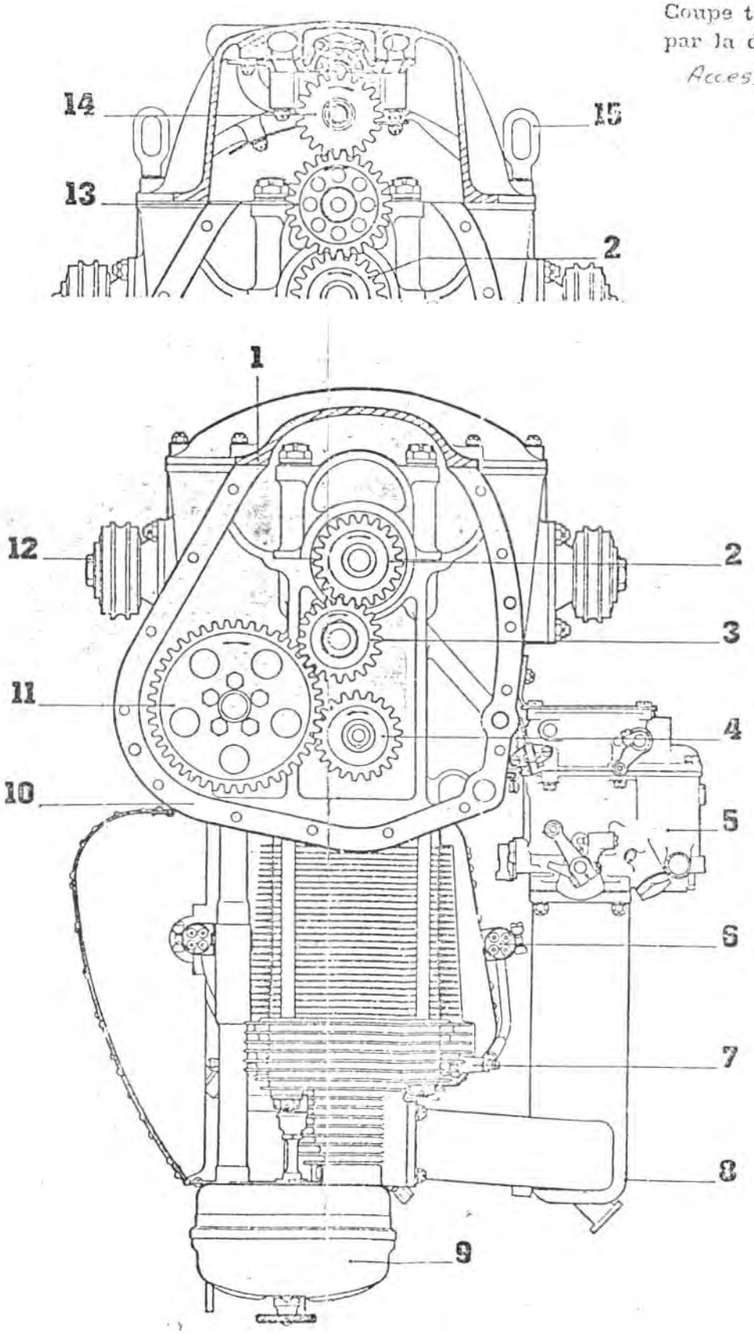
