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A CHANGING FACE

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"The Commission are determined to exploit the opportunities for re-equipment which modern science and techniques present, and to transform the operations of British Railways so as to offer the public a rail service second to none, whilst deriving from the equipment the full economic benefit it can provide."

Sir Brian H. Robertson.

INTRODUCTION

In January 1955, the British Transport Commission published their proposals to change the face of Britain's railways in what is known now as the Modernisation and Re-Equipment Plan.

For thirty years the railways had been unable to undertake any large schemes of modernisation or even keep up an adequate programme of replacement. In the early 1930s the railways like other industries, suffered from the slump, and in subsequent years up to the war, they were not in a position to raise large sums of new capital due to the challenge of road transport. During the war it was impossible to provide resources for the maintenance of the railways except to the very minimum to keep them running, and at the same time they were subjected to the increased strain imposed by heavy war traffic and by wartime conditions. They therefore emerged from the war with much of the equipment out-of-date and run-down. Since the war successive Governments have been forced to restrict investment in the railways because of other urgent claims on national resources, and only in 1955 did the Commission feel sufficiently confident to introduce this plan.

As can be seen from the official report, the plan embraces every aspect of railway working, and it would be impossible to treat every one separately in these pages. Hence only major subject matter will be dealt with; motive power and its associated rolling stock, the permanent way, signalling and telecommunications, and freight transit.

One point standing out in the proposals which might be surprising to some is justified by industry in the area concerned. This is the fact that, although changes have been, and will be made over the whole country, by far the majority of these changes concern the North Eastern Region. It is, therefore, intended that most emphasis be placed on activities in this area, rather than the country in general. This treatise does not deal with the proposals laid down by the Commission, but rather what has been and what is still to be done to satisfy their requirements.

MOTIVE POWER AND ROLLING STOCK

By far the most important and revolutionary factor in the modernisation of British Railways is the intention to eventually convert all motive power from the standard coal-burning type to the diesel, electric and combination units.

The Need For Conversion

Ever since the last war railway engineers have visualised using new sources of traction, but up till now lack of funds have prevented the change-over. Let us then look and see why these changes are included in the Modernisation Plan of 1955.

What are the advantages of using diesel oil as fuel as opposed to coal? Firstly, steam locomotives have never been really efficient - about 15% is an average level—whereas diesel units can be made up to 75% efficient. Coupled with this is the fact that good quality coal is becoming scarcer and therefore costlier almost month by month, and even though the political situation with oil-producing countries is still questionable, the general availability of oil supplies has improved immensely. The reduction in the number of steam locomotives will allow the better quality coal to be released for other vital industrial requirements. Surely the biggest advantage from the passenger’s point of view is the increased standards of cleanliness. Each and every one of the new units can be kept spotlessly clean and will remain clean for much longer periods. The associated rolling stock will also remain cleaner, thus eliminating one of the discomforts of the travelling passenger.

The New Iron Horse

Let us now look into some of the problems involved in deciding which type of motive power shall be used in which application in the future. On the East coast main line many passenger trains run non-stop for hundreds of miles. For example, the well-established "Flying Scotsman" runs from London to Edinburgh without a stop. Instances such as this are duplicated all over Britain's railway system. Thus there is a need for a locomotive which will haul a passenger train weighing anything up to 400 tons for long distances at average speeds of around *75* miles per hour. To do this, the locomotive must have a power of over 3,000 H.P. After much experiment, a diesel-electric locomotive emerged which would fulfil all these requirements, and go even one better than that. The reserve of power of these locomotives can be used to haul a train at speeds up to 100 miles per hour if necessary to make up time lost through some unavoidable delay. It is hoped that all main line trains will be in charge of these locomotives in the future.

For the more local and more numerous passenger trains it was realised that although slightly lower average speeds could be tolerated, a really excellent starting and stopping performance was necessary. This was achieved in the experimental stages by using pure diesel traction. The final results were adopted, and hence the new familiar diesel sets came into being. The units usually consist of three coaches with a diesel motor at each end of the complete set. The latter can be used separately or in conjunction with each other, the main advantage being that if a train has to be reversed, only the driver, and not the driving unit, need traverse to the opposite end of a train. This saves a great deal of time on a run such as the one between Whitby and Scarborough along the

Yorkshire coast, where two such reversals are necessary. The driver merely stops, switches off the motor, walks along the train to the opposite cab, switches on the other motor and drives away in the opposite direction. It has been estimated that this method cuts fifteen minutes from the time taken by normal methods. To increase the rate of starting, gears have been fitted to the motors. This is the first time such an idea has been adopted on the railways, and is possible only on this type of unit, but it has been found to be completely successful and will become standard practice.

