LIST OF ILLUSTRATIONS—*contd.*

LEADING PARTICULARS (GIPSY I).

Type	Air cooled, 4-cylinder, vertical.
Airscrew speed reduction	Nil. Direct drive.
Direction of rotation	L.H.T.
Bore and stroke	114 mm. × 128 mm.
Capacity	5,226 cc.
Numbering of cylinders (from airscrew rearwards)	1, 2, 3, 4.
Firing order	1, 3, 4, 2.
Rated B.H.P. at normal R.P.M.	85 B.H.P. at 1,900 R.P.M.
B.H.P. at maximum R.P.M.	98 B.H.P. at 2,100 R.P.M.
Compression ratio	5 : 1.
Weight complete with airscrew hub	285 lb.
Fuel consumption	·59 pints per B.H.P. hour.
Oil consumption	·5 to ·75 pints per hour.
Oil pressure	30 to 45 lb. per sq. in.
Oil recommended	D.T.D.109.—Summer and winter grades.
Oil capacity	16 pints.
Oil temperature	50° C. to 70° C.
Magnetos, number and type	2 B.T.H. Type A.G.4 variable.
Magneto timing	34° before T.D.C. fully advanced.
Sparking plugs	K.L.G.294, K.L.G.633 or Lodge A.55.
Carburettors, number and type	1 Zenith type 48 R.B.
Altitude control	Hand operated. Float chamber depression.
Oil pump	1 pressure pump.
Lubrication system	Pressure and splash.
Valve timing (engine cold and clearance of ·005 in. at both inlet and exhaust valves)—	
Inlet valve opens	20° before T.D.C.
Inlet valve closes	71° after B.D.C.
Exhaust valve opens	62° before B.D.C.
Exhaust valve closes	29° after T.D.C.
Standard carburettor setting—	
Choke tube	36 mm.
Main jet	440 cc.
Compensating jet	410 cc.
Slow running jet	1 mm.

CHAPTER IV.

Carburation.

Carburettor.

74. The mixture is supplied by a single type R.B. Zenith carburettor. This carburettor is based upon the well-known Zenith principle and employs main and compensating jets to provide the correct strength of mixture at all throttle openings. A slow running jet is provided for starting and slow running.

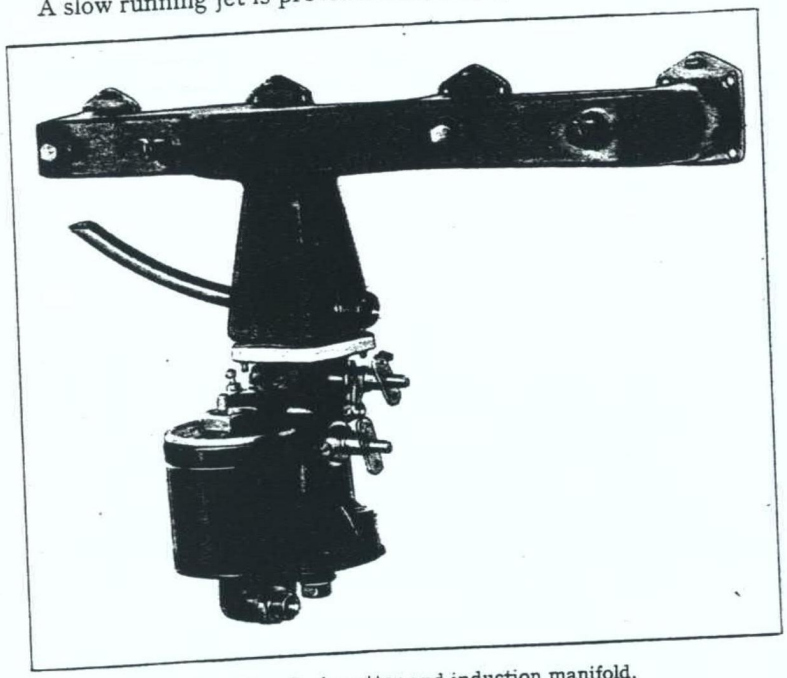

FIG. 38.—Carburettor and induction manifold.

