

Please Read Instructions carefully.

The Improved Patent "IDEAL" Loose-Leaf Lecture Note Book

138358 Wa Seymour

And Covers for MSS., Letters, &c.

INSTRUCTIONS.

Size No. 12

When the book is in use do not tie the lace but fasten by the ENDS ONLY, by inserting the spear tag into the sheath tag.

To re-arrange, remove, or insert leaves in any place, join the opposite black and brown laces by the tags, divide the leaves at the place required, draw the lace through and separate the tags: or withdraw and relace one lace before withdrawing the other.





WILLIAM HUNT, Patentee. Manufacturing Stationer, 18 BROAD STREET, OXFORD. (Opposite Balliol Coll.)

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W A Seymour RAF, '1' Flight A Squadron Bristol

130 HP. Clenget. GENERAL DATA HP: 100, ho of extendes Q .- order of 53792468 - Direction of whatin and clos apluders = 120 mms. - sticke = 160 mms. laden) = 375th, Then the · 23 16 Revs on Ground = 1150 pamini " 1200 -Petrot Comemption = 8610 galls phr. Oil. 12 to 12 gally . .. General Descrip This enquie is a colating a funder type is the cylinder crawk ease the revolve round a statunen and shaft . The can't shaft lung statuicey & hollow is Therefore the means of allaching enquie to the (By passing through 2 supports ralse conveying the mixture × Culocant to rotating for The crank case & cylinders are supported on the erank shaft by being bolled be veen thust box an war + Came Box in point. The protes inteting + statimery parts is also bed by a

130 HP Clerget

GENERAL DESCRIP

This engine is a rotating cylinder type i.e. the cylinder crank case etc revolve round a stationary crank shaft. The crank shaft being stationary & hollow is therefore the means of attaching engine to 'plane (Bypassing through 2 supports & also conveying the mixture & lubricant to rotating parts) The crank case & cylinders are supported on the crank shaft by being bolted between the thrust box on rear & Cam box in front. The friction between rotating & stationary parts is absorbed by a . . .

double thinst bearing contained in the thirist book GAN DESCRIP The gears which muchanceally operate the values situated at top of cylinders are contained in The Cam Box in front of Enquire . Two sharking plugs are served into leading edge at top cylunders which are annected by bars brass wines to a notating distributator, Bay near Thrust la haquetor & high tension carbon brushes we fire to cutral support & anney aument to plago via distributation + hass wines The propelles is bolted to the nose prese which is situated munidiately in first desgue. che of Sy operation : inlet value opens 4 ? lefore T. O.C. I.V. Closes 56° after B.D.C. Equition occurs 22° before T.D.S. on C.S. E.V. Spens 68° before B.D.C. IN cloves 4" after T.D.C. There is an overlap of 8. which is to allow for the slow opening elong of values which is due to the eccertic motion of campeac

GEN DESCRIP

... double thrust bearing contained in the thrust box. The gears which mechanically operate the valves situated at top of cylinders are contained in the Cam Box in front of Engine. Two sparking plugs are screwed into leading edge at top of cylinders which are connected by bare brass wires to a rotating distributator [sic], keyed on rear thrust box. Magnetos and high tension carbon brushes are fixed to central support & convey current to plugs via distributator & brass wires.

The propeller is bolted to the nose piece which is situated immediately in front of engine. Cycle of operation:

Inlet valve opens 4° before T.D.C. I.V. closes 56° after B.D.C. Ignition occurs 22° before T.D.C. on C.S. E.V. opens 68° before B.D.C. E.V. closes 4° after T.D.C. There is an overlap of 8° which is to allow for the slow opening & closing of valves which is due to the eccentric motion of cam gear.

(Clerget2)



T.DC T.P.C BD Robary notion: The sugue is her to robe on its centre, the crank shaft. The pis are file to whate on their seather ! to I have being ecce ach other at T.D.C. + are neares B.D.C. farthest about ab is so trived that the face divi may T.D.C. after nected 20 Low 4 dos through The force of Killool

Rotary motion:

The engine is free to rotate on its centre, the crank shaft. The pistons are free to rotate on their centre, the crank pin. The paths of travel being eccentric are nearest to each other at T.D.C. & are farthest apart at B.D.C.

