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SCIENTIFIC AMERICAN SUPPLEMENT

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MEETING OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

The decennial meeting of this association, in Providence, R. I., the 17th, 18th, 19th and 20th instant, called together more scientific and mercantile men and awakened a wider interest than any that have preceded; a notable feature, greater elaboration of technical detail in the papers read, and in the discussions closer adherence to mathematical accuracy. Following is given a transcript of the most notable papers and remarks:

Prof. Elihu Thomson, introduced as the greatest living electrician, said:

In 1889 it was my privilege to visit the Royal Institution, in London, and there inspect the original manuscript records made by Sir Humphry Davy and by Faraday—the two great mains, lying as it were at the foundation of the sign, at least, of electric lighting—to inspect also the apparatus, and even to handle the apparatus which Faraday used in his early experiments. These two mains are coupled with the beginnings of our great industry. Sir Humphry Davy was the first man who ever saw the electric arc; the first man who put two wires together tipped with carbon, drew them apart, and got the flame which we now call the electric arc. He called it the electric arch, I believe, or an arch of flame. I saw the record of this original inscription, and the inscription in Davy's rapid hand that this was a gorgeous experiment.

It was quite a contrast—the difference between Davy's style of recording his experiments and Faraday's; and there is that contrast even to be seen in their work. Davy was, as it were, brilliant—jumping from one thing to another, and getting there by a great leap—while Faraday's was the painstaking work of the scientific investigator who thought out carefully what he was about, and when he had concluded his experiments, wrote out just as carefully what he had obtained. The records of Faraday's are models of neatness; they are models of precision in every way. I recall this as a reminiscence. It is a late reminiscence, but it carries us back to the time when Faraday was at work in the discovery of the action of currents in magnetic fields. It is to Faraday that we owe the discovery of the principle which underlies the generation of current by the dynamo. It was he who moved armatures in magnetic fields. It was he who found that the magnet was capable, under proper conditions, of yielding currents.

Prof. Thomson traced the history of the dynamo from its development down to the present, declaring there to be a demand to-day for dynamos up to 500 to 1,000 horse power where a few years ago it would have been an unusual thing for a 100 or 150 or a 200 horse power machine to be spoken of; and it looks, so he said, very much as though in the near future machines of much larger capacity would be demanded for electric installation.

As to heating houses by electricity, he did not think the project was feasible until a means can be found of converting the energy of coal directly into electricity. We must look for another Faraday to explain to us the relation between electric energy and heat energy, so we can convert 35 or 40 per cent of the heat energy into electric energy. Then the steam locomotive will disappear, the steamship no longer be driven by the energy of the steam boiler.

Mr. Monks, of the West End Electric Railway, of Boston, said: At present we have 60 miles of electric track, with something over 300 cars. We are running about 18,000 miles a day electrically. From all quarters, and we cover a very large area, having some 260 miles of track through the popular towns and cities surrounding Boston, we have constant demands and repeated demands and urgent demands for the immediate introduction of the electric system. Though we have had great difficulty hitherto to pacify the public mind respecting the matter of introduction of electric roads, with us in Boston it becomes now simply a question of not getting it too quickly—too fast. I mean in the sense of saving ourselves the investment of a large amount of money in machinery which next month or next year may be regarded as inadequate. But after all is said and done, we are but in our experimental stage. Much remains to be done to perfect the system in regard to the proper form of car, of rail, and a thousand and one details remain to be perfected.

I think the electrical locomotive or motor car is going to be the Moses which will lead us into the promised land.

At the request of the association, a paper had been prepared by Mr. George Worthington, editor of the *Electrical Review*, on the Organization of the National Electric Light Association, its successful accomplishment having been in large measure due to his efforts. He was too ill, however, to be present.

F. H. Prentiss, of New York, read a paper on Distribution of Steam from Central Stations. He cited a steam company of this city, which he said is supplying steam for power and heating to nearly 700 consumers, and sells the product annually of more than 100,000 tons of coal burned under boilers aggregating nearly 20,000 horse power.

