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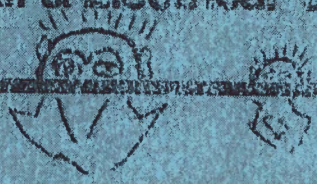
Mechanical & Electrical Engineering Department



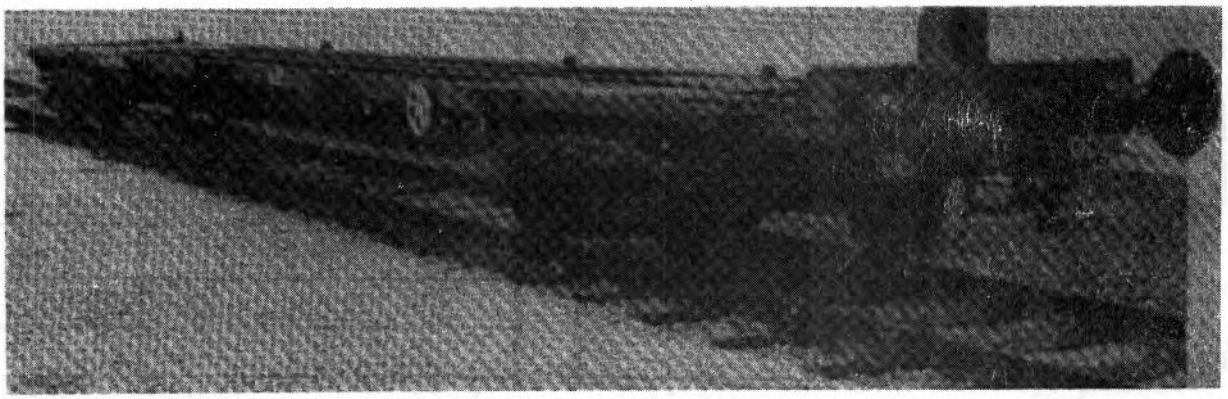
FREIGHTLINER [illegible]

Description and Maintenance

PREFACE

THIS PUBLICATION IS INTENDED TO PROVIDE COMPREHENSIVE DESCRIPTION AND MAINTENANCE INFORMATION FOR THE FREIGHTLINER VEHICLES

INNER-END



OUTER-END

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REVISION RECORD

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LETTERS 1 TO 8		

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4 Amendment pages to this publication will have the amendment indicated by a black line on the left hand side of the adjacent paragraph or illustration.

The figure adjacent to the black line will indicate the amendment number registered.

CONTENTS

FREIGHTLINER VEHICLES

1ST BATCH

End Vehicles	B.601003 - B.601020
Intermediate Vehicles	B.602003 - B.602084

The above vehicles are fitted with the Ridemaster Bogie to Drg. No. DE/37941 with 2'-8" dia wheels and Wheel Mounted Disc Brakes.

FREIGHTLINER VEHICLES

2ND BATCH

End Vehicles	B.601021 - B.601175
Intermediate Vehicles	B.602085 - B.602220

The above vehicles are fitted with the Ride Control Bogie BR-2M (Mk.I) to Drg. No. DE/48358 with 2'-8" wheels and Axle Mounted Disc Brakes (Girlings).

End Vehicles " "	B.601176 - B.601328 B.601336 - B.601345
Intermediate Vehicles " " " "	B.602221 - B.602608 B.602614 B.602772 - B.602811

The above vehicles are fitted with the Ride Control Bogie BR-2M (Mk.II) to Drg. No. DE/48390 with 2'-8" dia wheels and Axle Mounted Disc Brakes (Girlings).

End Vehicles " "	B.601358 B.601361
Intermediate Vehicles " " " "	B.602609 - B.602613 B.602644 - B.602646 B.602649 - B.602653

The above vehicles are fitted with the Ride Control Bogie BR-2M (Mk.II) to Drg. No. DE/48390 with 2'-8" dia wheels and Axle Mounted Disc Brakes (Knorr).

FREIGHTLINER VEHICLES

2ND BATCH CONTINUED

End Vehicles	B.601329 - B.601335
" "	B.601346 - B.601357
" "	B.601359 - B.601360
" "	B.601362 - B.601423
" "	B.601425 - B.601446
" "	B.601449 - B.601452
Intermediate Vehicles	B.602615 - B.602643
" "	B.602647 - B.602649
" "	B.602654 - B.602705
" "	B.602707 - B.602771
" "	B.602812 - B.602889
" "	B.602892
" "	B.602908

The above vehicles are fitted with the Ride Control Bogie BR-2M (Mk.II) to Drg. No. DE/48390 with 2'-9" dia wheels and wheel Mounted Disc Brakes (Girlings).

30	End Vehicles	B.601544 - B.601689
245	Intermediate Vehicles	B.603030 - B.603163

601690 -849

603164- 274

The above vehicles are fitted with the Ride Control Bogie BR-2M (Mk.III) to Drg. No. F-Al-3629 with 2'-8" dia wheels and wheel Mounted Disc Brakes (Girlings).

End Vehicles	B.601424	1
" "	B.601447 - B.601448	2
" "	B.601453 - B.601543	91
Intermediate Vehicles	B.602706	1
" "	B.602890 - B.602891	2
" "	B.602893 - B.602907	15
" "	B.602909 - B.603029	121

94

233

139

The above vehicles are fitted with the FL/1 Bogie to Drg. No. DE/38594 with 2'-9" dia wheels and wheel Mounted Disc Brakes (Girlings).

GENERAL PARTICULARS are as follows :-

Length over Headstocks		63'-6" End Vehicle
		62'-6" Intermediate Vehicle
Bogie Centres		46'-0"
Total Length of 15 wagon train		982'-3"
Buffer Centres		5'-7½"
Buffer Height		3'-5¼"
Buffer Projection		1'-10"
Platform Height above Rail BATCH I		3'-3.3/16"
Platform Height above Rail BATCH II		3'-4.3/16" with BR-2M (Mk.I) Bogies
Platform Height above Rail BATCH II		3'-4.13/32" with BR-2M (Mk.II) Bogies
Platform Height above Rail BATCH II		3'-3⅜" with BR-2M (Mk.III) Bogies
Platform Height above Rail BATCH II		3'-4½" with FL/1 Bogie
Bogies BATCH I		Ridemaster
Bogies BATCH II		Ride Control (BR-2M) Mk.I-Mk.II and Mk.III & FL/1
Bogie Wheel Base		6'-6¾"
Journal Dia		4⅞"
Journal Centres		6'-6"
Brakes - Air Operated Disc Brakes		
Max Load		61 Tons 61·8
Tare	End Vehicle	19 Tons 18 cwts. 20-2
	Intermediate Vehicle	19 Tons 8 cwts. 19-7
Max Running Speed		75 m.p.h.

DESCRIPTION OF TRAIN

Freightliner Trains are designed to work in fixed sets, which will only be split up in an emergency or as necessary for repair, replacement, etc.

There are two types of wagon, End wagons and Intermediate wagons.

The formation of these sets to be formed as required.

End wagons are constructed with one conventional end complete with Buffers, two air brake hose connections and a coupling hook but no coupling. Thus, when attaching a locomotive to a freightliner train, the engine coupling must be used. An Emergency Screw Coupling is carried on the Headstock at the conventional end of each End wagon for coupling End vehicles together or coupling the End vehicle to the locomotive should its coupling fail. The Inner end of End wagon and both ends of Intermediate wagons are fitted with special cast steel bar couplers which are held together with four bolts and nuts per pair of couplers. The bar couplers incorporate the air brake pipe connections between vehicles.

Freightliner Wagons are provided with hand operated I.S.O. Twist locks, which have location spigots that must engage with the I.S.O. Corner Castings of the containers, the twist lock can then be operated to secure the container to the Freightliner wagon.

All wheels are to the Tyre profile (P.6).

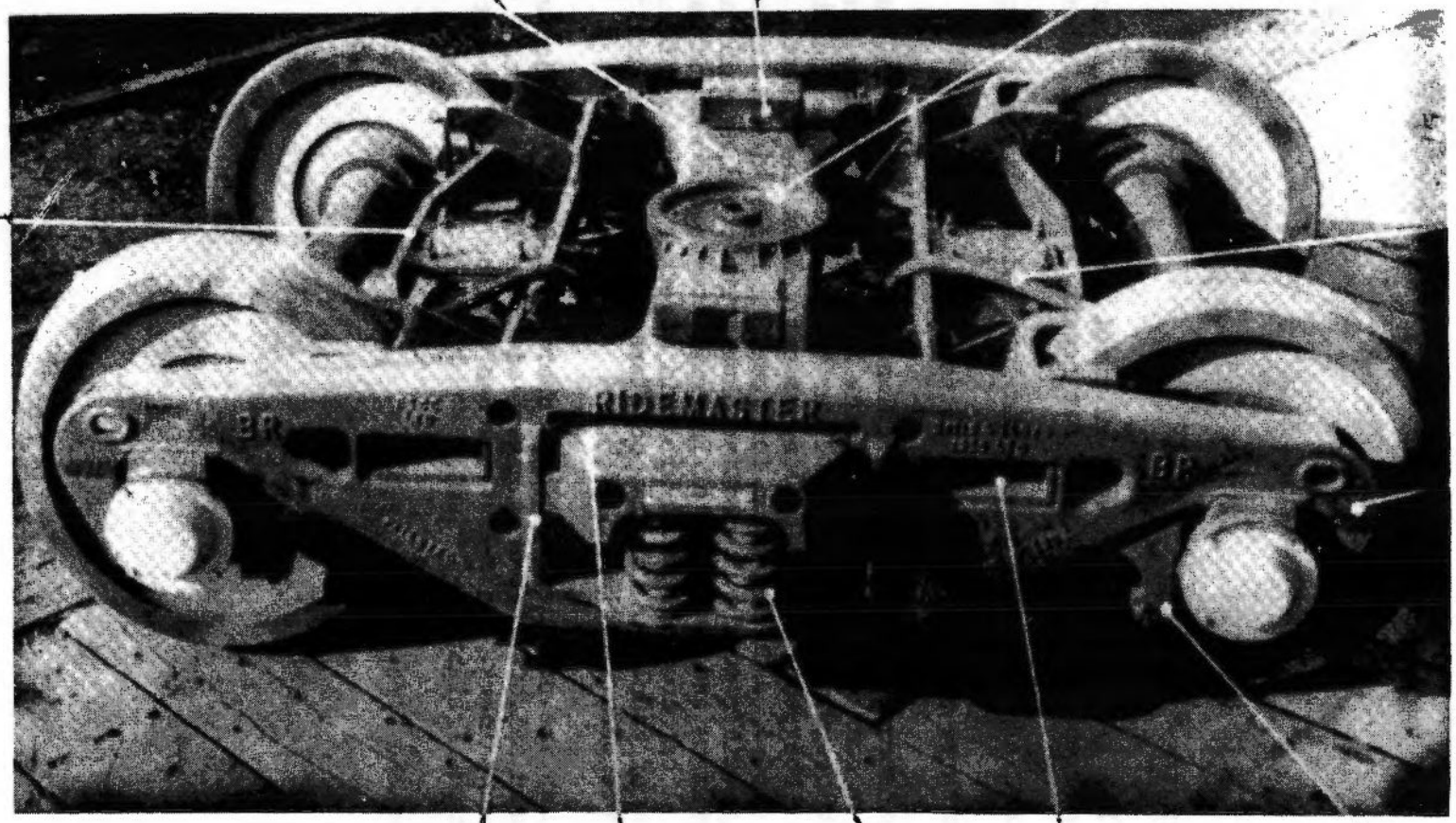


FIG.1

FREIGHTLINER TRAINS - RIDEMASTER BOGIE

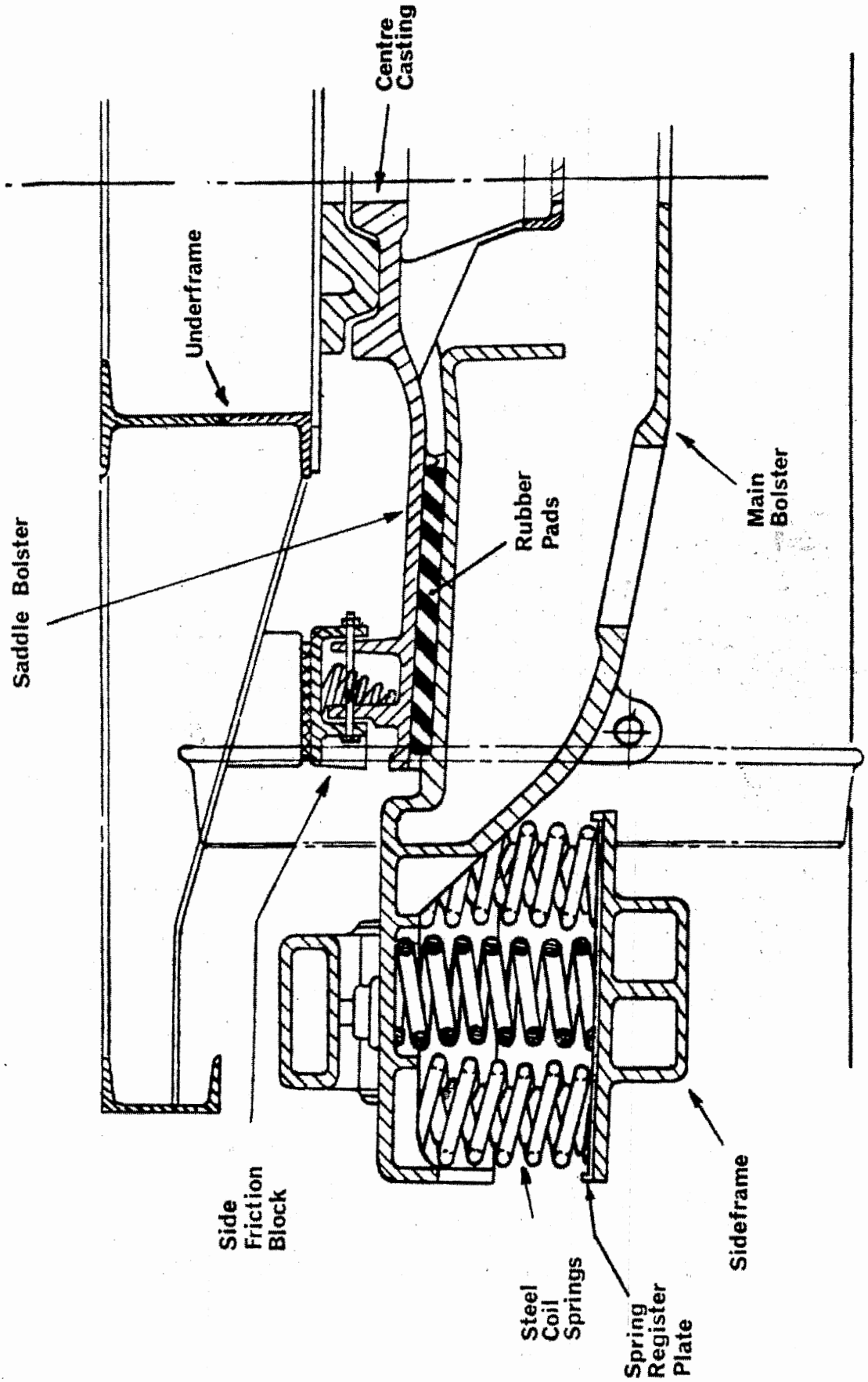


FIG.2

RIDEMASTER BOGIE

RIDEMASTER BOGIE (See Figs. 1 & 2)

The Ridemaster Bogie fitted to the 1st Batch of Freightliner trains have a cast steel frame fitted with 2'-8" dia wheels with $4\frac{7}{8}$" Journals and Roller Bearing Axlebox at 6'-$6\frac{3}{4}$" (2 metre) Axle Centres. The Bogie frame is made up of four main castings - two side frames, a main bolster, and a saddle bolster. The ends of the main bolster are fitted through apertures in the side frames and rest on nests of five steel coil springs, three of these springs have inner springs also. Fitted into the ends of the bolster are spring loaded cast steel wedges which bear on spring steel plates tack-welded to the sides of the aperture. These provide a measure of damping to the main springs and it is essential that these surfaces remain dry and unlubricated.

The saddle bolster, which also incorporates the bottom centre casting is fitted over the main bolster, where it is located by, and rests on, two rubber pads. There is provision for 1" of lateral movement in each direction. The two rubber pads provide the force to return the saddle bolster to the central position, as any lateral movement tends to distort the rubber.

The top face of the main bolster (and the rubber pads) is inclined at an angle of about 15^{0} viewed from the bolster end, so that as the load on the centre casting increases, the saddle bolster tends to slide down the incline. This causes friction plates on the sides of the saddle bolster to bear with increasing force on the sides of the main bolster. In this way a measure of damping, proportional to the load, is applied to the lateral movement of the saddle bolster and also of course to the vehicle frame.

There is in addition a spring tensioned bolt which provides a fixed (minimum) bearing pressure between the two friction faces, this tension is adjusted in Main Works and should not require re-adjustment during service.

The side friction blocks, also carried on the saddle bolster, are spring loaded so that they always remain in contact with those on the underframe. The faces are composed of anti-friction material and need no lubrication.

With the two side frames located, but not fixed, by the main bolster the side frames are free to move relative to one another in any direction, the amount of movement being governed only by the clearances provided between the various components. This is an essential part of the design of this type of bogie and it is vital that this movement is not restricted in any way. It is, therefore, most important that the clearances between the components are maintained.

The axleboxes are retained in the axlebox guides by means of small "keeps" bolted to the bottom of one leg of each guide, (see Fig. 3) and the top of the box is domed slightly to allow the side frame to rock in a vertical plane. This clearance between axlebox and guide is adjusted to allow this.

All the bogie brakework is carried on two beams, the ends of which fit into sockets cast into the side frames. In order to locate the brake callipers as accurately as possible, but still preserve the freedom of movement between the Bogie components, the Spigot End of these brake beams have to be fitted individually to their sockets, owing to the slight variations in the castings it is important, therefore that each beam should always be re-assembled at its correct position on the correct Bogie.

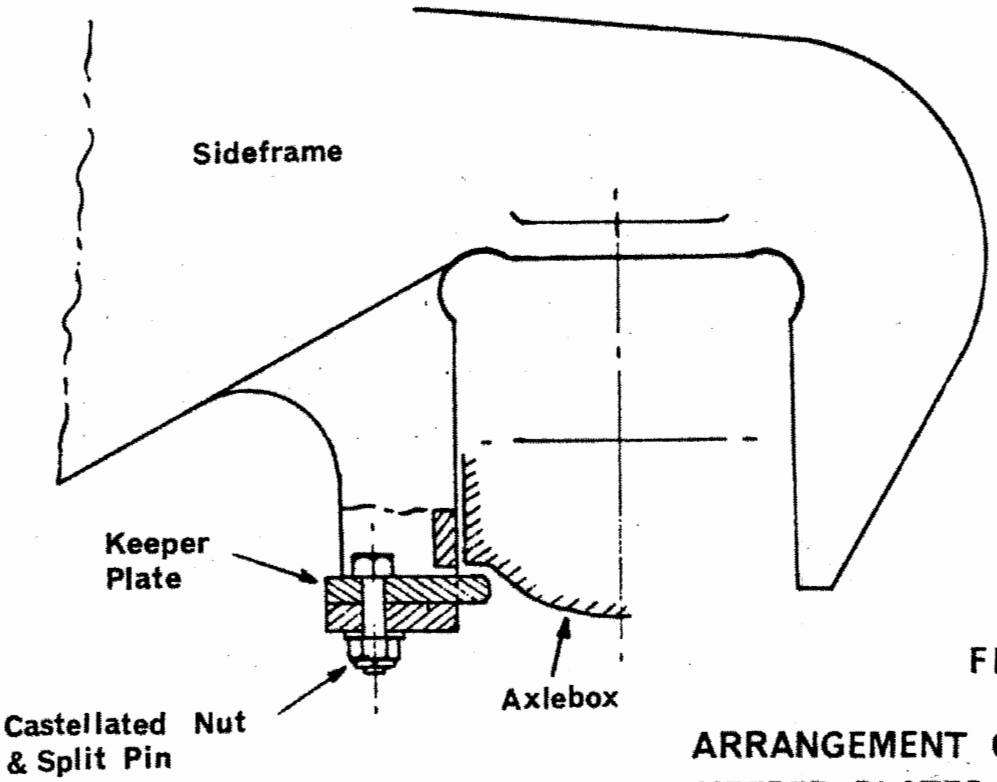


FIG.3

ARRANGEMENT OF AXLEBOX KEEPER PLATES

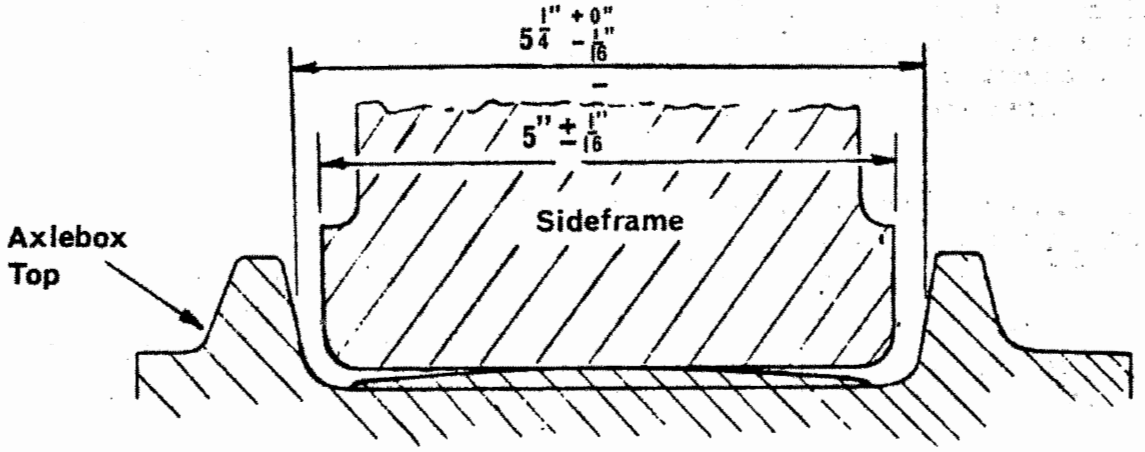


FIG.4

AXLEBOX TO SIDEFRAME

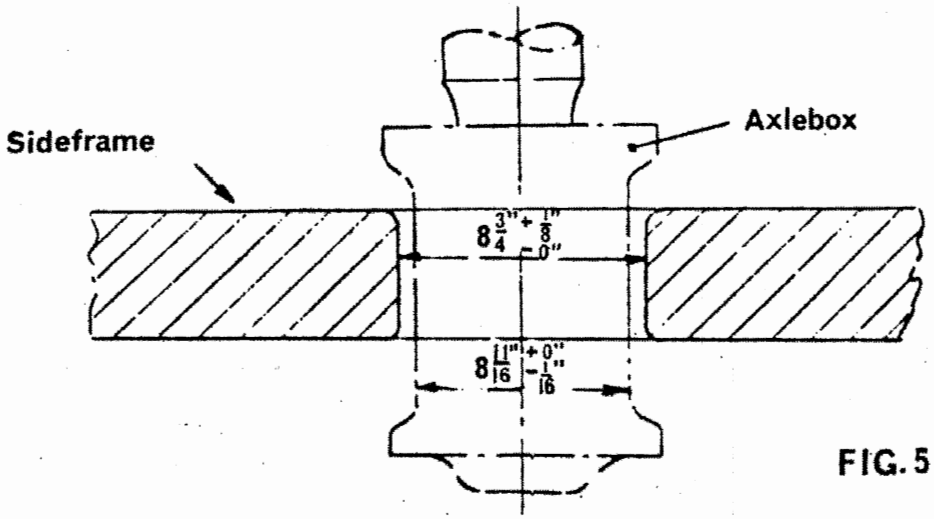


FIG.5

AXLEBOX TO SIDEFRAME

Maintenance of the Bogies consists of regular inspection of Clearances, checking for broken bolster springs and lubrication of axleboxes as necessary. In accordance with Engineering Instruction No. WF13.

For clearances between Brake Beam to Side Frame (See Fig 25).

For clearances between Bogie Bolster to Side Frame (See Fig 23).