Ignition is so timed that the full force of the explosion may be utilised immediately after T.D.C. so that the force shall not be directed down the connecting rod to crank pin & down crank web to crank shaft but through connecting rod at an angle to web. The force of explosion sends a force . . .

CLERGET (3)

he D.C.T B.D.C

... in a direction to the crank shaft, but the connecting rods direct this force to the crank pin which being an immovable object sets up a reactionary force to the gudgeon pin which creates a third force which is at [character for "right angles"] to connecting rod & takes line of least resistance & gives motion to the engine.

brank shaft: is made of C.N cheel vie space. () Longend (ii) Short en (iii) Eccentric shaft or extension of short end. The longend is connected a shorten a I crank pur by an inter fatting over the faper cia year. It es are secured by pour on the lo a bolt screwing through show and wints tapered crank pin. AB B collar enablin san rtion 8 and pen is cut away at top malle master co be taken of whilst in alcoplan that en huen na a shaft is a pus prevented is locked by a lo e preade

Crank Shaft:

is made of C.N. steel & in 3 parts.

- (i) Long end
- (ii) Short end
- (iii) Eccentric shaft or extension of short end

The long end is connected to the short end at crank pin by an internally tapered sleeve fitting over the taper crank pin on the long end. They are secured by a bolt screwing through short end & into tapered crank pin. The bolt has a double collar enabling to act as an extractor. The bolt is secured by a safety

plate. A portion of tapered crank pin is cut away at top to enable master connecting rod to be taken off whilst in aeroplane, giving both long & short ends perfect alignment is a key.

The eccentric shaft is a push fit on short end & is prevented from turning by a key & is locked by a locking ring screwing onto the threaded end of the

CLERGET (4)

CLERGET. (4) shaft which projects the cam 1 advau 8 dabe et up crau (ii 4 nor can be u anges there hal bal Uses of lona M Dhl curried rotali (i) enfine to (11) plane (iii) in acts a Clas relation sipe, having can (in) Courses e to enque Provide crank pur, the fixed por 0 the enfun exects its Flane! Now 8 ue is beld to end the eran aus long (1)

... eccentric shaft which projects through rear of cam box.

Advantages of a built up crank shaft

Engine can be partially dismantled while in plane Master connecting rod can be made solid with its flanges, therefore carrying 2 radial ball bearings Uses of crankshaft:

Forms centre of rotation

Holds engine to plane

- Being hollow & stationary acts as an induction pipe, having carburettor screwed on rear
- (ii) Conveys oil to engine
- (iii) Provides, in a crank pin, the fixed point against which the engine exerts its power

How engine is held to Plane:

By means of long end of the crank shaft through 2 supports or bearer plates.

(i) Central support having a tapered hole

with z Keyl to which fits beud back of cra 2 Keepin) thereby la sta (ii) support parallel hole this ach as an exha etor SHOTT END LATUR C

with 2 keyways into which fits tapered part of crank shaft, having 2 keys inlaid thereby keeping shaft stationary.

 (ii) Rear support has a parallel hole & fits just behind the solid collar near end of crank shaft. Securing shaft is a locking sleeve behind central support & a locking ring behind rear support. The locking sleeve acts as an extractor.

CLERGET (5)

CLERGET (5 Grank case: steek ig under torethe cyls, he ellus i oose with which pls a a cyle, g dowel pins are 4 of cranked aenjage 2 in crank ea Acre cyls from an io crank to threast box + in how 60 dus: are made of C.N. steel with each cyl head & It E.V. ae I being of on the heading calge suposes. 1 Felcum bosh with cychead eeth oppo wer apertines for Value Lages. 6n leading edge towards the To are 2 loles taccomodate klugs. la collar which fills u a ground in crant cas

Crank case:

Is a steel stamping made in halves which when bolted together by 9 bolts forms 9 appertures [sic] to hold cyls. In each half of apertures is a groove into which fits a collar on cyls, 9 dowel pins are fixed in rear half of crank case & engage ½ in solid collar & ½ in crank case thereby preventing cyls from turning. To crank case is bolted thrust box in rear & cam box in front.

