

AN INTERVIEW WITH MR. A. B. COUSINS OF MERTHYR
TYDFIL -- POWER STATION ENGINEER AND INVENTOR
OF THE EARLY 1900's

Eleanor D.P. Symons[†] and D.G. Tucker^φ

INTRODUCTION

Following an approach by Mr. William Hyland of Cardiff and a preliminary visit by the former NAEST Archivist, Mrs. Jean Goodship, we had a long interview with Mr. Cousins in May 1975. He is an active and clear-headed man of 92, who started his apprenticeship and studies in electrical engineering before the turn of the century, and whose recollections of the early days of the power supply industry are interesting, enlightening, and entertaining. It seems worth while to record some of these.

Cousins was born at Abingdon, where his father had a skin-yard, making 2000 chamois leathers a week. Cousins left school at 14, worked in the skin-yard at first, and could have carried on in the business after his father died. But his heart was in electrical engineering and he became apprenticed with the Reading Electric Supply Co. and took classes at the technical college there. He joined the Northwich Electric Supply Co. in Cheshire from 1902 to 1904. Here he had experience of the use of "Power Gas" as a fuel for the prime movers -- an unpleasant experience as the very toxic gas pervaded the station and made him very ill; he claims that it disabled his three successors.

He came to Merthyr Tydfil, then the great iron-making centre and once the largest town in Glamorgan, in 1904 as an assistant engineer with the Merthyr Electric Traction & Lighting Co., a subsidiary of the British Electric Traction Co. The Merthyr Co.

[†] National Archive for Electrical Science
& Technology

^φ University of Birmingham

had obtained its Provisional Order in 1899, had commenced public supply in February 1901 with a dc 3-wire supply, and had opened its first three miles of tramway in April 1901. By the time Cousins arrived there the generating capacity was 630 kW, with four Browett-Lindley steam engines driving three Peebles and one Silvertown dynamos. The Merthyr Co. had no dealings with the South Wales Electric Power Co. which was set up as a bulk supplier around 1900, until 1914 when a 3-phase ac supply was taken and converted by rotary-convertors to dc as a means of coping with expansion at minimum expenditure of capital.

Cousins never left Merthyr Tydfil, and lives there still.

SOME EARLY EXPERIENCES

Although public electricity supply was out of the pioneer stage by 1904, Cousins can recall a number of experiences which one hopes were unusual. One was when a junior member of the staff was asked to top up the batteries (lead/acid cells as provided in most dc undertakings) and by mistake used muriatic acid (HCl) instead of sulphuric (H_2SO_4). The result was the emission of chlorine. No gas masks were then available, and as Cousins and his chief, Mr. L.W. Dixon, felt they could not expose the staff to this danger, they themselves had to clean out the cells -- a very unpleasant task.

On another occasion, Cousins was taking a Saturday evening walk with the waterworks engineer, and decided to look in at the generating station. As they approached they could hear a noise getting louder and louder. Something was wrong with one of the engines. Cousins ran to the switchboard and tripped some switches, hoping he could remove much of the load and keep the town lighting going; but he was too late. Steam was blowing out from one of the engines, a broken connecting rod was flailing about, a man nearby could have been killed. He managed to get the steam cut off, but as he was doing it a piece of metal came off and cut the man's hand -- but there was no other injury.

Trouble of quite a different kind was the interference of the tramway return current with the electrical staff-and-ticket system of the Brecon and Merthyr Railway. This railway came up the valley and then over the mountains from Merthyr and down to the Usk valley. It was mainly a single-line railway, and the staff-and-ticket system was used to ensure that two trains could not be on any section at the same time. The tramway interference occurred whenever tramrails were being replaced; the earth voltage

unlocked the control device and so could have caused a serious accident.

X-RAYS, 1904

There was an X-ray set at the local hospital, with a spark coil, a trembler contactor and a Mackenzie-Davidson interruptor. As there was no resident technician, Cousins was asked to take a part-time responsibility for it. With no previous knowledge of X-rays or X-ray equipment, he had to learn by trial and error and manufacturers' instructions. He still has samples of the X-ray tubes he used:- one of 1900 with a platinum target and no heater, another slightly later called the "Cox's Record", and a third with an adjustable gap -- adjusted by tapping, not by any proper control device. There was no protection for the operator or patient, he tested tubes by a hand-held fluorescent screen, and some very long exposures were necessary when the doctor wanted a good photograph, for example, 1½ min to find a piece of metal in a hand, and 5 min to find a bullet in the cheek. It was through his work at the hospital that Cousins met his wife-to-be; she was a nurse there.

