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# Gas Trams at Croydon—the First in Britain

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Edward Gray's interesting article in *Tramway Review* No. 125 throws additional light on the fascinating subject of gas-engined trams—'gas trams' for short. He mentions that 'first experiments had apparently taken place at Croydon', and as far as Britain is concerned, this is probably true, although there were earlier trials in Germany; and the idea of gas-engined propulsion of tramcars (although admittedly by a separate locomotive) goes back to at least 14 May 1881, for a letter from F. W. Crossley to H. P. Holt describing and illustrating such a proposal is reproduced in a Manchester Ph.D. thesis of 1979 by K. A. Barlow.

Some information about the Croydon gas-tram trials of 1893-94 was given by the consortium of authors called 'Southmet' in 1960 in the book 'The Tramways of Croydon', but it was a little misleading, and the present author's research has been aimed at establishing the facts with greater accuracy and certainty, although it has to be admitted that neither of these qualities has yet been completely achieved. German and American journals, as well as the British journals *The Engineer* and *Engineering,* have been consulted; the *Croydon Times* has been examined (and some other newspapers); documents in the Public Record Office, including Board of Trade Inspector's reports and company records, and British Patent Specifications, have been searched; and, of course, the references given by Mr. Gray and 'Southmet' have been read.

It will be argued here that the tram used in the trials of late 1893 was a German one and that used in the trials of June 1894 was an improved English-built one.

**The German gas tram**

The gas trams used at Croydon, Blackpool (St. Anne's and Lytham), Trafford Park, and Neath, all originated in design work by Carl Lührig in Germany. They used Otto-type gas engines working on town gas stored under pressure in cylinders on the tram, and Lührig's patents covered the way in which such engines could be used in tramcars, including the avoidance of smells inside the tram, the arrangements for access to the machinery for maintenance, and the gearing and clutches. The original Lührig car used on a track in Dresden in 1892 had two engines each of 7 hp, each with its own flywheel, and carried 27 persons, inside and on the platforms but with none on the roof. As there were no staircases, the end platforms were almost certainly open on both sides, thus allowing passengers to be picked up and put down on the left- or right-hand side of the road. (Quite certainly the later trams at Dessau had this feature, shown clearly in the pictures in *Cassier's Magazine* of 1895). It was almost certainly this car which was run at Croydon in the later part of 1893, on the Thornton Heath section of the Croydon Tramways Company's track. The company had been formerly the Croydon and Norwood Tramways Co. and was so referred to in the newspaper and technical-press reports. *The Engineer* of 27 October 1893 stated that Major-General Hutchinson inspected the gas tram on behalf of the Board of Trade on 17 October, and the following is an extract from Hutchinson's report dated 21 October as filed in the Public Record Office:—