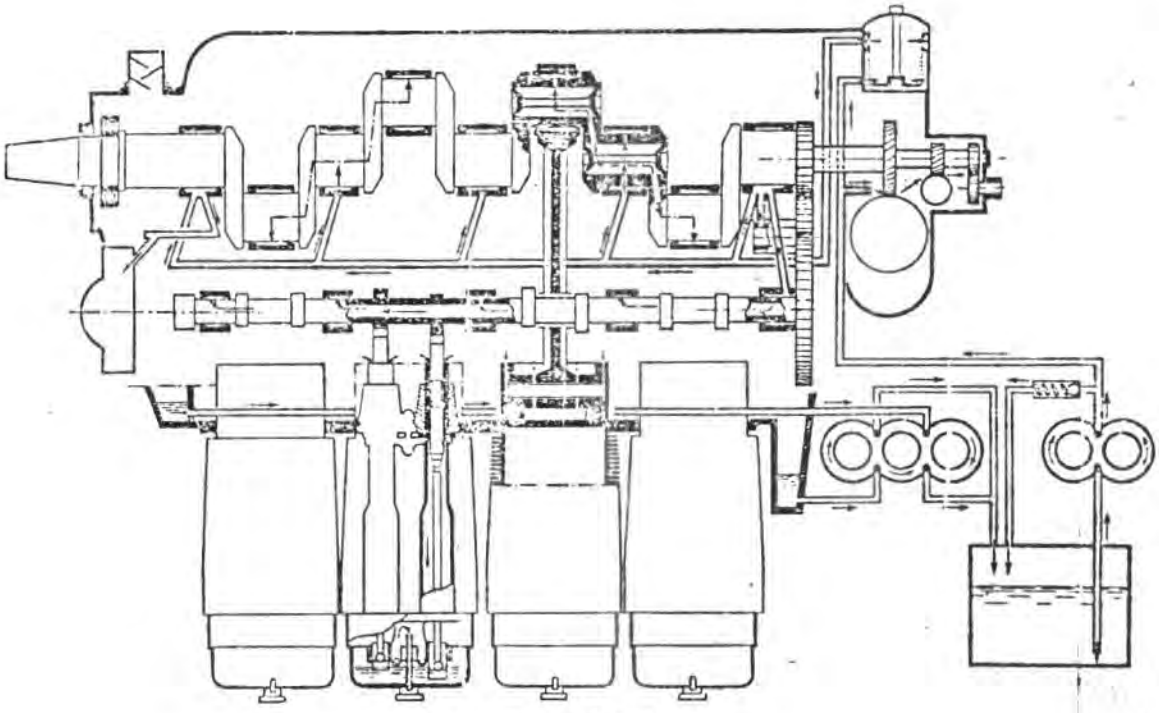