INVENTION: THE COUSINS-HOWARD ELECTRIC RADIATOR

Cousins and his colleague W.F.Howard, who was Power House Superintendent at Merthyr Tydfil at the time, designed and patented ⁽¹⁾ a much-improved lamp for electric space-heating radiators. Before the invention of suitable resistance wire such as nichrome, radiator elements had to use filaments in a vacuum tube. They were rather fragile. The Cousins-Howard heating tube was robust as they not only had a double-ended tube but also gave the filament an additional central support as shown in our rough drawing in Fig.1, which we made from a sample tube that Mr.Cousins still has. The original samples were made by the G.E.C. Robertson Lamp Works for the inventors, who hoped that G.E.C. would adopt their design and pay them royalties.

Repeated approaches to G.E.C. got no results in practical terms, although an agreement had been signed and a royalty settled. Eventually an interview with Hugo Hirst himself was arranged, and then things started to move fast. It was Howard who went to see Hirst, but no doubt Cousins's account of the interview is reasonably correct. Hirst asked what was the benefit of this particular heating lamp? Howard connected it up, then kicked it hard; it was still all right. Hirst said

G.E.C. made heating lamps, and asked the showroom to send in a couple. When they arrived he asked the man to kick them; he refused, saying they would break. So Hirst got in the Head of Department concerned, and asked why the new lamp had not been pushed. "I want every undertaking in the country to be notified within a week, and a sample radiator in every showroom within two or three weeks at most." After this the Cousins-Howard lamp went ahead fast; many thousands were sold, and Cousins and Howard got their royalties. Sales continued until about 1914. We have inspected the records in Mr. Cousins's possession, and there is no doubt about the sales.

THE HYDRO-ELECTRIC SCHEMES AT CYFARTHFA, 1929-32

Although of a much later date than the activities we have related above, one of Cousins's most interesting innovations was the utilisation of a century-old water-power system for a hydro-electric scheme.

Water-power from the River Taff had been very extensively used at the old ironworks at Cyfarthfa, on the north-western outskirts of Merthyr Tydfil, since they were founded by the Crawshay family in the early part of the 19th century. Cyfarthfa Castle, standing in fine grounds above the works, was built as the family home, and its ornamental lake was at the same time used as a storage reservoir for the water-power supply. The hydraulic arrangements, as far as they were relevant to the later hydro-electric scheme, are shown in Fig.2. Leats, or feeders, were taken from the river Taf Fechan (little Taff) and from the river Taf Fawr (big Taff) some distance above their confluence near Pont-y-Cafnau. The Taf Fechan feeder was connected to the ornamental lake, and had a level about 20ft above the Taf Fawr feeder. The Taf Fechan feeder was therefore connected to the other by means of a siphon, or pipe descending to the bridge and carried on it,* so that most of the Taf Fechan water could be added to that of the Taf Fawr feeder to give an adequate

*Indeed, the name Pont-y-Cafnau is Welsh for "bridge of the troughs" and so may have obtained its name from the fact that it carried two water feeders -- the second one being a minor one not involved in the later hydro-electric scheme, but actually carried in a trough under the bridge.

combined supply to the ironworks. The tail water from the works supplied the Glamorganshire Canal. Fig.2 is diagrammatic rather than a true map, but is based on a map of 1884.⁽²⁾

The Cyfarthfa ironworks closed finally in 1928, and it occurred to Cousins that the water-power thus made redundant could profitably be used for generating electricity at a very low capital cost. His particularly-important inspiration was to cut the siphon at the north-eastern end of the bridge, thus reversing the flow in the south-western end of the siphon, and to connect turbines to each side of the cut to generate electricity. The turbine house was completed in 1929,⁽³⁾ and two horizontal-shaft turbines were supplied by James Gordon & Co., that for the Taf Fechan feeder being of 195 hp at a head of 68 ft, while that for the Taf Fawr feeder was of 100 hp at a head of 44 ft.

