VACUUM ILLUMINATION AT THE ELECTRICAL EXHIBITION.

Modern electric lighting by means of arc and incandescent lamps is the outgrowth of discoveries made over a half century ago; and while the progress in electrical matters made since the business began to assume a commercial character is little short of wonderful, it seems almost unaccountable, in the light of what is known, that the grand electrical awakening was so long delayed.

Vacuum tube electrical lighting is almost a parallel case. The vacuum tube itself is not a new thing; it has long been known that it could give considerable light, but it is only very recently that anyone has had courage enough to undertake to reduce vacuum tube lighting to a practical form and render it available for everyday uses.

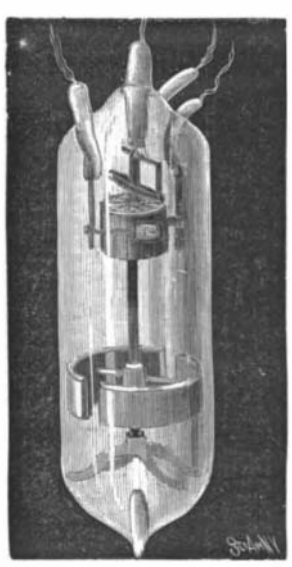

Fig. 2.—VACUUM TUBE OF RAPID CIRCUIT BREAKER.

At the Electrical Exhibition in this city was shown a Gothic chapel of fair size furnished with pews, a pulpit and full-sized organ. It was carpeted and furnished with stained glass windows and illuminated in a novel and attractive manner by a new and successful system of vacuum tube lighting invented by Mr. D. McFarlan Moore. Mr. Moore has been perfecting this system for some years, as will be seen by an examination of the files of the SCIENTIFIC AMERICAN. The exhibit embodies his improvements and gives an excellent idea of the practical value of this system. The windows are screened so as to exclude external light, thereby giving the observer the exact value of vacuum tube illumination. The vacuum tubes are about two inches in diameter and of sufficient length to reach from the pilasters to the apex of the ceiling. They are bent to conform to the curvature of the Gothic arches and their upper ends abutted against straight tubes extending along the highest part of the ceiling, all being mounted in neat, specially designed fixtures. Over the arched front door of the chapel were arranged vacuum tubes, in the form of letters, which spelled out the legend Moore's Vacuum Tube Chapel. The light within was soft and diffusive, having the color of daylight. The tubes were connected up in parallel, and the current used was the "kick" or extra current derived from simple coils without magnetic cores, and not from the secondary wires of an induction coil, as is generally supposed.

The secret of success lies in the use of a circuit breaker which completes and breaks the circuit 60,000 times a minute; but great rapidity in the breaks is not the only feature of the circuit breaker. Mr. Moore has placed the entire circuit-breaking mechanism in a vacuum tube, as shown in Fig. 2, in which a high vacuum is maintained. By this construction sparks are avoided and the instantaneous break depended upon for efficiency is secured.

The rapid circuit breaker is operated by a Gramme ring surrounding the tube, as shown in Fig. 3, and forming the field magnet of the motor which breaks the circuit, the armature being attached to the commutator of the circuit breaker. The breaker is connected with the Edison three-wire system, a simple coil being inserted in each of the leads.

No perceptible heat is given out by the tubes, and it is believed that this is the nearest approach to the production of light without heat that has been made.

From what has been said it will be seen that this system of lighting is adapted to the present commercial circuits—a great point in its favor. This system in its present stage of development has an efficiency about equal to incandescent lamp lighting, but it is believed experiments now in progress will show an efficiency far in advance of that already secured.

By changing the gases in the tubes, and by varying the degree of exhaustion, the color of the light may be varied for decorative purposes. Instantaneous photographic portraits have been made by this light, and it is believed photographers will find vacuum tube lighting of great utility in the absence of sunlight.

