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# British Railways Board

Chief Engineer (Traction & Rolling Stock) Department

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**HIGH CAPACITY COAL**

**WAGON TRAINS**

**Description &**

**Maintenance**

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## Preface

This publication is intended to provide comprehensive description and maintenance information applicable to the High Capacity Coal Wagon.

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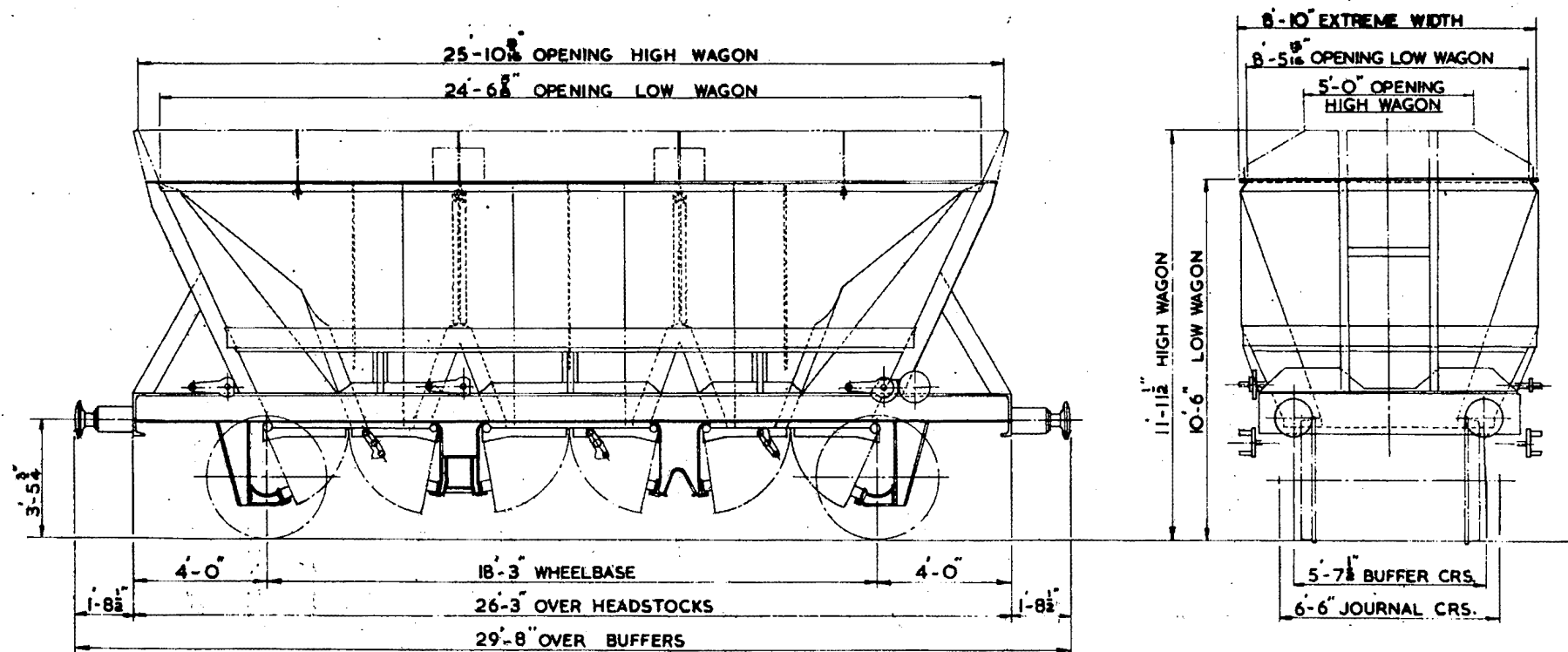


CONTENTS

SUBJECT	PAGE
LIST OF ILLUSTRATIONS	4
DESCRIPTION OF WAGON	6
DESCRIPTION OF AIR BRAKE	23
FAULT FINDING CHART FOR AIR BRAKE	29
TEST FOR AIR BRAKE	31
OUTSTATION MAINTENANCE OF WAGONS	35

## ILLUSTRATIONS

	Page
Fig. 1. Wagon Diagram	5
Fig. 2. Doors in closed position.	10
Fig. 3. Doors in open position.	10
Fig. 4. Power Station Layout.	11
Fig. 5. Arrgt. of Door Operating Catch Gear.	12
Fig. 6. Sequence of Door Operation.	13 - 21
Fig. 7. Door Manually Closing.	22
Fig. 8. Door Manually Opening.	22
Fig. 9. Air Brake Equipment.	26
Fig.10. Distributor.	27
Fig.11. Auxiliary Reservoir.	27
Fig.12. Brake Cylinder.	28
Fig.13. Brake Pad.	39
Fig.14. Handbrake Adjustment.	40
Fig.15. Position of Air Brake Cocks and Coupling Hoses.	41
Fig.16. Arrgt. of Torque Spanner and A.& B. Extension Lever.	42
Fig.17. Painting of Mating Surfaces on Underframe Plates.	43
Fig.18. Single link Suspension - Limits of wear.	44
Fig.19. Single link Suspension - Limits of wear.	45
Fig.20. Key to lubricating chart.	46
Fig.21. Door gear lubricating chart. End Bays.	47
Fig.22. Door gear lubricating chart. Middle Bay.	48



TEL CODE:-	HIGH WAGON	LOW WAGON	BODY:- STEEL
TARE:-	HOP 32 AB.	HOP AB.	DOORS:- 6 BOTTOM ACTUATED
CUBIC CAPACITY:-	13 TONS 19 CWT.	13 TONS 6 CWT.	BY LINESIDE EQUIPMENT.
MIN. CURVE:-	1424 CUB. FT.	1156 CUB. FT.	
BRAKE:-	2 CHAINS		
	AIR & HAND (LEVER)		

WHEELS:- 3'-7" DIA.  
 JOURNALS:- 5 1/2" DIA.  
 ROLLER BEARINGS.  
 COUPLINGS:- INSTANTER.  
 BUFFERS:- HYDRAULIC.  
 BUFFER HEADS:- 1'-1" DIA.

**FIG. 1**  
**HIGH CAPACITY COAL WAGON**

## HIGH CAPACITY COAL WAGON

### GENERAL DESCRIPTION

The wagons are designed with automatic door operating mechanism for the conveyance of coal to power stations where lineside equipment automatically discharges the coal from a continuous moving train of wagons.

The train passes through the lineside equipment at a controlled speed of half a mile per hour, obtaining full utilisation of wagons and equipment.

The capacity of the wagon (Fig. 1) is the maximum permitted for a four wheeled wagon with all-route availability; to attain this it was necessary to design the wagon to the maximum width and height permitted by the W.3 gauge, all body stiffening being internal. The maximum discharge door area has been provided, the end doors being narrower than the centre doors to clear the wheels whilst ensuring maximum door opening. The angles of the hopper sides and the valley angles in the corners of the wagon are designed to allow the coal to flow freely without any restriction, the three hopper outlets and the six bottom doors ensuring rapid discharge. The body of the wagon is galvanised to reduce corrosion, thus allowing plates of a minimum thickness to be used, resulting in a reduced tare. The surface presented by the galvanising also assists in the discharge of the coal.

The underframe is all steel welded construction consisting of 10" x 10" H section solebars suitably stiffened and fitted with a superstructure which forms a cradle to support the body.

Laminated side bearing springs are fitted with continental single link type suspension incorporating eye bolt adjustment with two stage rubber auxiliary. A horizontal link anchorage is also incorporated to maintain stability on the rubber auxiliary whilst still providing freedom of the continental link.

As it is essential for the height of the door operating lever trunnions to be accurately maintained, provision is made for the height to be adjusted by means of axlebox cone blocks in conjunction with the auxiliary eye bolts.

The wheels are 3'-7" diameter with continental tyre profile.(P5)

### BRAKES

Air operated power disc brakes are fitted operating on one combined wheel and disc on each axle, braked up to tare weight. A right hand lever hand brake is provided, operating cast iron blocks on the tread of the other two wheels.

### DOOR MECHANISM

The doors(Figs.2 & 3) are arranged in pairs, consisting of a driving door to which the gears and door operating levers are connected and a slave or following door.

An engaging horn is fitted at the centre of each door; the slave door horn having a projection fitted so that should the slave door not commence to open at the same time as the driving door, the driving door horn moving downwards contacts the projection on the slave door, pushing it open.

Each pair of doors on the wagon is opened by a separate door operating gear which is actuated by a trunnion projecting from the door operating levers at each side of the wagon and which contacts a corresponding cam on the lineside equipment at one side only.

A through shaft connects the two door opening operating levers, with reversing gears fitted at one side of the wagon so that the doors can be opened irrespective of which way round the wagon is situated in the train and irrespective of the direction of travel. The appropriate right or left hand lineside door opening equipment is fitted in the Discharge House to suit the direction of travel.

In opening the doors the trunnion on the door operating lever moves through  $130^{\circ}$  into a position ready to engage the door closing cam on the door closing mechanism.

In closing the doors, the trunnion on the door operating lever returns through the  $130^{\circ}$ , the horn on the driving door contacting the horn on the slave door, pushing it forward until both doors are closed.

The long link in the door operating gear (Fig. 2 ) is arranged with the top centre out of alignment so that when the doors are closed the over dead centre position ensures that the weight of coal upon the door retains the doors in the closed position and in effect acts as a locking device.

To compensate for wear in the pins and bushes of the door operating gear, adjustment packings are provided in the linkage (Fig. 5 ).

Rubber stops are fitted to cushion the doors when opening and to avoid undue strain on the door linkage, the position of the stop determining the angular movement of the trunnion on the door operating lever, thus ensuring that the trunnion is in the correct position to contact the door closing cam on the lineside equipment.

Safety catches are fitted at each side of the wagon and engage indirectly, trunnions attached to each side of the driving doors. The catches are operated by the trunnions projecting from the catch gear operating lever contacting a corresponding cam on the lineside equipment at each side of the line.

The safety catch is retained in position by a spring. They are prescribed by the catch in moving from the on to the off position ensures that the spring is in tension in both the on and off positions.

Attached to each safety catch gear on both sides of the wagon is an arrow pointed indicator (Fig. 2 ) which when pointing downwards indicates that the safety catches are in the safe position.

The indicator is painted white on both sides in order that an observer can, when standing at one side of a moving train, observe that all safety catches are in the safe position.



In the event of an emergency resulting in the non-automatic opening or closing of the doors, it is possible to open the doors by means of a short crowbar, inserted under the stirrup attached to the solebar behind the door operating lever (Fig. 8 ). The doors may be closed by means of manually operated door closing gear which fits between the door operating lever trunnion and an attachment fitted to the top of the solebar (Fig. 7 ).

### CANOPY

To cater for the loading of wagons at collieries where the height of the wagon is restricted, the wagon is designed with the top of the body in the form of a canopy, so that the wagon can be reduced in height without any structural modification to the top of the body. The capacity of the wagon without the canopy is dependant upon the density of the coal and will vary from 26 - 32 tons.

### METHOD OF OPERATION

The principle of the operation of the wagon is that a train of wagons approaches the Discharge House (Figs. 4 & 6) at the power stations at approximately  $\frac{1}{2}$  m.p.h. this speed being controlled automatically by special equipment fitted to the locomotive.

Before entering the Discharge House the wagons pass through a door safety catch removal mechanism situated at each side of the line. Immediately the locomotive has passed the mechanism the cams are extended to engage the trunnions projecting from the catch gear operating levers at each side of a pair of doors thus removing the safety catches as the wagons move forward.

The direction of travel through the Discharge House having been determined, right and left hand lineside catch removal gear is fitted accordingly.

The wagons then enter the Discharge House where a number of lineside door opening mechanisms are situated; these may be positioned at either side of the rail as convenient. The machines being right or left hand according to the direction of travel.

When the appropriate number of wagons are in position, the cam mechanisms of the door opening machines are simultaneously extended, the cams contacting the leading door operating lever trunnion on each wagon, dropping coal from the leading pairs of doors on each wagon almost simultaneously. As the train progresses the second and third door operating lever trunnions on each of the wagons (Fig. 5 ) also contact the cams opening the doors and dropping the coal in a similar manner. The opening of doors on a number of wagons simultaneously ensure an even distribution of the coal discharged into the underground hopper.

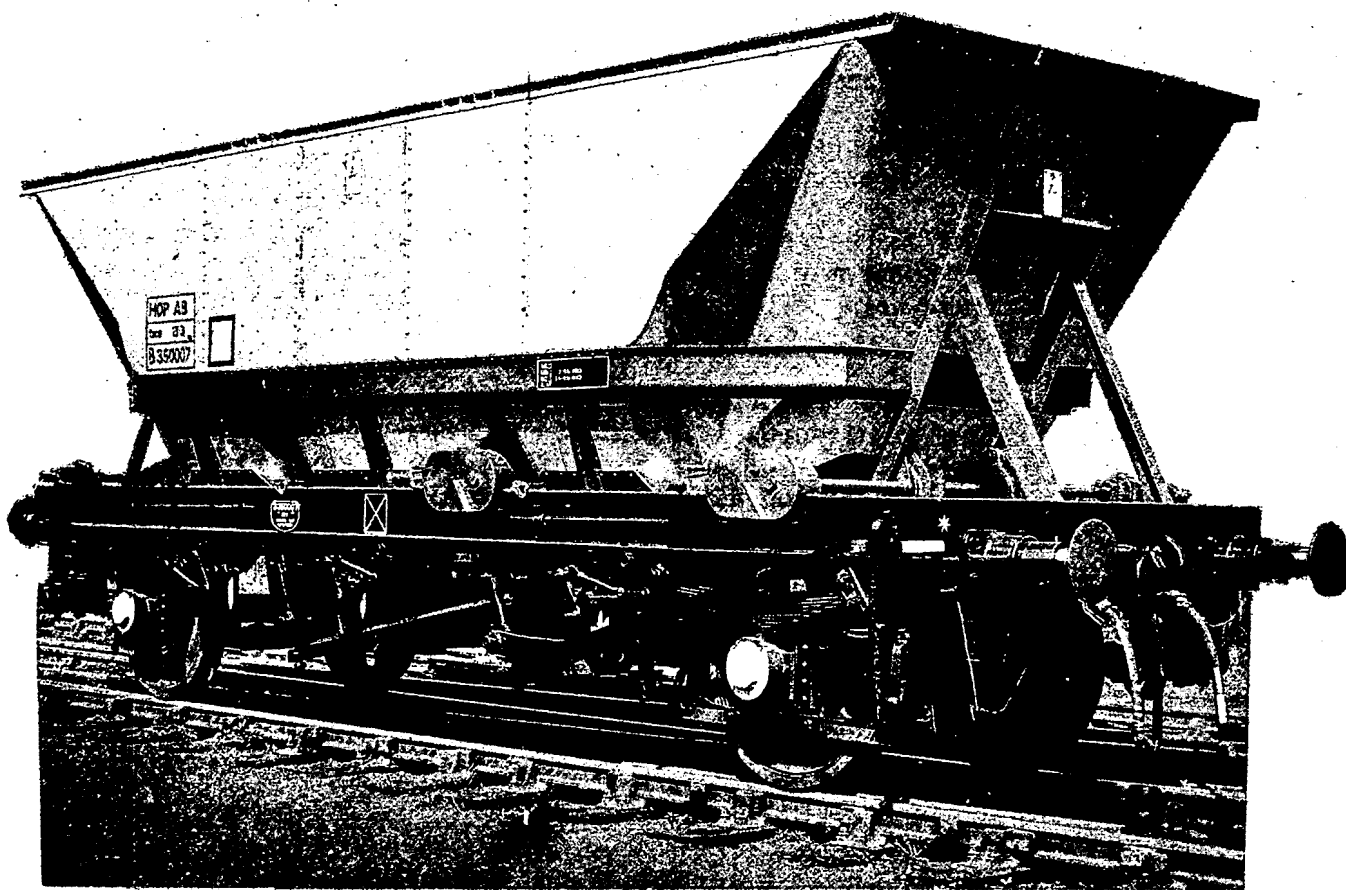
After the discharge of the first group of wagons the cams on the lineside equipment are retracted until further wagons are in position. This procedure being repeated until all the wagons on the trains are discharged.

After leaving the Discharge House the wagons pass through a lineside door closing mechanism on one side only which again is operated after the locomotive has passed through. The cam attached to the mechanism is extended to engage the trunnions on the door operating levers on all wagons as they leave the discharge house so closing all the doors. The doors can only be closed by a right hand door closing mechanism, the right hand being determined when looking into the direction of travel from the rear of the train.

