

BRITISH RAILWAYS

(North Eastern Region)

INSTRUCTIONS IN CONNECTION WITH THE WORKING OF ELECTRIC TRAINS ON THE TYNESIDE ELECTRIFIED LINES

In operation from 1st October, 1961

(Booklet dated 1st May, 1952 and Booklet headed "Instructions to Motormen in connection with the working of Electric Trains on the Tyneside Electrified Lines" dated March, 1947, are hereby cancelled)

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Each employee supplied with this book must make himself acquainted with, and will be held responsible for the observance of, the following instructions.

All Rules and Regulations applicable to the movement of trains also apply to electric trains except as otherwise provided herein.

GENERAL INSTRUCTIONS

Lines equipped
for electric
traction and
means of
transmitting
electrical
energy.

1.—These instructions apply to the following lines:—

Main lines between Newcastle and Benton Quarry ~~signal box~~ and from there to Benton station via the South West curve and Benton East via the South East curve.

Manors and Tynemouth via Backworth including Gosforth car sheds.

Heaton and Tynemouth via Wallsend.

The Riverside and Quayside branches.

~~Newcastle and South Shields branch~~

Supply of
electrical
energy and
sectioning of
third rail

2.—Electrical energy is obtained from the North Eastern Electricity Board supply by high tension cables connected to British Railways sub-stations at Wallsend, Pandon Dene, *Gosforth East, Benton, *Earsdon Grange, Cullercoats, Percy Main, *Gateshead, *Pelaw, *Jarrow and *Tyne Dock.

(*indicates unattended).

Electrical energy is fed from these sub-stations to the third rail and overhead wires by feeder cables.

The Chief Mechanical & Electrical Engineer is responsible for controlling the supply of electrical energy to the third rail and overhead wires. A Control Operator is stationed continuously in an Electric Control Room situated adjacent to Wallsend sub-station and controls all switching operations. Telephone communication with the Electric Control Operator is available as follows:—

**North Tyneside
Area**

**South Tyneside
Area**

Direct line Special circuit

Various Omnibus circuits Emergency circuit via
Newcastle Telegraph
Office

P.O. Wallsend 623471 ... P.O. Wallsend 623471

note. 611234/2340

Electrical energy is transmitted to trains through a third rail, except for sidings above and below the Quayside tunnel which are equipped with overhead wires. The third rail and overhead wires are charged at approximately 630 volts and safety precautions apply equally to both.

The third rail is divided into sections as shown below, each section being known by a number. In all cases where reference is being made to a section, care must be exercised to ensure that a clear understanding exists as to which section is under notice. Switches and circuit breakers are suitably marked on the various switch boards.

PASSENGER LINES					
Section No.	Situation of Switch	Section From	To	Line	Situation of Switch
P. 1		Buffer ends No. 1 platform	End of No. 1 platform	Platform	Platform switch chamber at end of Newcastle station Fish Dock.
P. 2		Buffer ends No. 2 platform	End of No. 2 platform	do.	do.
P. 3		Buffer ends No. 3 platform	End of No. 3 platform	do.	do.
P. 4		Buffer ends No. 4 platform	End of No. 4 platform	do.	do.
P. 5		Buffer ends No. 5 platform	End of No. 5 platform	do.	do.
P. 6		Buffer ends No. 6 platform	Diamond crossing	do.	do.
Section Nos. P. 1	to P. 6 refer to platform lines in Newcastle station.				
7	Newcastle third rail sectioning cabin East of station	Newcastle station	Manors station	Down main	Manors third rail sectioning cabin.
8	do.	do.	do.	Up main	do.
9	do.	do.	do.	Down Tynemouth	do.
10	do.	do.	do.	Up Tynemouth	do.

Hook switches are mounted on third rail sections Nos. 7, 8, 9 and 10 at Dean Street viaduct whereby the portions of these sections to the East and West of this point may be disconnected from one another.

Section No.	Situation of Switch	From	Section To	Line	Situation of Switch
11	Manors third rail sectioning cabin	Manors station	Riverside signal box <i>g.c.</i>	Down main	Riverside third rail sectioning cabin
12	do.	do.	do.	Up main	do.
13	do.	do.	do.	Down Tynemouth	do.
14	do.	do.	do.	Up Tynemouth	do.
15	Riverside third rail sectioning cabin	Riverside signal box <i>g.c.</i>	Heaton South signal box <i>g.c.</i>	Down main	Heaton South third rail sectioning cabin
16	do.	do.	do.	Up main	do.
17	do.	do.	do.	Down Tynemouth	do.
18	do.	do.	do.	Up Tynemouth	do.
19	Heaton South third rail sectioning cabin	Heaton South signal box <i>g.c.</i>	Point on Benton S.W. curve	Down main	Benton sub-station
20	do.	do.	do.	Up main	do.
21	do.	do.	Point East of Wallsend station	Down Tynemouth	Wallsend sub-station
22	do.	do.	do.	Up Tynemouth	do.
23	Riverside third rail sectioning cabin	Riverside signal box <i>g.c.</i>	Walker signal box	Down Riverside	Walker third rail sectioning cabin
24	do.	do.	do.	Up Riverside	do.

Section No.	Situation of Switch	Section From	To	Line	Situation of Switch
25	Walker third rail sectioning cabin	Walker signal box	Point East of Carville station	Down Riverside	Wallsend sub-station
26	do.	do.	do.	Up Riverside	do.
27	Wallsend sub-station	Point East of Wallsend station	Point West of Percy Main station	Down Tynemouth	Percy Main sub-station
28	do.	do.	do.	Up Tynemouth	do.
29	do.	Point East of Carville station	do.	Down Riverside	do.
30	do.	do.	do.	Up Riverside	do.
31	Percy Main sub-station	Point West of Percy Main station	Tynemouth South signal box	Down Tynemouth	Tynemouth third rail sectioning cabin
32	do.	do.	do.	Up Tynemouth	do.
33	Tynemouth third rail sectioning cabin	Tynemouth South signal box	Point North of Cullercoats station	Down Tynemouth	Cullercoats sub-station
34	do.	do.	do.	Up Tynemouth	do.

Sections 33 and 34 are continued through the platform lines. On leaving Tynemouth station the UP line becomes the DOWN line and the DOWN line becomes the UP line.

35	Cullercoats sub-station	Point North of Cullercoats station	Point East of Backworth signal box	Down	Earsdon Grange sub-station
36	do.	do.	do.	Up	do.
37	Earsdon Grange sub-station	Point East of Backworth signal box	Point East of Benton station	Down	Benton sub-station
38	do.	do.	do.	Up	do.

Section No.	Situation of Switch	From	Section To	Line	Situation of Switch
39	Benton sub-station	Point East of Benton station	Point North of South Gosforth East signal box	Down	Gosforth East traction sub-station
40	do.	do.	do.	Up	do.
41	Gosforth East traction sub-station	Point North of South Gosforth East signal box	Point North of Manors North station	Down	Pandon Dene sub-station
42	do.	do.	do.	Up	do.
43	Pandon Dene sub-station	Point North of Manors North station	West end of Manors North station	Down	Manors third rail sectioning cabin
44	do.	do.	do.	Up	do.
45	South Gosforth East switch chamber	South Gosforth East signal box	South Gosforth West signal box	Down	South Gosforth West switch chamber
46	do.	do.	do.	Up	do.
47	South Gosforth West switch chamber	South Gosforth West signal box	Point North of South Gosforth station	Down	South Gosforth emergency switch pillar
48	do.	do.	do.	Up	do.
49*	Chamber at Heaton East signal box	Heaton East signal box	Benton Bank signal box	Down Goods	
50*	do.	do.	do.	Up Goods	
*Goods lines used by passenger trains in emergency only.					
52		East end of Nos. 4, 5 and 6 platforms, Newcastle station	Diamond crossing	Up and Down	Platform switch chambers at end of Newcastle station Fish Dock.

Section No.	Situation of Switch	From	Section To	Line	Situation of Switch
53	Newcastle third rail sectioning cabin East of Newcastle station	North end of High Level bridge	Point West of St. James' bridge signal box	Down	Gateshead sub-station
53A	Hook switch mounted on Section 53A at North end of High Level bridge	North end of High Level bridge	South end of High Level bridge	Down Slow	Hook switch 70 yards North of North end of Gateshead East station
54	Central third rail sectioning cabin East of Newcastle station	North end of High Level bridge	Point West of St. James' bridge signal box	Up	Gateshead sub-station
55	Gateshead sub-station	Point West of St. James' bridge signal box	Pelaw signal box	Down	Pelaw sub-station
56	do.	do.	do.	Up	do.
On leaving Pelaw the UP line becomes the DOWN line and the DOWN line becomes the UP line.					
57	Pelaw sub-station	Pelaw signal box	Point East of Pontop signal box	Down	Jarrow sub-station
58	do.	do.	do.	Up	do.
59	Jarrow sub-station	Point East of Pontop signal box	Harton signal box	Down	Tyne Dock sub-station
60	do.	do.	do.	Up	do.
61	Tyne Dock sub-station	Harton signal box	South Shields signal box	Down	Switch chamber adjacent to South Shields signal box
62	do.	do.	do.	Up	do.

The following crossovers between Newcastle and South Shields must not be used by electric trains because of the arrangement of the third rail :—

Pontop, No. 1 crossover (West end)

Jarrow, crossover near entrance to Shell Mex branch

Jarrow, crossover at West end of station.

All other crossovers on this branch can be used by electric trains including the two following which, although not electrified, can be used in emergency by coasting the train through :—

Pontop, crossover No. 2 (East crossover near bridge No. 7)

Hilda signal box.

GOODS LINES, DOCK LINES AND SIDINGS

NEWCASTLE STATION—*Fish Dock, Horse Dock and siding lines.* Supply is derived from the lines between Newcastle station and Manors station, and between Newcastle station and Gateshead station. The switch is situated in the platform switch chamber at the end of Fish Dock.

MANORS NORTH STATION—*Bay Platform lines and Down Goods line.* Supply is derived from Section 43 or 44. The switch for selecting supply from 43 or 44 is situated in Manors North signal box. The switches for individual control of the respective lines are situated in a switch chamber between Nos. 4 and 5 Platform lines.

MANORS STATION AND NEWCASTLE QUAYSIDE—
Trafalgar Yard and Quayside lines. Supply is normally taken direct from Pandon Dene sub-station but can be taken from section 14. The switch for selecting supply from Pandon sub-station or section 14 is situated in a switch chamber near the mouth of Quayside Tunnel. To obtain supply from Pandon sub-station the switches at the following points must be closed:—

Pandon Dene sub-station.

Switch pillar at North end of Manors North No. 1 platform.

Switch pillar under Argyle Street bridge.

Switch pillar *on down line of line near*
~~outside Argyle Street signal box.~~
connection to Trafalgar dock Yd.

The switches for individual control of the Quayside tunnel third rail and Trafalgar Yard overhead lines are situated in the switch chamber near the mouth of the Quayside tunnel. The supply for the Trafalgar Yard Grain Dock overhead lines is derived from Trafalgar Yard overhead lines and the switch is situated in a switch box on a pole at the East end of the Grain Dock.

The supply for the Quayside overhead lines is derived from the Quayside tunnel third rail and the switch is situated in a switch chamber at the lower end of the Quayside tunnel.

HEATON EAST (WALKER GATE)—Down Goods line.
Supply is obtained from Section 21 by means of a switch situated in the switch chamber adjacent to Heaton East signal box.

HOWDON-on-TYNE STATION—Station siding. Supply is obtained from section 28 by means of a switch situated in a switch pillar adjacent to Howdon-on-Tyne signal box.

NORTH SHIELDS STATION—*Siding and Carriage Dock.* Supply is obtained from Section 32 by means of a switch situated in a switch pillar at the West end of the Up platform.

TYNEMOUTH STATION—*Down Main line. Platform lines 4 & 5 and Platform line 6 & Fish Dock.* Supply is obtained from section 33 or 34 by means of a switch situated in a switch pillar between Nos. 5 & 6 Platform lines, which also houses the three switches for the individual control of the above lines.

Up Main line and Platform lines 1, 2 and 3. Supply is obtained from section 33 or 34 by means of a switch situated in a switch pillar at the North end of the Up platform which also houses the two switches for the individual control of the above lines.

CULLERCOATS STATION—*Sidings.* Supply is obtained from section 33 by means of a switch situated in a switch pillar on the Down side, North of Cullercoats Station.

MONKSEATON STATION—*Shunting neck, No. 1 Standage siding, No. 2 Standage siding, Cattle Dock siding and Horse & Carriage siding.* Supply for the shunting neck, No. 1 Standage siding and No. 2 Standage siding can be taken from section 35 or 36 by means of a switch situated in a switch chamber at the east end of the Up platform, which also houses the three switches for the individual control of these siding lines. Supply to the Cattle Dock Siding is obtained from No. 1 Standage siding by means of a switch in a switch pillar adjacent to Monkseaton ~~East~~ signal box. Supply to the Horse & Carriage siding is obtained from Section 35 by means of a switch situated in a switch pillar at the East end of the Down platform.

SOUTH GOSFORTH EAST—*East Car shed lines and approach roads.* Supply is normally taken from Gosforth East traction sub-station via the switchboard in the South Gosforth East switch chamber or from the Car Sheds sub-station when the Gosforth East traction sub-station bus-bars are "DEAD".

Supply is normally taken from Gosforth East Traction sub-station via a switch in the S.O. Gos East Switch Chamber, a connecting cable, designated East to West Switch Chamber's pillar is a switch in the S.O. Gos West Switch Chamber or from the Gosforth East Traction sub-station bus bars when the Gosforth East Traction sub-station bus bars are DEAD.

Two switches are provided on the switchboard in South Gosforth East switch chamber, one of which controls the East Car Shed approach road for East Car shed lines North Independent, 1a and 1 to 8 and the other controls the East Car Shed approach roads for East Car shed lines 9 to 12. South Independent and New Lines 13 to 16. A hook switch is installed on the third rail of each Approach Road, the operation of which connects or disconnects that associated Approach Road from or to its associated lines.

Only the North Independent East End and East Car shed lines 1a and 1 to 8 and associated Approach Road can be made "ALIVE" directly from the Car Sheds sub-station where a switch is provided. To obtain a supply to East Car shed lines 9 to 12, South Independent East End, New East Car shed lines 13 to 16 and associated Approach Roads from this source, both the above mentioned switches in South Gosforth East switch chamber must be closed.

The New East Car shed lines 13 to 16 and South independent third rails are extended to a switch pillar midway between the East and West ends of Car Shed, namely the Middle switch pillar.

SOUTH GOSFORTH WEST—West Car shed lines and approach roads. Supply can be taken from sections 45, 46, 47 and 48 via the switchboard in South Gosforth West switch chamber or from Car Sheds sub-station when the Gosforth East Traction sub-station bus-bars are "DEAD".

Supply to sections 47 and 48 may be obtained in an emergency from sections 41 and 42 respectively by means of switches in a switch pillar adjacent to the Down line at the North End of South Gosforth station.

A switch is provided at South Gosforth West switch chamber which controls the West Car Shed approach road

for West Car shed lines, North Independent 3 to 8, 9 to 12, South Independent 13 to 16. A "hook" switch is installed on the third rail of each group Approach Road, the operation of which connects or disconnects that associated Approach Road to or from its associated Group Lines.

The North Independent West End, South Independent West End and all the West Car shed lines can be made alive from the Car Sheds sub-station, where a switch is provided for this purpose.

The West End South Independent and West End New Lines 13 to 16 third rails terminate at the West switch pillar which is situated at the South West corner of the car sheds and by the operation of the appropriate switches, in this switch pillar, all suitably labelled, supply can be extended to the third rails running between the West End and centre of the Car Sheds.

SOUTH GOSFORTH CAR SHEDS—East Car shed lines 1 to 8 may be coupled to West Car shed lines 3 to 8 by closing the two switches in the Car Sheds sub-station irrespective of whether the sub-station is supplying power or not.

PELAW STATION—*Station siding.* Supply is obtained from section 55 by means of a switch situated in a switch pillar at the East end of the island platform.

HEBBURN STATION—*Up Goods line.* Supply is obtained from section 58 by means of a switch situated in a switch pillar West of Hebburn station on the Up side.

JARROW STATION—*Down siding.* Supply is obtained from section 59 by means of a switch situated in a switch pillar West of Jarrow station on the Down side.