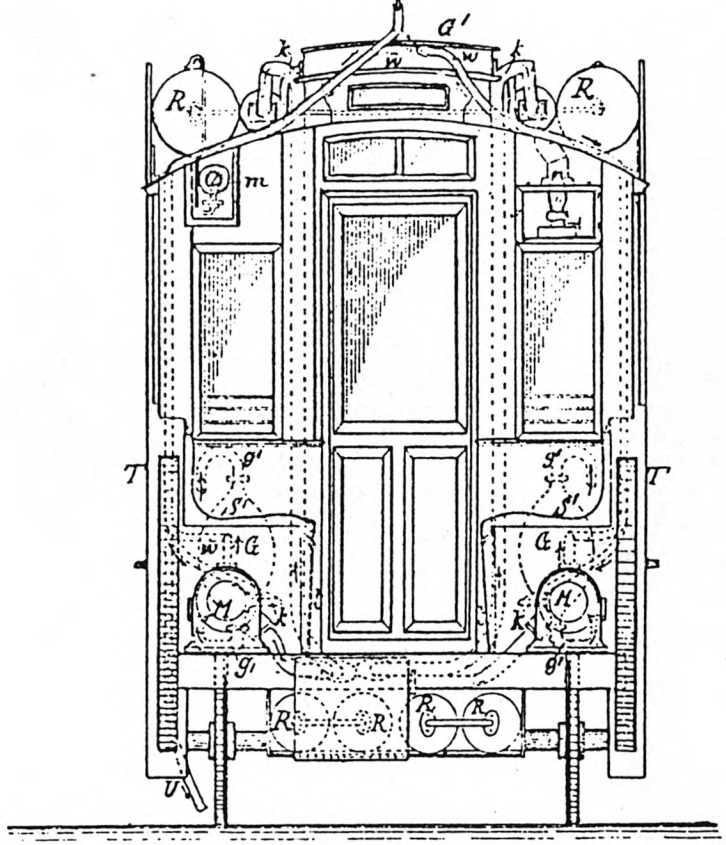



**Fig. 1. Transverse cross-section of Lührig gas tram as given in British Patent Specification No. 15, 841 of 1892. The Dresden or German tram used in the 1893 trials at Croydon is believed to have been practically identical to this.**

| | | | |
|---|---|---|---|
| M,M | two double-cylinder gas engines under the longitudinal seats | | |
| T,T | flywheels | | |
| R | four gas-holders under each end-platform and two on roof | | |
| G' | water tank on roof | G | rubber gas-pressure buffer vessel |
| k | cold-water pipe | U | water overflow pipe |
| w | warm-water pipe | m | gas-pressure gauge |
| g' | gas pipes | S' | seat |

". . . I have inspected the Lührig Gas Tram Car which it is desired to run experimentally on the Croydon Tramways. This car, which is constructed to carry 14 passengers inside and 6 on each platform, but none on the roof, is in appearance like an ordinary tram car. The motive power consists of two Gas Engines under the seats connected with a flywheel on one side of the car enclosed between inside and outside panelling; the ignition of the gas is caused by a single electrical contrivance. The cooling water for the engine is contained in a receiver on the car roof, the cold water flowing to the cylinders of the motors and the warm water returning automatically to the receiver. The gas is stored in cylinders under the platforms, the pressure not exceeding 12 atmospheres, and the quantity carried is said to be sufficient for a run of twelve miles on a line of average gradients and curves. The motors work on one shaft and rotation is transmitted by an intermediate shaft and by chain gearing to the



car axles. The motors are always working while the car is in use, the gearing being thrown out of action when the car is not moving. The car can be worked from either end. It is stated to weigh about 7 tons without passengers . . .". Hutchinson then requires a few minor modifications to be made to the car.

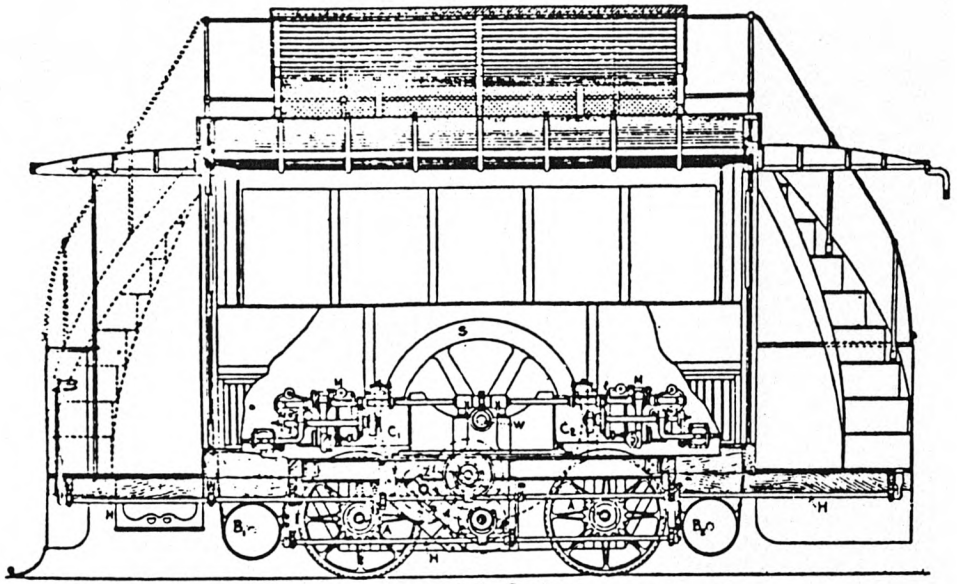
With the one exception of the phrase "a flywheel on one side of the car", Hutchinson's description accords perfectly with that given in September 1893 of the Dresden tram by A. Kemper in the *Journal für Gasbeleuchtung und Wasserversorgung,* and it is most probable that Hutchinson made a small error of observation or recording in this matter of flywheels. The Dresden tram was distinguished not only by having two engines, but also by having its gas cylinders under the platforms; the English cars, which we shall shortly come to, did not have storage cylinders under the platforms, but under the main part of the body and under one seat. The cross-section of the Dresden tram was very much the same as that in Fig. 1, which is taken from Lührig's British Patent No. 15,841 of 1892.