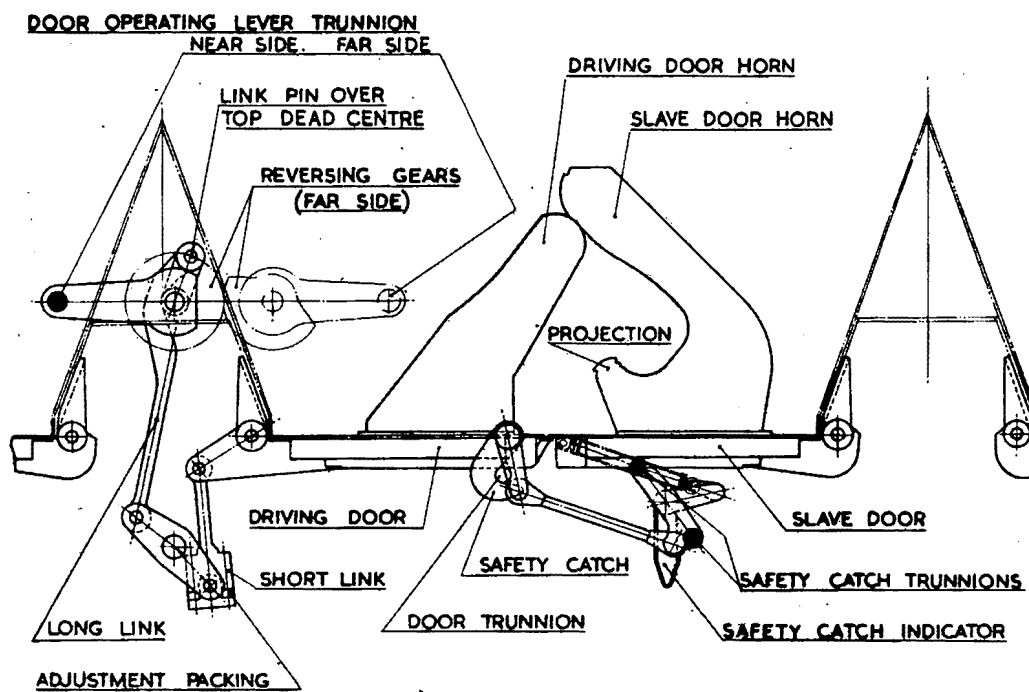
Finally the wagons pass through a lineside safety catch replacement mechanism situated at each side of the line, which again is actuated after the locomotive has passed through. The cam attached to the mechanism is extended to engage the trunnions projecting from the catch gear operating levers, returning the catches to the on position.

The lineside equipment is so designed that any run back or failure to open or close the doors does not result in any damage to the equipment or wagons.

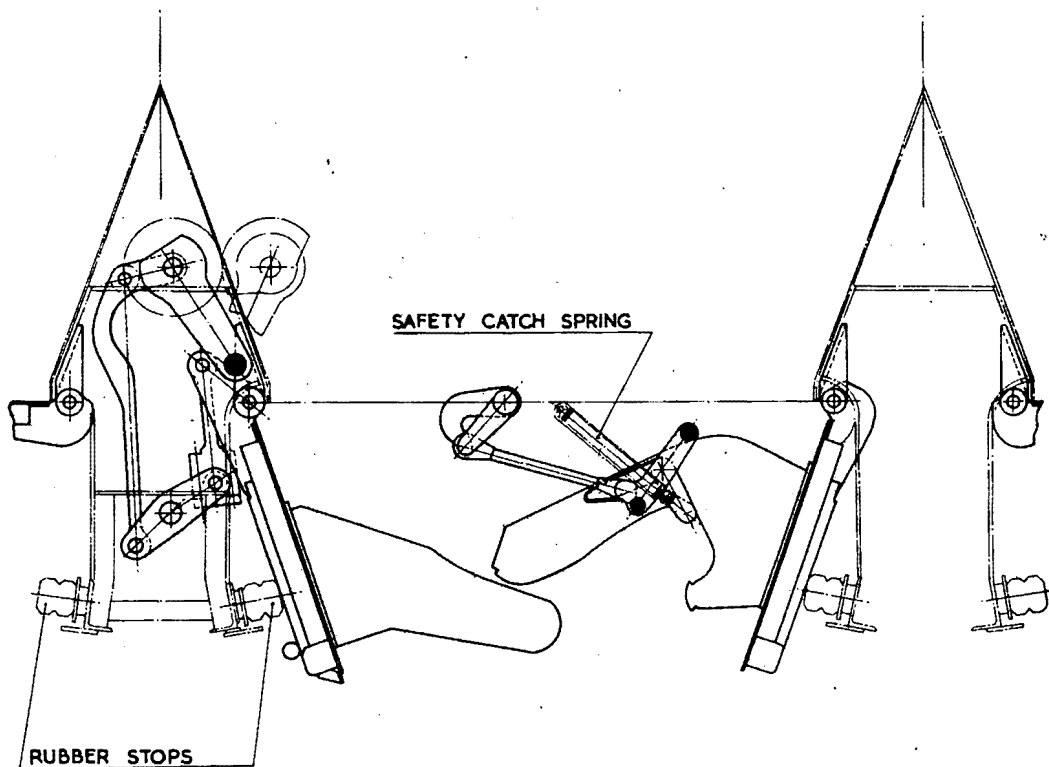
The lineside equipment is extended and retracted pneumatically, and is manually controlled. Alternatively the equipment could be controlled electronically.



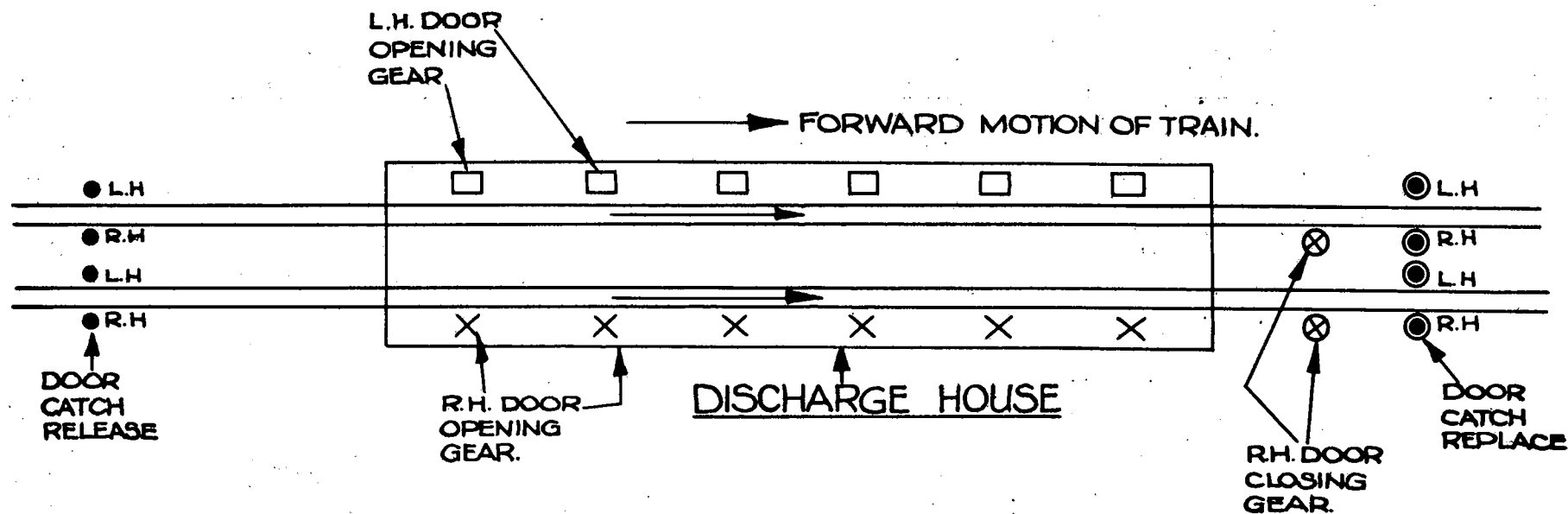
HIGH CAPACITY COAL WAGON.



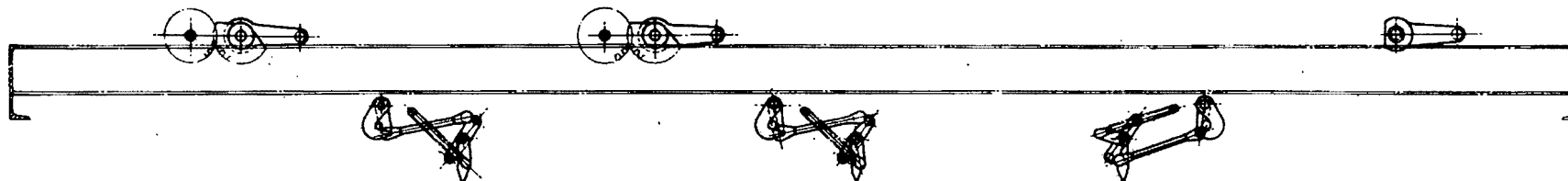
**FIG. 2**  
ATTITUDE OF DOOR OPERATING AND CATCH GEAR  
WITH DOORS IN CLOSED POSITION.



**FIG. 3**  
ATTITUDE OF DOOR OPERATING AND CATCH GEAR  
WITH DOORS IN OPEN POSITION



**FIG. 4. TYPICAL DIAGRAMATIC LAYOUT OF LINESIDE  
DOOR OPERATING GEAR AT POWER STATIONS.**



SECTION SHOWING DETAILS OF OPERATING LEVERS AND CATCH GEAR  
AT FAR SIDE OF WAGON

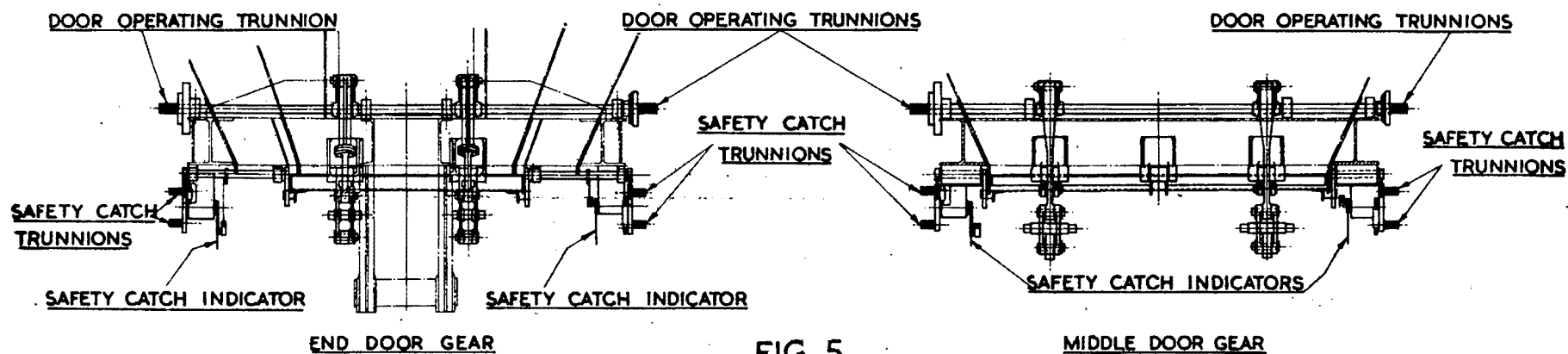
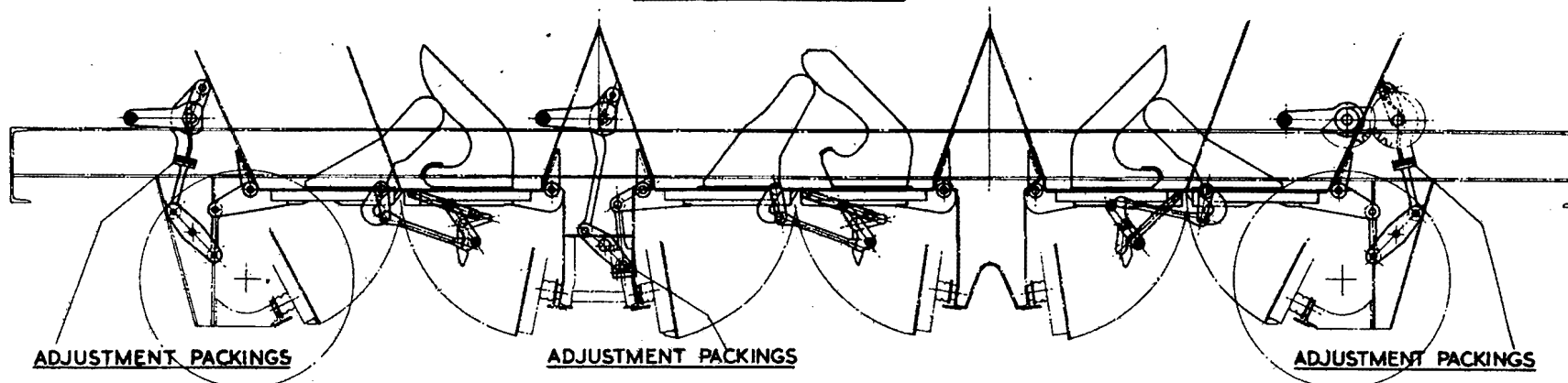


FIG. 5

ARRGT OF DOOR OPERATING AND CATCH GEAR.



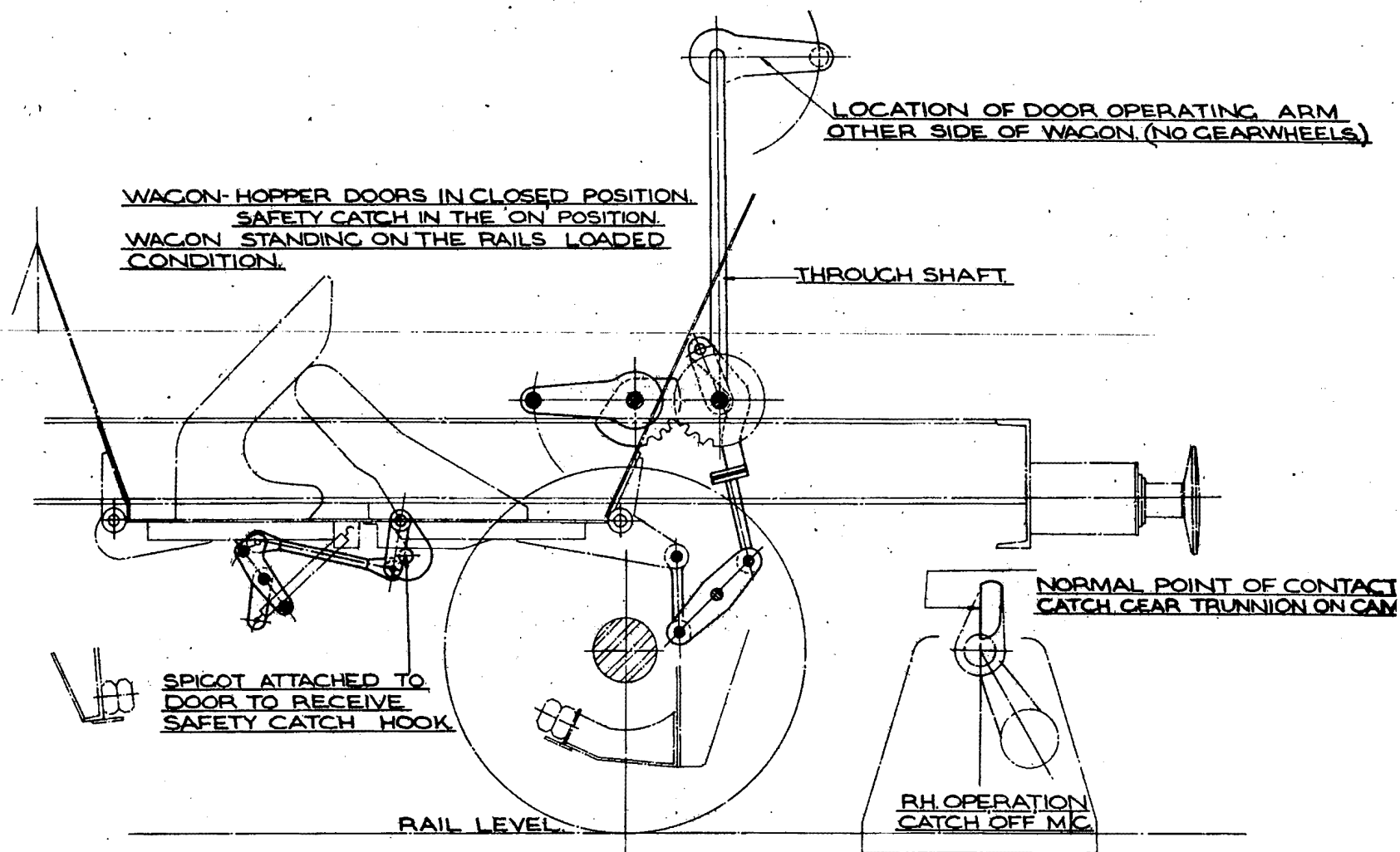


FIG. 6A.

WAGON APPROACHING SAFETY CATCH OFF LINESIDE MACHINE.