PLANCHE VII

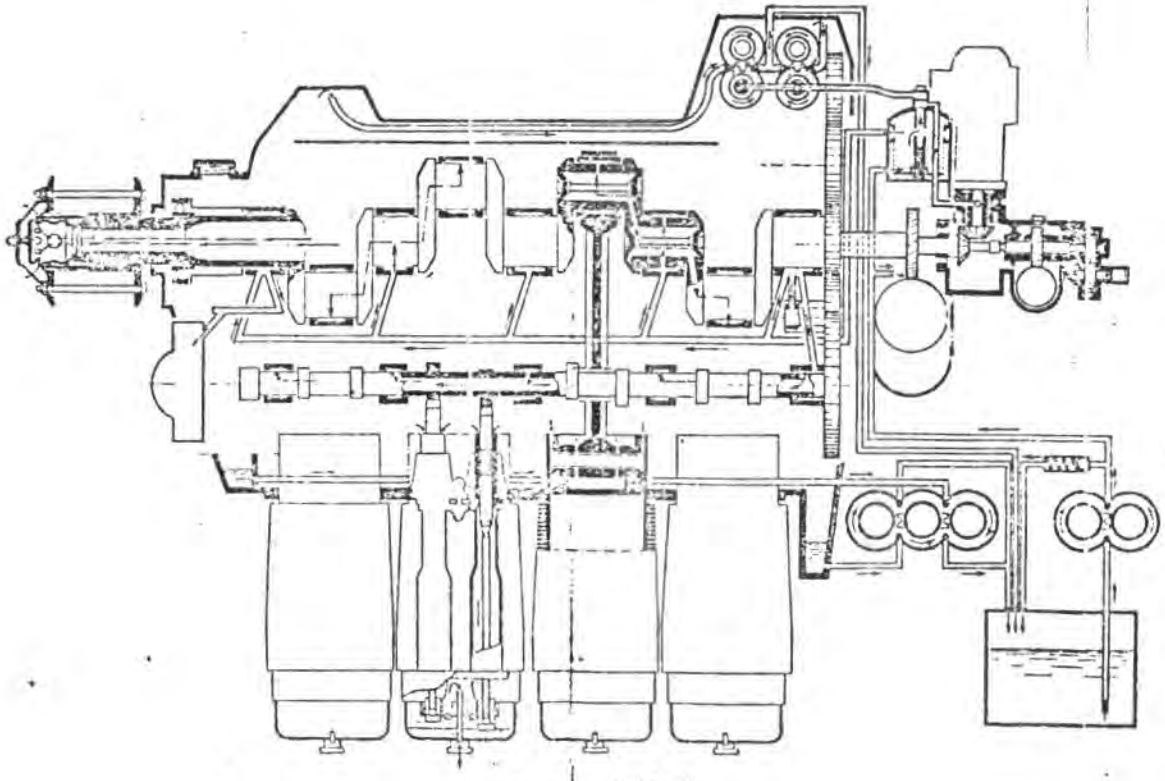
Plate VII

Schémas de la circulation d'huile

Oil circulation



MOTEUR 4 P 01



MOTEUR 4 P 05

PLANCHE VII A