Now the Gas Traction Co. Ltd., which was formally registered on 21 November 1893 and of which Percy Holyoake was Secretary, signed an agreement with Lührig's representatives on 4 November 1893, i.e. shortly after the B.O.T. inspection at Croydon. 'Southmet' says that it was the Traction Syndicate Ltd. which operated the Croydon car; this body was registered in England on 22 March 1893 and Percy Holyoake was associated with it too, so it may well have organised the initial trials. But there is no doubt that it was the Gas Traction Co. Ltd. which bought the Lührig patents for 22 different countries or states including England; there were from 3 to 20 patents in each country. It would therefore have been the G.T.Co. which developed the later English gas trams.

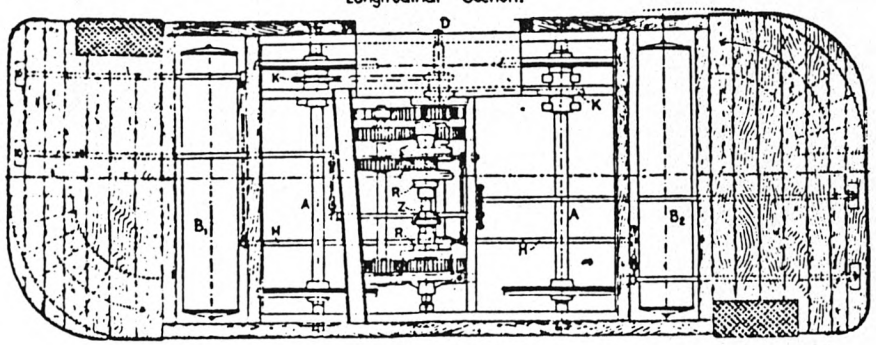
The gas tram inspected in October 1893 was certainly still undergoing trials at Croydon on 6 December that year, for the *Croydon Times* reports an accident at the tram depot involving the Connelly Car (oil-engined actually, but misrepresented as steam) while shunting to get the Lührig car out of the depot for an experimental run. However, no further reference to its operation has been found. It was probably sent back to Germany while a new English design was being prepared for the G.T.Co. It is understood that the engine for the new tram was still made in Dresden by the Deutzer Gasmotorenfabrik, but with modifications specified by Mr. H. P. Holt of Crossley Bros.

**The English gas trams**

The new design was a more typically-British tram, with seats (longitudinal) on the upper deck, and staircases to reach them, as shown in Fig. 2, which is reproduced from *Engineering News,* 24 January 1895, but which could have been put together from drawings published in various contemporary journals, including *Cassier's Magazine* of 1895. The excellent sketch by 'Southmet' in the book "The Tramways of Croydon" was based on these drawings. The transverse cross-section shows clearly that there is now only one engine, under one of the longitudinal seats in the main body of the tram, and under the other seat is a gas storage cylinder. The cooling water system is not shown on these drawings, but there was a water tank on the roof. There is no point in repeating the description given by 'Southmet', except to say that the seating capacity was 14 inside and 12 on the upper deck, although the report in *Engineering,* 22 June 1894, p.808, says 28 passengers in all. This report says the car "is now in regular work on the Croydon and Thornton Heath Tramway Company's



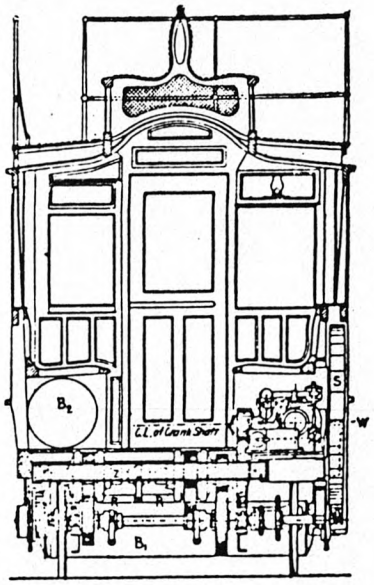

Longitudinal Section.