Cylinders:

Are made from C.N. steel with radiating pins for cooling & strengthening purposes. In each cyl head & I & EV cage The exhaust being on the leading edge for cooling purposes. 2 fulcrum posts are screwed into cyl head directly opposite screwed apertures for valve cages. On the leading edge towards the top are 2 holes, threaded to accommodate plugs. Near base of cyl is a solid collar which fits into recess or groove in crank case.

The advantage of the cyco being this clauped in crank case is that it allows an en - cive of cyc. Bok hading whailing a / cy lo at base are cut away to naled a ut case los to be erwant concer Joeoling cyls wear istons the made of alumin alloy with c advantages of alloy. () Radiates heat better Han C.T. or steel (ii) Shength for weight. Kours piston are 4 prooves which accoundate rings. i.e. 2 obtinator rings + 3 C. 1. rings 6 small boles are drieled round piston allow out to flow to cyl walls. a portor of exert is cut away to prevent pestons for at B.D.C. The ent anay portion is pl on the haling edge, 2 hussare cart in He piston tare bored out to take phosphon brouge bushes. These are secur set screws through lugs. Worker

The advantage of the cyls being thus clamped in crank case is that it allows an even expansion of cyls. Both leading & trailing edge of cyls at base are cut away to enable cyls to be fitted into crank case & also to prevent connecting rods fouling cyls near T.D.C.

Pistons:

Are made of Aluminium Alloy with concave heads:

- (i) Radiates heat better than C.I. or steel
- (ii) Strength for weight

Advantages of alloy:

- (i) Radiates heat better than C.I. or steel
- (ii) Strength for weight

Round pistons are 4 grooves which accommodate rings, i.e. 2 obturator rings & 3 c.i. rings

6 small holes are drilled round piston to allow oil to flow to cyl walls. A portion of skirt is cut away to prevent pistons from fouling at B.D.C. The cut away portion is placed on the trailing edge, 2 layers are cast inside the pistons & are bored out to take phosphor bronze bushes. These are secured by 2 set screws through keys. Working in . . .

CLERGET (6)

CLERGET (O. they one o 2 loto 0 obtinator los Lello 5 man nen the actual gap of each the japs bein e des ie. 120 or round cyl walls com Made of case bardenes speel + con sun Dout at tach end b seccing up a lach pur hara > mu * ou bath. sa driving lit groowhere it is locked by a bolt.

. . . bushes is a gudgeon pin. <u>Rings:</u>

Two obturator rings are fitted in top groove of piston [W.A.S. uses symbol for "at right angles"] in section & made of 70% copper & 30% silver. They are fitted one on top of other each having a gap of 1 mil. Gaps are placed 3 cms apart on leading edge of pistons. The object of the obturator rings is to follow the distortion of the cyls & so help to maintain compression. The 3 C.I. rings are in remaining grooves the actual gap of each ring being 1 ½ cms. The gaps being placed equal distance i.e.

120°. Their function is to evenly distribute oil round cyl walls & to assist in maintaining compression. <u>Gudgeon pins:</u>

Made of case hardened steel & hollowed out at each end to lessen expansion & so prevent them seizing up in their bushes in piston lugs. Each pin has a groove cut straight across forming an oil bath. The pin is parallel & is a driving fit into small end of connecting rod where it is locked by a bolt . . .

sing through 100 x naster 6 rieg t , Lollow rod es Both elled lo a ceru want nue su dre lled 2 boso of big ere 2 low p ara , Read down hollow course etc Conne 6.1. Akel 101 bigen

... passing through rod & pin. Master Connecting Rod:

Made of C.N. Steel, rod is hollow for lightness, strength & lub. purposes & is of round section. Solid with rod are two flanges which hold 2 radial ball races on which the master connecting rod revolves. Both flanges are drilled with 8 holes to accommodate big end pins or wrist pins. Ball races at front & rear prevent pins from coming out. Nine small holes are drilled round boss of big end to allow oil to flow from crank pin to big

end pins down hollow connecting rods to gudgeon pins etc.

