AIR BOARD.

TECHNICAL NOTES.

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80 H.P. GNOME.

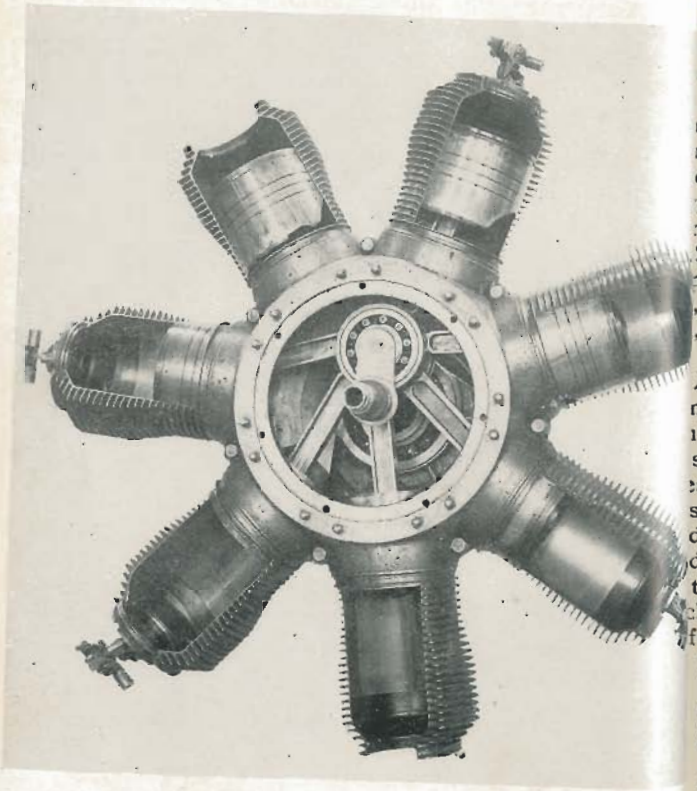


FIG. 1.

.P. GNOME.

ERAL DESCRIPTION. This engine is of the rotary oled type, with 7 cylinders, 124 m.m. by 140 m.m. rated H.P. and capable of developing about 65 H.P. at 1150 M. It is fitted with a double thrust ball race which es it to be used either as a pusher or as a tractor. The e works on the Otto or 4 stroke cycle, 2 revolutions of ngine giving 1 cycle (4 stokes) in each cylinder. The peculiarity of this engine, as compared with other rotary es, is that it has automatic inlet valves situated in the n heads. The direction of rotation is anti-clockwise, en from the propeller end of the engine. Like all other y engines it is made chiefly of steel for strength and ness. The angle through which the engine turns between 2 consecutive explosions is $102\frac{6}{7}°$.

prox. oil consumption = $1\frac{1}{2}$ to $1\frac{3}{4}$ galls. per hour.
,, petrol consumption = 7 to 8 galls. per hour.
,, weight of engine = 210 lbs., i.e., 2.63 lbs. per rated H.P.

NKSHAFT. The chrome nickel steel crankshaft of the me engine differs from that of a stationary engine in 2 1 points. First it is fixed instead of being free to turn, second, it has only one throw and is built up of 2 parts, ead of being machined from one solid piece. The 2 s, which are termed the long end and the short end, are d together telescopically at the crankpin. A dowel pin d to the short end locates the long end in correct align- t therewith. The short end is screwed to take a nut ch secures the 2 parts together. The crankshaft serves following purposes:—

(1) It provides a means of attaching the engine to the aeroplane.
(2) It conveys oil to the working parts.
(3) The carburetter is mounted on the rear end of the hollow crankshaft, which acts as an induction pipe.
(4) It provides, in the crankpin, the fixed point against which the force of the explosion exerts itself in turning the engine.