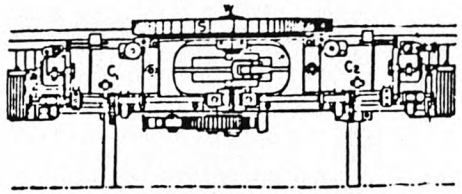

lines" and that "the performance of the car is quite satisfactory. It . . . makes a very fair speed . . . With the slow gear it will readily mount an incline near Thornton Heath station of 1 in 23, with a short piece of 1 in 16 . . .". Yet the revised version of "The Tramways of Croydon", brought out in 1983 by Mr. G. E. Baddeley, which adds some information to the original version by 'Southmet' (without removing the misleading parts), states that General Hutchinson had reported on the new tram on 15 May 1984 thus: "The car ran very smoothly and regularly on test but lacked power to ascend gradients . . .". Perhaps the discrepancy regarding performance on gradients can be explained by assuming that important adjustments had been made between the inspection and the public trials in June.

The gas-compressing plant was at the depot. The trials were supervised by Professor Kennedy (Alexander Kennedy was a well-known consulting engineer). And it was confidently stated that:—"It is intended that the gas cars shall entirely supersede the horse cars on the Croydon and Thornton Heath Tramway Company's system".






Transverse Section.



Part Plan Showing Motor.

**Fig. 2. Various cross-sections of the British gas tram used at Croydon in 1894. The cooling water tank is on the upper deck, but no pipes are shown in these drawings.**

**$B_1$,$B_2$,$B_2$ gas holders**
**M,M cylinders of engine**
**S flywheel**
**W shaft carrying flywheel and engine cranks**
**Z intermediate shaft**
**D second geared shaft carrying sprocket wheels**
**K sprocket wheels on main axles driven by chains from D**
**A main axles**
**H control lever**

There seems to be a complete lack of information as to how long these new trials lasted. That they were reasonably successful must be deduced from the fact that the commercial gas-tram routes that were built in the next few years at St. Anne's—Lytham, at Trafford Park, and at Neath, used tramcars which were merely enlarged versions of this design, apart from having transverse instead of longitudinal seats on the upper deck. But there is no evidence that the gas-tram system was introduced to take over the service at Croydon as suggested in the report quoted above.

It is interesting that the reports in both *The Engineer* and *Engineering* refer to the owning company as the Traction Syndicate Ltd., whereas the development and design was undoubtedly done by the Gas Traction Company Ltd. The reports also refer to the Croydon and Thornton Heath Tramway Co., which, it is believed, never existed; the company concerned was the Croydon Tramways Company.

Some notes on the companies directly concerned with gas trams in Britain are appended below, and also a note on the use of gas trams on the continent.

## Appendix 1

COMPANIES ASSOCIATED WITH GAS TRAMS IN BRITAIN

**Traction Sydicate Ltd.** Registered 22 March 1893. Dissolved 23 July 1901. No mention of gas trams in Memorandum of Association, but had an agreement dated 18 March 1895 with Blackpool, St. Anne's and Lytham Tramway Co. for sale of gas trams and working of tramway.

**Gas Traction Co. Ltd.** Registered 21 November 1893. Dissolved 10 March 1911. Capital subscribed £100,000 at 30 March 1894; £120,000 at 28 Feb. 1896. Stated object to introduce into Great Britain the Lührig-Holt system of Gas Traction for Tramways.

**Blackpool, St. Anne's and Lytham Tramway Co.** A Statutory Company, Acts of Parliament 1893 and 1896. "In course of being dissolved" on 15 Oct. 1898 when a new company of the same name but with Ltd. added was registered with nominal capital of £100,000. This company sold out to Blackpool Electric Tramways (South) Ltd. on 15 Oct. 1902.

**British Gas Traction Co. Ltd.** Registered 18 July 1896, compulsory winding-up 1 Nov. 1899. Nominal capital £250,000. Purchased patents and agreements from G.T. Co. Ltd. and the agreement with B.St.A. & L.T. Co.