Connecting rods:

Made of C.N. Steel, hollow for lightness, strength & lub. purposes & of round section. These connecting rods connect the 8 remaining pistons to the master connecting rod & crank pin. The big ends of connecting . . .

CLERGET (7)

CLERGET (7) was are bored out to told phospher ye bushes these bushes ar voved voulled forming a bath oil for bigenede pure to allow oil a down hollow connecting . Deg endo uncter eor eglica peur or Wris case ha tion Alle aded la kas a bey master concelia them pour burnie Cam box:of la C.N. tis bolked 6 cout of brank ca It carries a radial 6 oue 4 the ecc tuce on

... rods are bored out to hold phosphor bronze bushes. These bushes are grooved & drilled forming a bath for oil for big end pins & to allow oil to flow down hollow connecting rods to gudgeon pins. Big ends of rods are slotted to receive oil from the master connecting rod.

<u>Big end pins or Wrist pins</u>: There are 8 made of case hardened steel grooved for lubrication purposes & are hollow & threaded for the purpose of extraction. Each pin has a peg which fits into the slot in the front flange of master connecting rod & so prevents them from turning.

<u>Cam box</u>: Consists of a C.N. Steel casing & is bolted to front of crank case. It carries a radial ball bearing which forms one of the front supports of the engine on the eccentric shaft . . ,

Fitting in pour of the cambox is a late a cambox cover cloyed as a radial Foursey for a er on adei pose .. a lightre 6 cambo Fitting: - The prop. a the on a stell bors which ha na ha hole skeyway energaques with a lecuning on the Japered worse plece. the boss prop, is a cut, on sorew und of more prece. This Kept; row turung by a lo over feado/ un caled exhact

... fitting on front of the cam box is a centring plate or cam box cover, employed as a housing for a radial ball bearing mounted on the eccentric shaft forming front support of engine.

<u>Nose piece:</u> Made of C.N. Steel, hollowed for lightness & strength & is bolted on the cam box.

<u>Prop. fitting:</u> The prop is fitted on a steel boss which has a tapered hole & keyway engaging with a key on the tapered nose piece. Securing the boss & prop is a nut screwing on end of nose piece. This nut is kept from turning by a locking plate fitting over head of nut & being bolted to prop. The nut also acts as an extractor.

CLERGET (8)

CLERGET (8). Cam bear vachon :-- The campian con campear rings 2 0 - pearning have isteeth inter are keyed uside the cam box stherefore re engine speed. Meshing vbeing driven la respectively are he 2 for from from wheels, each ha nig 16 lette externally cat. Doth cam gran wheels are mounted on excentic cuties on the eccentric It. herey & took of ear year whals are extended to the rear salt as caus. The whet 1 care parning 7 1 wheel Cam Rau courses fare placed in cam box frest y each other on Heleft ude of car bot only. ethaust campean cousts of wheel which med only on right aun action : - the cour gearing a revolving at augue speed drives the wheel with 16 teth at a speed of P: 9 respectively this meet that can gear wheel revolves, The gear wheel auch therefore heek every new

<u>Cam gear & action:</u> The cam gear consists of 4 steel cam gear rings & 2 cam gear wheels. Cam gear rings have 18 teeth internally cut & are keyed inside the cam box & therefore revolve at engine speed. Meshing & being driven by each ring respectively are the 2 cam gear wheels, each having 16 teeth externally cut. Both cam gear wheels are mounted on eccentric centres on the eccentric shaft. Every 4th tooth of cam gear wheels are extended to the rear & act as cams. The inlet cam gear consists of 1 cam gear ring & 1 wheel which are placed in cam box front & mesh with each other on the left side of

cam box only. The exhaust cam gear consists of cam gear ring & wheel, which mesh only on right of cam box.