ANKCASE. The crankcase is made of 2 steel stampings ed together by steel bolts and centred by dowel pins. It 7 apertures disposed symmetrically around its periphery accommodate the 7 cylinders, each of which is gripped tly by the 2 parts of the crankcase and prevented from ning by a key. It is not supported directly on the crank- ft, but carries on its faces plates or covers, known res-

pectively as the cambox and the thrust box. The thrust b
tains the main ball race and a self-aligning double thru
The cambox contains the planet gears and the campack
actuates the exhaust valves, and one radial ball race. The
piece, which carries the propeller, is mounted on the c

CYLINDERS. The cylinders are of nickel steel, machine
the solid, the walls being only 1.25 m.m. thick. Th
numbered 1 to 7 consecutively in a clockwise direct
seen from the propeller end of engine. The order of fi
1, 3, 5, 7, 2, 4, 6. The head of each cylinder is bore
screwed to take the exhaust valve seating, which is h
position by a locking ring. The key referred to above is
between 2 shoulders which are turned around the b
the cylinder. These together act as the means of fixi
cylinder in the crankcase.

PISTONS. The pistons are made of cast iron, having
tion cut away at the trailing edge, to allow the piston
neighbouring cylinder to clear. Each piston is held be
an inlet valve seating, or cage, and a crosshead. The
valve cage screws into the crosshead, and these 2
bers clamp the piston head between them. The cross
are attached to the connecting rods by hollow steel gu
pins, which are held in position by means of a copper
and two steel washers. This tube passes through the
of the gudgeon pin, and has its ends flared out, so as t
the 2 washers which rest on the ends of the pin an
sides of the crosshead lugs. A small key is fitted to p
the gudgeon pin from turning in the crosshead. The p
have 2 grooves fitted with 3 rings, namely, the obtu
ring, the packing ring, and the wipe ring. The obtu
and packing rings are fitted in the top groove, and the
ring is fitted in the lower groove. The obturator ring is
of brass alloy, and is of L section. Its functions are to
the distortions of the cylinder and ensure gas-tightness
ing in the same manner as a cup-leather washer in a
pump. The cylinders distort through being unevenly c
The packing ring is of cast iron and, as its name denot
used as packing behind the obturator ring. The wipe r
also of cast iron and its function is to evenly distribut
oil over the cylinder walls.

Piston clearance	= 0.15 m.m.
Wipe ring gap	= 1 m.m.
Obturator ring gap	= 1 m.m.
Packing ring gap	= 2 to 4 m.m

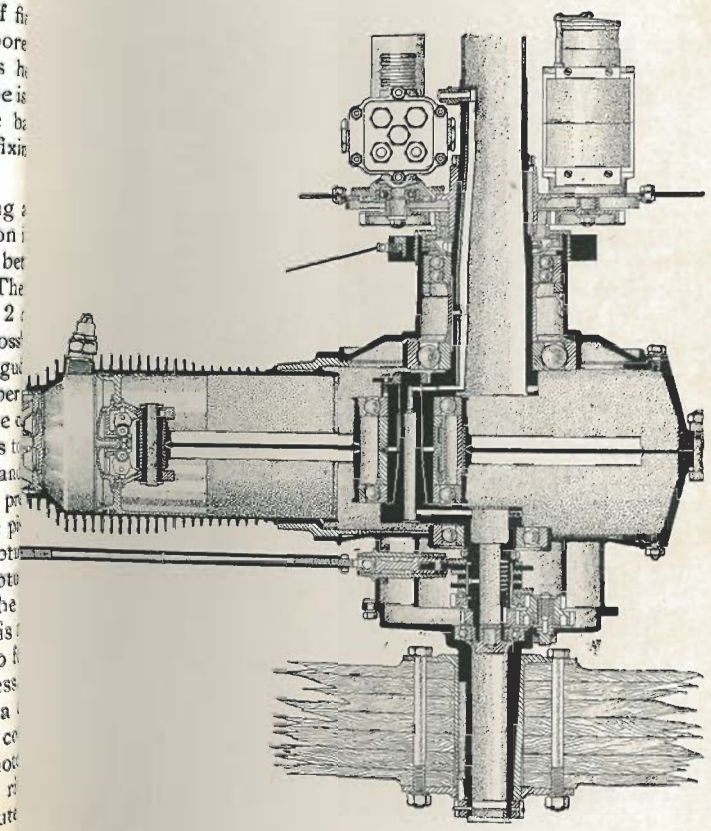


FIG 2.