75. An altitude control and a pressure balance system are incorporated, the former to ensure the correct strength of mixture as the aircraft rises, and the latter to maintain equality of pressure between the sealed float chamber and the choke tube, thereby preventing any disturbance of mixture strength through local disturbances in the air intake.

76. The float chamber and toggle mechanism are of normal design. The fuel enters by a right-angled union formed at the float chamber base. The float chamber cover screws into the mouth of the chamber to render it air-tight, the joint being made with a fibre washer. A spring-loaded plunger is fitted in the cover for depressing the float and flooding the chamber.

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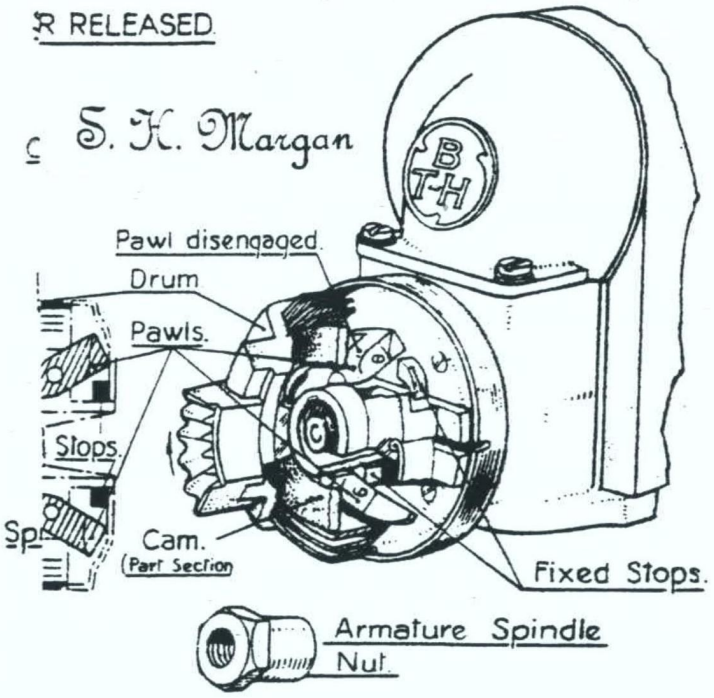

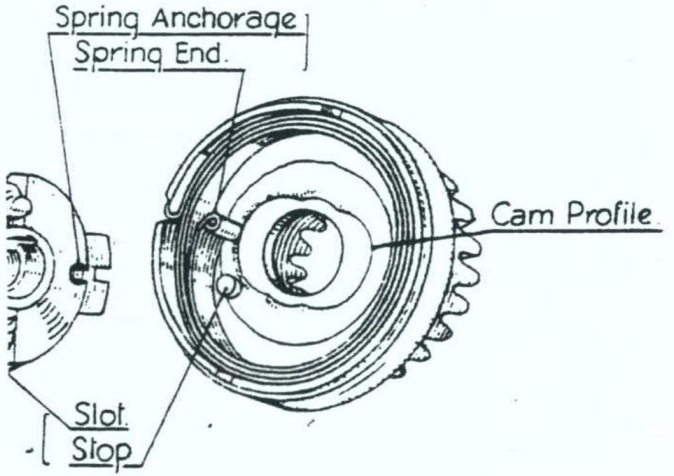

(LATER TYPE).

80. When the engine is stationary the petrol level lies just below the top of the main jet and the diffuser and slow-running jet. When the engine has started and is running slowly with the throttle nearly closed, the outlet from the slow-running jet chamber is subject to a strong depression owing to the fact that the throttle is only open a small amount, and as the slow-running jet passage opening is coincident with the throttle, the whole depression is concentrated on the small gap between the throttle and the choke tube housing. The depression in the inner tube of the slow-running jet assembly