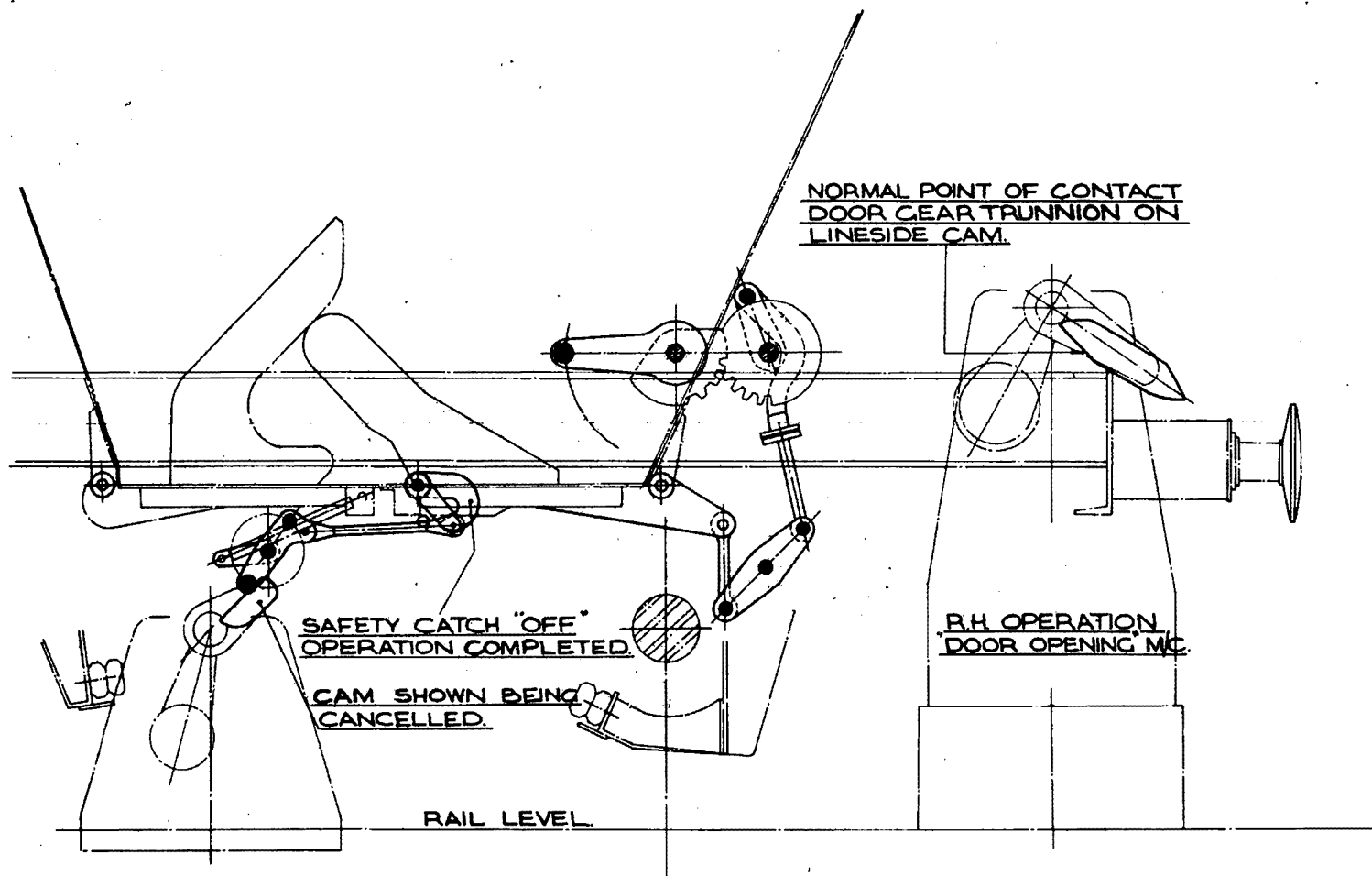


FIG. 6B.  
WAGON APPROACHING "DOOR OPENING" LINESIDE EQUIPMENT.

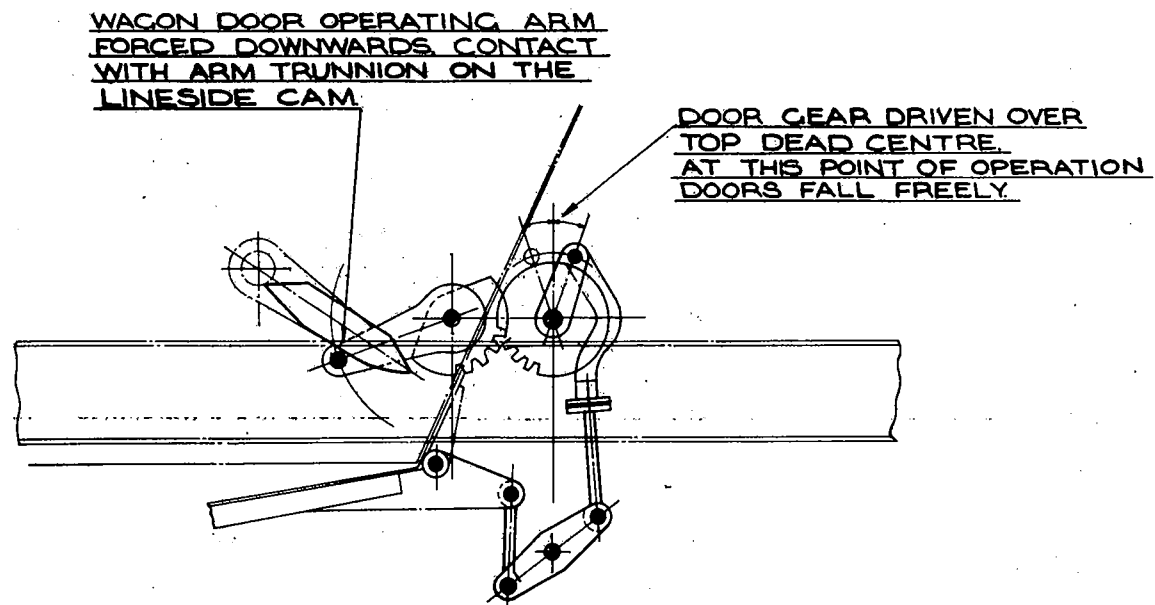


FIG 6C.  
POINT OF CONTROLLED OPERATION OF DOOR OPENING.

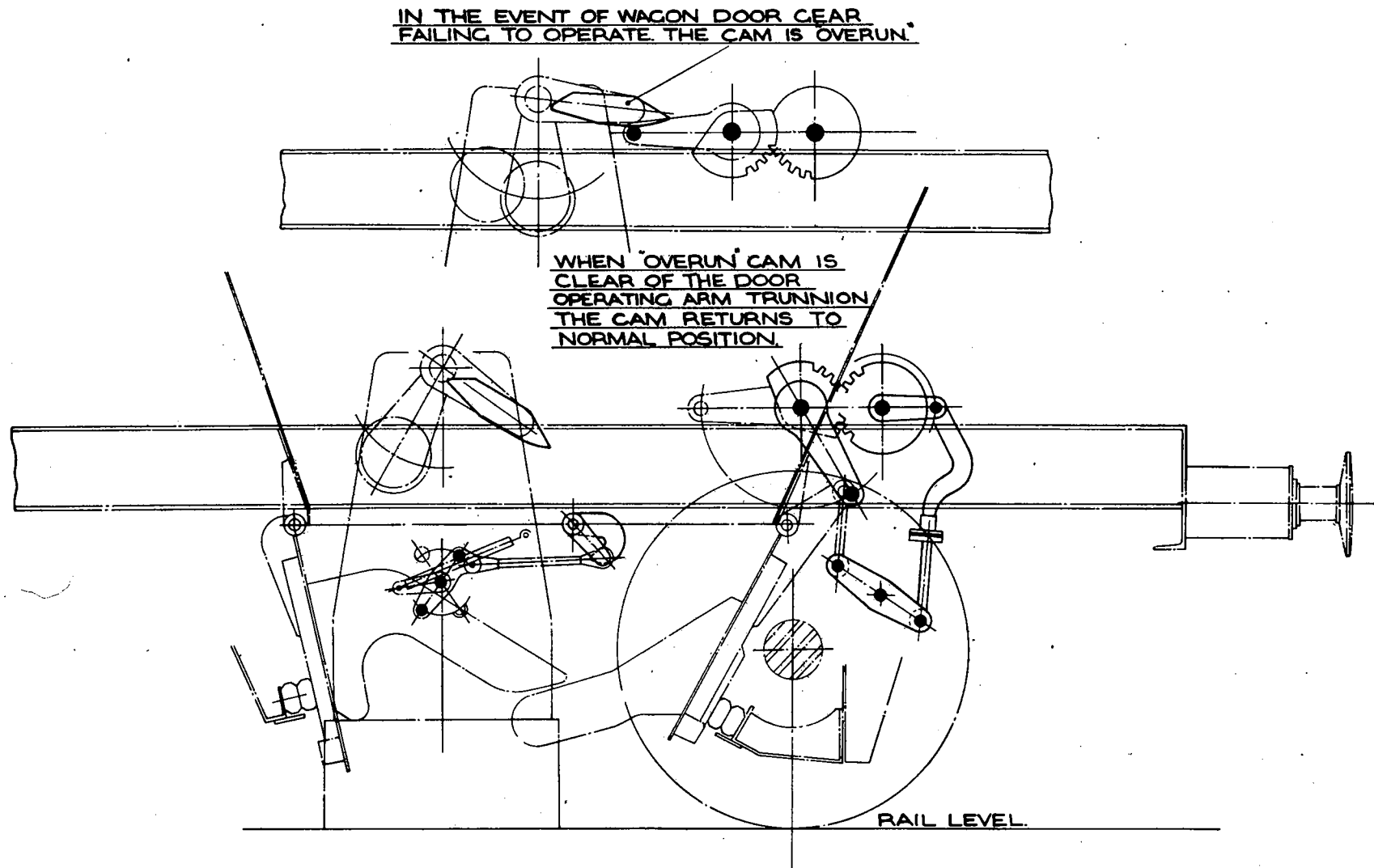


FIG 6 D.

WAGON DOORS HAVE NOW FALLEN FREELY TO FULL DISCHARGE.

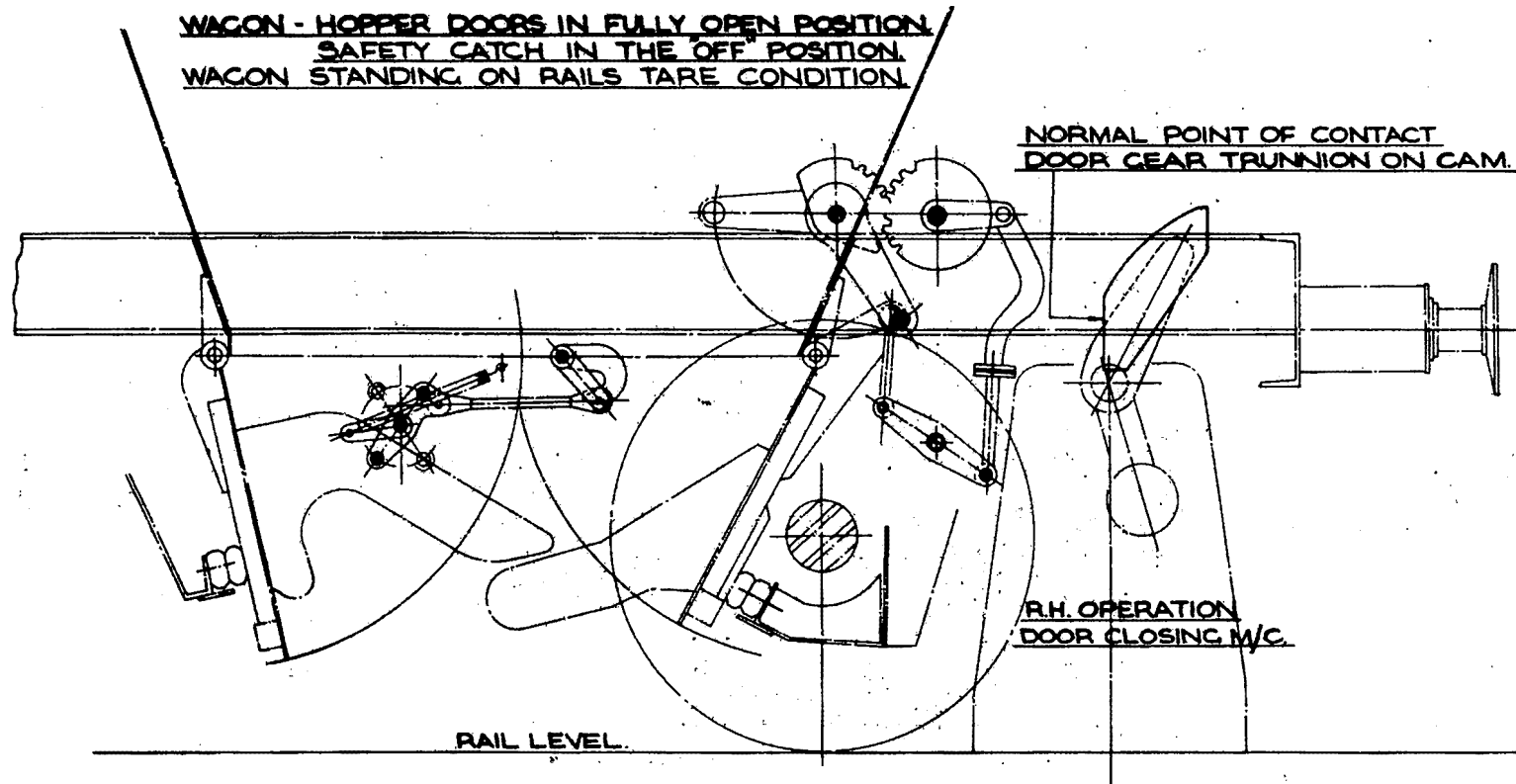


FIG. 6E.  
WAGON APPROACHING DOOR CLOSING LINESIDE MACHINE.



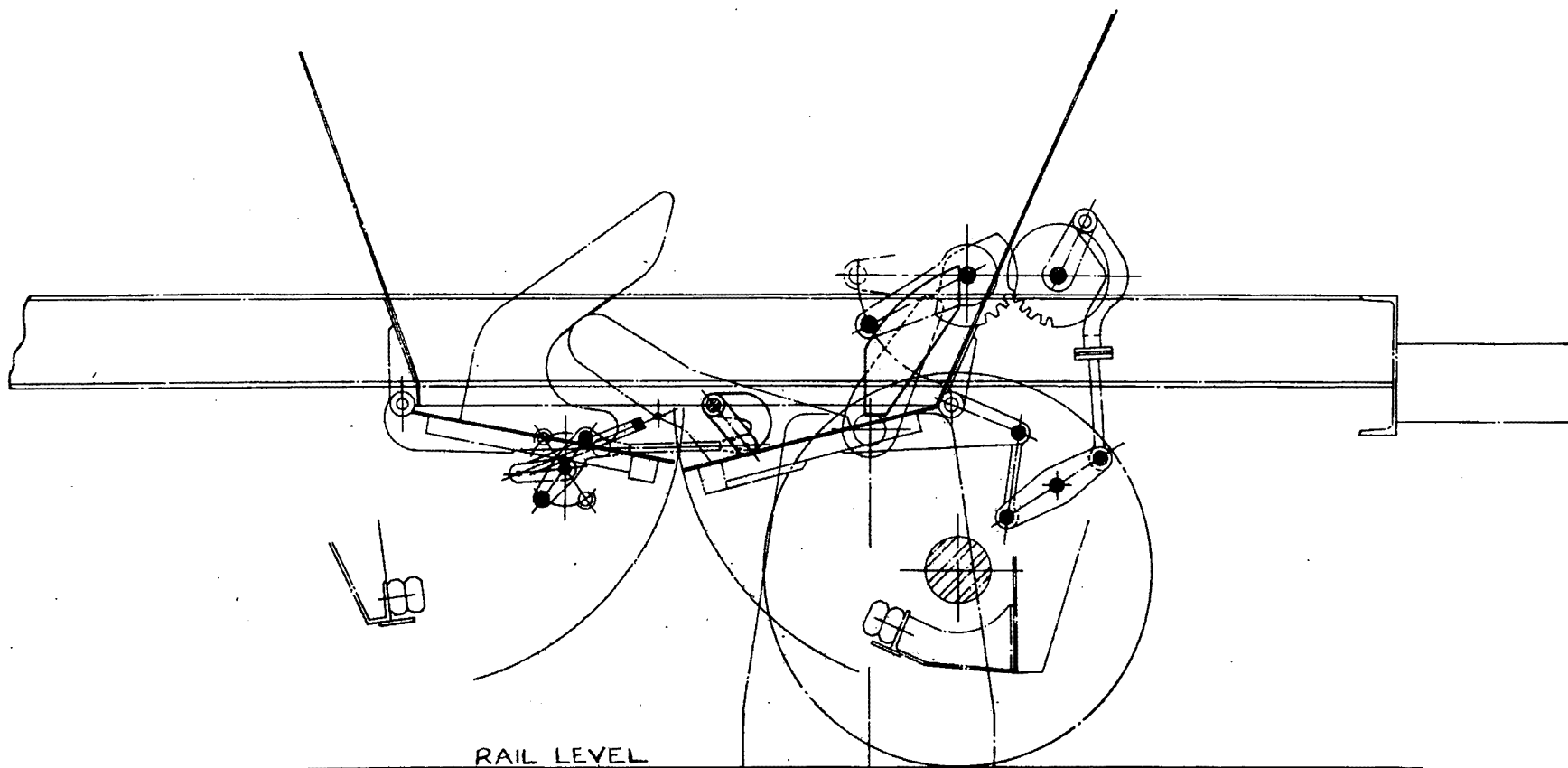


FIG. 6F.

