

The  
**VIRTUAL MUSEUM**  
of the  
**LANCASHIRE & YORKSHIRE RAILWAY**

Operational Documents & Pamphlets

1916

Description of the  
Electrification of the  
Manchester to Bury line.

Details of the Electrification scheme, rolling stock  
and Clifton power house etc.

(16 Pages)

**LANCASHIRE & YORKSHIRE  
RAILWAY.**

**ELECTRIFICATION  
OF LINE**

**Manchester  
to Bury**

**VIA PRESTWICH.**

—  
**1916**



**JOHN A. F. ASPINALL,  
General Manager.**

**Hunt's Bank,  
Manchester.**

A.D. 300.



FIVE-CAR ELECTRIC TRAIN—Manchester and Bury Service.

## First Electric Railway for Manchester.

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THE improvements made from time to time by the Lancashire & Yorkshire Railway Company in the work of conveying passengers quickly and comfortably have been most marked, and a further important advance has been made by the introduction of electric trains on the line which runs from Manchester to Bury through the favourite residential suburbs of Heaton Park and Prestwich.

The Lancashire & Yorkshire Railway Company first adopted this method of working when the section between Liverpool and Southport was electrified in 1904, and the highly satisfactory results obtained decided the Company in favour of similar arrangements on what is familiarly known as the "Prestwich Branch." Experience has proved that electrification of suburban railways encourages the growth of traffic, and it has the additional advantage of enlarging the terminal capacity of stations.

This is the first electric passenger carrying railway in Manchester, and the inauguration of such a service marks an important stage in the economic development of the city and the evolution of means of rapid transit between the city and its suburbs.

Although Manchester was not selected for the initial test of main line electrification, the city will benefit since it reaps the advantage of practically twelve years' experience gained elsewhere.

The growing importance of North Manchester as a healthy residential district, and the ever-increasing number of people who are making their homes there, induces the belief that the new undertaking will be as conspicuously successful as its forerunner, which now affords means of rapid transit for thousands of people between their homes on the Southport line and the City of Liverpool, where they have the fastest suburban service in the world.

Great as have been the improvements for reaching the inner suburbs of Manchester in recent years, the



BAND PERFORMANCE, HEATON PARK.



need for improved travelling facilities to the outer suburbs has not yet been fully met. Generally speaking, the city worker is compelled to live within a radius of three miles of his business owing to the lack of quick means of transit. Time occupied in travelling is often the measure of the distance at which he can live from the city.

The district served by the electrification scheme, standing as it does at an average height of 300 feet above sea level, is becoming increasingly popular as a residential one. During the past thirteen years the population of North Manchester and Prestwich has increased over 30 per cent., and the prospects are that the growth will continue at an even greater rate. The purchase of Heaton Park by the Manchester Corporation and the town-planning schemes which are in hand have greatly encouraged building operations in that district. Residential property is, as a rule, removed as far as possible from the railway. One of the great advantages of railway electrification is its freedom from smoke, dirt, and noise.

The work of electrifying the line was commenced before the outbreak of war, and as the necessity was felt for a rapid and efficient train service it was decided that the work should be completed at the earliest possible moment.

The conversion from steam haulage to electric traction had necessarily to be carried on under difficulties, but the management throughout determined that nothing should be done to interfere with the service of steam trains.

#### SERVICE OF TRAINS.

In consequence of the war the full service of electric trains will not be put into force immediately. It is proposed to substitute certain of the existing steam trains by electric trains, and augment the service from time to time.

The electric trains reduce the time occupied on the journey between Manchester and Radcliffe and Bury by 25 per cent.



FIRST CLASS CARRIAGE.  
Manchester and Bury Electric Service.



THIRD CLASS CARRIAGE.  
Manchester and Bury Electric Service.

A comparison of the time occupied on the journey is given below :—

From MANCHESTER to	Steam. Mins.	Electric. Mins.
Woodlands Road Halt ... ..	7	5
Crumpsall ... ..	10	7
Heaton Park ... ..	14	10
Prestwich ... ..	18	13
Whitefield ... ..	22	16
Radcliffe ... ..	26	20
Bury ... ..	32	24

From BURY to	Steam. Mins.	Electric. Mins.
Radcliffe ... ..	5	4
Whitefield ... ..	10	7
Prestwich ... ..	14	10
Heaton Park ... ..	17	13
Crumpsall ... ..	21	16
Woodlands Road Halt ... ..	24	18
Manchester ... ..	29	22

