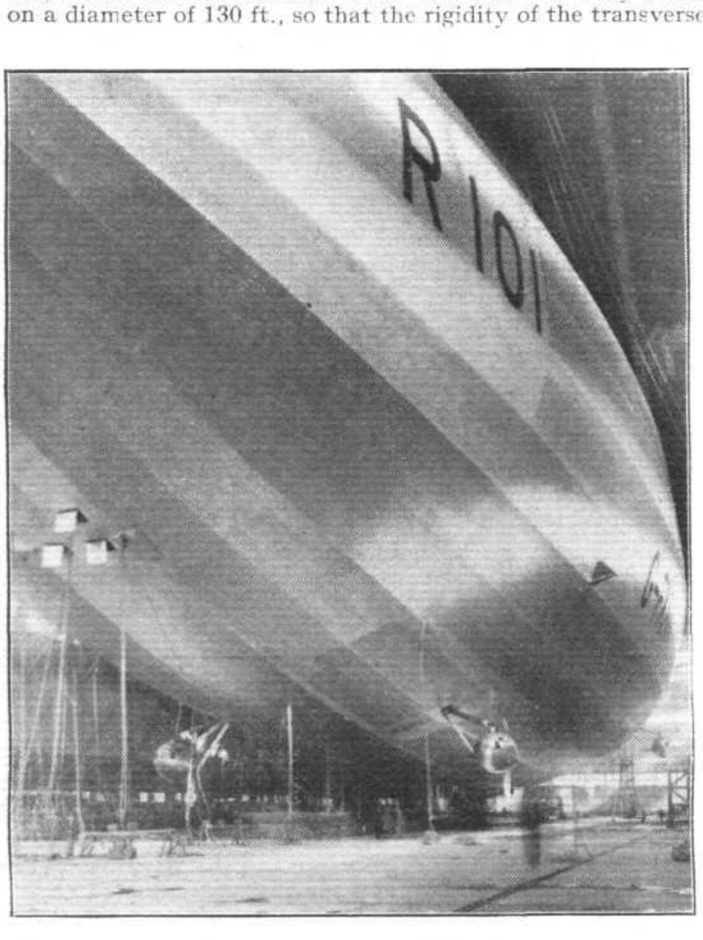
THE LOUNGE OF R.101 : This photograph was taken by electric light, and does not, therefore, show as clearly as it might the spacious nature of this compartment. ("Flight" *Photo.*)

in themselves to take any loads imposed. A test "ring" was suspended from its upper corner, and a load of six tons was suspended from the bottom of the frame. The extension of the vertical diameter under this load was only 4 ins., on a diameter of 130 ft., so that the rigidity of the transverse frames appears to be satisfactory. That they are slightly heavier than the older type seems probable, just as in an aeroplane a cantilever wing is heavier than a braced wing, but it was desired to look to the future rather than to the immediate needs, and therefore the extra weight was accepted. The rigid frame is very useful for stowing tanks, and for housing platforms and ladders, etc. Moreover, with the rigid type of frame it is possible to fit these items in place with the ring lying on the floor, which saves a great deal of time by avoiding the necessity for working on them at a great height after they are erected.



This view shows the two forward engine cars, and also one of the triangular steam condensers of the cooling system. ("Flight" *Photo.*)

There are 15 main longitudinal girders and 15 intermediate longitudinal girders. Only the former are structural members proper, the intermediate girders serving mainly to assist in supporting the outer envelope and reduce the tension in the fabric of the envelope.

With the geometrical characteristics given, and the loads to be borne at any point, Boulton and Paul evolved the details of the final structure, and with their long experience of steel construction, they were able to design very efficient structure members of high-tensile steel. The large size of R.101 was partly responsible for the use of steel being feasible, but the research and experimental work done by the Norwich firm also played a large and important part, as steel members were produced, the like of which had never been attempted before in the history of engineering. To indicate that Boulton and Paul were not merely out to show that they could produce some very efficient steel girders, but that their aim was to produce the structure with the lightest weight for the loads to be supported, we may quote the case of the extensive use of Duralumin in the structure, steel being used only where there was a definite advantage in doing so. For example, the main longitudinals are girders composed of three steel tubes running fore and aft, forming a triangle, joined by struts and braced by cables. The transverse frames or "rings," on the other hand, have steel booms with Duralumin webs. The diagram on p. 1094 illustrates the general arrangement. In the diagram the intermediate longitudinals have been omitted, partly for the sake of clearness and partly because, as already mentioned, they are not a part of the main structure. The booms in the main longitudinals are of the Boulton and Paul "closed-joint" type, made from steel strip, formed into a tube and with the edges of the strip curled over each other inside the tube. Continuous heat treatment permitted of making up 75-ft. lengths of these tubes in a steel which enabled a proof stress as high as 65