AIR BOARD

TECHNICAL NOTES.

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100 H.P. MONOSOUPAPE.

00 H.P. MONOSOUPAPE ENGINE.

ENERAL DESCRIPTION. This engine is of the rotary air oled type with 9 cylinders, 110 m.m. by 150 m.m. develop- g 100 H.P. at 1200 R.P.M. As the name of the engine plies it has only 1 valve per cylinder, and this is situated the cylinder head. It is fitted with a double thrust ball ce, which enables it to be used either as a pusher or as a actor. The engine works on the Otto or 4 stroke cycle, 2 volutions of the engine giving 1 cycle (4 strokes) in each linder. Its chief points of difference from other rotary gines are :—

(1) Absence of carburetter.
(2) No inlet valves.
(3) Inlet ports in cylinder walls.
(4) Non-explosive mixture in the crankcase.

ne engine revolves in the anti-clockwise direction as seen om the propeller end of the engine. As in the case of all tary engines, it is made chiefly of steel for strength and ghtness. The angle through which the engine turns between ıy 2 consecutive explosions is 80°.

Approx. oil consumption = 2 galls. per hour.
,, petrol consumption = 10 galls. per hour.
,, weight of engine = 300 lbs., i.e., 3 lbs. per H.P.

RANKSHAFT. The crankshaft is made of chrome nickel eel. It is hollow and in 2 parts, a long end and a short id. As in all single line rotary engines, it has 1 throw. is stationary and serves the following purposes ;—

(1) It provides a means of attaching the engine to the aeroplane.
(2) It conveys oil to the working parts.
(3) It conveys petrol to the crankcase.
(4) It provides, in the crankpin, the fixed point against which the force of the explosion exerts itself in turning the engine,

RANKCASE. The crankcase is made of 2 steel stampings olted together by steel bolts and centred by dowel pins. It as 9 apertures disposed symmetrically around its periphery accommodate the 9 cylinders, each of which is gripped ghtly by the 2 parts of the crankcase and is prevented from rning by a small key. It is not directly supported on the ankshaft, but carries on its faces plates or covers, known spectively as the cambox and the thrust box. The thrust ox contains the main ball race and a self-aligning double

thrust race. The cambox contains the planet gears a
campack which actuates the exhaust valves, and
ball race. The nosepiece which carries the prope
mounted on the cambox.

CYLINDERS. The cylinders are numbered 1 to
secutively in a clockwise direction as seen from the pr
end of the engine. The order of firing is 1, 3, 5, 7, 9, 2,
They are made of nickel steel machined from the so
each has an exhaust valve in the head and a series o
ports around the base. The key referred to above is
between 2 shoulders which are turned around the b
the cylinder. These together act as a means of fixi
cylinder in the crankcase.

PISTONS. The pistons are of cast iron with slightly c
heads. A portion of the trailing edge is cut away to
the piston in the adjoining cylinder to clear. Each pi
fitted with an obturator ring in a groove around its t
packing ring is fitted behind the obturator ring and
same groove. A wipe ring which is made of cast iron
fitted in a groove situated just below the obturator ring
piston is fastened to its connecting rod by means of a
steel gudgeon pin fixed in lugs on the underside of the
head by means of a tapered set screw.

Piston clearance	= 0·2 m.m.
Wipe ring gap	= 0·5 m.m.
Obturator ring gap	= 1 m.m.
Packing ring gap	= 2 to 4 m.m.

CONNECTING RODS. The connecting rods are m
special alloy steel. There is 1 master connecting rod, to
the 8 auxilliary connecting rods are attached by means o
pins. All the rods are of H-section and the auxilli
are bushed at both ends with phosphor bronze bushes
master connecting rod big end runs on 2 ball bearin
small end is bushed with phosphor bronze. In some
a light steel pipe is fitted to each connecting rod
conveys oil from the big end to the gudgeon pin.

