PAUL JABLOCHKOFF
PRACTICAL ARC LAMP

by Brian Roberts, CIBSE Heritage Group

Paul Jablochkoff, 1847-94

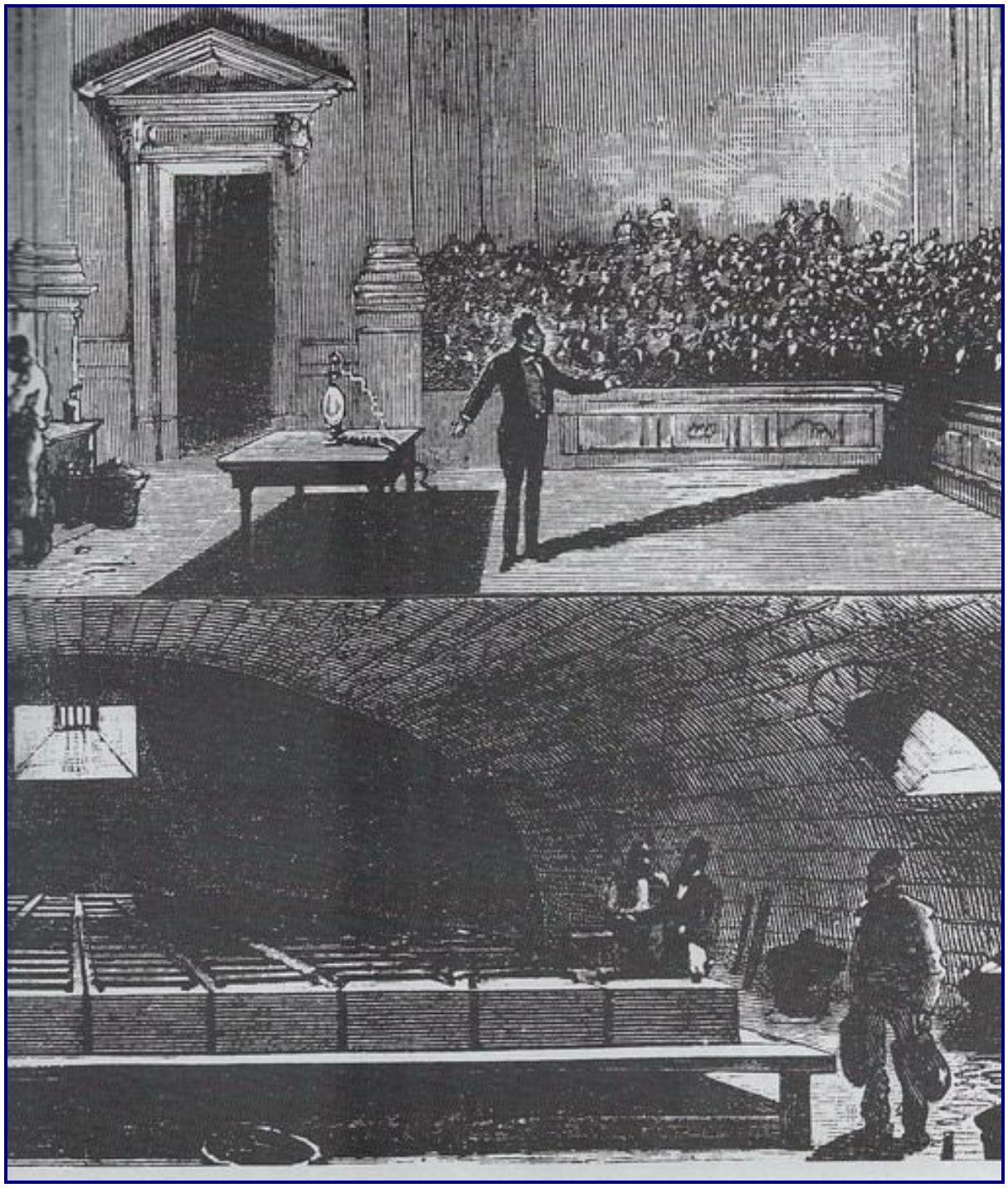
This pioneer of an arc lamp that eliminated the mechanical complexity of earlier arc lamps was born Pavel Nikolayevich Yablochkov on 14th September, 1847 to Nikolai and Elizabeta in Serdobsky, an impoverished village in the Saratov region of the Russian Empire. Pavel graduated in 1866 as a military engineer from the Nikolayev Engineering Institute (later the Military Engineering Technical University) in Saint Petersburg. He then served as Lieutenant Engineer in the 5th Engineering Battalion stationed in Kiev.

After briefly leaving the military he returned in 1869, enrolling in the Technical Electroplating Facility in Kronstadt, where he was trained as a specialist in electrical engineering, becoming head of the Galvanic Team where he remained until the 1st September, 1872.

At this time, he was transferred to the reserve in Moscow where he was appointed Head of the Telegraph Office at the Moscow-Kursk railway, and where he developed various improvements to the telegraph. It was here that he set up a workshop and carried our experiments in electrical engineering, which formed the basis for his later inventions covering electric lighting, electric machines, galvanic cells and accumulators. He also became a member of the Moscow Polytechnic Museum where he learned about contemporary electric lighting methods and saw room for improvements to existing arc lighting systems.

