painter and a skilful draughtsman, he ranks also as a sculptor of distinguished ability. He has treated the human figure with notable power, but it is by his representations of the larger wild animals, mainly the felidae, that he chiefly established his reputation; in this branch of practice he has scarcely a rival. His picture “ The Prodigal Son,” bought for the Chantrey collection in 1889, is in the National Gallery of British Art. He was awarded first class gold medals for painting and sculpture in the Paris Exhibition, 1900. He died on the 14th of February 1910.

See Sculpture; “ The Work of J. Μ. Swan,” by A. L. Baldry, in *The Studio,* vol. xxii. ; and *Drawings of John Μ. Swan, R.A.* (George Newnes, Ltd.).

**SWAN, SIR JOSEPH WILSON** (1828- ), English physicist

and electrician, was born at Sunderland on the 31st of October 1828. After serving his apprenticeship with a chemist in his native town, he became first assistant and later partner in a firm of manufacturing chemists in Newcastle. Among its operations this firm included the manufacture of photographic plates, and thus Swan was led to one of the advances in photo­graphy with which his name is associated—the production of extremely rapid dry plates, which were the outcome of an original observation made by him on the effect of heat in increasing the sensitiveness of a gelatino-bromide of silver emulsion. In 1862 he patented the first commercially practicable process for carbon printing in photography. This depended on the fact that when gelatine is exposed to light in the presence of bichromate salts it is rendered insoluble and non-absorbent of water. Swan took a surface of gelatine, dusted over with lampblack and sensitized with bichromate of ammonium, and exposed it to light below a photographic negative; the result was to make the gelatine from the surface downwards insoluble to a depth depending on the intensity, and therefore penetration, of the light which had reached it through the negative. In this operation thc surface of the gelatine was also rendered insoluble, and it therefore became necessary to get at its back in order to be able to wash away the portions that still remained soluble; this was effected by cementing the insoluble surface to a fresh sheet of paper by means of indiarubber solution, and then detaching the original support. It thus became possible to reach the soluble portions with water and to obtain a representation of the picture, though reversed as to right and left, in relief on the pigmented gelatine. This process has been simplified and improved by subsequent workers, but in its essential features it forms the basis of some of the methods of photographic reproduction most widely used at the present day. But Swan’s name deserves remembrance even more in connexion with the invention of the incandescent electric lamp than with improvements in photographic tech­nique. He was one of the first to undertake the production of an electric lamp in which the light should be produced by the passage of an electric current through a carbon filament, and he was almost certainly far ahead, in point of time, of any other worker in the same field in realizing the conditions to be met arid the difficulties to be overcome. So far back as i860 he constructed an electric lamp with a carbon filament, which was formed by packing pieces of paper or card with charcoal powder in a crucible and subjecting the whole to a high temperature. The carbonized paper thus obtained he mounted in the form of a fine strip in a vacuous glass vessel and connected it with a battery of Grove’s cells, which though not strong enough to raise it to complete incandescence, were sufficient to make it red-het. This was substantially the method adopted by Edison nearly twenty years later, after various fruitless efforts to make a practical lamp with a filament of platinum or a platinum alloy had convinced him of the unsuitability of that metal for the purpose—a conclusion which Swan had reasoned out for himself many years before. By the time Edison had hit upon the idea of carbonizing paper or bamboo by heat to form the filament, Swan had devised the further improvement of using cotton thread “ parchmentized ” by the action of sulphuric acid, and it was by the aid of such carbon filaments that on the 20th of October 1880 he gave at Newcastle the first public exhibition on a large scale of electric lighting by means of glow lamps. In another method devised by him for the manufacture of fila­ments, collodion was squirted into a coagulating solution and the tough threads thus obtained carbonized by heat. He also devoted attention to apparatus for measuring electric currents, to the improvement of accumulators and to the conditions governing the electro-deposition of metals. He was elected a fellow of the Royal Society in 1894, and served as president of the Institution of Electrical Engineers in r898-1899 and of the Society of Chemical Industry in 1901. In the last-named year he received the honorary degree of D.Sc. from Durham University, and he was knighted in 1904.

**SWAN** (A. S. *swan* and *swon,* Icel. *svanr,* Du. *zwaan,* Ger. *Schwan),* a large swimming-bird, well known from being kept in a half-domesticated condition throughout many parts of Europe, whence it has been carried to other countries. In England it was far more abundant formerly than at present, the young, or cygnets,@@1 being highly esteemed for the table, and it was under especial enactments for its preservation, and regarded as a “ bird royal ” that no subject could possess without licence from the Crown, the granting of which licence was accompanied by the condition that every bird in a “ game ” (to use the old legal term) of swans should bear a distinguishing mark of owner­ship *(cygninota)* on the bill. Originally this privilege was conferred on the larger freeholders only, but it was gradually extended, so that in the reign of Elizabeth upwards of 9∞ distinct swan-marks, being those of private persons or corporations, were recognized by the royal swanherd, whose jurisdiction extended over the whole kingdom. It is impossible here to enter into further details on this subject, interesting as it is from various points of view.@@2 It is enough to remark that all the legal protection afforded to the swan points out that it was not indigenous to the British Islands, and indeed it is stated (though on uncertain authority) to have been introduced to England in the reign of Richard Cœur de Lion; but it it now so perfectly naturalized that birds having the full power of flight remain in the country. There is no evidence to show that its numbers are ever increased by immigration from abroad, though it is known to breed as a wild bird not farther from the British shores than the extreme south of Sweden and possibly in Den­mark, whence it may be traced, but with considerable vacuities, in a south-easterly direction to the valley of the Danube and the western part of Central Asia. In Europe, however, no definite limits can be assigned for its natural range, since birds more or less reclaimed and at liberty consort with those that are truly wild, and either induce them to settle in localities beyond its boundary, or of themselves occupy such localities, so that no difference is observable between them and their untamed brethren. From its breeding-grounds, whether they be in Turkestan, in south-eastern Europe or Scania, the swan migrates southward towards winter, and at that season may be found in north-western India (though rarely), in Egypt, and on the shores of the Mediterranean.

The swan just spoken of is by some naturalists named the mute or tame swan, to distinguish it from one to be presently mentioned, but it is the swan simply of the English language

@@@1 Here, as in so many other cases, we have what may be called the “ table-name " of an animal derived from the Norman-French, while that which it bore when alive was of Teutonic origin.

@@@2 The king and the Companies of Dyers and Vintners still maintain their swans on the Thames, and a yearly expedition is made in the month of August to take up the young birds—thence called “ swan- upping ” and corruptly “ swan-hopping ”—and mark them. The largest swannery in England, indeed the only one worthy of the name, is that belonging to Lord Ilchester, on the water called the Fleet, lying inside the Chesil Bank on the coast of Dorset, where from 700 to double that number of birds may be kept—a stock- doubtless too great for the area, but very small when compared with the numbers that used to be retained on various rivers in the country. The swanpit at Norwich seems to be the only place now existing for fattening the cygnets for the table—an expensive pro­cess, but one fully appreciated by those who have tasted the results. The English swan-laws and regulations have been concisely but admirably treated by Serjeant Manning *(Penny Cyclopaedia,* xxiii. 271, 272).