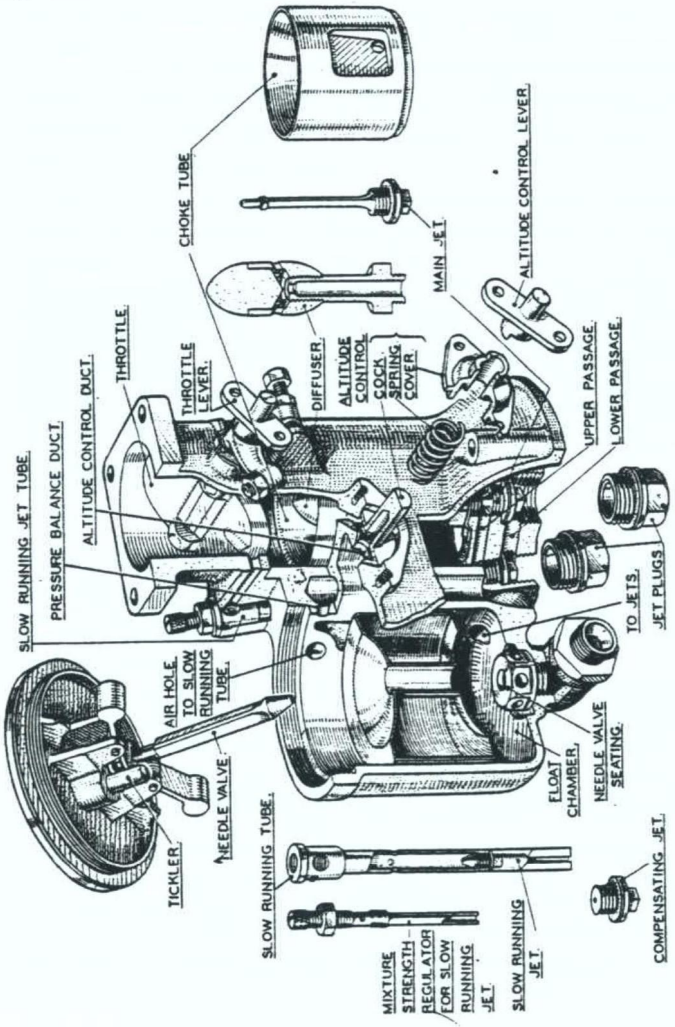

FIG. 40.—Section perspective view of carburettor.

draws fuel out of the jet, together with a quantity of air that passes through the air holes in the outer tube of the slow-running jet assembly and is drawn down and through the space between the inner tube and the jet nozzle.

81. As the throttle is opened the depression in the slow-running jet passage falls off and the main choke tube comes into action. Petrol is drawn through the diffuser, both from the main jet and the space supplied by the compensating jet. As the throttle continues to be opened, as is generally known, compensation is necessary to maintain the mixture strength constant, and prevent it from becoming too rich. This compensation is provided by the compensating jet, for this jet is only capable of supplying a limited quantity of fuel. When the throttle is opened wide, therefore, the upper passage at the base of the choke tube and the slow-running jet chamber, both become almost exhausted of fuel, since the amount that enters these is limited by the capacity of the compensating jet. When the fuel in the slow-running jet tube is exhausted, the normal air supply for the slow-running jet coming from the float chamber, passes down the slow-running jet housing and further weakens the mixture, and a mixture of air and petrol passes up the diffuser, effecting the necessary compensation. As soon as the throttle is closed, the fuel supply builds up in the slow-running jet tube and the upper passage at the base of the choke and provides the necessary reserve to ensure satisfactory acceleration when next the throttle is opened.

Altitude control.

82. The necessary weakening of the mixture to compensate for the reduced density of the air at altitude is obtained by the altitude control. The altitude control on this carburettor is of the float chamber depression type and relies for its operation upon communicating to the sealed float chamber a certain degree of the depression existing in the choke tube. The extent of the opening of the communicating passage is controlled by a spring-loaded taper plug cock.

83. The effect of reducing the pressure in the float chamber in this manner is virtually equivalent to lowering the jet level, for it will be realised that the discharge of the jet is dependent upon the depression created in the choke tube compared with the normal atmospheric pressure in the float chamber, causing the latter to force the petrol out of the jet. If the pressure in the float chamber and the choke tube were equalised, obviously no discharge would take place at the jet, and, therefore, by communicating a slight amount of the depression in the choke tube to the float chamber a weakening of the mixture will occur.