Three years later the scheme was extended by the construction of a weir about 400 yards further down the river Taff, and of another turbine house, this time with one vertical-shaft turbine of 195 hp at a head of 14 ft 6 in, the manufacturer being Gilbert Gilkes & Gordon, a firm formed by the amalgamation of two famous turbine builders. An automatic tilting gate was provided at the weir. Fuller details were published at the time.⁽⁴⁾

There was little doubt that the hydro-electric generation was very much cheaper than the steam generation of electricity at the Company's town plant. At nationalisation in 1948, the accounts⁽⁵⁾ showed the costs in the first quarter of 1948 as follows:-

Hydro generation ---	0.210 d/unit
Steam generation ---	1.715 d/unit
Bulk electricity, --	0.833 d/unit

purchased from S.Wales Power Co.

The hydro stations were unstaffed, and automatically-controlled from the town station. They were closed down in 1953 when the Merthyr Tydfil supply was changed over from dc to ac. All the plant has now gone, and the weir has been removed, together with the lower turbine house. The upper turbine house remains as an empty shell.

Mr. Cousins relates how when the Cyfarthfa ironworks -- then in the hands of GKN Ltd. -- closed in 1928, the water rights on the Taf Fechan were offered for sale at £1500. Before the

electricity company could purchase them, however, a local solicitor managed to obtain them, and so the company had to pay thereafter a royalty of 0.005 d/unit generated by the Taf Fechan turbine. Similarly the Taf Fawr water rights were held by the Wingfield Mackintosh Estate, who also received a royalty of 0.005 d/unit generated by the Taf Fawr turbine.

Mr. Cousins also pointed out that this H.E. scheme was not the first at Merthyr Tydfil. Some years earlier the Plymouth Collieries at Pentre Bach, a mile or so further down the river, had built an H.E. station to supply electricity for their own use, using an old leat known as the Plymouth Feeder, shown on the 1884 map.

THE GREAT SLUMP OF THE 1930's

Merthyr Tydfil was one of the worst-hit towns in Britain during the Great Slump of the 1930's. Nevertheless, the electricity company managed to treble the number of its consumers during the slump period. This was done by making very great concessions to help the unemployed and by making electricity supply a real economy for them, for example, by eliminating the need to purchase expensive batteries for their radio sets. The company reaped a great benefit from this when things picked up again.

ACKNOWLEDGMENT

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REFERENCES

1. W.F.Howard and A.B.Cousins, British Patent No. 2927, filed 10 Feb.1908
2. Map prepared for the Cardiff Corporation Bill of 1884, in possession of Mr. Cousins
3. Engineering, 127, 10 may 1929, pp.581-2
4. Ibid, 134, 16 Sept. 1932, pp.317-8
5. Account sheets in possession of Mr. Cousins

