Shedding Light on Electric Lamps

The Story of a marvellously compact device that has revolutionised lighting systems

IF not quite the most wonderful of all inventions, the electric lamp may surely claim to be amongst the most wonderful. How easily we take everything for granted nowadays! So simple outwardly—just a wire inside a glass bulb. It has, however, gone through change after change. In the present stage, it epitomises a whole world of research, experiment, mechanical ingenuity and manufacturing skill. Last, but not least, for very little can be achieved in any sphere without monetary risk, it represents considerable financial adventure. Millions of pounds have been sunk to obtain the present results. Optimists there must have been.

Within the limit of almost one human generation, the electric lamp has progressed from point to point. Many of us to-day, by no means old as years are counted, can remember the thrill with which the first electric lamp was greeted. The little thread of carbon in its glass container, which, at the touch of a switch, became a fountain of light, was a mystery to many.

That little thread of carbon, however, so long sought for, made from bamboo by Edison, and from cotton-wool by Sir Joseph Swan, while it served the purpose for upward of thirty years, never satisfied the inventors. Science, as ever, was advancing, seeking and inquiring. Even then, the inventors were looking for the illusive something better. Experiments were being conducted with filaments of fine platinum wire—a widely-famed metal. It was better than carbon, but had the disadvantage of melting when hot enough to emit a brilliant light. But thought had been turned in the right direction—to the exploitation of metals.

Tantalum filaments followed, were a great improvement on the carbon, and had their measure of success—but they had their limitations.

IT was not until tungsten was thought of that present-day efficiency became even remotely possible. Nothing seemed more hopeless, at the outset, than to make a practical filament from tungsten.

Do we know what tungsten is? From an ore, which is formed in association with tin in the mines of Cornwall, England, and of Australia and New Zealand (all within the Empire, mark you!) pure tungsten is produced in the form of fine powder, after a process of refining. But what a task, and what vision was needed even to contemplate its transformation into a filament, sufficiently tough to supply the purposes of an electric lamp? Ever since cotton-wool had become hard carbon, the apparently impossible was attempted, and with a large measure of success. To obtain the necessary fineness of thread the powder, formed into a hard paste with a binding material, was squeezed through a minute hole in a fragment of a diamond. The binding material was afterward burned away by means of an electric current, to destroy the waste. The result was just four times the brilliance of the carbon filament for the same expenditure of electrical energy. But, oh, the fragility! So much so that the process was considered commercially hopeless. Breakages from factory to user were enormous. But improvements were never despaired of, and the miracle of drawn tungsten wire was evolved, instead of the old "squirted" or pushed through filament.

To-day, drawn tungsten wire is a commonplace, and tungsten wire filaments withstand the incessant vibration of a railway train, and the shocks of gunfire on a battleship.

THE brain of the ant, said Charles Darwin, is the most wonderful speck of living matter in the world. He marvelled at it far more than he did at the great mammoths that impress us as the greatest wonders of life. And so it is with the small inventions—creations of man—that are to be marvelled at, and surely the electric lamp is one of the most wonderful of these. Like the valve of radio, the lamp has gradually and painfully evolved, until to-day it is a realistic imitation of even the sun.

EVEN with the achievement of four times the brilliancy, the spirit of invention remained discontented. The lamp burned with amazing brilliancy, it was true, but it was the pace that killed, and the lamp burned out all the quicker. What next, then? It was found that if an inert gas, such as nitrogen, were introduced into the bulb, the life of the lamp was indefinitely prolonged.

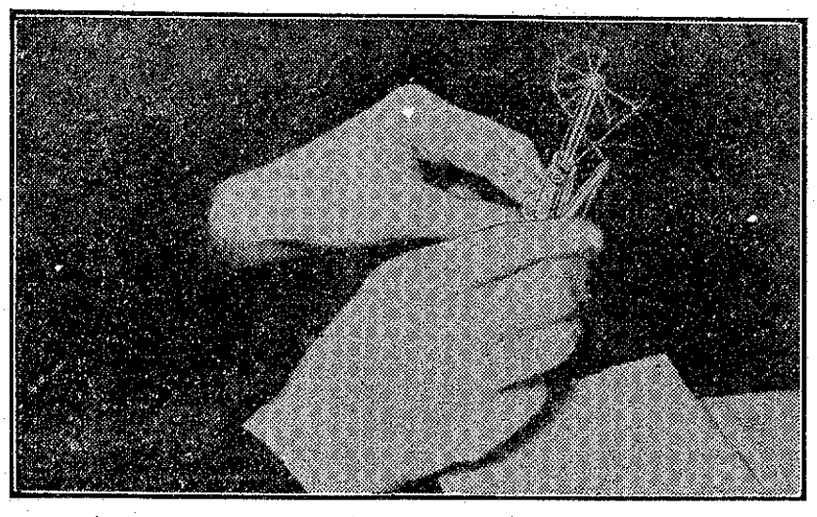
Out of this discovery came what we know and hail to-day as the gas-filled lamp. It is the most economical yet produced.

SO far, so good, and now how is the electric lamp we use to-day produced? By a number of processes, each one in itself interesting.

The most obvious part is the glass bulb, and probably all of us know something of the glass-blower's art—how it is spun out from a long tube, and broken off in the form of bubbles as required. For commercial purposes, however, these duties are relegated to an electrically-operated machine.

No adjective short of "wonderful" can be applied to this. Its iron arms flash into the pot of molten glass, pick up just the right quantity, no more and no less, transfer it to blow-pipes, and swing it and revolve it in uncanny imitation of the old-time craftsman's art. Compressed air is supplied at just the right moment. The pear-shaped bubble appears, it is automatically enclosed in a mould; the mould falls apart in sections into a cooling bath, and the bulb is left suspended. An endless chain of bulbs is evolved, the rough necks of which are cracked off by a special machine.

The tungsten wire is made next. The ore is crushed and ground to a powder, which is washed with acid to remove any impurities. Treated and treated again, it becomes the pure tungsten from which filaments have to be made—dust drawn into wire of an almost invisible fineness. Heated and hammered, with an infinitesimal proportion of steel added to give strength, it is now drawn again. The fragile rod becomes more and more ductile,



Winding the filament on to the supports for a gas-filled lamp.

Osram Lamps, photo.

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