# William Harding Scott  1862 -1938

Written for the benefit of his Great Grand Children by his grandson
Peter Tracey  April 2020

Pa Scott was born in Worksop, Nottinghamshire. We know little of his early years but believe his father had land in Burwell Cambridgeshire and may have been a grocer. I was also told that Pa Scott was very sickly when young.

I have transcribed, shown in italics, large parts of a letter which Grandmother wrote for the benefit of her grandchildren in 1944, and then added more information which I have gleaned from various sources.

So we start with Grandmother:
*''I wish you to know of some of the original inventions and painstaking works of your clever grandfather, William Harding Scott, founder of Laurence Scott & Electromotors. He was of a very retiring nature and never thought he was doing anything wonderful.*

*I have heard it said that he was one of the eight or so men of his generation who were the real progenitors of electrical engineering as we think of it now. Only a few people, like Edison in America and three or four in this country, were working on practical ideas.*

*He was a boy at a very interesting time, when many people had begun to wonder whether electricity could not be used ''in the service of man'' in other ways than in making interesting laboratory experiments or clever mechanical toys. Very little had been done for a couple of generations to make use of what had been found out in the laboratory, but towards the 1880's there were writers, with a lot of imagination but little wisdom, who were prophesying in the journals of the time that electricity (without apparently any other help) would do everything for mankind. There were also experienced engineers who pointed out how unpractical this was, but most of them seem to have thought there was little future for electricity beyond the rather showy and unreliable lighting of public places.*

*There were very few people, like your grandfather who had the imagination to see the way in which development could take place, and the skill and enthusiasm to make the ideas come true. He intended to be a schoolmaster, but electricity called him.*

*It was very soon after the 'incandescent bulb' lamps had first been made, and it had been found that they could be connected up to distributing mains in what is now the usual way (which made indoor lighting practical), that he took a job ( as a young fellow of 19) with Hammond Co. This brought him to Norwich where Colman's, the mustard people, wanted to install 'the electric light', by way of experiment.''*

Colman's employed 2000 people and the owner and managing director was a successful and philanthropic man, Jeremiah Colman then aged 52. Imagine young Scott, aged 20 telling Jeremiah Colman, that he believed he could produce a better dynamo than the ones from Crompton which he was installing. It so happened that Jeremiah Colman had an empty factory which he had acquired to pay damages in a patent dispute concerning mustard packing machinery. So he offered it to WHS.

"*He got about 20 men together (some of them fishermen, who were used to making nets and consequently handy with their fingers) and started making dynamos, and putting electric light in two or three factories and*