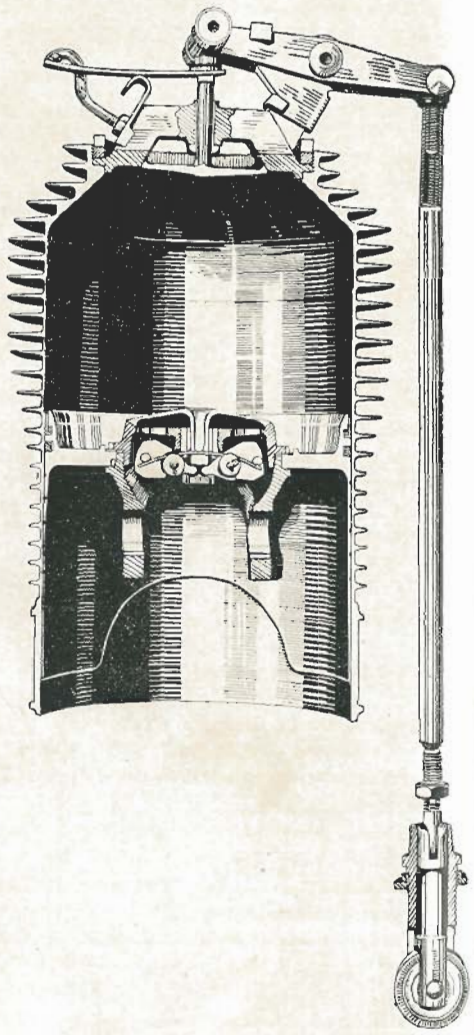


FIG. 3.

NECTING RODS. The connecting rods are made of spe-
lloy steel. There is 1 master connecting rod to which the 6
ary connecting rods are attached by means of wrist pins.
he rods are of H-section, and the auxiliary rods are
ed, at both ends, with phosphor bronze bushes. The
er connecting rod big end runs on 2 small ball races;
nall end is bushed with phosphor bronze.

VES. The inlet valves, which are in the centres of the
n heads, are made of steel and are extremely light. The
is cone shaped and has a short hollow stem which slides
cast iron bush in the centre of the valve seating or cage.
lance weights are fitted in such a position as to
ralize the action of centrifugal force upon the valve.
e springs, which are coiled around the balance weight
s, press the weights outwards, i.e., towards the top of the
der, and so keep the valve upon its seating. During the
on stroke, the pressure in the cylinder falls below that
e crankcase with the result that the valve opens, over-
ng the springs, and admits a charge into the cylinder.
exhaust valve in the cylinder head is mechanically
ated by means of a hollow steel tappet rod and steel
er arm. The valve stem slides in a cast iron bush in the
e of the steel valve seating or cage, which has a project-
ug on one side, carrying the valve rocker arm fulcrum pin,
on the other side an adjustable support for the leaf spring
h keeps the valve upon its seat. The valve itself is made
ght as possible and its weight is not sufficient to balance
action of centrifugal force on the tappet rod. This is
ralized by means of a counterweight on the valve end of
rocker arm. The exhaust valves are operated by the
pack, which consists of 7 cams keyed to a sleeve
ting on the small end of the crankshaft. The cams
ate the tappet rods which work the overhead rocker arms.
tappet rod is formed of a tappet and a rod jointed
ther. The tappet works in a guide in the cambox, and
s inner end is a roller which bears against the cam. The
et rod extends from the joint to the rocker arm of the
ust valve, and is adjustable. The campack is driven at
the engine speed by the planet gears which are fitted
e the nosepiece. It must be remembered that the engine
nning at twice the speed of the campack, so that the
rs at the bases of the tappet rods are overtaking the
pack the whole time. This causes the tappet rods to be
d as they pass over the cams and to thereby open the
es. The clearance between the rocker arm and the top

of the valve stem, when the tappet roller is at the
of the cam, should be as follows:—

Engine cold = 1 m.m.