In its distribution of steam through underground pipes, the company has had many obstacles to contend with, the chief trouble having been the securing of absolutely tight joints. This difficulty has been completely removed by the method employed during the last four or five years, as is well attested by the network of pipes on Madison Avenue and the adjoining streets, between Fifty-third and Seventieth Streets, where nearly three miles of pipe are in perfect operating condition and practically without a leak.

The joining of two enterprises together, such as electric lighting and the distribution of steam from central stations, has both its advantages and its defects.

In a combined plant the general expenses of management, superintendence, and so forth, need not greatly exceed the cost for the same items in a single plant alone. An obvious disadvantage is the increased back pressure put upon the engines.

In an exhaustive paper on the Electric Arc and its Use in Lighting, Professor Thomson said:

It was not till about twenty years after its discovery by Sir Humphry Davy that any proposals were made to use it in lighting, and, subsequently, for many years it was occasionally employed either in lecture demonstrations or in obtaining an intense light for some special purpose.

The charcoal points of Davy were touched together horizontally after attachment of the wires to the battery and were then separated. The stream of hot flame which followed or joined the points being deflected by air currents, took the form of an arch or curve which gave the name to the phenomenon. Even with one carbon directly over the other, the curved form of the stream is the rule when the carbons are widely separated. Davy's original experiment was made with a battery of 2,000 cells, with zinc and copper plates about six inches square, the exciting fluid being very dilute sulphuric and nitric acids.

In the electric arc there is a real distillation of the conductors forming it, and this accounts for the variation of color and temperature to be found in different arcs. The copper arc evolves a peculiar green light which is exceedingly trying to the eyes, as those who have experienced its effects well know. Zinc gives a whitish blue, while the carbon arc proper is purplish in tint. The arcs from various metals give in the spectroscope the characteristic lines of the vapor of each metal.

As a curious incident, showing the presence of the metal vapor in the arc, I may mention the fact that when by accident a person has had a portion of his clothing bathed for an instant in a heavy copper arc, caused by a short circuit of heavy current mains, there has been found a considerable deposit of copper, enough, in some cases, to give the reddish color of copper to the surface bathed, which if moistened turns green by oxidation. It also gives a deep blue to dilute ammonia in which it is washed, thus showing the presence of copper. In like manner these metallic arcs will give a deposit of the metal on cold surfaces which they touch.

In a paper on the Ferranti system in London, C. B. Haskins gave a detailed description of the various parts of that plant, its peculiarities, and the troubles which have sprung therefrom. Mr. Law pointed out that in ordinary practice it was necessary to keep the current on the wires for twenty-four hours in the day, and for that reason all connections must be made on live wires.

A New Mode of Administering Sulphonal.

Dr. D. D. Stewart, of Philadelphia, has given to the *Medical News* a new formula for the administration of sulphonal which has yielded very satisfactory results. His method is to give the drug at bedtime, stirred in six ounces of boiling water, or two thirds of a glassful, until the powder is thoroughly dissolved. To insure that the water is at the boiling point at the time of contact, it may be heated at the time over a spirit lamp. A little vigorous stirring will cause the drug to be taken up without precipitation when the potion has been cooled down to the point at which it can be drank. In order to cool the liquid, stirring will assist, but it will be necessary to add cautiously a little cold water. The patient should be encouraged to take the solution while it is yet hot, and to believe that the hotter the dose is, the better are its effects. The process of gastric absorption is facilitated by the hot liquid, especially if the stomach is empty, and the period of "therapeutic incubation" is practically done away with. Sleep results in a few minutes and is of a better quality than under the ordinary, less painstaking methods. In special cases, where the physician desires to obscure the disagreeable flavor of the dose, it may be well to add a tablespoonful of *creme de menthe* or some other cordial, which will also promote the speedy absorption of the remedy.

IT has been calculated that the electromotive force of a bolt of lightning is about 3,500,000 volts, the current about 14,000,000 amperes, and the time to be about $\frac{1}{50000}$ part of a second. In such a bolt there is an energy of 2,450,000,000 watts, or 3,284,182 h. p.