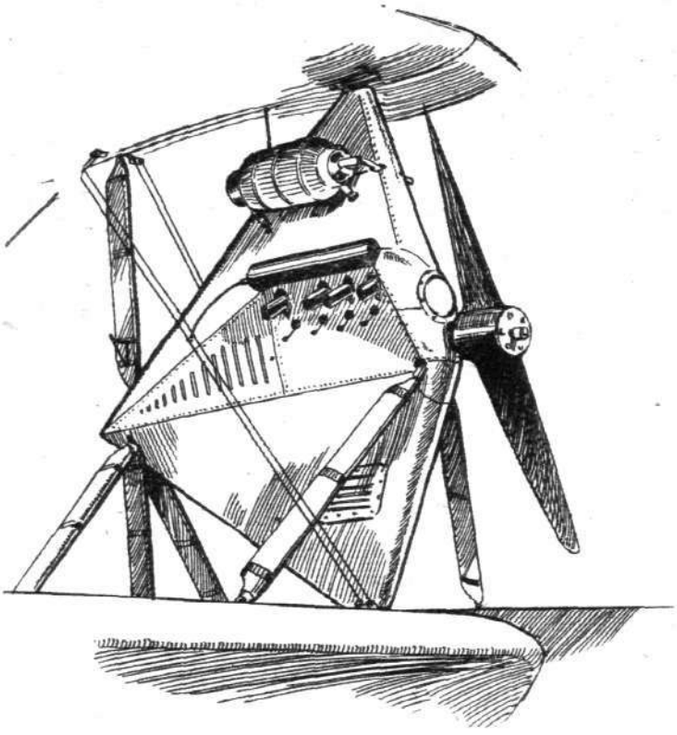
plane. A considerable distance aft of the wings is another gunner's cockpit.

The wings are of fairly deep camber, and are of unusual plan form in that the trailing edge is straight while the leading edge shows a gentle curve terminating in fairly pointed tips. Both top and bottom planes are fitted with ailerons, these being of high aspect ratio and provided with horn balance. The wing bracing is somewhat unusual, there being a wire-braced centre section between the two engine mountings,



Sketch showing unusual engine cowling on Bellanger flying boat.

followed on each side by a wire-braced bay, and finally, towards the tips, a set of Vee struts.

Of very peculiar design are the engine supports and cowls. The engine bearers appear to be carried from the front spars only, or at any rate mainly, and to be connected to top and bottom front spars by the apices of steel tube pyramids. Running back horizontally from the engine to the rear strut is a tail piece, similarly shaped, which serves to streamline the engine housing. The entire engine mounting is cowled in, the only portions projecting being the cam covers, exhaust pipes and sparking plugs. Two Lamblin radiators are mounted on the sides of each engine, and are fitted with the new type fan-shape shutters, operated by a small differential gear.

The main petrol tanks are carried in the hull and in the curved wing roots of the lower plane. A gravity service tank is built into the top centre section.

The tail surfaces are of usual type, with the exception of the fin, which is of quite unusual thickness, being the full width of the hull and formed integral with it.

The commercial hull shown is similar in outward shape except that there are no gunners' cockpits, a cabin seating six passengers being provided instead. As the power of the Hispano engines is 300 h.p. each, the machine uses 100 h.p. for each passenger, which is scarcely a commercial proposition.