GARDEN LANE (SOUTH SHIELDS)—*Nos. 1 & 2 Carriage Sidings.* Supply is obtained from section 62 by means of two switches situated in a switch pillar adjacent to Garden Lane signal box.

SOUTH SHIELDS—*Middle Road, Sidings 1 & 2, Sidings 3 & 4, and Sidings 5 & 6.* Supply can be obtained from either section 61 or 62 by means of a switch situated in a switch chamber adjacent to South Shields signal box which also houses the four switches for the individual control of the above lines.

When not in use, or in case of accident, individual sections of third rail can be made dead by having all the section feed point switches opened. The ends of these sections are indicated by the protection boards being painted red for a length of 12 feet. Up and Down lines can be made dead separately.

The term "Switch open" means that the switch contacts are apart thereby breaking the path of the electric current. The term "Switch closed" means that the switch contacts are closed together, thereby completing the path for the flow of electric current.

Third rail and
connections.

3.—(a) The third rail is usually placed in the 6 ft. way, sometimes outside the tracks, but never in the 4 ft. way. Mounted on porcelain insulators it is elevated slightly above the track rails. Timber protection boards painted white are attached to the rail where necessary, while at the section ends the protection boards are painted red. At various points the rail is anchored to the sleepers by strain insulators, known as anchor insulators.

(b) Electrical continuity is maintained over the gaps within the respective third rail sections by

Continuity Cables, the ends of each cable being marked near the terminals with the section number and cable number. These cables are separately numbered on each section; those on even numbered sections have even numbers and those on odd numbered sections have odd numbers.

A Section can be sub-divided by disconnecting the continuity cables. **BOTH TERMINALS OF THE CABLE MUST BE DISCONNECTED.** In the case of the dolly type terminal the set screws must be taken out and the bond lifted up clear of the metal cap and prevented, by some insulating material, from restoring contact. The bonds should not be allowed to make contact with ballast. In the case of the Callender connectors the cable terminal nuts must be unscrewed from the large bolt and the cable taken off. The cable socket must be prevented from coming in contact with the third rail, track rail or ballast.

Whenever possible disconnection should only be done when the rail is "dead", but in any case both ends of the cable must be disconnected as stipulated above.

4.—(a) Current is taken from the third rail by the collector shoes of the trains. It passes through the electrical equipment and the motors to the

Normal path
of current.

wheels, whence it is led back to the sub-stations by the track rails, which are suitably bonded for the purpose. In addition, a negative rail laid in the centre of the four-foot way, and bonded to the track rails to assist in carrying the current back to the sub-stations, is provided at various places. After leaving the apparatus on the trains, and reaching the track rails, the current is not dangerous.

(b) Where the normal path of the current is disturbed, a short circuit may be set up, which has harmful effects, and needs to be quickly remedied. A disturbance may be caused by conductive substances connecting the third rail with the ballast, track rails, or other track metal work.

Lines and sidings to be kept clear of material and refuse.

5.—Lines, sidings and yards must be kept clear of spare material, scrap, refuse and dirt to avoid risk of interference with current in the third rail.

Spare material must be returned promptly to the proper store and scrap must be placed in bins provided for the purpose. Proper receptacles must be kept at each station for dirt and refuse.

A shunter's pole must be kept at each signal box for removing articles from the rails. DRY wood may also be used for this purpose.

Grass near cables must be kept short to minimise the risk of fire damage.

6.—(a) When trains are approaching, staff working on the line must at once move clear to the outside of the lines and on no account stand in the six-foot way. Rules 15 and 234 are modified accordingly.

Safety of Staff
working on
the line.
Rules 15 and
234.

A Ganger or man in charge must not allow his men to work singly more than is necessary.

Staff must not cross the third rail more than is absolutely necessary in the course of their duties.

(b) IT MUST ALWAYS BE ASSUMED THAT THE THIRD RAIL AND ITS CONNECTIONS ARE ALIVE UNLESS IT HAS BEEN MADE "DEAD" IN ACCORDANCE WITH INSTRUCTION 67.

**CAUTION
AGAINST
ELECTRIC
SHOCK.**

When one shoe of a train is in contact with the third rail all other shoes are alive. Care must be taken not to touch a shoe when stepping from an electric train on to the permanent way or from the permanent way to an electric train.

(c) Before doing any work in connection with the third rail, staff must protect themselves from electrical contact by means of the safety equipment provided.

Means of
ensuring safety
to be used.

All staff required to work on electrified lines must be provided with rubber gauntlets and each permanent way gang with a rubber mat or other insulating equipment.

Persons in charge must see that men are aware of the danger of touching the third rail, or other conductive material, and must see that men working near the third rail use insulated tools and insulating equipment.

A pair of rubber gauntlets and two bags of dry sand must always be available at each station and signal box.

Wet or damaged
gauntlets.

(d) A damaged gauntlet is dangerous, as also is a wet one when moisture extends as far back as the wrist. All damaged gauntlets must be replaced at once.

Gauntlets or
mat not
available in
emergency.

(e) In default of rubber gauntlets or mat, a non-conductive medium should be improvised in case of emergency. Dry wood, or several thicknesses of dry woollen, cotton or paper material may be used.

Treatment for
shock.

(f) In case of any person suffering electric shock, treatment must immediately be given in accordance with the instructions in Appendix B.

Commence-
ment of traffic.

7.—(a) When power is required for electric traction the Electric Control Operator will advise the Signaller in charge of the section concerned that the third rail is about to be made alive.

Cessation
of traffic.

(b) As soon as the running of electric traffic has ceased on each section, the Signaller in charge of

the section must report the fact to the Electric Control Operator, giving the number of the section. The Electric Control Operator will then arrange to make the necessary section or sections dead, advising the Signaller in charge of the section or sections accordingly.

8.—Line leakage test of all sections of third rail except the Car Shed Lines, Sections P1, P2, P3, P4, P5, P6, 52 and the Fish Dock Lines will be made each Thursday morning. After cessation of traffic on Wednesday, all section switches will remain closed until instructions to open them are received from the Electric Control.

Line leakage test.

9.—The 1937 stock comprises articulated twin-coach units, each unit being made up of two coaches carried on three bogies one of which is a motor bogie. The units are coupled together by means of centre cowhead couplers and short screw couplings. Side Buffers are not provided. The coaches are fitted with the Westinghouse Electro-pneumatic Brake.

Electric rolling stock.

There are also two Luggage Motor Driving Second Class Passenger Coaches (non-articulated). Each coach is carried on two motor bogies. These coaches have side buffers as well as the centre cowhead coupler and can be attached to other 1937 electric stock or to non-electric stock. The coaches are fitted with the Westinghouse Electro-pneumatic Brake only.

In addition, there are two Motor Driving Parcels Vans for the conveyance of luggage, etc. Each van is carried on two motor bogies and is provided with side buffers as well as the centre cowhead coupler. The vans can be attached to other **1937** electric stock or to non-electric stock. The vans are fitted with the Westinghouse Electro-pneumatic Brake and with the Vacuum Brake.

The **1951** stock comprises fifteen two-car units each having one motor coach, with driving cab and guard's compartment, and one driving trailer coach. The motor and trailer coaches are coupled by a three link coupling with short centre link. Each end of the coupling is secured to the vehicles by a small shackle which has a bolt running through. The coupling is kept taut by a centre buffer, fitted with a powerful spring which presses against the metal face plate of the other vehicle.

In addition there is a Parcels Van which is fitted with centre automatic "Buckeye" coupler and side buffers. The van is fitted with Westinghouse electro-pneumatic and vacuum brakes and can be attached to either **1951** electric stock or to non-electric stock.

Formation
of trains.

Trains can be made up of two, four, six or eight coaches. All motor coaches and certain of the trailer coaches are fitted with apparatus by means of which the motors on one or more of the motor

coaches can be operated together from any one Motorman's compartment, whether at the front, rear or middle of the train.

Coaches of various building dates must not be coupled together except in case of emergency. On no account must an attempt be made to couple the electrical or brake connections between **1937** and **1951** stock.

The maximum load to be hauled by a **Parcels Van** must not exceed 100 tons. A parcels van which is running light or hauling vehicles, the weight of which does not exceed 30 tons, must have the motors of the trailing bogie cut out.

10.—1937 Stock. The following equipment must be carried in the Motorman's compartment of each motor coach :—

- 1 Screw coupling (Cowhead type).
- 1 Ice-scraper handle.
- 1 Shoe stick.
- 3 enclosed fuses of each type.
- 3 Motor fuses.
- 3 Shoe fuses.
- 1 Rubber mat.
- 1 Fire extinguisher (C.T.C. Pump Type—marked with yellow band) (Instruction 66).
- 12 Detonators and 2 red flags.
- 1 Pair of rubber gauntlets.

Load to be
hailed by
parcels vans.

Equipment in
electric trains.

In addition :—

- 1 30 ft. Train line coupler with slipper attachment in each double-ended motor coach (Instruction 27).
- 2 Fire extinguishers in every luggage compartment (Instruction 66).
- 1 Bag sand.

1951 Stock. The following equipment must be carried in each 2-car unit :—

Motor vehicles.

Motorman's Compartment.

- 12 Detonators, 2 red flags.
- 1 Fire extinguisher (C.T.C. Pump type, Yellow band).
- 1 Shoe and 2 equipment fuses.

Luggage Van.

- 2 Fire extinguishers carbon di-oxide type.
- 1 Shoe fuse key.
- 1 Ice-scraper key.
- 1 Hook switch stick.
- 1 Emergency screw coupling.
- 2 Shoe paddles.

Guard's Compartment.

- 3 Fire buckets (one filled with sand).
- 2 Bags of sand.

- 1 Crow bar.
- 1 Ladder, extending.
- 1 Cupboard with emergency and ambulance equipment (including 1 pair rubber gauntlets).
- 1 Rubber mat.

Trailer Vehicles.

Motorman's Compartment.

- 12 Detonators, 2 red flags.
- 1 Fire extinguisher (C.T.C. Pump type, Yellow band).

Motorman's Corridor.

- 1 Shoe fuse key.
- 1 Hook Switch stick.
- 2 Shoe paddles.

In addition :—

- 1 30 ft. Train line coupler with slipper attachment in each double-ended motor coach. (Instruction 27).

II.—Before taking a train into service the Motorman must, if the train is in the Car Sheds, insert the trolley jumper into the trailing train line socket in order to obtain power on the train, after which, whether in the Car Sheds or elsewhere, he must switch on the lighting in the

Preparing
train for
service.

leading Motorman's compartment to ascertain if power is available, place all compressor switches in the "On" position throughout the train; examine all control governor cut-out switches to ascertain that the seals are unbroken with the switches in the "Top" position; on reaching the rear Motorman's compartment place the main motor switch and barrel switch and control switch in the "On" position, and then operate the circuit breaker "Set" switch, try the controller in the rear Motorman's compartment in the "Forward" and "Reverse" positions on the first notch, when a reading of 250 amps should be registered, proceed to the next motor coach and place the control switch in the "On" position, try the controller in the "Forward" and "Reverse" positions when the movement should be felt from the rear motor coach; this will prove the continuity of the control circuit; place the main motor switch and barrel switch in the "On" position in the next motor coach and again try the controller in the "Forward" and "Reverse" positions and notice the ammeter reading.

Proceed in turn to the remaining motor coaches and repeat the last three tests.

Release the hand brakes and test the Westinghouse Brake in accordance with the instructions given in Appendix "A"—"Westinghouse Electro-pneumatic Brake Equipment".

12.—When a train has completed its rostered working, and is being left in the Car Sheds, sidings, or at a terminus, the Motorman must go through the whole train and place the main motor switches, barrel switches, compressor switches, control switches, destination and marker light switches and Motorman's compartment heater switches in the "Off" position.

Stabling train
after service.

The Motorman must also apply the handbrake in the Motorman's compartment of the leading coach and close all doors and windows in the Motorman's compartments.

13.—(a) The 1937 electric stock is fitted with a non-automatic centre coupling of the "Cowhead" type which acts both as a coupling and a buffer.

Instructions
for working
Cowhead
couplings,
Rules 12
and 145.
(1937 Stock).

In coupling electric parcels vans or luggage motor driving seconds to ordinary vehicles the Shunter must not stand between the vehicles until they come to rest.

TO COUPLE OTHER THAN ELECTRIC PARCELS VANS AND LUGGAGE MOTOR DRIVING SECONDS.—A screw coupling must be in one only of the two heads about to be joined together, and the pin must be out of the other head. The Shunter, taking up a position in the gangway of the carriage,

must hold up the end of the screw coupling until the vehicles are pushed together. The end must then be dropped and the remaining pin pushed through the head and the link, care being taken to see that both pins are far enough through to ensure that the drop-end falls down to prevent the pin from working out. The coupling must then be screwed up tightly, by means of the bar provided for that purpose. When tight, the screw must be in such a position that the bar drops down through a hole in the centre of the plain portion of the screw and through a hole in the coupling head, thus preventing the coupling from becoming slack.

The brake pipes may then be connected in the usual way, and the electrical connections as provided for in Instruction 14.

TO UNCOUPLE OTHER THAN ELECTRIC PARCELS VANS AND LUGGAGE MOTOR DRIVING SECONDS.—The brake pipes and electrical connections must be disconnected and the screw sufficiently slackened to allow the pin to be withdrawn. After taking out one pin the coaches may be drawn apart.

Spare screw couplings must be placed on the hooks provided in the driving compartment and must not be left lying on the floor.

Care must be exercised in shunting vehicles fitted with "Cowhead" couplings. They must not

be shunted against ordinary vehicles or against buffer stops if the latter are not provided with a centre buffing block.

TO COUPLE ELECTRIC PARCELS VANS OR LUGGAGE MOTOR DRIVING SECONDS to ordinary vehicles, a special screw coupling which is secured to the cowhead coupler by a pin is provided on the electric vehicle. The pin must be pushed through the head and link far enough to ensure that the drop end falls down to prevent the pin from working out.

The side buffers on these vehicles must be placed in the "Long" position.

The screw coupling link must be placed on the hook of the ordinary vehicle and the coupling screwed up tightly.

The brake pipes may then be connected in the usual way.

TO UNCOUPLE ELECTRIC PARCELS VANS OR LUGGAGE MOTOR DRIVING SECONDS from ordinary vehicles. The brake pipes must be disconnected, the screw coupling slackened and the coupling link lifted over the hook of the ordinary vehicle.

(b) The **1951** stock is fitted with "Buckeye" automatic couplings. Each end of the unit is fitted with "Buckeye" automatic coupler and movable buffers and has two jumpers only, one power "4 pin" and one control "27 pin". The two brake

Instructions for dealing with "Buckeye" couplings. Rules 12 and 145 (1951 Stock).

pipes are brought up to the same level as the jumper and are duplicated, one set being fitted to each side. As in the case of the jumpers only one set need to be connected up. The electro-pneumatic brake is fitted in addition to the usual Westinghouse Automatic Brake.

The " Buckeye " couplings on these vehicles must be dealt with in accordance with the instructions given on pages 79 to 83 of the General Appendix so far as they apply. The following additional instruction applies:—

" Vertical lock tell tale is incorporated in these couplings and when the coupler knuckle is in the open position the vertical lock tell tale will be at the top of its slide; and it will fall to the bottom of the slide when the coupler knuckle is shut, thus indicating that the vertical lock has dropped correctly and is projecting below the coupler head."

Use of
jumper cable.

14.—Except at Car Sheds, the station staff are responsible for attaching and detaching of coaches and for all connections being properly made. In assembling trains or coupling two trains together, after the screw or buckeye couplings have been placed in position, a set of jumper cables must be inserted in their respective sockets.

Care must be taken not to touch the terminals of

the jumpers, or let them come in contact with the rails, ballast or the metal work of the coach.

If a coach fitted with collector gear is being coupled or uncoupled, or two trains each containing one or more coaches fitted with collector gear are being coupled or uncoupled, the jumpers must not be inserted or pulled out unless **one or more of the shoes** on each portion are making contact with the third rail. If none of the shoes on one portion is making contact, **all the main switches** on that portion must be placed in the "Off" position before coupling or uncoupling.

In all cases when disconnecting motor coaches, the compressor switches on them must be opened before the jumper cables are withdrawn.

