

DREWRY DIESEL MECHANICAL LOCOMOTIVES

THE DREWRY CAR



COMPANY LTD.

RIVER PLATE HOUSE
TEL: MONARCH 3124

7/9 FINSBURY CIRCUS, E.C.2.
GRAMS: INNEAL, PHONE, LONDON.

THE DREWRY CAR COMPANY LIMITED

RIVER PLATE HOUSE

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LONDON, E.C.2

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INTRODUCTION

Whilst no one will now question the reliability and economical operation of the Diesel locomotive, much hard work and development has been necessary to bring this about, and in this connection it is not without importance, and we hope interest, to record that our experience in the design and manufacture of Internal Combustion Rail Traction Units dates back to 1905 and the experience gained during nearly half a century is embodied in the present design of Drewry locomotives.

The object of this booklet is to provide information regarding leading features, range and capacity, and brief operating instruction, which we hope will be of value both to actual users and to prospective customers.

We therefore include representative photo-

graphs which show the power unit and transmission without superstructure, cab interior showing control arrangement and a series of illustrations of completed locomotives, together with particulars giving leading dimensions and tables of speed and tractive efforts available.

A questionnaire is provided on **a separate sheet** so that it may be completed and returned to us with any enquiry for new locomotives.

Referring to the section dealing with Operating Instructions, this is intended as a handy and ready reference for drivers and is, of course, supplementary to the comprehensive General Maintenance and Operating handbook which is supplied for the information of workshop staff.

THE DREWRY CAR



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GENERAL DESCRIPTION

MECHANICAL PARTS. The design of the main frame and running gear conforms with standard steam locomotive practice, comprising plate frames, buffer beams and stretcher plates, all riveted construction. Coupling and side rods are steel forgings machined all over and materials used throughout are in accordance with modern locomotive practice and to British Standard Specification.

ENGINE. The well-known Gardner L3 and LW type are fitted and these have been selected by us following many years of completely satisfactory results in service and we cannot speak too highly of this power unit.

TRANSMISSION. Whilst our earlier designs em-

bodied variants of the conventional layshaft type of gearbox, we have for the last 25 years devoted our efforts to the development of our Wilson-Drewry epicyclic transmission in conjunction with the Self-Changing Gear Company Limited. This transmission provides four or five speeds and is direct air operated, and in place of the usual friction clutch a traction type Hydraulic coupling is employed.

REVERSE AND FINAL DRIVE. A spiral bevel reversing gear is employed with straight tooth reduction gearing to the jack-shaft final drive. All running gear is case hardened and ground and, pressure lubricated. This gear casing is a massive steel casting and is jackshaft mounted.

THE DREWRY CAR



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GENERAL DESCRIPTION

TRANSMISSION SHAFTS. Layrub resilient couplings and transmission shafts are employed between engine and gearbox and between gearbox and reverse unit, and the torque reaction members are also fitted with resilient mountings, thus making maximum possible provision for absorbing buffing and drawbar shocks.

AUXILIARIES. Westinghouse straight air brake is standard equipment, but continuous air brake or vacuum brake equipment may be fitted as required. Air compressors or exhausters are engine driven.

ELECTRICAL EQUIPMENT. Dynamo electric lighting and starting equipment is fitted including

head, tail and cab lights, also screen wipers to front and rear cab windows, together with Clayton-Dewandre cab heaters.

RADIATORS. Vertical radiators embodying oil-cooling sections are fitted, cooling being assisted by engine-driven fan.

CONTROLS. These are all air-operated and control levers are duplicated at each side of the cab. All necessary gauges and instruments, including speedometer and revolution counter, are mounted on an instrument board on the front cab plate.

THE DREWRY CAR



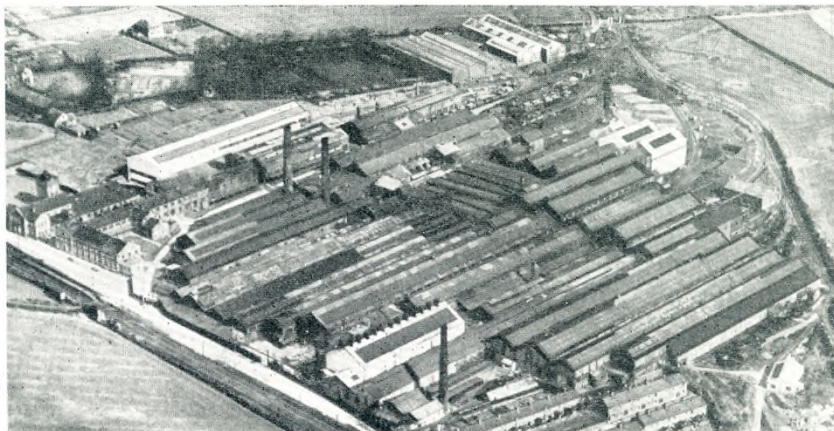
COMPANY LTD.

WORKS CAPACITY

Under an agreement which has been operating for a number of years with the Vulcan Foundry Limited and Robert Stephenson & Hawthorns Ltd. capacity is available for the manufacture of mechanical parts for Drewry locomotives at the Newton-le-Willows, Darlington and Newcastle works.

The high reputation enjoyed by this group of locomotive manufacturers is well known throughout the world and the advantages of this association will at once be appreciated.

Not only is ample capacity available under the most modern methods of production but there is also the fullest co-operation in matters of design based on over a century of steam locomotive practice and experience.



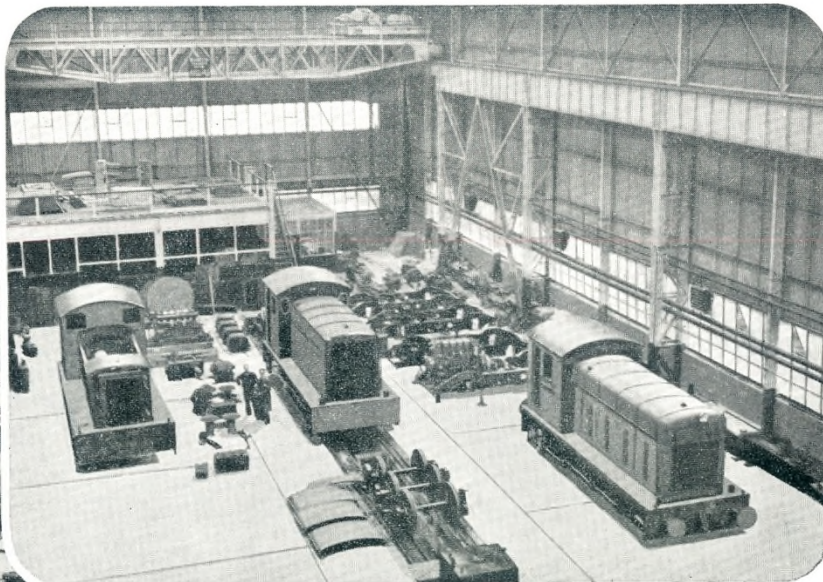
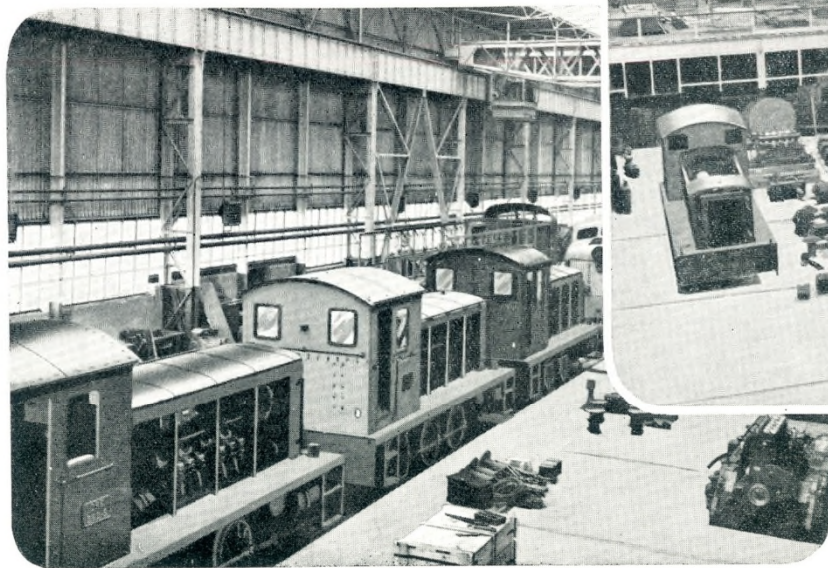
NEWTON-LE-WILLOWS WORKS