Up to 1956 freight traffic was hauled mostly by the ex-W.D. and British Railways "Standard" locomotives. To implement the modernisation plan important sections of the railways are being electrified to allow the use of the new electric power plants as sources of motive power. It has been found that these plants are particularly suited to hauling long and extremely heavy freight trains for almost any distance without the need for excessive maintenance. Standards of safety are preserved by the use of overhead conductors for supplying power to the motors to keep the supplies away from human activities such as loading and cleaning. Even with the proposed increase in the speed of freight trains, these units should hold their own.

Even before the British Transport Commission announced their plan, diesel locomotives were used successfully in marshalling yards and stations to replace the "saddle tank" type of engine which has given such long and yeoman service. It is hoped that eventually all such duties will be carried out by these small, but very effective, diesel engines.

Modern Rolling Stock

The most surprising factor of the modernisation plan is that except in the completely new compound diesel units for local services, there are no really revolutionary ideas affecting passenger rolling stock. However, the coaches coming off the assembly lines today are the last word in comfort, consistent with practicability and safety considerations.

Every possible thing is done to make both First and Second Class passengers as comfortable as possible on any journey, whether long or short. The hard seated, non-corridor coach will soon disappear from Britain's railways and be replaced by these superb coaches. Apart from actual seating arrangements, other services are being improved. Buffet Cars and Restaurant Cars are having minor conversions and improvements carried out on them and serious consideration is given to any way of reducing the necessary high prices for these services without excessive losses being introduced.

Whatever the result of this, the travelling passenger can be assured that he will be transported to his destination as quickly, comfortably and safely as possible.

IMPROVING THE RAIL HIGHWAY

The track is the railway's highway. Its quality is a big factor in securing smooth riding of the trains which run on it, and the comfort of travelling passengers.
It comprises essentially a pair of steel rails, set 4ft. 8½ ins. apart, supported and held at that distance on closely spaced cross sleepers. It is the free running of locomotives and vehicles on hard steel-tyred wheels on a pair of continuous steel rails which enables heavy loads to be hauled on the railway with the minimum expenditure of energy. While fifty years ago a few trains attained speeds as high as are attained at the present time, those trains were relatively short and light. Today long and heavy passenger trains are regularly reaching speeds of from 85 to 90 miles per hour. This is only achieved by using powerful locomotives, much heavier than the locomotives of fifty years ago.

The Permanent Way

Almost unknown to the travelling public throughout the last thirty-five years, railway engineers, interrupted only by the war, have been strengthening the tracks and bridges. Despite the progressively increasing track-loading, the long-established standards of safety are being retained, with no decrease in smooth riding qualities and standard of comfort. Track which carries high-speed trains must be firmly and evenly supported, but it must not be hard and rigid. A deep bed of open crushed slag or stone ballast supporting the track sleepers from the ground surface below provides a good foundation which can be compacted firmly, but which also gives a resilient support to the track, which is a valuable contribution to the smooth riding of trains. Huge quantities of ballast are being added to the foundations of the main line tracks on the North Eastern Region, and this will continue for years to come. Each week up to 6,000 tons of ballast is being deposited from rapidly discharging hopper wagons on to the tracks in this region alone. Mechanically hauled steel skids are used to plough the ballast between the tracks, and compacting machines to re-bed the track with a firm but resilient quality.

On many miles of track the old ballast bed is thoroughly cleaned to restore its quality and to speed the draining away of rain to prevent softening of the ground beneath the tracks. Big mechanical excavators are kept hard at work covering miles of track every week. The only evidence which the passenger sees of all this going on is an occasional glimpse of strange-looking machines parked alongside the track, and perhaps a measure of delay on a Sunday train, while avoiding a length of track on which the civil engineers are working, improving its foundation or replacing an old type bridge with a new one.

Since 1948 the medium weight steel rail which has been widely used on the main lines for the previous twenty-five years, has been replaced by a heavier and stiffer type of rail. The replacement is being accelerated as one of the track strengthening measures to provide for faster trains. British manufactured steel rail has proved itself to be second to none in the world. Nevertheless, manufacturers and British Railways are jointly investigating further improvements in the composition and manufacture of rail without impairing its toughness or increasing brittleness. Yet one of the most effective ways of reducing the development of flaws in rails under heavy traffic is to weld together the 60ft. lengths of rail as normally made at the rolling mill instead of joining them up with plates and bolts, and with "expansion gaps" which get wider in cold weather and close up as the temperature increases.