<u>Action:</u> The cam gear ring with 18 teeth revolving at engine speed drives the cam gear wheel with 16 teeth at a speed of 8:9 respectively (this means that cam gear wheel revolves faster than engine). The gear wheel must therefore gain 2 teeth every rev of engine.

as the sugure revolves a come comes we fact with slifts a tappet doe slight till a pour when the ring awheel are I'm meah. This is the pourt when the cel be fully open. Do the cam wheel value every laster shering on an eccentric cuch well predually move away how the tapped shoe which well allow the value to close by means fit ipring . but the next rev. the came where wellhave for tech too here is only an estanded both way 4th both, the value weel wit be opened this completing the cycle. Value turing: - The cam box wuch he takan of to time the values. assuming the E tappets rule aar ning are in tion place the cam boy with too cyl It appets at TD.C. this brugs No 4 exhaus lappet at about 58° past B.D.C. (powhor for luning exhaust.), + to 7 miles tap about 116° past T.D.C. (position fortune ulel)

As the engine revolves a cam comes into contact with & lifts a tappet shoe slightly till a point when the ring & wheel are right in mesh. This is the point when the valve will be fully open. As the cam wheel is revolving faster & being on an eccentric centre it will gradually move away from the tappet shoe which will allow the valve to close by means of its spring. On the next rev the cam wheel will have gained 2 teeth & as there is only an extended tooth on every 4th tooth, the valve will not be opened thus completing the cycle.

<u>Valve timing</u>: The cam box must be taken off to time the valves. Assuming the I&E tappets & inlet gear ring are in position place the cam box with No1 cyl I&E tappets at T.D.C., this brings No4 exhaust tappet at about 58° past B.D.C. (position for timing exhaust), & No7 inlet tappet at about 116° past T.D.C. (position for timing inlet)

CLERGET (9)

(LERGET (9) Julet :- Place eccentric shaft in can bet seeing that key way is at B. D. C. tac is dweetly underweath No 7 I tappet Mest campan wheel with campan ring, this tuning all well values. 4haust - Place cam year wheel on eccurric shaft having a can directly under Ko 4 E.V. tappet. Much ring with wheel wall exhaust values are twice. Tum cam hot over receive escartie shaft to same by sciencing locking ring to rear & shaft. Tlace Horcycat T. D.C. Abolton cambox having to I pair of tappets underneath horcy Cat T.D.C. all Hat tow remains to be done is to fix + adjust happet webs. Values : - are made of CN shell save of anot soon type. Value cages screw while cyle heads. The while has a flat seating se shause a correct seating. alves are held on their seating by a spiral eping als washer a cotter per

Inlet: Place eccentric shaft in cam box seeing that key way is at B.D.C. & av cam is directly underneath No7 tappet. Mesh cam gear wheel with cam gear ring, thus timing all inlet valves.

<u>Exhaust</u>: Place cam gear wheel on eccentric shaft having a cam directly under No4 E.V. tappet. Mesh ring with wheel & all exhaust valves are timed. Turn cam box over & secure eccentric shaft to same by screwing locking ring to rear of shaft. Place No1 cyl at T.D.C. & bolt on cam box having no1 pair of tappets underneath No1 cyl at T.D.C. All that now remains to be done is to fix & adjust tappet rods.

<u>Valves:</u> Are made of C.N. steel & are of mushroom type. Valve cages crew into cyl heads. The inlet has a flat seating & exhaust a conical seating. Both valves are held on their seating by a spiral spring, cup washer & cotter pin.

2 ERGET A huch lot :-Made of C.N. steel casary to bolk reac of crankcase. thrush a double thread bearing enable sugue lobe user in either pucker Acoutain also which for near se Reefactor Cla 1. Keyed & He rear of threat box is the dispetertor receivede better the spenne turing wheel is screwed into thrashbot. The tuning wheel carries a leather washer presentine an y air being drawn with exauticane oil being forces out of thrist bot He open tuning wheel drives the 2 mag. the oil prinip which are peteron the hal su Induction pipes (oval type): ber rare u ele of 1 then a flange trafed on at lop whee with the unles value eage. in of unduction asing

<u>Thrust box:</u> Made of C.N. steel casing & is bolted to rear of crank case. The thrust contains a double thrust bearing enabling the engine to be used in either "pusher" or "tractor" type of plane. It contains also 2 radial ball bearings which form rear support of engine on crank shaft. Keyed to the rear of thrust box is the distributor & immediately behind it is the spur timing wheel which is screwed into thrust box. The timing wheel carries a leather washer preventing any air being drawn into crank case & oil being forced out of thrust box. The spur

timing wheel drives the 2 mags & the oil pump which are fitted on the central support.