THE DREWRY CAR



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**DIESEL LOCOMOTIVE
ASSEMBLY SHOP**



THE DREWRY CAR



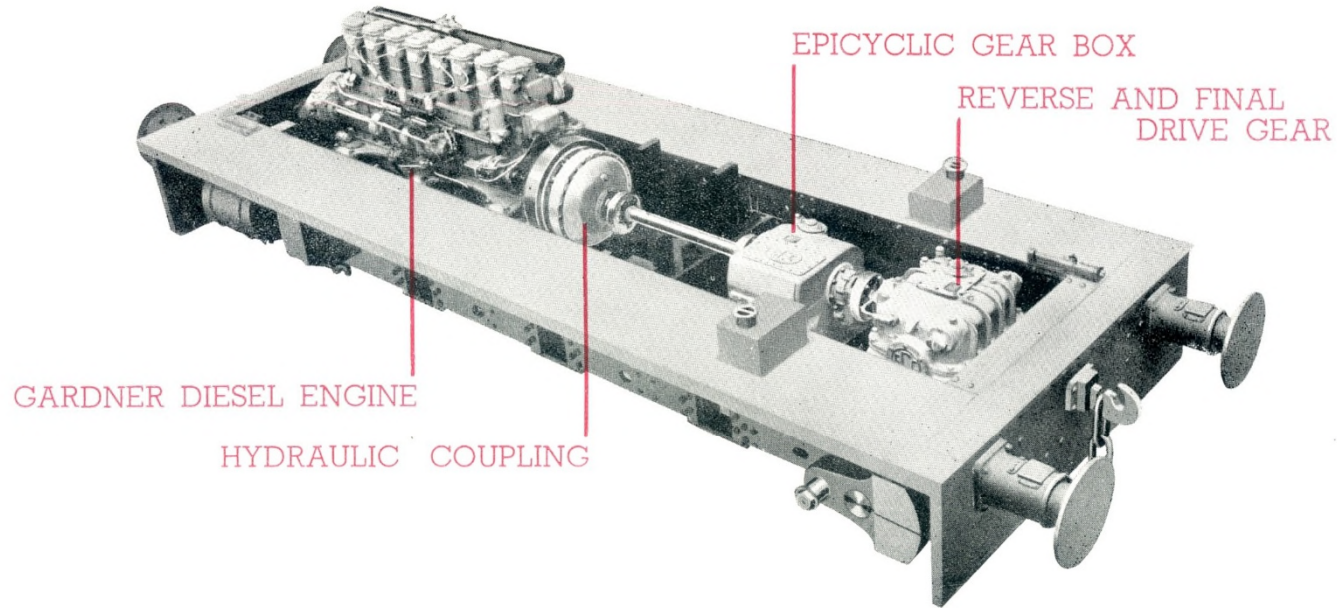
COMPANY LTD.

Admiralty
British Railways
Ministry of Supply
Ministry of Works and Buildings
Tanganyika Government Railways
North Eastern Gas Board
North Western Gas Board
East African Railways and Harbours
New Zealand Refrigerating Co. Ltd.
Regie Des Charbonnages de Colomb Bechar
Australian Iron & Steel Co.
Hyderabad State Electricity Department
Mexican Oilfields
Sangei Bidor Tin Co.
State Electricity Commission (Victoria)
Shell Petroleum Co. Ltd.
Queensland Government Railways
Kempthorne Prosser & Co. Ltd.
Anglo-Mexican Oil Co. Ltd.
Wm. Cory & Co. Ltd.
Zululand Sugar Millers & Planters Ltd.
Butler Bros. Ltd.
Western Australia Electric Commission
Norwegian State Railways
Lloyds Sawmills
Whites (S.A.) Portland Cement Co. Ltd.

SOME OF THE MANY USERS OF DREWRY DIESEL MECHANICAL LOCOMOTIVES

New Zealand Forest Products
Colonial Sugar Refining Co. Ltd.
Calcutta Electric Supply Corporation
Northern Aluminium Co. Ltd.
Tasmanian Government Railways
New Zealand Government Railways
Nagpur Government Power Station
Whakatane Paper Mills Ltd. (New Zealand)
Barking Jetty Co. Ltd.
Buenos Aires Great Southern Railway
Portuguese State Railways
Ohai Railway Board (New Zealand)
British Thomson Houston Co. Ltd.
Cornwall County Council
Auckland Farmers' Freezing Co. (New Zealand)
Union Cold Storage Co. (Argentina)
Buenos Aires Western Railway
Corby Basic Slag Ltd.
Sudan Government
Shell-Mex & B.P. Ltd.
The Sub Nigel Ltd.
Vulcan Foundry Ltd.
Selection Industries Ltd.
Kuan Hin Tin Mines
Rungagora Tea Estates

POWER LAYOUT



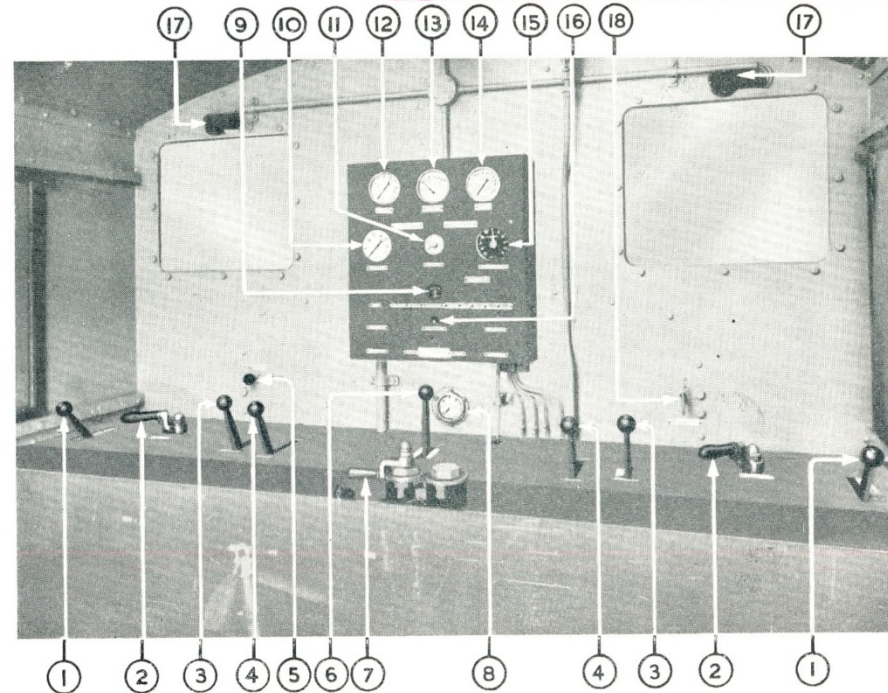
CAB INTERIOR

ARRANGEMENT OF CONTROLS.