84. The mixture control cock consists of a hollow conical plug, one end of which is open and communicating with the float chamber in the wall of which is a duct that communicates with the choke tube. A hole in the barrel of the cock covers or uncovers the duct. The whole cock is assembled as a unit to a brass cover which is mounted on the main body of the carburettor by two screws. The cock is spring-loaded to maintain working contact at its seating. In its normal position at ground level the duct in the cock is out of register with that in the seating, but, when weakening of the mixture is necessary, rotation of the cock spindle brings the two ducts into register to the degree required to effect the necessary correction. The outer end of the spindle is fitted with a cross lever for connection of the fork-ended control shaft by means of which the control is linked up with the cockpit lever. Movement of the valve is limited by a stop sleeve, which is integral with the cross lever and engages a similar sleeve that forms part of the cock cover.

85. As stated in para. 75, pressure balance forms a necessary part of the carburettor. This consists simply of a duct which runs from the air intake to the upper part of the float chamber and communicates any local variations of the air pressure in the intake to the float chamber, thereby maintaining constant relation between the conditions in the air intake and in the float chamber. Although at first it might appear that the presence of the pressure balance passage would negative the functioning of the altitude control, in practice the bore of the passage is kept within such limits as to prevent it having any appreciable effect on the altitude control.

Induction System.

86. A sheet steel air intake is secured on to the base of the carburettor by two bolts and makes a face joint with the latter. The intake is in the form of a right-angled bend and it extends to an aperture in the cowling where a small forwardly facing scoop is provided.

87. The induction manifold is built up of sheet steel with welded seams and consists of a square section four-branch manifold. Welded-on flanges are provided for attachment to the cylinders, the joint between the flanges and the facing on the cylinder being secured by four studs and nuts in each case. The inlet branch to which the carburettor is attached is situated in the middle of the manifold and projects downwards. It is formed with a four-stud flange at the mouth to receive a corresponding flange on the carburettor. An exhaust-heated jacket formed around the inlet branch is supplied by a by-pass pipe from the main exhaust pipe ; the outlet from the jacket is by another short pipe which discharges to atmosphere.

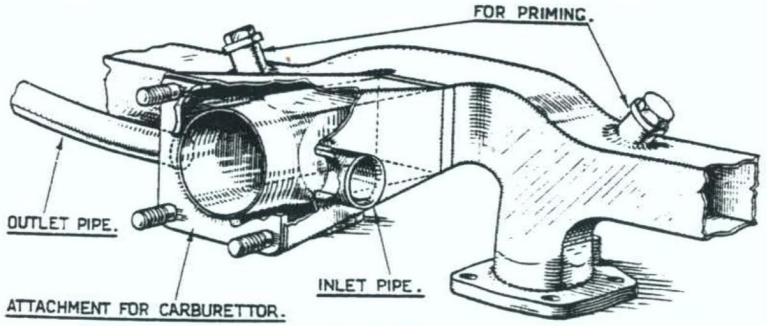

FIG. 41.—Part section view of exhaust heated induction pipe.

Controls.

88. The controls for the carburettor and magnetos are combined into one system and the two are therefore dealt with together. The control system consists of an assembly of transverse rocking shafts mounted on a bracket on the port side of the engine at the rear. An extension of the magneto control rocking shaft is carried across to the starboard side magneto, another bracket being provided on this side to support the end of the shaft. The cockpit controls are coupled to levers on the transverse assembly. The movement is transmitted from the rear of the engine to the carburettor by upwardly disposed link-rods which are ball-jointed to two levers (throttle and altitude control) at the rear ends of two longitudinal rocking shafts which run forward to the carburettor. Cross levers, drilled with a hole at each end are fitted at the ends of the throttle and altitude control spindles, and receive the end fittings on the longitudinal rocking shafts ; these fittings consist of similar cross levers with two fixed pins projecting from each for engagement with the holes in the levers on the carburettor.

89. The variable ignition is interconnected with the throttle lever in such a manner that the magnetos are retarded when the throttle is in the closed position, and are fully advanced when the throttle reaches the one-third open position. This movement is obtained by means of lost motion linkwork consisting of a camplate formed with a curved slot. The control lever on the magneto is linked to the camplate by a pair of slotted side plates, through the slots of which the main transverse rocking shafts pass and serve as a guide for the side plates. The upper ends of these side plates are drilled to receive a bolt and distance pieces. The inner distance piece spaces the two side plates apart when the bolt is tightened up, whilst the two outer ones leave freedom of movement for the camplate, through the slot of which the bolt and inner distance piece is fitted.