Perspective de la circulation d'huile du moteur 4 P 01

Vue 3/4 arrière

3/4 rear view of oil circulation 4P01

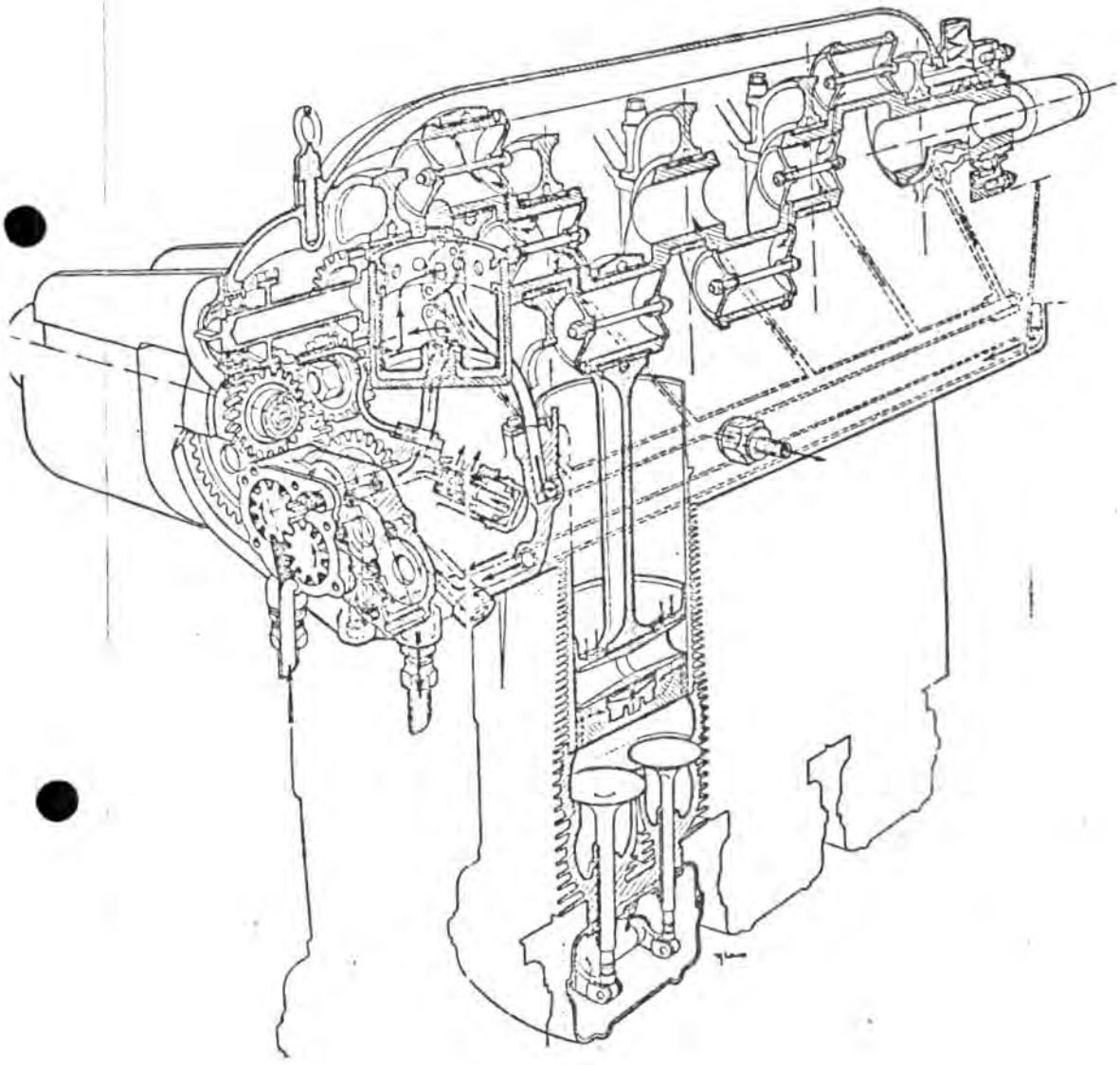
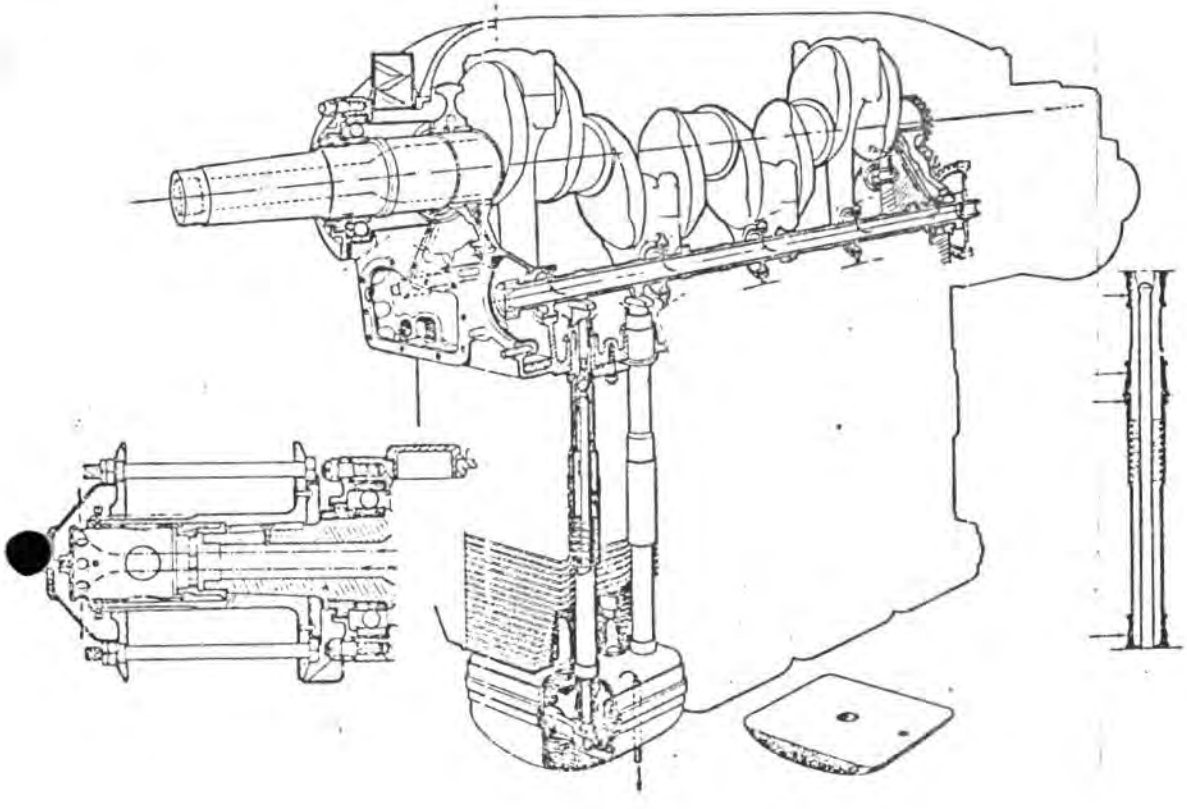