For clearances between Axlebox to Side Frame (See Figs 4 & 5).

VEHICLE HEIGHT ADJUSTMENT (Ridemaster Bogie) 1ST BATCH

Axlebox slippers are required to raise the height of the underframe when it falls below the specified height due to wheel re-turning. These are fitted between the axlebox top and the sideframe. Axlebox slippers must be fitted in accordance with
4 Drg No C1-A1-9001082.

Axlebox keep plates (retaining keys) are used to retain the wheelsets in the axlebox guides. The keep plates must be fitted in accordance with Drg No C1-A1-9001082.

ASSEMBLY OF BOGIE CENTRE PIVOT

Vehicles which have been modified to Mod No MB 3000/88 will have had the bolt holes opened out and counter bored in the top centre casting.

The casting will then be secured with 6 x M20 bolts, grade 12.9, nuts to grade 12, and hardened washers (See Fig 16A). These are torque tightened to 476 lbf ft (646 N m).

LIMITS OF WEAR (Ridemaster & Ride Control Bogies)

The vertical and horizontal horn guide liners must be restored to drawing dimension when wear exceeds 3/32" from the level at any point (See Fig 3 (a)). The overall dimension between the vertical liners must not at any point exceed 9.1/16" (See Fig 5 (a)). The overall width of frame or slipper should not be less than 4.7/8" (See Fig 4 (a)).

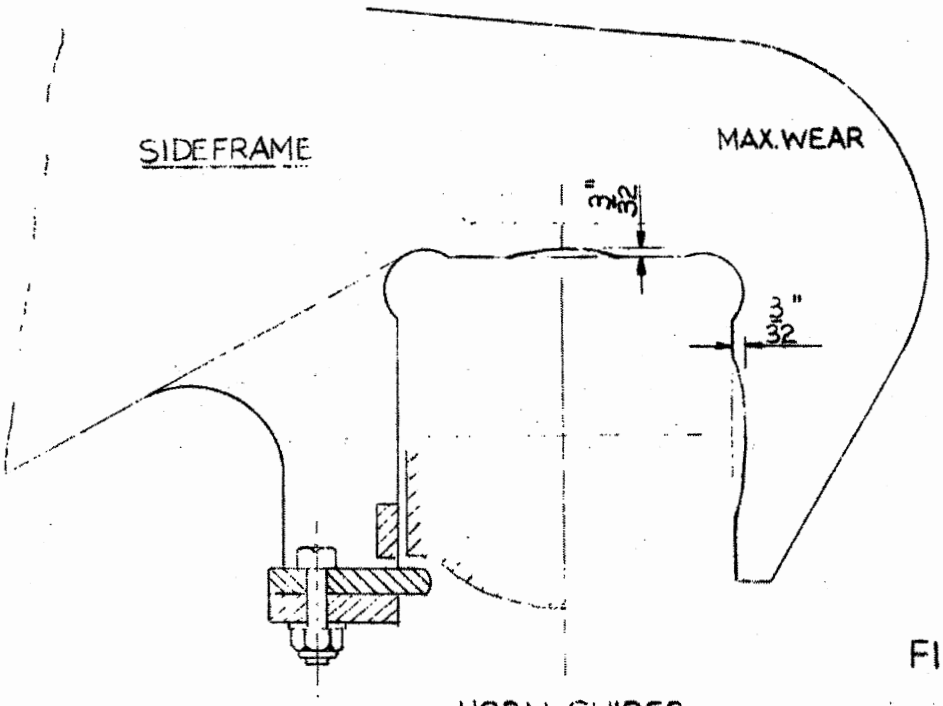
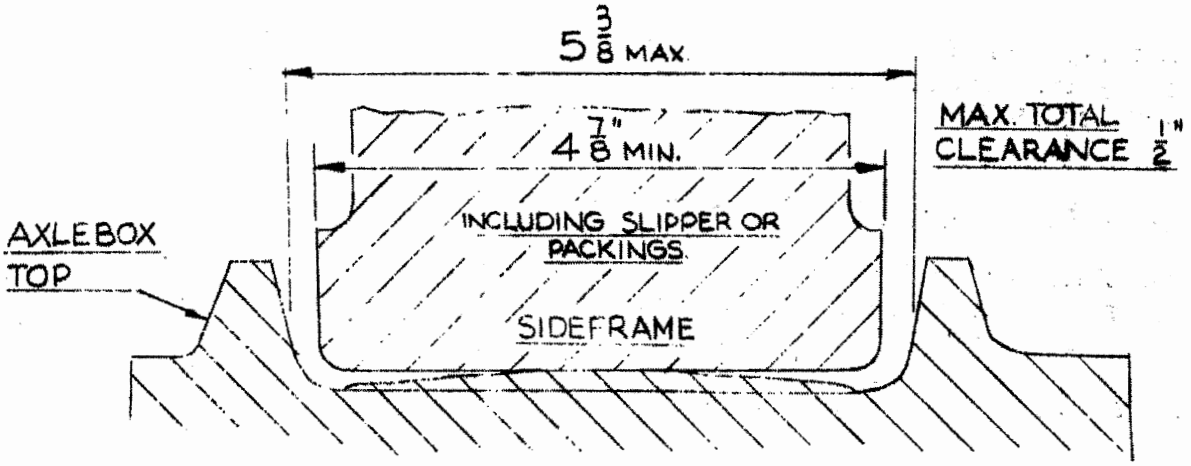


FIG. 3A

HORN GUIDES



AXLEBOX TO SIDEFRAME.

FIG. 4A.

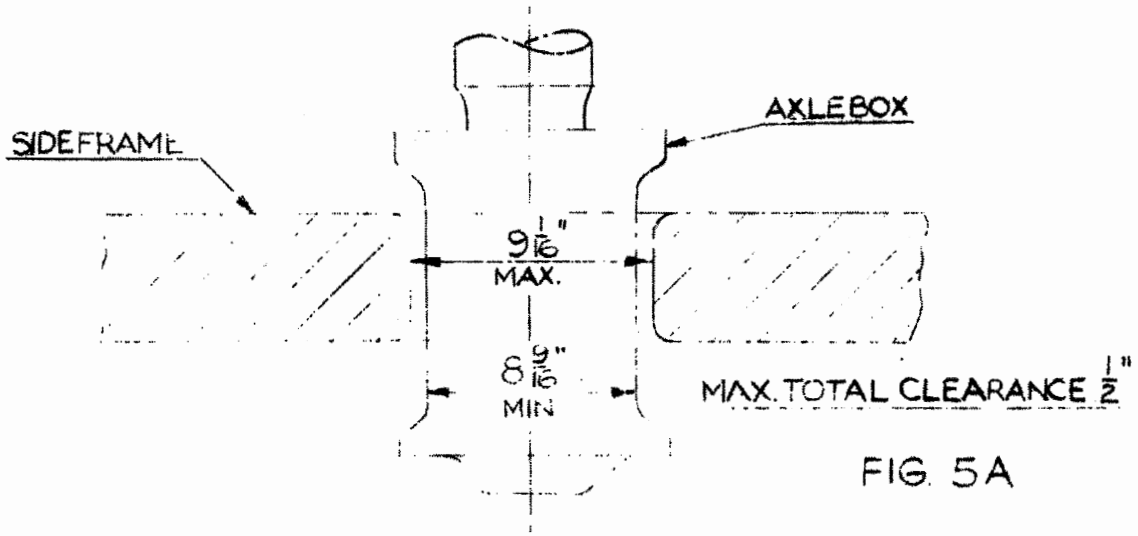
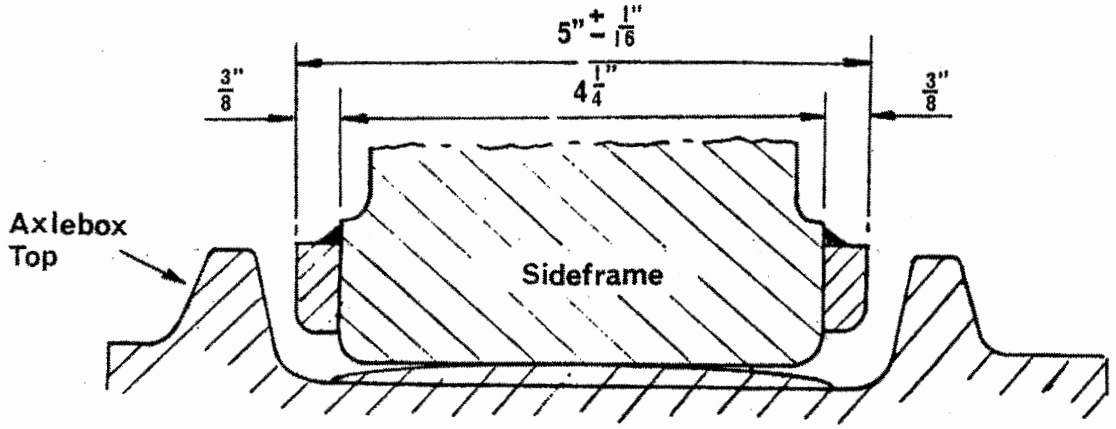


FIG. 5A

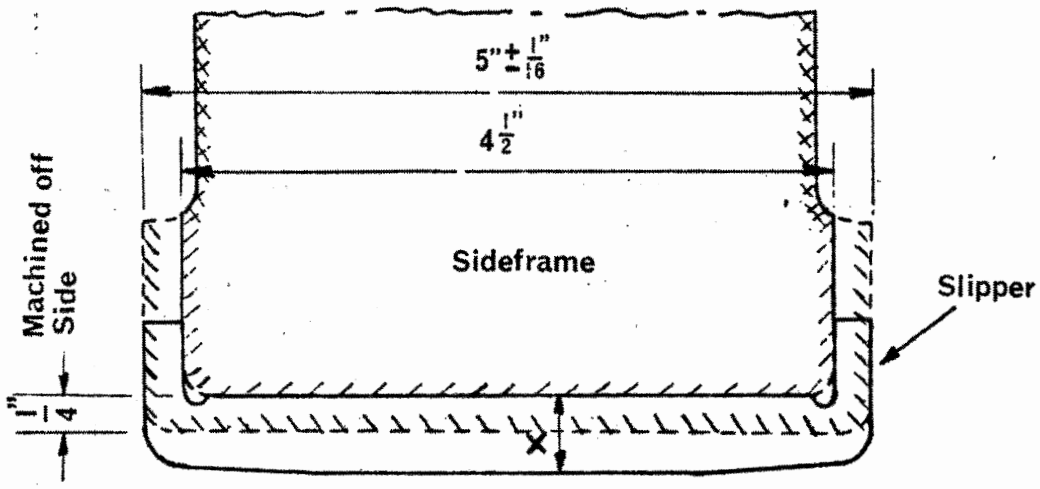
CANCELLED

AS PER REVISION LETTER NO. 4



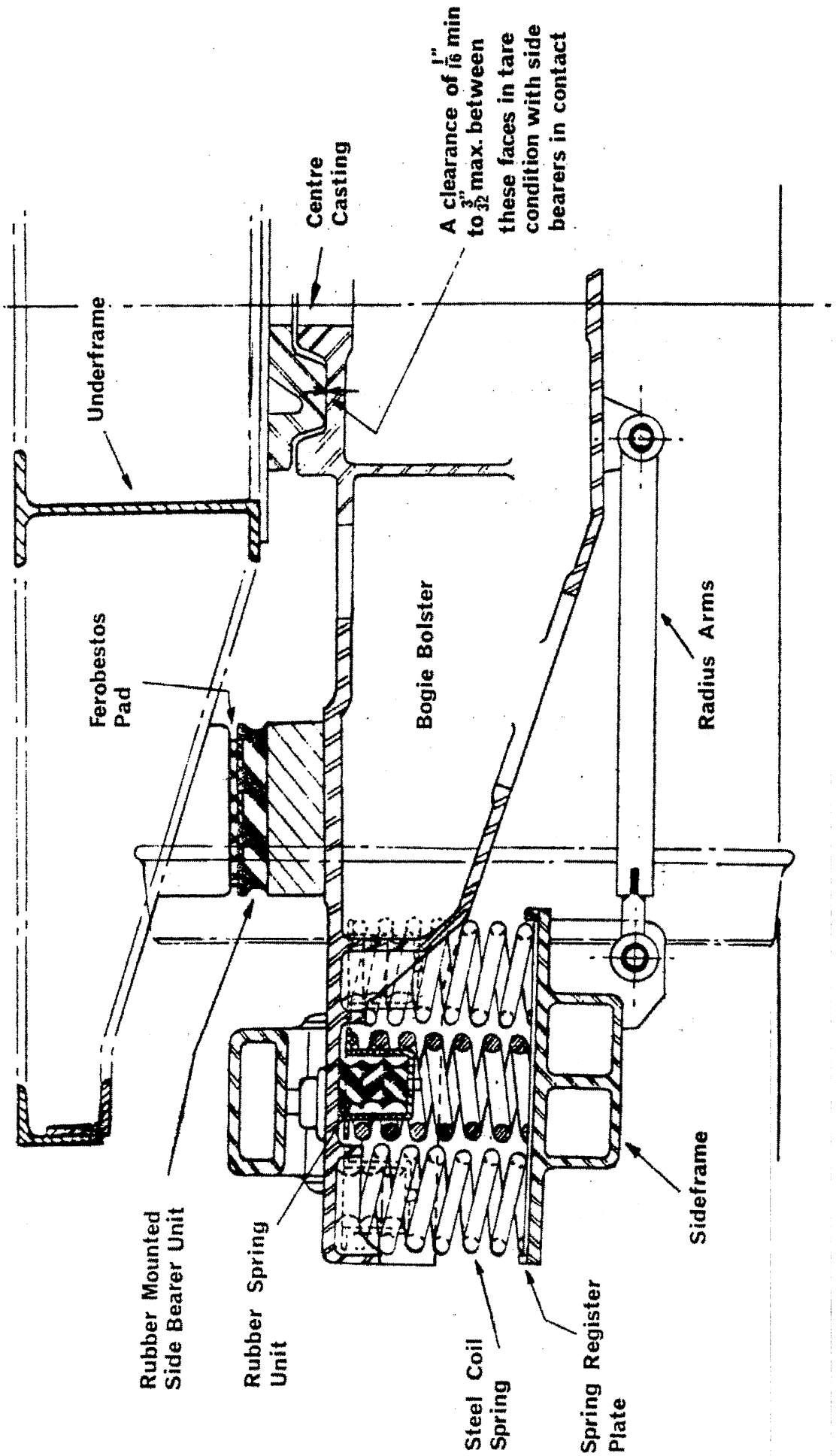
AXLEBOX CLEARANCE PACKINGS
BOGIE :- BR-2M(Mk.II) DE/48390

FIG.7



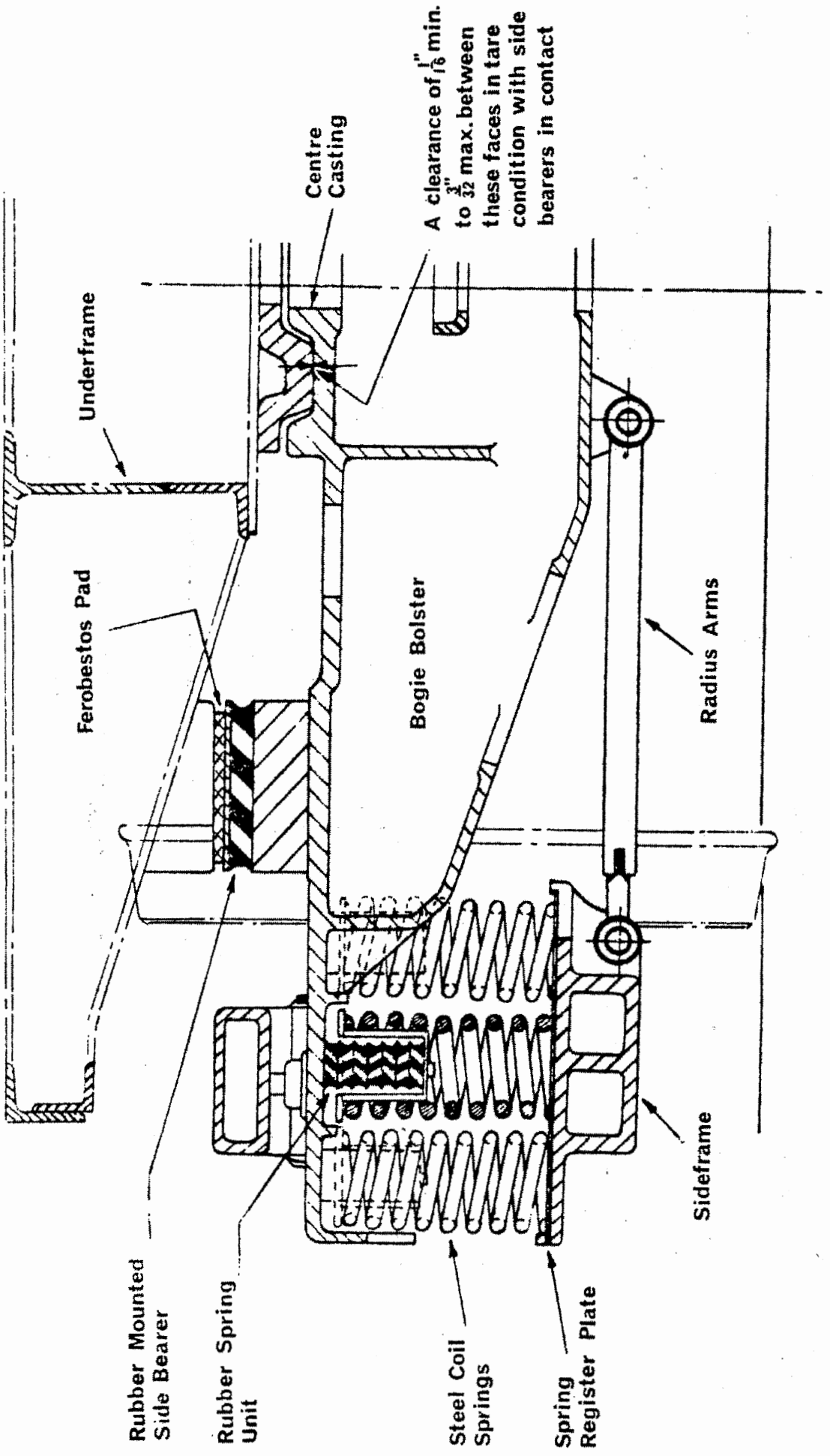
AXLEBOX SLIPPER TO SIDEFRAME
BOGIES :- RIDEMASTER DE/37941
BR-2M(Mk.I) DE/48358

FIG. 8



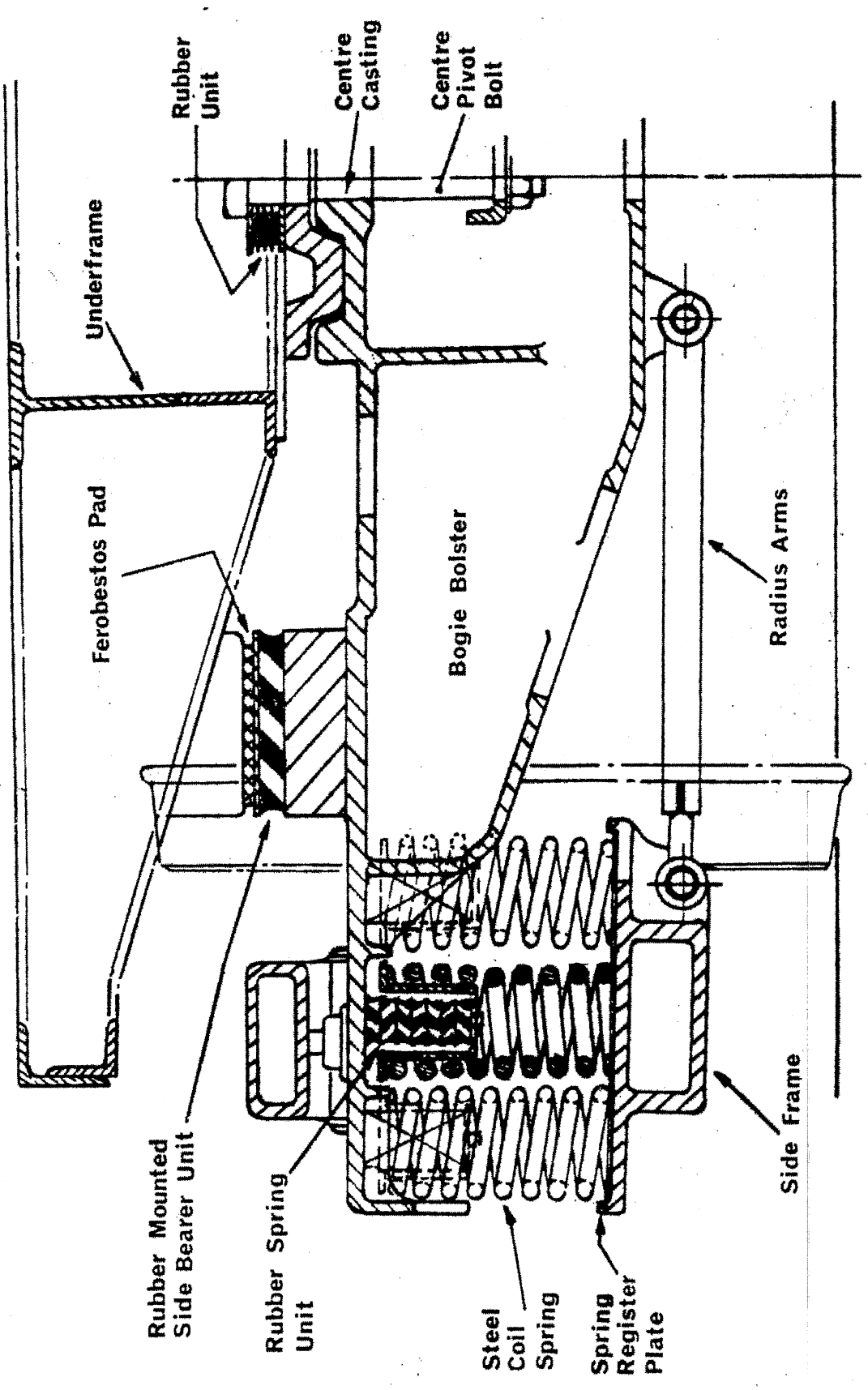
RIDE CONTROL BOGIE BR-2M (Mk1)

FIG.9



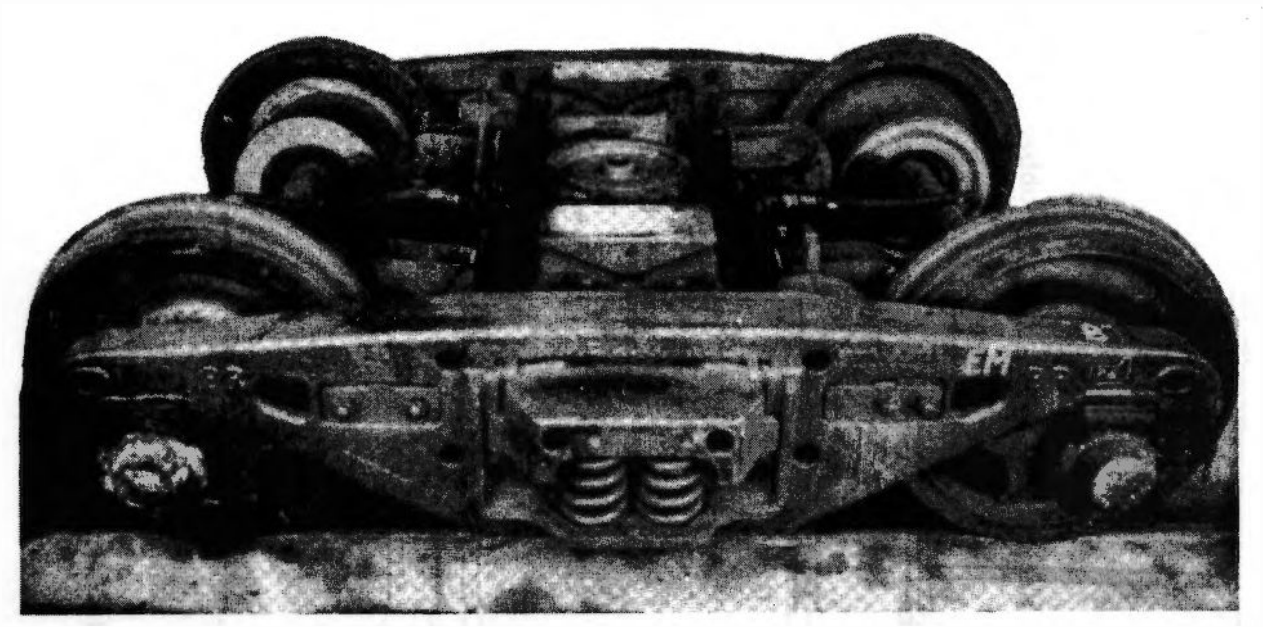
RIDE CONTROL BOGIE BR-2M(MkII)