VALVES. The single valve in the cylinder head perfo
following functions:—(a) It acts as an exhaust valve.
so doing its temperature is raised. (b) It admits
cylinder a quantity of air sufficient for the combustion
charge entering later through the ports at the base
cylinder. During this portion of the cycle it is coole
valve is mounted in a steel cage which also carries the

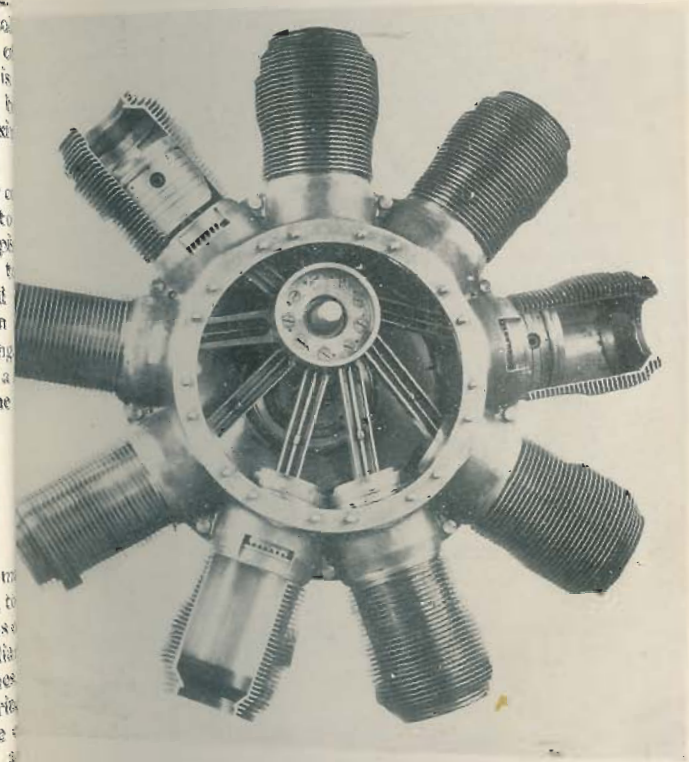
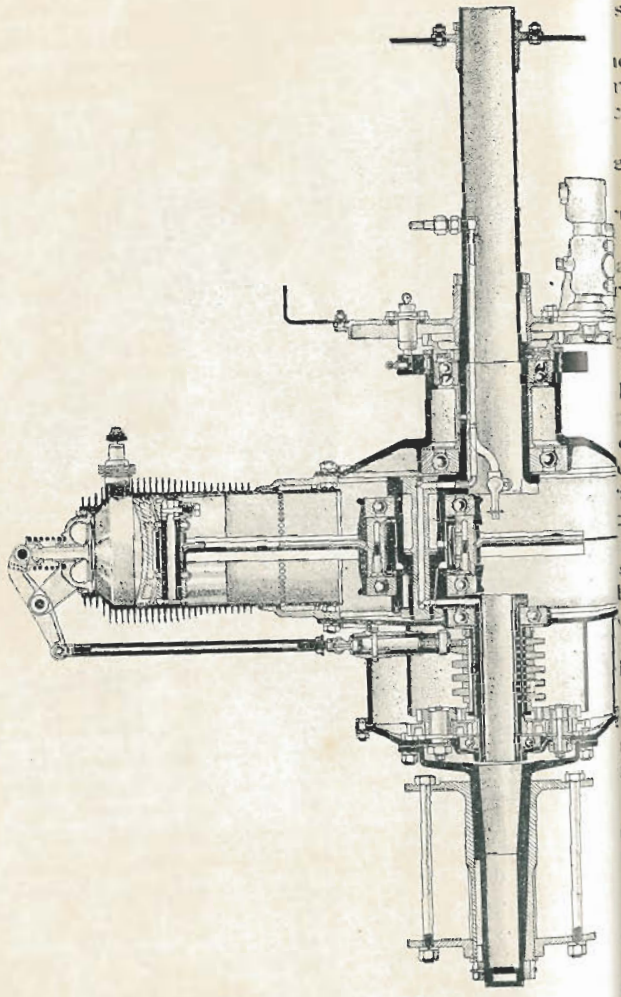


Fig. 1.



fulcrum pin, and is mechanically operated by means of a
ow steel tappet rod and steel rocker arm. The valve stem
s in a cast iron bush at the centre of the cage which is
in position by means of a locking ring screwed into the
nder head. The valve is made heavier than is necessary
nechanical strength and is of such weight as to balance
centrifugal action of the tappet rod which would otherwise
to keep the valve open. The valve spring consists of a
ed wire, the looped end of which engages the fulcrum
and the midlength part of which is coiled around the
um of the rocker arm. The free ends of the looped wire
underneath a cross pin passing through the valve stem.
ater type engines the valve spring is made spiral and
rcles the valve stem, taking its bearing against the valve
and a detachable collar on the valve stem. The valves
operated by the campack which consists of 9 cams keyed
bronze bushed sleeve rotating on the small end of the
kshaft. The cams operate the tappet rods which work
overhead rocker arms. Each tappet rod is formed of a
et and a rod jointed together. The tappet works in a
e in the cambox, and at its inner end is a roller which
s against the cam. The tappet rod extends from the
to the rocker arm of the exhaust valve, and is adjustable.
campack is driven at half the engine speed by planet
s, which are fitted on the inner face of the cover of the
box. It must be remembered that the engine is running
vice the speed of the campack, so that the rollers at the
s of the tappet rods are overtaking the campack the
le time. This causes the tappet rods to be lifted as they
over the cams and to thereby open the valves. The
rance between the rocker arm and the bottom of the slot
ie valve stem, when the tappet roller is at the bottom of
cam, should be as follows:—