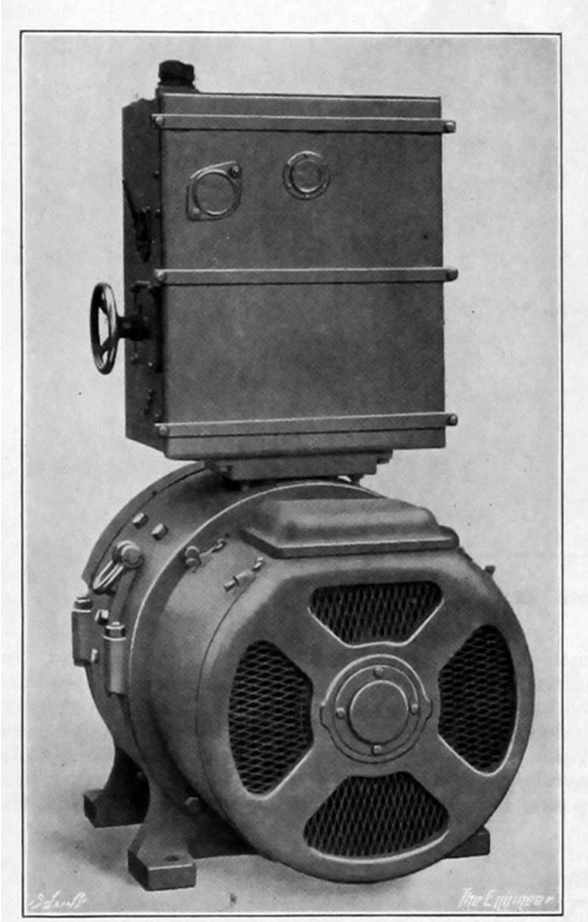


FIG. 25—MOTOR AND STARTER—LAURENCE, SCOTT

*shops.*

*There were no text-books on electrical design then, and such technical colleges and evening classes in engineering as there were could give little help in electrical matters. A few manufacturers had turned out dynamos that worked (mostly for outdoor arc lighting) but they were made by ‘‘trial and error’’, and it was quite usual to find, if the design were altered so little, that they would not work. Electric motors were not then thought to be a practical business at all.*

*Anyone wanting to fit up electric light had to make the dynamo (which he hoped would work), and also all the fittings such as switches, fuses and lamp holders, and even sometimes cover the copper wire. Added to all this, people had to be persuaded that electric light was a good thing, and (later) that electric motors would not always break down.*

*In the early 1880’s things were moving fast, and several people, in different parts of the country, were thinking in the same direction. Two or more*

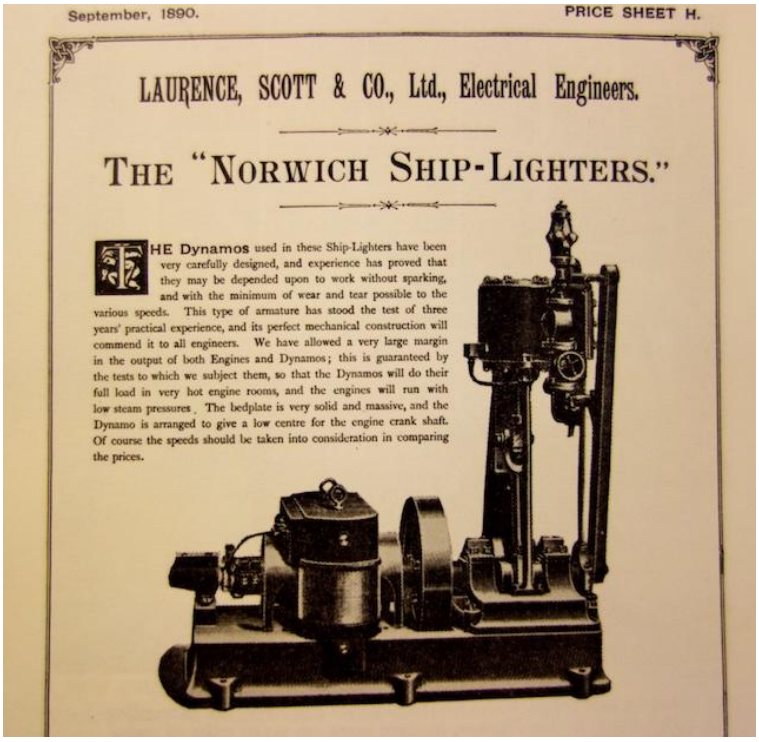
*people would be working for a year or more without knowing what others were doing, and sometimes much the same result was brought out within months, quite independently. It is therefore difficult to say anyone was first with a particular idea. One can say however that Pa Scott was the first, or one of the first, in many of the early advances.*

*In the early days of electric light the ceiling roses and switches were made of wood, which caused trouble due to the wood absorbing moisture and causing short circuits (or leaks). Pa Scott began to search for better insulating materials and worked with the pottery firms and produced such fittings in china. They were very successful and many patents were taken out.*

*With the limited knowledge available regarding insulating material the distribution of electricity was difficult and of course high voltage transmission over long distances, as now used, was unknown. Pa Scott developed a three wire system which greatly increased the distance over which electricity could be transmitted, using copper strips on china insulators and fitted in cement troughs or drain pipes. He was one of the first to study the problem of charging for electricity, realising that if everybody used electricity at night and hardly at all during the day it would be expensive. So he developed the Scott meter, which was arranged so that electricity used during the day was charged at a cheaper rate than that during the dark period when everybody wanted it.''*

He installed the first electric street lighting in Norwich, it was said that the wires below the pavement got so hot that the ground soon dried after rain. He also used batteries to top up power when demand was high, another early advance. He also put the first electric lighting in the City Library,