FIG.10



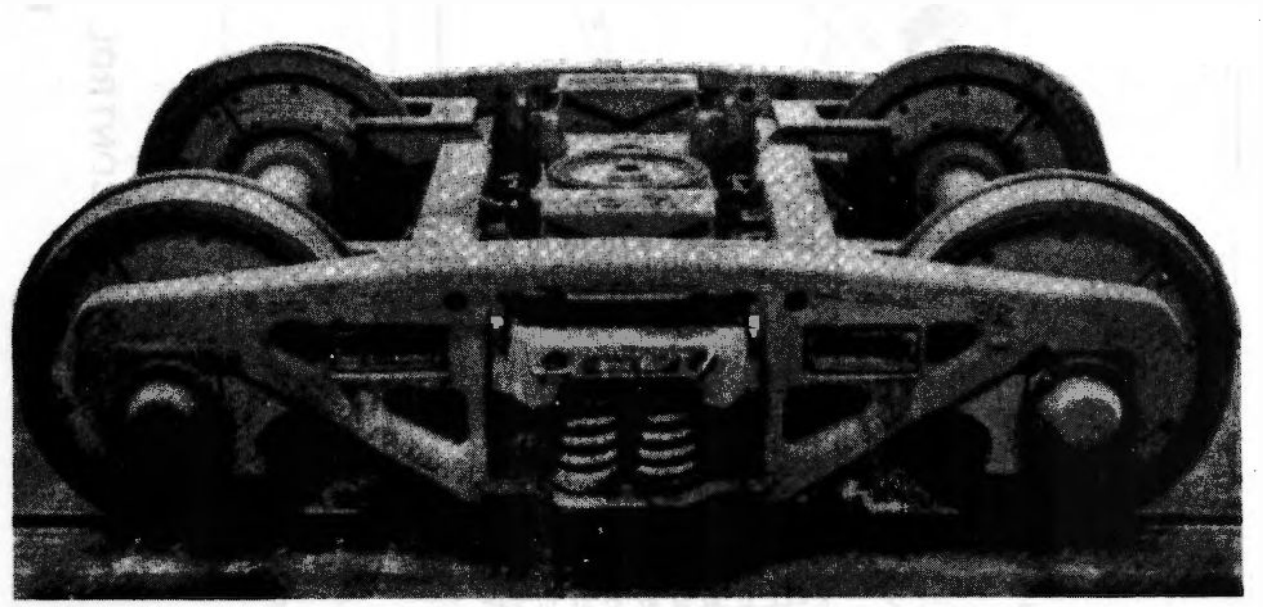
RIDE CONTROL BOGIE BR-2M(Mk.III)

FIG.11



RIDE CONTROL BOGIE (Mk.1)
AXLE MOUNTED DISC BRAKES

FIG 12(a)



RIDE CONTROL BOGIE (Mk.2)
WHEEL MOUNTED DISC BRAKES

FIG 12(b)

RIDE CONTROL BOGIE (BR-2M)

The 2nd BATCH of Freightliner Vehicles are fitted with the following Ride Control Bogies and the FL/1 Bogie.

BR-2M (Mk I) To Drg. No. DE/48358 (See Fig. 9)
BR-2M (Mk II) To Drg. No. DE/48390 (See Fig. 10)
BR-2M (Mk III) To Drg. No. F-A1-3629 (See Fig. 11)
FL/1 To Drg. No. DE/38594 (See maintenance manual MT/39)
(Engineering Instruction WF/59)

The ride Control Bogie is a three piece cast steel bogie frame fitted with either :-

(a) 2'-9" or 2'-8" dia solid Rolled Wheels with $4\frac{7}{8}$" dia Journals and roller bearing axleboxes BR-2M (Mk I & II) Bogies.

(b) 2'-8" dia solid Rolled Wheels with 5.3/16" dia Journals and A.P. roller bearing axleboxes BR-2M (Mk III) Bogies.

The Bogie Axle Centres are 6'-$6\frac{3}{4}$" (2 metre).

The bogie frame consists of two side frames and a Bolster. The ends of the Bolster are fitted through apertures, in the side frames, and are suspended on a nest of 5 springs, each spring consists of a steel coil spring with a rubber spring unit located at the top of the steel spring, and supported in a steel cup. This forms the only suspension on the vehicle. Fitted into the ends of the bolster are spring loaded cast steel ferobestos faced wedges which bear on spring steel plates tack-welded to the sides of the aperture. These provide a measure of vertical damping to the main springs, and it is essential that these surfaces remain dry and unlubricated.

Lateral control of the bogie is maintained by means of two radius arms which are fitted between the bolster underside and the inner faces of the side frame. The ends of the radius rods are rubber bushed so that freedom of the vertical movement of the bolster relative to the side frame is not impaired.

NOTE

The radius rods are fitted individually to each side frame, owing to the slight variation in the castings, it is most important therefore that the rods must not be interchanged.

The rotational stiffness of the Bogie relative to the underframe is controlled through rubber mounted side bearer units which are faced with a non-metallic friction material (ferobestos) mounted on the Bogie bolster, these are in contact with the steel underframe side bearer units (See Figs. 13 & 21). These surfaces must not be lubricated otherwise the Bogie rotational stiffness is decreased.

Monthly maintenance procedure to be carried out in accordance with Engineering Instruction WF 13.

BOLSTER SUSPENSION :- BR-2M (MKI) AND MK II BOGIES

On the BR-2M (MKI) Bogie each set of Spring Group, which consists of 5 steel coil spring and 5 rubber spring units have a total spring travel of $4\frac{1}{8}$" with a solid capacity of the Group of 46,602 lbs.

With the BR-2M (MKII) Bogie these Spring Groups were re-designed to give a total spring travel of 5.15/32" with a solid capacity of the Group of 46,840 lbs, in order to give improved riding characteristics.

A clearance of 1/16" MIN to 3/32" MAX is to be maintained between the two faces of the Centre Casting (See Fig. 9) in the Tare Condition, with the Side Bearer Units in contact when the Bogie and underframe are assembled.

BOLSTER SUSPENSION BR-2M (MKIII)

With this Bogie, the Side Bearer Units are under a pre-determined load in the Tare Condition.

This load which is constant throughout the vehicle load range, is exerted by means of a torque tightened centre casting bolt which fastens the underframe centre casting to the bogie bolster (see Fig.14) a rubber compression unit is sandwiched between the head of this bolt and the top centre casting, thus an improved lateral riding is obtained.

The rubber unit is set with an initial compression of 7/64" $\pm$ 1/64" (3/32" MIN $\frac{1}{8}$" MAX) by means of shims.

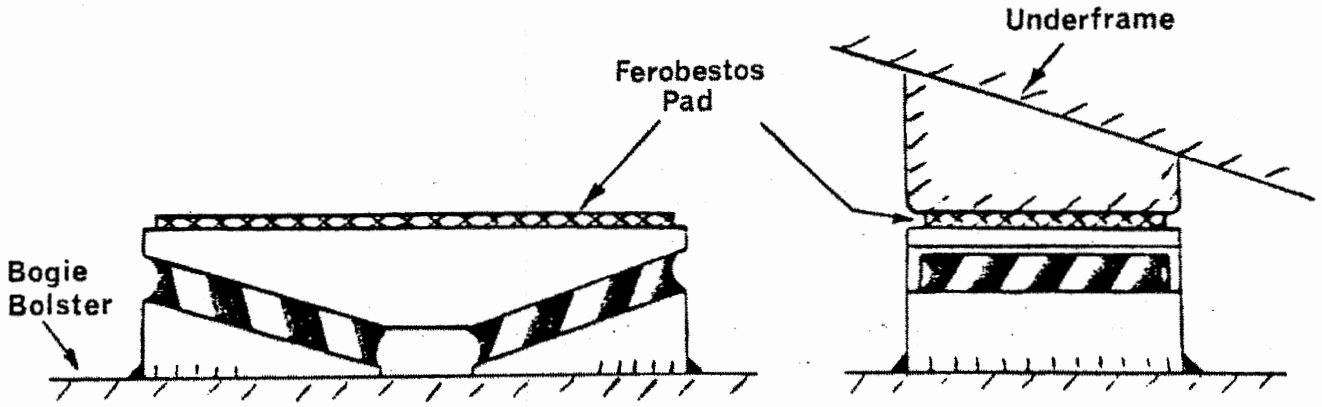
The centre casting bolt is tightened to a torque of 750 lbsft MIN - 950 lbsft MAX.

NOTE

To eliminate any residual shear in the rubber shear pads, the head of the pivot bolt must be prevented from rotating, whilst the nut is being tightened.

The bolster spring groups have been further re-designed to give a total spring travel of 5" with a solid capacity of the group to 49,420 lbs.

Register Plates have now been fitted under the Bolster steel coil springs, to prevent misplacement of springs on the Bogie. This modification has been carried out on all vehicles.



SIDE BEARER UNIT FIG.13

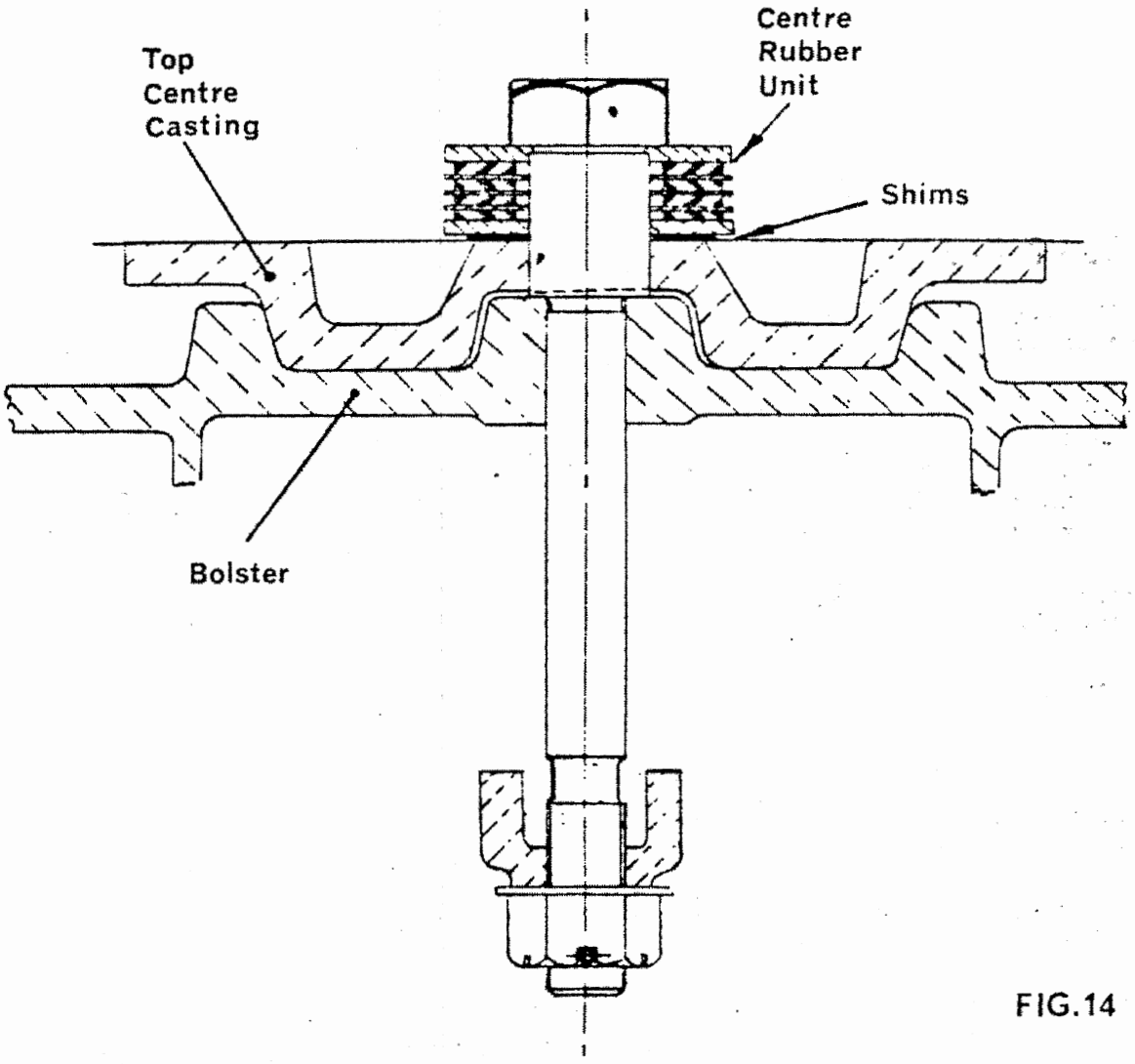


FIG.14

BOGIE CENTRE PIVOT BOLT

ASSEMBLY OF BOGIE CENTRE PIVOT

1. Ride Control Bogie (Mk I) and (Mk II)

The procedure for assembly of the centre pivot is as follows:-

(a) With the top centre casting loosely suspended, lower underframe onto bogie.
(b) With underframe supported on sidebearers measure gap between underframe and mating surface of top centre casting (Dimension 'A' FIG. 15).
8 (c) Fit shim to C1-A0-8600382 to ensure a correct Gap (Dimension 'A') of 1/16" MIN to 3/32" MAX.
(d) Fit Top Centre Casting bolts, nuts, and hardened washers, tightening casting to underframe to a Torque of 476 lbf. ft. (646 N m). (see FIG. 16A). The bolts are to be fitted in accordance with instructions nos. 1(a) & 1(e) on page 4 of Engineering Instruction No. WF 77. (This is when castings have been modified in accordance with Mod. No. MB 3000/88).

2. Ride Control Bogie (Mk III)

The procedure for assembly of the centre pivot is as follows:-

(a) With the top centre casting loosely suspended, lower underframe onto bogie.
(b) With underframe supported on sidebearers, measure Gap between underframe and mating surface of Top Centre Casting (Dimension 'A' FIG. 15).
8 (c) Make shim to C1-A0-3600382 to ensure a correct gap (Dimension 'A') of 11/64" $\pm$ 1/64" (5/32" MIN 3/16" MAX).
(d) Leaving top Centre Casting resting in position on bogie bolster remove underframe.
(e) Fit centre pivot Bolt and tighten in position.
(f) Measure depth between underside of Bolt Head and Top Centre Casting (Dimension 'X' FIG. 17)
(g) Measure free height of Rubber Unit (Dimension 'Y' FIG. 17).
(h) If necessary fit shims between rubber unit and top centre casting to obtain: Y - X = 7/64" $\pm$ 1/64" (3/32" MIN $\frac{1}{8}$" MAX).
(i) Fit any shims manufactured at stage (c) and fit 6 top centre casting bolts, hardened washers, and nuts. Tighten casting to underframe to a Torque of 476 lbf. ft (646 N m) (see FIG. 16B). The bolts are to be fitted in accordance with instructions nos 1(a) & 1(e) on page 4 of Engineering Instruction No WF 77.
(This is when castings have been modified in accordance with Mod No. MB 3000/88).
(j) With underframe sitting on bolster, tighten centre bolt to a Torque of 750 - 950 lbf ft and fit cotter.

NOTE: Whilst tightening centre pivot nut, bolt head must be prevented from turning to eliminate residual shear in rubber.

Lubrication of centre pivot is by means of graphite grease, BR Cat No 27/1362 applied between mating surfaces of Top and bottom centre castings.

LIMITS OF WEAR (Top and Bottom Centre Castings and Sidebearer Pads)

(a) If top centre casting wears more than 3/64" it should be re-profiled.

(b) Insert one-piece shims between underframe bolster and top centre casting to maintain correct relationship as indicated in 1 (c) and 2 (c), see Page 24.

(c) On Ride Control Bogies, MK I, MKII, and MK III, the 5" vertical dimension between the face of the underframe side bearer and face of the top centre casting (see Fig. 15 (a)), must be restored. On Ridemaster Bogies this dimension is 4.1/4".

(d) The total thickness of top centre casting shims must not exceed 3/16".

(e) The clearance between the top centre casting locating lugs and aperture in the underframe must not exceed 3/64" laterally, or longitudinally at any interface.

(f) If bottom centre casting wears more than 3/64" it should be re-profiled.

(g) The ferobestos pad on the sidebearer unit (see Fig. 13) should be replaced when at minimum thickness of 1/8".

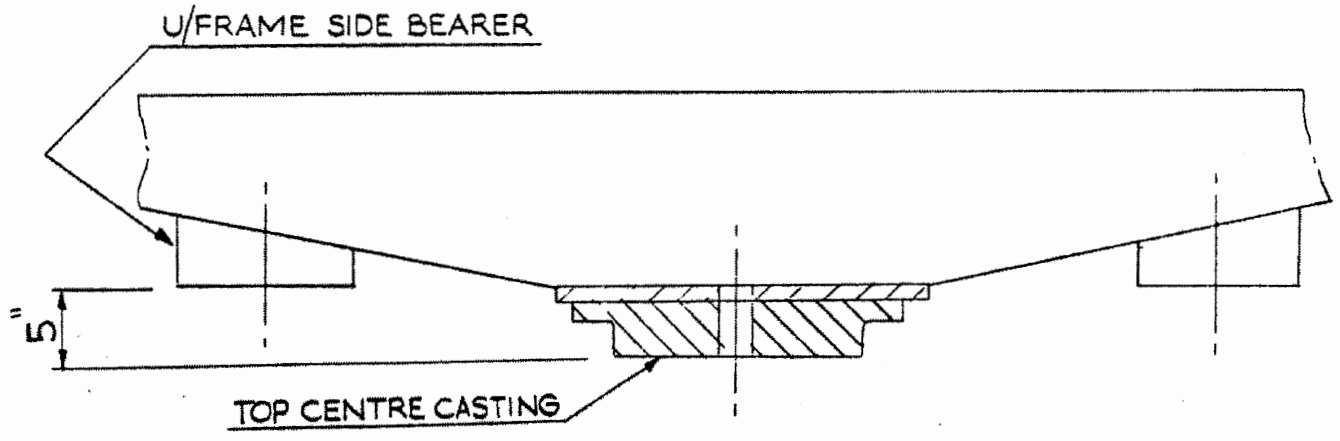
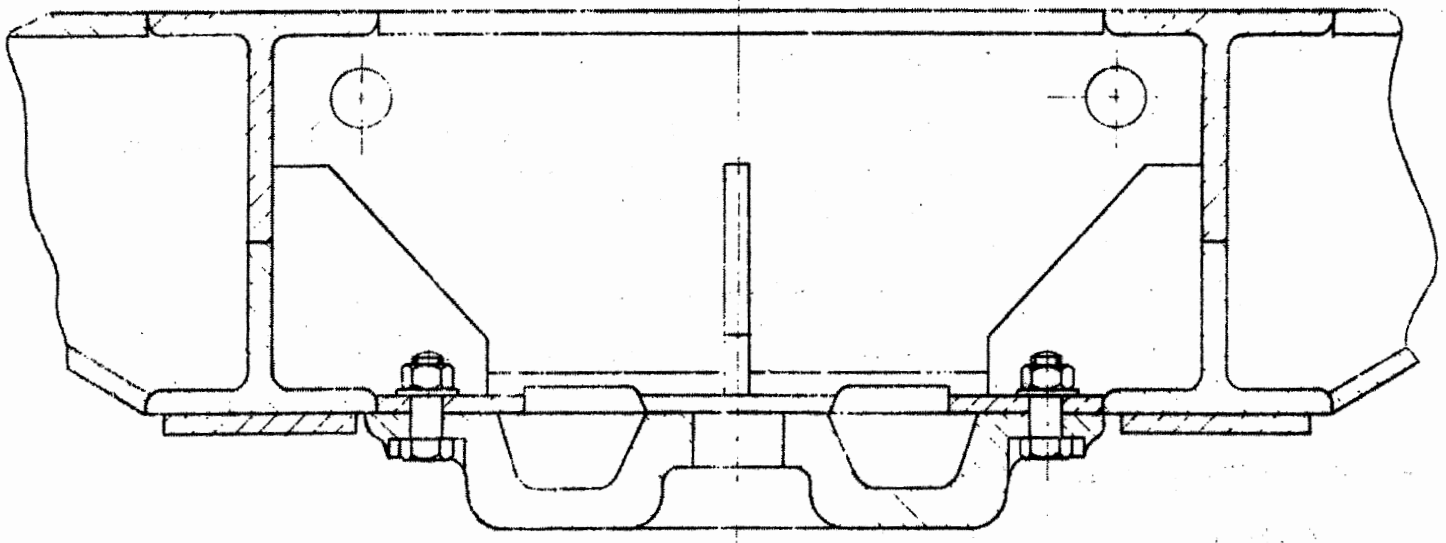
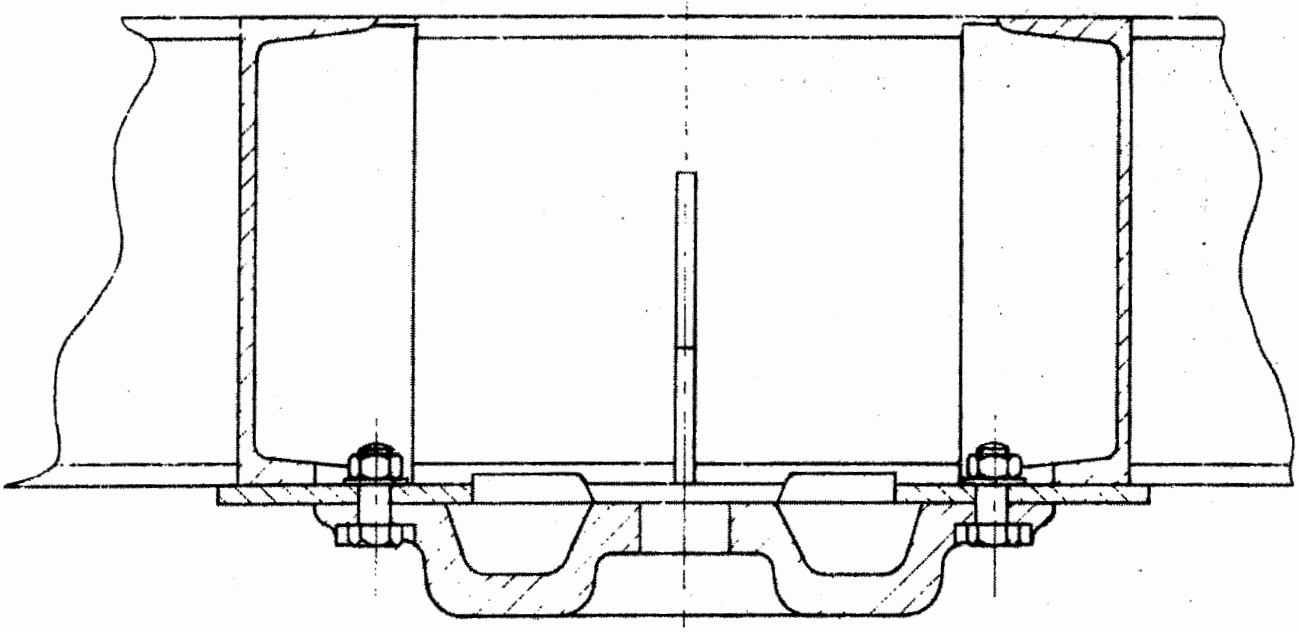