CYCLE OF OPERATIONS. Starting with any cylin
T.D.C. and the exhaust valve open, the cylinder mov
ward until it is 13° past T.D.C. at which point the
valve closes. The suction stroke then commences, th
matic inlet valve opening a few degrees after the
valve closes, i.e., as soon as the pressure in the cylind
become lower than in the crankcase. At, or imme
after, B.D.C. the inlet valve closes and the cylinder mo
towards T.D.C. on compression stroke. At 26° before
ignition takes place, and the cylinder moves on to the
stroke, passing T.D.C. while the flame is spreading t
the mixture. The exhaust valve opens 65° before B.D.
remains open through the remainder of the cycle.

Admission of explosive mixture	= 13° to 180°
Compression - - -	-=180° to 360°
Power - - - -	-= 0° to 115°
Exhaust - - -	-=115° to 360° + 13°

VALVE TIMING. Set any cylinder, for example No.
exhaust closing position, i.e., 13° past T.D.C. To g
position, set No. 3 cylinder horizontally on the right.
tappet rod clearance, and turn the campack anti-clo
until the cam is just about to lift the tappet rod. Ther
the planet gears. Set the remaining tappet rod clear
and check the valve closing positions for each cylinde
13° past T.D.C.

IGNITION TIMING. Set any cylinder, for example N
ignition position, i.e., 26° before T.D.C. on compr
stroke. To get this position, set No. 4 cylinder ver
downwards. Turn the magneto so that the points ar
breaking and mesh the magneto driving gear. Wi
distributor to the plugs. The timing of the engine is
complete.

MAGNETO. The magneto is mounted on the face
backplate remote from the engine. Its driving spindl
jects through the backplate and carries a small spur
which is driven by a large wheel screwed into the re
of the engine thrust box. The gear ratio is 4 to 7, i.
magneto armature makes 7 revolutions to 4 of the engi
as the magneto gives 2 sparks per revolution, there
7 sparks in 2 revolutions of the engine, during which
each cylinder will have completed 1 cycle. The cur

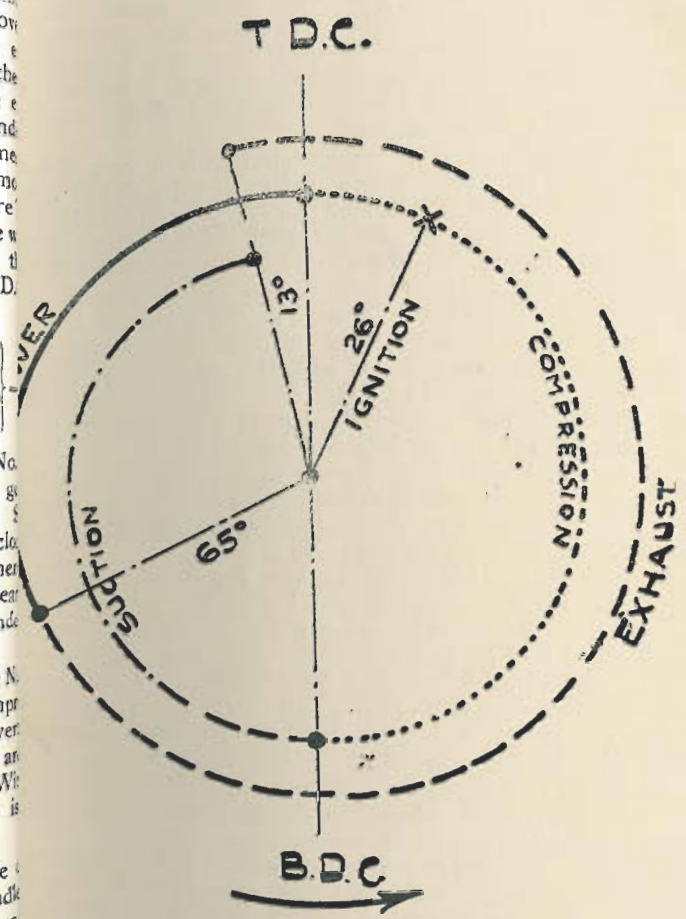


FIG. 4.