OPERATION CLOSING WAGON DOORS.

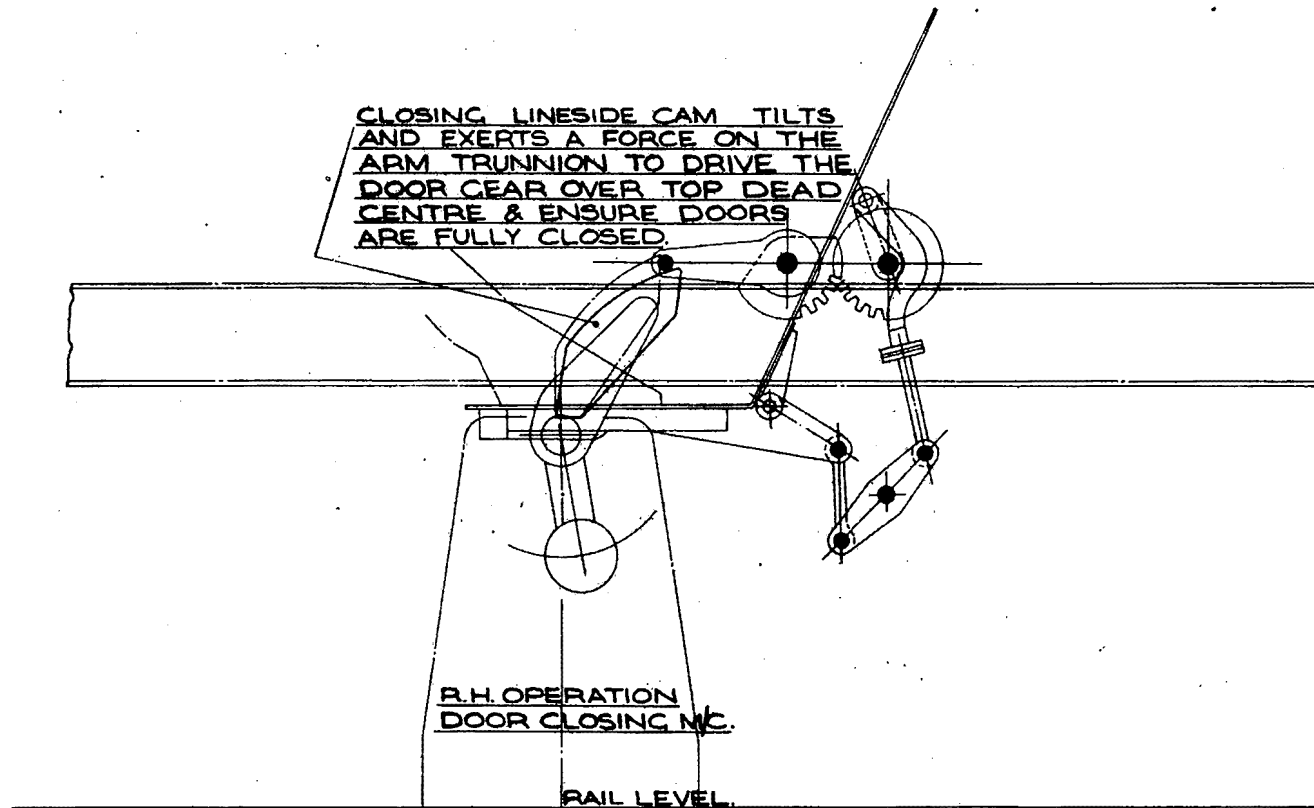


FIG. 6G.  
FINAL CLOSING OF HOPPER DOORS.

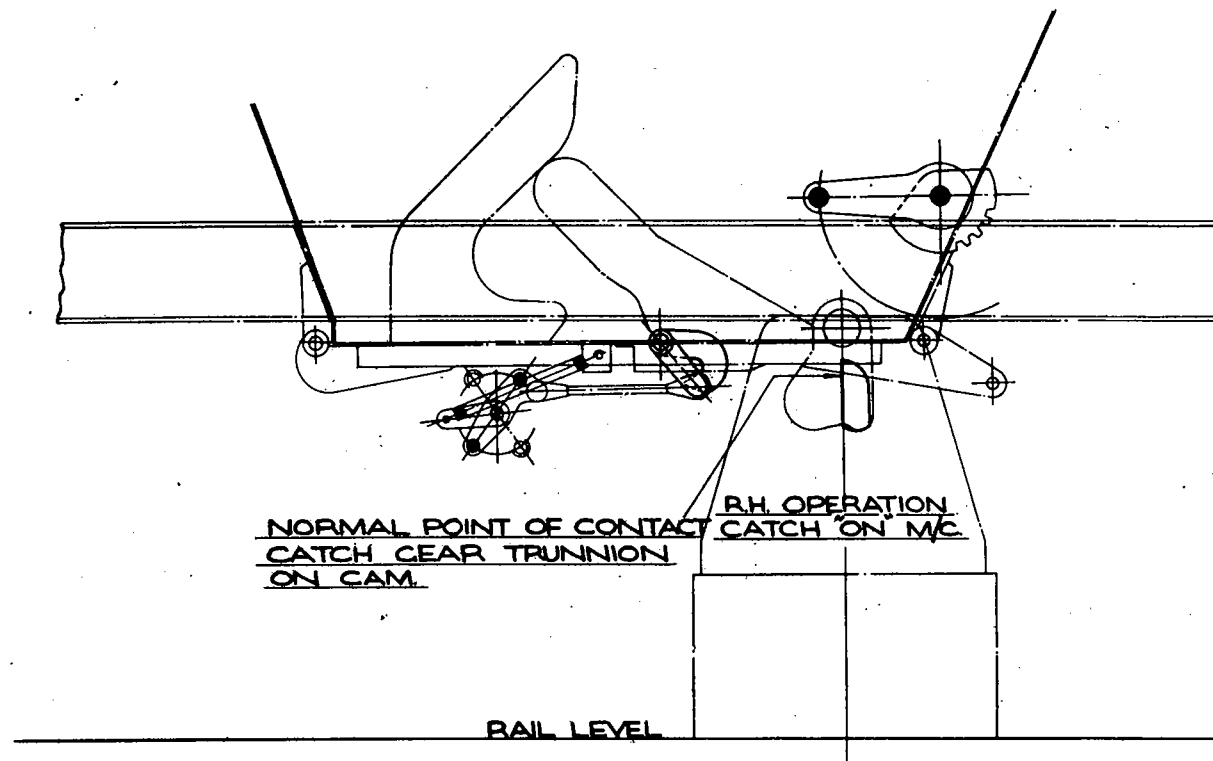


FIG 6H.  
WAGON APPROACHING SAFETY CATCH "ON" LINESIDE MACHINE.

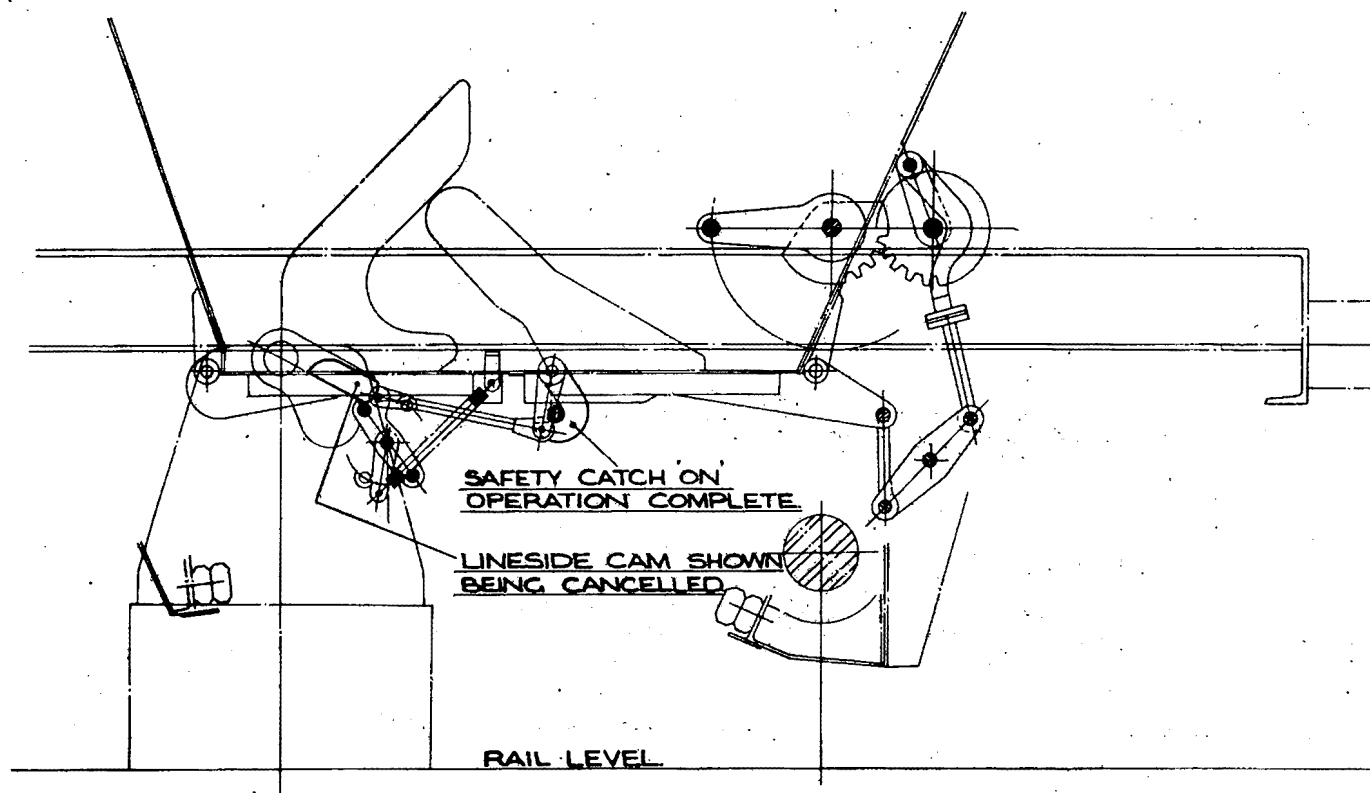


FIG. 6J.  
LINESIDE OPERATIONS COMPLETE - HOPPER DOORS CLOSED.  
SAFETY CATCHES IN 'ON' POSITION.

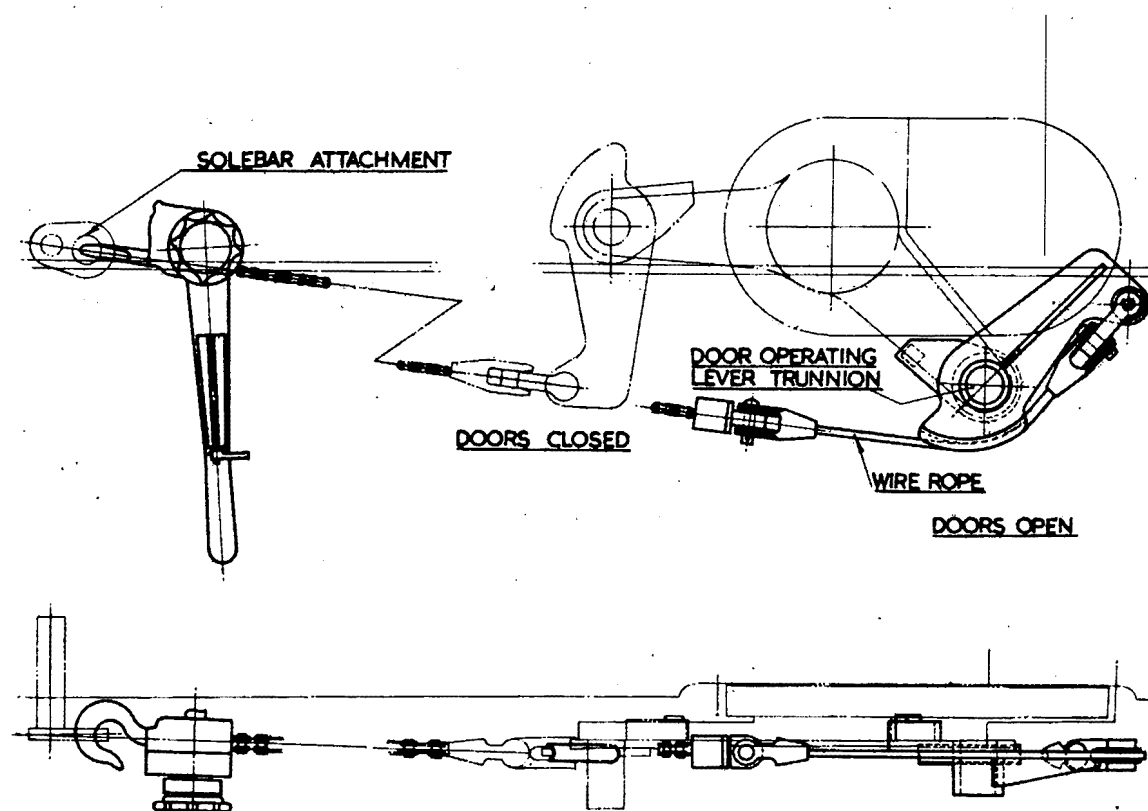


FIG. 7.

ARRANGEMENT OF MANUAL DOOR CLOSING GEAR.

Drg. No. DN 32314

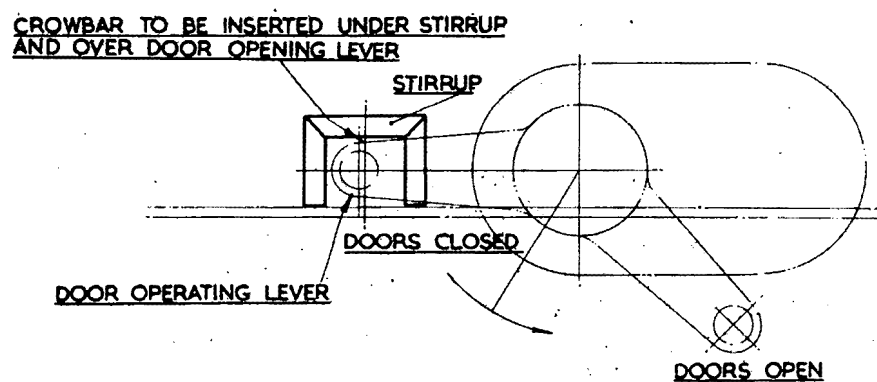


FIG. 8.

METHOD OF OPENING DOORS MANUALLY.



### Air Brake Description

The high capacity coal wagons are fitted with what is known as a "Two Pipe Automatic Air Brake" system and the following is a list of the main components on each vehicle:-

- (a) Main reservoir pipe.
- (b) Brake pipe.
- (c) Distributor with control reservoir, release valve, and isolating cock.
- (d) Auxiliary reservoir.
- (e) Brake cylinders (two per wagon).
- (f) Strainer, check valve and choke unit.
- (g) Main reservoir pipe isolating cock.
- (h) End coupling cocks.
- (j) Coupling Hose.

For Spare Part details see separate Westinghouse Catalogue No. Z1377.

### Description and Function of Components (See Figure 9 )

- (a) Main Reservoir Pipe supplies air from the main reservoir on the locomotive down the train at 85 to 100 p.s.i. (according to the type of locomotive) to the auxiliary reservoirs.
- (b) Brake Pipe supplies air from the locomotive to control the brakes on the train. A fall in brake pipe pressure will apply the brake. The brake pipe is charged to 70 p.s.i. to fully release the brake. A reduction to 50 p.s.i. will fully apply the brake. Reductions below this pressure have no effect on the disc brake pad pressure at the wheels, but serve to apply the brake more rapidly in an emergency application.
- (c) Distributor - Westinghouse Type P4G. (See Figure 10.)

The distributor controls the application and release of the brake and operates in response to air pressure changes in the brake pipe which are normally controlled by the driver's brake valve.