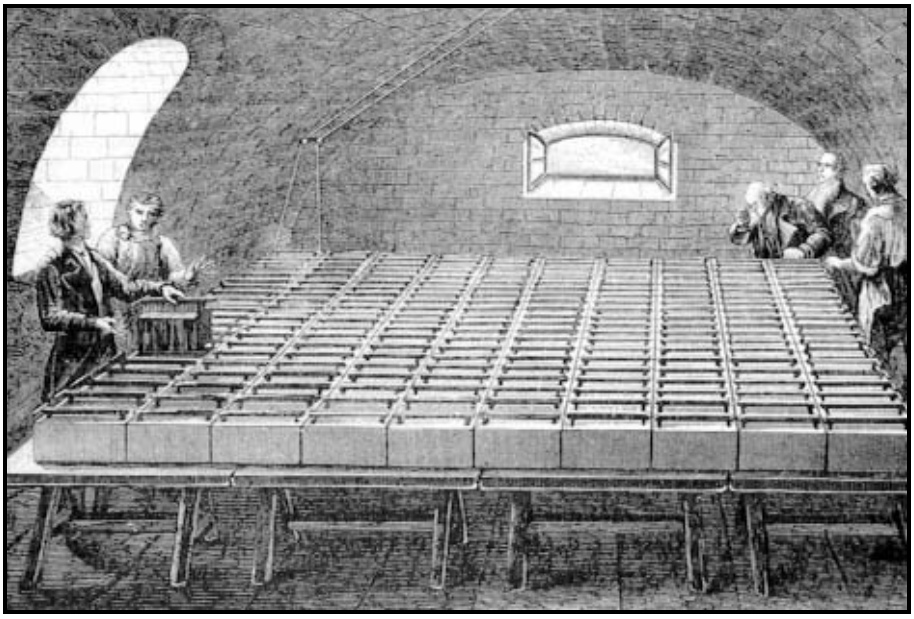
The Moscow Polytechnic Museum in 1884

DEVELOPMENT OF THE ARC LAMP



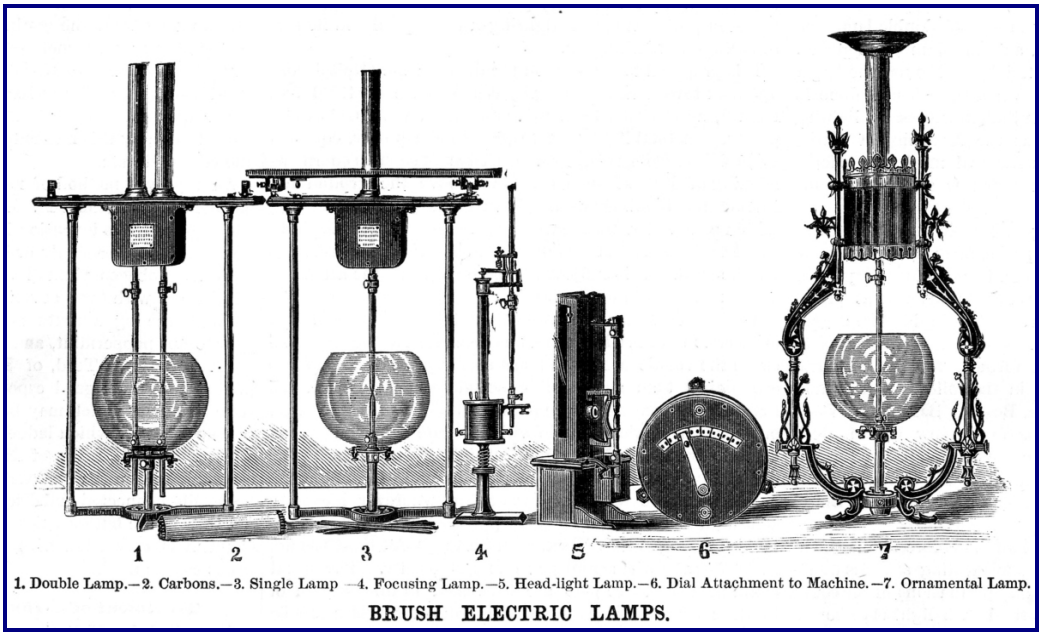
Humphry Davy's demonstration of the electric arc light using a battery of voltaic cells in the cellar below

With a massive battery of 2000 voltaic cells, British scientist Humphry Davy demonstrated the first electric arc lamp before the Royal Society in 1808. It was the birth of the research for a practical electric light.



Davy's battery of galvanic cells in the Royal Society basement

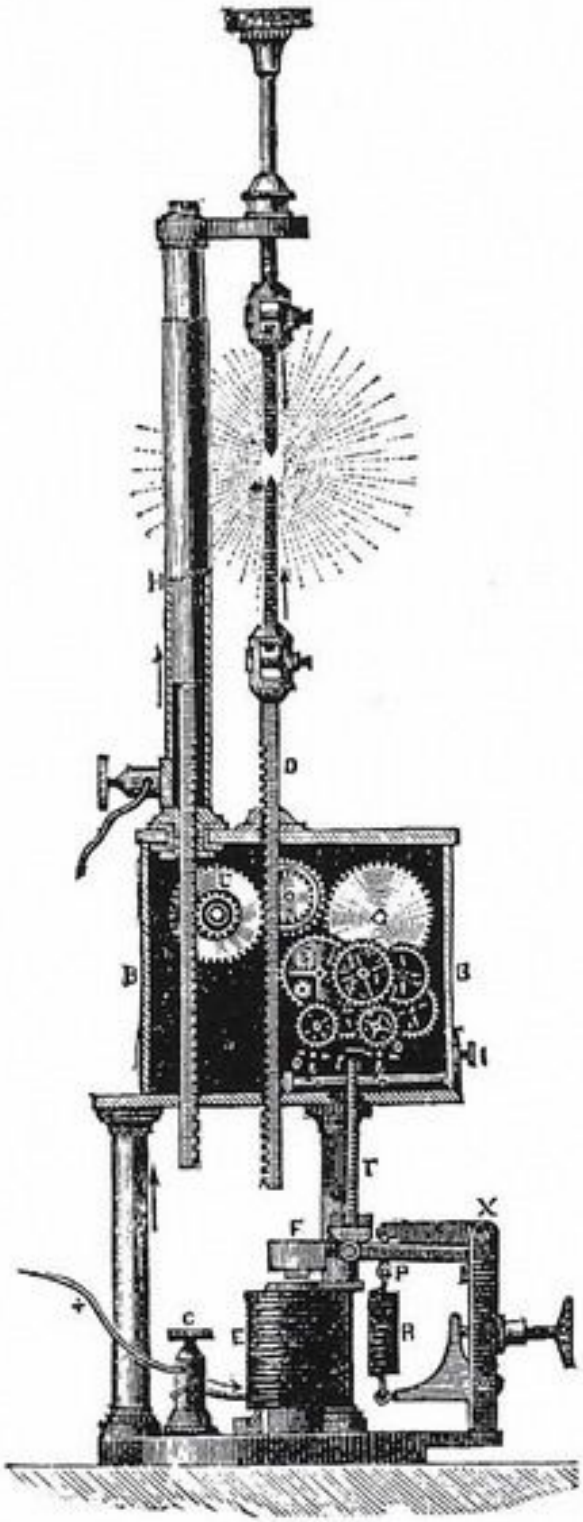
The original arc lamp uses carbon rod electrodes in free air. When these rods are touched together, this allows a relatively low voltage to strike the arc and as they are slowly drawn apart the electric current heats and maintains an arc (a highly luminous bright light). This burns the tips of the rods slowly away, so the distance between them needs to be adjusted regularly to maintain the arc. A variety of mechanisms were devised to do this automatically. In the design introduced by Jablochkoff the rods were repositioned and the various mechanisms no longer required. The carbon arc lamp was used from around 1870, but being unsuitable for domestic applications, it was widely used for street lighting. Pioneers in the development of the arc light include Charles Brush in the USA and Colonel Rookes Crompton in Britain.