Such continuous long rails would give smoother riding of trains and greater comfort to passengers. The elimination of a big proportion of the gaps between the ends of the rails would reduce the wear and tear on locomotives, coaches and wagons. The first experimental stage in the use of long rails having welded joints on British Railway track is nearly over. The safeguards which must be adopted to obtain sound and reliable welded joints and to secure a track without temperature expansion gaps have been confirmed. On the North Eastern Region flash welding equipment is being installed in a new rail welding depot near Darlington. The old familiar click-click, as wheels pass over the old open-gapped rail joints, will steadily disappear from the heavily used main lines on all regions.

A regular rail inspection has been introduced on the railways, making use of the recently developed Supersonic Rail Flaw Detectors to find where hidden flaws may be developing in rails in service. Particular attention is given to rails in tunnels, and any serious cases of defective track are immediately attended to by replacement.

Up to the present, softwood timber has been used for the cross sleepers which carry the steel rails. Most of these sleepers have to be imported and present supplies of good, slow grown fir are restricted. The long experimental stage in the development of a sound, reliable, British manufactured concrete sleeper is nearing its conclusion. British Railways and British manufacturers have together developed the design of a sleeper of pre-stressed concrete with suitable clips and fastenings which can now be used safely in place of wooden sleepers, even in the heaviest worked high speed tracks. The first lengths of main line track in the heaviest loaded sections have now been laid with these concrete sleepers. A high degree of resistance to electric leakage must be given by the track to secure the reliable functioning of the modern electrically interlocked signalling now being extended over all main lines. This requirement has been the most arduous to fulfil in the development programme.

Concrete sleepers with vibration absorbing rail pads and fixings will provide a strong, smooth riding bed for the long track rails of the future—the very near future.

The Use of Banking

Extensive refinements in the setting of curved tracks were made during the period between the two world wars, and most careful adjustments were made on the lines which carried the so-called high speeds trains of the 30s. Many places still remain where safety and comfort considerations compel trains to adhere to restricted speeds and interrupt the achievement of consistent high speed running over long sections of lines. Some of the bottlenecks in the area are now being dealt with in conjunction with track strengthening works. A major junction improvement here, the building of a diversion line there, the elimination of a speed restricting factor elsewhere—all places which can be improved at a reasonable cost in relation to the improvement in free-running of all trains are being dealt with.

By the time the higher powered locomotives are hauling trains on the main lines, they will be able to run very long distances at uninterrupted speeds in the 80s, and they will be able to make up minutes which may have been lost by unavoidable delays, by running all out at speeds of 100 miles per hour. However, all trains are not of the high-speed passenger type, some being very heavy freight trains. This means they do not take kindly to their being guided into and around curves, or being diverted at a junction. It is only recently that robust equipment has become available in this country with which accurate continuous records can be taken to reveal most irregularities which may have developed in the track. These records provide valuable information in seeking to ensure that small defects are corrected before they magnify and multiply, and lower the standard of smooth, comfortable riding.

Still more accurate recording has been the object of investigation for some years. Engineers will soon have the best equipment produced yet to guide them in the maintenance of tracks to the highest possible standard for the trains of the future.

ELECTRONICS USED FOR ECONOMY AND SAFETY

Effective communications between innumerable points within the Region—and to a lesser extent on an inter-regional basis—are an absolute necessity for the attainment of maximum efficiency in the overall working of the railways. Electronic equipment has been used in the North Eastern Region for some time now. The application of the thermionic valve to provide additional trunk telephone lines by means of carrier telephony resulted in the very first carrier type telephone installation between York and London, on what was then the London and North Eastern Railway.

Electronic equipment, in its many forms, is being used extensively to supplement the modernisation plan.

Remote Control Equipment

An important application of the carrier system of working as applied to the signalling sections will shortly be installed on the East coast main line in conjunction with a centralised traffic control area, which will enable the work at present carried out by three signal cabins to be concentrated under the control of only one. The installation, which is referred to as the High Speed Transistor Remote Control System, enables a signal cabin to control remotely situated points and signals and to receive all the necessary indications from the points, signals and associated track circuits by means of the transmission and reception of several carrier frequencies. Normally, remote operation of this magnitude necessitates a considerable number of multi-core cables being run between the cabin and remote area. The carrier remote control system, however, requires only one pair of wires between the two points, and in contrast with the coded pulse two wire remote control system the transmission time is instantaneous. This is ideally suited for the heavy traffic density encountered on the region.