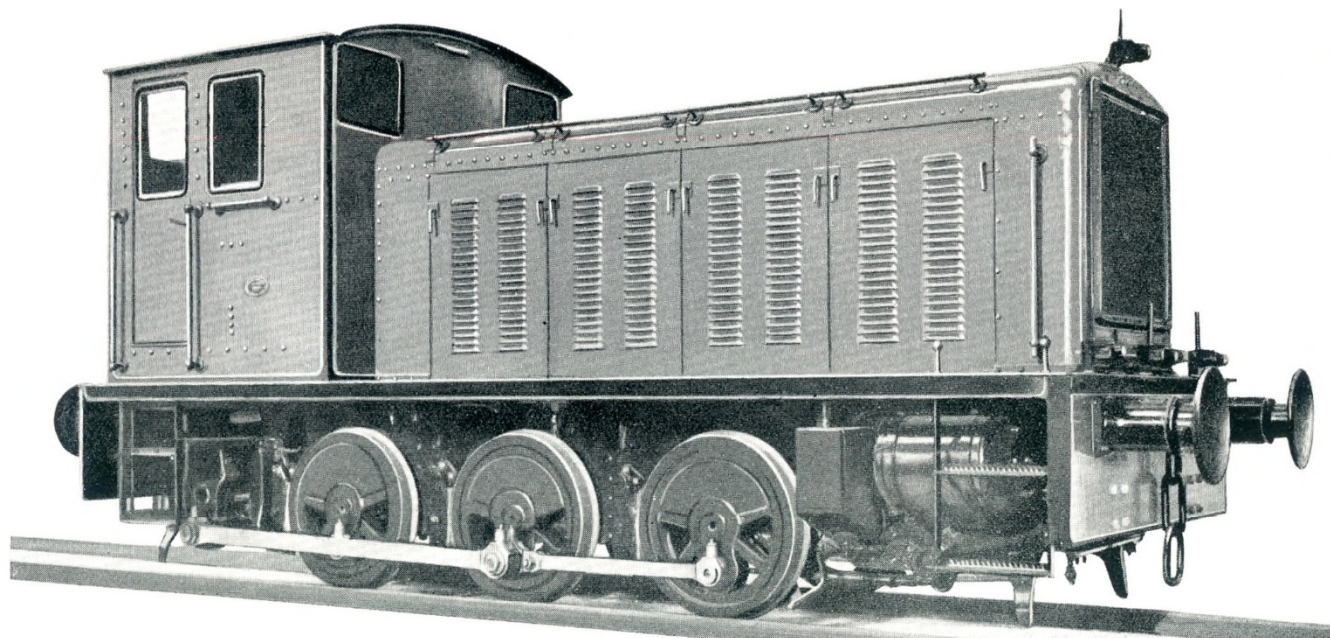
1. CHANGE SPEED LEVER
2. STRAIGHT AIR BRAKE VALVE
3. THROTTLE LEVER
4. REVERSE LEVER
5. ENGINE STOP CONTROL
6. SANDING LEVER
8. FUEL TANK GAUGE
9. AMMETER
10. ENGINE OIL PRESSURE
11. TACHOMETER
12. GEAR-BOX AIR PRESSURE
13. DUPLEX AIR PRESSURE GAUGE
15. SPEEDOMETER
16. ENGINE STARTER SWITCH
17. SCREEN WIPERS

SPECIAL CONTROL EQUIPMENT (IF REQUIRED)

7. AUTOMATIC AIR BRAKE VALVE
ALTERNATIVELY VACUUM BRAKE VALVE
14. AUTOMATIC AIR BRAKE GAUGE
ALTERNATIVELY VACUUM BRAKE GAUGE
18. RADIATOR SHUTTER CONTROL



204 H.P. BROAD GAUGE

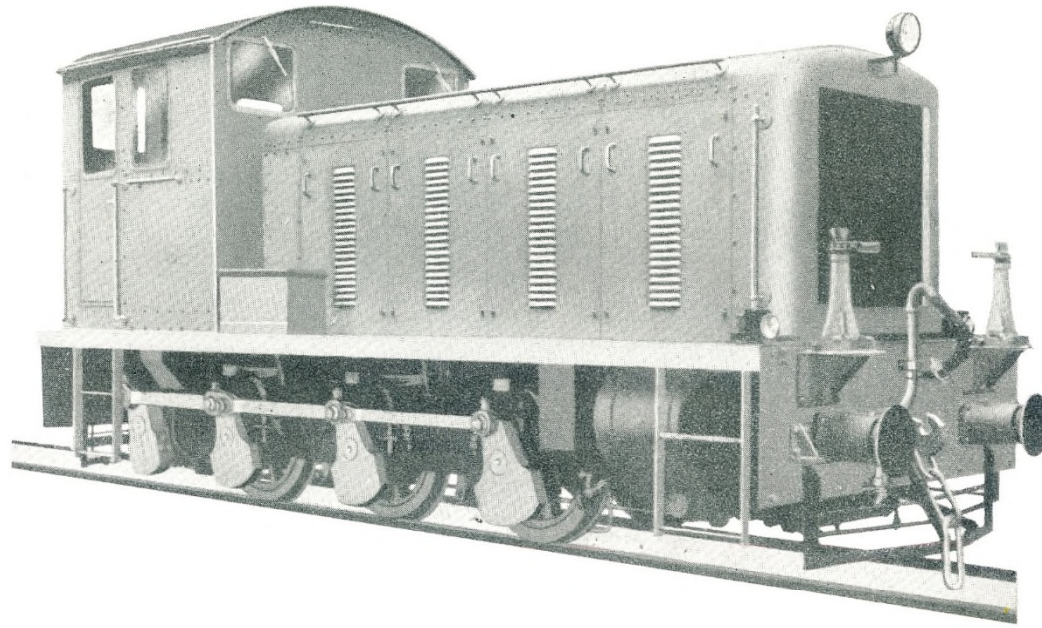


THE DREWRY CAR



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204 H.P. NARROW GAUGE



THE DREWRY CAR



COMPANY LTD.

PAGE 11

204 H.P. 0-6-0 TYPE LOCOMOTIVE GENERAL PARTICULARS

Gauges	One Metre to 5ft. 6ins.	Wheel, Diameter	3ft. 3ins.
Engine	"Gardner" 8L3 Type 204 B.H.P. at 1200 r.p.m. Traction Type Hydraulic Coupling.	Wheelbase	9ft. 0ins.
Transmission	Wilson-Drewry 5-speed Epi- cyclic Direct Air-operated Type. Spiral Bevel Reverse and Final Reduction Unit. Jack- shaft Mounted.	Length over Buffer Beams	22ft. 6½ins.
		Overall Width :	
		For One Metre to 4ft. 8½ins. Gauge	8ft. 6ins.
		For 5ft. 6ins. Gauge	9ft. 0ins.
		Overall Height	11ft. 4ins. to 12ft. 4ins.
		Weight in Working Order	26 to 30 tons approx.
		Fuel Capacity	225 gallons

The above General Particulars cover our Standard Locomotives and are subject to modifications as may be found desirable to meet special requirements or local conditions.