FIG. 15A



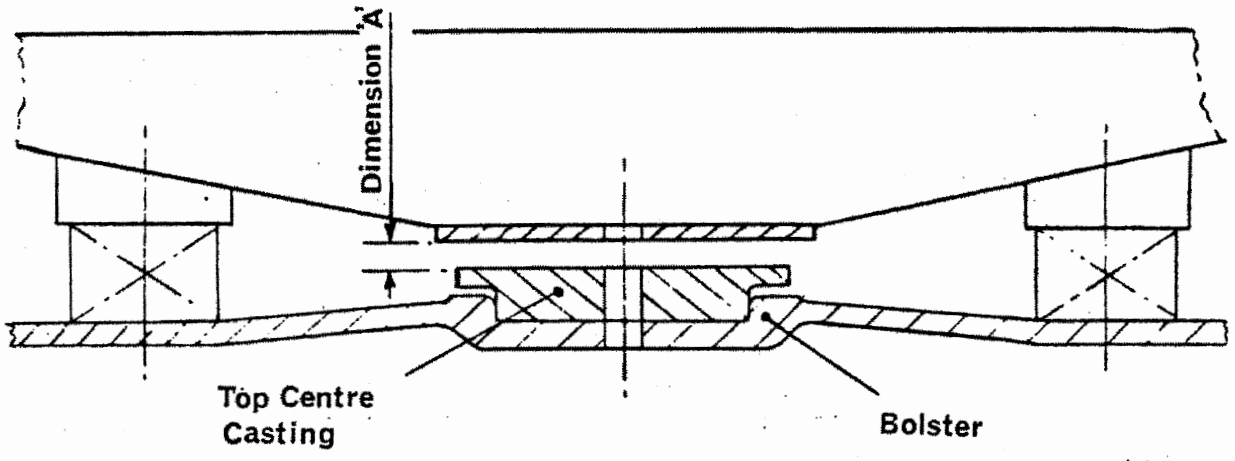
SECURING OF TOP CENTRE CASTING (RIDEMASTER BOGIE)

FIG 16A



SECURING OF TOP CENTRE CASTING (RIDE CONTROL BOGIE) MK I, II & III

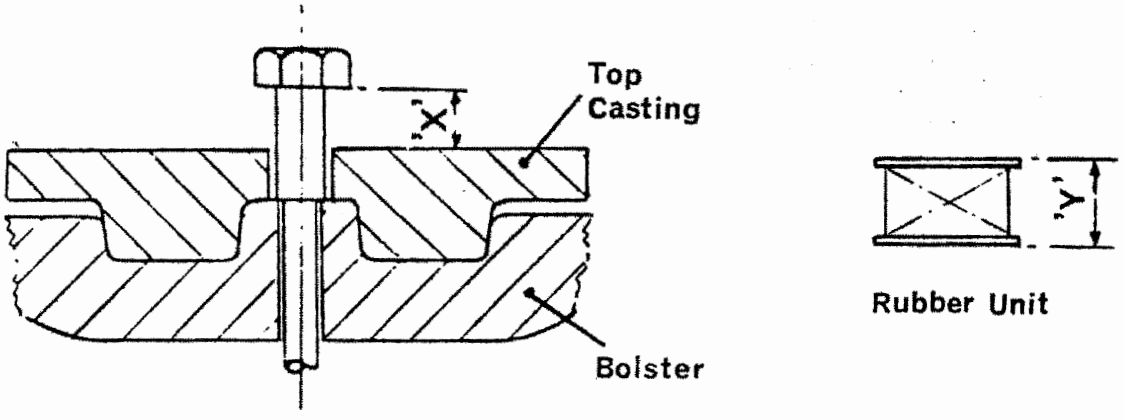
FIG 16B



SETTING CENTRE CASTING

FIG.15

8 FIG. 16. NOT REQUIRED. SEE DRG.NO. C-AO-8600382



SETTING RUBBER UNIT LOAD

FIG.17

WHEELS & AXLES

The wheels are solid rolled with either 2'-8" dia or 2'-9" dia on tread.

The Tyres are to profile (P.6).

The maximum allowable wear on the wheel is $2\frac{1}{2}$" measured at the rolling dia.

The maximum allowable hollow wear on tread is $\frac{1}{4}$" at which point the wheels must be returned to their original profile.

On wheels fitted with cast iron cheek discs (See Fig. 18) the assembly is as follows :-

(a) Disc halves on the same side of wheel to be fitted as matching pairs with identical serial number on each half (the same serial number is stamped in $\frac{1}{4}$" high letters on the outside edge on each pair of Half Discs).

(b) Disc fitting bolts to be fitted using a torque of 40 lbf ft

(c) Disc fitting nuts to be fitted using a torque of 20 lbf ft

(d) Bolts and nuts to be selected so that not more than two threads project through the nut after assembly. After fitting nuts, projecting threads of the bolt to be chisel notched to prevent nut loosening.

On BR-2M (Mk I) & (Mk II) Bogies, the axles have $4\frac{7}{8}$" dia journals and are fitted with roller bearing axleboxes to Timken Drg. 12-E-843.

On BR-2M (Mk III) Bogies the axles have 5.3/16" dia. journals and are fitted with A.P. Roller Bearing Axleboxes to Timken Drg. No. E.27468 and axlebox Adaptor to Timken Drg. No. E.28119.

Where axles are fitted with cast iron Brake Discs (See Fig. 19) a raised seat is provided, upon which the brake disc will be fitted by pressure with an approved machine to B.R. Spec. 163.

Provision is made for removal by means of the oil injection method.

The axleboxes are retained in the axlebox guide by means of small Keeper Plates bolted to the bottom of one leg of each guide (See Fig. 3) these bolts are to be secured with castellated nuts and split pins. The top of the axlebox is domed slightly to allow the side frame to rock in a vertical plane.

For clearances between Axlebox and Sideframe (See Figs. 4 & 5).

Monthly maintenance procedure to be carried out in accordince with Engineering Instruction No. WF 13

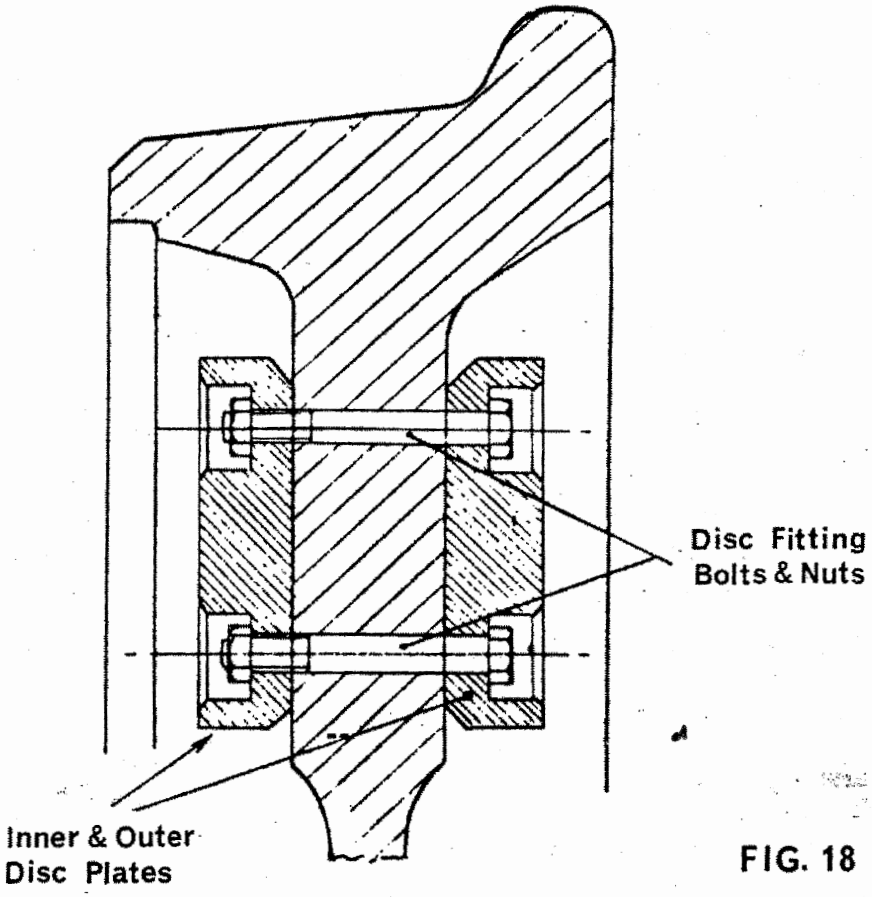


FIG. 18

WHEEL BRAKE DISC

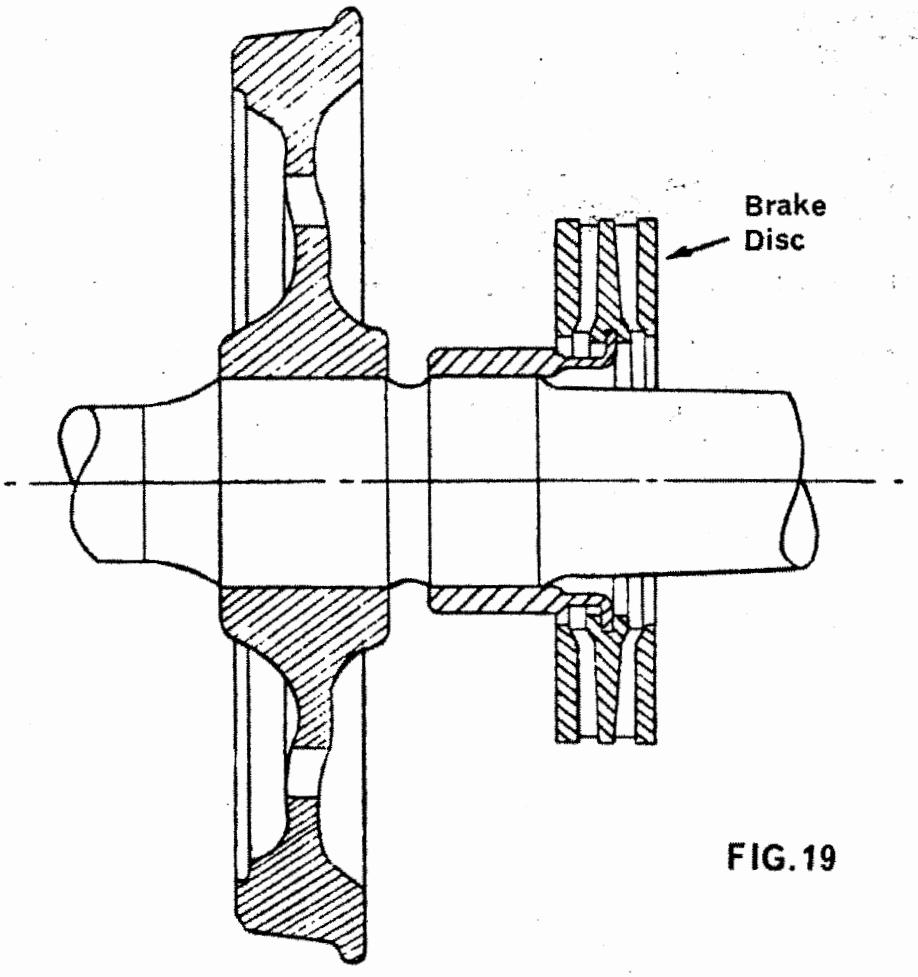


FIG. 19

AXLE BRAKE DISC

VERTICAL HEIGHT ADJUSTMENT (2ND BATCH)

RIDE CONTROL BOGIES, BR-2M (MK I, MK II & MK III)

Axlebox slippers are required to raise the height of the underframe when it falls below the specified height due to wheel re-turning. These are fitted between the 4 axlebox top and the sideframe. Axlebox slippers must be fitted in accordance with Drg No C1-A1-9001082.

Axlebox keep plates (retaining keys) are used to retain the wheelsets in the axlebox guides. The keep plates must be fitted in accordance with Drg No C1-A1-9001082.

All the Bogie Brakework is carried on two beams, the ends of which fit into sockets cast into the side frames. In order to locate the brake callipers as accurately as possible, but still preserve the freedom of movement between the bogie components, the spigot end of these brake beams have to be fitted individually to their sockets, owing to the slight variations in the castings it is important, therefore that each beam should always be re-assembled at its correct position on the correct Bogie.

On all Bogies fitted with Axle mounted Disc Brakes and Brake Beams to Drg. Nos. DE/12510 and DE/12519 safety support plates must be fitted (See Fig. 22) to fit these the back plates of the brake beam adjacent to the location spigot end must be drilled and the support plate assembled as shown on Drg. F-A2-1491. The securing Bolts & Studs should be torque tightened to 350 lbf ft.

Maintenance of the Bogies consists of regular inspection of clearances, checking for broken bolster springs, and lubrication of axleboxes as necessary.

SIDE BEARER UNITS

1. Ridemaster Bogie and Ride Control Bogies (Mk I) & (Mk II)

Each side bearer unit consists of two inclined resilient rubber elements bonded to one upper steel casting and 2 lower steel castings (See Fig. 13).

The top surface of the upper steel casting is lined with a ferobestos pad, which bears against the underframe and provides the necessary bogie rotational stiffness.

NOTE

The ferobestos pad must NOT BE LUBRICATED otherwise the bogie rotational stiffness is decreased.

SIDE BEARER UNITS (Contd.)

2. Ride Control Bogie (Mk III)

On these bogies each side bearer unit consists of two castings separated by 4 inclined resilient rubber elements. The top surface is lined with a ferobestos pad which bears against the underframe and provides the necessary bogie rotational stiffness. (See Fig. 21).

NOTE : The ferobestos pad must NOT BE LUBRICATED otherwise the bogie rotational stiffness is decreased.

The rubber elements are retained by special retaining strips. The securing set screws must be wired together with steel locking wire (copper wire is not acceptable).

The rubber units are graded to enable sidebearer units to be maintained as near as possible to the nominal stiffness specified. This is because it would be very costly to produce rubber units of exactly the same stiffness values and by grading the matching rubber elements this problem is overcome.

ASSEMBLY OF RUBBER UNITS

Rubber elements of nominal stiffness must be used whenever possible. If this is not practicable the rubber units must be paired as outlined below.

The stiffness of each unit is indicated by chiselled notches on one edge of one of the steel plates. Identification is as follows :-

1 notch - nominal (correct) stiffness
2 notches - unit is softer than nominal
3 notches - unit is stiffer than nominal

Where it is necessary for 2 notch and 3 notch elements to be used, each soft element must be paired with a stiff element to maintain the overall nominal stiffness (See Fig. 20).

When assembling a sidebearer unit, or replacing individual rubber elements, the plates on the rubber elements must not protrude beyond the sides of the castings. If this does happen the metal plates must be filed flush with the castings and on no account must packings be placed under retaining screws.

The retaining strips for the rubber elements are positioned as shown on Fig. 21. and secured by set screws which must be wired in pairs in "figure of eight" formation.

ACCESS TO SIDEBEARER UNITS

For access to the sidebearer units and rubber elements the procedure is as follows :

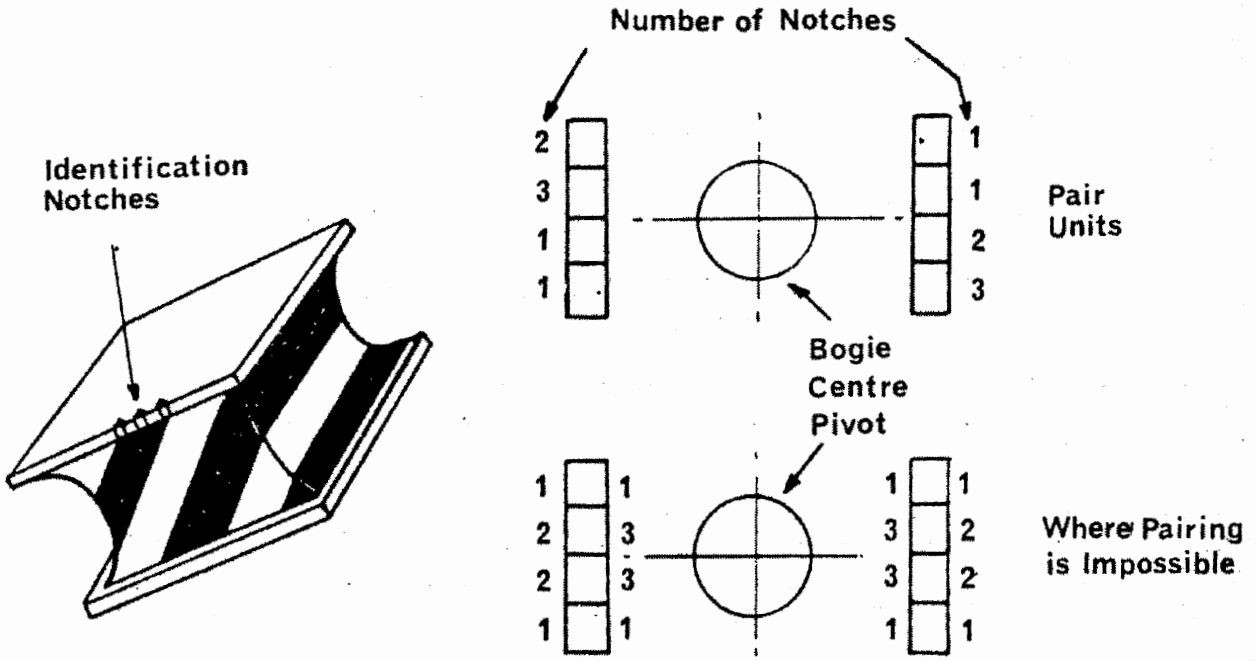
1. Disconnect Variable load Valve linkage, brake hosepipe, between underframe and Bogie, and where appropriate disconnect the handbrake linkage.

2. Disconnect wagon underframe, using either of the following methods :-

   (a) Remove nut from Bogie centre pivot Bolt.

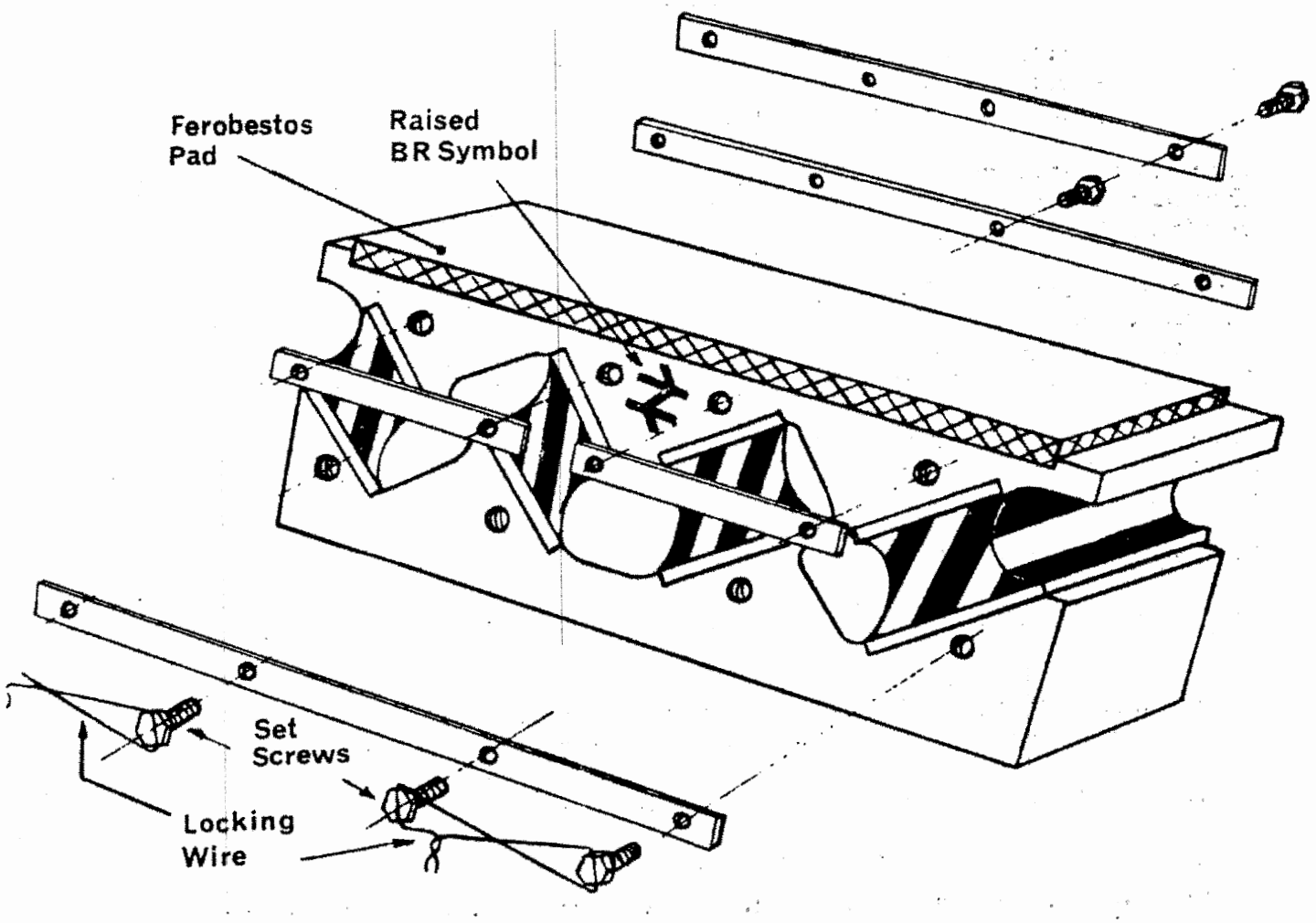
   (b) Remove countersunk set screws from cover plate, - remove cover plate - remove nuts on 6 Bolts securing top Centre Casting.

3. Lift underframe and run out Bogie.



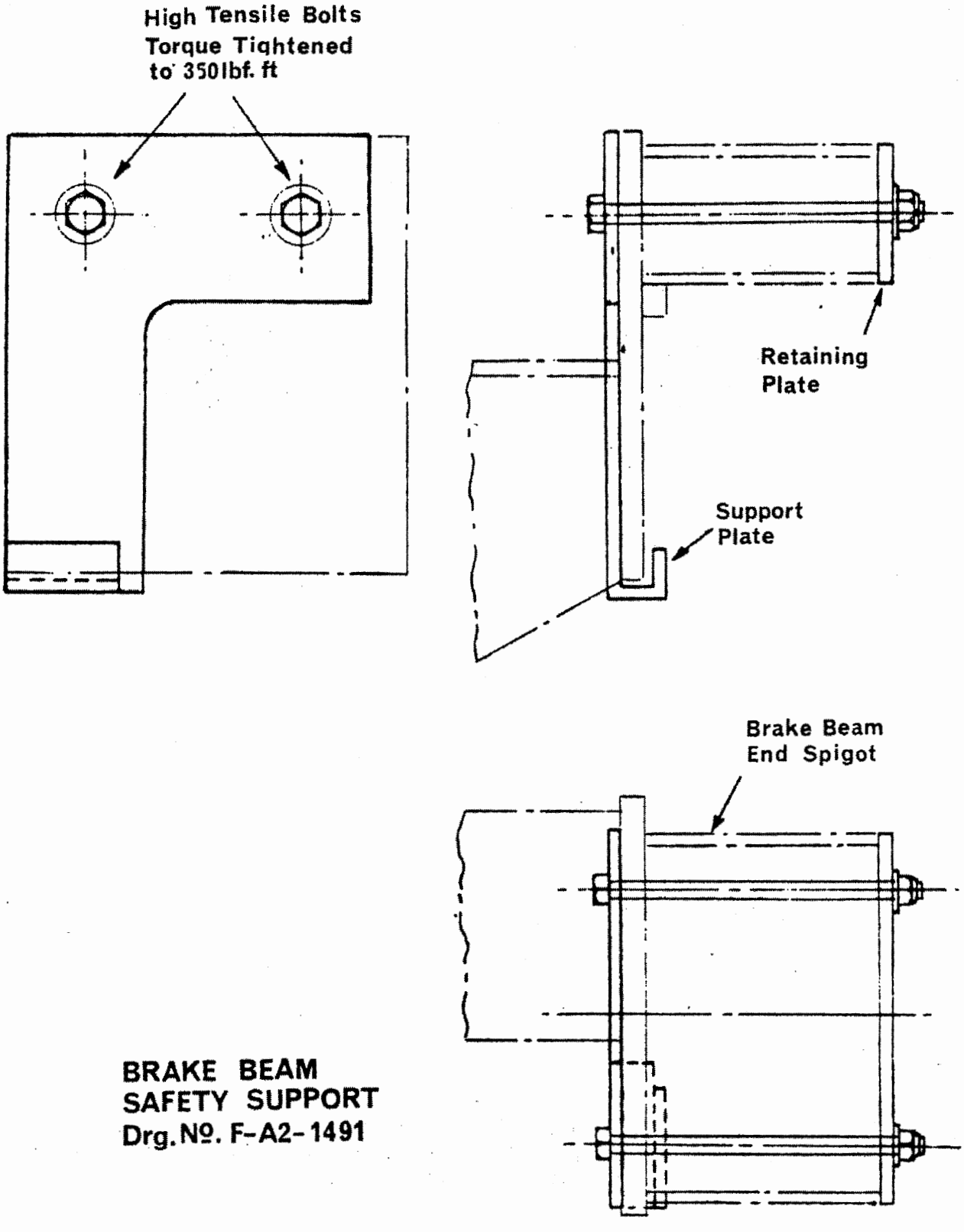
IDENTIFICATION & USE OF SIDEBEARER RUBBER ELEMENTS

FIG. 20



ASSEMBLY OF RETAINING STRIPS SIDEBEARER UNITS

FIG. 21



BRAKE BEAM
SAFETY SUPPORT
Drg. Nº. F-A2-1491

FIG. 22

BOGIE BOLSTER TO SIDE FRAME CLEARANCES (SEE FIG. 23)

2 The clearances between the manganese wearing plate on the Bolster Lug and the side frame must be maintained at 1/4" MAX and 1/16" MIN.