#### RESIDENCE IN THE NORTHERN SUBURBS.

It will be interesting to prospective residents in the Northern Suburbs of Manchester to know the Rates, Water Rents, and price of Gas in the various districts, and the following particulars give an approximate idea of these payments for a house of £25 rental per annum in 1915, as well as the daily cost of 1st and 3rd class annual season tickets :—

	Daily Cost of Season Tickets.		Rates and Water Rents per annum.				Gas per 1000 c.f. nett.	
	1st.	3rd.	£	s.	d.	s.	d.	
Woodlands Road Halt ... ..	2½d.	1½d.	10	10	3	.....	2	6
Crumpsall ... ..	3d.	1¾d.						
Heaton Park ... ..	4d.	2½d.	8	11	9	.....	3	2
Prestwich ... ..	4¾d.	2¾d.	8	11	9	.....	3	2
Whitefield ... ..	5d.	3¾d.	11	10	2	.....	3	2

#### POWER STATION.

The Power Station has been built at Clifton Junction, 4¼ miles from Manchester, on the main line to Bolton, the site possessing exceptional qualities for such a purpose. It is centrally situated with regard to the Lancashire section of the Lancashire & Yorkshire Railway ; it is also adjacent to extensive coal-fields, and there is a supply of water from the



Manchester, Bury, and Bolton Canal, which is owned by the Railway Company.

The Power Station is 37 feet below the main line which at this point is carried on an embankment, and this enables the coal wagons to be run direct to the coal bunkers above the boilers. For the purpose of handling material between the two levels a 50-ton electric overhead travelling crane has been installed. The boiler room is 110 feet long and 90 feet wide, and a turbine room 188 feet long and 64 feet wide runs parallel to the boiler room. A 50-ton electric overhead travelling crane has been provided in the turbine room, running the full length of the building.

Three Babcock & Wilcox water tube boilers are installed, each having a normal evaporation of 32,000 lbs. of water per hour. The boilers are fitted with mechanical stokers and provided with separate economisers carried on a special floor above the boilers. One chimney and induced draft fan which is common to two boilers is provided on this floor. The chimneys, two in number, are of steel, with a cast-iron ornamental top; they are brick-lined, and measure 6 feet inside diameter and 87 feet high from the firing floor level. A large steel bunker is provided above each boiler for the reception of coal, having a capacity of 50 tons, the coal being conveyed by rail in steel hopper wagons which run over the bunkers and are self-emptying, so that labour in coal handling is reduced to a minimum. The ashes from the boilers are automatically fed into ash hoppers underneath each boiler, and are then dealt with by means of a Suction Ash Handling plant provided by Messrs. Babcock & Wilcox, Ltd. For this purpose a large receiver is installed outside the boiler house above the coal roads. A large exhaustor is coupled up to the top of this receiver, and a cast-iron pipe for the conveyance of ashes, etc., is carried from the receiver down into the boiler room and underneath the ash hoppers. Special hoppers are also provided underneath each economiser and coupled up to the ash receiver in a similar manner to the above. By this means, both the ashes and soot are conveyed automatically when required into the large receiver, from which they are periodically emptied into wagons at the rail level.

At the present stage of the Power Station, two main generator sets are installed; these are of the "Dick-Kerr" direct coupled type Turbo Alternator, each having a normal capacity of 5,000 k.w. In connection with each set, a large surface condenser of ample dimensions, manufactured by Messrs. W. H. Allen, Son & Co., Bedford, is installed. Three-phase alternating current is generated at 6,600 volts, 25-cycles, the steam pressure being 200 lbs. per square inch, superheated to a total temperature of 650° Fahr.

In addition to the above, one 500 k.w. gear-driven Turbo Alternator, together with surface condensing plant, by Messrs. The British Westinghouse Co., Ltd., is installed. This set generates three-phase alternating current at 440 volts, 25-cycles, for the auxiliary plant throughout the station, and for lighting and power at the Goods Yards in the district, after the main generator sets are shut down at night.