With regard to the **1951** electric stock, all operations on the electric jumpers, i.e. inserting and withdrawing, must only be performed when the Westinghouse Brake pipes are uncoupled, irrespective of whether or not vehicles are being coupled or uncoupled.

15.—Each motor and trailer coach is fitted with Westinghouse Electro-pneumatic Brake equipment. There is a main air reservoir on each motor coach and a main reservoir pipe connects all main reservoirs on a train. A second pipe, known as the train pipe, is used for pneumatic operation only and is also continuous throughout the train.

Each motor coach is fitted with an air compressor capable of supplying air for braking on a train of four coaches. All compressors can be operated at the same time through a governor in each Motorman's compartment and a control cable throughout the train.

A Motorman's brake valve is provided in each Motorman's compartment but only in emergency must more than one valve be operated at the same time.

See Appendix A for complete instructions and description of Westinghouse Brake equipment.

A hand brake acting on that coach only is provided in each Motorman's compartment.

Train
headcodes,
indicators and
tail lamps.

16.—Electric head and tail signals must be carried by electric passenger trains, as shown in the Sectional Appendix to the Rules and Regulations and Working Time Table.

Block Regulation 19 is not applicable during daylight to electric trains (except electric parcels vans).

Electric parcels trains and electric parcels vans, loaded or empty, must exhibit an oil tail lamp at all times.

The Motorman is responsible for the correct setting of the destination indicator and the marker lights at the leading end.

The Guard is responsible for the correct setting of the destination indicator at the rear end and the tail light.

When trains pass through North Shields Tunnel the destination indicators must always be lighted as a warning to any person who may be working in the tunnel.

A spare oil tail lamp must be carried and lighted ^{Spare oil lamp} in case of failure of the electric light.

17.—Guards must regulate the lighting and ^{Lighting and heating.} ventilation of the coaches, and must also regulate the heating of coaches in accordance with the detailed instructions exhibited in the Car Sheds and at the terminal stations, and immediately inform the Motorman of any defect in the lighting or heating, who must take what steps he can to remedy the defect when practicable. The roof lamps must be extinguished when trains are standing out of service.

In the case of **1937** stock, the main heating and lighting switch and fuse are mounted on a panel which is enclosed and suspended from the under-frame. The lighting of the entire train can be controlled by trip and set switches which are mounted in each driving compartment. Circuit switches to control the lighting of each coach are

mounted in the gangway. Two heating switches (main and half-heat) are mounted in the gangway of each coach. Half-heat is obtained by turning the main switch only to the " On " position. Full-heat is obtained by turning both switches to the " On " position. A thermostat which is fixed to a partition towards the centre of each coach will then control the heating. Until the heat of the coach reaches the predetermined temperature, a small lamp fixed in the switch box will be illuminated.

The Station Inspector at the East End of Newcastle Station must record the temperature shown on the thermometer fixed near his cabin at 5.0 a.m., 9.0 a.m., 1.0 p.m., 5.0 p.m., and 9.0 p.m. daily. This information should be passed to Car Shed Superintendent, South Gosforth, and the Station Inspector on Nos. 5 and 6 platforms, Newcastle.

Instruction boards are provided at Newcastle No. 2 Platform and Gosforth Car Sheds and Guards must regulate the heating in accordance with the following:—

<i>Temperature</i>	<i>Heat required</i>	<i>Board Indication</i>
Above 50 degrees	—	Heaters off
40-50 degrees	Half Heat	Main switch only
Below 40 degrees	Full Heat	Both switches on

In the case of 1951 stock, the heaters are thermostatically controlled, the switches being operated by the Motorman.

All the isolating switches and fuses for the coach heating and lighting are in the motor coach cab cupboards. For these services there are no fuses anywhere else in the train and the only switches affecting them to be found elsewhere are the lighting trip-and-set switches in the guard's compartment.

The train lighting is under the guard's trip-and-set control, but before any trip-and-set switch can be used an electrical feed must be available from the adjacent cab. The guard can test this if need be by switching on his two separately controlled lamps. If at least one lights up the feed is available. The other two lamps in the guard's compartment are under the trip-and-set control in common with the train lighting and can be regarded as pilot lights.

Instruction boards have been placed, facing East along Nos. 5 and 6 platforms, at Newcastle Station, on the platform at South Shields and at Gosforth Car Sheds for the information of the Motormen as to whether or not heaters should be switched on.

The Station Inspector, Nos. 5 and 6 platforms, Newcastle Station, must alter this board to conform with the information received from the Station Inspector at the East End, of the temperature shown by the thermometer. He must enter on the record the time at which the alteration is made and

instruct South Shields station staff to alter their board in a similar way.

Temperature above 50 degrees Heaters OFF
Temperature 50 degrees or below	... Heaters ON

The Station Master, Newcastle, must advise the Station Master, South Shields, at 5.0 a.m., 9.0 a.m., 1.0 p.m., 5.0 p.m., and 9.0 p.m. each day whether or not heaters on the electric trains should be switched on.

Note:—

Guards should use their discretion on those occasions when the temperature is slightly above 50 degrees. If the atmospheric conditions are such as to keep coaches cold, heaters should be switched on (in the case of 1937 stock to half heat).

Running.

18.—(a) When running between Newcastle and Manors and between Newcastle and Gateshead in either direction, Motormen must not move the controller beyond the series position.

Complaints
with regard
to running.

(b) Should any complaint be made by the Motorman with regard to the running of any of the coaches, or should the Guard notice anything amiss with the train, the Station Master or person in charge at the next station at which the train stops must be asked to advise the terminal station to have

a spare set ready to put into traffic to take the place of the set about which complaint is made.

19.—The power must be switched off as soon as possible after attaining full speed, and as long an interval allowed before applying the brakes, as is consistent with smooth stopping and the keeping of proper time during each run. Motormen must endeavour to "coast" their trains as much as possible. For their guidance diamond-shaped boards have been placed by the side of the track marking the point at which the power should be switched off. Coasting.

20.—In the event of any apparatus in the leading Motorman's compartment proving defective, the train should be driven from the Motorman's compartment nearest to the leading end of the train. A Guard or other competent person who knows the line must be stationed in the leading Motorman's compartment to pass the necessary hand signals to the Motorman. The train should then proceed at caution either to destination or the nearest point at which the defective vehicle can be uncoupled or the train left. The Motorman must at once send information through the nearest Signal Box to the Car Sheds if the train or coach has to be left in a siding. Driving train from any other than leading Motorman's compartment.

→ When setting back from one line to another or into a siding, the Motorman need not change ends.

[Except at this ³⁷berline sin. where special instructions are applicable. By. Roy.
20/1/1966

When a propelling movement is being made the Motorman must have his train well under control. A Guard or Shunter must ride in the leading vehicle, keep a sharp lookout, give a warning to anyone on the line, observe all signals and give any necessary hand signals to the Motorman. The Guard or Shunter must be prepared to stop the train by application of the automatic brake if required.

Reverser
handle and
master key

21.—A reverser handle or master key is supplied to each permanent Motorman, who must see that it does not get into the possession of unauthorised persons and will be responsible for its care until given up.

A relief Motorman will be supplied with a reverser handle or master key by the person appointed by the Car Shed Superintendent, and this must be returned to him when finishing duty.

In the event of any vehicle being added to a train, or two trains being coupled together, the Motorman who takes over the complete train must, before proceeding, make certain that there is no other reverser handle or master key on the train.

Controller
safety device

Before the reverser key is moved either to the forward or reverse position, the controller handle

must be pressed down, whether the controller handle is being operated or not, otherwise the air brakes will be automatically applied throughout the train. The controller handle must also be kept down during the whole of the time the train is running, by pressure applied by the Motorman's hand. If it should be released, the control current will be cut off, and consequently the power current to all the motors; and at the same time the air brakes will be applied, as stated above. The controller handle can only be pressed down again when the controller handle is turned to the "Off" position.

If the "Dead Man's" device fails, it must be cut out by the isolating cock provided for the purpose and the Guard must ride with the Motorman until another competent person is provided, or the failure corrected.

The Motorman should report any failure of the "Dead Man's" device by the first available means to Traffic Control.

22.—The Motorman must always remain in the leading Motorman's compartment when the train is in motion, except as provided for in Instruction 20. If it is necessary for the Motorman to leave the leading Motorman's compartment, he must always take the reverser handle or master key with him.

Dead Man's
device

Motorman
leaving
leading
Motorman's
compartment.
Rule 126 (iv).

Persons in
Motorman's
compartment.
Rule 9.

23.—Motormen must not allow any unauthorised person in the Motorman's compartment or to handle any of the apparatus in or about the trains, and must enter the names of any persons travelling in the Motorman's compartment on their daily voucher giving the Motorman's compartment pass number.

Only two persons, in addition to the Motorman, are permitted to ride in the Motorman's compartment, at any one time.

Motorman not
to adjust
apparatus.

24.—(a) All disconnections or adjustments will be carried out by the maintenance staff. Motormen must not attempt to adjust any part of the equipment except in case of emergency.

Daily defect
reports.

(b) Motormen must report minor defects in the Occurrence Book, and sign their names clearly. If, however, a defect or other matter requires special attention, a Motorman's Report Sheet must be used and the faults briefly stated, giving the time, place and exactly what occurred.

Train refusing
to start.

25.—In the event of a train refusing to start after the switches have been put in and the controller handle and reverser handle or master key operated according to Instructions 11 and 21, the motorman must :—

- (1) Turn on lighting switches; if the lamps do not light up in any part of the train, then—

- (2) Examine the collector shoes and see that one or more are bearing on the third rail. The shoe fuses must also be examined and renewed if necessary in accordance with Instruction 29.
- (3) If the train still refuses to start the power will probably be off the line. Proceed as directed in Instruction 28.

If the lamps light up, and the train still refuses to start then—

- (4) Examine the fuse in the control switch box, and renew if necessary.
- (5) Move the circuit breaker " Set " and " Trip " switch to the " Set " position and on release a small arc should be noticed.
- (6) Should the train still refuse to start the Motorman should go to another Motorman's compartment and try the controller: if the power can be applied through this controller it is probable that the other is defective. Proceed as directed in Instruction 20.

26.—Should the controller fail to cut off the power, the Motorman must at once move the control switch to the " Off " position and apply the Westinghouse Brake to bring the train to a stand in the usual manner.

Unable to shut
off power.

The Motorman must then go through the train and place all the motor switches in the "Off" position before starting to remedy the defect.

Train
stopping out
of contact
with third
rail.

27.—Where gaps occur in the third rail Motormen must exercise great care so as to avoid stopping in such a position that the shoes of the train are not in contact with the third rail, especially when working a single coach or a train with the shoes on only one coach in use.

If a train or coach should stop over a gap, so that no shoe is in contact with the third rail, the Guard must take the loose train line coupler and insert the plug in the train line socket, and then hold the slipper down on the third rail at the nearest point to the train or coach. By this means the Motorman will be able to move the train until the shoes are again in contact with the third rail. The Motorman will be responsible for seeing that the temporary connection is properly made in the train line socket.

On no account must the ends of the loose train line coupler be allowed to come in contact with the track, ballast, or any metal work.

Power cut off
from third rail

28.—(a) Should the power be cut off from the third rail, the Motorman must, if he is applying power, move his controller handle to the "Off" position, then see that the lighting switches are

turned on, and wait till the lights indicate that the power has come on again. After the lamps have become fully lit up, he must, if on the up line, wait half a minute, and on the down line, one minute before starting the train, so that all trains will not commence to use current at the same time.

Should the power be cut off the third rail for more than three minutes, the Motorman must arrange for the Guard to communicate with the nearest signal box.

All power failures must be reported by the Motorman before signing off duty.

(b) Should any Signalman have reason to believe that there is an interruption of electrical energy, he must at once report the fact to the Signalman in charge of the third rail section, who will in turn report to the Electric Control operator, Wallsend.

29.—(a) Fuses are provided on the train line, shoe leads, and motor circuits. In the event of an undue amount of current passing in the cables used for any of these purposes, the fuse melts and opens the circuit. Fuses melting on power circuits.

Motormen may replace shoe fuses, but should not replace motor fuses unless there is insufficient power in the remaining motors to work the train. Should only one motor circuit fuse melt, the

corresponding switch must at once be placed in the " Off " position, and the train run by means of the remaining motors.

In addition to the motor fuse a circuit breaker is fitted and this may operate automatically in case of a fault on the motors. Should a circuit breaker on a coach continue to trip after being set, the main motor and barrel switch must be placed in the " Off " position.

If one train line fuse and one shoe fuse melt, the train will still be in a condition to run.

In all the above cases the train may proceed in accordance with Instruction 20, if such action becomes necessary.

Fuses melting
on auxiliary
circuits

(b) In the case of the melting of any of the smaller enclosed fuses which are provided on the control, lighting, heating and pump circuits, the Motorman may replace them with spare fuses supplied for the purpose.

Before replacing a fuse the Motorman must satisfy himself that the corresponding switch has been put in the " Off " position, and also make sure that the fuse is of the right value.

Melted fuses to
be returned by
Motorman.

(c) All enclosed fuses which have melted must under no circumstances be left in the coaches, but be returned to the Car Sheds by the Motorman who has replaced them.

30.—In the event of faults developing on coaches and the arc being maintained, the Motorman should isolate the affected coaches in the following manner: Isolating of coaches.

- (1) Ask for the power to be cut off as quickly as possible.
- (2) Put on rubber gauntlets.
- (3) Remove all shoe fuses on the affected coaches.
- (4) Remove the train line jumper at each end of the affected coaches.

The Motorman should not attempt to disconnect the jumper cables between the articulated coaches of the **1937** stock, or between the coaches of a two-car unit of the **1951** stock.

In the case of a fault developing on the main switchboard and an arc being maintained, the above procedure should be followed, and in addition the control and electro-pneumatic brake jumpers should be removed.

When shoe fuses have been taken out for isolating purposes great care must be taken to shut-off power at the gaps in the third rail so as not to overload the remaining shoe fuses.

31.—When dealing with a broken collector shoe great care must be taken when removing the broken parts. Collector shoe broken.

After bringing the train to rest and securing it, the Motorman must get out a rubber mat, shoe stick

and tool bag, and, after putting on his rubber gauntlets, he should take out the shoe fuse of the defective shoe if not already blown. This is most important as it prevents any current reaching the defective shoe from the shoe train line. With the Guard's assistance the Motorman should lift the broken parts whilst the Guard slips the rubber mat underneath to isolate the shoe from the third rail, then the two top shoe link bolts should be taken out and the shoe flex cut. The Motorman should not replace the shoe fuse.

If the defective shoe is standing on a gap in the third rail the Motorman may, after taking out the shoe fuse, work without the rubber mat.

Control
jumper slack

32.—When trouble is experienced due to a slack control jumper, the symptoms are usually that the ammeter reading is higher than normal, and a speed of only about 8 to 10 miles an hour is being attained instead of building up to normal, and the Motorman must place the main motor switch in the "Off" position in the Motorman's compartment of the leading coach and try the controller "Forward" and "Reverse".

If there is no movement on the train the control jumper has slacked back between the second and third coaches. After securing the train by applying

the brake and in the case of the **1937** stock, taking the reverser key from the controller, or in the case of the **1951** stock, locking the reverser in the "Off" position, the Motorman should walk back and tap the control jumper up tight so as to make sure that the male and female terminals are properly engaged, then replace the main motor switch in the "On" position when the train should run in the normal manner.

33.—When trouble is experienced due to the blowing of the control fuse, the Motorman must renew the control fuse in the Motorman's Compartment of the leading coach; if the control fuse blows again, the Motorman should proceed as follows:—

- (1) With an eight car set, after securing the train by applying the brake and, in the case of the **1937** stock, taking the reverser key from the controller, or in the case of the **1951** stock, locking the reverser in the "Off" position, the Motorman should walk back four coaches and take out the control jumper, and then get into the Motorman's compartment at the rear end of the first four coaches and try the controller. If the control fuse does not blow then the fault is on the rear four coaches. The Motorman, after renewing the control fuse at the leading end, can then proceed to

drive from the front of the train having power on the first two motor coaches only.