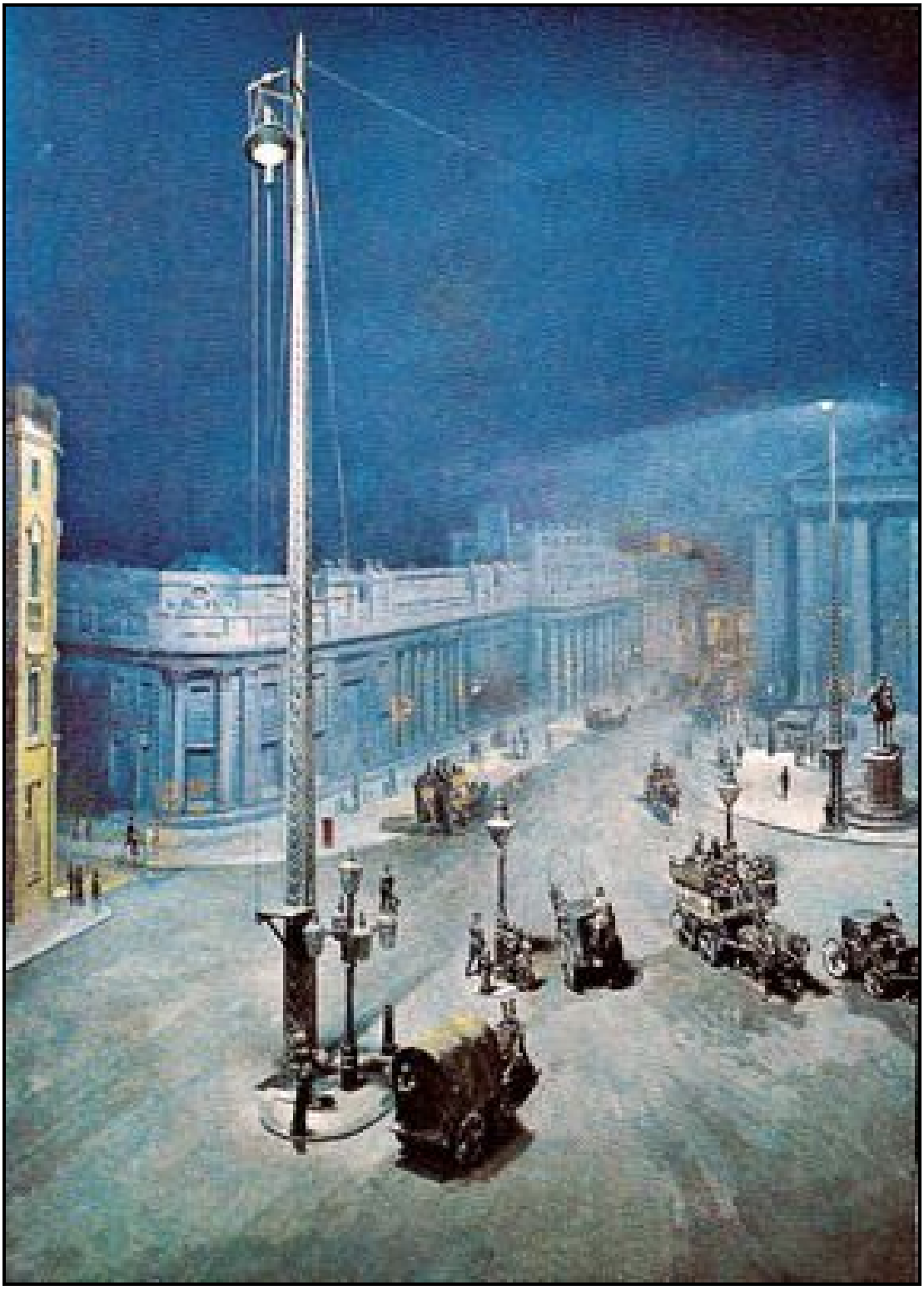
1. Double Lamp.—2. Carbons.—3. Single Lamp —4. Focusing Lamp.—5. Head-light Lamp.—6. Dial Attachment to Machine.—7. Ornamental Lamp.

BRUSH ELECTRIC LAMPS.

10.15 One of the first mechanizations of the arc lamp was the Foucault Regulator. In order to maintain the desired distance between carbon rods, electromagnetic controls caused the carbons to move closer together when the current carried across the arc decreased, and stopped the movement when the current increased. The movement itself was produced by a spring in the mechanism. (*Appleton's Cyclopedia*, 1880, 1:545.)

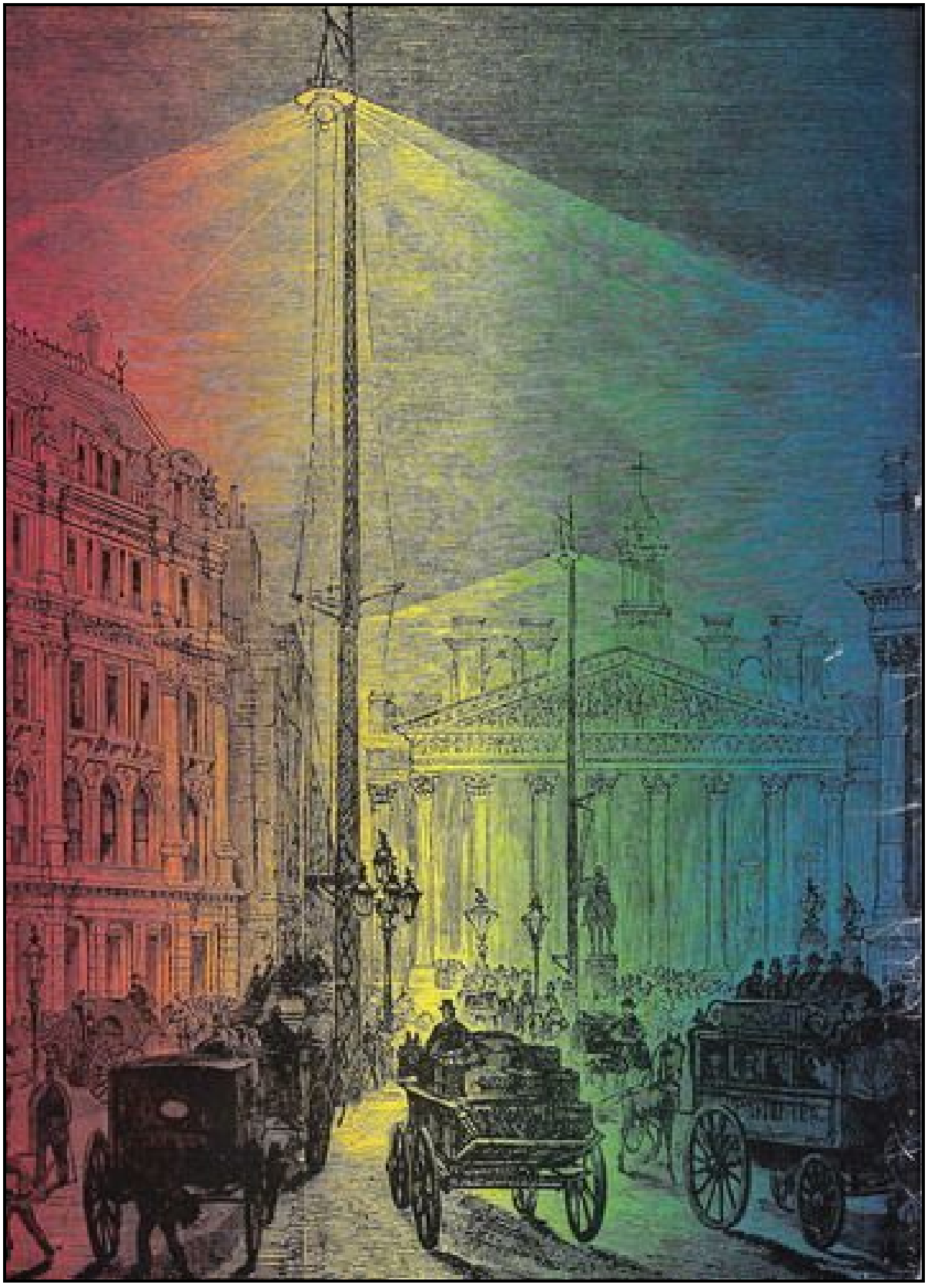


A pioneering and important firm in the use of the arc lamp was Siemens Brothers of Britain, part of the German founding company.