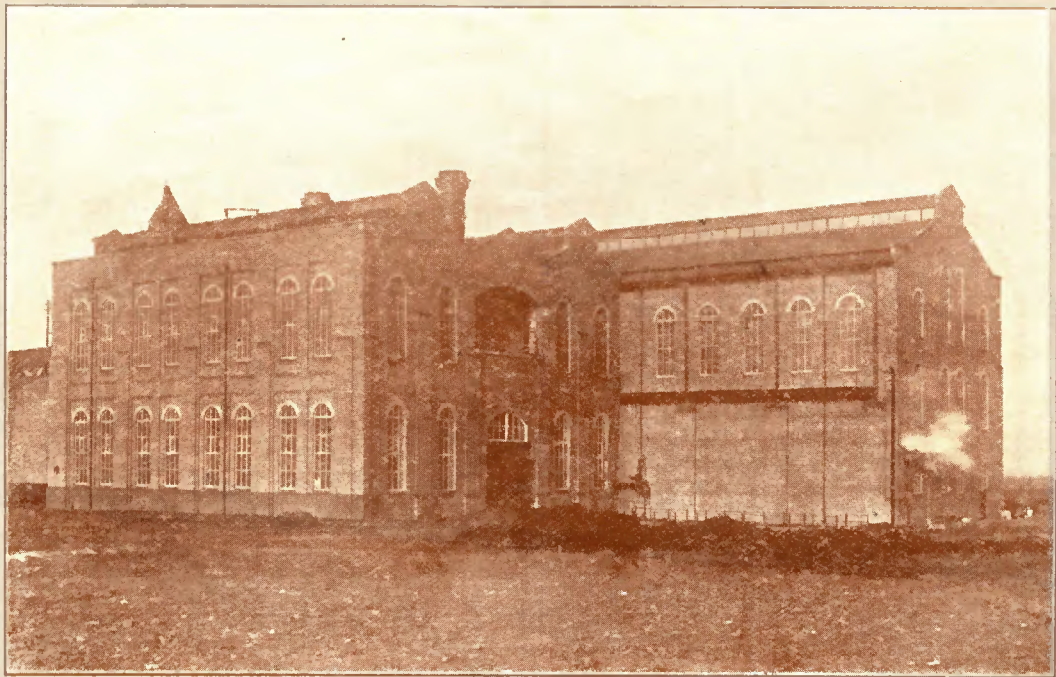
A suite of offices for the operating staff is arranged at one end of the turbine room, the top floor of which is used for the main switchboards.

A separate building is provided outside the turbine room for the reception of the high-tension switch-gear which is electrically controlled from the turbine room, thus safeguarding the switchboard attendant from high-tension current and laborious handling of the main switches.

The switchgear is manufactured by Messrs. The British Thomson-Houston Co., Ltd., of Rugby, its special features being the cellular constructions of the high-tension portion in concrete, protective interlocking, thus ensuring the safety of all concerned, and the electrical remote control.

A small battery is installed in the lower portion of the switch-house, so that in case of a complete shut-down of the Power Station, power will be available for the operation of the main switch-gear, lighting the station, and working the two overhead cranes.

In conjunction with the canal, a cooling pond has been provided 408 feet long and 109 feet wide. Spray nozzles and pipes are arranged over the full area of the pond for cooling purposes, and coupled up with two



POWER STATION, CLIFTON JUNCTION.

centrifugal pumps in the turbine room. The main water supply from the cooling pond to the condensers is conveyed by a 45in. diameter pipe line.

The discharge pipes from the condensers are led direct into a special channel, parallel to the canal, with outlets at convenient points. The whole of the circulating water pipes have been manufactured by Messrs. J. Clayton, Son & Co., Leeds.

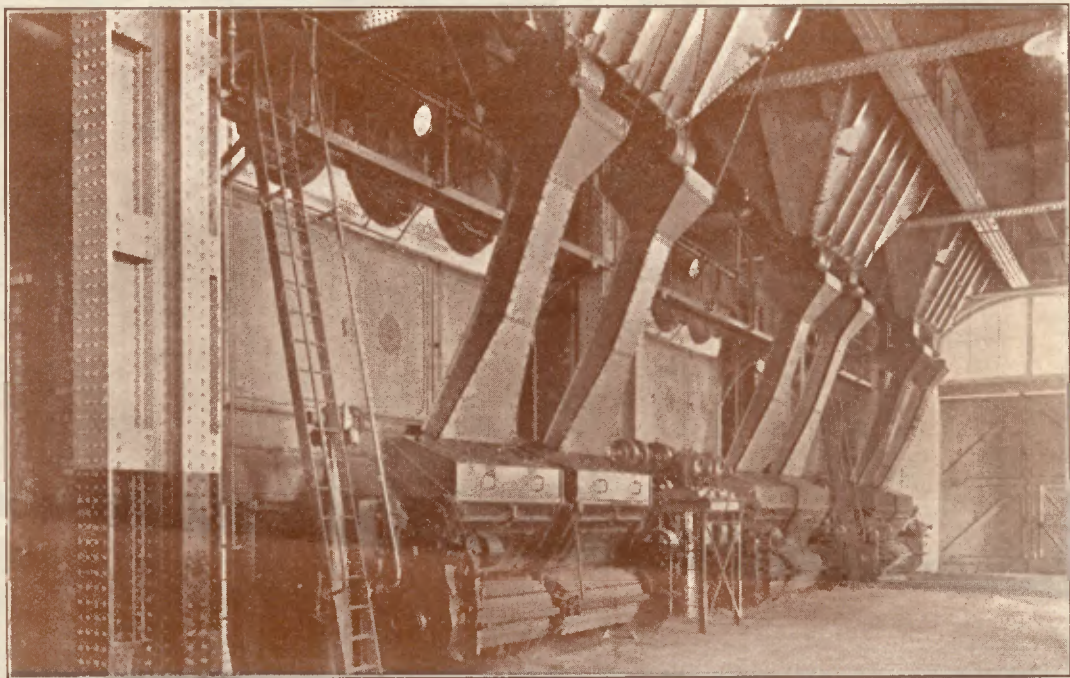
For transmission purposes, the high-tension alternating current is available, but in order that it may be converted and put on to the live rail at the required voltage, two sub-stations have been equipped, one at Radcliffe and the other at Manchester (Victoria Station). Each sub-station consists of three Rotary Converters, each 1,000 k.w., together with transformers, whereby direct current is supplied to the live rail at 1,200 volts. A large battery is installed at each sub-station for the purpose of reducing peak loads on the Power Station, and in case of emergency to enable all trains to reach their respective destinations without inconvenience to the travelling public.