''*The first dynamos were driven with steam engines through belts, and owing to the engine speed being imperfect the lights were always going up and down to the rhythm of the engine speed. Pa Scott worked with the engine makers, and produced direct-coupled engines and dynamos and eventually a type of vertical steam engine known as the ''Scott'' engine which had a greatly improved governor and gave a steady light without jerking. This was also the period when the gas and the paraffin engine (the precursor of the modern internal combustion engine) were being developed, and Pa Scott took a very active part in all these fast-moving developments on both the electrical and mechanical sides.*



September, 1890. PRICE SHEET H.

LAURENCE, SCOTT & CO., Ltd., Electrical Engineers.

THE "NORWICH SHIP-LIGHTERS."

THE Dynamos used in these Ship-Lighters have been very carefully designed, and experience has proved that they may be depended upon to work without sparking, and with the minimum of wear and tear possible to the various speeds. This type of armature has stood the test of three years' practical experience, and its perfect mechanical construction will commend it to all engineers. We have allowed a very large margin in the output of both Engines and Dynamos; this is guaranteed by the tests to which we subject them, so that the Dynamos will do their full load in very hot engine rooms, and the engines will run with low steam pressures. The bedplate is very solid and massive, and the Dynamo is arranged to give a low centre for the engine crank shaft. Of course the speeds should be taken into consideration in comparing the prices.

*He was very early in getting down to workable methods of design, so he could be sure beforehand of the results. He was very early in making and installing practical electric motors, and was one of the first to make multi-polar dynamos and motors. He made slotted armatures when nobody else was doing so, much as they are made today, and introduced several methods of doing the windings, and invented schemes of connections.''*

Scott invented wave winding and armatures made with multiple laminations to reduce losses, both of which are used today. Everything had to be designed from scratch and the biggest problems were motors overheating. Bearings which were of white metal had to be finished (lapped in) on site. Commutator brushes were made of a bunch of brass gauze rather than carbon and did not last.

Pa Scott was never satisfied and would try to introduce a modification at any stage of manufacture. On one occasion he awoke in the night with an idea for an improvement, knowing that a consignment of motors was waiting on Norwich station for the morning train. He got his right hand design man from his bed, went to the station and took the motors back to the factory. They were back on the platform in time for the morning train.

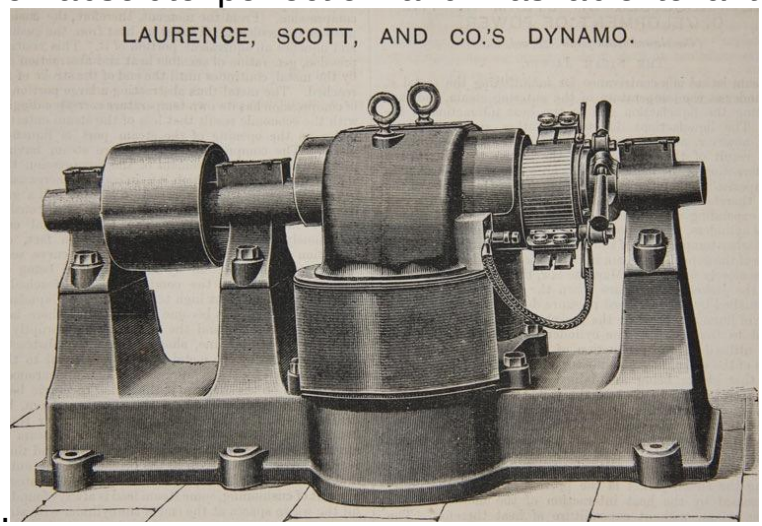
There was no national electricity grid as we know it today. So all electricity

was generated locally. The company was able to undertake the complete supply and installation, from the generating plant to the distribution mains. The distribution mains were of copper strip laid in stoneware ducts. One system had 7 miles of conduit. Only one explosion occurred in three years and that was attributed to a leaky gas pipe.