Science Museum diorama of the Siemens' experiment

In 1881, Siemens Bros carried out experiments in area lighting near the London Exchange. They mounted six lights of 4,000 candlepower on 80 ft high poles, each light with its own dynamo.

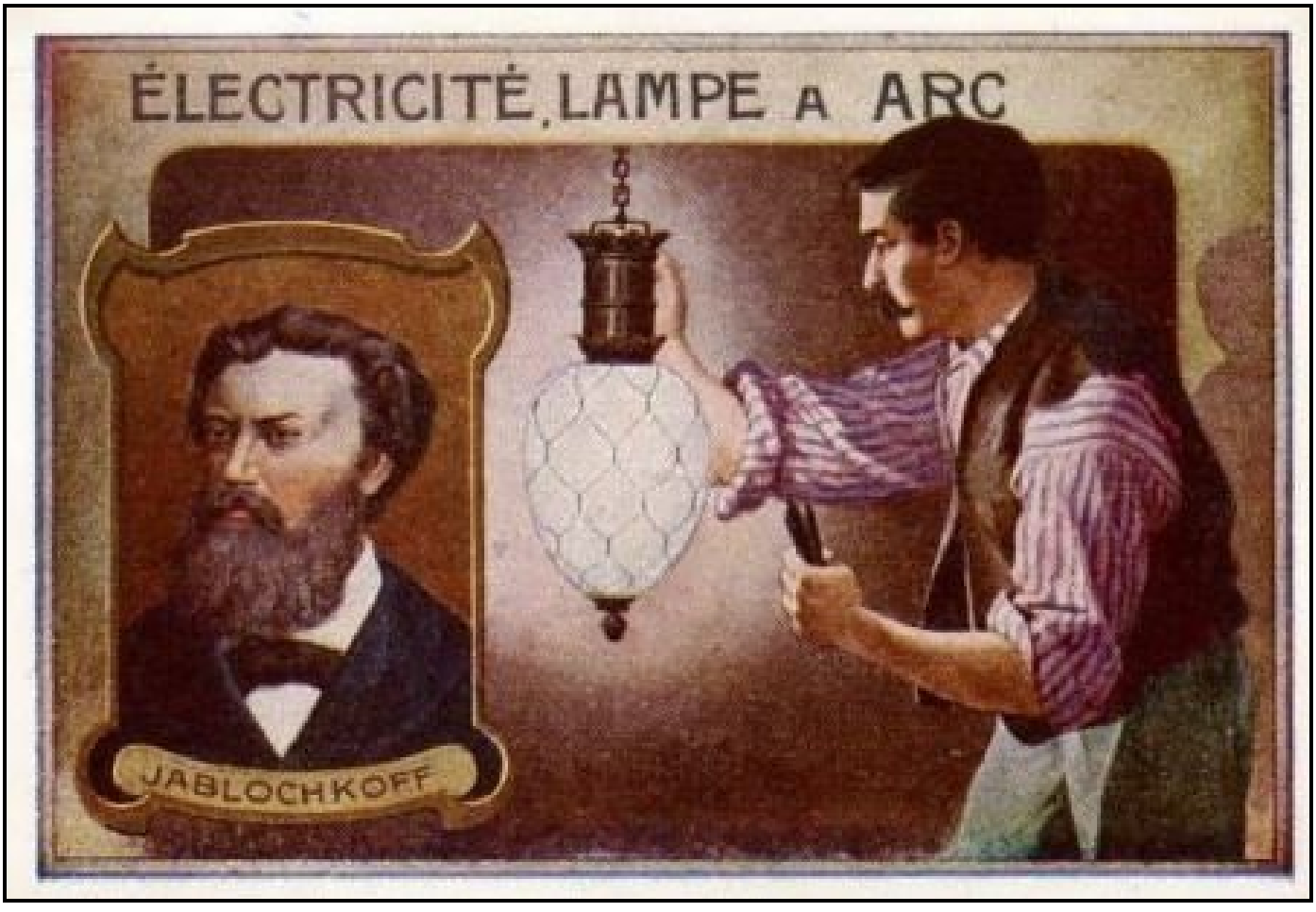


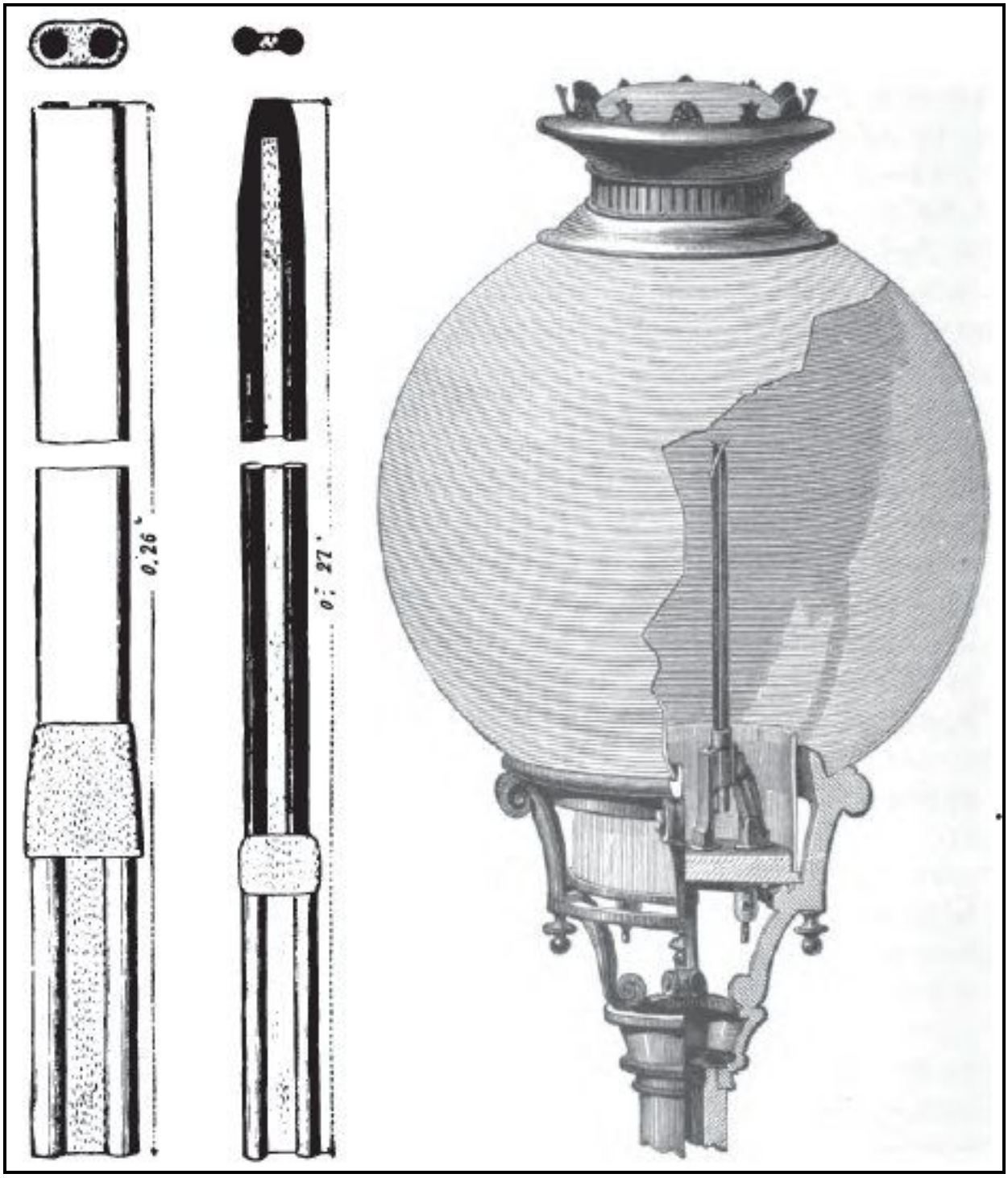
A drawing of the Siemens' arc light experiment near the London Exchange

When Jablochkoff retired from the telegraph service, he opened a shop in Moscow, where with N Glukhov, an experienced electrical engineer, he worked on improving lighting methods, the battery and the dynamo. Existing carbon arc rods functioned in a tip to tip arrangement, but in an 1875 laboratory accident he produced a bright arc from two rods in parallel. This led him to develop the improvements which later became the famous Jablochkoff *Candle.*

Later in 1875, he moved to Paris and took up employment with Louis Clement-Breguet, a well known academic, where he continued his work, being awarded French Patent No. 112,024 for his electric candle. The first public exhibition of the candle was in London on 15th April, 1876, where it enjoyed immediate success. Another exhibition was held in London in June, 1877.

