batteries are in full-time use. Otherwise the heavier batteries mean additional non-paying load.

When the huge alternating current network of the Grid supply was completed, many thought that there would be little further use for storage batteries in connexion with lighting supply. Having practically obtained standardization, it is most unlikely that Great Britain will ever drift back into the large variety of voltages and systems of supply which existed before the advent of the Grid. There have been a few breakdowns and blackouts since the early years of its working, but their number is diminishing. In *Electrical Industries* of May 6, E. C. McKinnon raises the interesting point whether their number is not a secondary consideration to the question of the possibility of their ever occurring at all. The national supply is now so great that to consider emergency duplicates or alternatives for all of it is impracticable, but there are many sections of the community which might be imperilled in the absence of light and power. Statistics show that the list of installations where an alternative supply has been provided so as to be available in the remote possibility of the cutting off of the main supply by storm, riot, enemy's action, etc., is rapidly mounting. Engineers who have been studying the question of emergency plant recognize that there must be no appreciable time lost after a breakdown in putting it into commission.

It has been customary in the past to regard the average working life of a battery of the stationary type to be something over ten years. But this assumes that the battery has been working during this period. A battery that is only used for standby purposes has a much longer life. It is unlikely that any system of telephone supply would be run solely from the public mains. There is always a storage battery in reserve and so continuity of supply is assured. Proprietors of cinemas are compelled by law to instal a lighting supply secondary to the main supply.

The use of the storage battery as the nucleus for the alternative supply is now firmly established. In several hospitals the storage battery is introduced as a means of assuring constant illumination. The chances of interruption of the public supply are very small, but the outlay required to ensure an unfailing brilliant illumination by a storage battery with automatic control is not a serious item and might possibly save the life of a patient. In stores and public buildings the object of installing automatic emergency lighting devices is to prevent panic amongst those present and the prevention of pilfering should there be a breakdown of the main supply.

In central electric stations and electricity works standby batteries are much used to help carry over the peak loads and so delay the inevitable purchase of more generating plant. A large standby battery in a London supply station was kept fully charged by allowing a 'trickle' of current to flow continuously through it. When recently subjected to the annual examination it was found, for all intents and purposes, to be equal to new after nine years' running.

Turf Nurseries

THE experimental planting work carried out by Sir John Stirling Maxwell at Corrour in Inverness-shire over a long period of years has attained an almost, if not complete, world fame. It was a study of the Belgian system of turf planting which gave Sir John his first successes at Corrour. Since then he has inaugurated what may be considered a sound technique in afforestation work in this type of country.

Sir John has now applied the wide experience gained to the nursery. In the *Scottish Forestry Journal*, 50, Pt. 1 (Edinburgh, March 1936), he describes his method in an article entitled "Turf Nurseries". It is obvious, says the author, that the method has a restricted application; it can only be practised where peat beds are available. The method was suggested by the ease with which it was found possible to move trees planted on upturned turfs for several years after planting. The method is described as follows by the author:

"An area of peat is selected free from roots and boulders. Nothing is more suitable than the *Molinia* flats which are found on nearly all Scots moors. Turfs are lifted and turned over in continuous rows, leaving a space between the trenches from which they are taken just wide enough to carry the line of upturned turfs. These nurseries are best prepared in the autumn and planted in the spring, but this is not essential. The plants are inserted in the centre of each turf, a plug being cut out by a circular spade. A dressing of manure mixed with sand or gravel is applied to the roots of each plant. The plug is broken up and used to fill up the hole. Well-grown 2-year seedlings are the best plants for the purpose. As regards species, we have hitherto only used Sitka and Norway spruce and *Contorta* pine, but Japanese larch, which grows well on certain types of peat, should be equally suitable. As regards the size of nurseries, the ideal arrangement would be to have each nursery just large enough to plant an acre so that no plants would have to be carried more than thirty yards. In practice we have generally found it more convenient to make the nurseries rather larger, since the number of suitable sites is limited. After two years' growth in the nursery the plants are ready to move. They are carried on hand barrows, six or eight turfs to a barrow. Enough plants are left in position to make the nursery part of the wood. For Sitka we leave every fifth plant in every other row. For Norway every fourth plant. The remainder are set out at whatever distance is desired. If the heather is long a space has to be cut or pulled for each turf. Sometimes on very steep slopes it is necessary to make a nick to prevent the turf sliding downhill. The setting out is usually done as soon as the second year's growth is complete. It may be asked why the turfs are not cut where required and placed at once in their permanent positions. The answer is that there is great economy in concentrating all the preparatory work in one spot. Also the turfs are heavy to handle when first cut, whereas after two years' exposure they become much lighter."

Sir John states that the advantage of the system is that the plants receive no check at any stage in their growth; that the method can be used with success on ground where planting in pits or notching would result in prolonged check; and finally, where draining is required, it does not make up for the lack of it. The author discusses the types of countryside on which he thinks the method is applicable. He says that the turf nurseries require little shelter. Nurseries placed on exposed salients at 1,600 ft. in Scotland have produced plants which "would do credit to any lowland nursery". As regards manures, the old Belgian recipe of one part of slag to seven of sand has given the best results.