He planned a central power station for Norwich but the corporation fought shy of it ‘‘in view of the large expense for sewerage’’. So it was drains before electricity. The first Norwich power station was eventually built in 1896 and led to other power stations in Lincoln and Ipswich,

Pa Scott, as he was known in the company, came from a poor background and had no money, so he started business with a partner, Paris.
Pa Scott wanted to reinvest all profits back in to the company, whereas Paris wanted early dividends. So Paris left and a much wealthier investor, Laurence joined the company and brought much needed investment and financial control. He also tried to stop Pa Scott tackling too many projects simultaneously.

The combination of the clever young engineer and the sound financial investor worked although they must have had totally different personalities.
When J A Reavell joined the company in 1892, he found Laurence to be overbearing, austere and remote. Pa Scott on the other hand was completely absorbed in his work, to the virtual exclusion of all else. He always searched for absolute perfection and was able to anticipate the needs of the future.



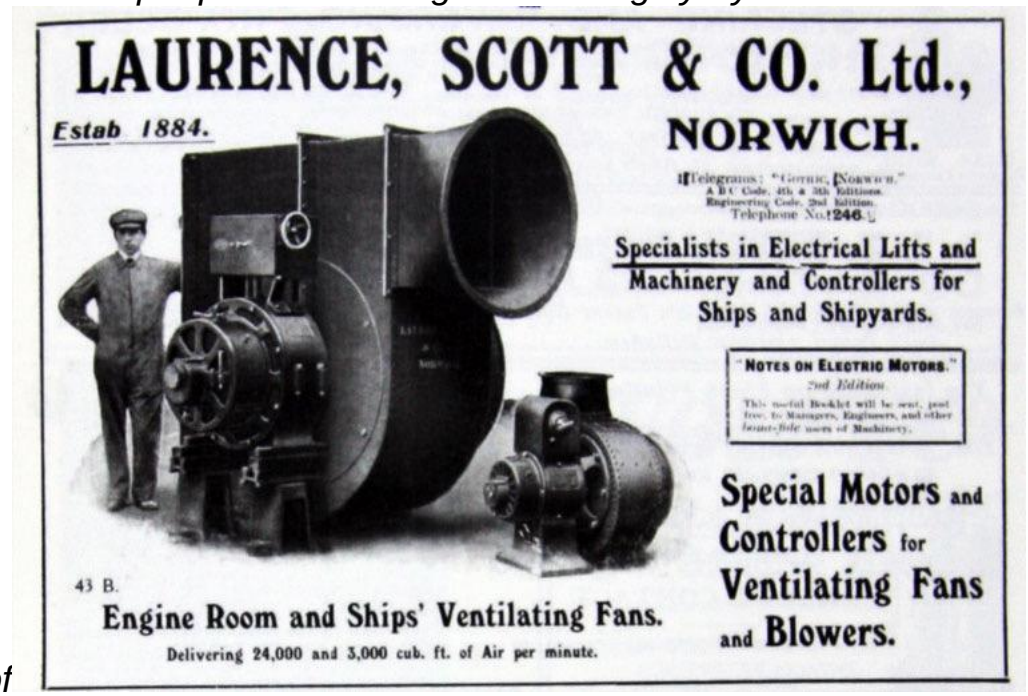

‘‘*He made dynamos for some of the first merchant ships to have electric light, and later he got the Admiralty to put electric motors in warships. He*

*designed and made for the Admiralty the first of nearly every type of electric apparatus they tried - electric fans, capstans, turret turning, ammunition hoists, lifts, circuit breakers and other switchgear, and drives for much of the auxiliary machinery.*

*The success of this sea going work was due mainly to the reliability of what he made, particularly his methods of armature winding, and use of mica for most of the insulation, in which he was a pioneer.*

*For many years (during which things were moving very quickly) Pa Scott was unofficial ‘‘Consulting Engineer’’ to the Engineering Department of the Admiralty, and when later a new Electrical Department was formed at the Admiralty, his standard practice was taken as the official Admiralty Specification, and in essence still remains.*

*Work for merchant shipping came on quickly, after much doubt on the part of the ‘‘steam’’ people had been got over. largely by his influence. He was*