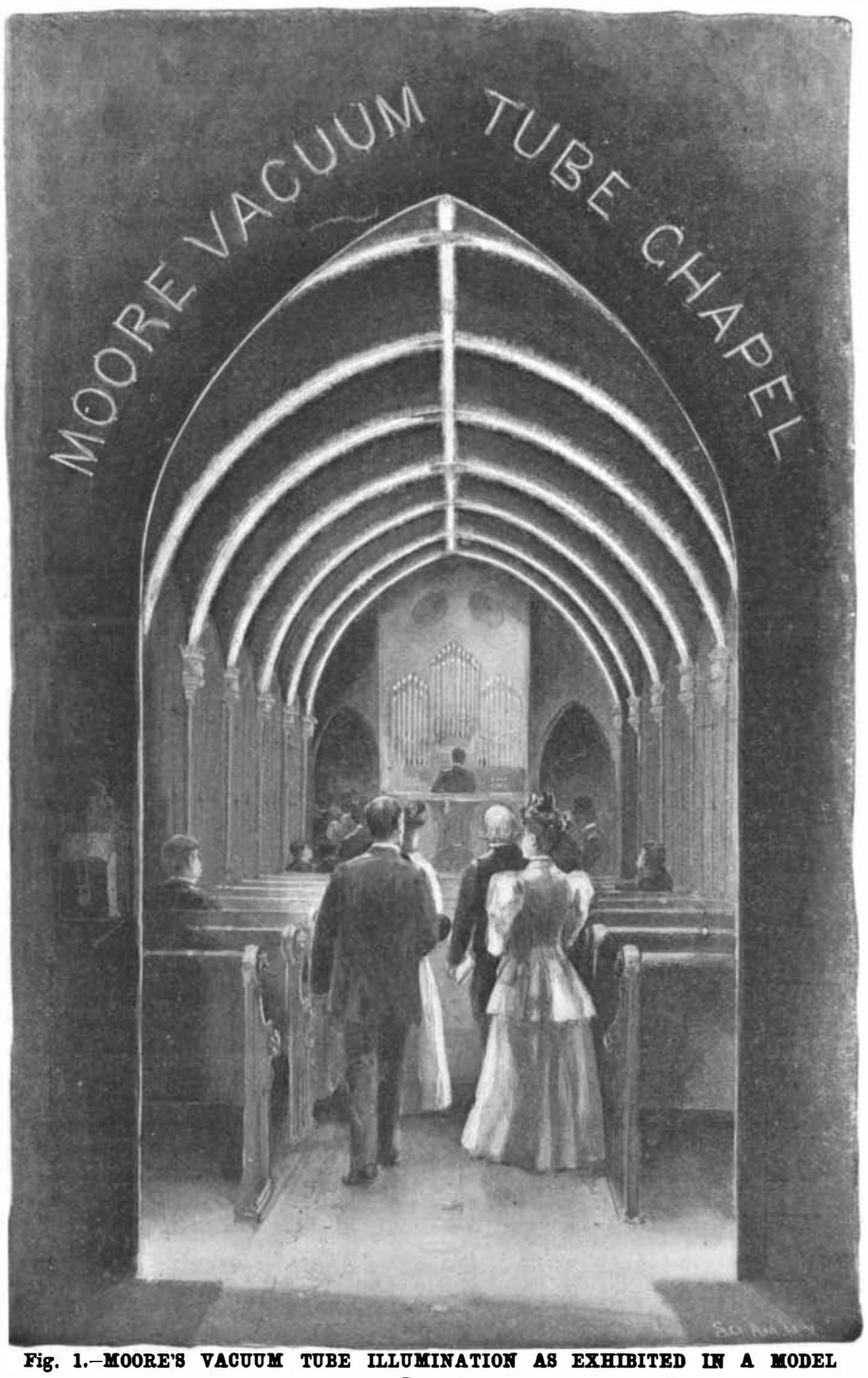

Fig. 1.—MOORE'S VACUUM TUBE ILLUMINATION AS EXHIBITED IN A MODEL CHAPEL.

Strength of Elephants.

Not much information respecting the strength of elephants has ever been placed before the public, hence the interest which attached itself to the tests made some days ago upon two elephants belonging to Messrs. Barnum & Bailey at Olympia, London, says The Engineer. Unfortunately for the trials, the large elephant Mandarin, who weighs somewhere about four tons, could not be induced to put the whole of his strength into the experiments, and succumbed ignominiously to the small elephant Bébé. The measuring instrument was a tractometer lent by Messrs. Thornycroft, of Chiswick, and registering up to 30 tons. The tractometer was placed on a small trolley and attached at one end by means of ropes to half a dozen holdfasts driven into the earth of the arena. The first animals tested were a pair of powerful draught horses, which are considered capable of hauling on a wagon on an ordinary road from 8 to 9 tons. Yoked by means of whiffletrees to the tractometer, they only pulled 1·2 tons. The elephant Mandarin had the ropes leading to the measuring instrument passed round his forehead, and he ran the indicator up to 1·85 tons. In a second attempt the force indicated was 2·5 tons. The small elephant was next