The distributor is fitted with an isolating cock (See Fig. 15.) controlled by a handle for use in isolating the brake on a wagon. The handle is vertical for normal operation and horizontal to isolate the brake. The distributor is also fitted with a release valve for use in releasing the brake manually on individual wagons. It is operated by the normal cord method from either side of the vehicle.

The distributor is fixed to the vehicle by three bolts to a support bracket which enables the distributor to be charged without breaking any pipe joints.

(d) Auxiliary Reservoir (See Figure 11).

Air is stored in the auxiliary reservoir. It is supplied direct from the main reservoir pipe which maintains the auxiliary reservoir at between 80 and 100 p.s.i. (depending upon type of locomotive and circumstances). If, however, the main reservoir pipe is not able to supply any air to the auxiliary reservoir for some reason or other, then the auxiliary reservoir is charged to 70 p.s.i. from the brake pipe and the brake will then function as a single pipe brake system in the conventional manner. In this case the application and release times of the brake will be increased slightly.

The auxiliary reservoir supplies air to the brake cylinders via the distributor in accordance with the brake pipe pressure

When it is necessary for any reason, the auxiliary reservoir can be vented to atmosphere by placing the distributor isolating cock in the horizontal or isolated position (See figure 10 ).

(e) Brake Cylinder (See Figure 12 ).

A brake cylinder is fitted at diagonal corners of the wagon and operates the brake pads on one wheel of each axle.

The cylinder houses the piston and slack adjuster mechanism which is single acting.

A handwheel is provided at the push rod end of the cylinder for re-adjustment when new brake pads are fitted.

When a brake application is made, compressed air drives the piston through its operating stroke, the piston takes with it the push rod which is connected to the calipers which force the non-metallic brake pads against the brake disc faces on the wheel web.

By maintaining a constant optimum clearance between brake pads and discs the slack adjuster ensures even braking throughout the train.

(f) Strainer, Check Valve and Choke Unit.

This is fitted in the pipe line from the main reservoir pipe to the auxiliary reservoir. The strainer is fitted to filter out any foreign matter which may be present in the air supply.

The check valve is fitted to ensure there is no back flow of air from the auxiliary reservoir to the main reservoir pipe if the latter is at a lower pressure.

The choke unit is fitted to control the rate of compressed air supply from the main reservoir pipe to the auxiliary reservoir.

- (g) Main Reservoir Pipe Isolating Cock is fitted in the pipe from the main reservoir pipe to the auxiliary reservoir. In conjunction with the distributor isolating cock it enables the braking system on a vehicle to be isolated. (See Fig.15.)

The operating handle is at right angles to the pipe when the cock is closed and in line with the pipe when open.

- (h) End Coupling Cocks are fitted at the headstocks to the brake pipe and main reservoir pipe. (See Fig.15.)

When in the closed position the hose side of these cocks is vented to atmosphere thus releasing any air pressure in the hose piping prior to uncoupling.

The operating handle is upright when the cock is closed and horizontal when open.

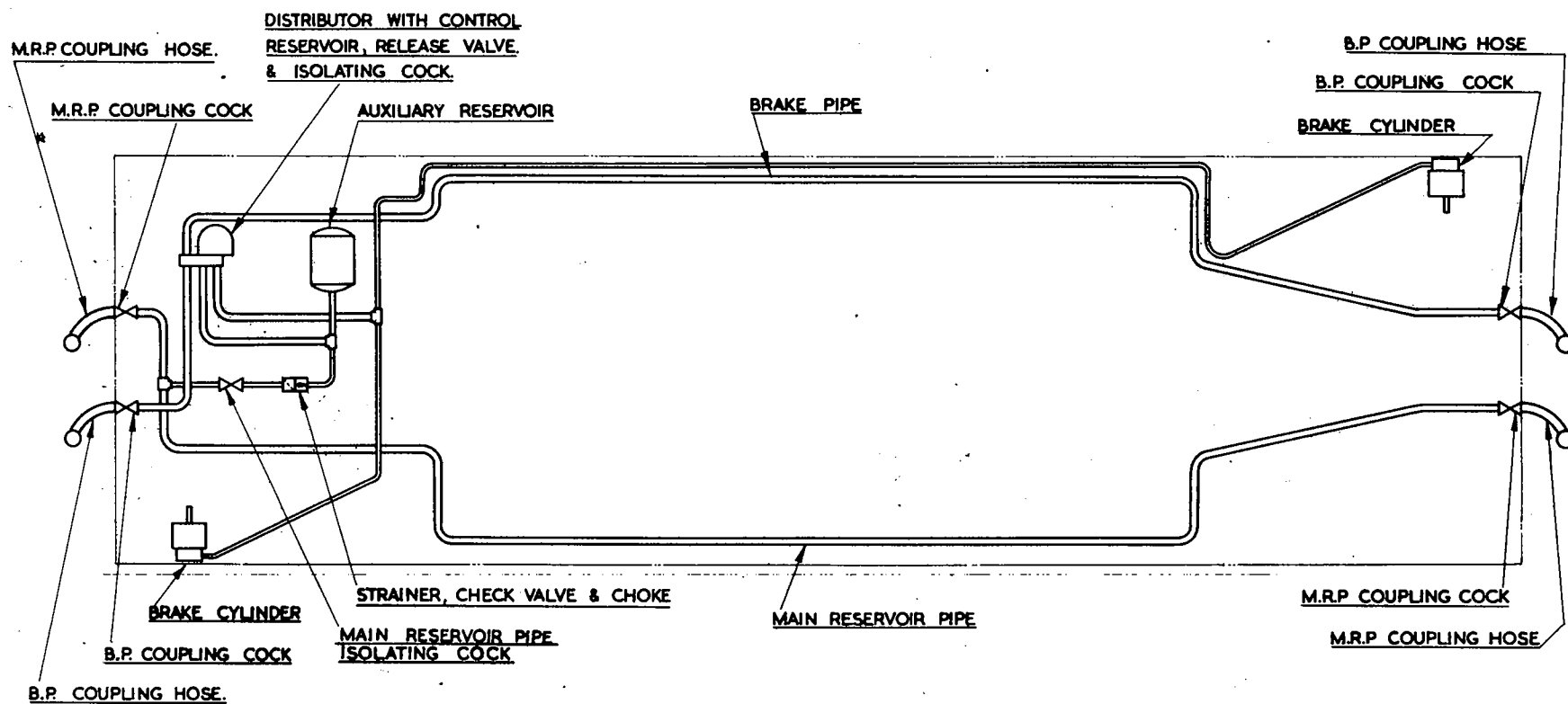
- (j) Coupling Hoses fitted at both ends of the wagon to facilitate the coupling of the brake pipes and main reservoir pipes respectively on adjacent wagons. (See Fig.15.)

The brake pipe coupling hose is fitted with a 1" coupling head and has no identification.

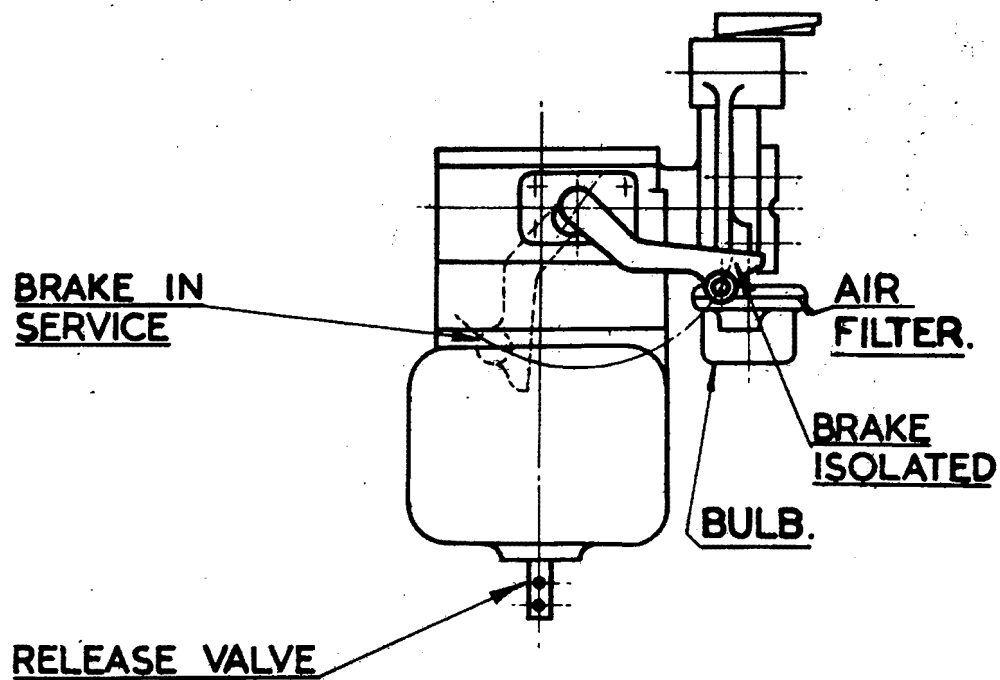
The main reservoir pipe hose is fitted with a 3/4" coupling head and is identified by white tape.

NOTE: All pressures quoted in the foregoing are nominal.

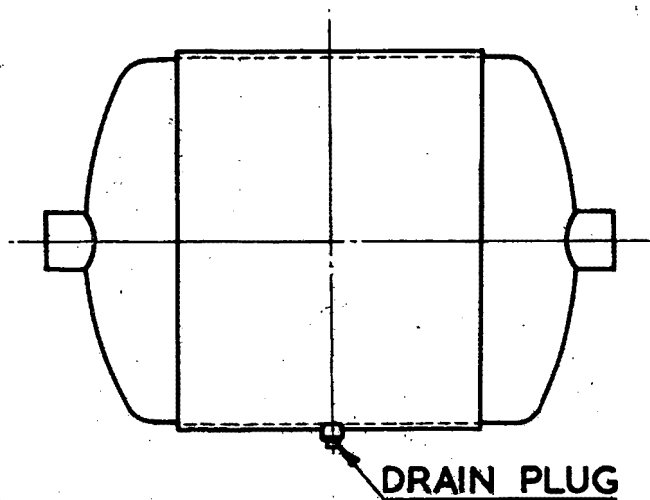
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**FIG. 9**  
**HIGH CAPACITY COAL WAGON.**  
**AIR BRAKE EQUIPMENT.**



**FIG. 10**  
**DISTRIBUTOR**



**FIG. 11**  
**AUXILIARY RESERVOIR**



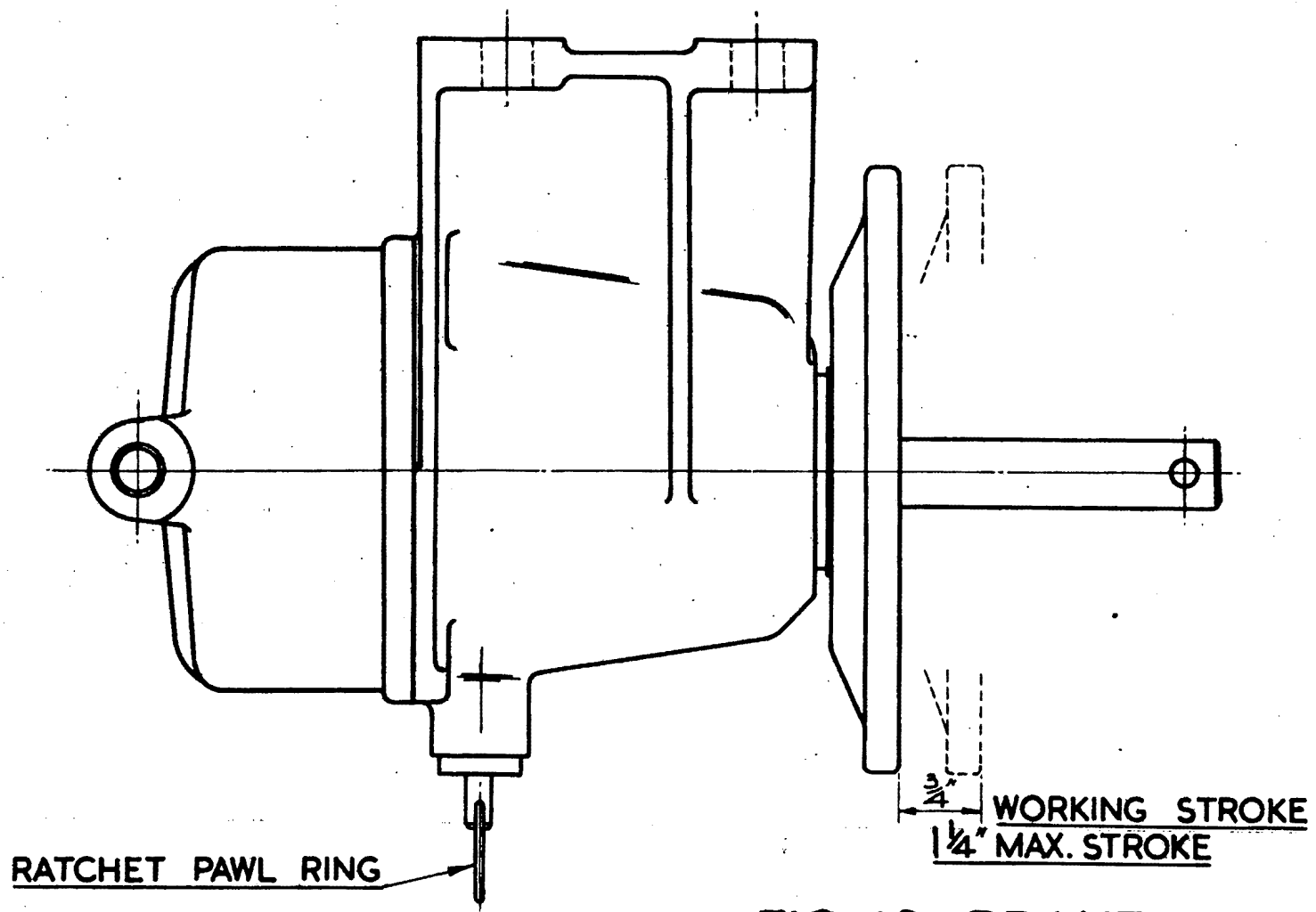


FIG. 12: BRAKE CYLINDER

MERRY-GO-ROUND TRAINSFAULT FINDING CHART - BRAKES

FAULT	CHECK	ACTION
1. No air pressure in either or both brake pipe or Main Reservoir Pipe (Cannot charge brakes).	All coupling cocks are open (except end of train)	Open cocks (handle horizontal)
	All hoses properly connected.	Connect hoses.
	Pressure gauge on locomotive	If no pressure - locomotive defective.
	For obvious air leaks.	Seal as necessary.
2. Brake fails to apply on one vehicle.	Main Reservoir Isolating Cock is open	Open Cock (Handle in line with pipe).
	Distributor isolating cock is open (The Handle to be in vertical position.)	<u>Note:</u> If this cock has to be opened recharge brake pipe, allow time for auxiliary reservoir to fill, re-apply brake. If this fails to rectify fault, change distributor.
3. Brake Fails to apply.	Brake cylinder and levers jammed.	Lubricate or replace components as necessary.
4. Brake does not release on one vehicle.	Operation of distributor.	Pull release cord. If brake is not released change distributor.
	Brake cylinder or levers jammed.	Pull release cord to release brake cylinder pressure. Prise levers apart to free pads. Lubricate or replace components as necessary.

FAULT	CHECK	ACTION
5. Brakes not fully released at end of train.	Drivers brake valve handle is in RUNNING position and check all pipework on train for leaks.	Seal leaks as necessary. It is likely that this Fault is caused by a number of small leaks rather than one large one.
6. During charging, the low main reservoir pressure device on the locomotive operates, causing the Driver's Safety Device to vent the air brake pipe.		Move the Driver's brake valve handle to the EMERGENCY POSITION. When the main reservoir pressure on the locomotive has been restored to at least 95 lb/in <sup>2</sup> , return the handle to the RUNNING position.

**IMPORTANT.** If time does not permit repairs or replacements to be carried out it may be necessary to isolate brake on vehicle.

Proceed as follows:-

- (a) Close  $\frac{1}{2}$ " isolating cock between main reservoir pipe and the strainer/ check valve/ choke unit (handle to be at right angles to the pipe).
- (b) Close the isolating cock on the distributor (handle to be in the horizontal "BRAKE ISOLATED" position).
- (c) Pull the release cord to vent the air from the control reservoir.
- (d) Check that the brake pads are clear of the brake discs.

If fault is large leak anywhere on main reservoir pipe, this pipe may be isolated by closing main reservoir coupling cocks on locomotive and on leading vehicle.

The brake system will now be fully operative, but brake release times may be slightly increased.

Before the train is allowed to go forward with a vehicle with its brake isolated, reference should be made to the Operating instructions to ensure that train has the requisite number of braked vehicles. The destination terminal of the train must also be advised of this action, and also if it has been necessary to isolate main reservoir pipe.

Generally, except for air leaks on the train, either low or high pressures on the brake pipe or main reservoir pipes is indicative of a fault on the locomotive.