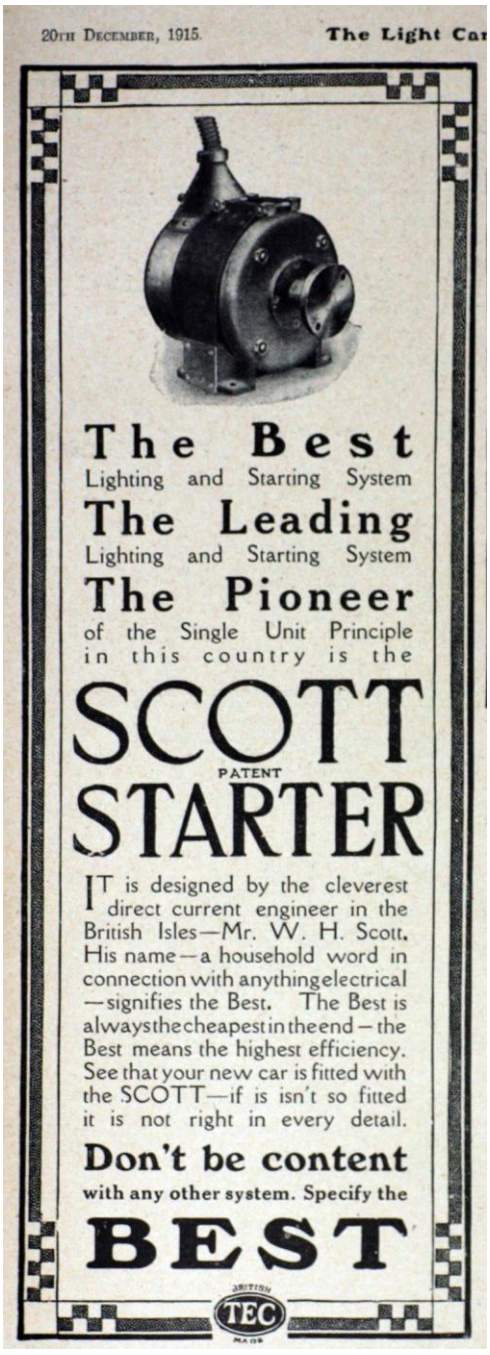

*one of the first in the field of electric capstans and windlasses, and the first with the worm geared winches which are generally associated with his name, and with electric steering gear.*

*For shore work, as well as for ships, Pa Scott was responsible for many ingenious schemes of control and for combined equipment for which motors, motor-generators and switchgear had to be designed together as a*

*single whole.’’*

The last years of the nineteenth century must have been ones of great change. Pa Scott’s first wife, Alice, died in 1895. The Duke of Northumberland wanted to install electric light in Alnwick Castle. The Reavell brothers recommended Pa Scott who they had met through business and that is how he met their sister Clare. They were married in 1898. Reavells of Ipswich took over production of the steam engine which Pa Scott had designed. Pa Scott also designed their first compressors and his fundamental design was still in use 100 years later. I found the adiabatic diagrams which he used for the design; I do not find them easy to understand. His knowledge and invention extended way beyond electrical engineering.

In 1903 we have a record of Pa Scott going to America. What for? Was it to visit Edison? it must have taken a lot of time from a busy life and was surely not for pleasure.
He must have been making good money at this time. He built Oaklands on 25 acres of prime land with a fine view of the Yare valley within walking distance of the factory. It had many unique features. He thought that the servants should be able to clean windows on the outside without climbing ladders. So the windows had hinges on extended brackets to allow access to the outside when opened. He put in a tunnel to take the warm air from the boiler room to the drawing room.




The unique oven in the centre of the kitchen table consisted of a hat or inverted cylinder, about one metre in diameter and one metre high which could be raised above the table on pulleys. Electric elements were wound round the inside of the hat. The food being cooked sat on a fixed stand inside like a cake stand. Raising the hat kept all the heat trapped inside. This was still working in 1950. Sadly, Oaklands is now a rather second class hotel and I do not recommend staying there.

However you can still see a window at the top of the stairs with extended

hinges. Grandmother said that he was always dreaming and thinking up new ideas wherever he was. A flapper valve for a motor was said to have been sketched on the back of the programme of a Philharmonic Concert to which he had reluctantly been taken.