conveyed from the magneto in the following manner:—F
the magneto the current passes by a high tension wire to
insulated brush holder fitted on the backplate. A sensi
spring keeps a carbon brush in the brushholder in con
with the distributor which is mounted on the outside of
thrust box. The current is then taken from the segments
the distributor to the sparking plugs through thin brass wi
The distributor revolves with the engine and its function i
ensure that the current generated by the magneto reac
the cylinders in proper sequence.

CARBURATION. The Gnome carburetter is a very sim
device in which float and needle valves are dispensed w
It is mounted on the rear end of the hollow crankshaft
consists of a bronze body with a funnel shaped extension
the rear end through which the main air supply is admit
Extra air intake ports are provided at the bottom of
carburetter body and these, as well as the main air int
are covered with copper gauze. A vertical jet is situa
inside the body, and concentric with the jet is a cylindr
throttle barrel controlled by a lever. The petrol reaches
carburetter by a pipe which is brought to a union at the b
of the jet, and the amount of petrol passing through this p
is regulated by a screw down needle valve operated from
pilot's seat. The stream of petrol issuing from the jet me
the main air supply at right angles and is drawn with it i
the crankcase via the hollow crankshaft.

LUBRICATION. This is by pressure and centrifugal fo
combined. There are two leads, "C" and "B," equal in s
"C" Lead. The oil is pressure fed from the pump int
copper pipe inside the long end of the crankshaft, and ab
one-third flows through a branch into the thrust box, oiling
thrust ball race and main engine ball race. The surplus
overflows from the thrust box into the crankcase thro
holes drilled for this purpose and passes on to the cylin
walls through a series of holes in the base of the cylind
The main supply of oil passes up the long end crank w
through the hollow short end crankpin and down the sh
end crankweb into the hollow short end of the cranksh
from whence it is conveyed by a series of small holes to
campack. The oil then passes through grooves in betw
the cams and is thrown centrifugally over the interior of
cambox, lubricating the cams, cam rollers, tappets, pla
gear wheels, and the cambox and nosepiece ball races.
surplus oil flows through a series of holes into the crankc
and passes on to the cylinder walls as in the case of
overflow from the thrust box.