Engine cold = 0.5m.m.

ater type engines the rocker arm engages the valve stem
neans of a roller which bears against the end of the stem.

LE OF OPERATIONS. Starting with any cylinder on
C. and the exhaust valve open, the cylinder moves
ard drawing in pure air through the open exhaust valve
it is 45° before B.D.C. at which point the exhaust valve
s. The cylinder then moves forward creating a partial
um until it is 20° before B.D.C. At this point the ports
ie base of the cylinder are uncovered by the piston and

rich petrol vapour enters from the crankcase, mixing
air already there and forming an explosive charge.
past B.D.C. the ports are again covered by the piston
cylinder moves around to T.D.C. on compression
Ignition occurs 20° before T.D.C. and the cylinder
forward on the power stroke until it is 90° past T.D.C
the exhaust valve opens and remains open throu
remainder of the cycle.

Admission of pure air	0° to 135°	= 2 Re
Partial vacuum - -	135° to 155°	
Admission of rich gas	155° to 200°	
Compression - - -	200° to 360°	
Power stroke - - -	0° to 90°	
Exhaust stroke - -	90° to 360°	

VALVE TIMING. Set any cylinder, for example
exhaust closing position, i.e., 60° before B.D.C. To
position set No. 4 cylinder vertically upright. Set th
rod clearance, and turn the campack anti-clockwise u
cam is just about to lift the tappet rod. Then mesh th
gears. Set the remaining tappet rod clearances an
the valve closing positions for each cylinder, i.e., 60°
before B.D.C. These instructions refer to a cold
The diagram refers to the actual cycle of operations
engine is hot.

IGNITION TIMING. Set any cylinder, for examp
in ignition position, i.e., 20° before T.D.C. on com
stroke. To get this position set No. 5 cylinder
downwards. Turn the magneto so that the points
breaking and mesh the magneto driving gear. W
distributor to the plugs. The timing of the engin
completed.

MAGNETO. The magneto is mounted on the fac
backplate remote from the engine. Its driving spin
jects through the backplate and carries a small sp
which is driven by a large wheel keyed to the th
casing. The gear ratio is 4 to 9, i.e., the magneto
makes 9 revolutions to 4 of the engine, and as the
gives 2 sparks per revolution there will be 9 spa
revolutions of the engine during which period each
will have completed 1 cycle. The current is conve
the magneto in the following manner:—From the ma
current passes by a high tension wire to an insula
holder fitted on the backplate. A sensitive spring
carbon brush in the brush holder in contact

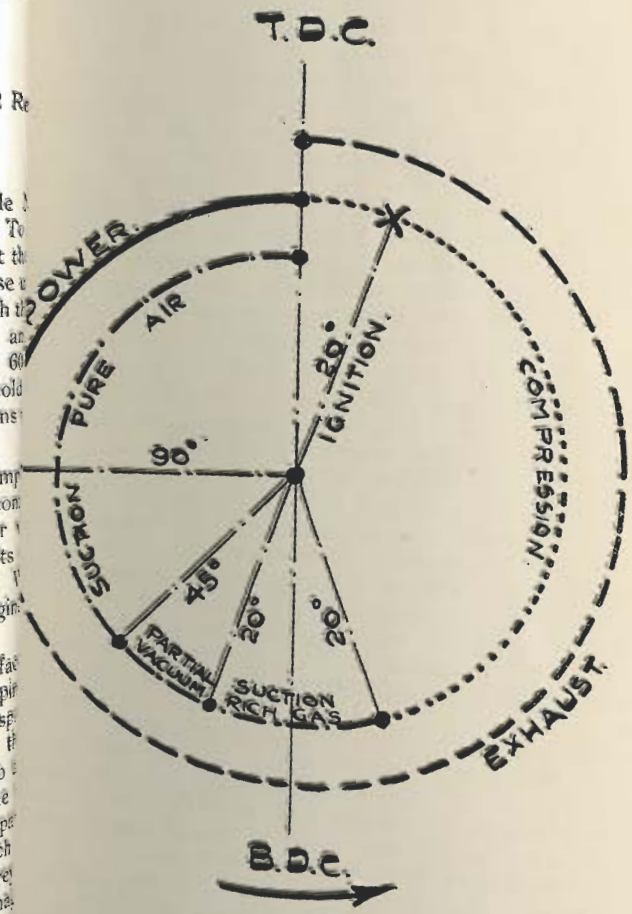


FIG. 3.