In about 1912 he patented a design for motor cars which combined the starter and dynamo into one motor using an epicyclic gear. Tightening the band round the outside of the gear converted it from starter to dynamo. He fitted it to a Crossley car and invited Mr. Crossley to try it out. Wright, his chauffeur and much else, told me that he demonstrated the reliability of the design by driving the car round the drive just on the starter motor.

Unfortunately, war intervened, and making shells took precedence. By the end of the war the American industry had become well entrenched and costs had been cut with separate dynamos and starters and there was no room for this development.

Immediately after the first world war we have a wonderful account of the family driving to the Pyrenees in a pre war Delahay with Wright the chauffeur. Few roads were sealed and it was clearly a great adventure. Mother recounts that on one occasion in Spain there was a problem with the car. From her hotel bedroom Mother could hear Pa Scott trying to communicate with the Spanish local engineer by speaking louder and louder and saying ‘‘but I am an engineer and I know’’.

The following years must have been difficult. Pa Scott commissioned a cruiser yacht for the Broads, Moonraker, which was the first to have Bermudan sail and a mast made with a unique spiral composite made by McGruers in Scotland. He was always interested in trying new ideas, wherever they came from. I was told that work on Moonraker stopped for a year when things were tight at work.

During the 1920’s Pa Scott introduced profit sharing for the workforce, very unusual for the time. He also became a Unitarian for a time. My mother was sent to a Quaker school in Darlington. I have seen correspondence in the local paper, The EDP with a friend concerning ‘‘The Open Mind’’.

In 1929 Pa Scott with Granny and my mother had an extended holiday to Jamaica, Panama and Central America. In the San Blas islands, Mother was the first person they had ever seen with red hair.

At the start of the depression of the early 1930’s much work was in hand to equip the new liner Queen Mary. This all came to a halt. My mother remembers how they had always been comfortably off and did not think about expenditure. Suddenly they had to look at their costs. Pa Scott took no salary for some time. To keep the workforce busy, Pa Scott designed

traffic control systems which were used in Norwich for many years. It was also at this time that Electromotors, a manufacturer of small motors in Manchester was added, at the insistence of their bankers.

Using his design, I was told that the offices of the local electricity supply company were early in using a heat pump taking heat from coils of piping in the river Yare.

It is clear that he did much to look after his less well off relatives. This included a grave for his father and his disabled son Harold, paying for maiden aunts, and a house below Oaklands for his brother in law Tom Reavell.

Towards the end of his life he was offered a knighthood. The story goes that he shouted up the stairs to his wife ‘‘I have been offered this knighthood but do not want it, the hotel bills will go up’’.

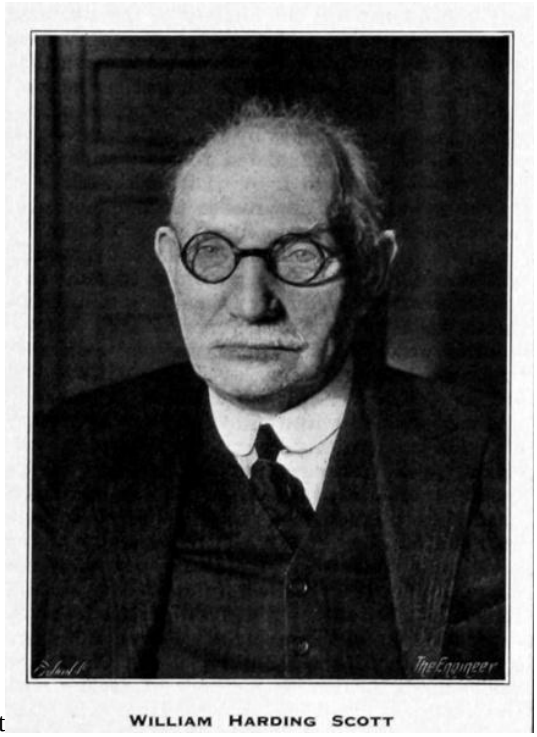
In 1938 Pa Scott had a stroke at the tea after his son Tom’s funeral and died a few days later. He had been very depressed by the prospect of war. The loss of his son had been a terrible blow. To the end he maintained a close relationship with his workforce and it was typical that his office had a window which opened on to the factory. Unfortunately the accountants then took control, an office block was erected away from the factory on the opposite side of the road and the rot started. With all their advantages as prime suppliers to the defence and marine industry, they should have gone on to be the Siemens,the ASEAs or Brown Boveries of their day. My training as an apprentice at LSE taught me mostly how not to run a company.