Where practicable, and partly where it would be economical, consideration is being given to the use of micro-wave links instead of cable links. It is possible that the East coast trunk route will be replaced by this type of carrier installation, because its initial cost and subsequent maintenance costs will be lower than those of a cable scheme. V.H.F. radio communication has recently been provided at Newport marshalling yard to enable the controller to communicate with the drivers of the diesel shunting engines. Marshalling of freight trains will be facilitated, delays reduced and improved services given by this installation.

Speeding of Services

V.H.F. mobile radio has been installed at Leeds and Newcastle to improve the parcels and goods collection and delivery service. Continuous telephone communication will be made available by means of radio between the central office and the mobile vehicles. The office, having received a request for collection from a trader, will be able to get in touch with a particular vehicle in that area as soon as possible, and collection of parcels or goods will be undertaken without the delay unavoidable under the present system when mobile vehicles have to return to the central office for instructions.

Loud-speaker installations for the distribution of information to passengers already exist at several stations within this region, but the number of installations will be increased considerably as the modernisation programme proceeds.

The sleepers on most of the magnificent four track route north from York to Northallerton, have been replaced by the concrete types. This route is absolutely straight and almost level as far north as Pilmoor, a distance of 23 miles. Thus heavy express passenger trains run at average speeds of around 85 miles per hour along this stretch. However, the sleepers are standing up to the strain perfectly and are providing even safer riding than before. This section of track is generally thought of as being the best on British Railways.

Signalling engineers have recently completed one of the most arduous tasks required for foolproof handling of trains on this country's railway system. Before electronics really came into its own, no less than thirteen signal cabins of the manual type were required to effectively marshal all the various control sections at York. Four years ago these cabins were superseded by an engineering masterpiece. This is a single completely electrically operated control centre—a nucleus controlling in all eight miles of main line track and all associated depots and marshalling yards. It consists of a single room built on a platform roof, and from there all points, signals, marshalling depots, locomotive sheds, road services, telephone traffic and teleprinter signals can be controlled. All points are electrically operated and all signals are of the colour light variety. The original thirteen cabins have now been demolished to provide building sites for other important depots.

In an underground centre there has been installed a twelve-channel carrier telephone system of the type described previously. The system affords direct communication between York and Leeds, primarily to deal with the increased telephone traffic which has arisen because of the recent bringing of the West Riding Operating Area under the jurisdiction of the Chief Traffic Manager of the region at York. Voice frequency dialling equipment has been installed to enable the York operator to dial any Leeds number without the intervention of the Leeds operator. A new telephone exchange will be provided at York towards the end of the year, and any extension connected to it will be directly able to dial any Leeds number. An automatic teleprinter will be installed in the centre during the next two years which will enable any point to obtain access to any other point simply by dialling two or three digits. The present system suffers from the disadvantage that all messages have first to be transmitted to York and then re-transmitted from there. The new system will effect a considerable saving, in staff as well as in time, and the efficiency will be greatly increased.

Apart from being a main passenger station, York deals with large amounts of freight traffic. Trains originating in the region are gathered up, sorted and sent out on fast long-distance runs. For example, there are many fish trains from Hull which have to be dealt with quickly and efficiently, and many coal and iron ore trains from the Newcastle area have to be similarly treated. The physical location of the two main marshalling yards at York is ideal, and there are no problems involved, but steps are being taken to increase the efficiency and modernise these yards. The introduction of diesel engines for shunting is a great boon. V.H.F. radio has been installed at the Leeman Road yard for easier communication between shunting engines, B.R. and G.P.O. road transport vehicles and the associated offices. A new system of fluorescent lighting has improved the standards of night activity in the yards, and already there has been a marked increase in the amount of traffic successfully dealt with since these amenities were installed.

This, then, is how the plan is affecting just one small area of the railways. These changes are being duplicated all over the main stations in the region, and on British Railways as a whole and to a lesser extent at every smaller and less important position in the complete system.

Automatic Exchanges

The existing regional teleprinter network is used extensively for the transmission of messages in connection with every aspect of railway working, and this network will be extended and improved. In the proposed new systems the various district train controls, which supervise the running of trains, marshalling of rolling stock, motive power depots, and are responsible for diverting trains in case of accidents, are connected to the required signal cabins, motive power depots and so on, by "omnibus" telephone circuits. Many of the existing circuits are of the battery code-ringing type and it is proposed that these will be replaced by the more efficient selective dialling type, whereby the control can gain access to any point by dialling two numbers. Automatic exchanges will be provided at all important centres in the region within the next five years, and as the number of trunk circuits between the various points is increased, voice frequency subscriber dialling will become available throughout the region.