- (2) If, however, the control fuse blows at the rear end of the first four coaches, the Motorman should try the nearest controller of the four rear coaches and if that control fuse does not blow, ask the Guard to go to the front Motorman's compartment and the Motorman should drive from the nearest convenient coach in accordance with Instruction 20 and with power on the two rear motor coaches only.
- (3) Similar procedure should be carried out in the case of a four or six car train.
- (4) The Station Master or Person in Charge at the next station should be asked by the Motorman to inform the Leading Motorman at Newcastle that the set is defective and arrangements must be made to replace the set on arrival there.

Circuit breaker
set and trip
switch.

34.—If arcing is set up and maintained on the circuit breaker set and trip switch, the Motorman must place the control switch in the " Off " position and then drive from the most convenient Motorman's compartment in accordance with Instruction 20.

35.—If the notching relay should operate in a rapid or irregular manner, the Motorman must place the barrel switch and the main motor switch in the "Off" position. It is still possible to operate the remaining motors on the train from the Motorman's compartment.

Notching
relay.

36.—The control governor cut-out switch is normally sealed in the "Top" position, and if, for any reason, it is necessary to cut out the control governor, the seal should be broken and the switch placed in the "Bottom" position, and the Motorman must report the matter at the first opportunity.

Control
governor
cut-out
switch.

37.—Guards are responsible for the opening and closing of inter-communication doors as necessary.

Duties of
Guards.

In cases where there is more than one luggage compartment on a train, the Guard must ride in the one nearest the rear of the train.

Ride in
rear van.

In cases of difficulty the Guard must give every possible assistance to the Motorman consistent with the first duty of caring for the safety of the passengers.

To assist
Motormen.

Guards must assist the station staff in coupling and uncoupling vehicles.

To assist
station staff.

38.—The signalmen at the undermentioned boxes will be responsible for reporting to the Electric Control all matters pertaining to the working of the third rail sections enumerated below and for the execution of instructions from the Electric Control concerning such sections:—

Signal Box	Section Numbers:
Newcastle ...	7, 8, 9, 10, 43, 44, 52, P.1, P.2, P.3, P.4, P.5, and P.6
Riverside ...	11, 12, 13, 14, 23 and 24
Heaton South ...	15, 16, 17, 18, 19, 20, 21, 22, 49 and 50
Walker Station...	25 and 26
Percy Main Station ...	27, 28, 29, 30, 31 and 32
Tynemouth South ...	33 and 34
MONKSEATON Backworth Station ...	35, 36, 37 and 38
13th TON South Gosforth Box ...	39, 40, 41, 42, 45, 46, 47 and 48
Gateshead High Street	53, 54 and 53a
Pelaw ...	55, 56, 57 and 58
Harton ...	59, 60, 61 and 62

~~During the time Riverside Signal Box is closed,
third rail sections 11, 12, 13 and 14 will be under
the charge of Heaton South Signal Box.~~

During the time Percy Main Station Signal Box is closed third rail sections Nos. 27, 28, 31 and 32 will be under the charge of Tynemouth South Signal Box.

During the time Walker Station Signal Box is closed when the Riverside lines are alive, third rail sections 25 and 26 will be under the charge of *Percy Main* ~~Riverside~~ Signal Box.

~~During the time Harton Signal Box is closed third rail sections 59, 60, 61 and 62 will be under the charge of Pelaw Signal Box.~~

When a Signalman closes or opens any of the above mentioned signal boxes he must report to, and take instructions, from the Electric Control Operator.

39.—Signalmen must only operate the switches and circuit breakers on the sectioning switchboards under the instructions of the Electric Control Operator, except as otherwise laid down in local printed instructions. In emergency Station Masters or Inspectors in charge may execute switching operations on receipt of instructions from the Electric Control Operator.

Operation of switches.

One Signalman only should undertake the arrangements for making the third rail alive or dead. A Signalman engaged on this duty must not be relieved until such arrangements are completed and the entries recorded in the book provided for the purpose.

Signalman not to be relieved until switching completed.

A diagram showing the arrangement of the switches has been placed in every signal box in which there is a switchboard. The switches are of two kinds, section switches and interconnector switches. The handles of the interconnector switches are painted white and, like the section switches, must only be operated on receipt of instructions from the Electric Control Operator.

During the times the lines are normally open to traffic, all section switches will be kept closed, except in the case of siding switches which must be closed only at such times as is necessary for traffic purposes.

A section of third rail is not disconnected and dead until all the feed point switches connected to the section are opened. The Signaller in charge of the section is responsible for ensuring that all such switches are open before advising other Signallermen or workmen that the third rail is dead in accordance with Instruction 67.

Operation of
Siding switch
pillars and
chambers.

40.—The switch pillars and chambers must be kept locked and the keys left at the nearest signal box. Special instructions are posted in each pillar and chamber, in regard to the operation of the switches. These switches may be operated in accordance with Instruction 41 without first having the current cut off or communicating with the

Electric Control, provided there is not a train in motion or electrical trouble in the siding. The Electric Control must be immediately advised of such operations as soon as complete through the Signalman in charge of the Section. When electrical trouble is being experienced on the third rail system, siding switches must only be operated on the instructions of the Electric Control.

The Signalman in charge of the switch pillar and the Signalman in charge of the third rail section must record full particulars of every switch operation in the book provided for this purpose.

When necessary Station Staff may act for the Signalman in the operation of the switch pillars and chambers.

41.—When the special instructions in the signal box are being carried out, a subsequent step must not be taken until assurance has been received that the previous step has been completed. Handling of switch gear.

The person opening or closing switches must always stand clear. On opening, switches must be pulled out sharply with the strap provided. Switches must always be left in either the fully closed or fully open positions. Not more than one switch must be operated at the same time.

In the event of a fire continuing after a switch has been opened, it should be extinguished by means of dry sand.

After a fire on a switch board, the switch blades and forks should be examined, and if any beads of metal or roughness caused by burns are found, the switches and forks concerned must be made dead, and the beads or roughness filed off before the switches are again operated so as to ensure an even contact. A six-inch second-cut file which must not be used for any other purpose is supplied to each appropriate signal box. Rubber gauntlets must be worn while this is being done.

Automatic switch gear and circuit breakers.

Circuit breaker alterations and adjustments will be made only by Electric Traction Engineer's staff in conjunction with the Electric Control Operator, Wallsend.

Equipment in signal boxes.

42.—At each signal box on the Electrified Lines there should be on hand:—

- (i) Two bags of sand and one pair of rubber gauntlets.
- (ii) One Shunter's pole.
- (iii) One Whitworth single-ended spanner (1 in.).

North Tyneside.

- (iv) One Whitworth single-ended spanner ($\frac{5}{8}$ in.).

South Tyneside.

(v) One 6-in. second-cut file where necessary.

43.—When a telephone message is sent relating to the restoring or interrupting of the current the message must be repeated by the person receiving it in order to confirm that it is correctly understood. Great care must be taken to ensure that the correct number of the section is given.

Repeating
telephone
message.

44.—Defects in telephones must be reported at once. Inattention to calls must also be reported to the District Operating Superintendent. It is important that information be transmitted quickly and measures taken promptly.

Defects and
inattention to
telephones.

45.—Luggage, etc., must only be conveyed across the line at stations via the barrow crossings.

Barrow
crossings to
be used for
luggage.

46.—(a) When shunting in sidings and yards on the electrified lines, care must be taken to see that the doors of all wagons are pinned up or shut, so that nothing can come in contact with the third rail and nothing can fall out of the wagons on to the rail.

Wagon doors
to be secured.

(b) When pinning or unpinning brakes, coupling or uncoupling wagons, Guards, Shunters and others

Shunting
operations.

concerned, must, as far as practicable, work on the side of the wagons at which there is no third rail.

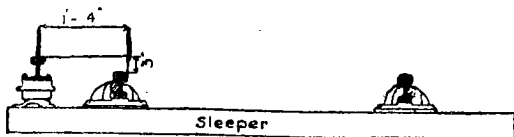
Brake pin chains.

(c) Brake pin chains must be secured to prevent them coming into contact with the third rail. In all cases of brake pins or other metallic substances coming into contact with the third rail or its connections, the Guard, Shunter or other person concerned must immediately arrange for the pins to be fastened up or the metallic substance removed, even if this necessitates the stopping of the train. The Guard, Shunter or other person concerned must report such occurrences.

Electric track equipment—
general description of
third rail.

47.—The third rail is supported upon insulators fastened by coach screws to the sleepers of the permanent way. The rails are normally of 60 feet lengths and are jointed with fish plates. Copper bonds provide continuity at the joints.

The centre of the third rail is at a distance of 1 foot 4 inches from the gauge line, and the top is 3 inches above the level of the track rails. A section of track is shown below.



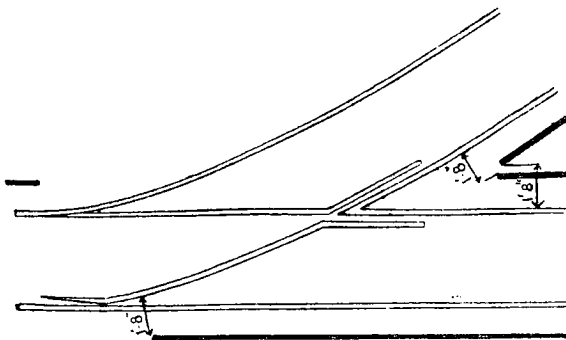
The rail ends on either side of gaps and Intersections are suitably shaped to allow the collector shoes to mount the rail easily.

In order to ensure sufficient clearance at junctions and crossings between the shoes of a train travelling on one track and the third rail of the converging track, a clear distance of 1 foot 8 inches must be left between the track rail and the third rail, as shown below.

Note

Track Rail shown thus 

Third 



In special cases side run-on pieces are fixed to the side of the third rail to allow the collector shoe to mount the rail where it cannot be broken near points.

A space of at least 3 feet is left between the ends of third rails and the sides of all level crossings.

The insulators are generally fixed on the longitudinal centre line of the sleepers, and are not usually fixed upon the track rail joint sleepers. The distance between insulators should never exceed 14 feet from centre to centre.

Bonding.

Both the third rail and the track rails are respectively connected by means of copper bonds so as to ensure electrical continuity. At crossings and junctions long bonds are used to bridge interruptions to the track rail.

The track rails are generally cross-bonded between the two rails of each track at intervals of 300 feet, and between the two inner rails of adjacent tracks at the same space interval. The bonds in the 6-foot way are midway between those in the 4-foot way. Where track circuits are installed cross-bonding is altered to suit.

All bonds are made of flexible copper strands in order to prevent breakage by vibration.

Main cables.

48.—Main cables (i.e., high tension, telephone, pilot and lighting cables), run alongside the track in several places on the North Tyneside Area; they are generally buried in the ground, and their route is indicated by cast-iron-pillars marked "Cables". At bridges, viaducts, in tunnels and in cuttings

where they cannot be laid underground, the cables are carried on brackets, and either armoured or enclosed in iron troughs.

49.—Third rail feeder cables pass from the sub-stations, signal boxes with section switch boards and switch chambers or pillars to section gap terminals. Third rail continuity cables pass from terminal to terminal where the third rail is interrupted.

Third rail
and negative
return cables.

Negative return cables pass from the track rails or negative return rail (where installed) to the sub-stations. Where the negative return rail is interrupted, electrical continuity is maintained by either cables or bonding.

Cables are generally laid on or near the surface and are either covered by tiles marked "Electric Cable" or encased in wooden trunking. Where laid underground they are placed at a depth of 1 to 3 feet.

50.—Care must be taken not to allow ballast or any other material to come into contact with the third rail, insulators, anchors or terminals.

Unloading
material.

Ballast or other material must be unloaded in the four-foot way or clear of tracks used by electric trains. Only wagon doors furthest from the live rail must be let down.

The man who has charge of the unloading must ensure that materials are not left nearer than 2 feet 3 inches from the outside of the track rails nor higher than the top thereof.

Trolleys.

51.—Great care must be taken when placing trolleys on the line and removing them, so that they do not come into contact with the third rail.

Use of metallic material adjacent to third rail.

52.—In all cases when using metallic material, staff must attach it to a cord when reeving under the rails, and also place a piece of dry wood under the third rail to prevent accidental contact.

It is strictly forbidden to leave any wire or other metallic material by the side of the line unless it is secured in such a way as to prevent anyone tampering with it or placing it in contact with the third rail.

Drains.

53.—Each Ganger or man in charge must carefully examine the drains on his length, and keep them in proper order. On no account must he allow the water to accumulate so as to interfere with the third rail or insulators, and in cases where this is likely to occur he must at once report the matter to the nearest Signaller and to the Permanent Way Inspector.

54.—All boxing over point rods, signal wires, water pipes, gas pipes, etc., and all timbers at level crossings and bridges, must not be above the level of the track rails for a distance of 1 foot 9 inches from the outside thereof so as to be clear of the collector shoes of electric coaches. The shoes drop to a lower level when free from contact with the third rail.

Clearances for collector shoes.

55.—Gangers, men in charge, and others, when excavating ground or sleepering must, if they come across any hard substance, investigate the matter carefully before proceeding further with the work.

Protection of cables.

They must on no account allow anyone to drive posts, crowbars or picks into the ground near those places where cables are known to be laid without first having received permission from the Technical Officers concerned.

56.—Tools, bonds, etc., for repairs to the electrified lines must be kept dry and clean.

Tools and stores.

57.—Spanners which may be required for use on cable terminal nuts and bolts are kept at each signal box.

Special tools.

58.—When examining lengths, the Ganger or other authorised person must have with him a pair

Examining lengths.

of rubber gauntlets in addition to the articles mentioned in Rule 220. He must examine the insulators, rail joints, anchors and cable terminals, and any breakage or defect must at once be reported to the Permanent Way Inspector.

The Ganger or other authorised person when walking a length, must attend to any matter reported by the Signalmen.

Lifting and
ballasting
permanent
way.

59.—(a) When lifting the permanent way in accordance with Rule 224, all sleepers to which insulators are fastened must be properly packed before trains are allowed to pass over them, to avoid breakage of the insulators.

(b) Each gang is provided with a track jack, which must be used in place of the ordinary bars, and on no account must it be placed under the third rail. In slewing the line or in packing the road, great care must be taken that the bars or tools do not come into contact with the third rail, insulators, anchors, terminals or cables.

Lifting
cross-over
roads.

(c) When lifting and packing the lines at cross-over roads and junctions, care must be taken to see that both rails are raised equally up to a point where the rails are 2 feet 6 inches apart, so as to prevent the collector shoes of the trains from catching the cross rails.

60.—A broken rail must be replaced as early as possible, but in cases of emergency the broken part may be drilled, fished and bonded until proper arrangements can be made to remove it. All cases of broken rails must be reported immediately to the Permanent Way Inspector.

Broken rails.

61.—When any alterations involving the breaking of the track rails are made they must be re-bonded as speedily as possible. All materials and tools necessary for this purpose must be on hand previous to breaking the road.

Alterations to permanent way—
re-bonding.

62.—Fencing protecting the Commission's property along the electrified lines must be kept under careful observation and if at any time it is found to be defective, steps must be taken to repair it immediately and a report sent to the Permanent Way Inspector.

Defective fencing.

63.—The electric stock is fitted with passenger communication apparatus, and the Regulations for Communication between Passenger, Guard and Driver by means of the Automatic Brake as shown in the General Appendix to the Rules and Regulations and Working Time Table must be observed as far as they are applicable.

Passenger communication

64.—In case of accident, passengers should be advised not to leave the coaches except at station platforms so long as the third rail is alive.

Passengers leaving train in case of accident

If it should become necessary to call upon the passengers to alight otherwise than at a station, care must be taken that they alight at the side which is clear of the third rail, and from the doors of coaches remote from collector shoe gear. The passengers must walk in the four foot way and must leave the railway at the nearest available place. The Guard or other competent person must accompany the passengers, and be responsible for their safe guidance.

Fire or
sparking on
third rails,
overhead
wires, cables or
connections.

65.—Any employee becoming aware of fire or sparking on the third rail or overhead wires (other than when a train is passing) or on the cables and connections, must report it at once to the nearest signal box, stating the exact locality and line affected, and wait and perform such services as the Signaller or the occasion may require.

Signalmen must immediately advise the Electric Control Operator, and District Control of such occurrences through the Signaller in charge of the third rail section.

If the Signaller considers it desirable he must arrange for the section of third rail affected to be made dead in accordance with Instruction 67.

The Signaller must call the attention of Lengthmen and other staff concerned to cases of fire or

sparkling and the cause must be ascertained and removed as quickly as possible.