distributor which is mounted on the outside of the box. The current is then taken from the segments distributor to the sparking plugs through thin brass The distributor revolves with the engine, and its funct ensure that the current generated by the magneto reac cylinders in proper sequence.

CARBURATION. The carburation system of this e very simple. Petrol is pressure fed from a tank thr main petrol tap and a fine adjustment valve into a copp inside the crankshaft, and issues into the crankcase fr which is situated in the hollow big end of the cranksh some engines a small amount of air enters the cr through the leading open end of the crankshaft and in vapourising the spray of petrol from the jet. The isation is further assisted by the churning action connecting rods and the heat of the engine. The drawn from the crankcase through ports in the bas cylinders when these ports are uncovered by the towards the end of the suction stroke.

LUBRICATION. This is by pressure and centrifug combined. There are two leads, "C" and "B," equal

"C" Lead. The oil is pressure fed from the pump copper pipe inside the crankshaft, and about one-thir through a branch into the thrust box, oiling the thr race and main engine ball race. The surplus oil o into the crankcase through holes drilled for this purp passes on to the cylinder walls through the ports in t of the cylinder. The main supply of oil passes up crankweb through a hollow plug in the centre of the crankpin, down the short end crankweb into the short end of the crankshaft, from whence it is conv a series of holes to the campack. The oil then passes grooves in between the cams and is thrown centrifug the interior of the cambox, lubricating the cams, cam tappets, planet gear wheels, and the cambox and r ball races. The oil then overflows back into the cr and passes on to the cylinder walls as in the case of t flow from the thrust box. Some of the oil also pass the hollow tappet rods to the rocker arm pins.

"B" Lead. The oil is pressure fed from the pump second copper pipe inside the crankshaft, and flows t the long end crankweb into an annular space aro brass plug in the long end crankpin and out of hol balls to 2 grooves or channels cut in the ends of t