A close watch is being kept on developments in telecommunications, and particularly to applications of electronics to any apparatus which would be of value to the signals engineer. The various manufacturers have been most helpful and co-operative in adapting their most modern equipment to the particular need of the railways.

SPEEDY FREIGHT TRANSIT

The North Eastern Region is essentially an industrial region. About 80% of its receipts is derived from its freight traffic, and speedy and economical transits are of great importance to the railways, trade and industry.

Transit time of freight traffic is broadly divisible into three factors :—

- Time at the loading and receiving end.
- Time occupied in marshalling yards to sort the wagons into their proper trains.
- Time taken to actually move the train from its source to its destination.

The most important factor of the modernisation as far as freight traffic is concerned is the remodelling of goods yards and terminal stations, the building of modern marshalling freight vehicles yards and the fitting of all with the automatic brake.

New Marshalling Yards

Perhaps the greatest problem with which the railways are faced in freight working is getting wagons from their starting point to their destination with the minimum number of changes from one train to another. In the past, the location and design of marshalling yards was determined by the geographical relationship of the former railway companies. British Railways are facing up to this problem by placing the new yards at strategic points determined by the flow of traffic to be handled. These new yards will, in some cases, displace some inefficient yards which normally cause delays. They are being planned, built and maintained to enable trains to be made up in such a way as to ensure the wagons of which they are composed get to their destination in the least possible time.

In the North Eastern Region, new mechanised yards are being planned for Teeside. These will enable trains to be made up in this important industrial area for all parts of the country. Similarly, traffic going into this area will be distributed to the great steel-making and other firms direct from the new Down Yard instead of, as is sometimes the case nowadays, having to go through two yards before it can get to its train.

Automatic Brakes

The decision to equip all freight vehicles with the automatic brake forecasts a stepping-up in the speed of freight trains. It is not generally realised that speed is largely determined by the ability to bring the train to a standstill in a given distance; in other words, on brake power. The automatic brake will be specially useful in connection with long-distance freight trains. It is the aim to increase the speed of such trains to 60 miles per hour. The process of fitting vehicles with this brake is already under way, and the number of fast trains is being increased. At the start of 1957 approximately 38% of merchandise vehicles were fitted with automatic brakes. By 1960 this figure will have risen to nearly 70%.

The equipping goes hand in hand with the introduction of the new forms of freight motive power—diesel and electric. Locomotives of these types can for most practical purposes work indefinitely. Just think what this means: a long distance train need have no change of engine on its journey at all. It is easier and quicker to change crews than it is locomotives, and as higher speeds will be involved, the crews will be able to work longer distances in shorter times.

CONCENTRATED EFFECTS AT YORK

One might ask just how much these plans will affect any particular section of British Railways. For illustration let us look at the development and re-organisation of a main railway centre in the North Eastern Region. The area to be dealt with is York and its immediate surrounding responsibilities.

Firstly, then, what are the arrangements for utilising motive power other than steam locomotives? York was one of the first areas to use diesel engines as shunting locomotives in its marshalling yards, and even more are scheduled to be delivered to completely replace the familiar old tank engines. Since York is situated on the East coast main line, the large diesel-electric units will eventually be hauling trains into and out of the stations on this line. Already experimental units have been given trials on this route and have proved themselves 100% successful. At the beginning of 1957, some multiple diesel units were introduced to effect relatively local runs. Today about 50% of passenger trains running between York and Harrogate, Filey, Bridlington and especially Hull, are of this type. It is hoped and expected that eventually all of these services will be handled by the diesel units.

CONCLUSION

Today, less than five years after the plan was announced, the rate of modernisation has already become more than a trickle; before very long it will have become a flood.

The nation must have a first class railway system if it is to compete prosperously with other highly industrialised countries, and with the help of industry it is intended to provide it. This help is necessary as British Railways are very much buyers of machinery, raw materials and stores of every description. For the modernisation of our railways the engineers must have from industry a mass of new equipment, and have it on schedule.

The day is not far distant when it will become apparent to everyone that British Railways has been both revolutionised and transformed, and manufacturers who are giving co-operation and confidence today will come to feel very satisfied that they did so.