<u>Induction pipes (oval type)</u>: Are 9 in number & are made of thin steel. There is a flange brazed on at top which coincides with the inlet valve cage. The flange at bottom of inductor fitting on thrust box casing is soft soldered on . . .

CLERGET (10)

CLERGET (10) allows allo hol is pres hour a tai carburetto whe el A hollow crank As onto rear between facek a carterello cock + a fue adjustment false which The supply of peter basafilter. The petrol is spran also runged with an in the can out along follow crauk Hen such cian then to gloles u casure up the u duchoi. duction shoke is freeked u Cyls where it is in Turn compressed ne rexpansed intace den EV. Carba a block tube ette appe recrews proper are fitted from

... which allows for the expansion of cyls. A fibre washer is fixed on both flanges to ensure an airtight joint.

<u>Path of Petrol:</u> The petrol is pressure fed from a tank to carburettor which screws onto rear end of hollow crank shaft. Situated between tank & carburettor is a petrol cock & a fuel adjustment valve which regulates the supply of petrol to carburettor & acts as a filter. The petrol is sprayed out of the jet & mixed with air in the carburettor &

is then sucked along hollow crank shaft into crank case, then to 9 holes in thrust box casing up the induction pipes & on induction stroke is sucked into cyls where it is in turn, compressed, fired & exhausted into air, via E.V.

<u>Carburettor</u>: This is a "block tube" type & screws on rear end of crank shaft. It consists of a rectangular casing with 2 openings, for admission of air, these airports being surrounded with gauge. 2 exhaustion pipes are fitted from air ports . . .

to outseeded firsdaye I draw proper are fitted mettor c all sur of away pour place. crauk and a carbinettor is peter eliding throttles locie of throttle a ball nerd whe is a dapen s opened as ug peril to I carbuello throw elsa ber a grelation Chi also Ga true Double Kneadi Locking nug an Pat onts non perforts

... to outside of fuselage. 2 drainpipes are fitted to carburettor casing carrying all surplus petrol away from plane. At crankshaft end of carburettor is fitted a sliding throttle & attached to end of throttle by a ball joint is a tapered needle which slides in jets: as throttle is opened allowing more air to flow through carburettor, more petrol is forced through jet.

<u>Fuse adjustment valve:</u> is situated between petrol tank and carburettor & contains a needle valve regulating amount of petrol flowing to carburettor. It is also fitted with a fuse gauge for filtering purposes.

Wiringto plugs : - mays revolve q: 4 engu speed clockwise. From HT. Herning pag a H.T. insulated wire is led to a carbon brush fother to central suy This carlos breach is always in with distribution, which being keyed rear of thrust box casing revolves at a in ferminals on dishe ie brass wires are led to sparking Wiring to switter a wire is led ferminal on contact br Switch, another wire Wearth Camp shalionary

<u>Wiring to plugs</u>: Mags evolve 9:4 engine speed clockwise. From H.T. terminal on mag a H.T. insulated wire is led to a carbon brush bolted to central support. This carbon brush is always in contact with distributor, which being keyed at rear of thrust box casing revolves at engine speed. From terminals on distributor bare brass wires are led to sparking plugs.

<u>Wiring to switch</u>: A wire is led from L.T. terminal on contact breaker cover to switch, another wire is led from switch to earth (any stationary part of engine)

Place any cyl. on ution 22° before T. D.C. shoke at compresse Serion wheeld in divillion i. l. Clockwise = 2 plating con + ph are about to tre Then mese wheel plucon wheel with eng wheel on the ust lok to ma Connect a current. an T. yourtes unst be taken to symcronize be Inhication :- The oil is pravity fed to oil pecup to cee support. Ter lea ceel al a copper Concider copper pipe . which co a long and web. The welled to four out Here are three longerel boss of master anneching pas ing rods lub pudges

Ignition timing:

Place any cyl on compression stroke at 22° before T.D.C. Turn ignition wheel mag in direction of rotation i.e. clockwise & 2 platinum pts are just about to break. Then mesh mag, wheel pinion wheel with engine spur wheel (on thrust box) & bolt up mag. Connect up H.T. & switch current. Care must be taken to synchronise both mags.