Sir John is modest, and thinks the scope of the method is limited. This is by no means so certain. There are parts of the Empire, by no means restricted to peat lands, where it is possible that this type of nursery rearing of plants might be applicable both with success and cheapness.

Educational Topics and Events

CAMBRIDGE.—Applications for a John Lucas Walker studentship in pathology are invited and should be sent before September 30 to Prof. H. R. Dean at the Department of Pathology, to whom requests for further information regarding the studentship may be addressed. This studentship will be tenable for such period and will be of such annual value not exceeding £200 as the professor of pathology with the approval of the Managers may determine.

The Board of Management of the Frank Edward Elmore Fund will shortly proceed to the award of not more than three or four studentships for research. The studentships are open to male graduates of any University in any country who were born at any place within the British Empire other than Scotland. The students first appointed will work in the Department of Medicine under the direction of the regius professor of physic. The commencing salary will be £300 a year.

At Clare College, Prof. R. S. Hutton, Goldsmiths' professor of metallurgy, has been elected into a professorial fellowship.

At Emmanuel College, the external studentship offered to graduates of other universities intending to commence residence as research students in October next has been awarded to C. O. Hutton of Otago University, New Zealand, for research in geology.

SCIENTIFIC research is made self-propagating by the peculiar methods in use by the Wisconsin Alumni Research Foundation. As explained in "A Decade of Service" recording achievements of the first ten years, 1925–35, of the Foundation's existence, this trust started with no invested capital but only a patent application belonging to one of the University professors, Dr. Harry Steenbock. The application, then pending before the United States Patent Office, related to the use of ultra-violet rays to enrich the vitamin D content of foods and medicinal products. A corporation was formed to exploit this patent and any others that might be similarly acquired from members of the University. In ten years the earnings of the Steenbock patent alone have enriched the University by nearly 700,000 dollars and provided an endowment worth more than 125,000 dollars a year for the future needs of research.

Science News a Century Ago

Use of Coal in American Steam-boats

ACCORDING to Admiral Preble, up to the year 1834, steam-boats in the United States burnt wood only. On August 18, 1836, *The Times* published a note from the *New York Evening Star* about the steam-boat *Novelty*, which said that "recent successful experiments of driving this boat, of the largest class, with anthracite coal, against the tide and a strong current at 16 miles an hour has caused much remark in the city, as an astonishing fact of great importance on the subject of fuel which may lead to revolutions in steam navigation. Dr. Knott, the distinguished president of Union College, is the proprietor of the *Novelty*, which he constructed, we believe, with machinery after his own ingenious invention. The fact of the practicability of using anthracite being now ascertained so as to produce as great a degree of heat as pine-wood, will no longer compel steam-boat proprietors to import their wood at exorbitant prices from the remote forests of Maine and the shores of the Chesapeake. Nearby, and almost at our doors, we have the anthracite coal mines of Pennsylvania, of every possible variety, in exhaustless quantities. The successful navigation of the Atlantic from America to Europe is made certain. Wood is now selling at the Hudson, at five or six dollars a cord. The cost, in fact, of pine-wood is about double that of anthracite."

Progress of Ballooning

IN 1836, balloon ascents were very frequent, and considerable sums were paid by passengers desiring to make an aerial voyage. The subject was one of great public interest, and on August 18, 1836, *The Times* in an article on "Aerostation" gave a chronological account of some of the landmarks in ballooning. In this article it said on September 19, 1736, J. Montgolfier sent up a balloon in Paris, filled in eleven minutes with the smoke of burnt straw and wool. Montgolfier then made a balloon of spherical form 45 feet in diameter and 75 feet high in which Pilatre de Rozier ascended, he having the honour of being the first aeronaut. On December 1, 1783, a balloon filled with hydrogen gas took up aeronauts in the persons of MM. Charles and Robert. In 1784 Madame Thible ascended at Lyons before the King of Sweden. She was the first aeronaute. On June 18, 1786, Mr. Festin ascended from Paris, and remained a whole night in the sky. On November 25, 1783, the first ascent in England was made by Count Zambecarri, from the Woolwich Artillery ground. He descended at Petworth. On September 21, 1784, the Chevalier Lunardi made the first ascent from London. On January 7, 1785, Mr. Blanchard and Dr. Jeffries, an American physician, ascended at Dover and descended near Calais. After referring to the use of balloons in military operations, the article concluded with the observation that balloons have not justified the expectations they raised.

Death of Edward Turner Bennett

ON August 21, 1836, Edward Turner Bennett, secretary of the Zoological Society, died at the early age of thirty-nine years. Born at Hackney on January 6, 1797, he was trained as a surgeon, and practised for several years near Portman Square. He devoted himself with the greatest ardour to the