204 H.P. 0-6-0 TYPE LOCOMOTIVE PERFORMANCE

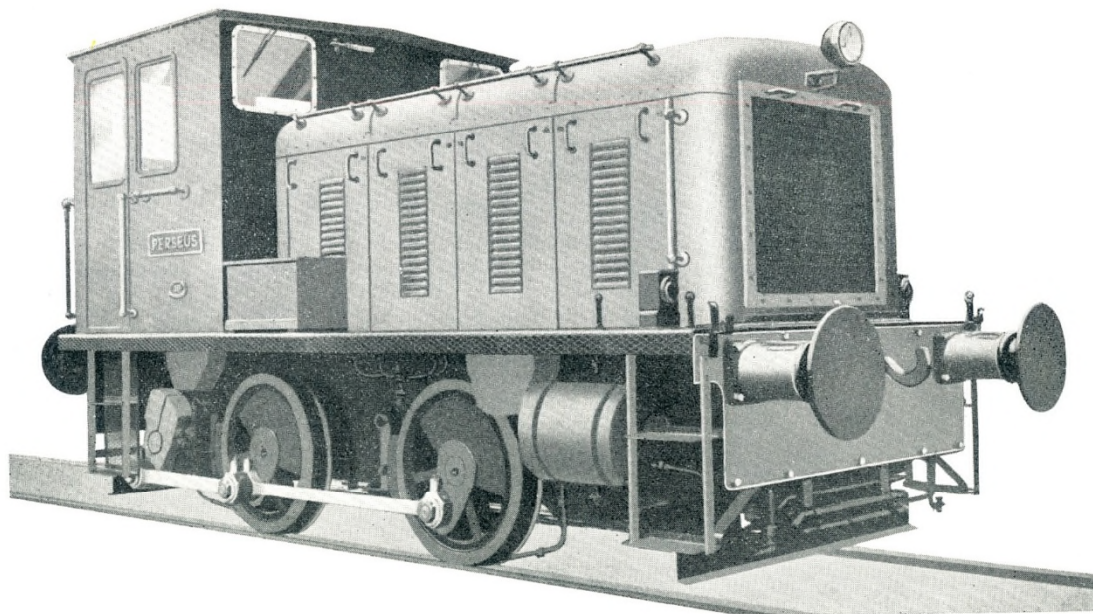
		With 8.47-1 Final Drive Ratio					With 9.82-1 Final Drive Ratio				
Speeds (m.p.h.) Forward and Reverse		4.0	6.9	10.3	16.0	30.0	3.4	5.9	8.9	13.8	25.8
Tractive Effort (lb.) (75% efficiency)		14550	8340	5540	3580	1920	16850	9700	6440	4150	2220
Load hauled in tons											
On level	tangent track	1180	665	432	268	130	1370	778	506	316	155
Up 1 in 200	„ „	597	329	209	124	53	698	388	247	148	65
Up 1 in 100	„ „	393	212	131	74	26	460	252	157	90	34
Up 1 in 75	„ „	317	168	102	55	15	371	201	123	68	23
Up 1 in 50	„ „	226	116	67	33	—	266	140	83	43	9

The above Tractive Efforts are based on a conservative mechanical efficiency of 75% at N.T.P. site conditions, and as these performance figures are obtained with maximum governed speed of the engine a reserve of Tractive Effort is available at maximum torque speed. These performance figures, however, would be reduced when working at an altitude or in tropical temperature as follows:

4% loss for every 1000 ft. above sea level and 1% loss for every 5° Fah. rise above 60° Fah.



153 H.P. BROAD GAUGE

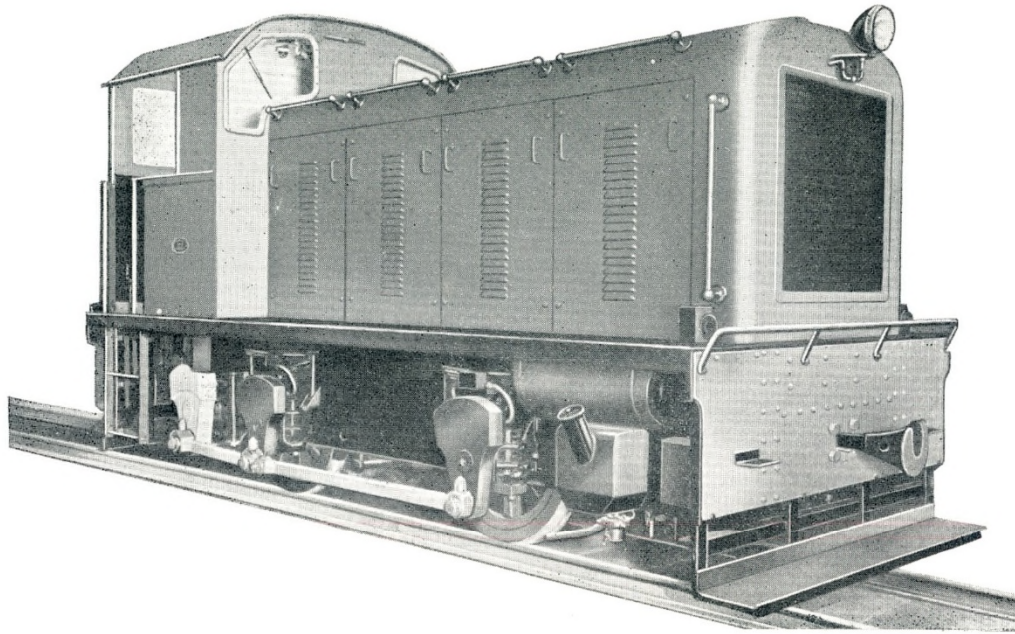


THE DREWRY CAR



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153 H.P. NARROW GAUGE



THE DREWRY CAR



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153 H.P. 0-4-0 TYPE LOCOMOTIVE GENERAL PARTICULARS

Gauges	One Metre to 5ft. 6ins.	Wheel, Diameter	3ft. 3ins.
Engine	"Gardner" 6L3 Type 153 B.H.P. at 1200 r.p.m. Traction Type Hydraulic Coupling.	Wheelbase	5ft. 9ins. or 7ft. 0ins.
Transmission	Wilson-Drewry 4-speed Epi- cyclic Direct Air-operated Type. Spiral Bevel Reverse and Final Reduction Unit. Jack- shaft Mounted.	Length over Buffer Beams	18ft. 0ins. to 18ft. 9ins.
		Overall Width :	
		For One Metre to 4ft. 8½ins. Gauge	8ft. 0ins. or 8ft. 6ins.
		For 5ft. 6ins. Gauge	9ft. 0ins.
		Overall Height	11ft. 4ins. to 12ft. 4ins.
		Weight in Working Order	20 to 23½ tons approx.
		Fuel Capacity	100 gallons

The above General Particulars cover our Standard Locomotives and are subject to modifications as may be found desirable to meet special requirements or local conditions.