Lubrication:

The oil is gravity fed to oil pump bolted to central support. After leaving pump it is forced along a copper pipe to a union on central support. Coinciding with union is another copper pipe inside the hollow crankshaft which conveys oil as far as the long end web. The remainder of the shaft is drilled to four oil channels. There are three outlets for oil (i) At back of long end web lub. thrust box & contents. (ii) At crank pin lub boss of master connecting rod, big end pins & then passing down hollow connecting rods lub gudgeon pins, . . .

bushes, peston reglwalls. (11) Between the camptan wheels on eccentric shaff but , can box ball bearings, toppets yourd In cold weather 10% wethe spirit is with easton oil & prevent it pour every Culsalo. to a dou shappell ushun board, Concelled to man or by a least taken from pipe belover oil pump cuhal upport. flass is 9 the welld with oil the pressure caused by the percent oll engene, also can oce in e a pulsate. a lap is filled on alor plass to been fort should le use of plass is to see that working correc Presator thrust for fall hannes a phrust races Big and ball bearings Car box ball beerings To Pulsali Cam pealing Bigend pins Sudjeon prin. Philos very livello appets fluide

... bushes, pistons & cyl walls. (iii) Between two cam gear wheels on eccentric shaft, lub cam gears, cam box ball bearings, tappets & guides. In cold weather 10% meths spirit is mixed with castor oil to prevent it from congealing.

Pulsator glass:

Is a dome shaped glass fitted to instrument board. Connected to main oil pipe by a lead taken from pipe between oil pump & union on central support. The glass is ½ filled with oil & the pressure caused by the pump forcing oil to engine, also causes oil in glass to rise or pulsate. A tap is fitted on pulsator glass to turn of [sic] oil should glass get broken. The use of glass is to see that oil pump is working correctly.

Oil Jump. Consiste lan alunun bolked to central sup asure on which are accused bla ho ege b puces. The anore cher. 11.011 Gavely pour lacet ch oil by pugsed 4 a screw regula operates on peoton lengthering on the sh any of oil peru preup person 36 reath to spec 63 feeth Pincon sha shaff-1/69 Celion of Gil Pum in plunder descends ig outles TCLORU hugue (ii) Piston pluger els succes (iii) Value pluger 5 per

Oil Pump:

Consists of an aluminium casing bolted to central support containing a shaft on which are mounted 2 cases kept in contact with cams by spiral springs are a valve & piston plungers working in phosphor bronze barrels. Secured to bottom of pump casing is an oil inlet chamber. This chamber is filled with oil by gravity from tank. The amount of oil being pumped to engine can be regulated by a screw which operates on piston plunger either lengthening or shortening the stroke. The gearing of oil pump is as follows: Oil pump pinion 36 teeth to spur wheel 63 teeth = 7:4. Pinion shaft to cam shaft 25:1 (by worm & worm wheel)

Action of oil pump:

- (i) Valve plunger descends opening inlet port & closing outlet port to engine
- (ii) Piston plunger ascends succing [sic] in oil
- (iii) Valve plunger ascends opening outlet to

nº 12 engine + closing inlet. Pistor plunger desends forcing oil to (iv) enque

... engine & closing inlet.

(iv) Piston plunger descends forcing oil to engine

Revolution indicatio frontore :to fixed to out ferrage carrage + driven pump spicelle at a spece Gear box contain a reducing gear of 7:1. the flip ich driving shaft of new. indicator revolves at 1/4 enque speed reducing pretion swear. action of altitude on engines. 9 enddenly from a preat-A will be necessary c pump, otherwis petrol bank sufficient the enque loose news advantages of Robary engine (1) Compactness fael cyls work on I cran (ii) Light weight per H.P. 111 lasy to overhave (1) hyme puns on ball bearings proving smooth muning

Revolution indicator gear box:

Is fixed to oil pump casing & driven from pump spindle at a speed of 7:4. Gear box contains a reducing gear of 7:1 : the flexible driving shaft of rev. indicator revolves at ¼ engine speed thus reducing friction & wear.