The first commercial use of the Jablochkoff candle was at the Paris Louvre in October, 1877, which employed six lamps (increased to 120 lamps by 1880, "with 84 lit at a time powered by a 100 horsepower steam engine"). Many overseas sales followed and at one point the Breguet factory was producing 8,000 candles per day. Perhaps the most famous demonstration was at the Paris Exhibition of 1878 and where, with the assistance of Gramme and his dynamo, he was successful in having 64 of his arc lamps installed along the half mile length of Avenue de l'Opera, the then Place du Theatre Francais and around the Place de l'Opera.





In late 1878, after selling his patents to a French company, Jablochkoff returned to Russia where he was greeted as a hero, and with financial backing he set up his own company. He returned to Paris for the first International Electrotechnical Exhibition of 1881. It was here that Thomas Edison demonstrated his incandescent lamp which rendered the arc lamp virtually obsolete.

After this, Jablochkoff enjoyed little success and in deteriorating health and in financial difficulty he returned, in 1892, to St Petersburg. Then having tried, unsuccessfully, to settle in the Caucasus he returned to the Saratov region.

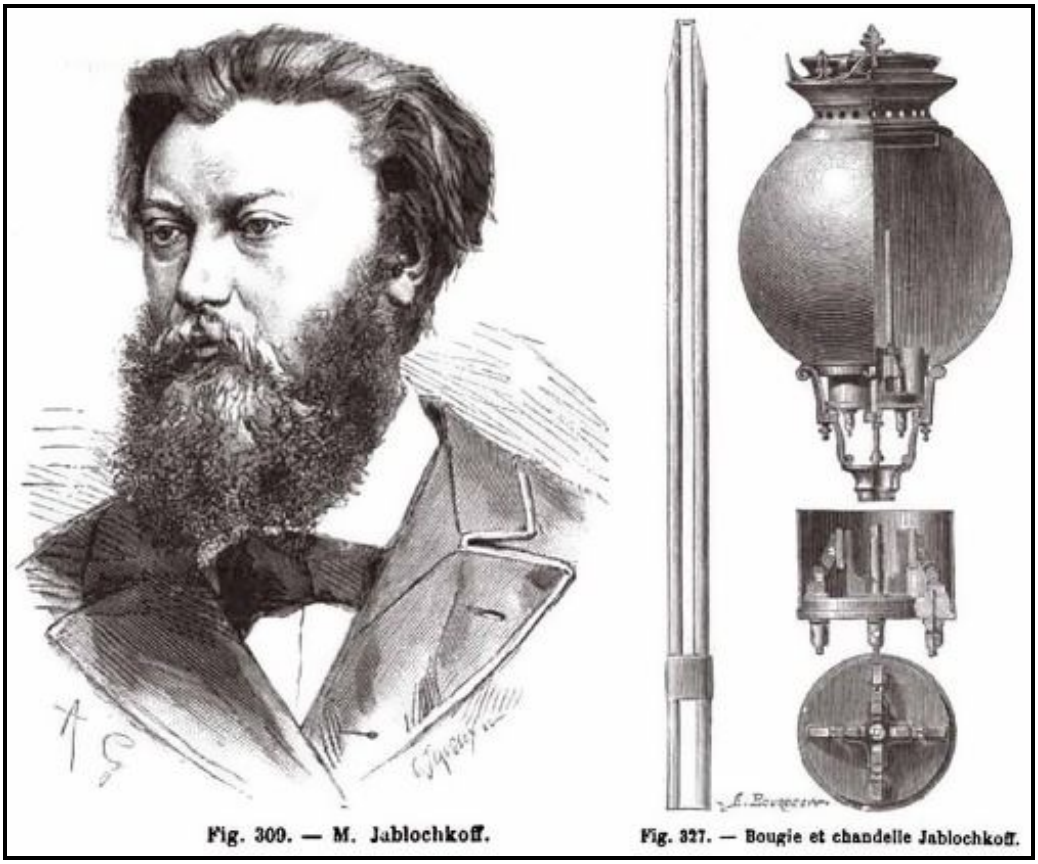
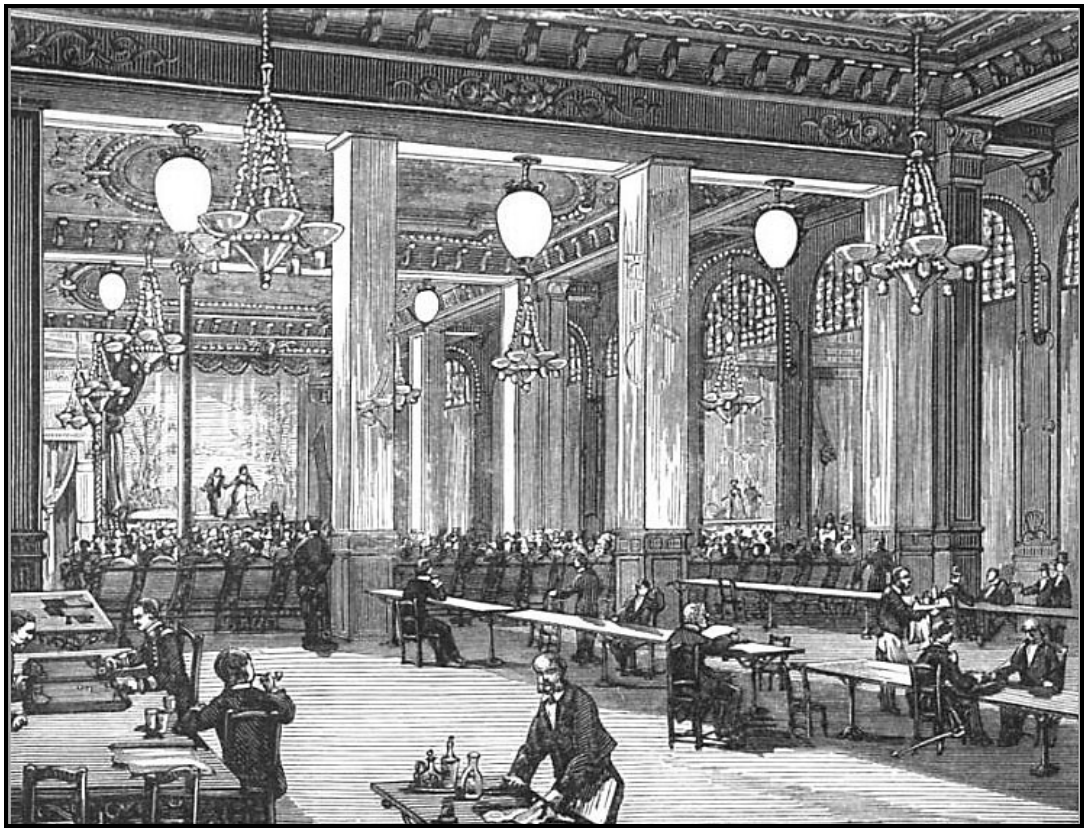