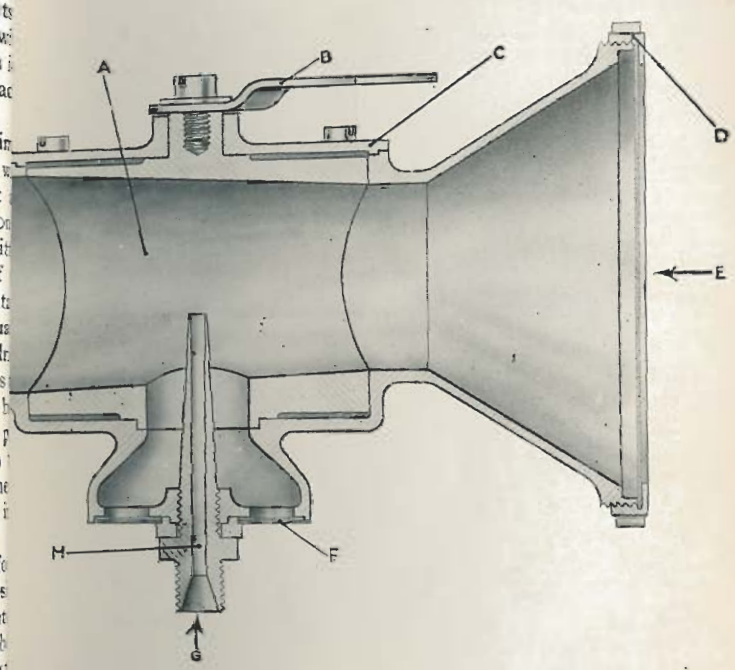
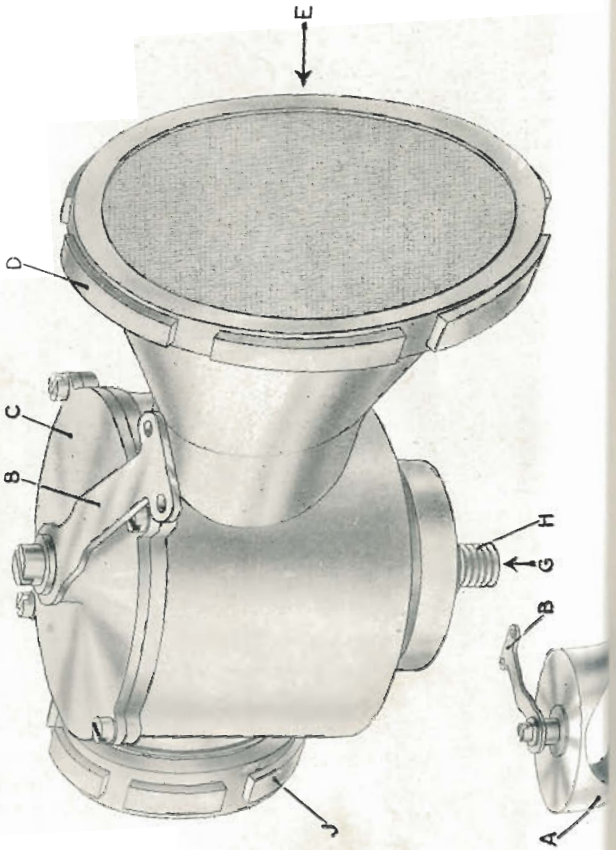


Fig. 5.

A. Throttle Barrel.
B. Throttle Control Lever.
C. Removable Cover.
D. Nut Securing Gauze.
E. Main Air Intake.
F. Extra Air Intake Holes (Wire Gauze).
G. Petrol Supply.
H. Jet.
J. Nut Securing Carburetter to Crankshaft.



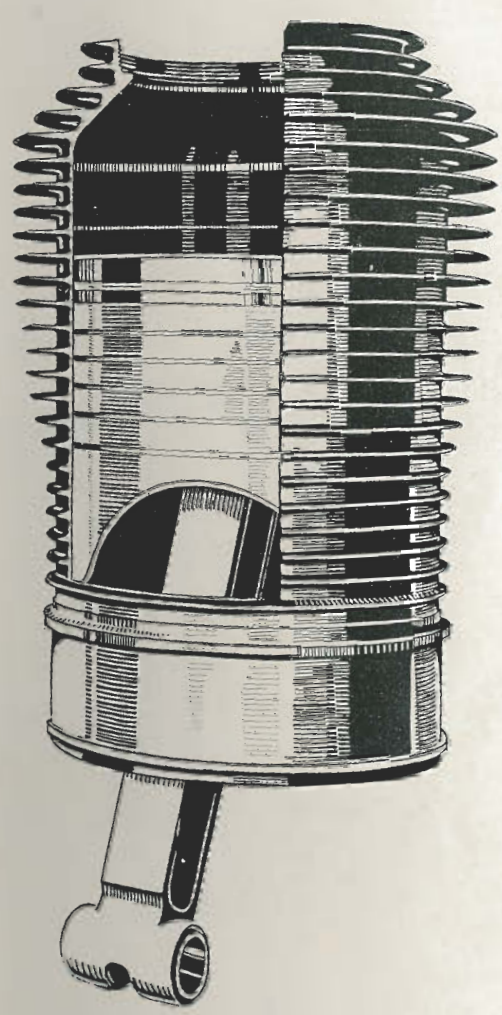


Fig. 8.