**NOTE:** All pressures quoted above are nominal.

MERRY-CO-ROUND TRAINSBRAKE TESTS

1. BLOCKAGE TEST. To ensure that there is no blockage in the Brake Pipe or Main Reservoir Pipe. Check that both end coupling cocks at the far end of the train are fully closed and that all intermediate end coupling cocks are fully open. Attach air supply to the train, open Brake Pipe and Main Reservoir Pipe end coupling cocks on end wagon and air supply. Check that the brake pipe is charged to approximately 70 p.s.i. and the Main Reservoir Pipe to 85 to 100 p.s.i. Check this value at both ends of the train.
2. LEAKAGE TEST. Outstations. (The leakage rates quoted are for a completely formed train).
  - (a) Ensure that all distributor isolating cocks and Main Reservoir Pipe isolating cocks are fully open on the train. Also check that both end coupling cocks at the far end of the train are fully closed, and that all intermediate end coupling cocks are fully open.
  - (b) Attach air supply to the train. Open Brake Pipe end coupling cocks on end wagon and air supply. Main Reservoir Pipe end coupling cocks on end wagon and air supply should remain closed.
  - (c) Apply and release the train brakes twice. If there is air pressure in the Main Reservoir Pipe, open Main Reservoir Pipe end coupling cock on wagon next to air supply and allow Main Reservoir Pipe to exhaust to zero via the vent hole in the air supply end coupling cock. Close end coupling cock on this wagon.
  - (d) Ensure that Brake Pipe is charged to approximately 70 p.s.i. Check this value at both ends of the train.
  - (e) Isolate the Brake Pipe from the air supply by closing the end coupling cocks on the end wagon and air supply. Note subsequent fall in Brake Pipe pressure. This must not exceed a rate of fall of 10 p.s.i. in 5 minutes. Leakages above this rate must be traced and corrected. Note that it is possible for defective check valves (Main Reservoir Pipe and Auxiliary Reservoir) to by-pass air back to the Main Reservoir Pipe in which case there will be a rise in Main Reservoir Pipe pressure. Check that this has not occurred. By closing all Main Reservoir Pipe isolating cocks in turn and observing the Main Reservoir Pipe pressure, defective check valves can be traced.
  - (f) Recharge Brake Pipe to approx. 70 p.s.i. and open both Main Reservoir Pipe end coupling cocks on end wagon and air supply. Wait at least 2 minutes after Main Reservoir Pipe has attained 85 to 100 p.s.i. and check this value at both ends of the train.
  - (g) Isolate the Main Reservoir Pipe from the air supply by closing the end coupling cocks on the end wagon and air supply. Note subsequent fall in Main Reservoir Pipe pressure. This must not exceed a rate of fall of 10 p.s.i. in 5 minutes. Leakages above this rate must be traced and corrected.

## 2. LEAKAGE TEST (Continued).

- (h) Recharge Main Reservoir Pipe to 85 to 100 p.s.i. by opening the end coupling cock and fully apply the brake by reducing the brake pipe pressure to approximately 46 p.s.i. Check each brake cylinder and associated pipework for leaks. All leaks must be traced and corrected.
- (k) At six monthly intervals, pressure gauge to be attached to the brake cylinder. Recharge Main Reservoir Pipe to 85 to 100 p.s.i. by opening the end coupling cock and fully apply the brake by reducing the brake pipe pressure to approximately 46 p.s.i. Note subsequent fall in brake cylinder pressure. This must not exceed a rate of fall of 1 p.s.i. in five minutes. Leakages above this rate must be traced and corrected.

## 3. ONE PIPE SYSTEM OPERATION TEST. (To ensure that the brake operates without the use of the Main Reservoir Pipe.) Check that both end coupling cocks at the far end of the train are fully closed and that all intermediate end coupling cocks are fully open.

Attach air supply to Brake Pipe on end wagon. Open Brake Pipe end coupling cock on end wagon and air supply to recharge brake pipe to approximately 70 p.s.i. Check this value at both ends of train. If there is air present in the Main Reservoir Pipe, open Main Reservoir Pipe end coupling cock on the end wagon and allow Main Reservoir Pipe to exhaust to zero. Close all distributor isolating cocks to exhaust all auxiliary reservoirs. When auxiliary reservoirs are exhausted open all distributor cocks, this will automatically recharge the auxiliary reservoirs from the brake pipe. Reduce brake pipe pressure to approximately 46 p.s.i. and check that all brakes have been applied. Recharge brake pipe to 70 p.s.i. to release brakes.

## 4. TWO PIPE SYSTEM OPERATION TEST. (To ensure that the auxiliary reservoir will be charged from the main Reservoir Pipe only, when operating as a two pipe system).

Check that both end coupling cocks at the far end of the train are fully closed, and that all intermediate end coupling cocks are fully open.

Attach air supply to Main Reservoir Pipe on train, open Brake Pipe and coupling cock on end wagon to allow Brake Pipe to exhaust to zero. Close all distributor isolating cocks to exhaust all auxiliary reservoirs and control reservoirs. Operate all control reservoir release valves (pull release cords) to accelerate exhaust of all control reservoirs. When the system is completely exhausted, open all distributor isolating cocks and open Main Reservoir Pipe end coupling cock on end wagon and air supply. Wait at least 2 minutes after Main Reservoir Pipe has attained 85 to 100 p.s.i. Check this value at both ends of the train, this will automatically recharge auxiliary reservoirs. Close Main Reservoir Pipe end coupling on air supply and allow Main Reservoir Pipe to exhaust to zero via the vent hole in the air supply end coupling cock.

Close all the distributor isolating cocks and allow all auxiliary reservoirs to exhaust to zero. If little or no air is discharged through the Distributor then main reservoir pipe has not been charging the auxiliary reservoir and a fault exists in the feed pipe system from the main reservoir pipe.

LEAKAGE TESTS. Main Works. (The leakage rates quoted are for single vehicles).

All coupling cocks to be open. 1" dummy coupling to be fitted to brake pipe hose at opposite end of wagon to air supply.

Brake Pipe.

- (a) Shut off air supply to main reservoir pipe, and check that the main reservoir pipe pressure is zero.
- (b) Charge the brake pipe to 70 p.s.i. Wait at least 4 minutes for the brake system to fully charge.
- (c) Check on main reservoir pipe gauge for any rise in pressure above zero (this indicates leakage through the strainer, check valve and choke unit).
- (d) Shut off air supply to brake pipe (wait for 1 minute for temperature settlement).
- (e) Maximum permissible leakage from brake pipe 5 p.s.i. in 5 minutes.

Brake Cylinder

- (a) Exhaust main reservoir pipe to atmosphere.
- (b) Charge the brake pipe and auxiliary reservoir to not more than 60 p.s.i.
- (c) Make a full brake application, (the brake cylinder and auxiliary reservoir are now equalised at less than 55 p.s.i.).
- (d) Maximum permissible leakage from brake cylinders  $\frac{1}{2}$  p.s.i. in 5 minutes.

Main Reservoir Pipe

- (a) Close the main reservoir pipe isolating cock.
- (b) Charge the main reservoir pipe to 100 p.s.i.
- (c) Shut off air supply to main reservoir pipe. Wait 1 minute.
- (d) Maximum permissible leakage from reservoir pipe. 5 p.s.i. in 5 minutes.

**BRAKE CYLINDER APPLICATION AND RELEASE TIMING TESTS.**  
(The timings quoted are for single vehicles)

SYSTEM	APPLICATION TIME 0 p.s.i. to 52 p.s.i. BRAKE CYLINDER PRESSURE	RELEASE TIME 55 p.s.i. to 5 p.s.i. BRAKE CYLINDER PRESSURE
Single Pipe	18 to 30 secs.	30 to 35 secs.
Two Pipe	9 to 15 secs.	30 to 35 secs.

## OUTSTATION MAINTENANCE

Wheels : To profile P.5.

Gauges : See B.R. publication MT/11 "Tyre Profile and Wheel Gauges for Rolling Stock."

### Link Suspension.

For Limits of Wear see Figs. 18 & 19.

### Door Operating Equipment.

In order to ensure that the door opening and closing equipment will operate satisfactorily, it is essential that the wagon be maintained in a level attitude within  $\pm 1/4"$ , and the height above rail of the door operating lever trunnions and catch gear operating lever trunnions must be maintained as follows:-

Door operating lever trunnions	$4'-5" + \frac{1}{4}" - \frac{1}{2}"$
Catch gear lever top trunnion	$2'-11\frac{5}{8}" + \frac{1}{4}" - \frac{1}{2}"$
Catch gear lever bottom trunnion	$2'-4\frac{3}{8}" + \frac{1}{4}" - \frac{1}{2}"$

Necessary adjustment to effect these dimensions can be obtained by regulation of the side bearing spring eyebolts but care must be taken to ensure that such adjustment is carried out evenly.

'Nip' is the term used to define the designed tension in the door operating linkage to ensure positive locking of the linkage in the 'over top dead centre' position when the doors are closed.

Cumulative wear on the pins and bushes will eventually result in loss of 'Nip' in the door operating equipment which would allow the link pin, Fig. 2 to move over top dead centre should the wagon receive a severe jolt, and could result in accidental door opening when the safety catches are disengaged.

The wagons must, therefore, be regularly checked by the use of an extension lever and torque spanner, Fig. 16 which is to be used in the 'GO' and 'NOT GO' positions to ensure that the amount of 'NIP' is within the prescribed limits. The torque spanner should be pulled downwards by means of the hand loop provided.

The term "break" used in the following instructions apply to the spanner shown in Fig. 16A. The alternative spanner shown in Fig. 16B instead of "breaking" makes a click which is felt and heard, the application being the same in both instances. Extension lever for end doors drawing number DN.333236 Item 1 (B.R. Catalogue No.9/19/442 extension lever for centre doors DN.333236 Item 2, (B.R. Catalogue No. 9/19/441). Torque spanner to be set at 170 lb.ft. and the setting must be checked every four weeks to ensure the spanner breaks at 170 lb.ft.



BEFORE USING THE TORQUE SPANNER IT IS ESSENTIAL TO SEE THAT THE SAFETY CATCHES ARE IN THE 'ON' POSITION.

The spanner must first be fitted to the extension lever in the "NOT GO" position.

In this position the spanner must 'break' without turning the extension lever; should the extension lever turn before the spanner 'breaks' this is an indication that there is insufficient 'Nip' and the requisite 'Nip' must, therefore, be restored by adjustment of the packings (Fig.2 ). One method of obtaining 'Nip' is as follows :-

1. The doors must be held up to the fully closed position (i.e. no sag).
2. Links must be connected up with the arm on the operating shaft in the correct position (i.e. the curved portion of the long link in contact with the operating shaft) and without any packings in the adjustable link, i.e. short link at centre doors, long link at end doors.
3. The bolts on the adjustable links must be finger tightened maintaining a parallel space at the adjustment point.
4. A slotted gauging packing piece of the appropriate 'Nip' thickness (i.e. 0.06" for centre doors and 0.04" for end doors) must be inserted and the remaining space measured.
5. Packings equivalent to the space measured within  $\pm 0.01"$  must be prepared.
6. The slotted gauging packing piece must be removed, the prepared packings fitted and the securing bolts tightened.

When the torque spanner is used in the 'GO' position the spanner must not 'break' as the extension lever turns to move the link pin (Fig. 2 ) over top dead centre to the released position. Should the spanner break this is an indication that there is excessive nip and adjustment to the packings should be made.

The link pin can be returned over top dead centre by exerting an upward pressure on the barrel of the torque spanner.

After checking nip and any subsequent adjustment, the link pin must be returned to the door closed position, i.e. door operating lever in horizontal position.

Finally the wagons must pass through the lineside equipment to ensure that all doors, door operating gear and catch gear are operating satisfactorily.

Should any shafts or pins be removed for any reason these should be liberally greased at all bearing points with grease to B.R. Catalogue Number 9/27/4150 before replacement.

Where grease nipples are fitted in accordance with Figs. 14, 20, 21 and 22, grease must be applied at regular intervals.

Note :- The edges of the underframe plates which mate with the door plates must be kept free from corrosion and a coat of paint CAM GALV (Camrex Paints Ltd. Sunderland) maintained on the surfaces indicated in Fig. 17.

#### Disc Brakes : Renewal of Brake Pads.

The vehicles are fitted with Automatic Brake Slack Adjusters of a design which is integral with the air brake cylinders and manual adjustment is, therefore, unnecessary. Brake pads must not, however, under any circumstances, be allowed to wear to less than 1/4" thick, this thickness is indicated by the step on the pads (fig. 13 ) and should be checked at both top and bottom of the pads. Worn conditions can be determined by visual examination without removing the pad from the metal shoe. Care must be taken to see that the wagon does not move while brake pads are being changed.

#### To remove Brake Pad.

The ratchet pawl ring of the slack adjuster, (Fig. 12 ) must be pulled to disengage the pawl and maintaining the pull on the ring, the handwheel of the slack adjuster should be rotated in order to screw in the push rod. When sufficient clearance is obtained the keeper plate, which is located at the bottom of the pad, should be released by loosening the two 1/2" diameter studs; these will not fall away, as they are captive in the keeper plate.

#### To fit new pad.

The brake pad should be placed against the face of the shoe with the friction side facing the wheel disc. The pad should then be slid upwards until the recess in the end of the pad locates beneath the stud on the brake shoe. The keeper plate should then be replaced, ensuring that the circular projection is located in the lower recess of the brake pad and the keeper plate studs tightened to 50 lbs. ft.

To reset the brake after the pads have been removed place a 3/16" packing between one pad and the disc face of the wheel and rotate the handwheel of the slack adjuster until the packing is lightly clamped. The packing should then be removed and correct engagement of the pawl ensured by checking that the handwheel will not turn to retract the pull rod.

#### Distributor pipe bracket filter.

The filter indicated in Fig. 10 to be inspected every six months. the date of examination to be chalked on the body of the distributor with "yellow grease" chalk.

Before removing the filter, vent the brake pipe and close the main reservoir isolating cock and the isolating cock on the distributor.

When all air pressure is released remove the bulb, filter and gasket, clean out the bulb and clean the filter by directing clean dry compressed air through it in the reverse direction to the normal air flow. Renew if damaged or in poor condition. It is recommended that a new gasket should be used, and that the filter should be fitted with the smooth side towards the bulb. After assembly, test to ensure that there is no leak.

#### Hand Brake.

Because of the necessarily high leverage ratio of the hand brake, it is essential that it be regularly adjusted. In addition to the adjustment afforded by the '5 hole' brake block coupling pull rods, 'half hole' adjustment can be effected by changing from one hole to the other of the secondary pull rod. (Fig. 14).

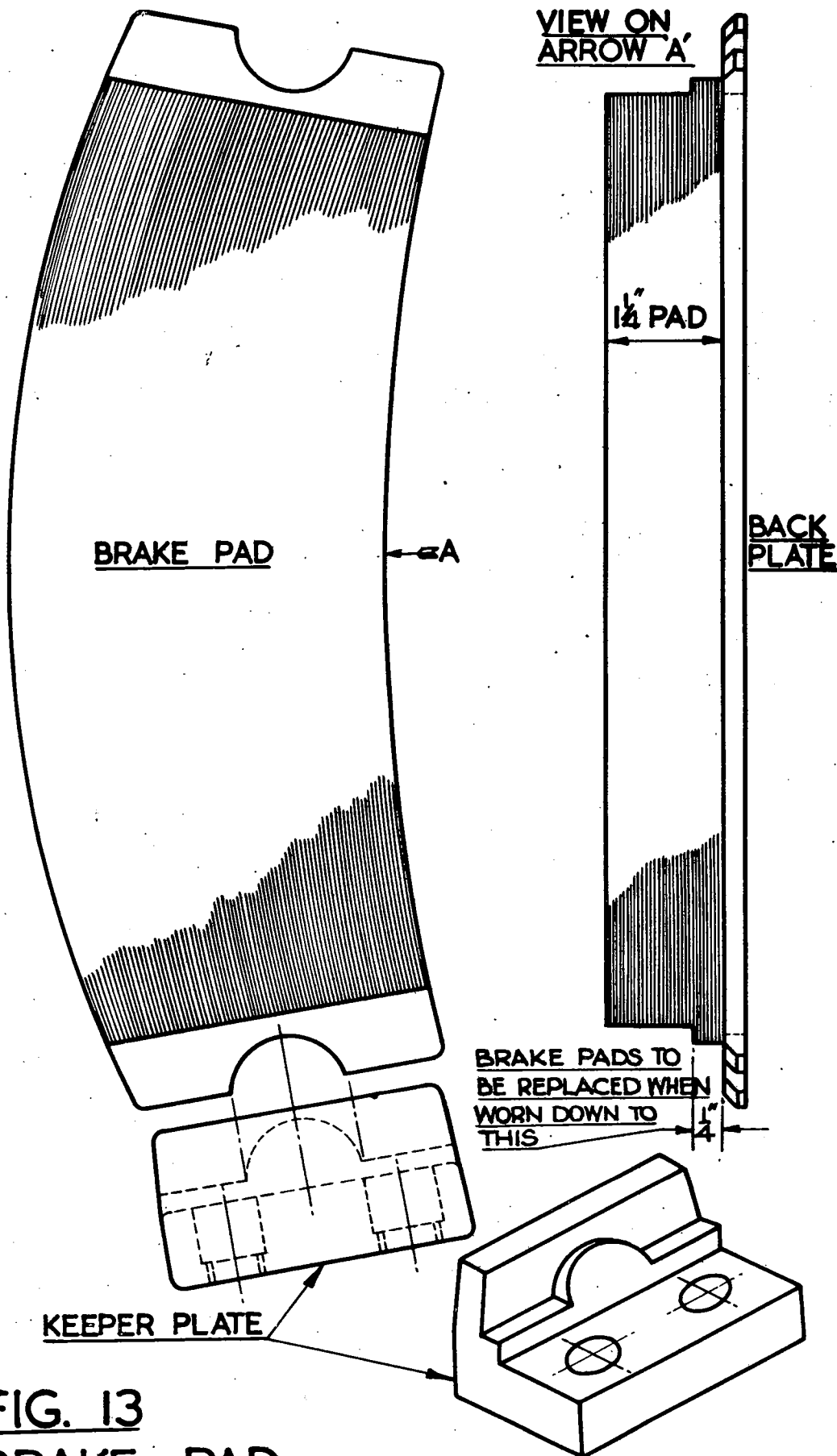
Care must be taken to ensure even adjustment all round.