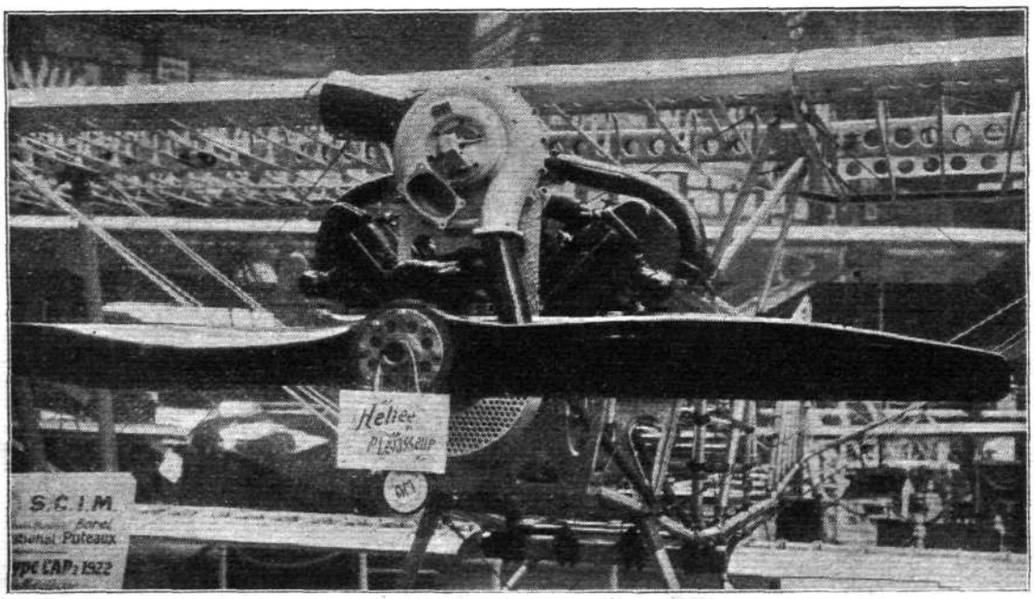
Following are the main characteristics of the Bellanger flying boat: Length of hull, 14 ms. (45 ft. 10 ins.); span, 20 ms. (65 ft. 7 ins.); wing area, 70 sq. m. (750 sq. ft.); weight empty, 2,000 kgs. (4,400 lbs.); total loaded weight, 3,500 kgs. (7,700 lbs.); speed, 180 kms./hr. (112 m.p.h.); range with six passengers and a crew of three, 1,000 kms. (620 miles); endurance, 6 hrs.

BOREL S.C.I.M.—PUTEAUX (SEINE)

The machine exhibited by Borel is an all-metal two-seater fighter and reconnaissance biplane with 300 h.p. Hispano engine fitted with one of the Rateau superchargers. The machine is built of metal throughout, Duralumin for spars, longerons, etc., and steel fittings. The fuselage is of tubular construction, Duralumin tubes being used for the longerons and struts, while the fittings are of sheet steel, wrapped around the longerons and secured by tubular rivets passing right through longeron and fitting. It is of interest to note that the diameter of the tubular longerons decreases from nose to stern. The method of reduction is to fit into the steel sockets an aluminium bush, into which the smaller tube fits. Thus at one end of the steel fitting the Duralumin tube just fits, while at the other the bush makes up the difference in diameter between the two tubes. The bracing is piano wire with strainers in the rear portion, while in front the struts more or less triangulate the structure.

The wings are also built entirely of metal, Duralumin for spars and ribs, and steel for the bracing—wire fittings, etc. While the lower spars are in the form of rectangular-section Duralumin tubes, those of the top plane appear to be built up of Duralumin sheet to form a box section, reinforced internally by channel-section strips riveted to the flanges. The sides of both upper and lower spars have circular lightening holes, those of the upper spars being slightly flanged over, while those of the lower spars are quite plain.

The ribs have channel-section flanges, joined by channel-section stiffeners formed from Duralumin sheet. Leading and trailing edges are formed of sheet Duralumin in the shape of horizontal Vee sections. The top plane, which is of greater chord than the bottom, has an extra channel-section stringer behind the rear spar and trailing edges, as the spars are placed far forward in the wing section. The main spars are placed at a considerable angle to the chord line, presumably on account of the pronounced stagger. The wing fittings are of steel, and are in the form of stirrups going around the spars.



The Rateau supercharger on Borel all-metal biplane.