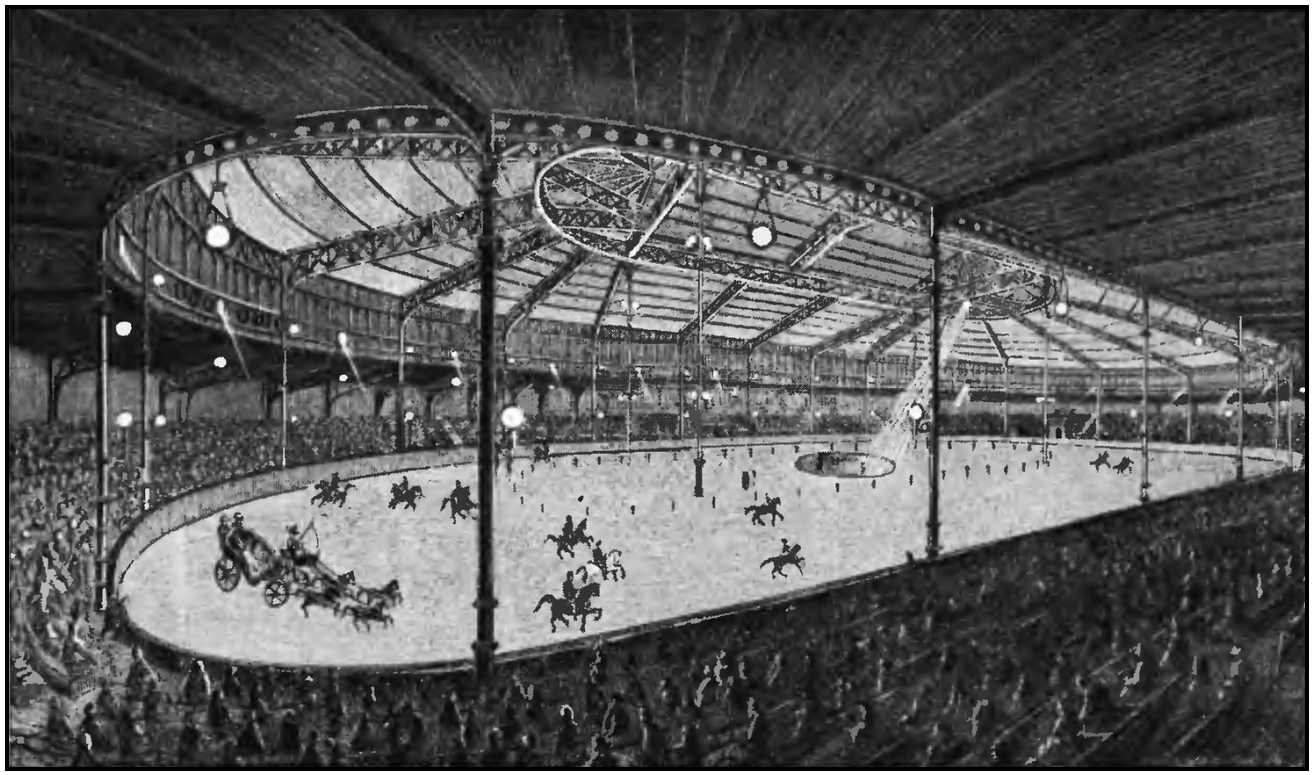
Fig. 309. — M. Jablochkoff.

Fig. 327. — Bougie et chandelle Jablochkoff.