If the push/pull rod connecting the two hand brake lever shafts has an open end care must be taken that this open end is above the short shaft.

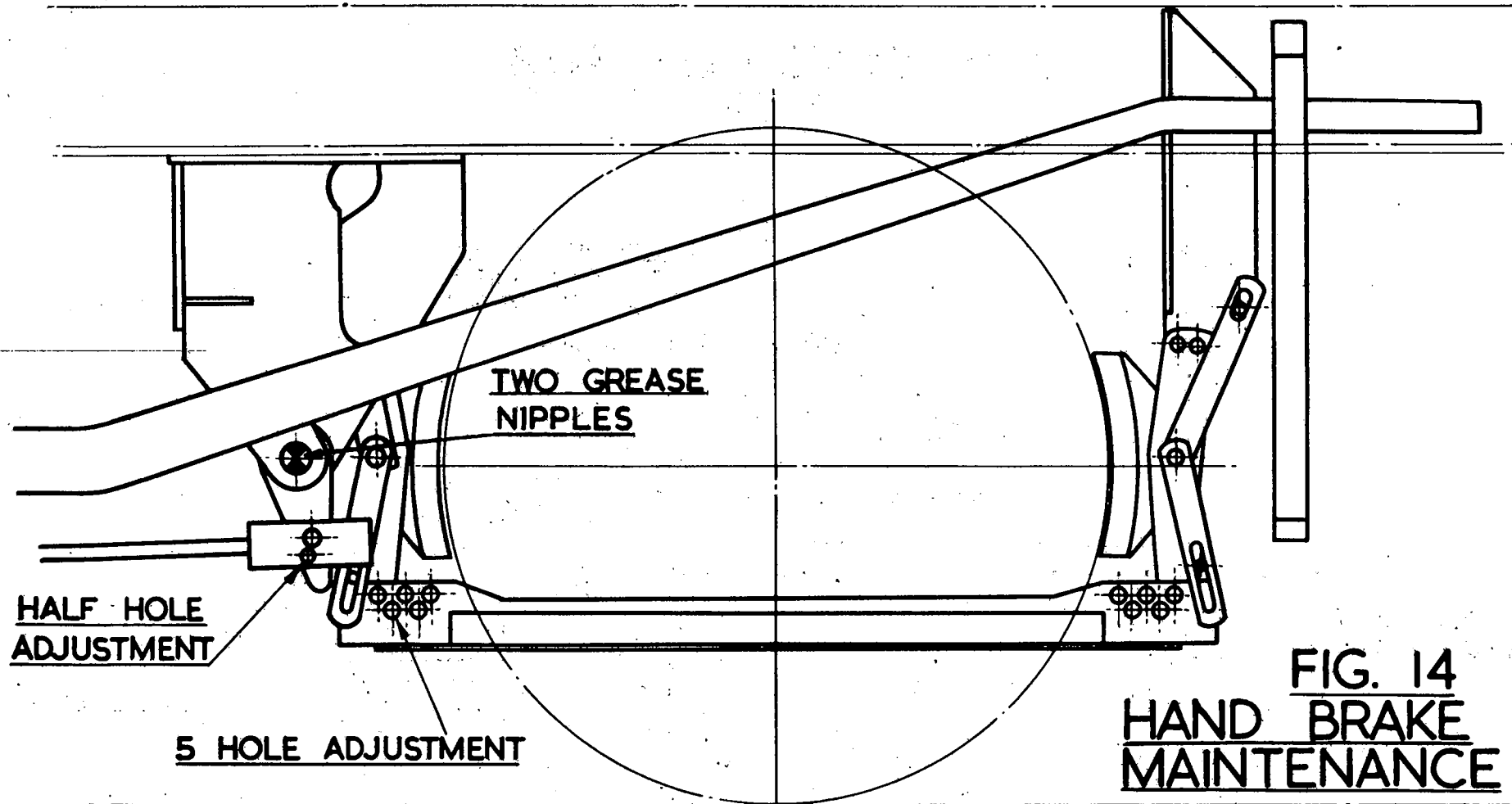
#### Standard Equipment

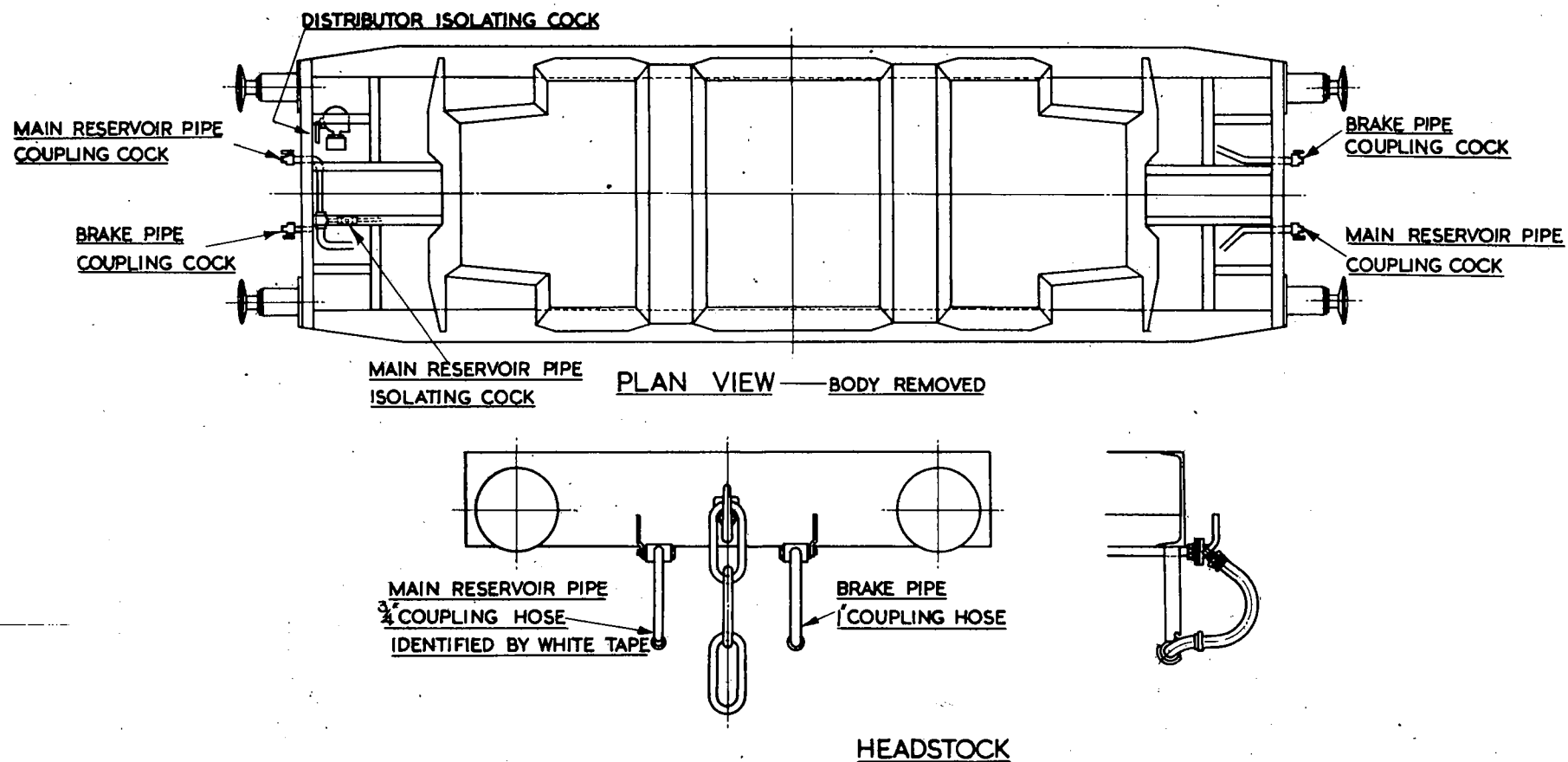
Items of equipment, which are of standard design, e.g. buffing and drawgear, axleboxes etc. must be dealt with in accordance with standard instructions.

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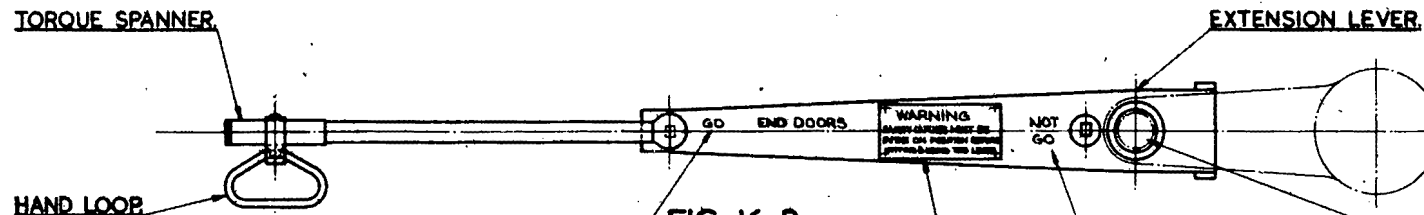


**FIG. 13**  
**BRAKE PAD.**





**FIG. 15**  
**HIGH CAPACITY COAL WAGON.**



**FIG. 16 B.**  
**DOOR CLOSED.**

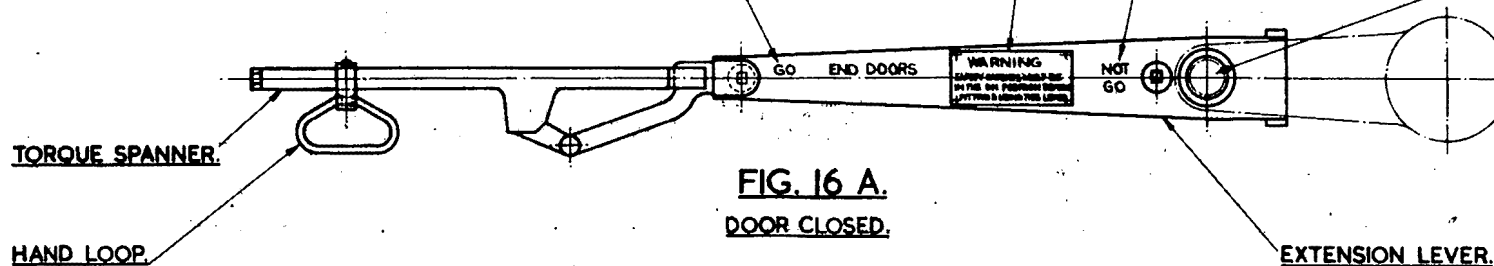
THIS MEANS THAT THE LEVER MUST 'GO' DOWN BEFORE THE TORQUE SPANNER 'BREAKS' WHEN USED IN THE POSITION SHOWN.

**WARNING**  
SAFETY CATCHES MUST BE IN THE ON POSITION BEFORE FITTING & USING THIS LEVER.

THIS MEANS THAT THE LEVER MUST NOT 'GO' DOWN BEFORE THE TORQUE SPANNER BREAKS WHEN FITTED IN THE ADJACENT SQUARED HOLE.

THE TORQUE SPANNER & EXTENSION LEVER TO BE FITTED TO THE DOOR OPERATING LEVER TRUNNION PREFERABLY ON THE NONE GEAR SIDE OF THE DOOR OPERATING SHAFT.

DOOR OPERATING LEVER TRUNNION.



**FIG. 16 A.**  
**DOOR CLOSED.**

**ARRANGEMENT OF TORQUE SPANNER AND EXTENSION LEVER. END DOORS.**

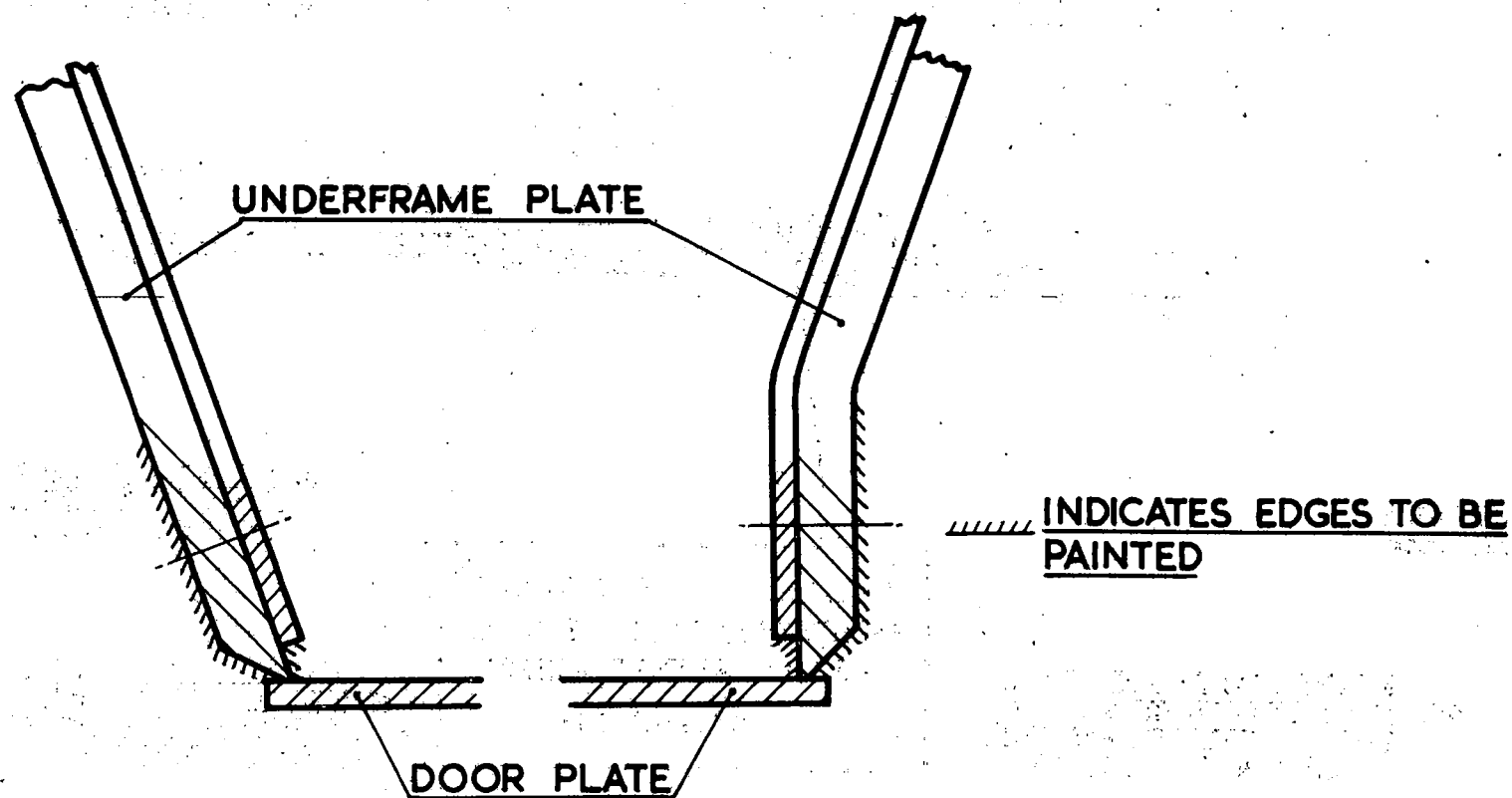
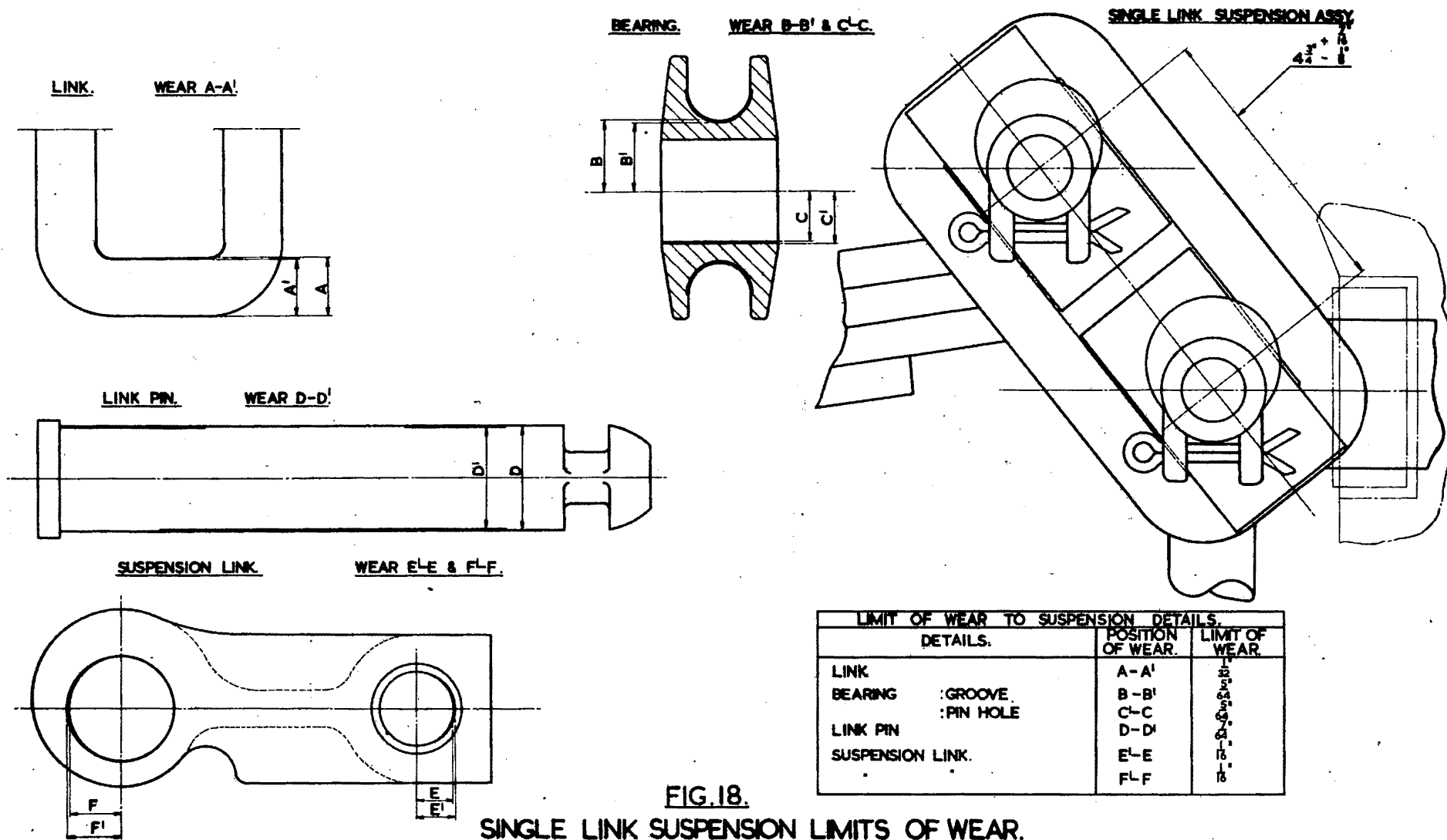


