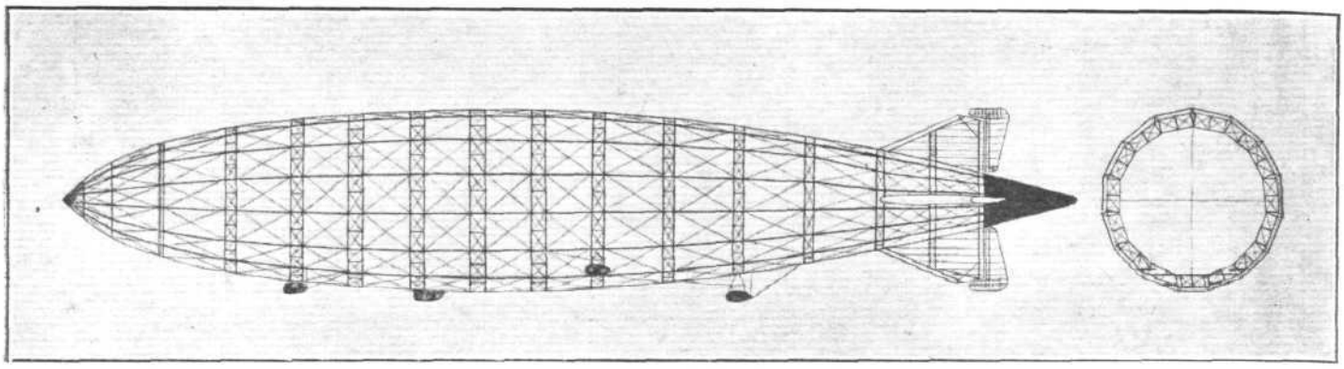

In this diagrammatic Representation of R.101 the intermediate longitudinals have been omitted.

A certain number of tanks on the passenger decks are intended chiefly for providing compensating weights when the full complement of passengers is not being carried, but if desired they can be utilised for fuel to give a greater flying range. The normal fuel tanks have a capacity for nearly 29 tons of fuel, and by using the tanks on the passenger decks this can be increased to a little over 37 tons in all, or approximately 10,000 gallons.

The water ballast system includes ballast bags and ballast tanks. Between them they have a capacity of 15 tons, of which 7 tons is carried in the tanks, and may, if desired, be replaced by fuel if it be found that the whole 15 tons of ballast is not necessary. The water in the tanks can be transferred, like the fuel oil, from one part of the airship to another by compressed air. If no passengers are carried, and all available tanks are filled with fuel, including those normally of the water ballast system, the total supply available becomes about 44 tons.

The Power Plant

Originally it was the intention that both R.100 and R.101 should be fitted with Beardmore heavy-oil compression-ignition engines. During the development of these engines, however, a certain amount of trouble was encountered, due to a period of resonance developing at an engine speed of slightly over 900 r.p.m. By using spring couplings between the crankshaft and propeller, and damper flywheels, the trouble was overcome, the critical speed being thereby brought well below the running range. Delays were, however, unavoidable, and Commander Burney and his company decided not to wait for the Beardmore engines for R.100, but to use petrol engines instead. Later on it will be quite feasible, if desired, to substitute compression-ignition engines. In R.101, on the other hand, it was decided that in view of the undoubted advantages of the heavy-oil engine, the original plan be adhered to, and Beardmore "Tornado" engines are actually fitted.

