This part-sectioned view of the Mannerstedt engine, drawn by Sixten Sason, shows the main features and the central airscrew drive. Each unit comprises three 7-cyl. radial engines.

### The Mannerstedt Engine

An Unorthodox Swedish Multi-row 42-cyl. Radial: Central Drives and Ingenious Valve Operation

REFERENCE has been made previously in this journal to the difficulties that beset a small country which finds itself suddenly deprived of the supply of aircraft and engines hitherto obtained from abroad. In our issue of August 26th, 1943, we published an illustrated description of the new Swedish J 22 single-engined, single-seater fighter, designed by the Swedish aircraft engineer Bo Lundberg. This aircraft has made Sweden independent so far as fighters are concerned. She also has a bomber type of Swedish design, but hitherto the engine question has remained unsolved.

It now appears that in the matter of engines also Sweden may in time become self-supporting. The production of a new aircraft engine is not an undertaking to be tackled lightly. Even firms with very long experience have to allow several years for development work, and it is not really until an engine has been in actual service for a year or so that one can be sure that all the "bugs" have been removed.

Sweden has, of course, built large numbers of aircraft engines. For many years Bristol engines were manufactured there under licence, but engines of Swedish design have not been built since the early days of flying. Now, however, a Swedish engineer has tackled the problem, and the following notes and pictures, for which we are indebted to our Swedish contemporary *Flyg*, of Stockholm, indicate that he has gone to his difficult task with boldness and imagination. Herr Folke Mannerstedt will probably not be known to many in the British aviation world, his career having been connected with motor cycles. The name Husqvarna was familiar on the Continent in the years before the war, chiefly in connection with Grand Prix motor cycle races. Mr. Mannerstedt was the designer of the Husqvarna motor cycles, so he went to the task of designing an aircraft engine with long experience in getting maximum power for low weight and small size.

In his article in *Flyg* Mr. Mannerstedt goes fully into the reasons which led him to choose the somewhat unorthodox layout adopted. We have not the space to reproduce these fully but must content ourselves with selecting a few.

Aircraft designers appear to ask for the engine of 2,500 h.p., and the general tendency is seen everywhere to be towards increased number of cylinders, increased revolutions, and reduced cylinder dimensions, all these being dictated by considerations of aerodynamic efficiency. By way of examples Mr. Mannerstedt quotes the Rolls-Royce Vulture and Napier Sabre engines, as well as the double Daimler-Benz 24-cyl. type, which is virtually two DB 601s geared together.

In the M engine Mr. Mannerstedt has chosen air cooling, and the engine is probably to be regarded as a double multi-bank radial, the two halves of the engine being separated by the airscrew reduction gearing. This, Mr. Mannerstedt says, was done in order to obtain improved cooling, but certain other advantages follow. For example, torsion in the crankshaft is reduced by the fact that the drive is taken from the centre instead of from one end of a long engine. Manufacture of the crankshafts is also facilitated. The front and rear units, each comprising three 7-cyl. radials, one behind the other, is geared to the airscrew shaft, which lies above the crankcases. The shaft itself is of large diameter in order to provide room for a 20 mm. or even possibly a 37 mm. cannon. The cylinders are at an angle of 50 deg. except for those on each side of the top centre line, which are at 40 deg. in order to give room for the hollow airscrew shaft. To transmit the large power gears of 130 mm. (5 in.) width are necessary. The splitting of the engine reduces this to half, so that mal-alignment and imperfect