2

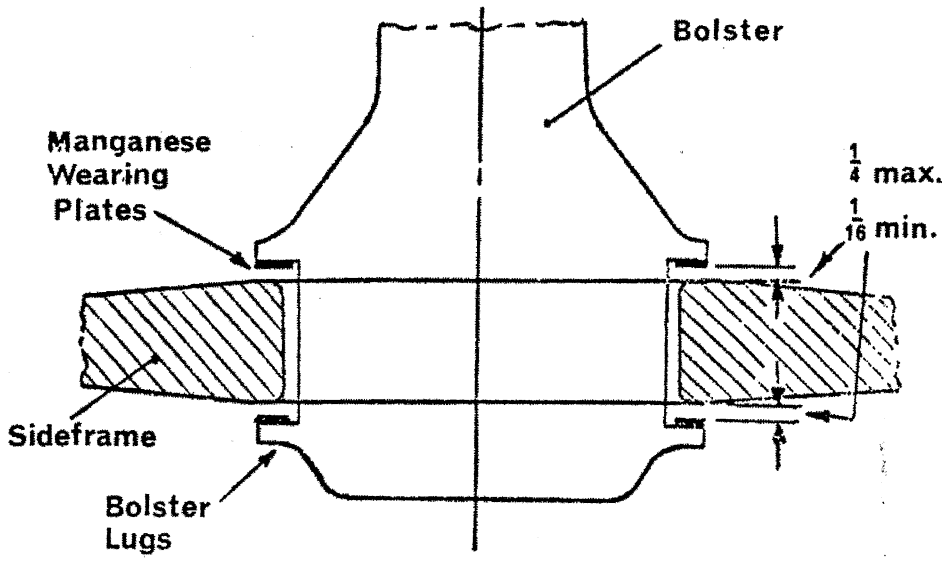


FIG.23

LIMITS OF WEAR

BOLSTER TO BOGIE SIDE FRAME

AXLEBOX TO SIDEFRAME CLEARANCES (SEE FIGS. 4 & 5)

The total longitudinal clearances to be $\frac{1}{4}$" MAX 1/16" MIN

The total lateral clearances to be 5/16" MAX $\frac{1}{8}$" MIN

LIMITS OF WEAR (Sideframe)

2 Sideframe columns should be checked to determine if welds retaining the friction plates (see Fig. 24) are sound. If cracked they should be re-welded. The friction plates should be replaced if worn more than 3/32". The sideframe columns adjacent to the bolster lugs (see Fig. 23) if worn to a depth of 3/32" should be restored by welding.

BOGIE BOLSTER & SIDEFRAME WEARING SURFACES

For instructions governing Assembly, Inspection and Maintenance of Ride Control Bogies See :

English Steel Castings Corporation Ltd. Bulletin No. 102.

When Bogies are dismantled for the repair of Bolster inclined ledges (SEE FIG. 24) the following parts should be replaced if the following conditions exist :-

Ride Control Springs :

Replace all springs, unless it is found that the capacity lost is less than 20% of the original value.

Friction Wedges :

If angle surfaces of wedges is worn 1/16" inch concave on the angle surface.

2 Bolster Lugs:

Manganese wearing plates to be examined for excessive wear and to be replaced if necessary.

Friction Wedge Inspection (SEE FIG. 24a)

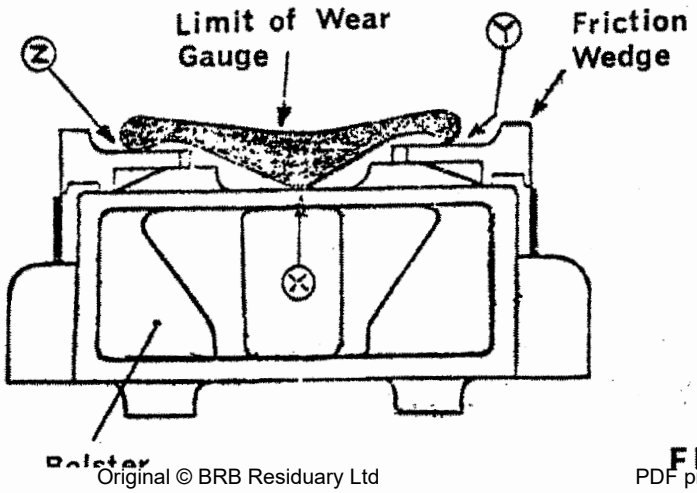
1. Repairs to be carried out when the Top of the wedge reaches $1\frac{5}{8}$ ins. above the Top of the Bolster, indicated when the Gauge contacts points Y - Z & X. (Although 60% of the original control still remains).

2. Ride Control elements are in good working order when the Gauge contacts the Bolster at position "X".

Minimum adequate control remains, but repair is indicated, when Gauge contacts both friction Wedges and Bolster at positions Y - Z & X.

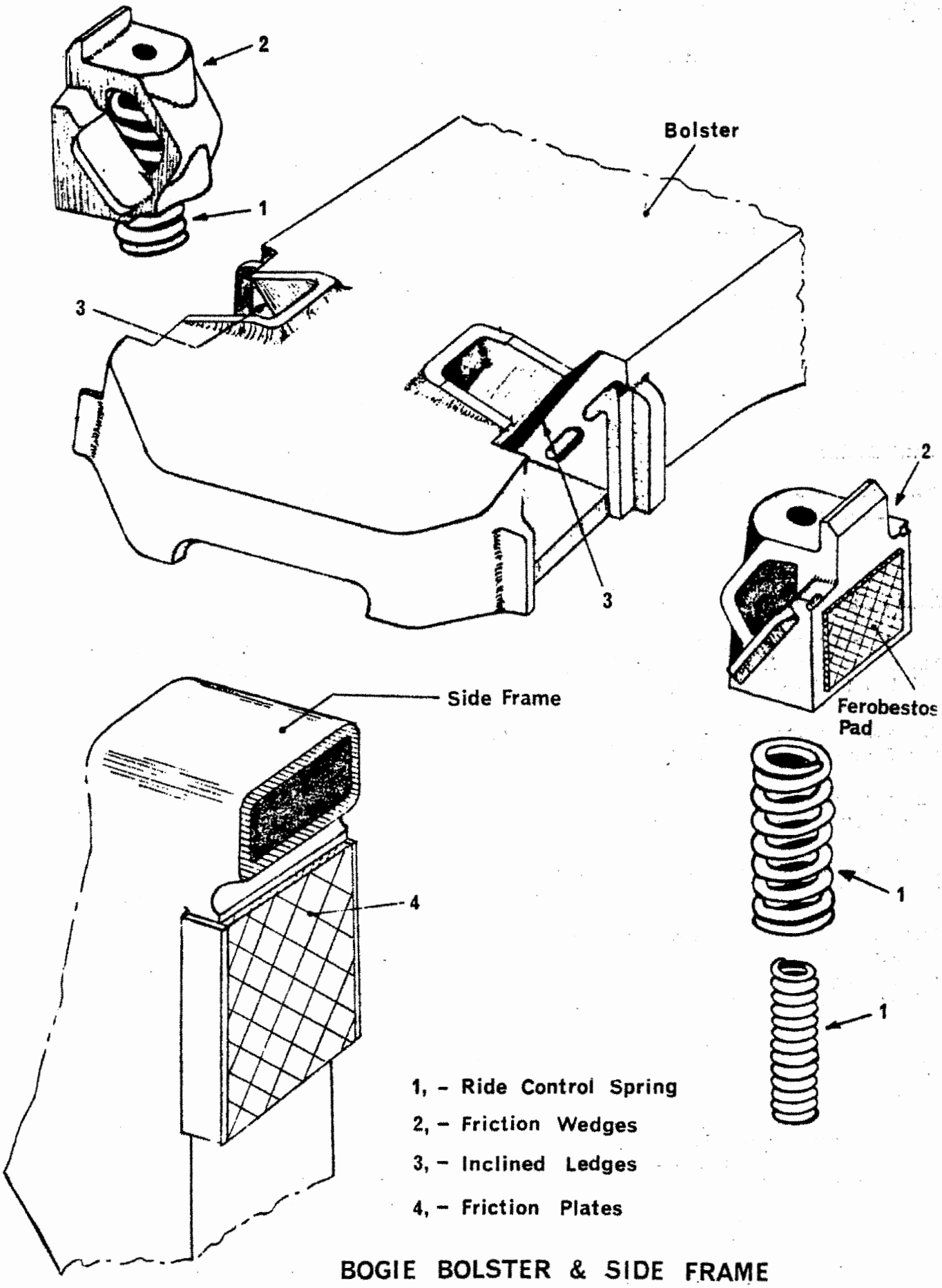
3. When it has been determined that the friction wedge heights exceed the recommended limits, the Bogies should be dismantled and proper repairs made.

Modifications may be required to any one or combination of parts such as, replacing friction wedge castings, repairing the incline surfaces of the bolster pocket, replacing the ride control springs and renewing wear plates on the friction Wedges and Side Frames when worn or missing.



LIMIT OF WEAR

FIG. 24 (a)



BOGIE BOLSTER & SIDE FRAME WEARING SURFACES

FIG. 24

LIMITS OF WEAR

BRAKE BEAM TO BOGIE SIDEFRAME (SEE FIG. 25)

The vertical clearance between the top face of the brake beam end spigot, and the top face of the bogie sideframe pocket to be 1/8" + 0"
- 1/32"
(i.e. at Main Works repair)

2 Where this clearance cannot be obtained by selection assembly, the top face of the spigot end may either be skimmed, or shims welded to this face to give the correct clearances (see Fig. 27).

If the bearing surface in the sideframe pocket is worn at any point to a depth of 3/32" below the level surface, it must be restored by welding.

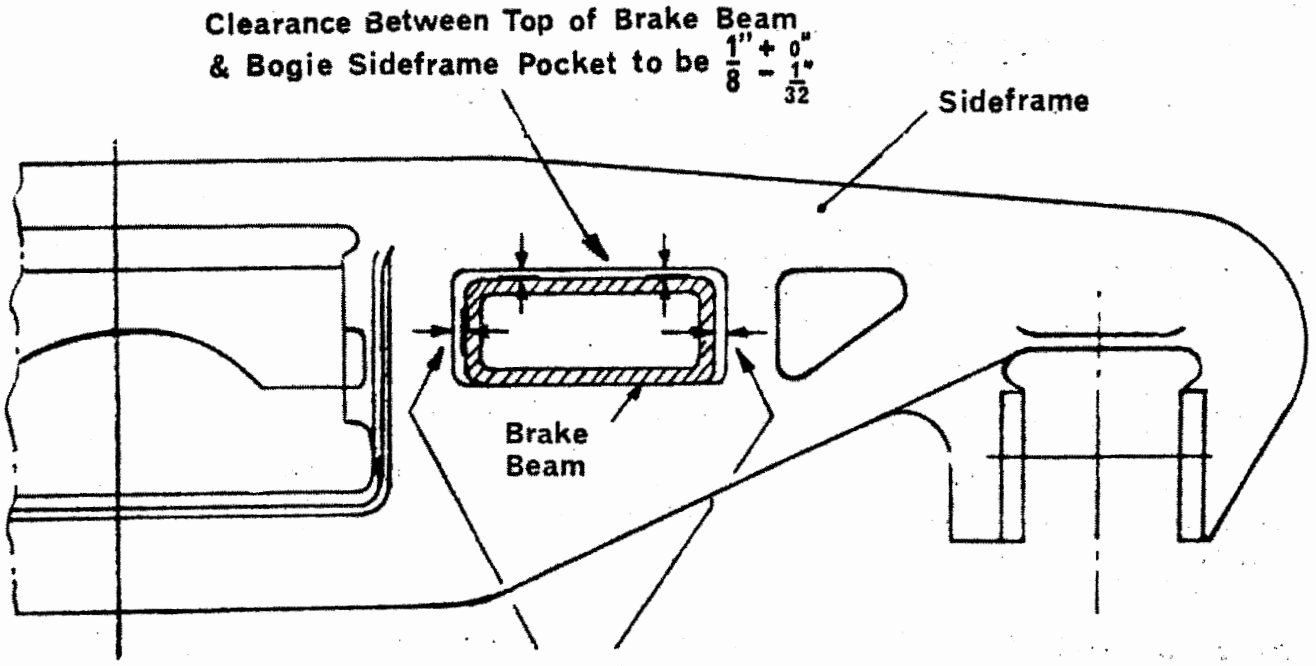
2 Whilst in service, the clearance between the top of the brakebeam end spigot, and the top face of the bogie sideframe pocket must not exceed 1/4". If the clearance exceeds 3/8" with 2 packings fitted (see Fig. 27), the vehicle must be withdrawn.

The total longitudinal clearance between the brakebeam and the bogie sideframe pocket must not exceed 3/8". Rectification if this occurs to be made by suitable shims welded to the face of the brakebeam spigot end furthest away from the centre line of the axle. (see Fig 25).

(Repair Schedules procedure to achieve correct clearances have been issued by the respective CM & EE Depts).

The total transverse movement of the brakebeam between the sideframes to be 1/2". This must be obtained by assembling the brakebeam centrally in the sideframe, ensuring that the sideframes and axles are set parallel and square, then positioning the taper steel packings to give a lateral clearance of 1/4" at either end of brakebeam. (see Fig. 26). The maximum wear allowed on
2 sideframe or packing on brakebeam end due to transverse movement is 1/8".

MONTHLY MAINTENANCE PROCEDURE TO BE CARRIED OUT IN ACCORDANCE WITH ENGINEERING INSTRUCTION NO. WF 13/1



2

LIMITS OF WEAR
BRAKE BEAM TO BOGIE SIDE FRAME

FIG. 25

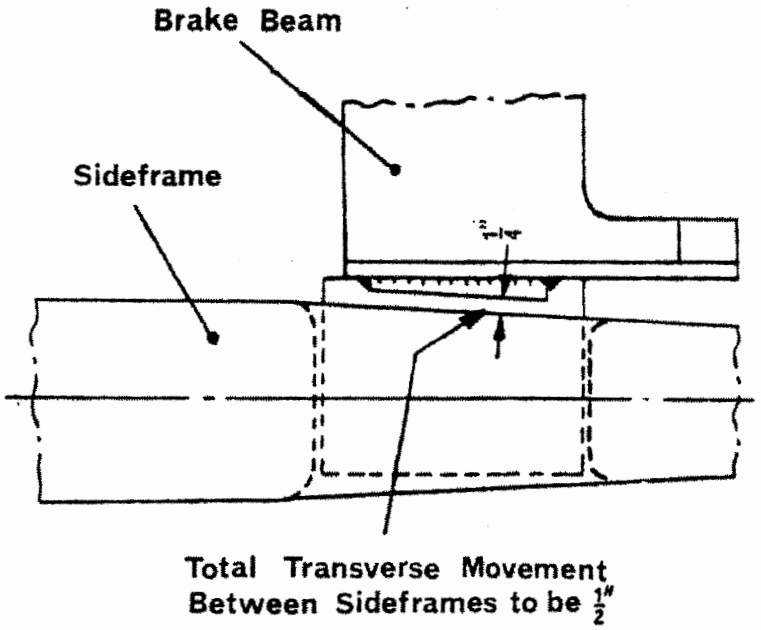
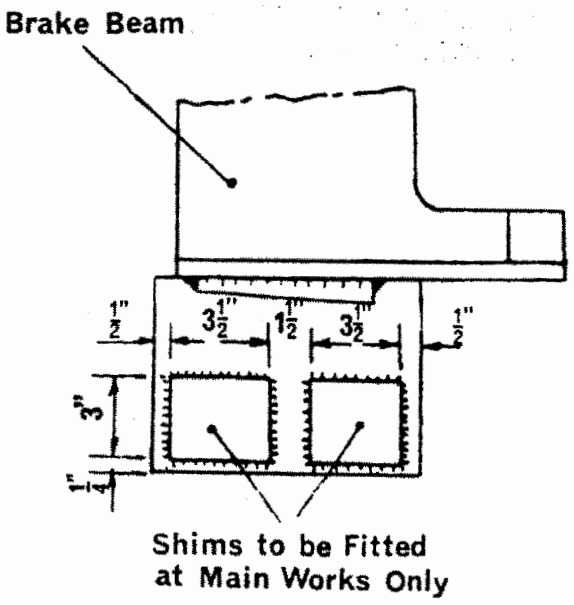


FIG. 26



BRAKE BEAM END SHIMS

FIG. 27

BRAKE BEAM REPAIR PROCEDURE

Where shimming is carried out, the procedure adopted depends upon whether it is carried out in Main Works or Depots, the procedure is as follows :-

(a) Repair in Main Works

1. Determine thickness of single shims in each position which, when welded to top surface of brake beams, will give required vertical clearance of $\frac{1}{8}$" $^{+0"}_{-1/32"}$ (allowance must be made for Ferobestos pad if this is to be changed during repair).

2. Remove all existing shims from Top face of brake beam and smooth down.

3. Fit and weld new pair of shims to brake beam in accordance with (FIG. 27) using shim sizes given in Table below :-

Thickness	Size	Weld Size Leg Length
1/16 inch	$3\frac{1}{2}$" x 3"	1/16 inch
1/8 inch	$3\frac{1}{2}$" x 3"	1/8 inch
3/16 inch	$3\frac{1}{2}$" x 3"	3/16 inch
1/4 inch	$3\frac{1}{2}$" x 3"	1/4 inch

(b) Repairs in Depots

1. Remove all existing shims which are welded on front edge only.

2. Determine thickness of single shim in each position which, when welded to top surface of break beam, will give required vertical clearance of $\frac{1}{8}$" $^{+0"}_{-1/32"}$

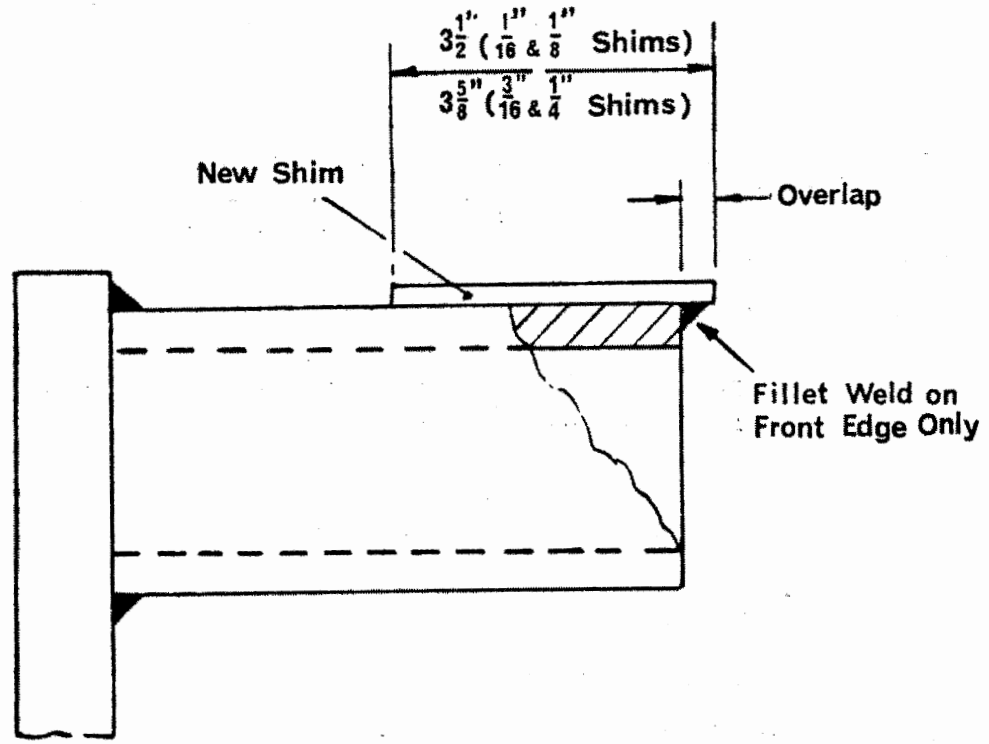
3. Using shim sizes given in Table below weld along front edge only as shown in (Fig. 28).

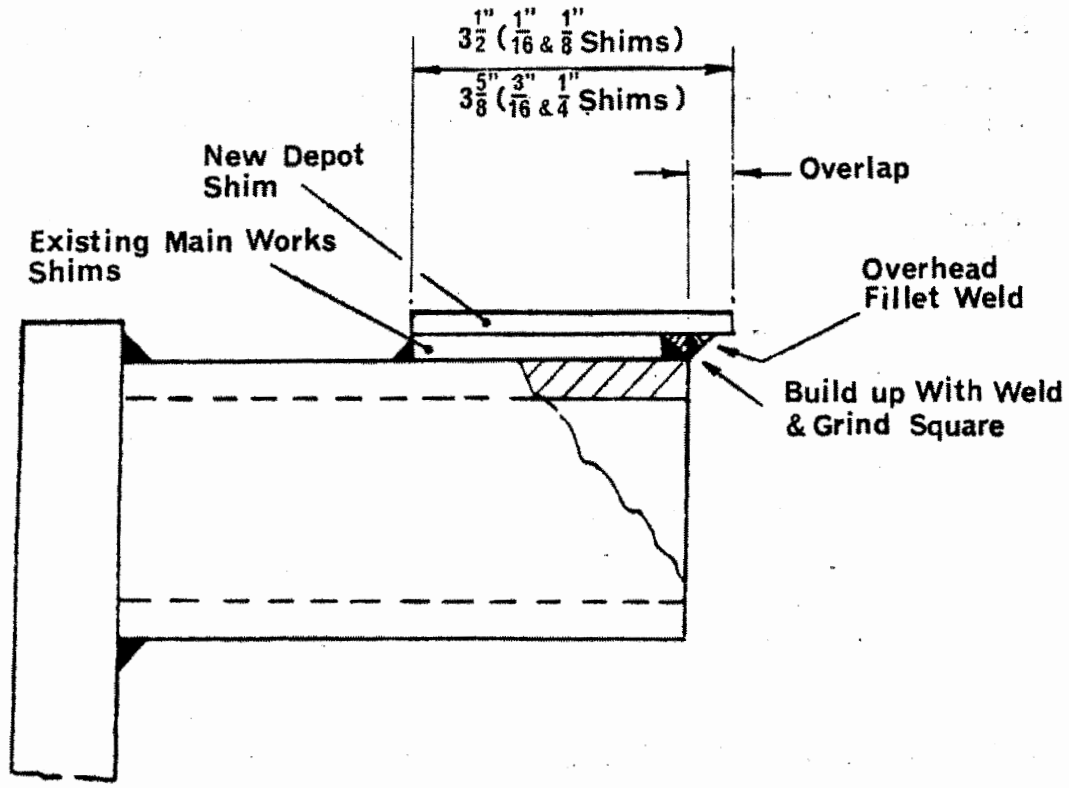
Thickness	Size	Overlap	Weld Size Leg Length
1/16 inch	$3\frac{1}{2}$" x $3\frac{1}{2}$"	3/16"	1/8"
1/8 inch	$3\frac{1}{2}$" x $3\frac{1}{2}$"	1/4"	3/16"
3/16 inch	$3\frac{1}{2}$" x $3\frac{5}{8}$"	3/8"	1/4"
1/4 inch	$3\frac{1}{2}$" x $3\frac{5}{8}$"	3/8"	1/4"

NOTE

The maximum number of shims allowable in any one position is 1 - main works shim and 1 - Depot shim.