66.—WATER MUST NOT BE USED FOR EX- Extinguishing fires.
TINGUISHING FIRES UNDER ANY CIRCUM-
STANCES IN THE ELECTRIFIED AREA WHILST
THE CURRENT IS STILL ON. In all cases, except where machinery and instruments are involved, DRY sand may be used.

Permanent Way Inspectors are responsible for seeing that a supply of dry sand is kept at each station.

Two water type (gas pressure) extinguishers are provided in each luggage compartment in electric stock. These must **not** be used on, or adjacent to, electrical equipment which may be alive.

One extinguisher suitable for use on live electrical equipment is provided in each Motorman's compartment. This type can be identified by a broad yellow band painted on the body of the extinguisher.

Staff must acquaint themselves with the methods of working both types of extinguishers.

When using extinguishers marked by yellow bands, staff must guard against fumes, particularly if working in a confined space.

67.—(a) Should it be necessary to make a section of the third rail dead for repair purposes, or for men to work on the track when the third rail is normally dead, the man in charge of the work must go to the nearest signal box.

An entry must be made in the Train Register giving particulars of the work about to be done and this must be signed by the man requesting the third rail to be made dead and by the Signaller.

If not in charge of the section of third rail affected, the Signaller receiving the request must telephone the Signaller who is in charge of the section and tell him what is required.

The Signaller at a box not in charge of a section must not allow work to commence until he is informed by the Signaller in charge of the section that the third rail has been made dead.

On receipt of a request for a section of third rail to be made dead, the Signaller in charge of a section must inform the nearest box on the adjoining section to ensure that no train is bridging a gap between sections and then tell the Electric Control Operator what is required.

When the third rail has been made dead the Electric Control Operator will give the Signaller in charge of the section an assurance that this has been done. The Signaller who made the request

originally must then be advised accordingly, also the Signaller at other boxes on the affected section.

The times at which all messages are received and transmitted, in connection with making the third rail dead, must be recorded in the Train Register by the Signallers concerned.

(b) The Electric Control Operator will make special arrangements for safeguarding men working on the track and will issue any necessary instructions to the Signaller in charge of the section.

Safeguarding
men working
on track.

The signal boxes, switch pillars and chambers in which switchboards are fixed are provided with wooden blocks painted red and lettered "Men working on line". These must be placed on switch contacts whenever men are working on the third rail or its connections.

The caution blocks must not be removed from switch contacts until definite information has been received from the person in charge of the work that all men are clear of the third rail and, in addition, after permission has been granted by the Electric Control Operator.

Where there are Signallers at each end of the section, the Signaller who receives the information must advise the Signaller at the other end of the section of the reports, but instructions from the

Electric Control Operator must always be transmitted through the Signaller in charge of the section.

Making third
rail dead in
emergency

(c) In case of emergency, especially if there is danger to life or risk of fire, Signallers must tell the Electric Control Operator what has happened and which section or sections of the third rail should be made dead. The Electric Control Operator will make the necessary arrangements and then tell the Signaller in charge of the section, who must in turn tell the Signaller at the nearest box open on the adjoining section(s), other boxes on the affected section(s) and the Signaller who reported the occurrence.

(d) If a section is made dead during the time the third rail is normally alive, the Signaller in charge must telephone all signal boxes on the section and the nearest signal boxes on the adjoining sections. No electric train must be allowed to pass on to a dead section and if a section has to be made dead during the hours that electric trains are running, all such trains must be stopped at the last signal box before reaching the dead section.

Trains not to
bridge gaps.

(e) A Signaller having been informed that a section is to be made dead must ascertain from the Motorman or Guard whether any train at his box is in contact with the section of rail or standing over the section gaps and, if so, the train must be moved clear before the section is made dead, unless owing

to an emergency, the arrangements set out above have been applied, in which case the Signaller must immediately arrange for both sections on which any train is standing to be made dead.

Death or serious injury to men working on the dead section may result if an electric train is allowed to bridge the gap between the dead section and adjacent live sections or the dead part and live part of a section.

(f) When a section is made dead and the fault or obstruction continues it may be necessary to minimise the effects by disconnecting cables. If this is proposed, the Electric Control Operator must be advised by the Station Master or Signaller nearest to the point where the disconnection is to be made or by the person in charge of the work.

Minimising
extent of
fault.

If necessary Permanent Way staff may be called upon to make the disconnection on the instructions of a Station Master, Signaller, or other authorised person. When terminals have been disconnected the Electric Control Operator must be advised immediately.

(g) If Signallers change duty whilst the work is in progress, the man leaving duty is responsible for seeing that the man taking duty countersigns the entry in the Train Register. If a person in charge of the work leaves duty before it is completed, his relief or authorised deputy must assume his responsibilities.

Staff taking
and leaving
duty whilst
Third Rail has
been made
dead.

Work
completed.

(h) When work has been completed, or a fault or obstruction removed and all men and materials are clear so that the section concerned is again available for traffic the man in charge must go to the signal box at which the request was made for the third rail to be made dead and inform the Signaller accordingly. An entry must be made in the Train Register and must be signed by the man in charge of the work and the Signaller.

Restoration
of current.

(j) If not in charge of the affected section, the Signaller who is advised that the line is again available for traffic must pass this information to the Signaller in charge of the section who will then inform the Electric Control Operator and the third rail will be made alive again as soon as it is required for traffic. When current has been cut off owing to repairs or emergency, it must be restored only on the application of the Signaller at the box where the request was originally made for the third rail section concerned to be made dead.

The Signaller in charge of the section must advise Signallers at other boxes on the section and note in his Train Register the times at which he is advised the line is again available for traffic and the Electric Control Operator and the other Signallers on the section are so advised.

Assistance to
a disabled
electric train.

68.—(a) A disabled electric train may be assisted by a steam or diesel locomotive, or provided electric power is available, by another electric train or

electric parcels motor, subject to the conditions set out in Instruction 69.

Hauling or propelling of an electric train must be done only on the authority of the District Control, a Station Master or other responsible person.

A defective electric train must be removed to the nearest convenient siding equipped with third rail shoe approach if possible. Passengers must be detained at the first station.

(b) In case of current failure, or third rail defect, assistance by a locomotive or locomotive hauled train must be given only as far as is necessary to clear the lines and meet essential traffic requirements. If the defect is likely to continue for any length of time, a diesel unit or locomotive hauled train service should be substituted.

Current
failure or
third rail
defect.

Assistance to 1937 Stock by a Locomotive.

Emergency rigid couplings are provided at all stations in the electrified area and also at Park Lane, St. James' Bridge, Pontop, St. Bede's, Hilda and Garden Lane signal boxes to enable a locomotive to be coupled to 1937 stock. The rigid coupling can be used only on locomotives on which the footplating does not protrude beyond the buffer beam.

Benton BK
+ H.B. to C.
Benton

Assistance to 1951 Stock by a Locomotive.

The coupler heads must be dropped and the buffers extended on the vehicle next to the locomotive. The emergency screw coupling must be used.

Control
of train.

(c) The Motorman of a train being assisted and on which the Westinghouse brake cannot be operated, must apply the hand brake as required. If being hauled, he must be prepared to observe hand signals from the Motorman of the assisting train or the Driver of the assisting locomotive. If being propelled, the Guard of the disabled train must also ride in the leading Motorman's compartment and exchange hand signals with the Motorman of the assisting train or Driver of the assisting locomotive.

Third rail
dead.

(d) If for any reason a section of third rail is dead, **all** sections of third rail over which a train is to be moved by a locomotive must be made dead whilst the train is being moved over them.

To reduce as much as possible the distance over which trains have to be moved by a locomotive, third rail cables should, if necessary, be disconnected by a qualified person (Instruction 67) at the nearest point on each side of the defect, derailment or other cause, where a locomotive can be attached or detached and the electric train run to or from the appropriate point under its own power. Gaps so created at each end of the defective portion of the third rail must not be bridged until the third rail is dead on both sides of the gap.

Electric trains
assisting
disabled trains.

69.—(a) 1937 and 1951 types of multiple unit electric stock may be used to assist vehicles of the same type subject to the conditions set out below.

1937 units should be joined by the cowhead couplers and **1951** units by buckeye, or if not practicable, emergency screw couplings. In either case, if the Westinghouse brake on the disabled vehicles is in order, the brake pipes must be connected but the electrical connections must not be joined.

When a disabled electric train is to be assisted by another train and the Westinghouse brake can be operated throughout the vehicles, the Motorman of the disabled train must remove his reversing handle and hand it to the Motorman of the assisting train before assistance commences.

In the case of propelling when the Westinghouse brake can be operated on the disabled vehicles, the train must be controlled in accordance with Instruction 20. If the Westinghouse brake cannot be operated, the handbrakes must be used in accordance with Instruction 68.

1951 type electric stock may also be used to assist a disabled steam or diesel locomotive hauled train or a disabled multiple unit diesel train or to remove vehicles left on a running line as a result of an accident. The assisting train must be joined to the vehicles by the emergency screw coupling. In the event of loose coupled freight vehicles being propelled, a stop must be made before descending a falling gradient for wagon brakes to be pinned down to enable full control of the vehicles to be maintained.

Assisting trains must be driven with the controller in the second notch and speed must not be allowed to exceed **20 m.p.h.**

The weight of the train or vehicles to be assisted must not exceed that of the assisting set except between Manors North and West Jesmond where the weight of the train or vehicles to be assisted must not exceed half that of the assisting unit.

In calculating equivalent weights of locomotive hauled trains, a locomotive in power classes 1 to 5 should be reckoned as equivalent to two bogie coaching stock vehicles and a locomotive in class 6 or over as equal to three bogie coaching stock vehicles. In the case of freight trains, 2 loaded or 3 empty ordinary wagons should be regarded as equal to one bogie coaching stock vehicle.

Assistance by
electric parcels
motor vans.

(b) **1937** type vans may assist trains composed of either **1937** or **1951** type stock. When assisting **1937** type stock the side buffers at the end of the van nearest the train must be closed up and only the cowhead couplers engaged. **1951** type vans may assist only similar electric stock. Both types of vans may be used to assist a disabled steam or diesel locomotive hauled train, or a diesel multiple unit, or to remove vehicles left on a running line as a result of an accident. In all cases the weight to be assisted must not exceed 100 tons per van.

70.—(a) Should an accident to an electric train accompanied by only one Guard cause an obstruction of any line or lines used by trains running in the opposite direction, the Motorman must immediately go forward on foot and protect the opposite line or lines in accordance with Rule 180(a).

Protection of
train in case
of accident.
Rules 179,
180 and 181.

Under these circumstances, when a Guard is not available for protection, the Motorman must act in accordance with Rule 180(c).

(b) If an accident results in a fire breaking out and there is also an obstruction of any line or lines used by trains running in the opposite direction, the Motorman must take the necessary action to extinguish the flames and the Guard must act in accordance with Rule 180(d).

71.—(a) When fire, sparking, accident or other emergency affects or is likely to affect safety of the line or the working of traffic, the District Control, the Electric Control Operator, the Station Master's Office, Newcastle and Gosforth Car Sheds must be advised immediately.

Reporting of
accidents.

(b) A record must be made of the time, nature, and consequences as far as can be ascertained, and a report sent immediately to the Station Master, who must report fully to the District Operating Superintendent.

Yon. Rules 148, 149, 180 & 214. Track
circuit operating clips must not
be used on electrified lines equipped
with conductor rails. T.C. Operating clips

72.—Thermometers are fixed outside certain signal boxes and at South Gosforth Car Sheds. The signalman at each box so equipped must advise the District Control of the thermometer reading at 10.30 p.m. and midnight. If weather conditions change a further advice should be sent hourly.

If the reading is 32° F. or less, or the foreman at South Gosforth Car Sheds considers it necessary, the District Control must arrange with the District Engineer's staff for the de-icing van to be called out and special opening of signal boxes as required. The route to be followed by the de-icing van is shown in a separate circular.

When it is frosty the staff at Newcastle Central, Manors, Tynemouth, Monkseaton and South Shields must confer with the District Control in regard to the desirability of screwing down ice-scrapers on trains and the District Control must advise South Gosforth Car Sheds accordingly.

Gauges indicating the position to which ice-scrapers should be set are kept at South Gosforth Car Sheds, Newcastle Central, Manors North and South Shields. At other places ice-scrapers should be screwed down until they touch the third rail and two further full turns given to the screw.

Rubber gauntlets must always be worn when altering the position of ice-scrapers.

If necessary, assistance must be given at terminal stations to shunt trains in order to deal with

scrapers which are on the platform side of the coaches.

Particular attention must be paid to the first service each day over every line. If the de-icing van has treated the third rail within the previous 24 hours scrapers should not normally be required for dealing with frost and unnecessary use of scrapers should be avoided as it would remove the special de-icing fluid from the third rail. If, however, there has been a heavy fall of snow, the use of scrapers will probably be required.

When ice or snow accumulates on the third rail, trouble may be experienced with the leading collecting shoes in making proper contact. In order to preserve the shoe fuses when icing conditions are severe, trains should be driven with the controller in the series position (i.e. No. 2). This may cause some loss of time but the small delay so incurred is preferable to blowing the shoe fuses.

Whenever snow or ice is likely to accumulate on the third rail when permanent way staff are not on duty, the Permanent Way Inspector or man in charge must be called out and will be responsible for having the third rail cleared. If it is considered that further assistance is required by the use of ice-scrapers, communication must be made with South Gosforth Car Sheds for a vehicle with scrapers to be made available. Detailed arrangements for calling out staff are shown in local instructions.

APPENDIX "A"

THE WESTINGHOUSE ELECTRO-PNEUMATIC BRAKE FOR MULTIPLE UNIT STOCK

GENERAL DESCRIPTION

The brake consists of an electrically controlled compressed air brake for normal service use, giving sensitive and rapid application of the brakes, together with the well known "Westinghouse Automatic Brake" providing for emergency applications of the brake made either by the Motorman, the Guard, passengers, or if the train should divide. The Automatic brake may also be used for normal service stops if required.

Throughout these instructions the electrically controlled brake is referred to as the "E.P." brake, and the automatic portion as the "Automatic Brake". The term "equipment" refers to the complete fittings which make up the brake, independent parts being generally termed "components" or "fittings".

Important features of the brake equipment may be summarised as follows:—

- (1) Flexibility and sensitivity of control enabling accurate stops to be made.
- (2) Ease of control due to the self-lapping feature of the E.P. Brake.
- (3) Simultaneous action of the E.P. brake on all cars enabling the use of heavy application and consequent short stops without shock.
- (4) Graduated application and graduated release of the E.P. Brake.
- (5) The E.P. Brake is inexhaustible up to the capacity of the compressor and main reservoir system, thus enabling repeated application and release to be made in quick succession if desired.
- (6) Graduated application of the Westinghouse Automatic Brake, thus enabling this brake to be used for normal service stops if required.
- (7) Westinghouse Automatic brake always available for emergency stops made either by the Motorman, Guard, or passengers.
- (8) A full and rapid application of the Westinghouse Automatic brake throughout the train should the train part.

ELECTRO-PNEUMATIC BRAKE

The E.P. brake being electrically controlled provides for simultaneous and uniform application and release on all cars irrespective of the length of train. The brake is independent of the auxiliary reservoirs and repeated applications and releases can be made.

Each Motorman's cab is fitted with a brake controller pipe bracket which carries the Motorman's brake valve for operating both the E.P. and Automatic brakes, an equalising discharge valve combined with the Motorman's brake valve, a reducing valve for use with the Automatic brake, and an isolating valve for isolating the air supply from non-operative brake valves. A separate low voltage electrical supply through a 10-amp fuse is provided for each Motorman's cab.

Electrical contacts are provided on the Motorman's brake valve. When the E.P. brake is operated, these contacts complete electrical circuits and energise magnet valves which are fittings of an E.P. brake unit on each car. These magnet valves admit air to, and exhaust air from, the brake cylinders to apply or release the brake.

A main reservoir pipe is continuous throughout the train and all E.P. units are connected to, and are fed with compressed air from this pipe.

Graduated operation of the E.P. brake is afforded for both application and release, and the self-lapping feature of the Motorman's brake valve permits a brake cylinder pressure in both application and release, dependent on the degree of handle movement within the E.P. range of the Motorman's brake valve.