THE DREWRY CAR



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153 H.P. 0-4-0 TYPE LOCOMOTIVE PERFORMANCE

	With 8·47-1 Final Drive Ratio				With 9·82-1 Final Drive Ratio			
Speeds (m.p.h.) Forward and Reverse	3·9	6·9	10·75	16·0	3·4	5·9	9·3	13·8
Tractive Effort (lb.) (75% efficiency)	10940	6250	4000	2780	12680	7250	4630	3110
Load hauled in tons								
On level tangent track	889	497	309	207	1031	579	362	235
Up 1 in 200 „ „	448	245	148	95	523	288	175	109
Up 1 in 100 „ „	294	157	92	56	344	186	110	66
Up 1 in 75 „ „	237	124	71	42	278	148	86	50
Up 1 in 50 „ „	168	86	46	25	199	103	57	30

The above Tractive Efforts are based on a conservative mechanical efficiency of 75% at N.T.P. site conditions, and as these performance figures are obtained with maximum governed speed of the engine a reserve of Tractive Effort is available at maximum torque speed. These performance figures, however, would be reduced when working at an altitude or in tropical temperature as follows:

4% loss for every 1000 ft. above sea level and 1% loss for every 5° Fah. rise above 60° Fah.



102 H.P. BROAD GAUGE

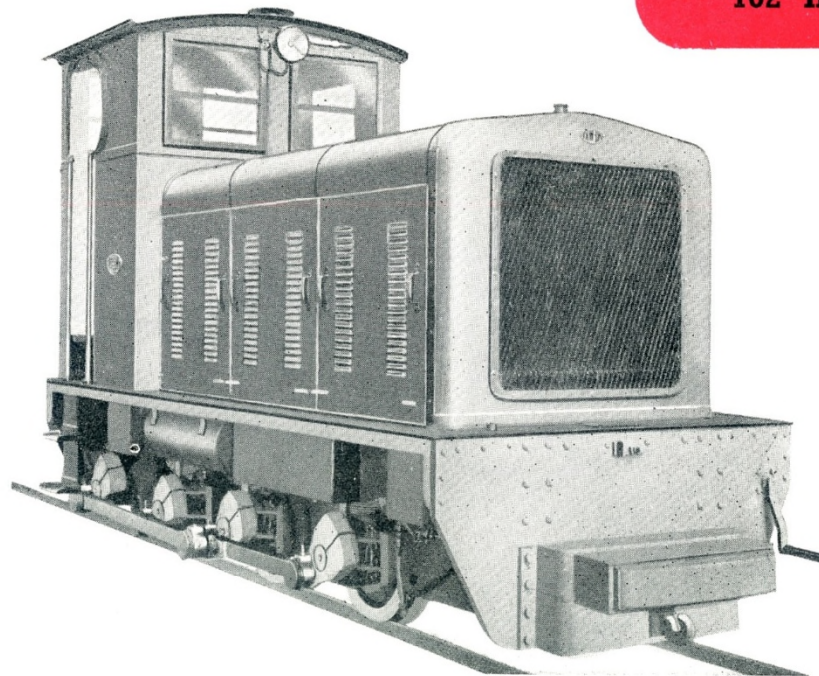


THE DREWRY CAR



COMPANY LTD.

102 H.P. NARROW GAUGE



THE DREWRY CAR



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102 H.P. 0-4-0 and 0-6-0 TYPE LOCOMOTIVE GENERAL PARTICULARS

Engine			
"Gardner" 6LW Type 102 B.H.P.			
at 1700 r.p.m.	Type	Gauges	Gauges
Traction Type	Wheel, Diameter	2ft. 0ins. to 3ft. 6ins.	3ft. 6ins. to 5ft. 6ins.
Hydraulic Coupling.	Wheelbase	0-4-0 and 0-6-0	0-4-0
Transmission	0-4-0 Type	2ft. 0ins.	2ft. 9ins.
Wilson-Drewry 4-speed Epi-	0-6-0 Type	5ft. 0ins.	6ft. 0ins.
cyclic Direct Air-operated	Length over Buffer Beams	6ft. 0ins.	—
Type.	Overall Width ^{(according} _{to gauge})	14ft. 2ins.	16ft. 9ins.
Spiral Bevel Reverse and	Overall Height	7ft. 0ins. or 7ft. 6ins.	7ft. 6ins. to 10ft. 0ins.
Final Reduction Unit. Jack-	Weight in Working Order	10ft. 0ins.	10ft. 0ins. to 12ft. 0ins.
shaft Mounted.	Fuel Capacity	12 tons approx.	12 to 15 tons approx.
		52 gallons	52 gallons

The above General Particulars cover our Standard Locomotives and are subject to modifications as may be found desirable to meet special requirements or local conditions.

THE DREWRY CAR



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102 H.P. 0-4-0 and 0-6-0 TYPE LOCOMOTIVE PERFORMANCE

	With 2 ft. 0 in. Dia. Wheels and 8·4-1 Final Drive Ratio				With 2 ft. 9 in. Dia. Wheels and 10·5-1 Final Drive Ratio			
Speeds (m.p.h.) Forward and Reverse	3·4	6·0	9·0	14·1	3·7	6·5	9·8	15·4
Tractive Effort (lb.) (75% efficiency)	8450	4780	3170	2030	7760	4420	2920	1860
	Loads hauled in tons							
On level tangent track	688	383	249	154	631	353	228	140
Up 1 in 200 " "	349	191	121	72	319	175	110	65
Up 1 in 100 " "	230	124	77	44	210	113	70	39
Up 1 in 75 " "	186	98	60	33	169	90	54	29
Up 1 in 50 " "	133	69	40	20	121	62	36	17

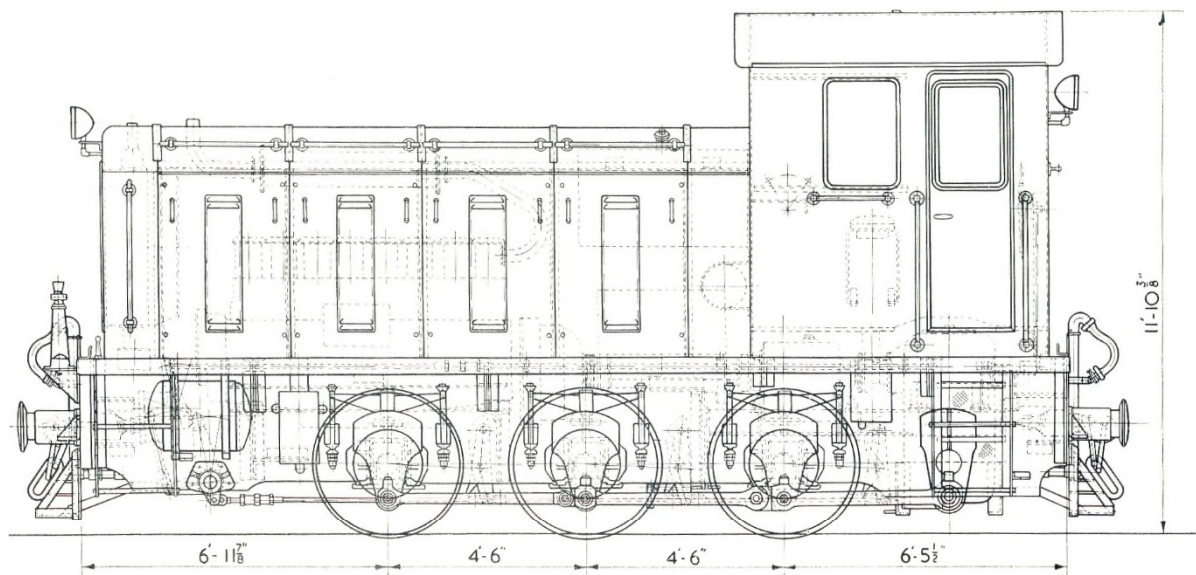
The above Tractive Efforts are based on a conservative mechanical efficiency of 75% at N.T.P. site conditions, and as these performance figures are obtained with maximum governed speed of the engine a reserve of Tractive Effort is available at maximum torque speed. These performance figures, however, would be reduced when working at an altitude or in tropical temperature as follows:

4% loss for every 1000 ft. above sea level and 1% loss for every 5° Fah. rise above 60° Fah.