Both the sub-stations are linked up electrically with the Power Station by means of bare copper conductors carried on poles overhead along the line side in the open districts, and in congested areas these are substituted by three-core cables carried on short stumps and brackets.

The new features of the electrification scheme are the adoption of high-tension direct current (1,200 volts) and the special form of third rail. The essential features of the latter are the introduction of a side contact, and complete protection of the rail by wood guarding. The rail is of channel form, with a head of sufficient section to provide a wide contact surface on the side. It is carried along the side of the running rails upon insulators secured by lugs to the sleepers, to prevent lateral movement. The contact device is mounted on both sides of the motor bogies, and is pressed against the head of the rail by means of a coiled spring.

A "fourth" or "return" rail of square section is laid in the centre of each track and secured to the sleepers. It is connected electrically by means of copper bonds to the running rails.





BOILER HOUSE POWER STATION, CLIFTON JUNCTION



## THE NEW TRAINS.

The electric trains consist of either TWO, THREE, FOUR, or FIVE cars according to the requirements of the traffic, but the standard train has FIVE Bogie Cars, the front, centre, and rear vehicles being Third Class Motor Cars, and the intermediate vehicles First and Third Class Trailer Cars, a feature of the design being that a Driving Compartment for the accommodation of a Motorman is at each end of all cars, which enables the trains to be made up to any accommodation required with the minimum of shunting operations and time so valuable on an electrified service.

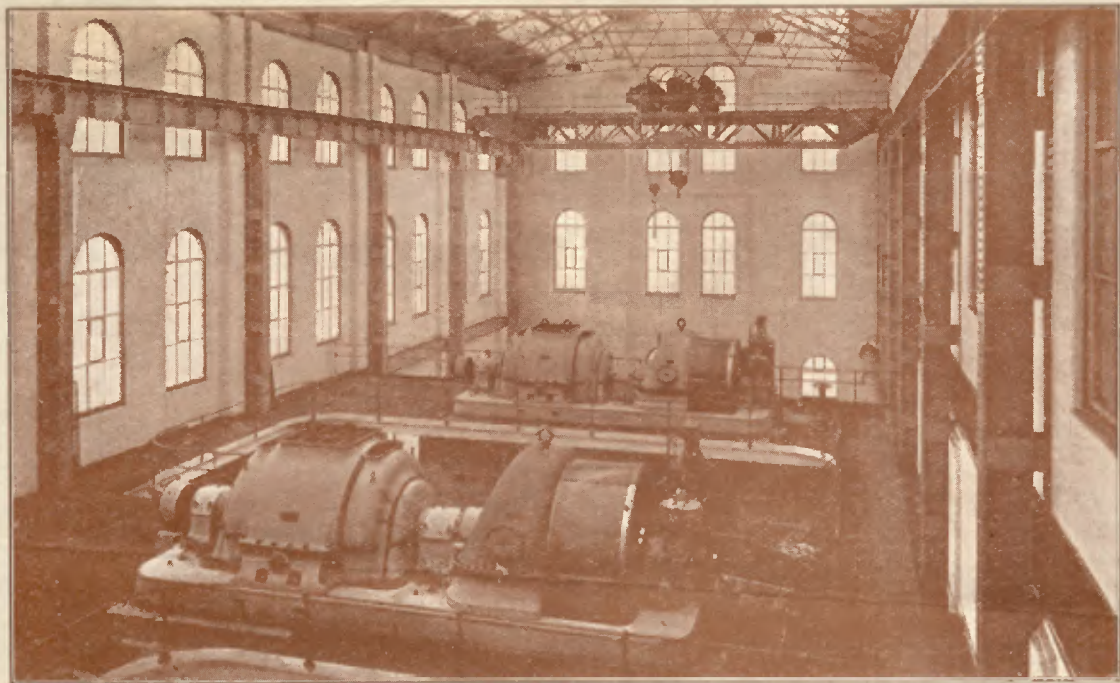
The total length of a Five-Car train is 326ft. 3in. overall, providing seats for 72 First Class and 317 Third Class, or a total of 389 passengers.