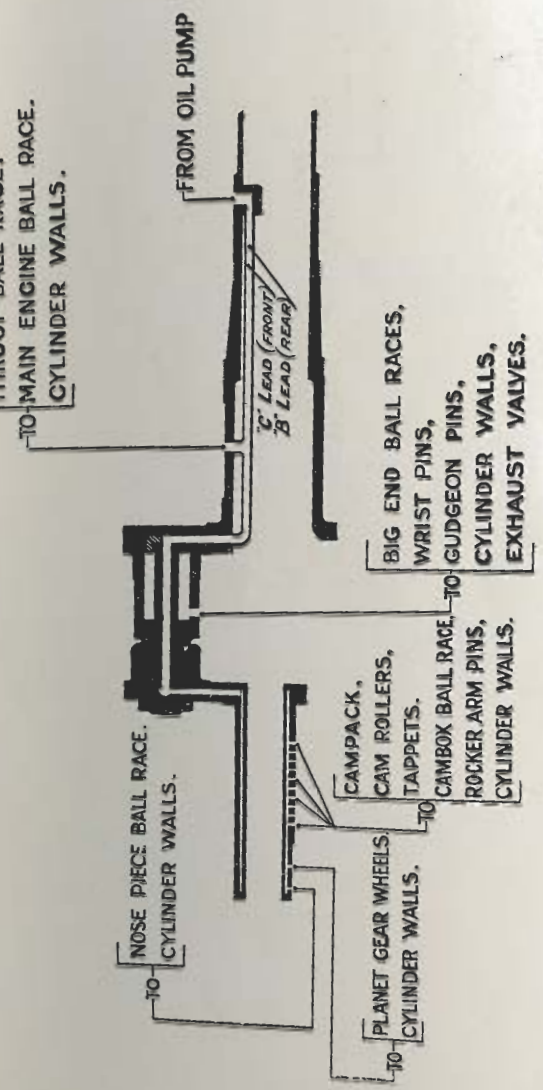
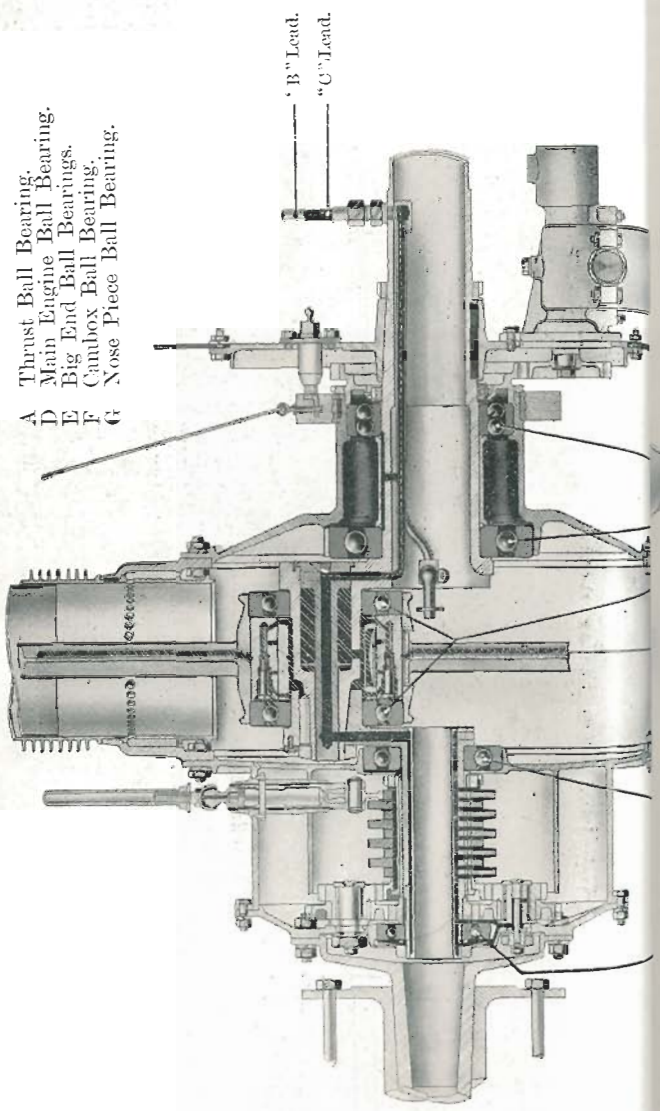


Fig. 4.



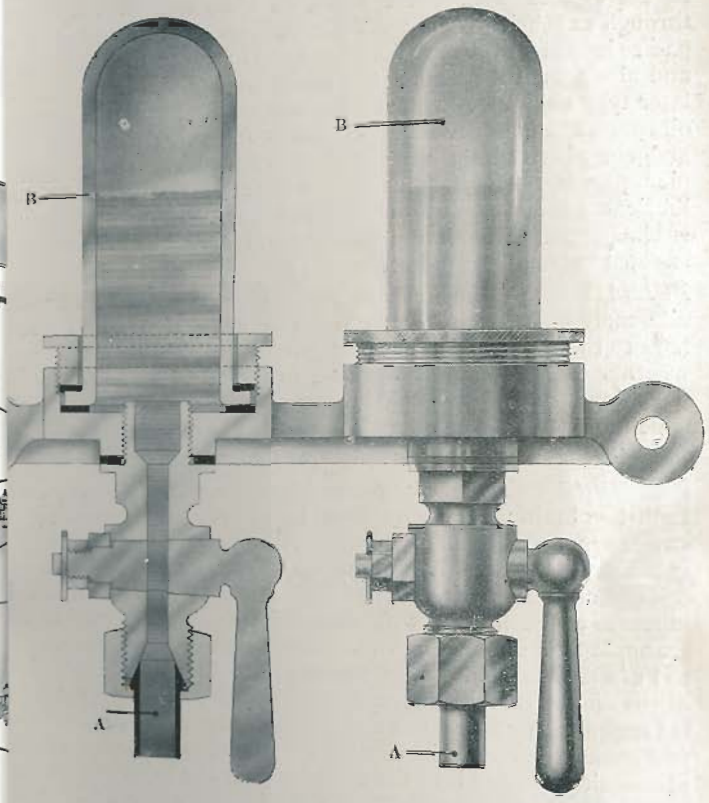


FIG. 6.

A Branches from Oil Delivery Pipe between Pump and Crankshaft.

B Sight Feed Glasses.