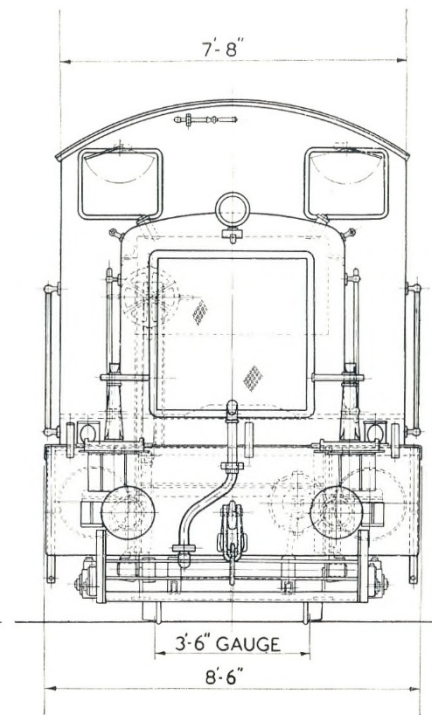
N.B. Final Drive Ratios between 8·4-1 and 10·5-1 can be arranged to suit customers requirements.



204 H.P. 0-6-0 TYPE LOCOMOTIVE



DRAWGEAR TO SUIT CUSTOMERS' REQUIREMENTS

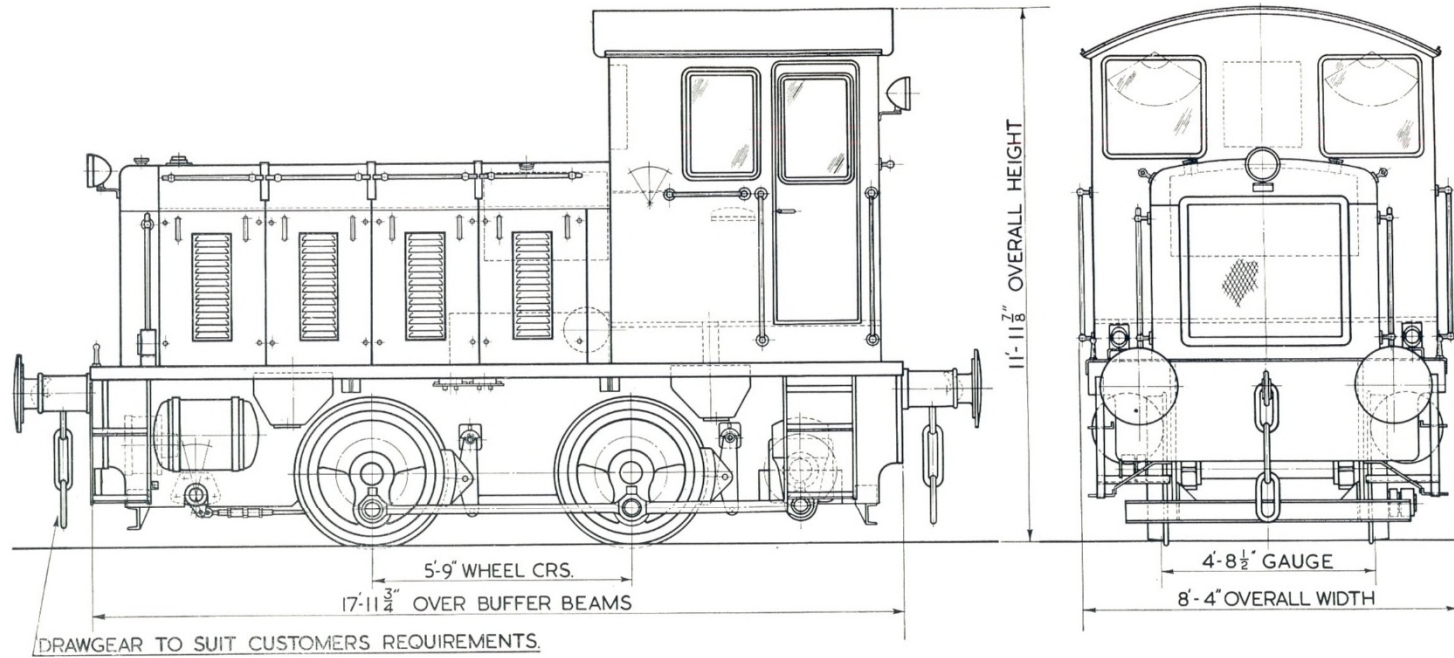


THE DREWRY CAR



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**153 H.P. 0-4-0 TYPE
LOCOMOTIVE**