PLANCHE VII C

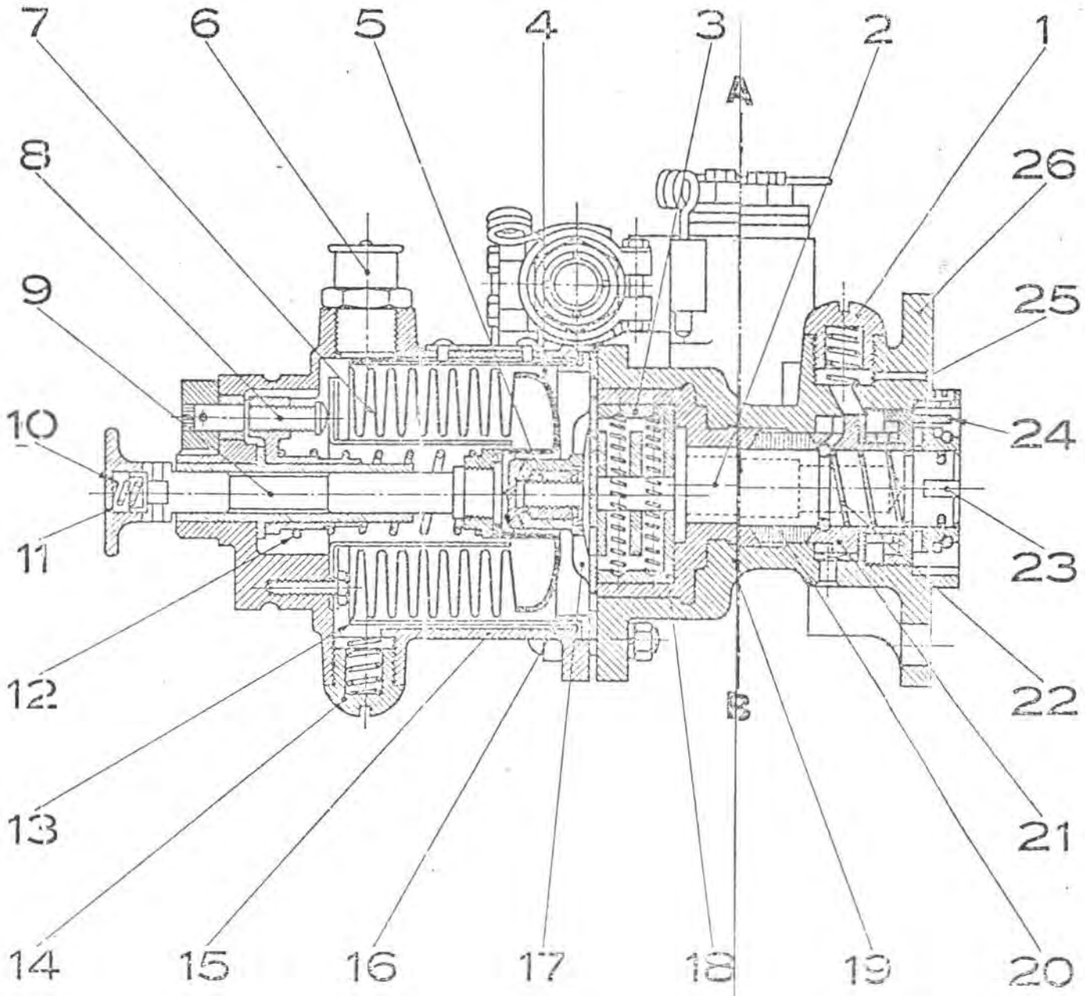
Perspective de la circulation d'huile des moteurs 4 P 01 et 4 P 05

Vue 3/4 avant

3/4 front view of oil circulation 4P01 and 4P05



Fuel pump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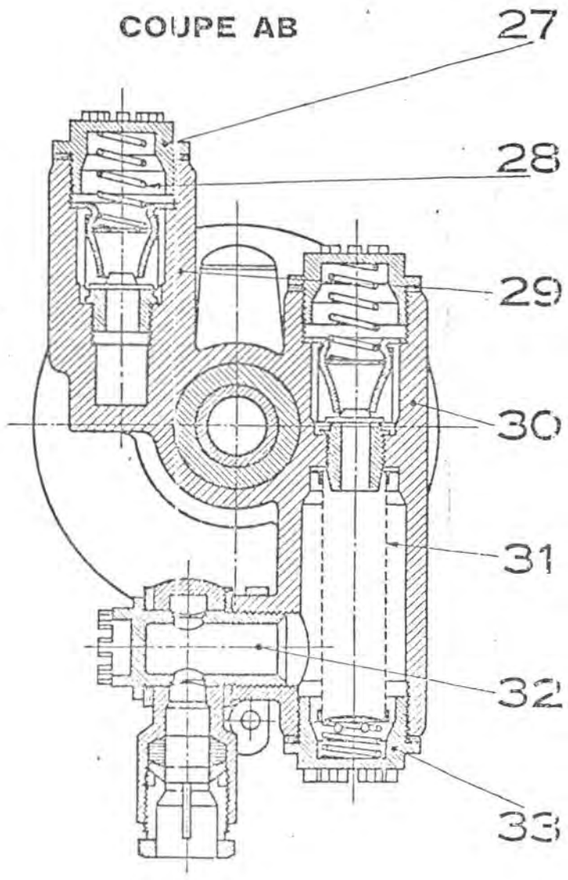
COUPE AB
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