Originally it had been expected that the Beardmore engines would develop 700 b.h.p. at 1,000 r.p.m. This has not been found possible with the existing engines, and the engines are now to develop a continuous full power of 585 b.h.p., with a short-period maximum of 650 b.h.p. As there are five engines in all, the total continuous full power available would have been 2,925 b.h.p. Again, however, difficulties have arisen. This time not with the engines but with the variable pitch propellers. These were designed with the object in view of being able to give a reverse, such as for checking speed when coming up to the mooring mast, etc. Presumably because the development of the variable pitch airscrews has taken longer than expected, R.101 has been fitted provisionally with wooden propellers, and the reverse has had to be obtained by putting the airscrew of one of the five engines (the port, forward one) on "front to back," *i.e.*, giving forward thrust. This, unfortunately, means that the engine cannot be used for giving rearward thrust, and thus is a "passenger" except for a few minutes at a time. One result obviously must be that the maximum forward speed of the airship will be reduced, not only because of the deletion of one power unit (as far as forward thrust is concerned), but also because the continuous full power is less than the airship was originally designed for. The original designed top speed was about 80 m.p.h., but it is now estimated that with the power available this figure will be reduced to about 70 m.p.h., with a cruising speed of something like 63 m.p.h. It is to be assumed that with but four engines running, the range for a given quantity of fuel will be somewhat increased at the lower cruising speed, but here head winds enter into the calculations to a marked extent. It is customary, we believe, to base estimates of range upon a head wind of 15 m.p.h., and if the cruising speed in still air is found to be the estimated one of 63 m.p.h., the average speed made good over the ground will be reduced to 48 m.p.h. This may handicap the airship not a little as regards her general utility, but one should, we think, regard this as being merely a temporary set-back which does not greatly affect the technical value of the airship. There is very little doubt that considerable improvement in the engines can and will be made. This may take the form of lighter engines for the same power, or more powerful engines for the same weight, and in the meantime the existing engines and propellers will serve a very useful purpose in enabling us to begin flying tests. While these will be no criterion as to what the airship will ultimately do in the way of performance and useful load, they will at any rate enable us to test out the general design and structure of R.101, and give invaluable information concerning the heavy-oil engines under actual working conditions.

The "Tornado" engines are carried in five exactly similar engine cars, of which two are placed forward, a slight distance outboard, two a little abaft of midships, and further out from the centre line, while the fifth car is placed aft, on the centre line. It might have been thought logical to use this central engine for the reverse, but it was desired to retain this engine for forward thrust in order to get the slipstream of its propeller on to the tail surfaces for manœuvring purposes. Consequently the port forward engine is at present used for reverse. In each engine car there is a small (40 h.p.) auxiliary petrol engine for starting the main engine. The petrol tank for the

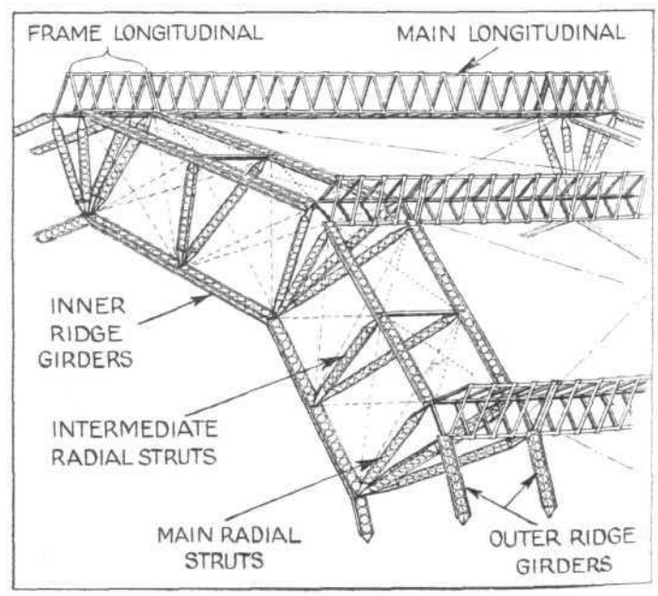

Diagram of the main structural members of the framework of R.101. The intermediate longitudinals are not shown. They occur midway between the main longitudinals, and are secured to the outer ridge girders in such a way, by a screw thread arrangement, that they can be displaced radially outwards, and thus take up any slack developed in the outer cover or envelope.