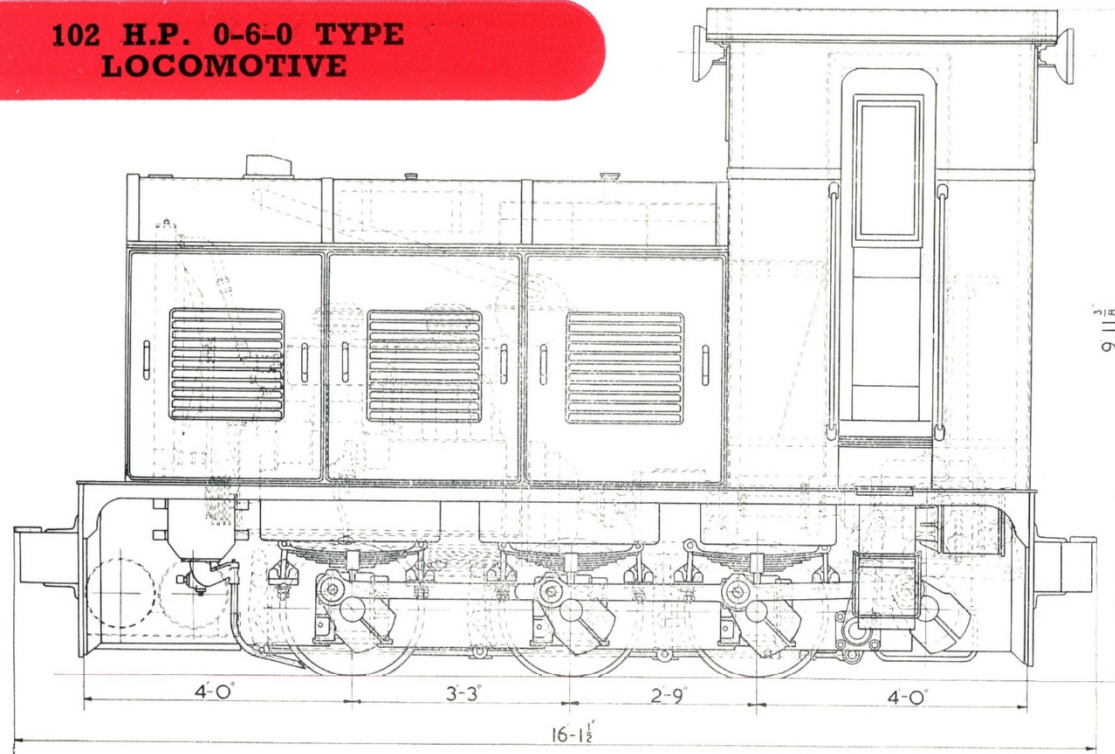


THE DREWRY CAR

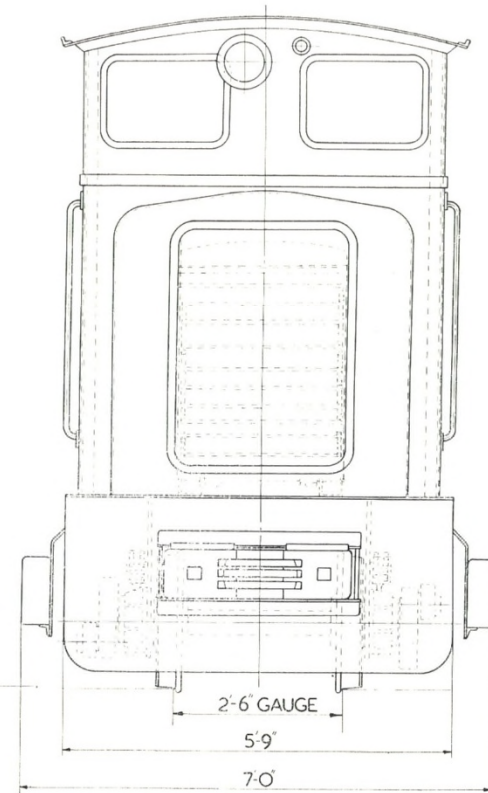


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**102 H.P. 0-6-0 TYPE
LOCOMOTIVE**



DRAWGEAR TO SUIT CUSTOMERS' REQUIREMENTS

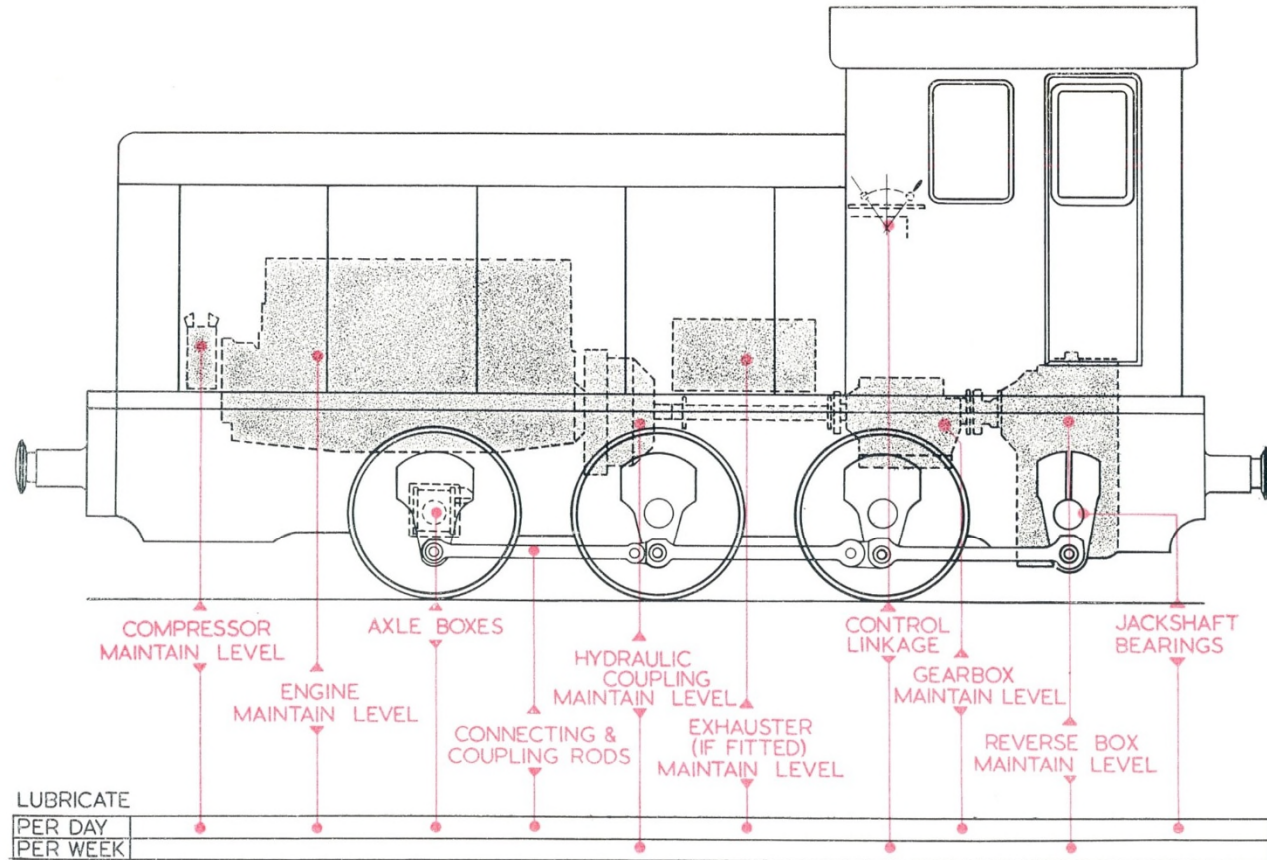


THE DREWRY CAR



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LUBRICATION DIAGRAM



OPERATION NOTES

Whilst there may be isolated cases when drivers will be required to attend to general maintenance, this work is usually the duty of maintenance-shop staff, and a comprehensive manual is provided for this purpose.

Drivers will, therefore, be given instructions by the appropriate authority for the handling of the locomotive and their duties and responsibilities will be determined by those instructions.

It is, however, important that both maintenance staff and drivers should have available for handy reference general information such as this booklet contains.

The reader will be familiar with the general details of construction of the locomotive and disposition of the engine and transmission units and auxiliaries from the preceding pages of illustrations, and we cannot too strongly stress the importance of cleanliness.

If machinery is kept clean it should follow that development of minor defects such as oil-, water- or air-leaks and slack mechanical connections will be observed and corrected before possible serious trouble can arise.

Drivers are provided with a roomy and comfortable cab with good vision in all directions, together with the most simple system of control, and are therefore working under much more favourable conditions than is the case with a steam locomotive.

The layout of the power unit renders all components as accessible as possible for lubrication and examination, and a lubrication diagram is given on page 25. Attention must also be given to topping-up of radiator and battery levels.

A card providing "Notes for Drivers", which gives essential information to be observed in the handling of the locomotive, is fixed in the cab.



OPERATION NOTES

A feature of the transmission is the inclusion of the traction-type Hydraulic Coupling in place of the usual friction clutch and it is important for users to understand how this functions.