Jablochkoff candles illuminating Music Hall on la Place d'eau Chateau, Paris, 1880

Jablochkoff candles lighting Avenue de l'Opera, Paris, 1878



Paris Hippodrome lit by Jablochkoff candles, about 1880

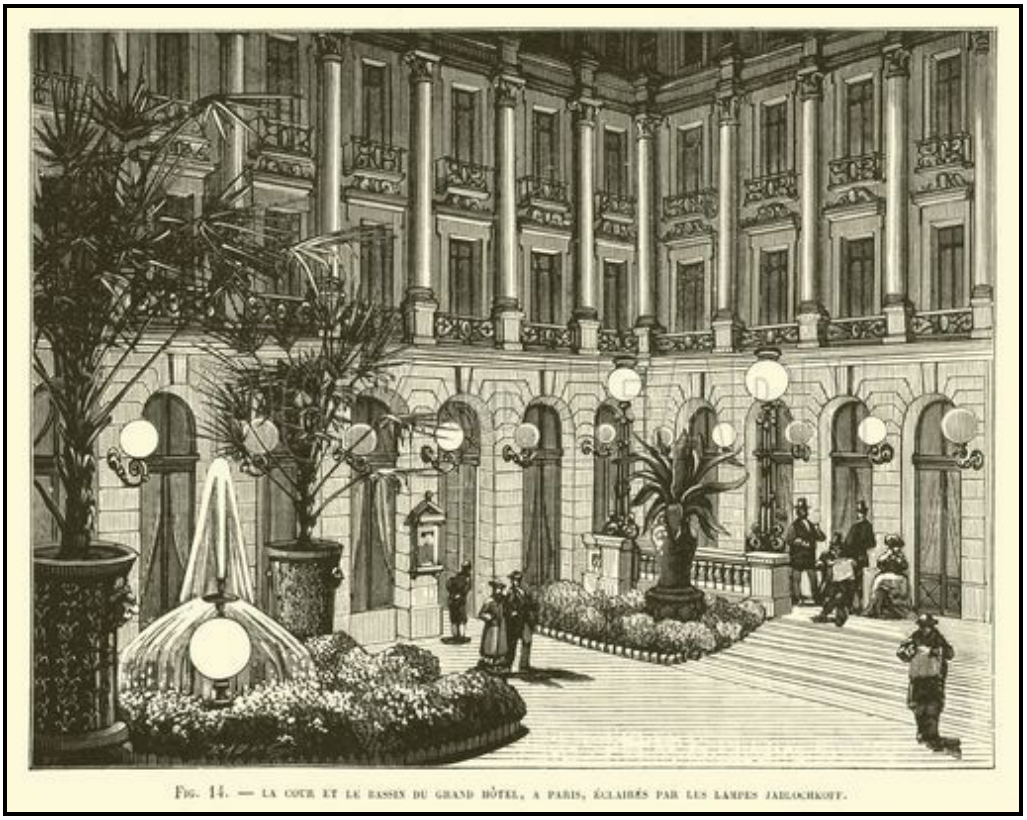


Fig. 14. — La cour et le bassin du Grand Hôtel, à Paris, éclairés par les lampes Jablochkoff.

Courtyard of the Grand Hotel in Paris lit by Jablochkoff candles

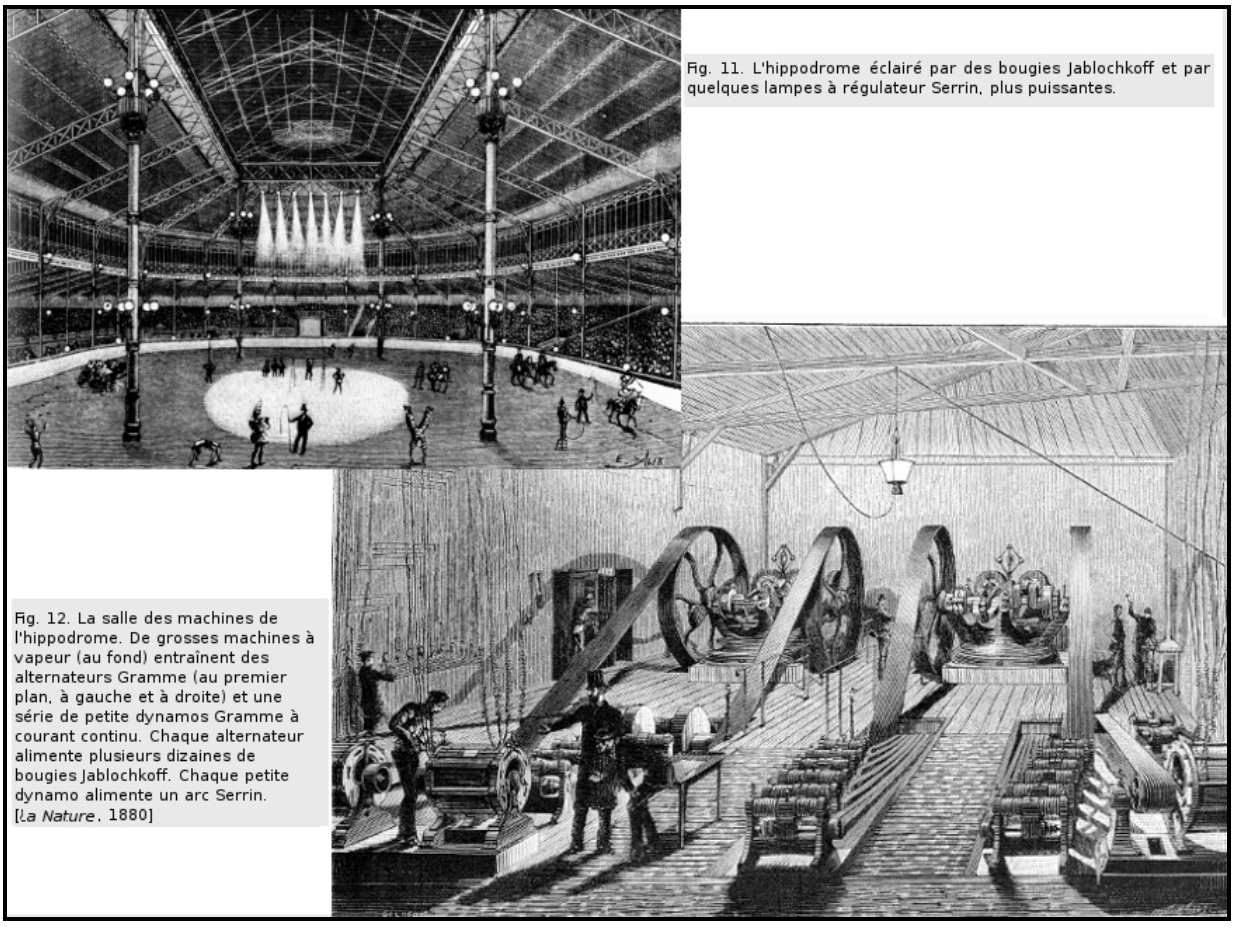
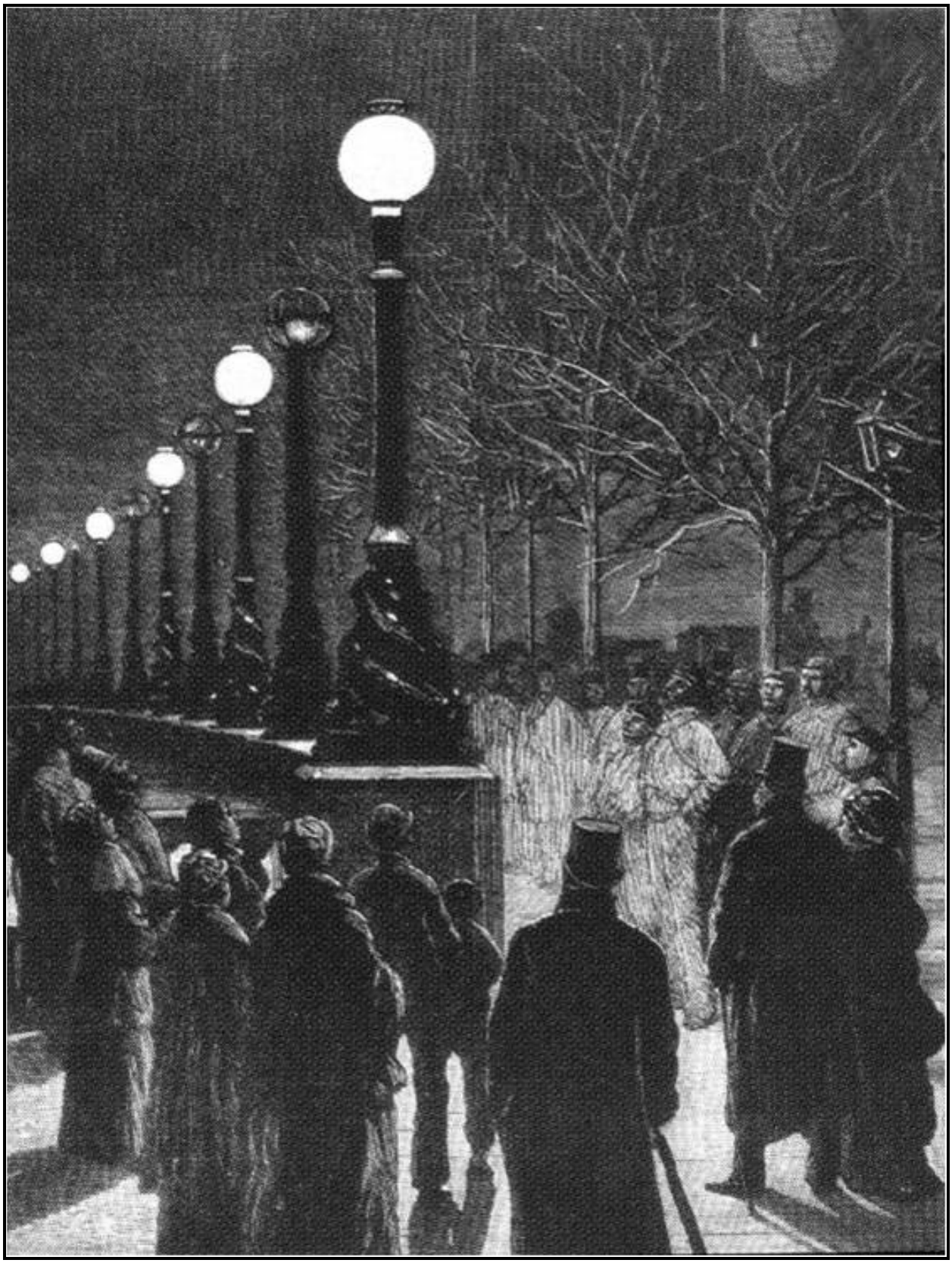