To obtain the best possible braking, E.P. applications should be made as fully as conditions permit and then graduated off as the speed of the train decreases, so that at the end of the stop, little or no pressure remains in the brake cylinders. The amount of braking necessary in any given case depends upon conditions of rail, grade, loading, speed and kind of stop required. It should always be borne in mind that the retarding effect is greater at low than at high speed.

A 10-amp fuse is provided in the driving compartment auxiliary cupboard for the E.P. Brake system. A BLUE indicator light on the Motorman's panel should light up as soon as the master switch handle is moved to the "On" position.

The E.P. brake system is normally fed (together with the control circuits) via a selector switch in the auxiliary cupboard from the driving position in use. In emergency, however, by throwing the selector switch, an alternative feed can be obtained from the next motor coach. The master switch handle in the driving compartment must, of course, remain in the "On" position.

Should the blue indicator light not light up, the E.P. brake must be considered inoperative, but not before an endeavour has been made to obtain an alternative feed as described above. The failure of a lamp filament in the indicator light must also be regarded as a failure of the E.P. brake.

If a failure occurs during running, the subsequent brake application should be made by moving the brake valve handle to the "Service Automatic" or "Emergency" position (position 4 or 5) as the occasion demands. The selector switch should then be thrown down, and if no alternative feed is obtained, the E.P. brake fuse must be isolated and withdrawn.

AUTOMATIC BRAKE

The Automatic brake is continuous through the train and is operated by compressed air from the main reservoir pipe which is fed via the isolating valve, reducing valve and Motorman's brake valve into the train pipe (brake pipe) and equalising reservoir.

The Automatic brake is applied by lowering the pressure in the equalising reservoir which in turn reduces the pressure in the train pipe through the medium of the equalising discharge valve. The reduction in the train pipe pressure causes the pistons of the triple valves to move and compressed air stored in the auxiliary reservoirs flows to the brake cylinders, to apply the brake.

The brake is released by restoring the air pressure in the train pipe, which causes the triple valves to:—

- (a) Close the communication between auxiliary reservoirs and brake cylinders.
- (b) Open a port from the brake cylinders to atmosphere, thus allowing the brake cylinders to exhaust and release the brake.
- (c) Permit air to flow again from the train pipe to the auxiliary reservoirs.

The brake is normally applied by the Motorman, or in cases of emergency by the Guard or passengers. A rupture of a train pipe hose coupling or other incident causing an escape of air from the train pipe, will also immediately apply the brake. This brake is therefore described as “Automatic”, in contrast to the E.P. brake which operates only under the control of the Motorman.

When the E.P. brake is in use the Automatic brake is not applied but remains with the train pipe and auxiliary reservoirs charged ready for use in emergency.

When operating the Automatic brake for service stops, care should be taken that the brake is applied earlier than would be the case with the E.P. brake to ensure the train stopping at the correct point.

This is because:—

- (a) for service stops using the Automatic brake, the brake cylinder pressure builds up less rapidly than with the E.P. brake;
- (b) the application of the Automatic brake on the rear vehicles is slightly later than on the leading vehicles of the train, due to the time taken for the air to flow through the train pipe whereas the E.P. brake applies the brake on all coaches in the train simultaneously.

After the train has been brought under control and just before it comes to rest, the Motorman's brake valve handle should, in order to prevent the jerk which is often experienced at the moment of stopping, be put into Position I (Release and Running) so that the brake cylinder pressure is reduced to a low figure when the train stops. At this moment, in order to prevent the train from rolling whilst in the station, a further application may be necessary.

For emergency applications made with the Motorman's brake valve, the E.P. brake will apply in addition to the Automatic brake resulting in a somewhat more rapid application (unless the E.P. brake is not in use). Under these conditions excessive brake cylinder pressure is prevented by the safety valve of the E.P. brake unit which is set at 55 lb./sq. in.

PARTICULARS OF THE BRAKE FITTINGS

Fittings on all coaches.

(1) E.P. BRAKE UNIT is situated on the underframe and comprises the following fittings assembled to a pipe bracket:—

- (a) *Holding Magnet Valve* which when energised by the Motorman's brake valve closes the brake cylinder exhaust.
- (b) *Application Magnet Valve*, which when energised by the Motorman's brake valve admits compressed air from the main reservoir pipe to the brake cylinder.
- (c) *Limiting Valve* which restricts brake cylinder pressure to a predetermined maximum during E.P. applications.
- (d) *Positive Acting Check Valve* which acts as a non-return valve between the brake cylinder and the application magnet valve.
- (e) *Triple Valve Stabilising Valve* ensures that when the E.P. brake is released, the triple valve slide valve is returned to the release position should it have moved to a lap position.
- (f) *Brake Cylinder Safety Valve* safeguards against excessive brake cylinder pressure.

- (g) *Triple Valve* for use with the Automatic brake. The triple valve exhaust connects to the Holding Magnet Valve so that the brake cylinder is always exhausted via the triple valve.
- (h) *Terminal Block* (in E.P. Unit) connects the electrical leads of the E.P. brake unit to the external leads of the E.P. brake circuits.

- (2) CENTRIFUGAL DIRT COLLECTOR AND STRAINER cleans the air from the main reservoir pipe to the E.P. brake unit.
- (3) CENTRIFUGAL DIRT COLLECTOR cleans the air from the train pipe to the triple valve.
- (4) E.P. UNIT ISOLATING COCK for isolating the E.P. Unit from the Main Reservoir pipe when necessary.
- (5) TRIPLE VALVE ISOLATING COCK for isolating the triple valve from the train pipe when necessary.
- (6) AUXILIARY RESERVOIR stores air at train pipe pressure for use with the Automatic brake.
- (7) BRAKE CYLINDER applies the brake blocks to the wheels through the medium of the brake rigging.

- (8) SLACK ADJUSTER (mounted on each brake cylinder) automatically takes up the wear of the brake blocks and limits the brake cylinder piston travel to a predetermined maximum.
- (9) RELEASE VALVE installed in the brake cylinder pipe line permits the brake cylinder pressure to be released by hand if necessary.
- (10) 1" HOSE COUPLINGS connect the train pipe between coaches.
- (11) TRAIN PIPE COUPLING COCKS enable train pipe continuity to be maintained or broken as required.
- (12) $\frac{3}{4}$ " HOSE COUPLINGS connect the main reservoir pipe between coaches.
- (13) MAIN RESERVOIR PIPE COUPLING COCKS enable main reservoir pipe continuity to be maintained or broken as required.
- (14) PASSENGER COMMUNICATION VALVE in each coach enables passengers to make an emergency application of the Automatic brake.
- (15) THE WHISTLE OR HORN.
- (16) THE WHISTLE OR HORN VALVE in each motorman's cab for operating the whistle or horn.

- (17) JUMPER COUPLINGS (between coaches) for making the control wires throughout the train. The 3 wires required for the E.P. brake are the holding wire 11, application wire 10 and E.P. brake negative return wire 12.

Fittings on Motor Coach only.

- (18) COMPRESSOR SWITCH controls the supply of electricity to the compressor motor via the contacts of the compressor contactor.
- (19) COMPRESSOR GOVERNOR CUT - OUT SWITCH is normally closed, but can be opened in case of failure of the compressor governor.
- (20) COMPRESSOR SYNCHRONISING SWITCH which, when opened, isolates the relative compressor from the synchronising circuit.
- (21) COMPRESSOR GOVERNOR switches the electricity "On" and "Off" the synchronising circuit in accordance with the air pressure, thereby operating the compressor contactors.
- (22) COMPRESSOR CONTACTOR controls the compressor motor circuit.
- (23) MOTOR DRIVEN AIR COMPRESSOR delivers compressed air through the cooling coil to the main reservoir.

- (24) MAIN AIR RESERVOIR in which the compressed air is stored and fed to a main reservoir pipe, continuous throughout the train.
- (25) MAIN RESERVOIR SAFETY VALVE protects the main reservoir against excess pressure.
- (26) MAIN RESERVOIR ISOLATING COCK for isolating the compressor and main reservoir air system from the main reservoir pipe if necessary.
- (27) CENTRIFUGAL DIRT COLLECTOR for cleaning the air from the main reservoir pipe to the brake controller.
- (28) BRAKE CONTROLLER consists of a pipe bracket to which are assembled the following fittings:—
 - (a) *Motorman's Brake Valve* has electrical contacts for control of the E.P. brake and a rotary valve for operating the Automatic brake.

Air from the reducing valve passes through the brake valve rotary valve into an equalising reservoir, the equalising discharge valve and the train pipe.
 - (b) *Equalising Discharge Valve* relays to the train pipe (continuous throughout the train) any reduction of pressure in the equalising reservoir.

- (c) *Reducing Valve* reduces main reservoir supply pressure to the prescribed train pipe pressure.
 - (d) *Isolating Valve* which is operated by a pilot isolating valve in the master controller, and is opened when the Master Switch handle is moved to "On". In the operative Motorman's cab it is open and permits brake cylinder air to communicate with the self lapping portion of the Motorman's brake valve and also allows air from the main reservoir pipe to flow to the reducing valve. In non-operative Motorman's cabs it is closed and isolates the brake cylinder pipe and the main reservoir pipe from the brake valves.
 - (e) *Terminal Block in Brake Controller* connects the electrical leads of the brake valve to the external leads of the E.P. brake circuits. The electrical supply and E.P. brake return circuit are "made" or "broken" when the Master Switch handle on the Master Controller is turned to the "On" or "Off" position.
- (29) **EQUALISING RESERVOIR.** Reductions of pressure in this reservoir are made by the Motorman's brake valve for Automatic applications.

- (30) ILLUMINATED DUPLEX PRESSURE GAUGE indicates main reservoir and train pipe pressures.
- (31) ILLUMINATED SINGLE BRAKE CYLINDER PRESSURE GAUGE indicates brake cylinder pressure.
- (32) BLUE INDICATOR LIGHT which is alight when the electrical supply is available to the Motorman's brake valve.
- (33) BRAKE APPLICATION RELAY relays electrical control from the Motorman's brake valve to the Holding Magnet Valves and Application Magnet Valves throughout the train.
- (34) CONTROL CIRCUIT GOVERNOR cuts out the motor control electrical circuit when train pipe pressure falls to approximately 41 lb./sq. in. and re-makes the motor control electrical circuit when train pipe pressure is restored to about 55 lb./sq. in.
- (35) MASTER CONTROLLER DEADMAN'S VALVE, when released, applies the Automatic Emergency Brake.
- (36) EMERGENCY APPLICATION VALVE operated by the Deadman's valve to vent the train pipe and cause an Automatic Emergency application.

- (37) PILOT ISOLATING VALVE in the master controller controls the isolating valve in the Brake Controller. The pilot isolating valve in turn is operated by the Master Switch handle on the master controller.
- (38) GUARDS EMERGENCY COCK in each Guard's compartment for making an Automatic emergency application if required.
- (39) TRAIN PIPE PRESSURE GAUGE in each Guard's compartment to enable the Guard to observe train pipe pressure.
- (40) BRAKE CYLINDER PRESSURE GAUGE in each Guard's compartment to enable the Guard to observe brake cylinder pressure.

Fittings on Driving Trailer Coach only.

The principal fittings are Items 1-17 and 27-40.

Fittings on Trailer Coach only.

The Principal fittings are Items 1-17.

PREPARING AND BERTHING TRAINS.

Preparation for Service.

The following checks and tests of the brake equipment are to be made during preparation of the train for service.

In the motorman's cab at the front end of the train:—

- (1) Check that the hand brake is applied.
- (2) See that the Auxiliary Cut-out Switch is "On". These must also be "On" in all other Motormen's cabs. The motor generator sets and compressors should then be running.
- (3) Insert and turn the Master Switch Key to unlock the Master Switch Handle which is then turned to "On". Check that the blue indicator lamp lights up. The Motorman's brake valve should be in Position I (Release and Running).
- (4) Check the readings of the duplex and brake cylinder gauges whilst the air system is charging up. The final pressures should be:—

Main Reservoir 90-100 lb./sq. in.

Train Pipe 65-70 lb./sq. in.

Brake Cylinders 0 lb./sq. in.

If there is a tendency for the main reservoirs or train pipe to overcharge, the compressors must be stopped and the defect remedied in accordance with special instructions.

(5) The following cocks should be CLOSED:—

- (a) Train pipe and main reservoir pipe coupling cocks at both ends of the train (not between coaches).
- (b) All drain cocks on reservoirs and dirt collectors.
- (c) All guards' emergency cocks and passenger communication valves.

The following cocks should be OPEN:—

- (d) Train pipe and main reservoir pipe coupling cocks between coaches (not at the ends of the train).
- (e) All main reservoir isolating cocks.
- (f) All compressor governor isolating cocks.
- (g) All E.P. brake unit isolating cocks.
- (h) All triple valve isolating cocks.
- (i) All deadman's valve isolating cocks.
- (j) All whistle or horn valve isolating cocks.
- (k) The isolating cocks on all reducing valve units.
- (l) All isolating cocks between control reservoirs and the control equipment.

(6) Test the Electro-Pneumatic Brake as described on Pages 99 to 101.

- (7) Check the operation of the Deadman's Handle. Note that the "Train Pipe" pointer on the gauge falls at least 30 lb./sq. in. and that brake cylinder pressure builds up to approximately 50 lb./sq. in. Return the Deadman's Handle to normal and note that the "T.P." Pointer of the gauge recharges to 65-70 lb./sq. in. and the "Brake Cylinder" pressure returns to zero.

TURN THE MASTER SWITCH HANDLE TO "OFF" then make an emergency application of the Automatic brake by moving the brake valve to Position V (Emergency). Note that the "T.P." pointer on the gauge falls at least 30 lb./sq. in. and that the brake cylinder builds up to approximately 50 lb./sq. in. Return the brake valve to Position I (Release and Running).

Examine that all brake blocks are applied to the wheels; at the same time check all gauges throughout the train to see that the pointers are as follows:—

Main Reservoir	90-100 lb./sq. in.
Train Pipe	Below 40 lb./sq. in.
Brake Cylinders	50 lb./sq. in.(approx.).

See that the brake valve in all motorman's cabs is in Position I (Release and Running). Check

that all hand brakes are released (except in the Motorman's cab at the leading coach).

On arrival at the rear-most motorman's cab carry out the following:—

- (1) Insert and turn the Master Switch Key and move the Master Switch Handle to "On". Note that the blue indicator lamp lights up; see that the brake valve is in Position I (Release and Running). Check the gauge to see that the train pipe recharges to 65-70 lb./sq. in. and that the brake cylinder pressure returns to zero.
- (2) Carry out the test of the E.P. brake as described on Pages 99 to 101.
- (3) Check the operation of the Deadman's Handle and note the gauge readings as described above for the Motorman's cab at the other end of the train. Return the Deadman's Handle to normal. Check from the gauge that the brakes are released before leaving the cab; move the Master Switch Handle to "Off" and remove the Master Switch Key. See that the brake valve is in Position I (Release and Running). See that the hand brake is released.

Examine all brake blocks to see that they are released from all wheels. (Brake blocks will still be applied at leading motor coach as the hand brake is still on.)

On returning to the front end of the train, the test of the Automatic brake for continuity as described on Pages 101 to 102 must be carried out jointly by the Motorman and Guard.

Berthing Trains.

When changing ends or berthing the train, before leaving the driving cab make a full application of the Westinghouse Automatic brake; put the master switch handle on the master controller in the "Off" position and return the Motorman's brake valve handle to Position 1 (Release and Running).

Uncoupling and Coupling.

- (a) *Uncoupling.* A full Westinghouse Automatic brake application must be made, after which the brake pipes should be uncoupled first, then the control jumper, and finally the power jumper. The Shunter must then signal to the Motorman that all is ready for uncoupling and the units should then be eased together and the uncoupling lever pulled and held whilst the two units are moved apart by a few feet. The unit which is moved away must be halted until the Shunter signals that the couplings have disengaged satisfactorily.
- (b) *Coupling.* Before another unit is brought on to a stationary unit, the Shunter must satisfy

himself that one of the coupler knuckles is open.

After the two units have been brought together, the Shunter must satisfy himself that the couplers have engaged properly by seeing that the vertical lock tell tale has dropped to the bottom of its slide in both couplers, and that knuckles of the couplers are clasping each other. In addition it is necessary to make a further test by easing back the unit which has been brought on to the stationary unit.