Action of Altitude on engines:

Descending suddenly from a great height it will be necessary to use the hand pump, otherwise the pressure in petrol tank will not be sufficient & the engine will loose [sic] revs or stop. Advantages of rotary engine:

- (i) Compactness (all cyls work on one crank pin)
- (ii) Light weight per H.P.
- (iii) Easy to overhaul
- (iv) Engine runs on ball bearings giving smooth running

(v) lique having fly wheel effect gives poor equilibries to machine (1) Unequal cooling (i) Excessive oil consemption (ill) Cacut be throtted down with reliabilit as can a stationing enquis. Iquition faults .-O. Platimum pts diity or petted (i) File bush swollen through dampues a broken contact beaker spring. (II) M.T Bad hoke a shorting. (v) Carbon hust on curhal supports on collector hust in mag. sticking in Tolder through dist noil. (1). Glayes carbon buches. (W) Wills pour dishib. toplugs shorting or (Vi) Plug gaps incorrect.

(iv)	Engine having fly wheel effect gives good
	equilibrium to machine
Dissadvantages: [sic]	
(i)	Unequal cooling
(ii)	Excessive oil consumption
(iii)	Cannot be throttled down with reliability as
a stationary engine	
Ignition foults	

Ignition faults:

- (v) Platinum pts dirty or pitted
- (vi) Fibre bush swollen through dampness or broken contact breaks spring
- (viii) H.T. lead broken or shortting [sic]
- (ix) Carbon brush on central support, or collector brush in mag sticking in holder through dirt or oil
- (x) Glazed carbon brushes
- (xi) Wires from distrib. to plugs shorting or broken
- (xii) Plug gaps incorrect

Results hrice 14 Mispring unsprueg Carbonettion toults. (i) Loo rich untere detecter by black suche how exhaust causes on loss of news. spower in de fue adjustment being too for open ii) too week a mixture causing popposed in carbulla, overheating, losso nois is due to partial Abowle stopport a pui ad on las closed. It Vilralis 10

Results:

- (i) Misfiring
- (ii) Engine stops
- (iii) "
- (iv) "
- (v) Misfiring
- (vi) Regular misfiring & faulty cyl

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(vii) Irregular "

Carburettor Faults:

- (i) Too rich mixture detected by black smoke from exhaust causes overheating loss of revs.
 & power & is due to fire adjustment being too far open
- (ii) Too weak a mixture causing popping in carburettor, overheating, loss of revs & power & is due to partial stoppage in flow of petrol or fire adjustment being too far closed.
- (iii) Vibration

Vibration ! Misteria gues unevenly ballance. a cure piece But crauk shaft after fittuce loose buttion facely. 101 heque loose in VII) Chepped prop Equition too far advanced. (Vili) Jop overhaul 30 h is dischaubled as for as ea exhaul 21 with Na ethad st pues, per ching rod deo Worn be mys, brok wrist pino, oil ways in connecting rods chocked, won

Vibration:

- (i) Misfiring
- (ii) Engine unevenly ballanced [sic]
- (iii) Bent crankshaft or nose piece
- (iv) Cyls fitting loose
- (v) Carburettor faulty
- (vi) Engine loose in supports
- (vii) Chipped prop
- (viii) Ignition too far advanced

Top overhaul (30 hrs):

Engine is dismantled a far as possible without taking out of plane, that is take of [sic] prop & nose piece, cowling, fulcrum pins, cam box, extract short end together with big end radial ball bearing, extract wrist pins, remove pistons & connecting rods.

Faults:

Worn bearings, broken pegs on wrist pins, oil ways in connecting rods chocked {sic], worn . . .

obturator ringsp 210 carbon deperse bu duty plu 2 02 valu ball h e undes Ki 0 elete overhaul: - (60 hr roc cou ylever Cou thorac

... obturator rings or piston rings, carbon deposit, worn piston lug bushes, dirty plugs or plug gaps incorrect, badly sealing valves, worn valve stem guides, worn knife edge on fulcrum pins.

Through or complete overhaul (60 hrs):

Engine is taken out of aeroplane completely dismantled & every part thoroughly expected [sic].