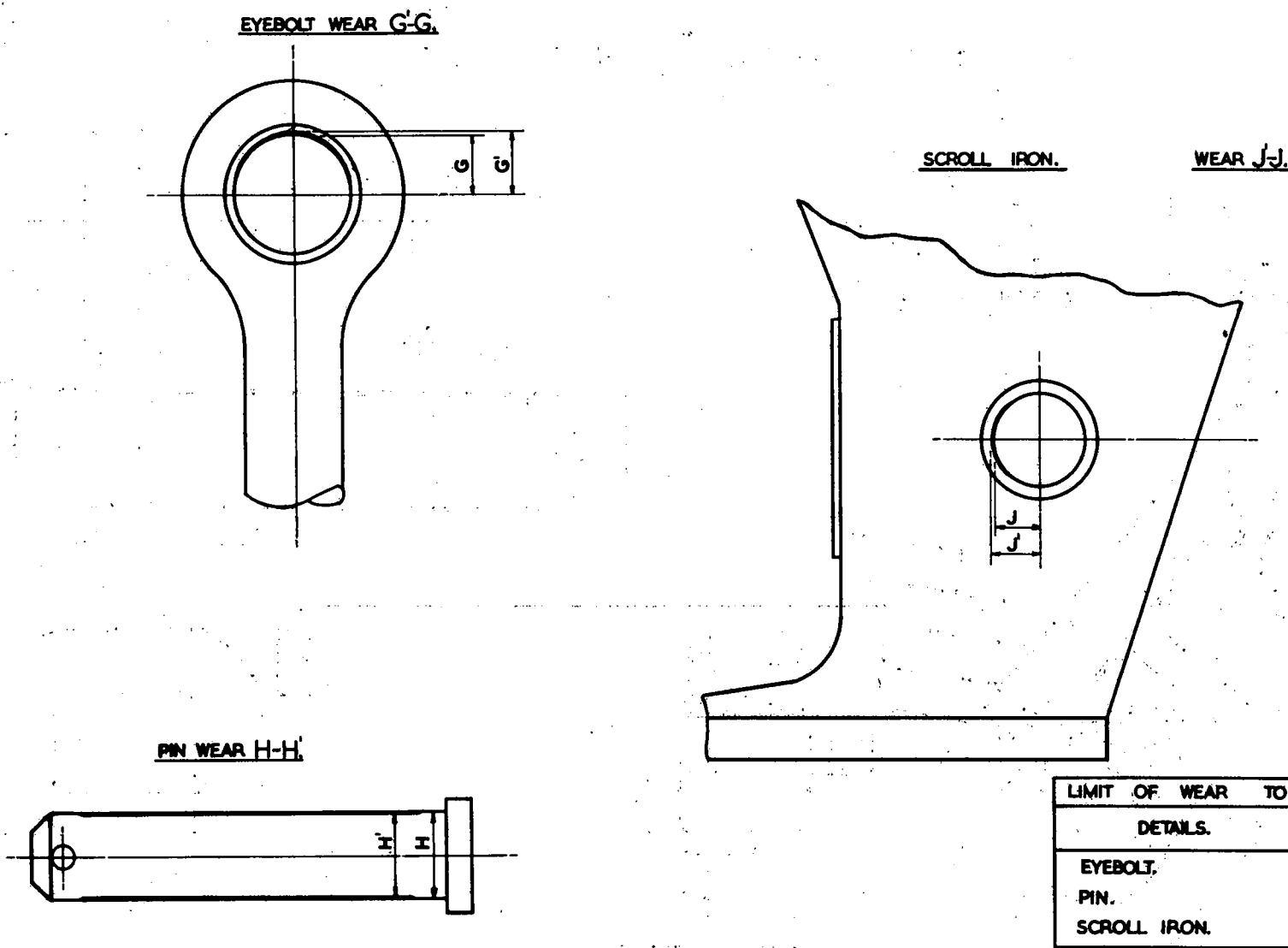
FIG. 17

PAINTING OF UNDERFRAME PLATES AT DOOR OPENING.



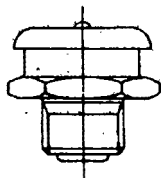


**FIG.18.**  
**SINGLE LINK SUSPENSION LIMITS OF WEAR.**



LIMIT OF WEAR TO SUSPENSION DETAILS.		
DETAILS.	POSITION OF WEAR.	LIMIT OF WEAR.
EYEBOLT.	G' - G	$\frac{1}{16}$
PIN.	H' - H	$\frac{1}{16}$
SCROLL IRON.	J' - J	$\frac{1}{16}$

**FIG.19**  
**SINGLE LINK SUSPENSION LIMITS OF WEAR.**



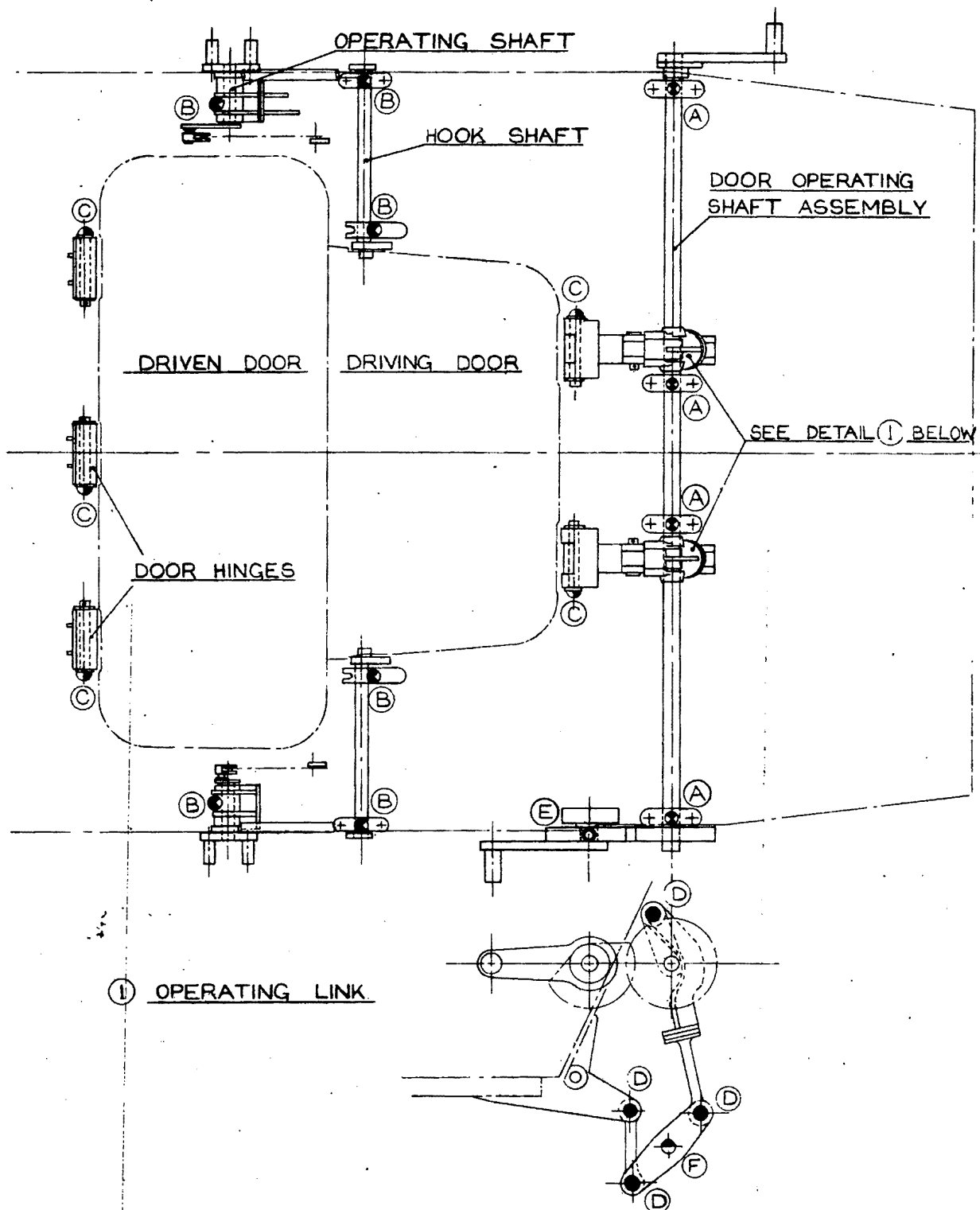
GREASE NIPPLES ARE OF THE BUTTON  
HEAD TYPE AS SHOWN TO B.S. 1486.  
PART 1, TYPE 11B.

<u>LOCATION</u>			<u>SYMBOL</u>	<u>Nº. OF POINTS</u>
GREASING	POINTS	ON DOOR OPERATING SHAFT BEARINGS	(A)	12
"	"	" HOOK SHAFT & OPERATING SHAFT BEARINGS	(B)	18
"	"	" DOOR HINGE PINS	(C)	16
"	"	" DOOR OPERATING LINK PINS	(D)	22
"	"	" QUADRANT BRACKETS	(E)	3
"	"	" BOTTOM SHAFT BEARINGS	(F)	12
			(G)	2
			<u>TOTAL</u>	<u>85</u>

NOTE:— GREASE TO BE TO B.R. CAT. Nº 9/27/4150

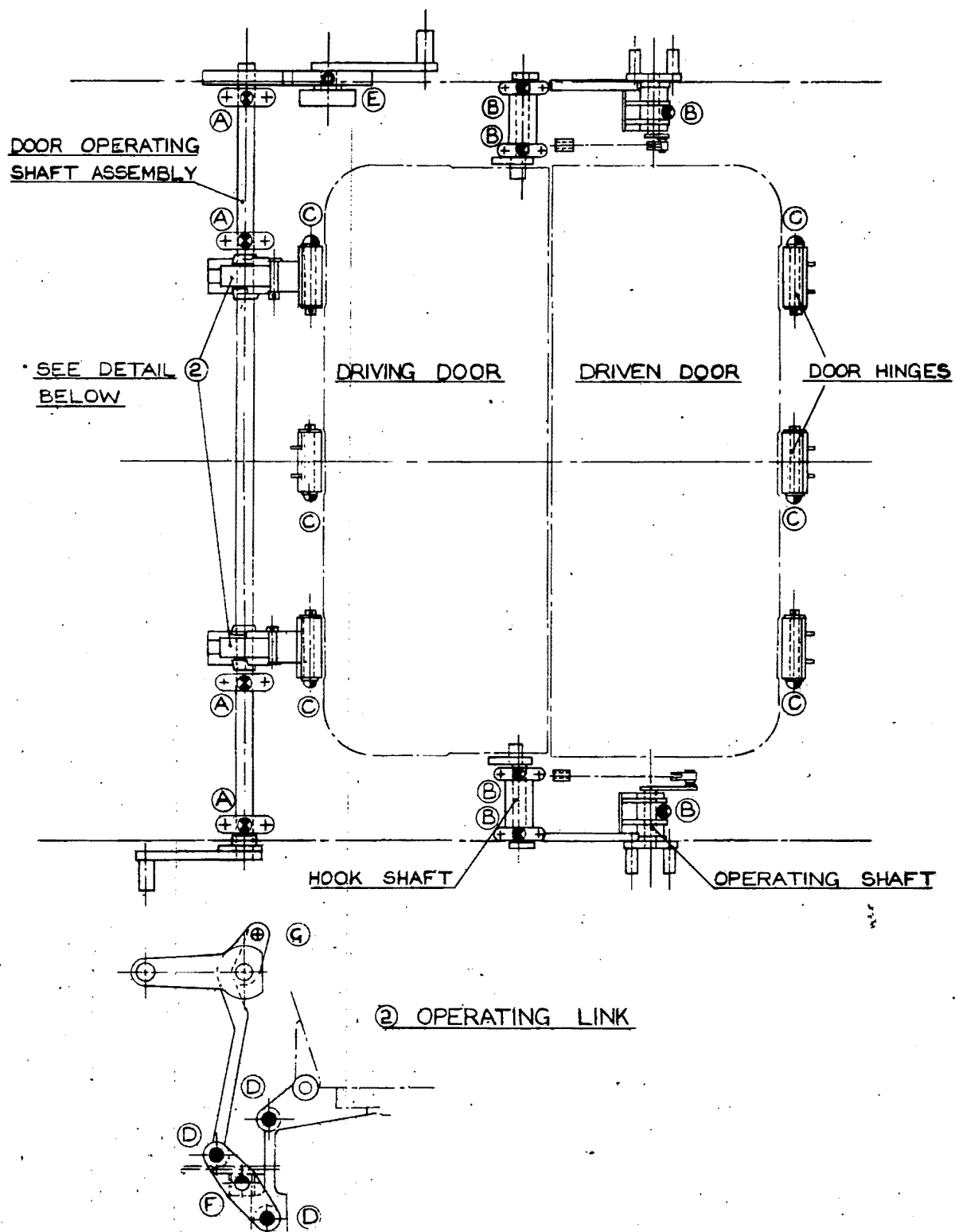
Fig. 20

KEY TO LUBRICATION CHARTS, FIG'S. 21 & 22, FOR  
DOOR OPERATING & CATCH GEAR.



DOOR GEAR LUBRICATION CHART  
END BAYS

FIG. 21



DOOR GEAR LUBRICATION CHART  
MIDDLE BAY

FIG. 22