At idling speed of the engine no useful torque is transmitted, but this rises very steeply as the engine is speeded up, to the extent that full engine torque can be transmitted to the driving wheels of the locomotive at zero speed.

This results in a very even starting torque under heavy load and is ideal for the purpose of "inching" wagons over a weigh-bridge and similar duties.

It will, however, be appreciated that if on any gear the tractive effort demanded to handle the load behind the locomotive is in excess of the tractive effort available, then the coupling will "slip", although the engine will continue to

develop its maximum torque output, which will be absorbed by the fluid in the coupling, with consequent overheating if persisted in.

The "Notes for Drivers" referred to above include a table of minimum and maximum speeds permissible on each gear. The minimum speeds correspond to the maximum torque speed of the engine, and if this cannot be maintained, the next lower gear must be engaged or, if in low gear, the load behind the locomotive must be reduced.

This procedure will prevent what we call "stalling" of the coupling and avoid overheating.

This speed-range table must therefore be strictly observed.

We include in this booklet tractive-effort speed tables, also tables showing the loads which can be hauled on level track and on varying gradients.



OPERATION NOTES

Drivers are instructed that, when the load is in motion, gear changes must be made progressively when changing up or down. This is particularly important when changing from a high gear to a lower gear.

The gear-box provides varying ratios, from an overdrive ratio of 1 to 1.87 in the case of a locomotive fitted with a five-speed gear-box, down to a reduction ratio of approximately 4 to 1 in bottom gear. If, therefore, to go to an extreme, a change was made under load from over speed to bottom gear, very severe "snatch" would take place and the engine would be seriously over-speeded, the whole of the transmission being subjected to heavy reaction loading which could cause serious damage.

On the other hand, it is not necessary always to start in bottom or lowest gear and, with experience,

drivers will be able to select a suitable gear in which the load for the time being can be started and accelerated. Provided the load behind the locomotive can be accelerated in a particular gear, then there is no danger of submitting the Hydraulic Coupling to excessive "slip" and consequent risk of overheating.

Gear changing requires no special skill such as is the case with the conventional arrangement of friction clutch and layshaft type of gear-box. Gear is engaged while the locomotive is at rest and while the brake is applied, and the locomotive will move off on releasing the brake and opening the throttle, following which higher or lower gears are engaged depending upon load and speed requirements.

Neutral gear should not be engaged until after the locomotive has been brought to rest.

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OPERATION NOTES

When negotiating long down-grade sections do not engage neutral gear and "coast" but remain in high gear. This is a precautionary measure designed to ensure that there will be no risk of a low gear being engaged at speed and, moreover, provides the advantage of the "braking" effort of the engine. On no account must the gear-box be used to provide additional braking by engaging a low gear from a high gear.

The Wilson-Drewry epicyclic gear-box is of the direct air-operated type, in which changes in ratio are obtained by admitting air through a four- or five-way control valve to separate operating-cylinders which contract the brake bands of the gear-train required, through toggle mechanism which is provided with an automatic device which takes care of adjustment for wear in the brake linings. Details of the gear-box are fully described

in the maintenance manual which includes sectional drawings of all details.

Gear changing is positive and practically instantaneous and is effected merely by moving a control lever from one gear position to another and, as already explained, the Hydraulic Coupling replaces the usual friction clutch in the engine flywheel.

It will be appreciated that it is important to avoid any undue "slip" on the epicyclic brake bands, and on this account the capacity of the operating-cylinders and the rate of operating pressure has been selected to ensure positive grip of the brake bands, with the minimum of "snatch".

Drivers and maintenance staff should therefore check that the automatic adjusting device continues to function satisfactorily and that undue "slip" is not allowed to develop.



OPERATION NOTES

Drivers are warned in the "Notes" referred to that indirect gears should be engaged and disengaged about five times each at the end of every day's run.

Any tendency to "slip" will be easily detected by drivers by a softening of the rate of take-up on engaging a particular gear, and if this occurs he should report to the maintenance staff who should check the adjustment as described in the instruction manual.

Care should be taken to ensure that the correct oil level is maintained (which will generally be a maintenance-staff responsibility), and drivers may safely rely upon the transmission responding to control requirements and load demands. It is, however, only prudent to ensure the satisfactory performance of the locomotive that drivers should be familiar with what takes place following move-

ment of the control levers and thus be in a position to report defects, however unlikely these may be.

Like the gear-box control, the reverse control is air-operated, and a mechanical interlock is provided so that the reverse gear lever can only be moved after neutral gear has been engaged, but it is most important to remember that the reverse lever must not be moved from one position to the other until the locomotive has been brought to rest.

Change of direction is effected by the movement of a sliding dog-clutch between two bevel wheels, and unless these bevel wheels are at rest the internal teeth of the sliding dog will "ratchet" and fail to engage.

Provided air for control operation is available this dog-clutch will always follow the movement of the reverse control lever.



OPERATION NOTES

If, however, the controls are interfered with by some unauthorised person after the driver has shut down the locomotive and when air is not available, the dog-clutch will not follow the movement of the control lever.

Consequently, should the engine later be started up under the above conditions, the sliding dog would begin to move over as air pressure slowly builds up and "ratcheting" could result.

To avoid this possibility a cock is provided which isolates the reverse control valve; this cock must always be closed by drivers after shutting down the locomotive and it must not be opened until full control pressure is available. The following general advice to drivers should be strictly observed:

Do not attempt to drive the locomotive unless correct pressures are registered on the gauges:

Engine oil pressure.

Control air pressure.

Brake air pressure or vacuum.

If your duty requires you to attend to lubrication, proceed in accordance with lubrication diagram, page 25, and also check contents of fuel tanks as registered on fuel gauge in cab, also check correct adjustment of auxiliary driving belts:

Fan drive.

Compressor and/or exhauster drive.

Dynamo drive.

Do not fail to report at all times any unusual symptom and ensure that it is attended to at once.



OPERATION NOTES

Remember that, whilst drivers will be free from anxiety so long as the locomotive continues to function properly, such a condition is dependent upon reasonable maintenance attention and the prompt reporting of any sign of defect.

Maintenance staff are entirely dependent upon drivers' reports, without which suitable action cannot be taken in time to ensure completely satisfactory service of Drewry locomotives or, for that matter, any other piece of machinery.

Drewry locomotives, because of the care taken with the design and the simplicity of the control

system, will continue to give satisfactory service in spite of abuse in handling but, ultimately, failure must result, with consequent unnecessarily high cost of maintenance. This is a fact which will be fully appreciated by all concerned in the employment of machinery.

We have therefore endeavoured in these remarks briefly to explain the main features in the design and operation of Drewry locomotives, and it is our sincere hope that this booklet will be found of service not only to those already operating our locomotives but to prospective customers.



QUESTIONNAIRE

Local climatic conditions, i.e. altitude, temperature, and humidity, all affect the performance of compression-ignition type engines, and it is important that the fullest possible data should accompany all enquiries. To enable us, therefore, to determine the size and type of Diesel Locomotive most suitable for any given set of conditions, kindly complete the following Questionnaire and forward to us.

1. Gauge of track
2. Weight of rails in use or maximum permitted axle load
3. The steepest gradient and length of same
4. (a) Maximum load to be hauled on level track
- (b) Maximum speed at which this load is to be hauled
5. (a) Maximum load to be hauled up steepest gradient

THE DREWRY CAR



COMPANY LTD.