The Sight Feed Glasses are half filled with air and each stroke of Pump Plungers is indicated by a Pulsation.

of the master connecting rod big end. Holes are drilled f
these grooves to each wrist pin and the wrist pins are dr
to correspond with these holes, so that the oil may
through to lubricate the wrist pin bushes. From these th
passes into steel tubes (which are fixed to the connecting r
and along the tubes, oiling the gudgeon pins and bushes.
later type engines, the steel tubes are dispensed with, an
oil passes along the face of the connecting rods to
gudgeon pins and bushes. The overflow from the gud
pins passes through holes in the side of the pistons,
lubricates the rings and the cylinder walls. The surplus
is blown out through the exhaust valve and lubricates
exhaust valve guide and stem.

PULSATORS. Branches are taken from the "B" and
oil supply pipes before they enter the crankshaft, and
lead to the pulsator glasses, the purpose of which is to
whether the oil pump is working properly. The numb
pulsations per minute is also a measure of the engine s
which may be calculated as follows :—

R.P.M. of engine = Pulsations per minute × 11·L

PRESSURE PUMP. The pump for forcing air into the
tank to obtain a pressure feed is of the reciprocati
stroke type. The pump is composed of a casing form
crankcase in which is mounted a small crankshaft a
worm and worm wheel drive; and a cylinder in whi
mounted a piston fitted with piston rings and connected
crankpin by a connecting rod. The worm drive is gear
to 1 of the crankshaft, and 9 to 4 of the engine; 5·3 revol
of the engine therefore give 1 delivery of air. The cy
is formed with cooling fins and has automatic non-return
and exhaust valves in its head. On the down stroke
piston air is sucked into the cylinder past the inlet valve
on the upstroke of the piston the air in the cylinder is
pressed and forced past the exhaust valve which has a
connected by tubing to the petrol tank. The pressure
is mounted on the engine backplate between the oil
and the magneto and below the engine crankshaft
driven from the same large wheel.

OIL PUMP. The oil pump is similar to that used
Gnome engine, excepting that the bore of the 2 pump
is the same, 12 m.m. The worm drive is geared 25 to
the pump camshaft, and 9 to 4 of the engine. The oil
is mounted on the engine backplate opposite to the ma
and is driven from the same large wheel.

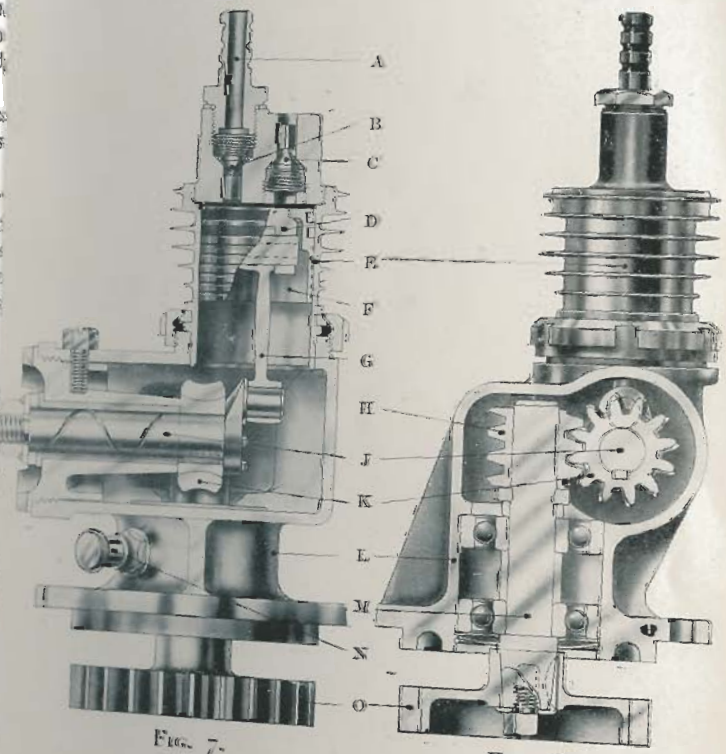


Fig. 7. Fig. 8.

A Connection to Petrol Tank.
B Non-Return Discharge Valve.
C Non-Return Inlet Valve.
D Crosshead.
E Cylinder.
F Piston.
G Connecting Rod.
H Worm.
J Crankshaft.
K Wormwheel.
L Crankcase.
M Driving Shaft.
N Lubricator.
O Pinion Driven by Wheel on Engine Thrust Box Casing.