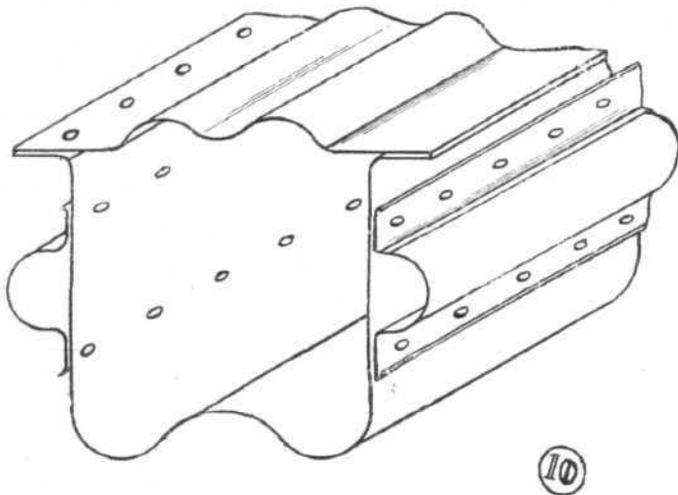


THE AIRCRAFT ENGINEER



quantity, kind and accessibility of equipment could be closely scrutinised.

When these shows have greater commercial value, such display of the internal parts of aircraft will, of course, be essential for large sales, and although at this Show the constructors mentioned had their products pushed well out of the way, if the number of technical enquiries is any criterion, that factor did not affect the amount of interest displayed in them.

Needless to say, of the Continental exhibits, steel aircraft were practically non-existent: the Bréguet was the sole exception, although the C.A.M.S. had a steel spar on view (drawings of the spar sections are shown in Figs. 8 and 9, and another Continental effort at a metal spar is shown in Fig. 10).

The reinforcement of flat surfaces against secondary buckling, as by means of channels riveted on is quite effective, but corrugation is a lighter and cheaper means of attaining the same end.

(To be concluded.)

THE PROGRESS OF AERO ENGINE DESIGN AT THE PARIS SHOW

By CAPTAIN ANDREW SWAN, B.Sc., A.M.Inst.C.E.

*Captain Andrew Swan, as many of our readers will probably know, is one of the Principal Technical Officers at the Royal Aircraft Establishment, Farnborough, where he is head of the Engine Department and in charge of the development and research work on engines. We count ourselves extremely fortunate in having been able to persuade Captain Swan to give us his impressions of the progress of aero-engine design as exemplified by the engines exhibited at the Paris Aero Show which closed a few weeks ago.*

There was a large display of engines at the 12th Aero Show held in Paris, particularly by French engine builders who, in many cases, were showing examples of all their models. British constructors were well represented by Armstrong Siddeley, Bristol and Rolls Royce engines of the latest type, whilst Alfa Romeo, Fiat and Isotta-Fraschini (Italy), Argus, B.M.W. and Siemens (Germany), Elizalde (Spain) and Walter (Czecko Slovakia), were showing a fairly full complement of their products. No American engines were on exhibition other than the Hornet and Wasp radial engines manufactured on licence by Siemens.

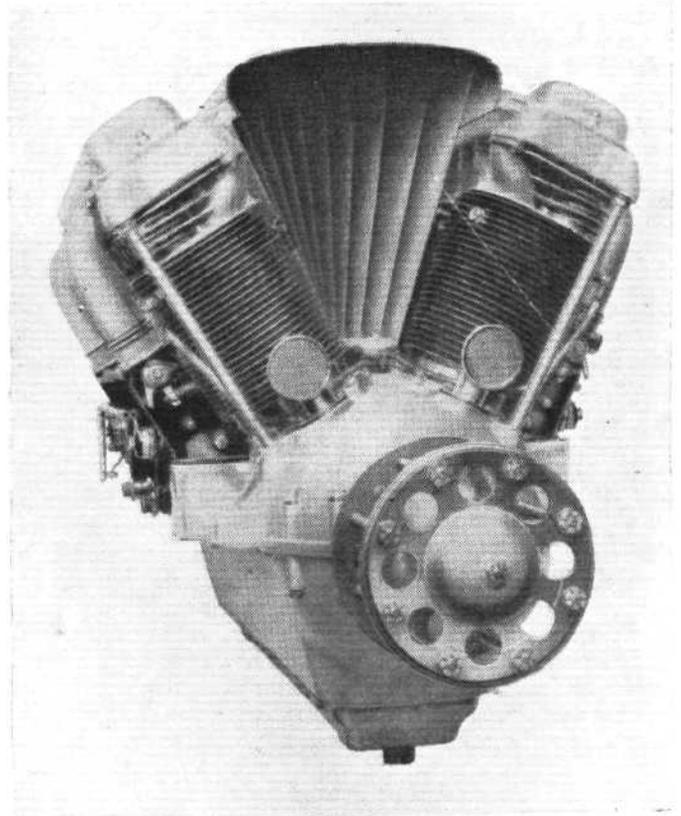
Recent progress in engine design as typified by the engines exhibited is definitely along orthodox and well recognised lines, and any changes noted are more those of detailed improvement in the technique of design and construction or re-arrangement of accessories than actual departures of any importance from present principles and practice. By this it is in nowise intended to decry the progress shown, as it is fully acknowledged that the perfection of even the smallest

detail, whether it be a point in design, or the adoption of a more suitable material, is of importance, and it is the combination of perfect detail from design to final construction which distinguishes the successful engine from its apparently similar brother.

In another category however, there are the compression ignition engines which are now making their appearance, namely, the Clerget nine-cylinder radial air-cooled engines of 100 and 200 h.p., and the Junkers 600 h.p. water-cooled six-cylinder opposed piston engine, of which some details will be given later.

It is proposed in the first instance to make a general survey of the engine types shown and to indicate, with some criticism, the present trend of development, leaving to the end any mention of details worthy of note.

Air-cooled and water-cooled engines were about equally represented. Some makers, perhaps uncertain as to the future trend in this respect, make both types. Air-cooled engines, with few exceptions, were of the radial type, the single



The Isotta-Fraschini "Asso Caccia" is an air-cooled Vee type of 450 h.p.

row of cylinders being used for small and medium horse-powers, and the double row for the larger horse-powers. Two exceptions were the Asso 80 R six-cylinder in-line engine developing 100 h.p. and the twelve-cylinder Asso Caccia V-type developing 450 h.p., both made by Isotta Fraschini, who also make excellent water-cooled engines. The cooling air in the latter engine enters between the Vee of the cylinder blocks, and is divided and directed by baffles to pass across each cylinder. This engine is not a new type, but as far as is known has not been put into series production. The difficulties of adequately cooling the large cylinders of these engines by an air stream collected over a relatively small area are very considerable, and it would seem necessary to provide a greater flow of air by fan or other means. The air-cooled vee engine of 400-500 h.p. is attractive in that low frontal resistance would be obtained in addition to the elimination of the water-cooling system, but as forced or induced air cooling would appear to be necessary, much of the simplicity of the system would unfortunately be lost.

Another exception of special note was a small four-cylinder 100-h.p. engine by the firm of Chaise: Instead of the cylinders being in line, each pair, that is the first and third and the