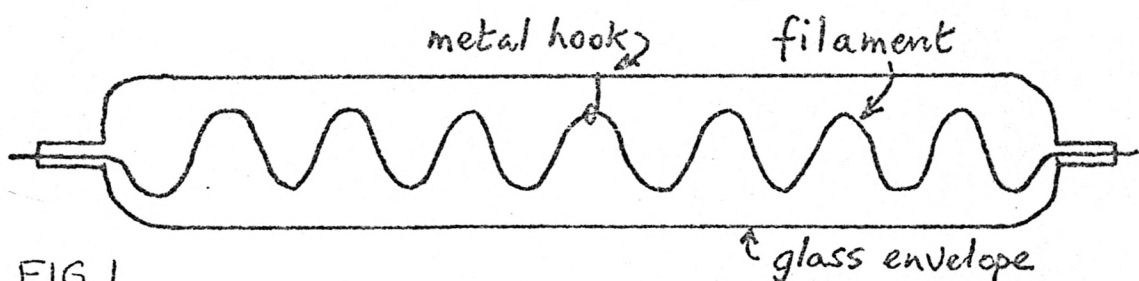
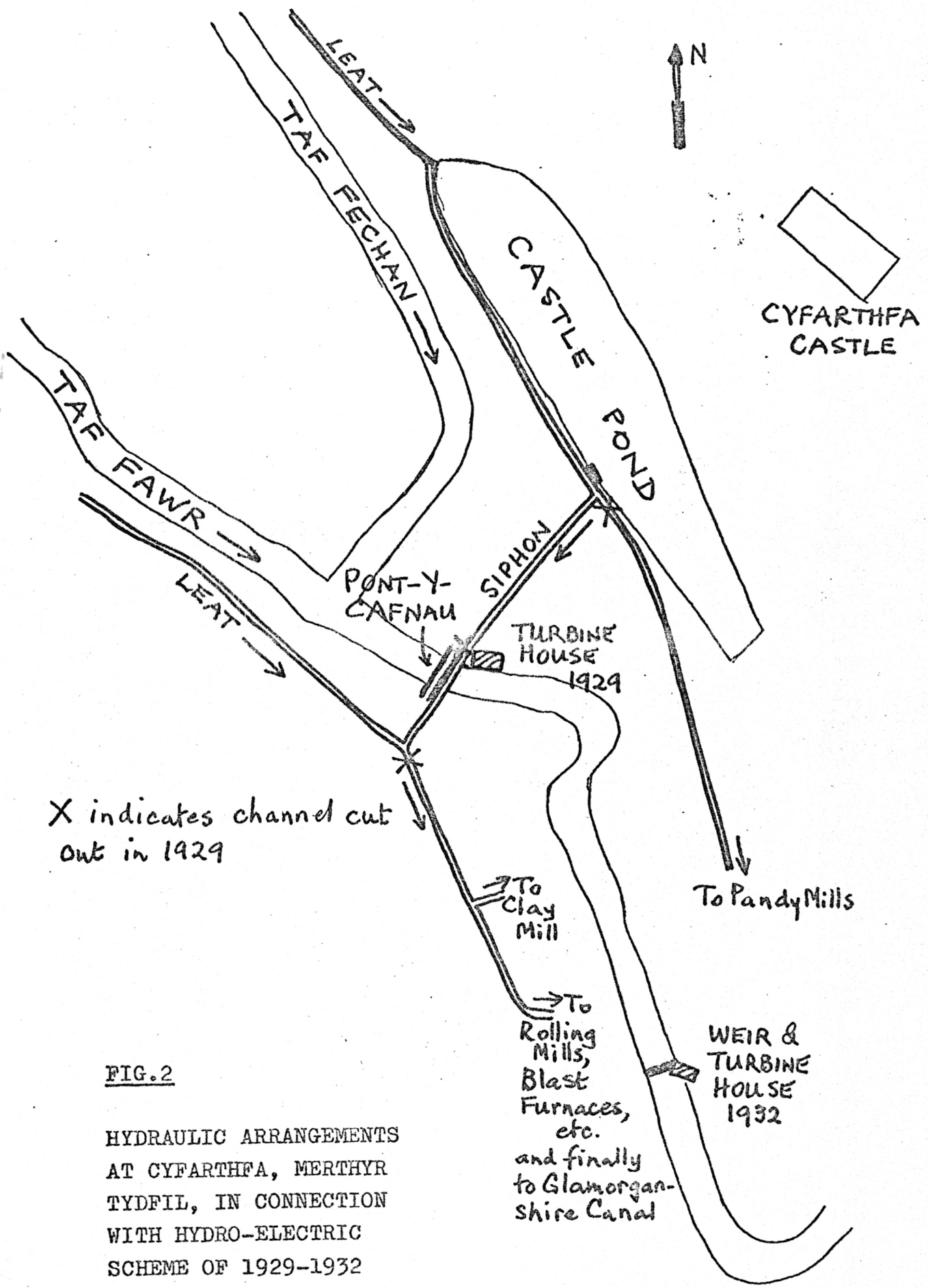


FIG.1



X indicates channel cut out in 1929

FIG.2

HYDRAULIC ARRANGEMENTS
 AT CYFARTHFA, MERTHYR
 TYDFIL, IN CONNECTION
 WITH HYDRO-ELECTRIC
 SCHEME OF 1929-1932

To Pandy Mills

To Clay Mill

To Rolling Mills, Blast Furnaces, etc. and finally to Glamorgan-shire Canal

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