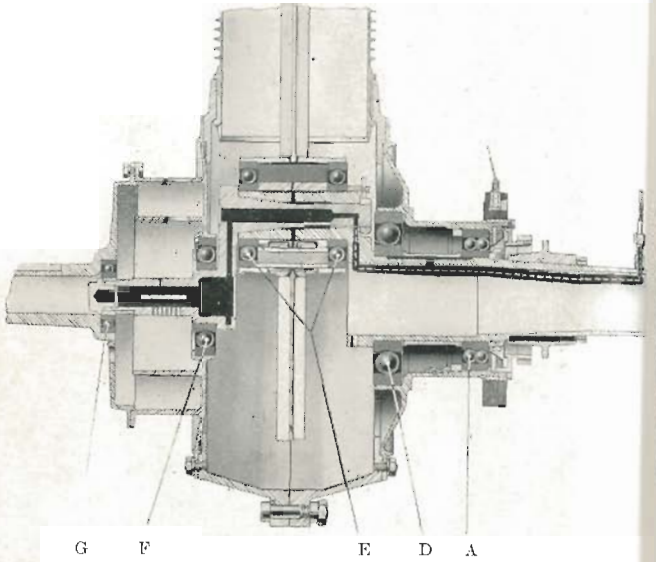


FIG. 9.

A. Thrust Ball Bearing.
D. Main Engine Ball Bearing
E. Big End Ball Bearings.
F. Cambox Ball Bearing.
G. Nose Piece Ball Bearing.

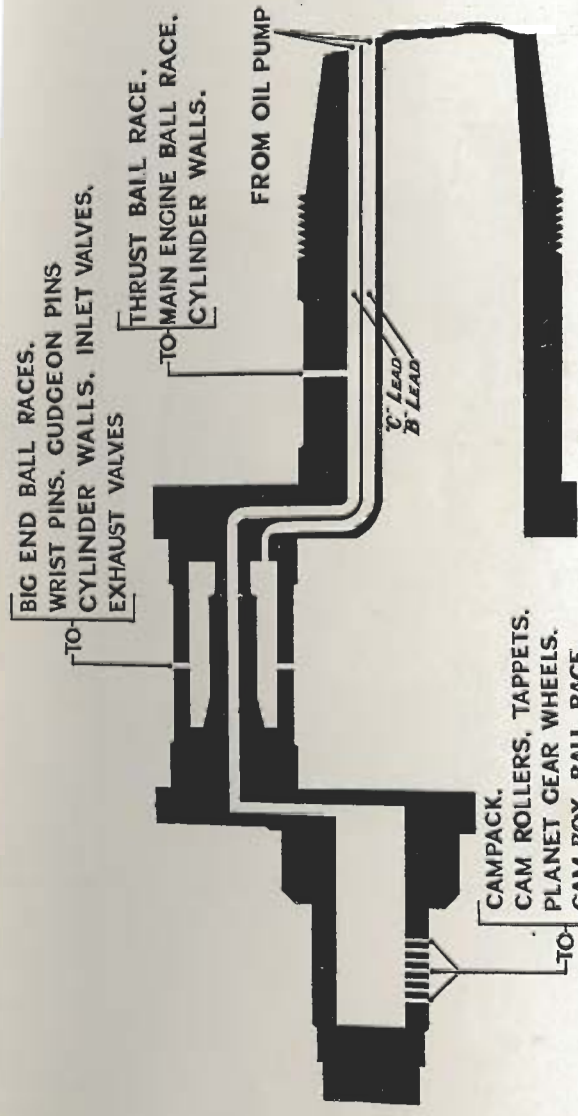


FIG. 10.