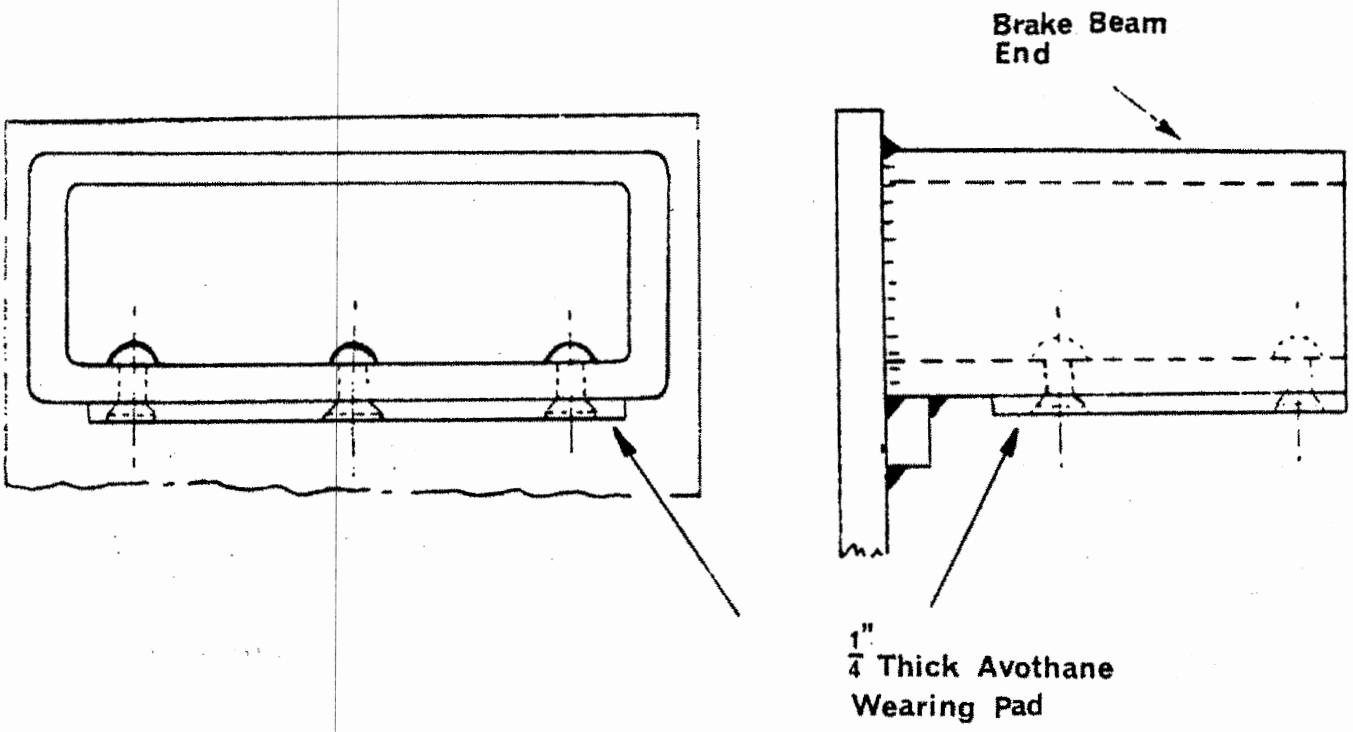
For procedures to achieve correct brake beam to bogie sideframe vertical clearance. See also Engineering Instruction W.F.8

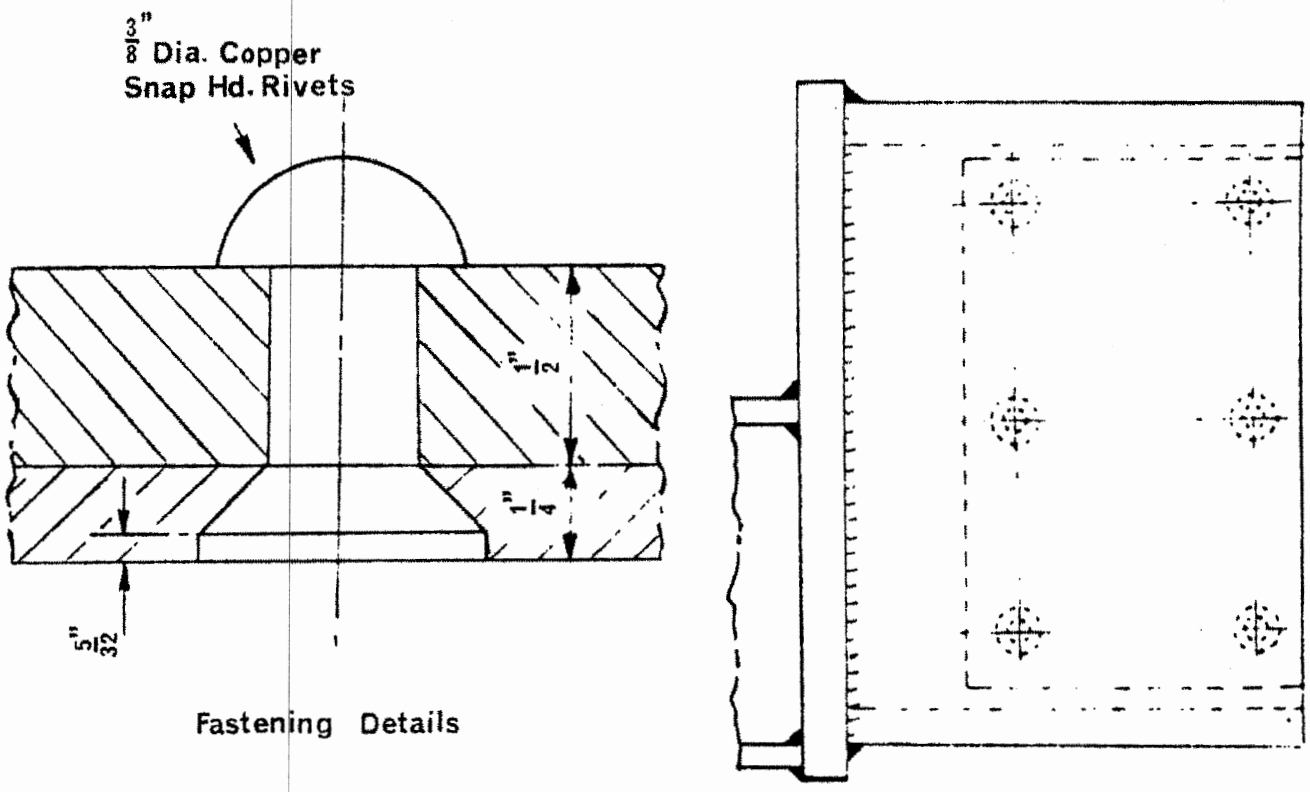




BRAKE BEAM END - DEPOT SHIMS

FIG. 28





Fastening Details

FIG. 29

BRAKE BEAM END – WEARING PAD

BRAKE BEAM END - WEARING PADS

REPAIR PROCEDURE

The spigot end of the brake beams must be fitted with a $\frac{1}{4}$" thick AVOTHANE wearing Pad.

The wearing pads are secured to the brake beam by six copper snap head rivets (SEE FIG. 29)

2 All wearing pads must be renewed when worn down to the copper rivet heads (MAX. WEAR 5/32"), or when pads are broken away at two or more rivets.

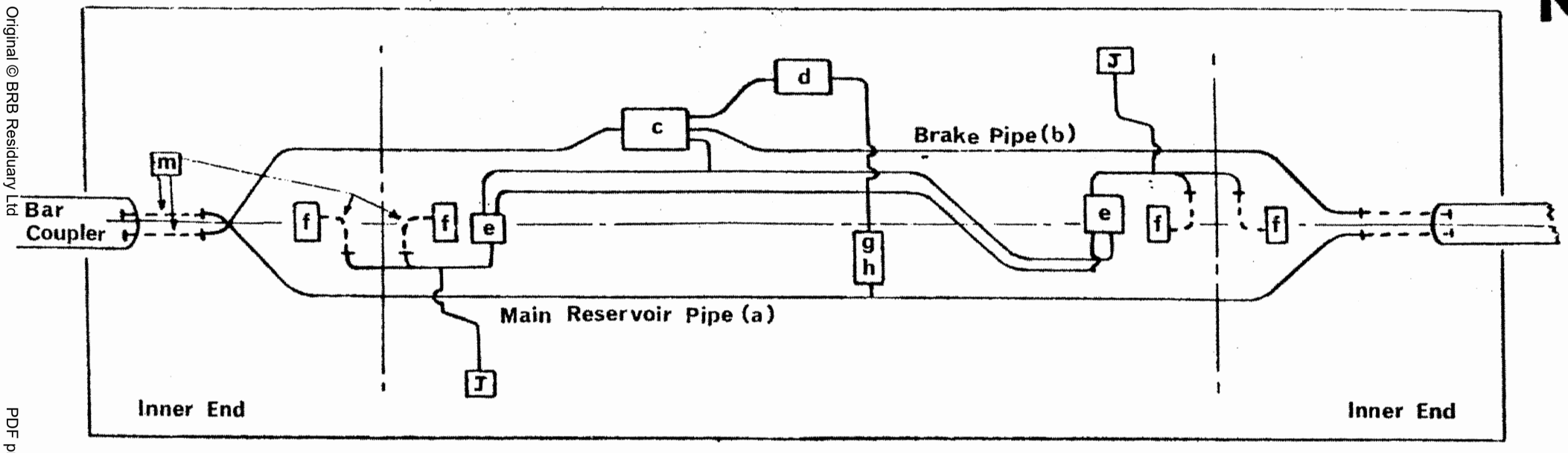
NOTE -

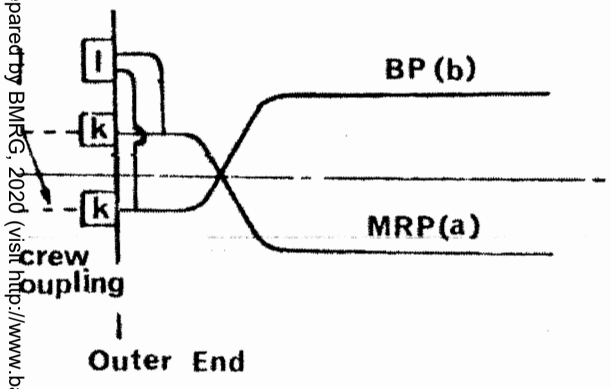
It is important that the ends of the copper rivets do not stand proud of the AVOTHANE wearing pad.

For repairs to Brake Beam End on 1st Batch Freightliner Vehicle see Drg. No. DE/48457.

For repairs to Brake Beam End on 2nd Batch Freightliner Vehicle see Drg. No. F-AO-892.

2 Maximum bending allowed on 3rd Batch Brake Beam (Drg. No. F-S-100) due to contact with underframe/longitude, not to exceed 1/8".





c	Distributor
d	Auxiliary Reservoir
e	Variable Load Valve
f	Brake Cylinder
g	Strainer Check Valve & Choke Unit
h	Isolating Cock
l	Duplex Pressure Gauge
J	Schrader Check Valve
k	End Coupling Cocks
m	Flexible Hose Pipes

AIR BRAKE EQUIPMENT FIG.30

AIR BRAKE DESCRIPTION (SEE FIG. 30)

Freightliner vehicles are fitted with what is known as a "Two Pipe Automatic Air Brake" system.

There are two makes thus :-

(a) Westinghouse
(b) Davies & Metcalfe

Both work on similar principles; the following is a list of the main component parts on each vehicle :-

(a) Main Reservoir Pipe
(b) Brake Pipe
(c) Distributor Valve
(d) Auxiliary Reservoir and Automatic Drain Valve
(e) Variable Load Valves (two per vehicle)
(f) Brake Cylinders (two per bogie)
(g) Strainer, check valve and choke unit
(h) Main Reservoir Isolating Cock
(j) Schrader Check Valve (two per vehicle)
(k) End Coupling Cock
(i) Duplex Pressure Gauge (End vehicles only)
(m) Flexible Hosepipes and Coupling.

For Layout of Air Brake Equipment (SEE FIG. 30)

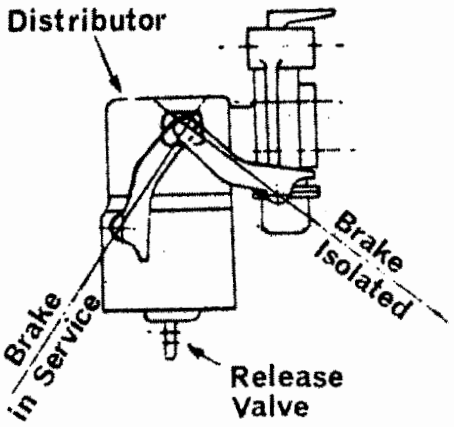
For Maintenance and Testing of Air Brake Equipment reference must be made to appropriate manual.

Monthly and three monthly maintenance procedure for air brake equipment to be carried out in accordance with Engineering Instruction W.F. 13

DESCRIPTION AND FUNCTION OF COMPONENT PARTS :

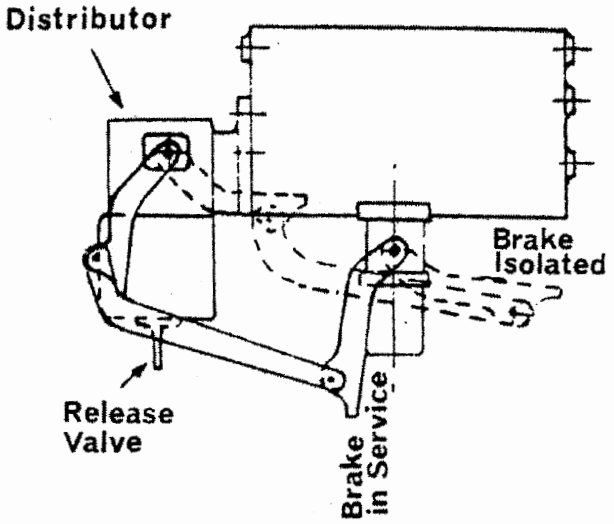
(a) Main Reservoir Pipe supplies air from the locomotive down the train at 100 p.s.i. to the auxiliary reservoirs.

(b) Brake Pipe supplied 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 72·5p.s.i. to fully release the brake. A reduction to 46·5 - 50.5p.s.i. will fully apply the brake. Reduction below this has no effect on the brake pad pressure at the wheels, but serve to apply the brake more rapidly as in an emergency application or division of the train.



WESTINGHOUSE P4P DISTRIBUTOR MOUNTED ON P4 PIPE BRACKET

FIG.31



WESTINGHOUSE P4P DISTRIBUTOR MOUNTED ON CHARMILLES PIPE BRACKET

FIG.32

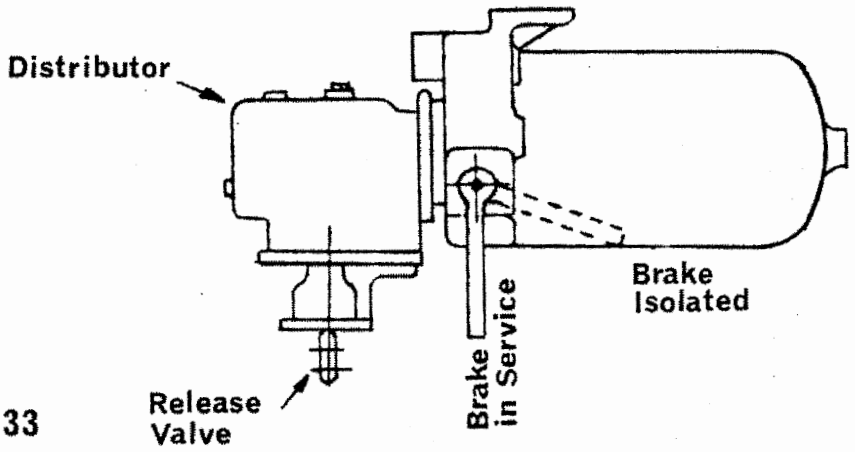


FIG. 33

DAVIES & METCALFE OERLIKON DISTRIBUTOR MOUNTED ON PIPE BRACKET TYPE 4

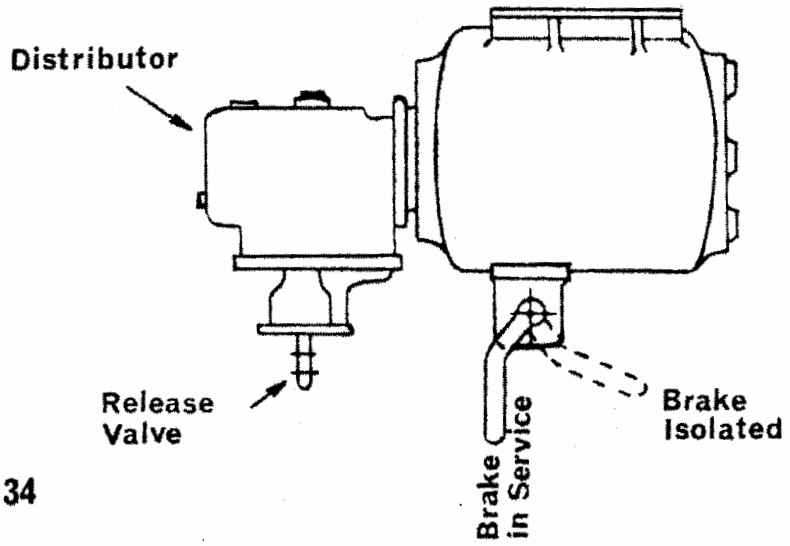


FIG. 34

DAVIES & METCALFE OERLIKON DISTRIBUTOR MOUNTED ON PIPE BRACKET TYPE S3

(c) Distributor (SEE FIGS. 31 - 32 - 33 & 34)

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 drivers brake valve.

The distributor is fitted with an isolating cock controlled by a handle for use in isolating the brake. The handle is vertical for normal operation and horizontal for brake isolation.

The distributor is also fitted with a release valve for use in releasing the brake manually on individual wagons. It is operated on 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 changed without breaking any pipe joints.

(d) Auxiliary Reservoir (SEE FIGS. 35 & 36)

Air is stored in the auxiliary reservoir. It is supplied direct from the main reservoir pipe which maintains the auxiliary reservoir at 100 p.s.i. The Auxiliary reservoir supplies air to the brake cylinders via the variable load valve and distributor in accordance with the brake pipe pressure.

Either an automatic drain valve complete with drain plug (SEE FIG. 35) or a drain plug (SEE FIG. 36) must be fitted at the bottom of all auxiliary reservoirs in order to vent the reservoirs to atmosphere, UNDER NO CIRCUMSTANCES MUST THESE PLUGS BE UNSCREWED BY MORE THAN TWO OR THREE TURNS WHEN THE RESERVOIR IS CHARGED WITH AIR.

When the Westinghouse Distributors and the Davies & Metcalfe Distributor (Type S.4) are fitted, the auxiliary reservoirs can be vented by placing the distributor isolating valve in the horizontal or "isolated" position.

A maintenance record panel is painted on the side of the auxiliary reservoirs facing the outside of the vehicle, showing date of maintenance and depot.

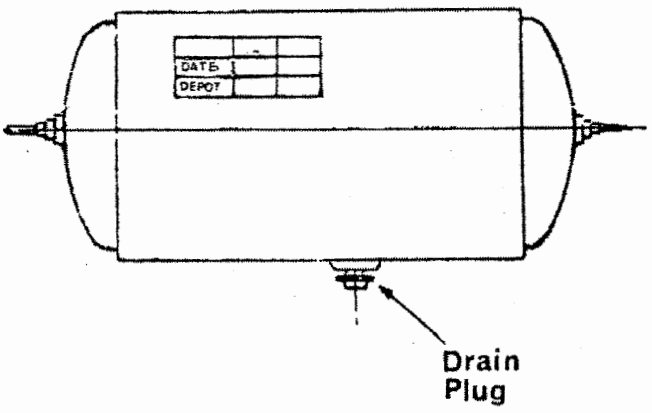


FIG. 36

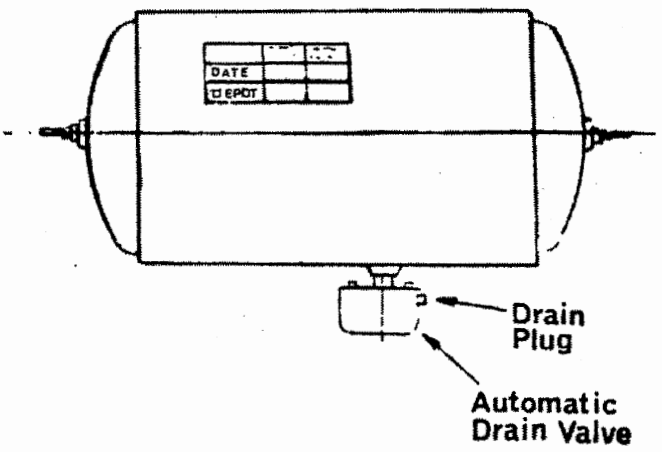
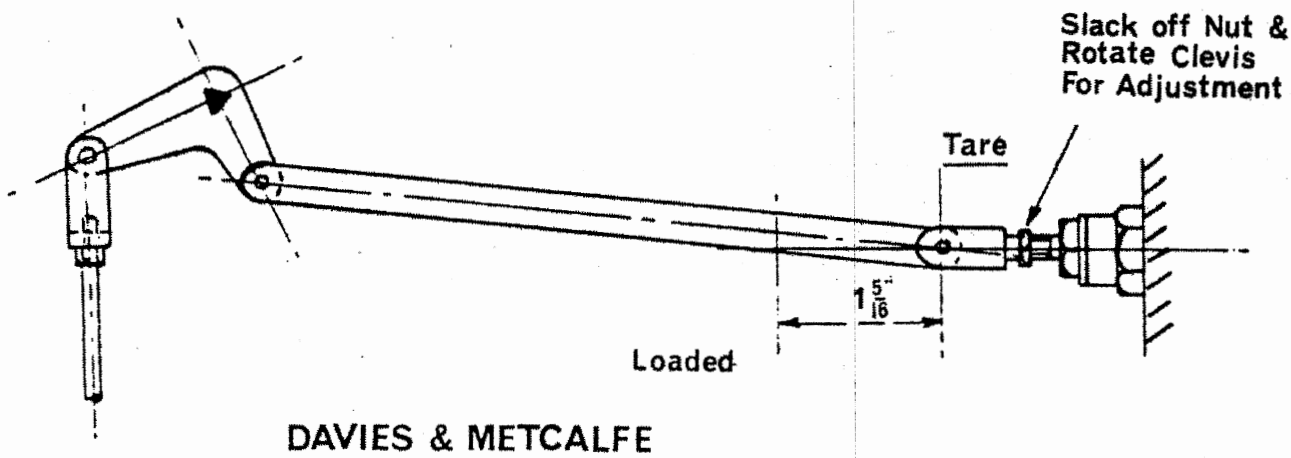