Each motor car is carried on two bogies, on each of which is mounted two 200 h.p. electric motors, operated at a voltage of 1,200 direct current, thus the total horse power of each motor car is 800, and that of a Five-Car train of 2,400 h.p.

The cars are of the multiple unit type, the control equipment being the manufacture of Messrs. Dick, Kerr & Co., Ltd., of London and Preston. A special high-tension compartment is provided at each end of the motor cars, in which all high-tension gear is housed; the door is automatically locked when the current is on the car, thus ensuring complete protection from the high-tension current to the passengers and train staff.

The cars are entered at the extreme ends of the vehicles, and vestibule gangways are provided throughout the train so that passengers can pass from one car to another to secure a seat. A feature of note is that the usual stepboard used on most British trains is dispensed with, and passengers are able to enter the vehicles direct from the station platform without making the usual intermediate step, which is a decided advantage in quickening the ingress and egress of passengers at the stations.

Each car is divided into two main passenger compartments with a centre aisle, fixed and reversible seats being arranged alternately on either side; the first class seats are upholstered in Tapestry and the



TURBINE ROOM, POWER STATION, CLIFTON JUNCTION.

third class in Rattan, the former having the floors carpeted.

The most interesting feature from a public point of view is that timber has been entirely superseded by metal in the construction of the cars, the vehicles being therefore entirely fireproof and much stronger to resist the effects of accident; the framework is entirely of steel and the panelling of the sides of the car and roof is made up of aluminium sheets, the interior work being finished with mouldings of drawn steel and aluminium sections; the luggage racks, air extractors, and electrical fittings, together with all inside furniture of the cars are in polished aluminium.

The floor has been built up of a special dovetailed form of galvanized sheets which are rivetted to the steel frame, and on which is laid an insulated cement floor.

The "All-metal" car has been largely introduced in America and to some extent in this country, but the term is somewhat of a misnomer, as timber has been extensively used for windows, seats, packings, and other fittings. It is therefore a point of some importance that the cars which run on the Manchester and Bury electric line are no doubt the first passenger cars in either country, and probably in the world, in which metal has superseded wood entirely in the construction of the vehicles.

Other interior fittings specially noted are the arrangement of electric lighting and heating, the former of which gives an excellent distribution of light and the latter arranged in ducts along either side of the car at the floor level will ensure comfort in the coldest weather. Electric fans are also fitted in all cars, arranged by means of a switch, to either supply fresh air from the outside of the car or extract foul air from inside.

A novelty is also provided by the interior painting of the cars being finished in self-colours. The lower portion of the body is in dark brown with a restful shade of green above the bottom panels to the cornice, whilst the roof is of white. Large panorama photographs of places of interest add a pleasing effect to the inside decorative arrangements.

# LANCASHIRE & YORKSHIRE RAILWAY.

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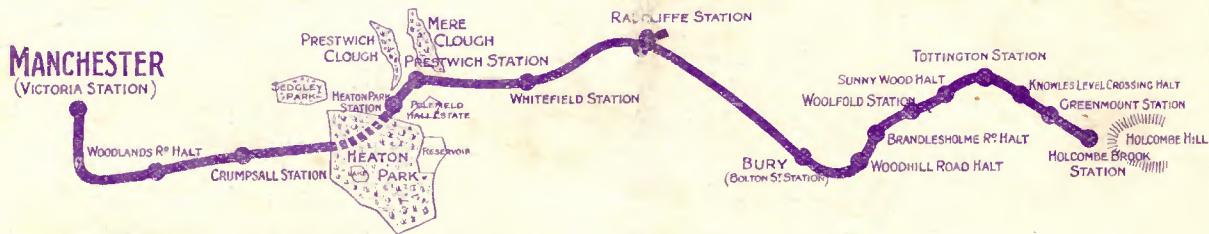


DIAGRAM OF ELECTRIFIED LINE,  
Shewing Residential Districts of North Manchester.