When this has been done the power jumper should be coupled first, and then the control jumper and finally the brake pipes.

Note—The Shunter should, as far as possible, work from the platform.

BRAKE TEST BEFORE SERVICE OR AFTER ALTERING THE COMPOSITION OF A TRAIN

Checking the Blue Indicator Light and Air Pressure.

Before carrying out these tests the Motorman must always observe that the blue indicator light is "On" and that the main reservoir and train pipe are charged to the prescribed pressure, viz.

Main Reservoir 90-100 lb./sq. in.

Train Pipe 65-70 lb./sq. in.

Test of the Electro-Pneumatic Brake.

- (1) Move the brake valve handle to a position about halfway between Position 1 (Release and Running) and Position 2 (Full Service E.P.). Note that the brake cylinder gauge records a pressure of approximately 30 lb./sq. in.
- (2) Move the handle to Position 2 (Full Service E.P.) and note that the brake cylinder pressure builds up to not less than 45 lb./sq. in. Walk along the train and inspect that all brake blocks are applied to the wheels.

The Guard or Shunter must observe in the rear-most coach (Guard's compartment or driving cab) of the train, that the brake has applied by noting that the brake cylinder pressure rises from zero to NOT LESS THAN 45 lb./sq. in. and remains steady.

- (3) Return the brake valve handle to Position 1 (Release and Running). Air should be heard escaping through the holding valves and the brake cylinder gauge should return to zero. Walk along the train and inspect that all brake blocks are released from the wheels, except those applied by the hand brake.

The Guard or Shunter must see that the brake has released, i.e., that the brake cylinder pressure has returned to zero.

- (4) If the E.P. brake does not operate correctly the situation should be dealt with in accordance with special instructions.

Test of the Automatic Brake for Continuity.

The train must not be moved until the Motorman and Guard have tested the equipment to ensure satisfactory operation of the Automatic brake on all coaches as follows:—

The Motorman must put the master switch handle on the master controller in the “Off” position.

- (1) Check that the main reservoir and train pipe pressure are correct as described above.
- (2) In the rear-most coach (Guard's compartment or driving cab) the Guard having observed that the train pipe is charged to 65-70 lb./sq. in. must reduce the train pipe pressure by at least 30 lb./sq. in. The emergency cock must then be shut or the brake valve handle replaced in Position I (Release and Running) as the case may be.
- (3) When the Guard applies the brakes, both the Motorman and the Guard must observe that the train pipe pressure falls and that the brake cylinder pressure rises to indicate that the brakes are applied (NOT LESS THAN 45 lb./sq. in.).

- (4) The Motorman will release the brakes by placing the Master Switch handle to "On" noting that the brake valve is in Position I (Release and Running). Both he and the Guard must observe that the brake cylinder pressure falls to zero, and the Motorman must observe that the train pipe pressure is restored to 65-70 lb./sq. in.
- (5) The Guard must return to the rear-most Guard's van and observe that his train pipe gauge registers 60-75 lb./sq. in.
- (6) The Motorman must make an Automatic Service application of the brakes with the Motorman's brake valve by reducing train pipe pressure at least 30 lb./sq. in. Check that the brake cylinder pressure gauge indicates NOT LESS THAN 45 lb./sq. in. Release the brakes.
- (7) The Motorman must make an E.P. application of the brakes to about 25 lb./sq. in. brake cylinder pressure before releasing the hand brakes. After the E.P. brakes have been released the train may be moved.

Alteration of the Make-up of a Train.

Should any alterations be made to the make-up of a train by the attaching or detaching of any coaches, the brakes must be tested by the Motorman and Guard, as described above.

OPERATION OF THE BRAKE

Observing the Blue Indicator Light and the Air Pressure Gauges.

Before moving the train and at frequent intervals during service the Motorman must check that the blue indicator light is on. He must also make a practice of frequently observing the Duplex pressure gauge and the brake cylinder gauge noting that the pressures are correct—particularly after releasing an Automatic or Emergency application. The main reservoir pressure must be restored to 90-100 lb./sq. in. and the train pipe restored to 65-70 lb./sq. in. before the train is again moved.

Operating the Electro-Pneumatic Brake.

(a) *Running.*

Keep the Motorman's brake valve in Position 1 (Release and Running) when not being used.

All Motorman's brake valves in non-operative cabs are to be left in Position 1 (Release and Running).

If the brakes apply whilst running, due to opening of a guard's emergency cock or passenger's emergency cock, or the rupture of the train pipe, move the Motorman's brake valve to Position 5 (Emergency) and **LEAVE IT THERE UNTIL THE TRAIN STOPS** so as to expedite the discharge of air from the train pipe and avoid loss of main reservoir air pressure.

(b) *Service Application (E.P.).*

To apply the E.P. brakes for a service stop, move the handle from Position 1 (Release and Running) towards Position 2 (Full Service E.P.). The brake cylinder pressure builds up rapidly and simultaneously on all cars to a value dependent on the position of the brake valve handle. The maximum brake cylinder pressure for a service stop is obtained with the handle in Position 2. Any intermediate position of the handle, between Position 1 and Position 2 results in an intermediate brake cylinder pressure.

The amount of braking necessary in any given case depends upon the conditions of rail, gradient, loading, speed and kind of stop required. Bearing in mind that the retarding effect of any brake application is greater at low than at high speed, the best possible stop will be made when the brakes are applied at the commencement as fully as the conditions permit, and then graduated off as the speed of the train decreases, so that at the end of the stop, little or no pressure remains in the brake cylinder.

(c) *Holding the Brakes Applied (E.P.).*

When the brake valve has been moved to give the brake force required, the handle may

be left in that position until it is desired to release or partially release the brake.

(d) *Release.*

To release the brake fully after an application move the brake valve handle to Position 1 (Release and Running) in which position it must be left at all times when the brakes are not in use.

To graduate or partially release the brakes, move the handle towards Position 1 until the brakes have been released to the desired extent and leave the handle in that position until a further release is required.

Changing over from E.P. to Automatic Operation

When it is necessary for any reason to change over from E.P. operation to the Automatic brake, the latter can be operated in the usual manner, no other action being required. If, however, the 10 amp fuse has not been withdrawn, the handle must be moved smartly from Position 1 through Position 2 to prevent an E.P. application. The operative service positions for the Automatic brake are:—

- | | | | |
|---|-----|-----|----------------------|
| 1 | ... | ... | Release and Running. |
| 3 | ... | ... | Lap. |
| 4 | ... | ... | Service Automatic. |

As before, the handle must be kept in Position 1 (Release and Running) when the brakes are not being used.

(a) *Service Application (Automatic).*

When making a service Automatic application the brake valve is first brought quickly to Position 3 (Lap) and then moved to Position 4 (Service Automatic) for a few seconds and then back to Position 3, the degree of braking depending upon the time the handle is left in Position 4.

The amount of train pipe reduction necessary depends upon the running conditions at the time of application, but it is useless and indeed wasteful of air, to effect a reduction below the point at which the auxiliary reservoir and brake cylinder pressure equalise, as no further increase in brake cylinder pressure can be obtained. This usually corresponds to a reduction of 20 lb./sq. in. from a train pipe pressure of 70 lb./sq. in. (i.e. equalisation pressure is approximately 50 lb./sq. in.).

(b) *Release.*

To release the brake after an Automatic application, the handle is moved from Position 3 (Lap) to Position 1 (Release and Running) and left there.

Test of Automatic Brake during each trip.

To test the satisfactory functioning of the Automatic brake the train should be stopped or checked at least once on each trip by means of the Automatic brake.

Changing Ends.

When changing ends, before leaving the driving cab, make a full application of the Westinghouse Automatic brake, put the **Master Switch Handle** on the master controller in the "Off" position and return the Motorman's brake valve handle to Position I (Release and Running).

When the brakes are released and before moving off, check that the blue indicator light is on, and the gauges for correct pressures as already described.

Should the Motorman leave the train at any time during service, e.g., when he leaves his compartment to telephone for a signal, it is advisable to leave the train braked by means of an Automatic application in preference to an E.P. brake application. Thus the braking is independent of any electrical fault which could occur whilst the Motorman is away from the driving compartment.

Emergency.

In the event of sudden danger, the Motorman must move the brake valve handle quickly to

Position 5 (Emergency) and LEAVE IT THERE UNTIL THE TRAIN STOPS. The Motorman should never use the Deadman's handle for intentional emergency applications.

IRREGULARITIES IN WORKING

Defective E.P. Brake.

Should a defective E.P. brake necessitate a change-over to Automatic brake, the E.P. brake fuse must be isolated and withdrawn at the first opportunity.

If the E.P. brake unit on one coach becomes defective, the E.P. brake unit isolating cock must be closed. This will prevent E.P. operation on that coach only but the Automatic brake will remain effective throughout the train. IF THE DEFECT IS ON THE DRIVING COACH THE AUTOMATIC BRAKE MUST BE USED SINCE THE SELF-LAPPING PORTION OF THE MOTORMAN'S BRAKE VALVE WILL BE INOPERATIVE.

Defective Automatic Brake.

If on any of the coaches the Automatic brake does not operate properly the train pipe must be vented then the triple valve isolating cock must be closed; also the E.P. brake unit isolating cock on that coach must be closed. The brake is then released by hand by pulling the release valve wire and holding it until all the air has been released

from the brake cylinder and auxiliary reservoirs. This renders the brake entirely inoperative on that coach, but the brakes remain operative on the remainder of the train.

Note.—When a Motorman finds it necessary to put either the Automatic or the E.P. brake out of action on any coach due to a defect, he must inform the relieving motorman (if relieved) and the circumstances must be reported at the first opportunity.

Burst Hose in Train Pipe.

In the event of the bursting of a coupling hose in the train pipe, the brakes on the entire train will be applied and the train brought to a standstill. The brake valve should be moved to "Emergency" and left then until the train stops. The defect is to be dealt with in accordance with special instructions.

Burst Hose in Main Reservoir Pipe.

In the event of the bursting of a coupling hose on the main reservoir pipe, the train must be brought to rest using the Automatic brake. The coupling cocks on both sides of the burst hose must be closed. Providing that compressors are available both in front of and in the rear of the burst hose the E.P. brake may be operated normally.

If no compressor is available at the rear of the burst hose the Automatic brake should be operated, as only those brakes in front of the burst hose will be effective on E.P. operation.

If no compressor is available in front of the burst hose, the Automatic brakes cannot be released from the front Motorman's compartment. The defect is to be dealt with in accordance with special instructions.

Break-away.

If the train should part, the brakes will be applied automatically to both portions of the train. The brake valve should be moved to "Emergency" and left there until the train stops. The incident is to be dealt with in accordance with special instructions.

LOCATION OF PIPE LINE STRAINERS AND DIRT COLLECTORS

Pipe line air strainers and dirt collectors are included in the air system wherever necessary to guard against ingress of dirt and foreign matter to vital fittings.

SUCTION STRAINER. Adjacent to compressors.

STRAINER IN COMPRESSOR GOVERNOR in body of compressor governor.

STRAINER IN REDUCING VALVE in reducing valve body in the brake controller.

CENTRIFUGAL DIRT COLLECTOR beneath Motorman's cab and in the air supply line to the reducing valve unit.

STRAINER FOR PROTECTING CONTROLS EQUIPMENT in the reducing valve unit.

All the above strainers, centrifugal dirt collectors etc. are located on the motor coaches. The following strainers and dirt collectors are located on all coaches.

CENTRIFUGAL DIRT COLLECTOR in the branch pipe from the train pipe to the triple valve.

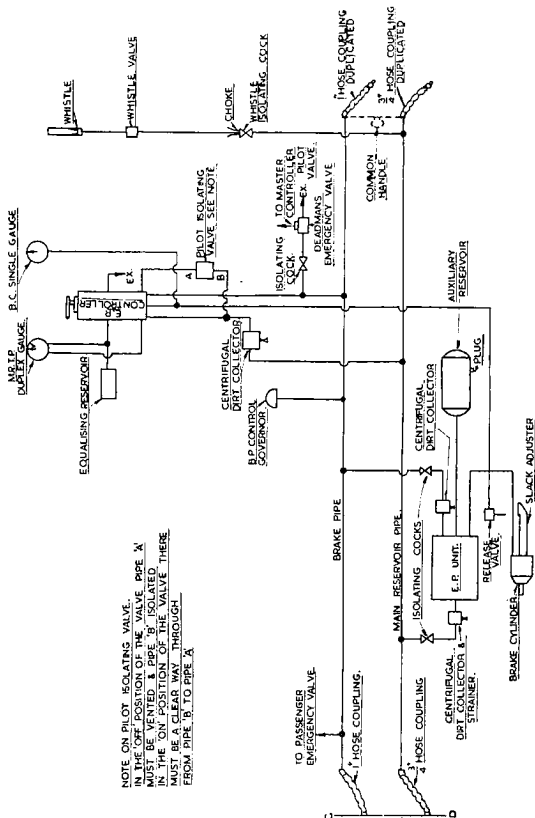
DIRT COLLECTOR & STRAINER in the main reservoir pipe connecting the branch pipe to each E.P. unit.

BRANCH PIPE TEES. In the main reservoir pipe and train pipe connecting the branch pipes to each E.P. unit.

The successful operation of the E.P. brake and automatic brake depends to a great extent on cleanliness of the air used in the system. It is, therefore, of vital importance that all the above strainers and dirt collectors are cleaned and inspected at frequent and regular intervals.

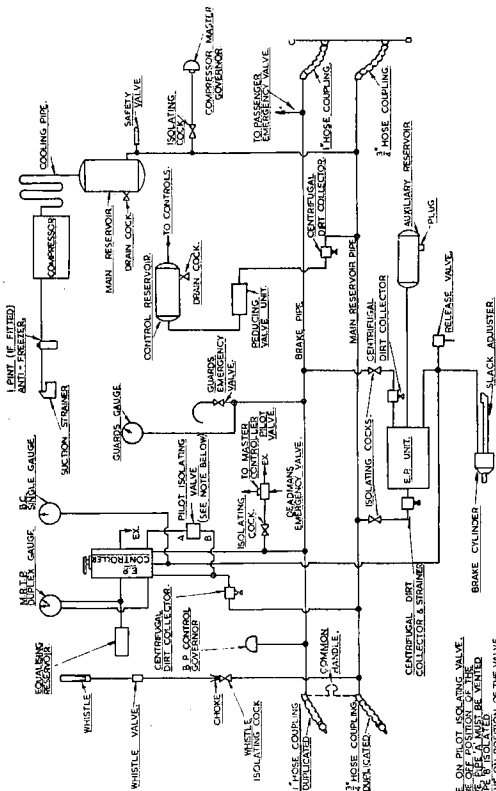
It is equally important that the main reservoir and control reservoir are drained of water at frequent and regular intervals.

CLEANLINESS IS OF THE UTMOST IMPORTANCE.



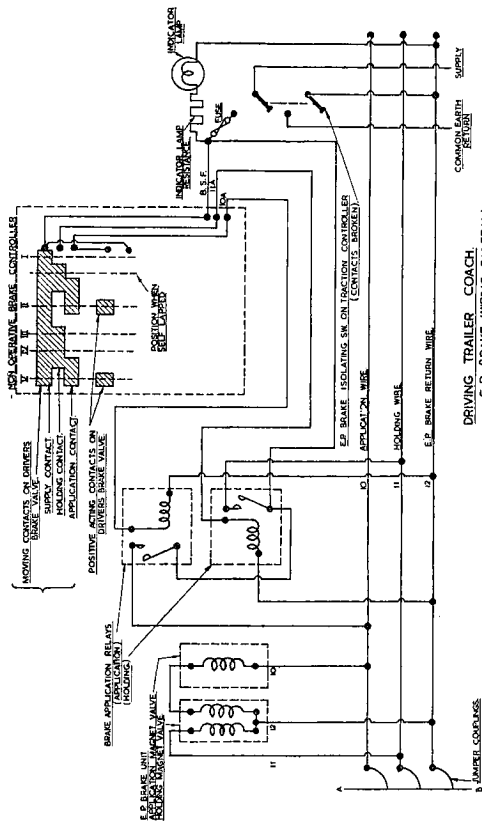
NOTE ON PILOT ISOLATING VALVE.
IN THE 'OFF' POSITION OF THE VALVE PIPE 'A'
MUST BE VENTED TO PIPE 'B'. ISOLATED
IN THE 'ON' POSITION OF THE VALVE THERE
MUST BE A CLEAR WAY THROUGH
FROM PIPE 'B' TO PIPE 'A'

DRIVING TRAILER COACH
BRAKE PIPING DIAGRAM.