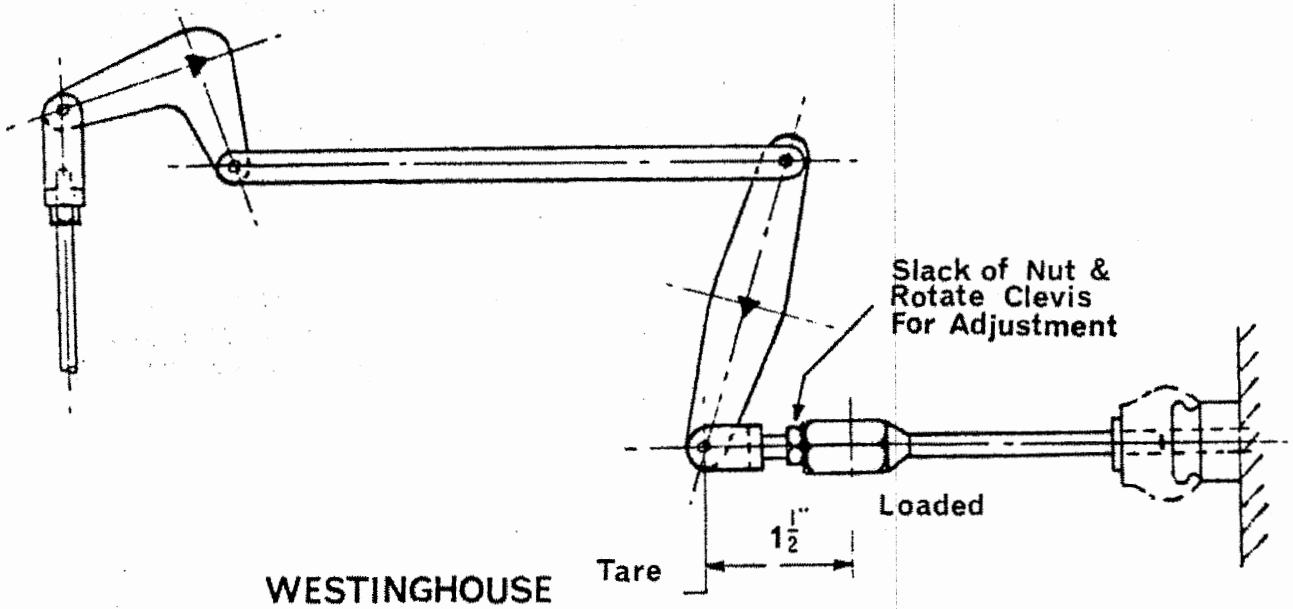
FIG. 35

AUXILIARY RESERVOIR



DAVIES & METCALFE
LINKAGE FROM BOGIE TO VARIABLE LOAD VALVE

FIG. 37



WESTINGHOUSE
LINKAGE FROM BOGIE TO VARIABLE LOAD VALVE

FIG.38

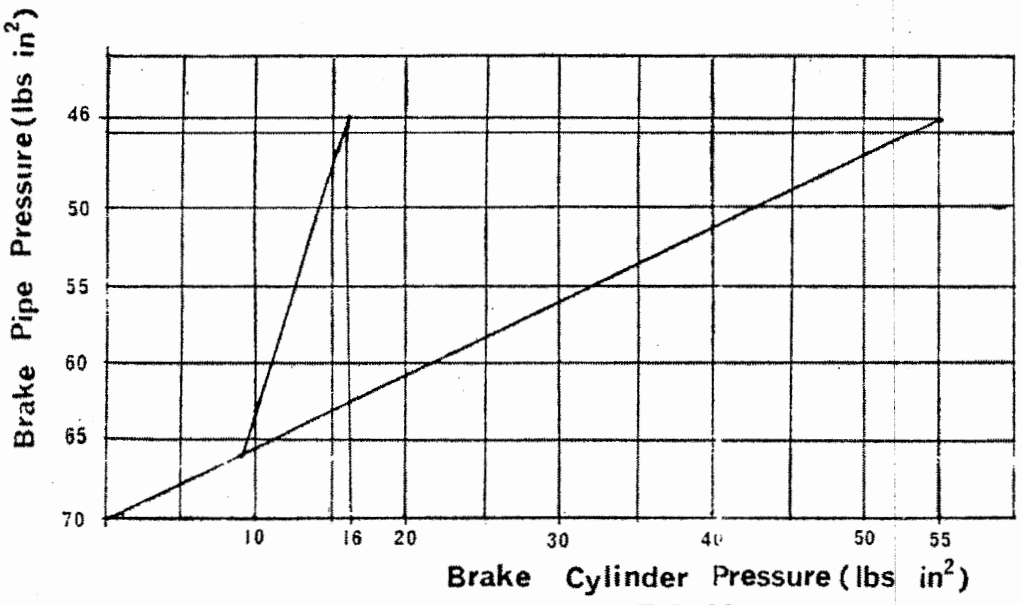


FIG.39

(e) Variable Load Valve (SEE FIGS. 40 & 41)

These are fitted on to control each pair of brake cylinders on each bogie. They relay air from the auxiliary reservoir in proportion to the load on the bogie. Thus, with a fully loaded vehicle the variable load valve adjusts the pressure of the air supply to the Brake cylinders to 55 p.s.i. for a full brake application on the train. Likewise with an empty wagon the supply to the brake cylinders is adjusted between 18 and 16 p.s.i. (See FIG.39). The relationship between Brake 3 Cylinder Pressure and Payload is shown on Drg. No. F-S-20910. This drg. also shows the Load/Deflection graphs for the various bogies.

There is a difference in the mechanical linkage to the variable load valves, i.e. Westinghouse or Davies & Metcalfe (SEE FIG. 37 & 38)

Due to the variations in the Spring Rate of the bolster springs on the bogies, the mechanical linkage to the variable load valve had to be modified to suit.

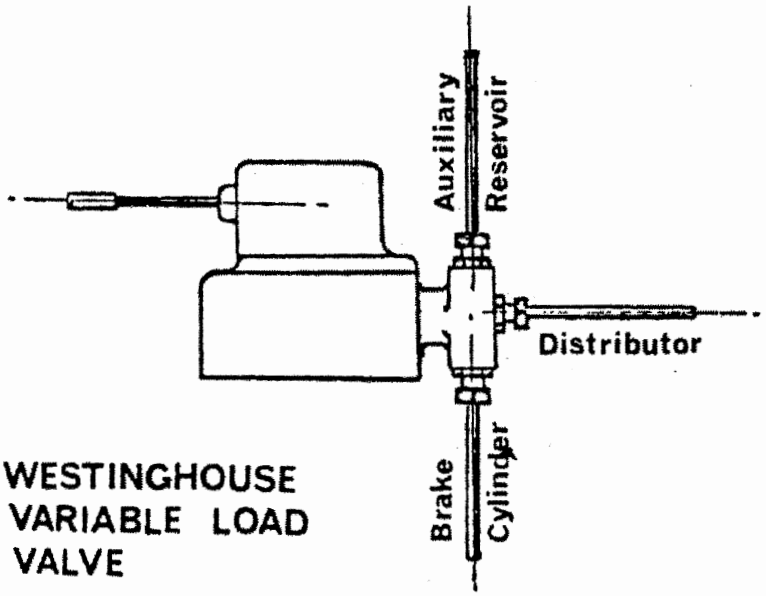
For variable load valve mechanical setting on all vehicles see Engineering 3 Instruction W.F.286.

The air pressure in the brake cylinders can be checked when the load on the vehicle is not known by measuring the distance between the top of the bolster and the inside face of the frame pocket (SEE FIG. 43).

A graph (SEE FIG. 42) showes the air pressure in relation to these dimensions to suit all vehicles.

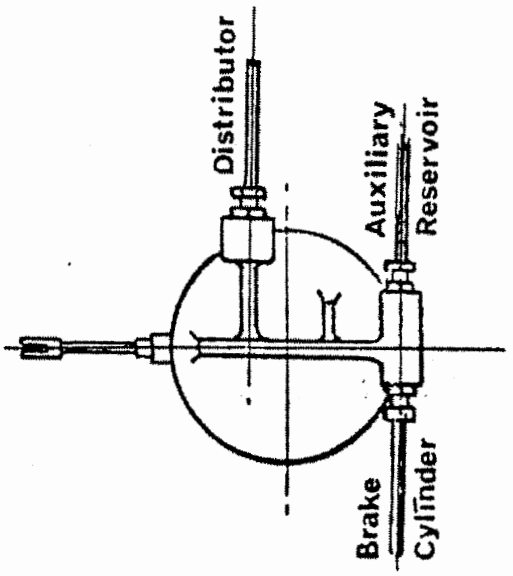
Limits of Wear

In the variable load valve linkages the pins are to be replaced when wear exceeds 0.010" from nominal diameter. The Polypenco bushes are to be replaced at each classified repair. Holes in the connecting rods are to be checked for ovality, and if visibly worn the rods must be replaced.



WESTINGHOUSE VARIABLE LOAD VALVE

FIG. 40



DAVIES & METCALFE VARIABLE LOAD VALVE

FIG. 41

CANCELLED

AS PER REVISION LETTER NO. 3

CANCELLED

AS PER REVISION LETTER NO. 3

(f) Brake Cylinders

One brake cylinder is arranged to operate the brake pads on each pair of wheels on the vehicle. They are mounted on the Bogie brake beams.

1st Batch : Ridemaster Bogies (SEE FIGS. 58 & 59)

On these Bogies the brake cylinder is of the duplex type in that two piston rods are fitted, one at each end of the cylinder, and connected on to each pair of calipers at the wheel brake discs. This cylinder incorporates a slack adjuster which is single acting.

2nd Batch : Ride Control Bogies (BR-2M) (SEE FIGS. 56 & 57)

On these bogies the brake cylinder is single acting, the piston rod being connected with the two sets of calipers at the Brake Discs. An adjusting rod is fitted between the calipers to maintain the correct clearances between the brake pad and the brake disc.

(g) Strainer Check Valve & 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 that 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.

(h) Main Reservoir Pipe Isolating Cock

This is fitted in the pipe from the main reservoir pipe to the auxiliary reservoir. In conjunction with the distributor isolating valve it enables the braking system on a vehicle to be isolated. The operating handle is at right angles to the pipe when the cock is closed and in line with the pipe when open.

(j) Schrader Check Valve (SEE FIG. 45)

This valve is fitted in the pipe line from the variable load valve to the brake cylinders. Thus, the brake cylinder pressures can be obtained with the aid of a portable pressure gauge. Both the valve and pressure gauge must be kept perfectly clean and free from dirt and foreign matter.

(k) End Coupling Cocks

End Cocks are fitted to the headstock end of the brakepipe, and main reservoir pipe on end vehicles, only.

The outlet side of these cocks is vented to atmosphere when the cock is in the closed position thus releasing any air in the hosepipes.

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

(l) Duplex Pressure Gauge

This is fitted to the headstock of outer vehicles only and enables the brake pipe and main reservoir pipe air pressures to be observed at both the front and rear of the train.

(m) Flexible Hosepipes

There are three types of Hosepipes thus:-

(1) End Coupling Hosepipes

These are fitted to the outer ends of end vehicles and enable the brakepipe and main reservoir pipe to be coupled. The hosepipe connected to the brakepipe is fitted with a 1 inch coupling head. That connected to the main reservoir pipe is fitted with a $\frac{3}{4}$" coupling head. For colour code see Engineering Instruction G/70.

(2) Bar Coupler to Brakepipe & Main Reservoir Pipe Hosepipes

These are flexible hosepipes with unions at both ends. They are of the same type and size. Since the intermediate vehicle coupling for both the brakepipe and main reservoir pipe is via the bar coupling they allow free movement of the latter.

(3) Brake Cylinder Hosepipes

These are fitted in the pipeline to the brake cylinder to cater for the relative movement between the bogie and the underframe. They are flexible hosepipes with unions at both ends.

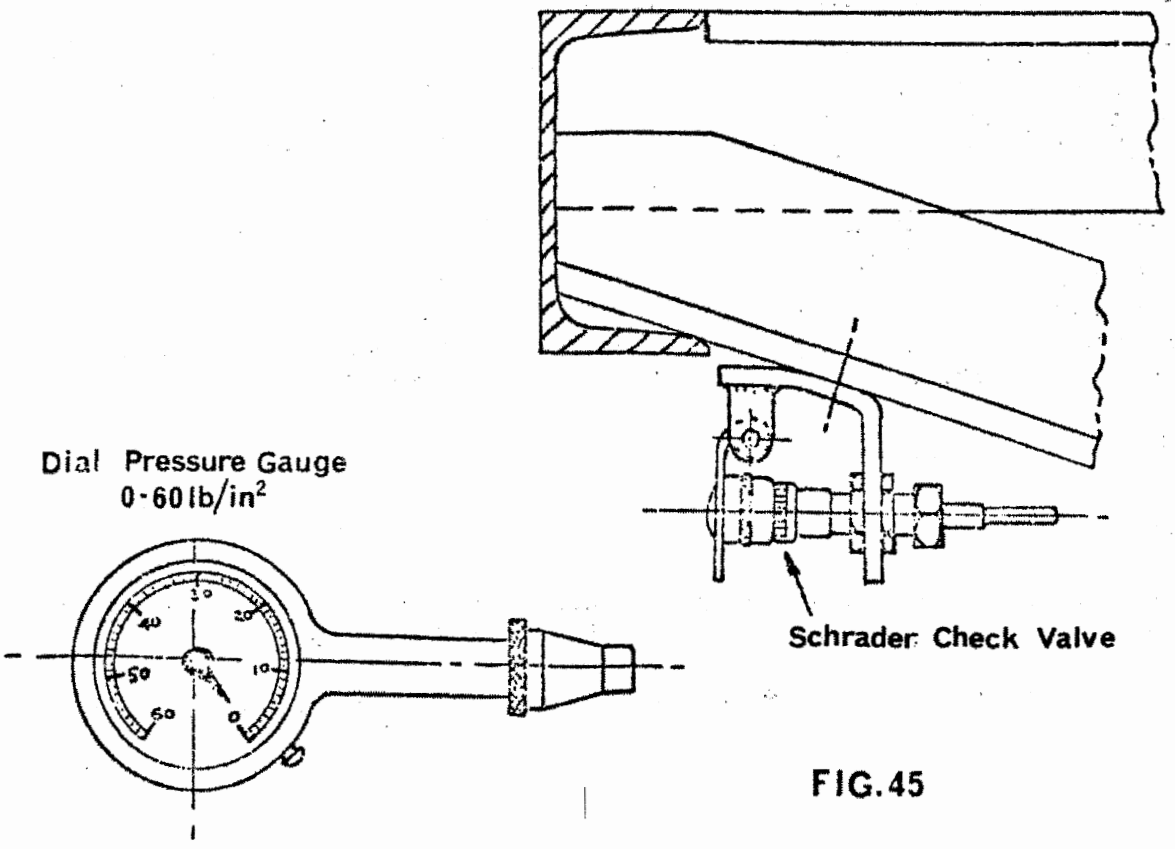


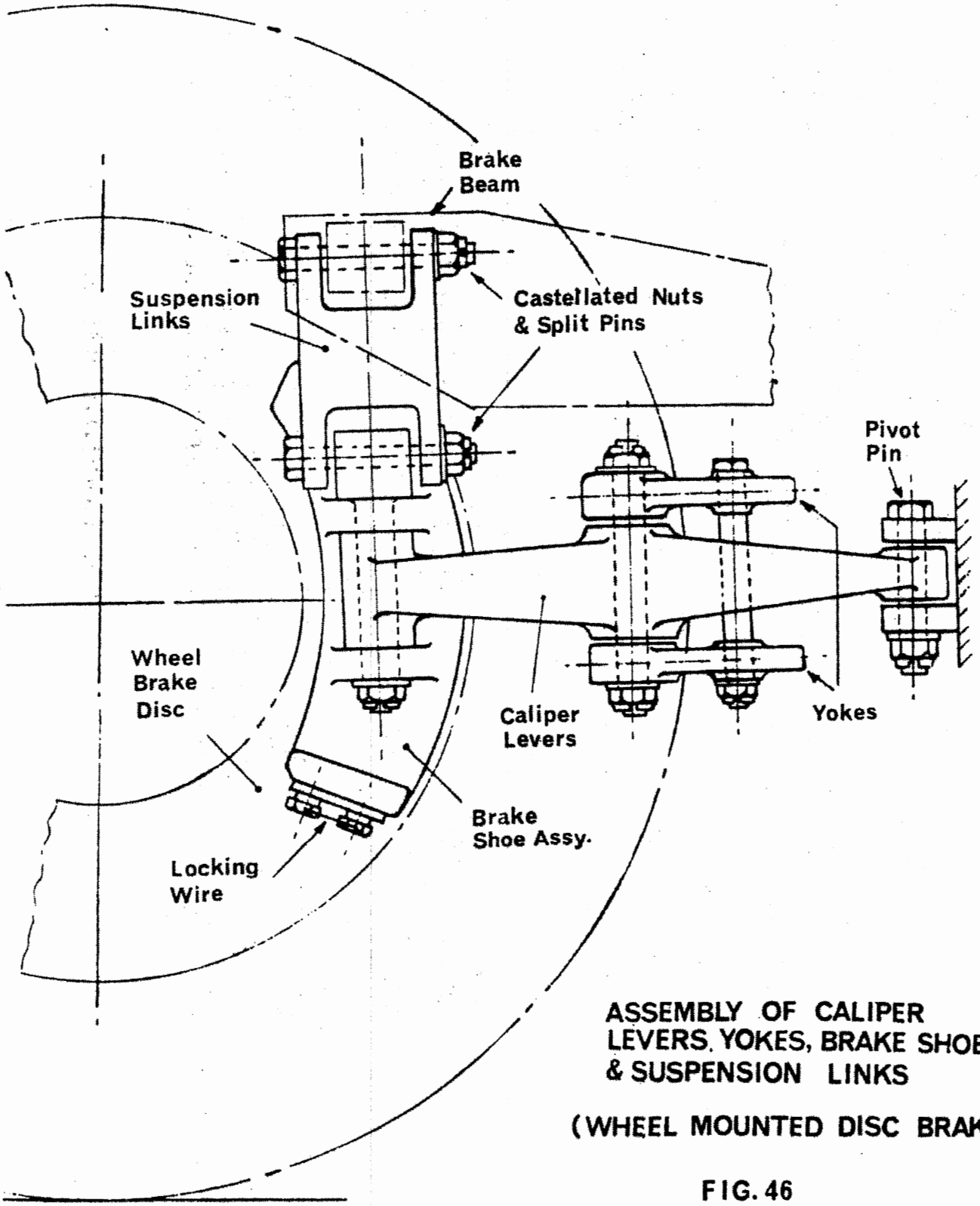
FIG.45

INSTALLATION OF DISC BRAKES

ASSEMBLY OF CALIPER LEVERS, YOKES, BRAKE SHOES AND SUSPENSION LINKS : (SEE FIG. 46 & 47)

The caliper levers are supported on the brake beam and connected by levers to the brake cylinder and the hand brake connecting rod.

The brake shoes are supported by means of suspension links between the brake beam and the caliper levers.



ASSEMBLY OF CALIPER LEVERS, YOKES, BRAKE SHOES, & SUSPENSION LINKS

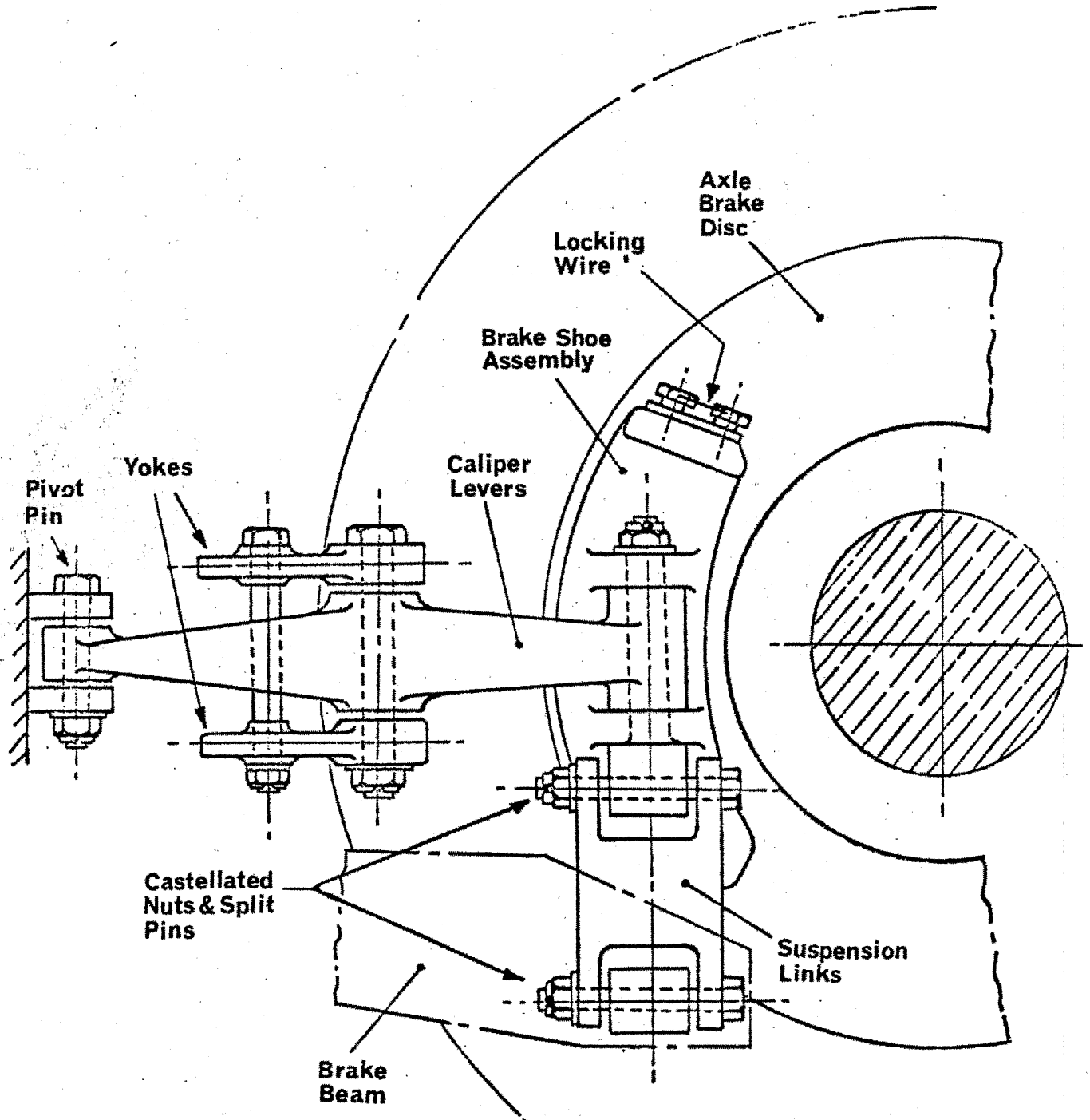
(WHEEL MOUNTED DISC BRAKE)

FIG. 46

NOTE

For Safety reasons, all the disc brakework must be assembled by means of Bolts, Castellated Nuts, and Split Pins (as shown in Figs. 46 & 47).

The set screw heads securing the brake pad retaining plate must be securely fastened by locking wire (See Figs. 46 - 47 & 55).



ASSEMBLY OF CALIPER LEVERS, YOKES, BRAKE SHOES, & SUSPENSION LINKS.