**Traction Company of the United Kingdom Ltd.** Incorporated 21 Sept. 1899. Nominal capital £150,000. Agreement with G.T. Co. Ltd. and B.G.T. Co. Ltd. for exclusive rights in the gas-tram patents in the U.K. Bought out these companies on their liquidation. Went on to electric traction.

**Traction Development Co. Ltd.** Incorporated 4 March 1899. Capital £40,000. Took over gas-tram patent rights of G.T. Co. Ltd. in France, Spain, Portugal, Turkey, Egypt and their colonies. Wound up voluntarily on 10 Oct. 1904.

**Provincial Gas Traction Co. Ltd.** A company based in Neath. Registered 1902 to take over the operation of the Neath Corporation tramways by gas trams purchased from the B.G.T. Co. Ltd. on its liquidation. (See *Tramway Review* No. 107).

## Appendix 2

### Late news of gas trams at Neath

Mr. Alan Brotchie of Aberdour has supplied the two photographs (Figs. 3 and 4) relating to the gas trams at Neath after the cessation of service in August 1920. The photograph showing the engine which was fitted under one longitudinal seat and one of the gas cylinders which was fitted under the other confirm the arrangement shown in the later Croydon tram, Fig. 2 in the article above. The photograph of the trams being dismantled in the depot is especially interesting because it shows not only the larger 52-seater type of tram which was really the standard gas tram, but also the smaller 40-seater type which had been used initially on the Blackpool, St. Anne's and Lytham Tramway Co.'s line in 1896 and which almost certainly came to Neath when the Lytham line went over to electricity in 1903. (See my article in *Tramway Review* Nos. 107 and 108). A copy of the picture of the "Blackpool" tram of 1896 published in *The Engineer* of 17 July 1896 is shown in Fig. 5, and it can be seen that it is identical with the smaller tram at Neath in 1920—six windows on each side as opposed to eight



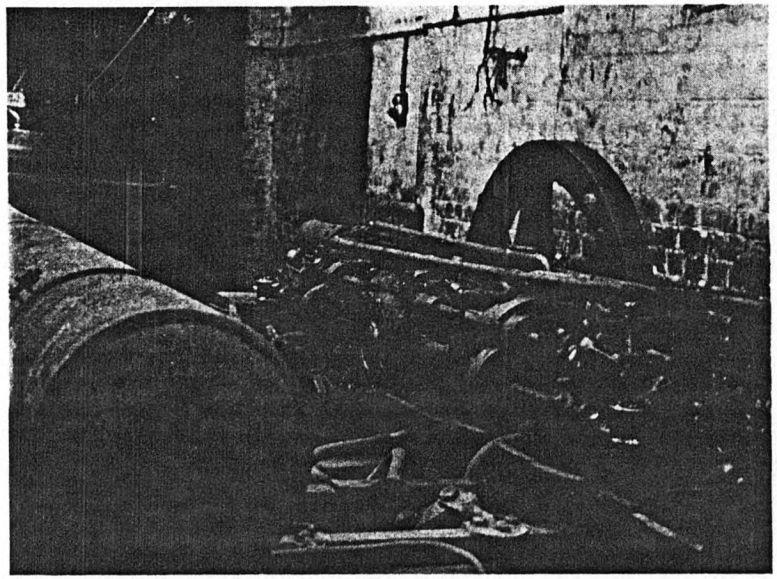
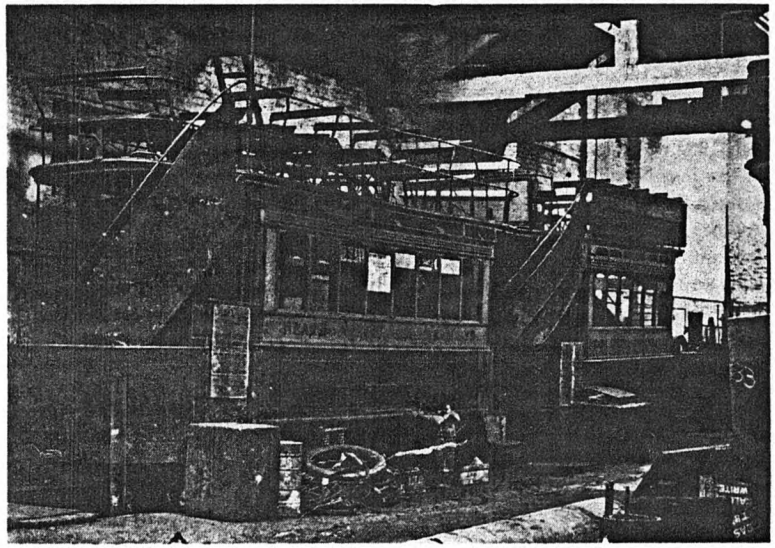