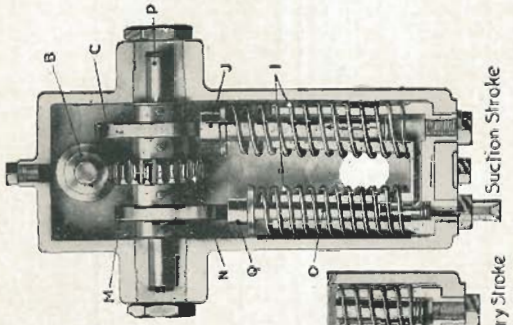


FIG. 12.

J. Bridge connecting Plunger Pistons.
K. Pin holding Cam on Camshaft.
L. Revolution Indicator Drive.
M. Valve Piston Cam.
Worm Wheel Driving Camshaft.

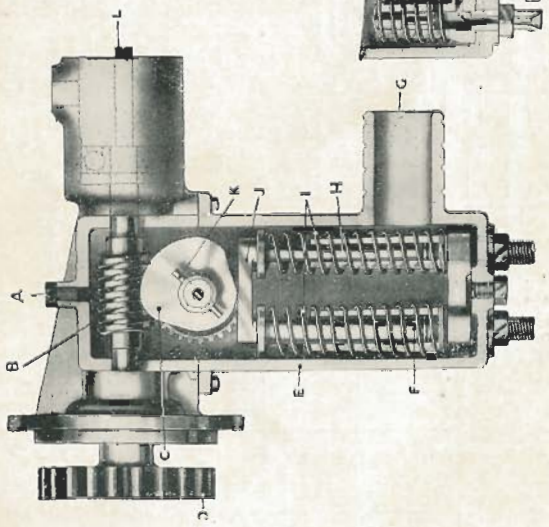


FIG. 11.

A. Screw for Releasing Air from Pump Chamber.
B. Worm.
C. Plunger Piston Cam.
D. Spurwheel Driving Worm Shaft.

3" LEAD. The oil is pressure fed from the pump into a ond copper pipe inside the crankshaft, up the long end nkweb, and into an annular space between the inner nkpin, which is part of the short end of the crankshaft, and outer or main crankpin which is part of the long end of crankshaft. From here it passes through holes in the in crankpin to an annular groove inside the master con- cting rod big end and along the crankpin to the master nnecting rod ball races. The groove inside the master rod end has 6 holes fitted with nipples through which oil ws to the wrist pins. The auxiliary rods and their "big d" bushes are slotted so as to expose the wrist pins at ese points. Surplus oil is thrown out of the wrist pin shes through holes at either side of the connecting rod webs d along these webs to the gudgeon pins via holes in the s of the rods. The master rod gudgeon pin is lubricated the same manner, a seventh hole in the annular groove ide the big end supplying oil to the base of the rod. The erflow from the gudgeon pins lubricates the inlet and the haust valves and the cylinder walls. A series of holes near piston head directs a portion of the oil directly upon the linder walls.

ILSATORS. Branches are taken from the "B" and "C" supply pipes, before they enter the crankshaft, and these d to the pulsator glasses, the purpose of which is to show nether the oil pump is working properly, The number of lsations per minute is also a measure of the engine speed, ich may be calculated as follows :—

R.P.M. of engine = Pulsations per minute ×14·3.

L PUMP. The Gnome oil pump is of the reciprocating stroke type. The pump is composed of 2 castings rming a casing for the mechanism and a reservoir for the . The top casting carries a worm drive operating a orm wheel mounted on a shaft carrying 2 cams. One m depresses 2 piston valves, which are connected by a idge piece on which the cam bears. In a similar manner e other cam depresses the 2 pump plungers. The piston lves and the plungers are raised on the return stroke by tral springs. The piston valves regulate the admission and scharge of the oil into and from the plunger barrels. e plungers suck the oil into their barrels and force it erefrom into the lubricating pipes. The diameter of the "C" pump barrel is 12 m.m., and the diameter of the "B" mp barrel 8 m.m. The worm drive is geared 25 to 1 of camshaft, and 7 to 4 of the engine. The oil pump is ounted on the engine backplate opposite the magneto and driven from the same large wheel.