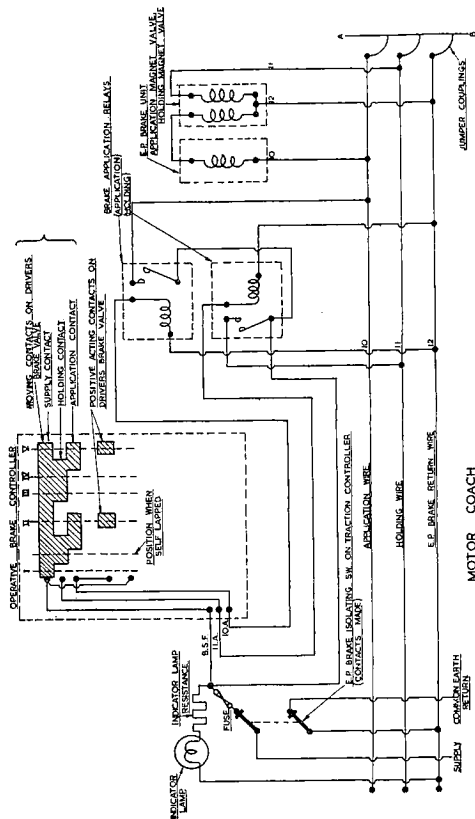


NOTE: ON PILOT ISOLATING VALVE, IN THE OFF POSITION OF THE VALVE, PIPE A MUST BE VENTED & PIPE B ISOLATED. IN THE ON POSITION OF THE VALVE, AIR MUST BE KEPT IN PIPE A, THROUGH FROM PIPE B TO PIPE A.

MOTOR COACH.
BRAKE PIPING DIAGRAM



DRIVING TRAILER COACH.
 E.P. BRAKE WIRING DIAGRAM.



MOTOR COACH
E.P. BRAKE WIRING DIAGRAM.

APPENDIX "B"

TREATMENT FOR ELECTRIC SHOCK

Should the patient still be in contact with the third rail or overhead conductor when LIVE, switch off the current.

Danger of third rail or overhead conductor when touching the body of the injured person.

If it is impossible to switch off the current immediately, precautions must be taken to prevent the person rendering assistance from receiving a dangerous, or even fatal shock. He should therefore protect himself by standing, if possible, on a dry non-conducting material which will resist the current, such as indiarubber, linoleum, glass or any other non-metallic substance. He should similarly protect his hands with indiarubber gauntlets, tobacco pouch, mackintosh or other article of dry clothing.

If no means of protection are at hand, an attempt may be made to drag the patient away by means of a loop of dry rope or a crooked stick. Care should be taken to avoid touching with naked hands the patient's skin, wet clothing, or boots if the soles are nailed. The armpits should be avoided, as perspiration usually makes the clothing damp there.

SEND FOR, but never wait for a DOCTOR.

Send for Doctor.

Effects on
the patient.

When a patient has been in contact with electric current, in addition to injuries and burns, the act of breathing may fail and this should receive first attention by performing artificial respiration by one of the two approved methods (Schafer's or Holger Nielsen) as described below.

The Holger Nielsen method should be used for preference for electric shock.

SCHAFER'S METHOD

How to place
the body.

Patient should be placed face downwards on a flat dry surface, head slightly turned to one side, arms stretched forward beyond the head.

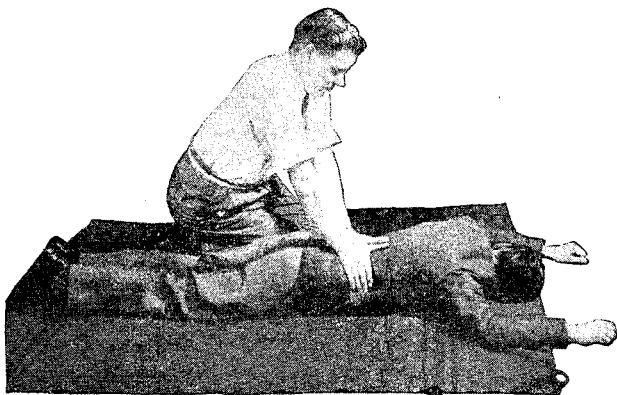


Fig. 1 ARTIFICIAL RESPIRATION (Schafer's Method)

Kneel down on one side of the patient facing his head, sitting back on your own heels, place your hands on the SMALL of the patient's back, the wrists nearly touching, the thumbs as near each other as possible and the finger passing over the loins on either side and pointing towards the ground. (Figs. 1 & 2).

Method of
conducting
artificial
respiration

Bending your body from the knees swing slowly forward, keeping your arms straight and rigid so that the weight of your body is conveyed on to your hands directly downwards on to the small of the patient's back. (Fig. 3). Then swing backwards

Action.

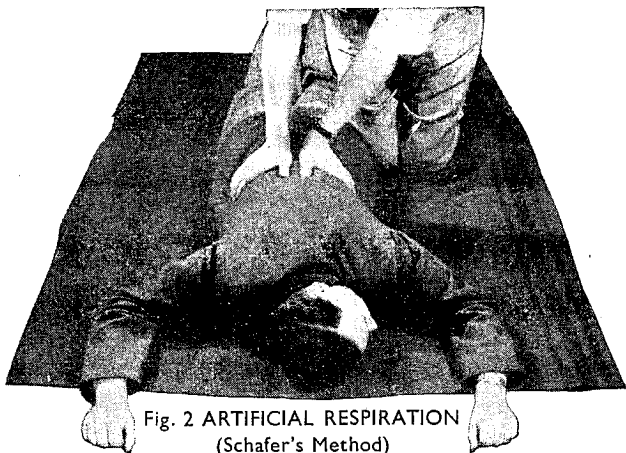


Fig. 2 ARTIFICIAL RESPIRATION
(Schafer's Method)

on to your heels again. Continue these movements of swaying forwards and backwards of your body from the knee joints at the rate of 12 times per minute until natural breathing begins. Then watch carefully in case of failure again.

Promote circulation by rubbing the limbs vigorously towards the heart and by applying warmth.

Artificial respiration must be continued perseveringly (sometimes for hours) until breathing is restored or until a doctor pronounces life to be extinct.

Shock, etc.

Treatment of shock and other injuries is essential but strong stimulants should be avoided unless recommended by a doctor.

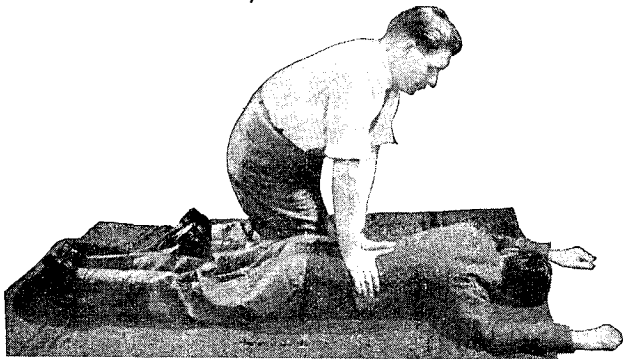


Fig. 3 ARTIFICIAL RESPIRATION (Schafer's Method)

HOLGER NIELSEN METHOD

Lay the patient in the prone position on a flat surface. Position of patient.

If there is a slight slope place the head low if the face is pale; high if the face is congested.

Place the patient's hands one over the other, under his forehead. If this is insufficient to keep the nose and mouth from the ground, the head must be turned slightly to one side. The nose and mouth must be unobstructed.

If the patient is lying on his back turn him to the prone position as follows. Turning. Go down on the right knee opposite the patient's head. Place the left foot on the ground out to the side.

Place the patient's arms carefully above his head and keep them there during the turn.

Grasp the patient's left upper arm and turn him over, protecting his face with the right hand. Adjust the position of the patient's hands as previously instructed.

Slap the patient smartly several times between the shoulders with the flat of the hand. This helps the tongue to fall forward and drives out any water which may have been inhaled in drowning cases.

Place one knee with the inner side in line with the patient's cheek six to twelve inches from the top of the patient's head. Position of operator.

Place the other foot with the heel in line with the patient's elbow.

Place the hands on the patient's back with the palms resting on the shoulder-blades, the thumbs on the spine and the fingers pointing to the patient's feet. (Figs. A and B).

Movement (1)

Keeping the arms straight rock gently forward until the arms are vertical, using no special force.

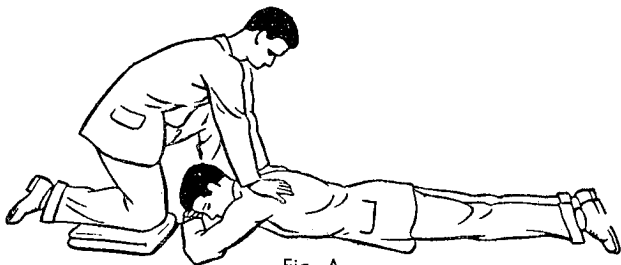


Fig. A

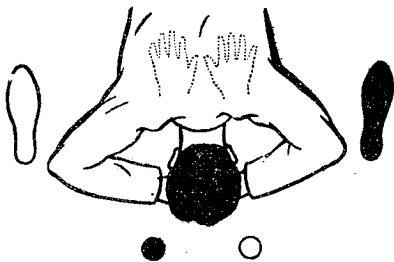


Fig. B

The movement takes $2\frac{1}{2}$ seconds counting "One, two, three." This pressure causes expiration. (Figs. C and D).

Movement (2)

The operator now rocks back counting "four" and slides his hands past the patient's shoulders

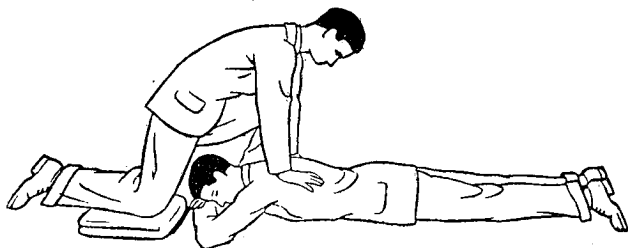


Fig. C

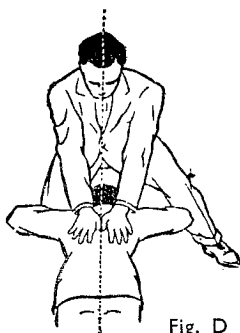


Fig. D

until they can grip his upper arms near the elbows. He raises and pulls on the arms for a period of $2\frac{1}{2}$ seconds counting "five, six, seven."

This movement causes inspiration. The arms should remain straight for the whole period. (Figs. E and F).

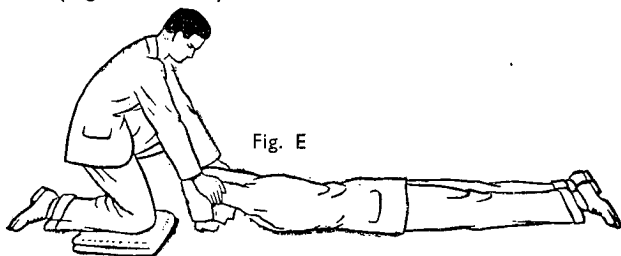


Fig. E

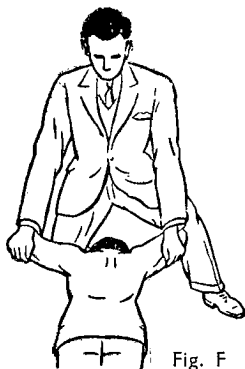


Fig. F

Counting "eight" the operator lowers the patient's arms to the ground and replaces his hands in the original position.

The whole operation should be rhythmic in character and should be continued until breathing re-commences.

When the patient begins to show signs of breathing the operator should continue with Movement 2 only, raising and lowering the arms alternately counting 1, 2, 3 ($2\frac{1}{2}$ seconds) for Inspiration and 4, 5, 6 ($2\frac{1}{2}$ seconds) for Expiration. This will now give a rate of 12 times per minute. (Figs. G and H).

Fig. G

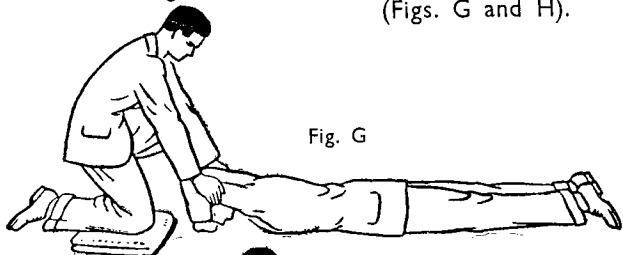
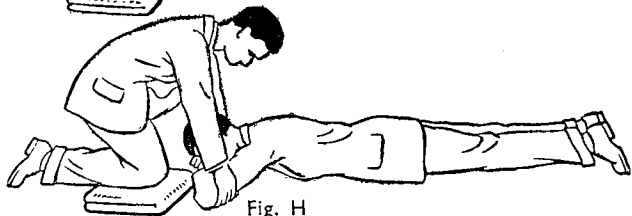


Fig. H



Children.

For children down to the age of 5 years the pressure on the shoulder-blades should be considerably reduced and applied with the finger tips only. The rate should be 12 times per minute. (Figs. J and K).



Fig. J

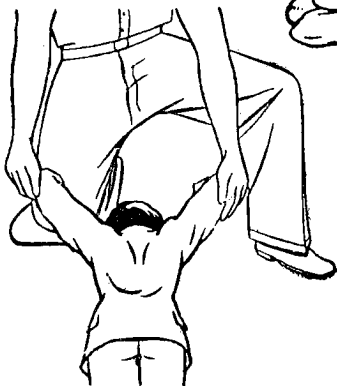


Fig. K

Below 5 years of age the arms should be laid by the sides and a support placed under the child's head or with the head supported by a helper, grasp the shoulders with the fingers underneath and the thumbs on top. Lift the shoulders steadily with the fingers to expand the chest: lower the shoulders and with the thumbs press gently on the shoulder-blades. (Figs. L and M).

The rate should be 2 seconds Inspiration and 2 seconds Expiration or 15 times per minute.

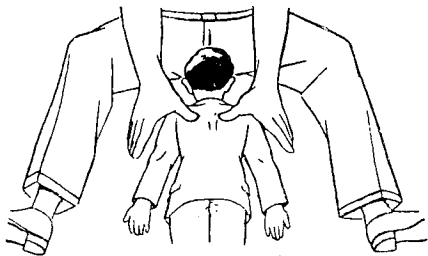
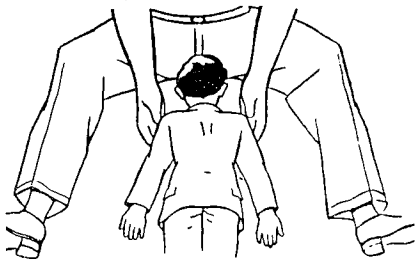


Fig. L

Fig. M



This method may be done with the patient on a table and the operator standing.

Injury to
upper limb.

When the upper limb is injured, the patient should be laid on his face with his arms by his sides.

The operator should be nearer the patient and after pressing on the shoulder-blades for Expiration (Movement 1), should place his hands under the shoulders and raise them for Inspiration (Movement 2). He should then lower them and continue with Movement 1 at the standard rate of 8 to 9 times per minute. (Fig. N).

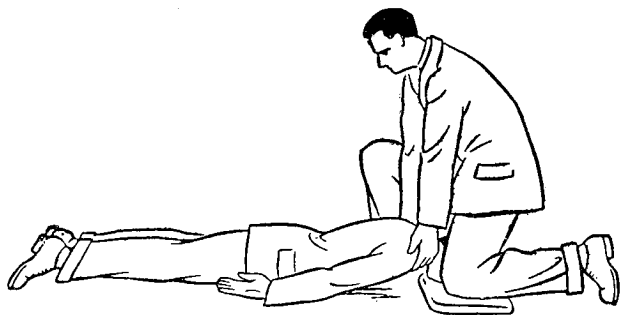


Fig. N

(These diagrams are reproduced by kind permission of The St. John Ambulance Association from their textbook "First-aid to the Injured").

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