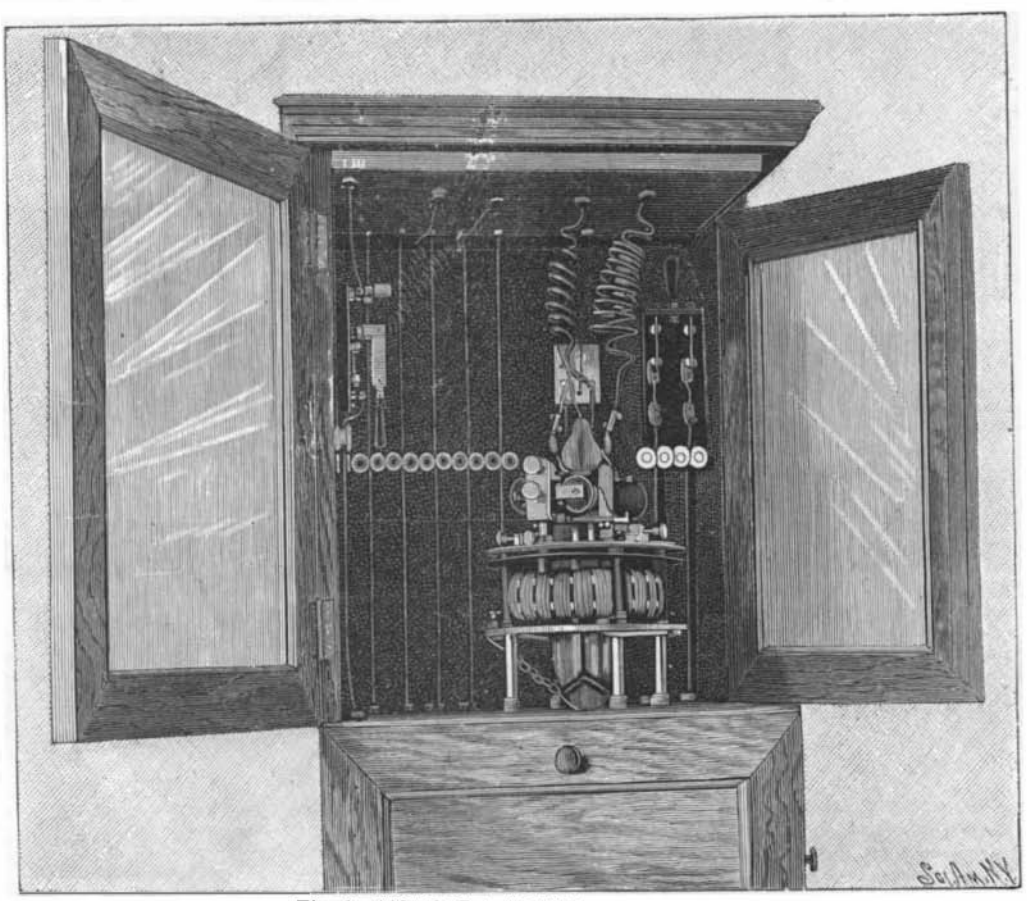

Fig. 3.—COMPLETE CIRCUIT BREAKER.

put to it, and she in her first attempt exerted a force of 5½ tons. After that she shoved, with her head resting on the tailboard, a heavy wagon round the whole arena. This task she did with great ease, although the wagon contained no fewer than fifty-eight men, and was, all told, of an estimated weight of 5 tons. Man had then his turn. Some eighty-three of the show hands were put on to the ropes attached to the tractometer, and pulled against it as in a tug-of-war. With a pull of 2·7 tons the rope broke and precipitated the whole crowd of men to the ground. It was attached afresh, and again broke, this time at 3·2 tons. With a new rope the attempt was again made, when a resistance of 5·6 tons was overcome.

Formation of Chlorophyl.

W Palladine finds that oxygen is essential for the reproduction of the green color in etiolated leaves, and in greater quantity than is necessary for respiration. Thus when leaves which had been etiolated for forty-eight hours in the dark in a 10 per cent solution of saccharose were exposed to the light, immersed in water in a test tube, it was found that the green color was restored most rapidly to those leaves which were in the upper part, in contact with the air, although the light was equally distributed over the whole length of the tube.

The action of solutions of various carbohydrates on the formation of chlorophyl was also experimented with. Thus leaves almost entirely free from carbohydrates were obtained by etiolating them in boiled water. A portion of these, when exposed to light, still immersed in water, showed scarcely any development of chlorophyl. When immersed in a 10 per cent solution of saccharose, however, an intense green color was developed; raffinose in a 5 per cent solution acted in a similar manner. Dextrose and fructose gave rise to the green coloration somewhat more slowly, and with galactose, for the first five days, the leaves showed no color; after then the color developed very rapidly. Dulcite solution, mannite, asparagin, urea, alcohol and ammonium hydrochloride prevented the formation of chlorophyl, while inulin and tyrosin appear to be neutral in their action.—Comptes Rendus.