Fig. 11. L'hippodrome éclairé par des bougies Jablochkoff et par quelques lampes à régulateur Serrin, plus puissantes.

Fig. 12. La salle des machines de l'hippodrome. De grosses machines à vapeur (au fond) entraînent des alternateurs Gramme (au premier plan, à gauche et à droite) et une série de petite dynamos Gramme à courant continu. Chaque alternateur alimente plusieurs dizaines de bougies Jablochkoff. Chaque petite dynamo alimente un arc Serrin. [*La Nature*, 1880]

Paris Hippodrome lit by a combination of Jablochkoff and Serrin regulated arc lamps with electricity supplied by Gramme machines



Jablochkoff lamps on London's Victoria Embankment, December 1878

Another view of Jablochkoff lamps on London's Victoria Embankment

Paul Jablochkoff (Pavel Nikolayevich Yablochkoff)

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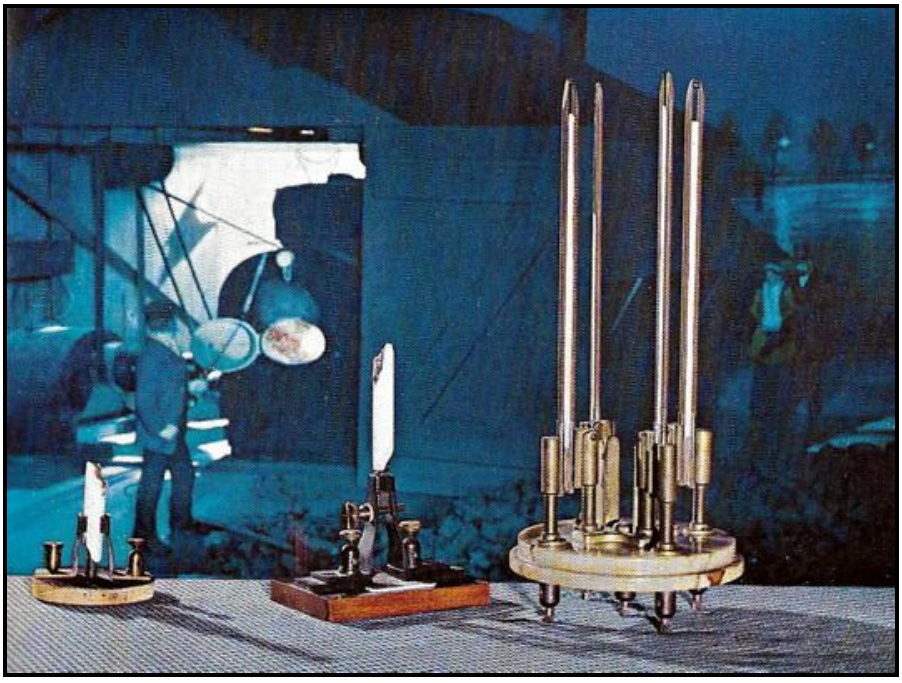

Remnants of early Jablochkoff candles (left) with an 1882 four-candle unit (right) (Science Museum Collection)

EPILOGUE

Paul Jablochkoff died on 31st March, 1894 and was buried in the Church of Archangel Michael in the village of Sapozhok. In the 20th century, he was recognised as a national hero, but the church where he was buried was destroyed in the late 1930s.

In 1952, the USSR Academy of Sciences was instrumental in arranging for the erection of a monument to Jablochkoff at the probable grave site.

Statue of Jablochkoff in Serdobsk

In 1951, the USSR issued a commemorative postage stamp celebrating Jablochkoff's achievements.