tions, and the researches are assisted by a grant from the Treasury. The income during the past year was above 70,000*l.*, an increase of nearly 20,000*l.* over that of the preceding year. The major part of this total is received in payments for work done, and this involves a serious financial liability. Much attention has been given recently to the question of the future of the laboratory, and in particular to its relations with the Department of Scientific and Industrial Research, and a scheme will no doubt be arranged whereby close relations with the department will be established.

PEAT AND ITS USES.

CONSIDERABLE interest attaches to a recent article in *La Nature* on "Peat," in view of the increasing attention being paid to the use of this substance to replace coal in countries in which the latter is absent or difficult to obtain. The author of the article, M. Renié, discusses concisely the distribution of peat-beds in the various countries, the treatment (drying and pressing) of peat and its uses. He does not pretend that it can compete successfully with coal; except where freights for the transport of the latter are excessive. The best solution, he suggests, is to transform it on the spot into energy, and to recuperate the by-products. The drying and mechanical treatment must be carefully carried out so as to render the fuel as homogeneous as possible. The pressing operation increases the specific gravity of dried peat from 0.7 to 1.03. The cost of treating is not high. Ekenberg has shown that peat heated for a short time at a temperature above 150° C. loses its gelatinous consistency, and thus allows of its being dried by compression. The final product is usually converted into briquettes without the addition of a "binder."

Peat in the agglomerate form has not, however, proved satisfactory in practical use, and to get over the difficulty the use of peat in powdered form has been proposed, a factory having been opened at Bäck (Sweden) to carry out a process invented by Ekelund, which is kept secret. Special grates have to be used for burning powdered peat, and in steam-raising in boilers large grate areas and closely spaced bars, together with modification of the furnace draught, are necessary.

In connection with the use of peat for steam-raising, the following quantities of steam are raised from 1 kilo of the following:—Compressed peat, 4.3 kg.; "half"-coke, 6.6 kg.; coal, 7.4 kg. Peat can be carburised for the extraction of coke and volatile products, a Ziegler continuous-type furnace being generally used in Germany and Russia. Peat coke can be used for metallurgical purposes, and the "half-coked" peat for steam-raising. Particulars of the process are given in the article. It is also possible to extract ammonia water and tars, the latter giving, on distillation, light and heavy oils and phenol. The yield of methyl alcohol is about 3.7 kg. from a ton of peat, and 3 kg. ammonia sulphate and 9 kg. of acetate of lime.

Peat is successfully used in Sweden, in combination with a gas-producer, for working engines of the "waste-gas" type. From one ton of peat 2000 to 3000 cubic metres of gas, giving from 1200 to 1400 calories per cubic metre, are obtained. As the author points out, special care is needed in purification.

Peat is advantageously used as a litter, owing to its deodorising properties, while during the war the Germans have employed it extensively as a substitute for absorbent cotton for bandages. Its antiseptic properties are well known.

E. S. HODGSON.

SCIENCE AND INDUSTRY¹

FOR the past three years war and the consequences of war have dominated our thoughts and compelled our actions. May we not hope now that the time is coming when we shall reap the fruits of the heroic efforts of those who have died that England might live? How can we best learn the lessons of this terrible time and turn the experience we have gained to the future welfare of our country? The question is much too wide and far-reaching to be dealt with in a single lecture, and it is beyond my powers to attempt to handle it in a general manner. I wish to deal only with one aspect.

We realised at a very early date that science was to be an important factor in success, and while against the heroism of our men all that the science of our foes could do proved unavailing, it was clear that bravery and self-sacrifice without the aid which science could bring would fail to give us victory. Let me remind you of some few of the methods in which scientific investigation has aided our cause; they are so obvious as to need little more than a passing reference.

Take flying, for example. Every part of a modern aeroplane is the product of a highly specialised science. In the machine itself, to combine strength with lightness, to select the right material for each part, to design the wings so that they may bear the greatest weight and offer the least resistance to the motion, to give the body ample strength to withstand the shocks of alighting, and yet not weight the machine unduly—all these points and many others have been the subject of long and difficult scientific examination.

At the National Physical Laboratory there are five wind channels continually in use to test on models all the various factors on which the aerodynamic efficiency of a machine depends. Two of these channels are 7 ft. in diameter and nearly 80 ft. in length; in one wind speeds up to sixty miles an hour can be obtained. The model is attached to a specially designed balance, or dynamometer, and the forces it experiences in various positions relative to the wind are measured; from these data the behaviour of the machine in flight is determined. Here Mr. Bairstow and his colleagues have worked out the practical conditions of stability of motion and determined by many ingenious devices the constants which occur in the theory. That theory was first given in a general form by Bryan, the theory of the disturbed motion of a body moving in three dimensions, under gravity, the thrust of the propeller, and the resistance of the air. The quadratic which gives the energy in terms of the six co-ordinates and velocities corresponding to the six degrees of freedom of the body contains twenty-one constants. Conditions of symmetry reduce these in number; the air channel experiments afford the means for determining their values, and thus predicting the properties of the machine. The work at Teddington would have proved of little value without the corresponding full-scale experiments brilliantly carried out at Farnborough by two Cambridge men, E. H. Busk and Keith Lucas, who gave their lives for the cause, and now continued by two other Cambridge men, Farren and George Paget Thomson. The name of Busk is, I trust, to be commemorated in Cambridge by a scholarship founded in his memory by friends who admired his powers and loved the man.

But it is not only in the structure of the aeroplane that science has done its part. The engine brought problems of the highest complexity, which are being

¹ From the Rede Lecture, delivered at Cambridge on June 9 by Sir Richard Glazebrook, C.B., F.R.S.