Peter Tracey
November 2015

**Obituary from The Engineer**
**9th September 1938**

**William Harding Scott.**

By the death of Mr William Harding Scott, founder and chairman of Laurence Scott and Electromotors Ltd., a prominent figure has been removed from the filed of electrical manufacture. For some time Mr Scott, who was 76 years of age, had ceased to take a very active part in the management of the company, but he was a regular visitor to the works, and will be keenly missed by all the senior members of the staff. He died on Sunday last, September 4th.



WILLIAM HARDING SCOTT

Beginning his career with the Hammond Company, he went to Norwich to install electric light at Colmans' works, and remained in the city to found the firm of Paris and Scott in 1883, which soon gained a reputation for the manufacture of reliable dynamos and motors. Shortly after its formation the company began to give a supply of electricity to Norwich. For the scheme Mr. Scott introduced a two-rate system of charging and designed and made two-rate meters controlled by pilot wires from the power station. He also devised and patented an underground duct system for distribution with bare copper conductors.

Scott dynamos soon won fame for shipboard use, and the present extensive employment of electricity for marine purposes owes much to Mr. Scott's painstaking work and sound engineering judgement. Finding that slate was unable to stand up to the conditions prevailing at sea, he is said to have been one of the first to have made use of the metal-mica principle of insulation for switch and control gear. He was also among the first to use the slotted armature, carbon brushes and multi-polar machines and was the inventor of the wave winding and various mechanisms connected with control gear. For his "Norwich Shiplighter" he designed the dynamo and engine which is believed to have been the first example of a high speed steam prime mover for electric lighting sets. Some eighty engines were made by Reavells of Ipswich in accordance with this design in sizes up to 800 kW and it was not until the lighter and cheaper double-acting Belliss engine appeared that the engine was supplanted. He invented the electric cargo winch, which he lived to see installed on many of the finest ships afloat, machines representing nearly 20,000 HP having been constructed for the "Queen Elizabeth". During his lifetime he took out over 100 winch patents.

For many years Mr. Scott acted as a more or less unofficial consulting engineer to the Admiralty, for which his firm carried out a great amount of work. The first Lloyds Regulations for electric motors are said to have been based on the firm's machines. On the purely industrial side he developed motors and control gear for cranes and lifts, printing presses, and the industrial drive.

During the war, Mr. Scott found time to join the Management Committee of the East Anglian Munitions Board which was successful in considerably reducing the cost of shells, many thousands of which were made on

improvised machines in the Norwich works. At the conclusion of the war Mr. Scott applied himself to improving the designs of the younger engineers who were developing the firm's range of AC machines. He had an almost uncanny knack of detecting errors in design merely by the examination of drawings and when he said that something was wrong a check on calculations generally him to be correct. Pure theory he rightly regarded mainly as a guide to practical experiment, his reasoning faculties guiding him to reliable conclusions.

In the welfare of his staff and workpeople he took a keen interest and as shown at the dinner given in Norwich last year to celebrate his seventy fifth birthday (reported in our issue of May 21st of that year), he was greatly aided in this connection by his wife. During the years of trade depression he always had in mind the welfare of those dependent on his business, and there is no doubt that the anxiety of that period told severely on his health. In his early days he would play football with the men, whilst in recent times he was greatly interested in the revival of the Gothic Social Club. That club was founded by his younger son, who died at the age of twenty seven under tragic circumstances only a week ago and Mr. Scott senior collapsed on the day of the funeral. His son, Capt. G. J. Scott, managing director of the company, has been appointed chairman in succession to his father, and sincere sympathy will be felt for him and for Mrs. Clare M. Scott in their great loss.