**Fig. 3. Engine of a Neath tram; horizontally-opposed twin-cylinder gas engine. Cylinder (one of three on the tram) on left of photograph stored compressed town gas.** *[N.B. Traction*

**Fig. 4. Neath trams photographed in the depot, presumably after closure in 1920. No. 20 of the larger type in the foreground and the smaller in the background. A third tram is just visible on the right.** *[N.B. Traction*



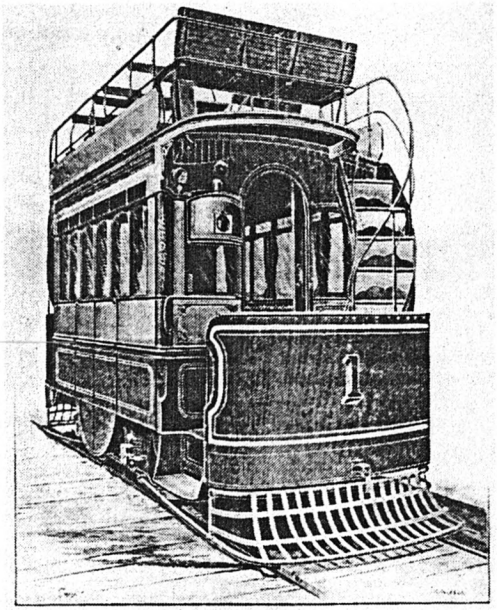


**Fig. 5. 40 seater gas tram of 1896 as supplied to Blackpool, St. Anne's and Lytham Tramway Company.** *[From The Engineer, 1896*

in the larger tram. It is most interesting that this early tram should have been one of the last survivors. Of course, even this smaller tram was considerably larger than the version tried at Croydon in 1894.

Evidence was recently found that not all the Neath gas trams were scrapped. Mr. Peter Wakelin of Swansea sent me a cutting from the *South Wales Evening Post* of 14 July 1984 which announced (with a photograph) the discovery of a former gas tram in use in a Neath garden as a shed. The Neath Antiquarian Society proposed to restore the tram, and have already, with the help of the Neath Borough Trainee Agency, restored the body. Mr. Philip Havard, one of the discoverers of the tram, informs me it is of the small type, with six windows each side. Thus it is probably ex-Lytham, dating from 1896; but it must be emphasised that there is still no absolute certainty that Neath did not start with one or two small trams.

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**Appendix 3**

GAS TRAMS ON THE CONTINENT

1. **Dresden,** Germany, 1892. Trials using Lührig car, probably the same one which later came to Croydon. There was also a smaller single-engined car of 4½ tons, but no more was heard of it. From early 1894, an operational gas-tram service operated over 3-mile route, using Lührig-Holt cars.

2. **Neuchatel,** Switzerland, 1893. Service operated by gas trams built by Guilliéron & Amrein, weight 6 tons full, 20 passengers (inside only), engine 7.9 hp on outside platform, using town gas, speed 11 mph, line 3.3 miles long connecting Neuchatel to St. Blaise. (See A. Kemper, *Journal für Gas-beleuchtung,* 1893, pp.505-13, also *Engineering News,* 3 May 1894, p.359).

3. **Dessau,** Germany. From Autumn 1894, gas-tram service operated using Lührig-Holt cars built by van der Zypen & Charlier, engines by Deutzer Gasmotorenfabrik; 4-mile route. Operating company was Deutschen Gasbahn-Gesellschaft. 13 cars by end of 1896. (See R. Schöttler, 'Die Dessauer Gasbahn', *Zeitschrift des Vereines Deutscher Ingenieure,* 24 Aug. 1895, pp.1009-12).

4. **Paris,** France, early 1897. Trials of Lührig-Holt type of car reported in *Engineering,* 26 Feb. 1897, p.286.