(AXLE MOUNTED DISC BRAKES)

FIG. 47

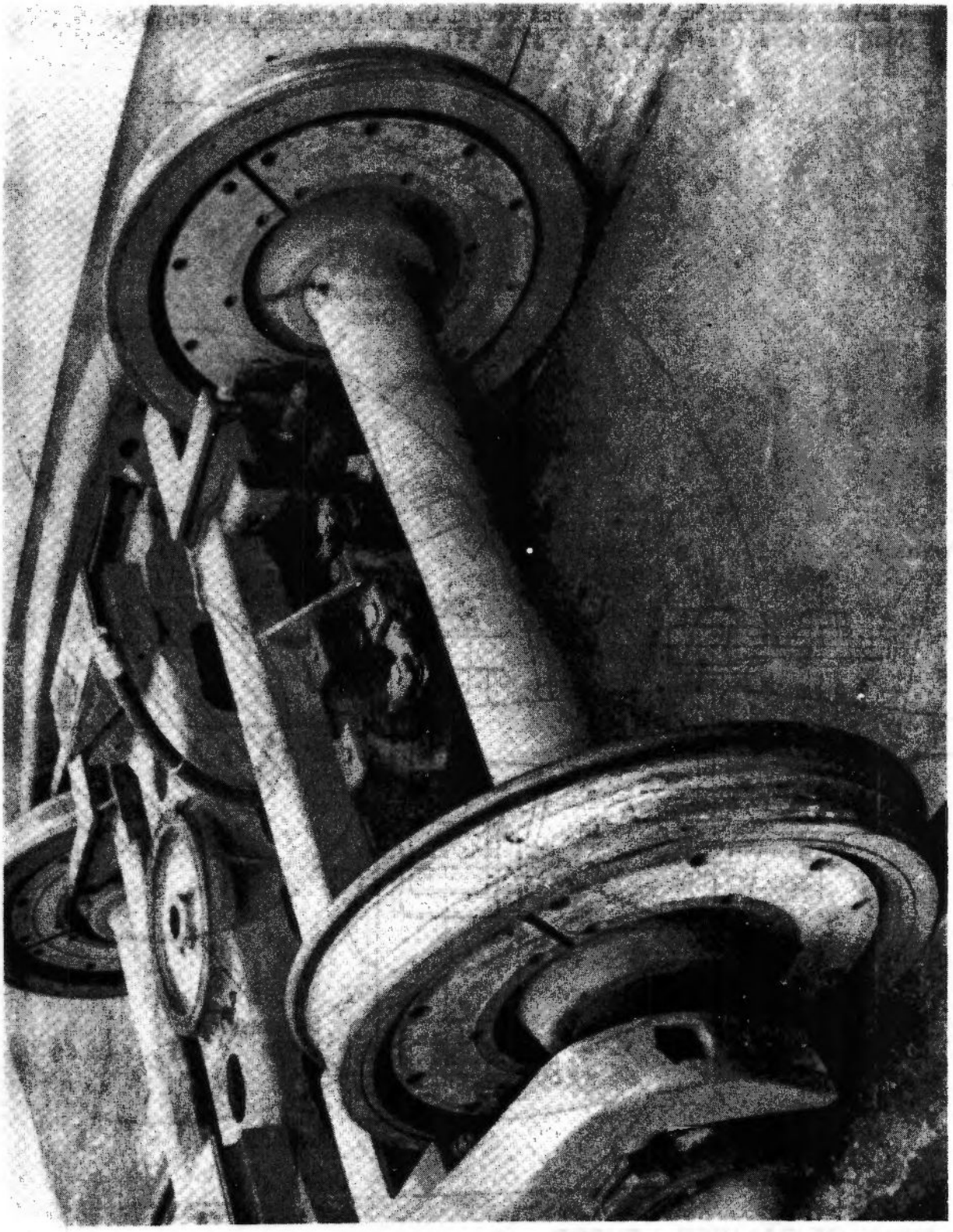


FIG. 48

WHEEL MOUNTED DISC BRAKES

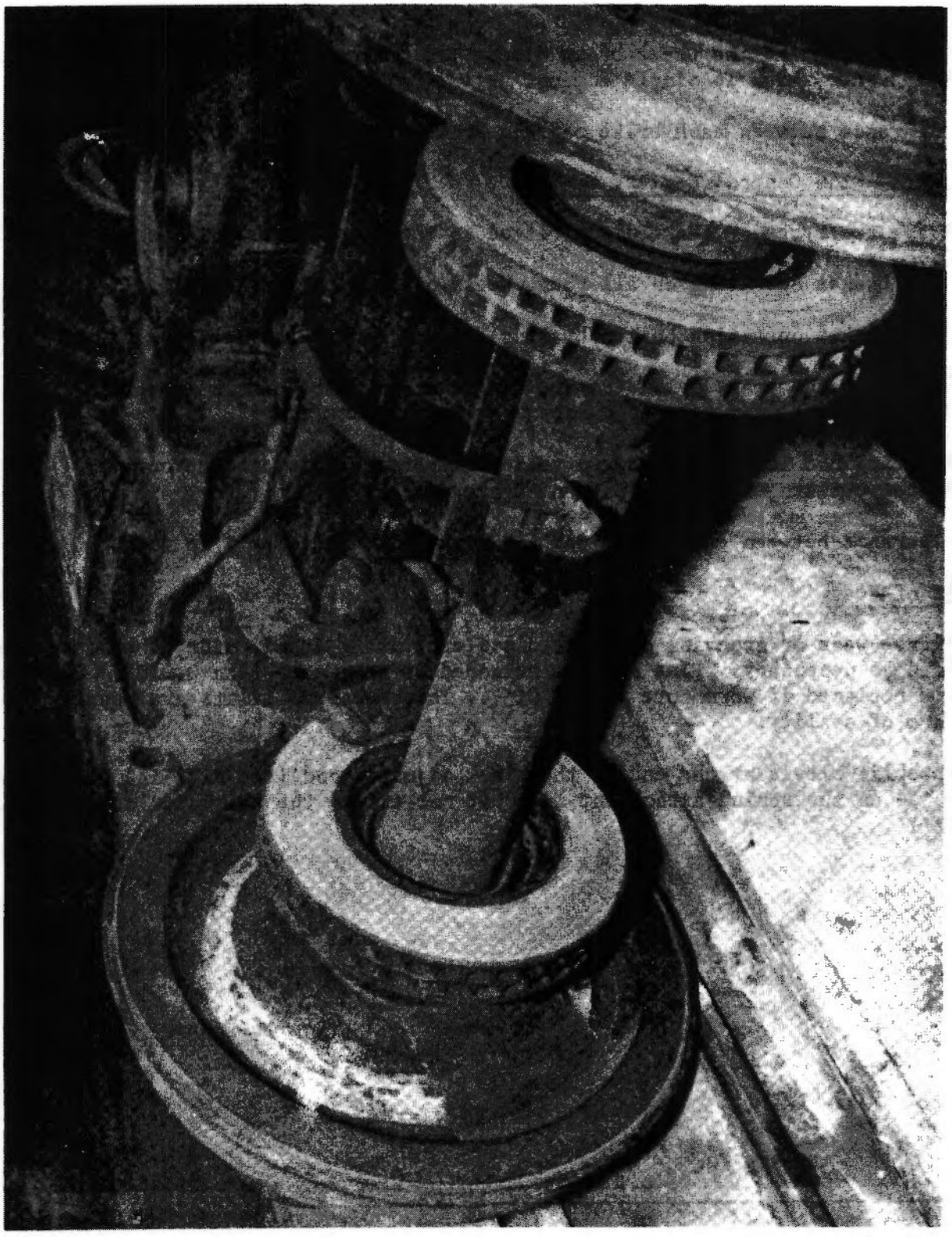


FIG. 49

AXLE MOUNTED DISC BRAKES

INSTALLATION OF DISC BRAKES (CONTD.)

1st Batch Ridemaster Bogies

Disc Brakes are operated on all four wheels of each bogie (See Fig. 50) the brake discs being of the cast iron check type bolted directly onto the wheels.

The brake cylinder is of the Duplex type and each piston rod is connected to a pair of calipers at the wheel brake discs, the brake cylinder incorporates a slack adjuster which is single acting.

The clearance between each brake pad and brake disc is to be 1/16 inch.

2nd Batch Ride Control Bogies. BR-2M

There are two types of brake discs fitted to these bogies as follows :-

(1) Disc Brakes operating on all four wheels of each bogie (See Fig. 51).

(2) Disc Brakes operating on two braking disc of each axle (See Figs. 52 & 53)

In both cases the brake cylinders are single acting, the piston rods being connected with the two sets of calipers at the braking discs.

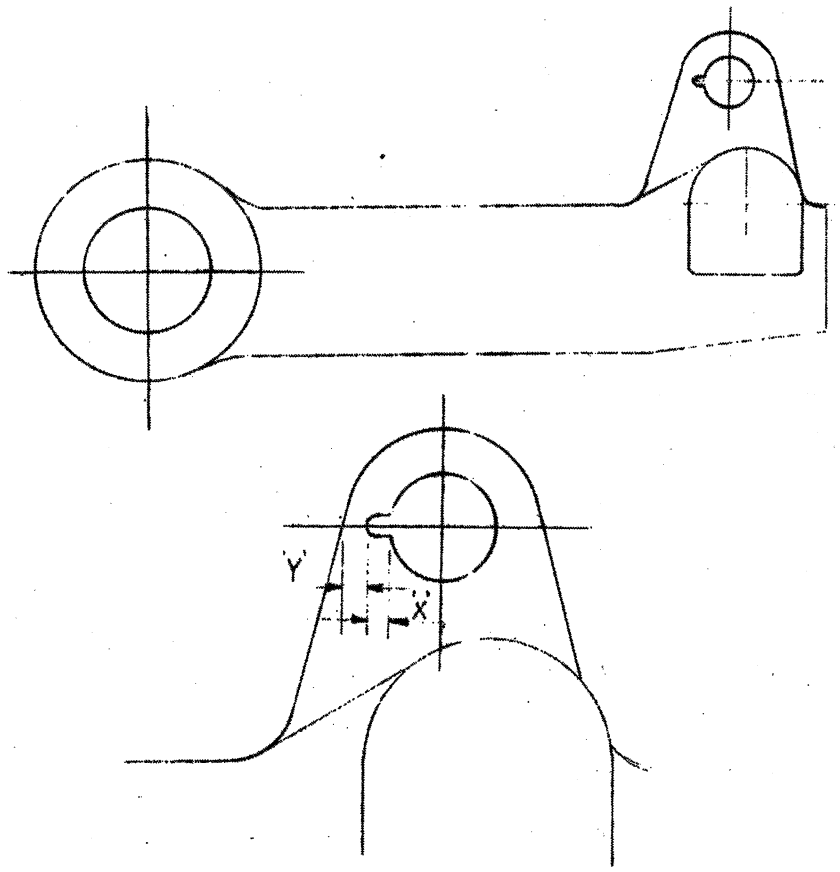
An adjusting rod is fitted between these calipers to maintain the correct clearances between each brake pad and brake disc.

The clearance between each brake pad and brake disc is to be 1/16 inch.

Limits of Wear

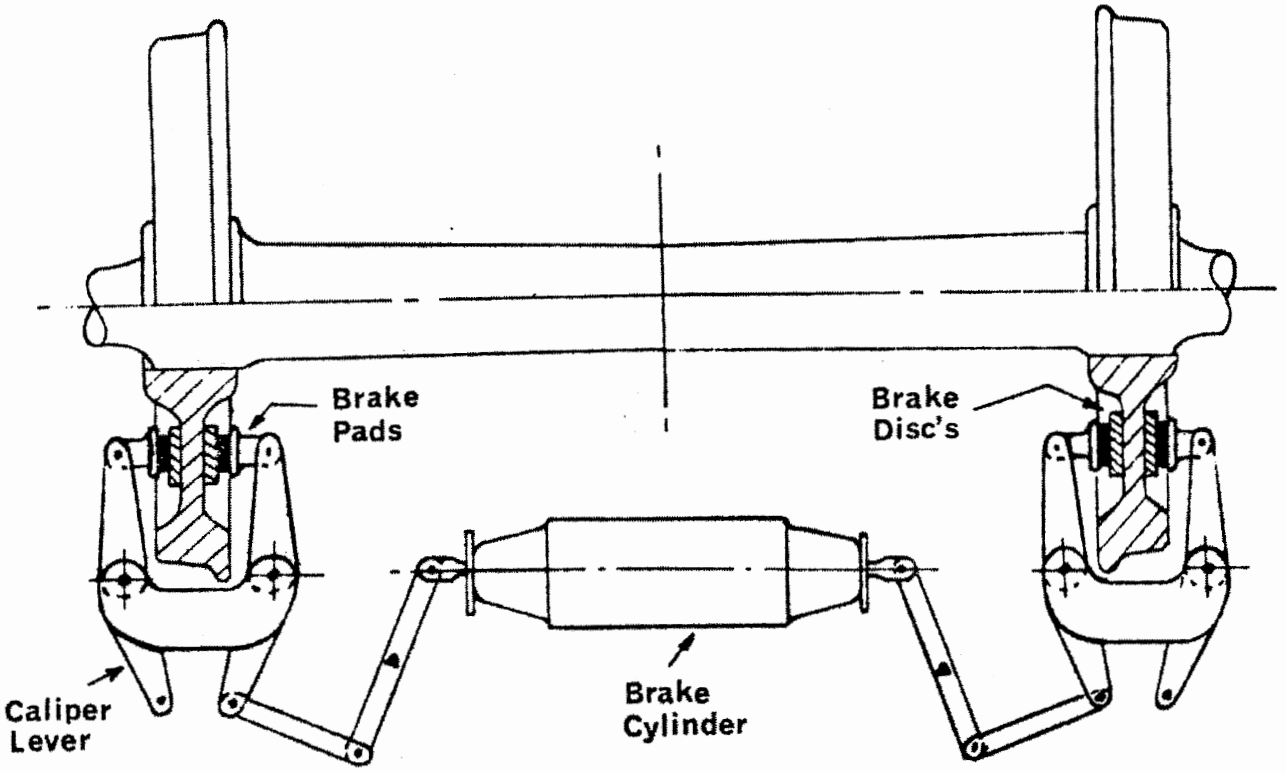
2 If surface wear or grooving on brake discs exceeds 3/32" per side, they must be replaced as necessary. Pins must be replaced if worn more than 0.010". Bushes must be replaced if worn more than 0.015". These wearing limits are usually in the form of ovality.

On the split clevis at the end of the slack adjuster rod (see Fig 51A) the groove depth 'X' on the spring attachment lug must not exceed the thickness of material left, 'Y'.



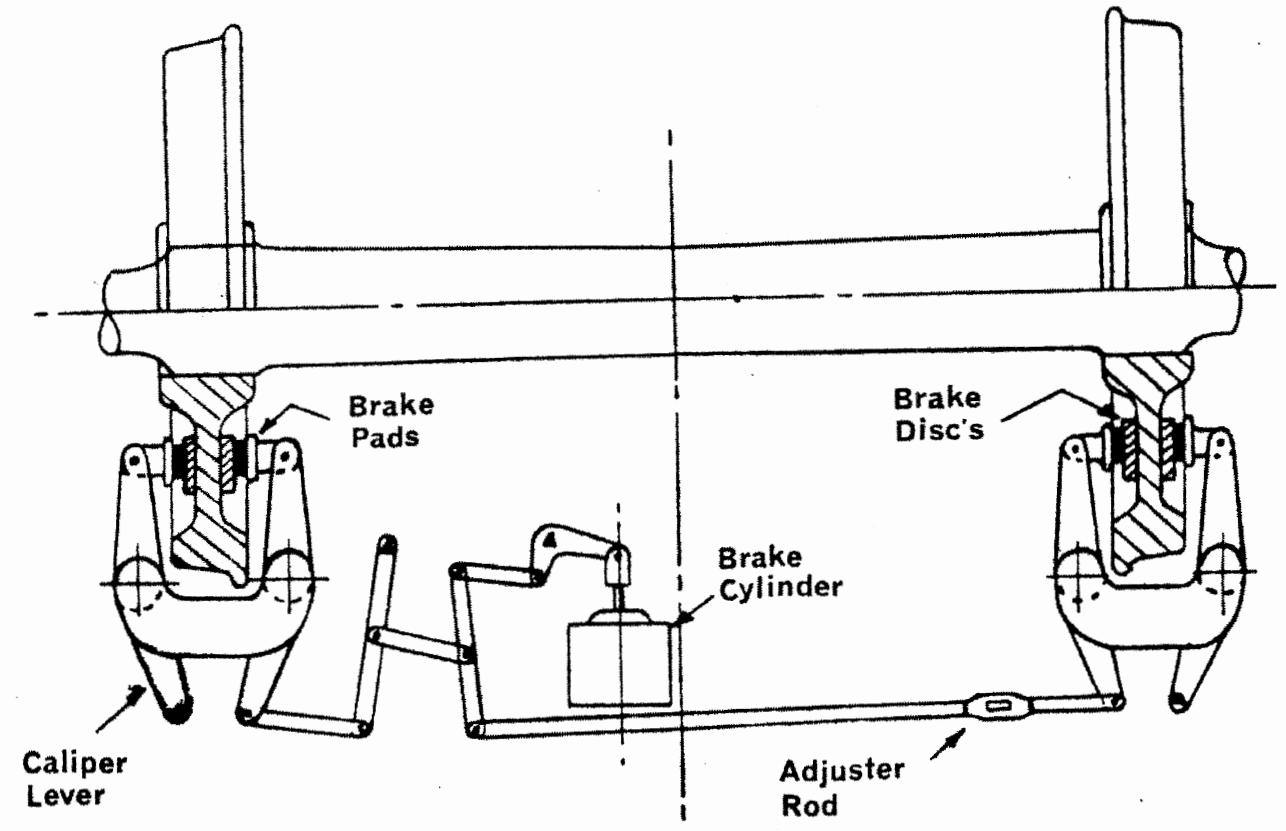
SPLIT CLEVIS

FIG 51A



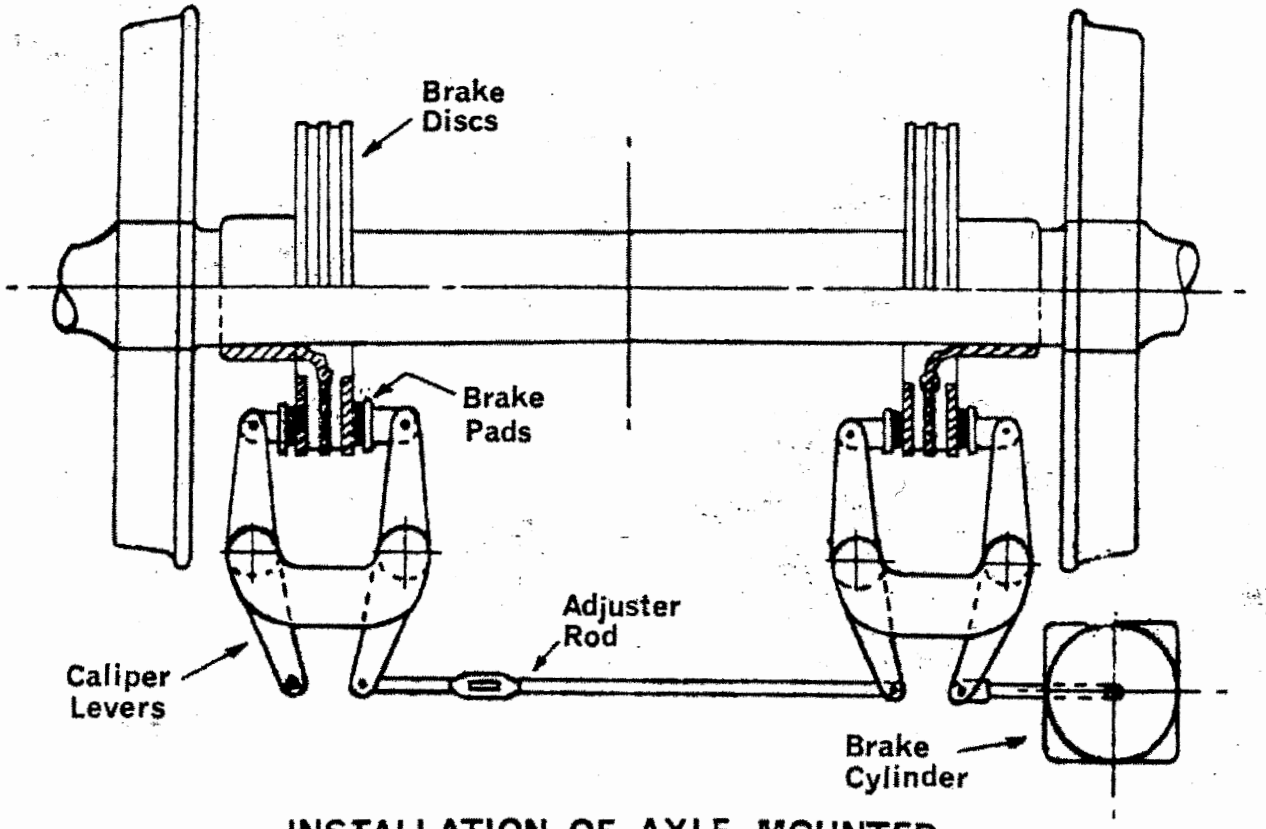
INSTALLATION OF WHEEL MOUNTED DISC BRAKES

FIG. 50



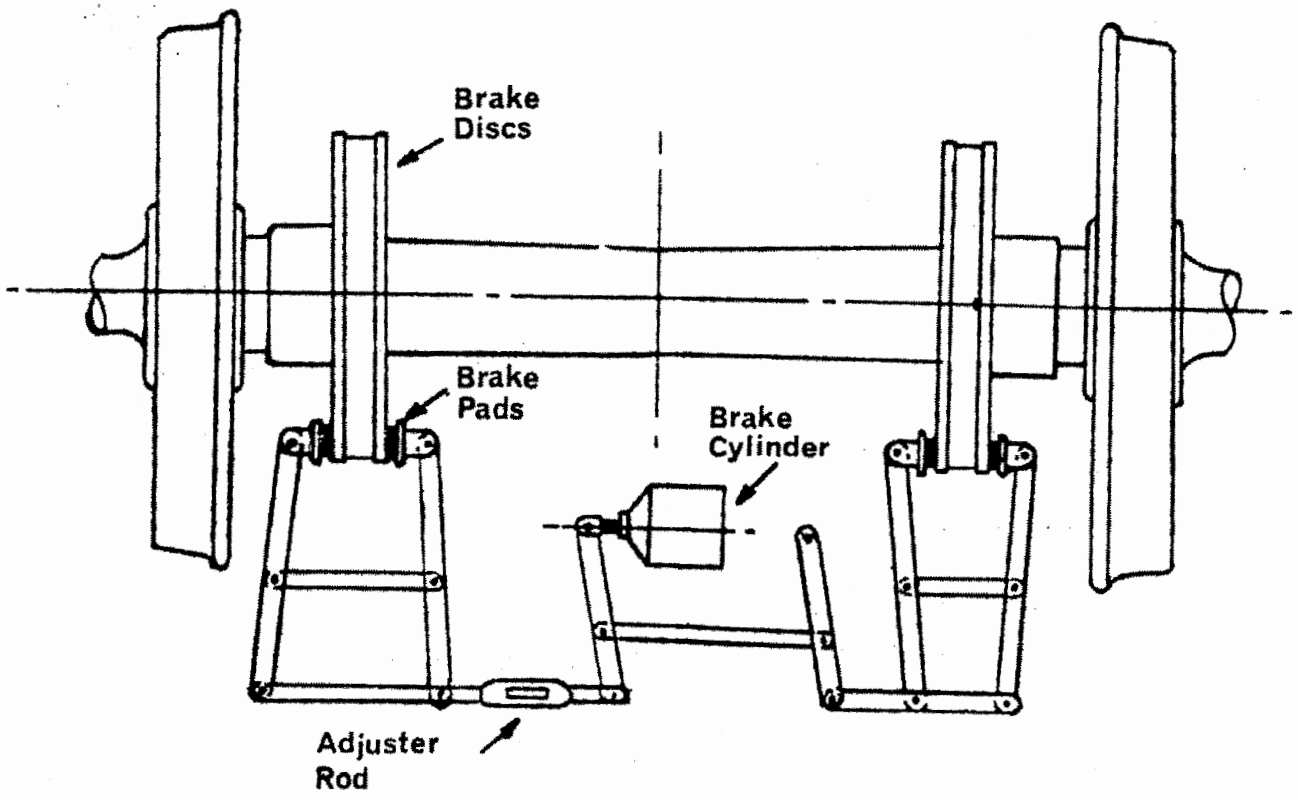
INSTALLATION OF WHEEL MOUNTED DISC BRAKES

FIG. 51



INSTALLATION OF AXLE MOUNTED DISC BRAKES

FIG.52



INSTALLATION OF AXLE MOUNTED DISC BRAKES(KNORR)

FIG.53

HAND BRAKE

A hand brake is fitted of the screw type operated by a hand wheel mounted on the underframe (See Fig. 54).

On the 1st batch of Freightliner Vehicles, one handbrake wheel operates clockwise, and the other anti-clockwise to apply the brake. On the 2nd Batch both handbrake wheels operate in a clockwise direction to apply the brake.

The handbrake only operates on one pair of wheels on one bogie, and is designed to hold a fully laden vehicle on a one in forty gradient.

The power brake is designed to conform with the U.I.C. S.S. stopping distance requirements.

Monthly maintenance of Hand Brake and Power Brake gear to be carried out in accordance with Engineering Instruction No. WF13.

Limits of Wear

2 Handbrake Rigging:- Maximum wear on pins and bushes to be 1/64" in any direction.

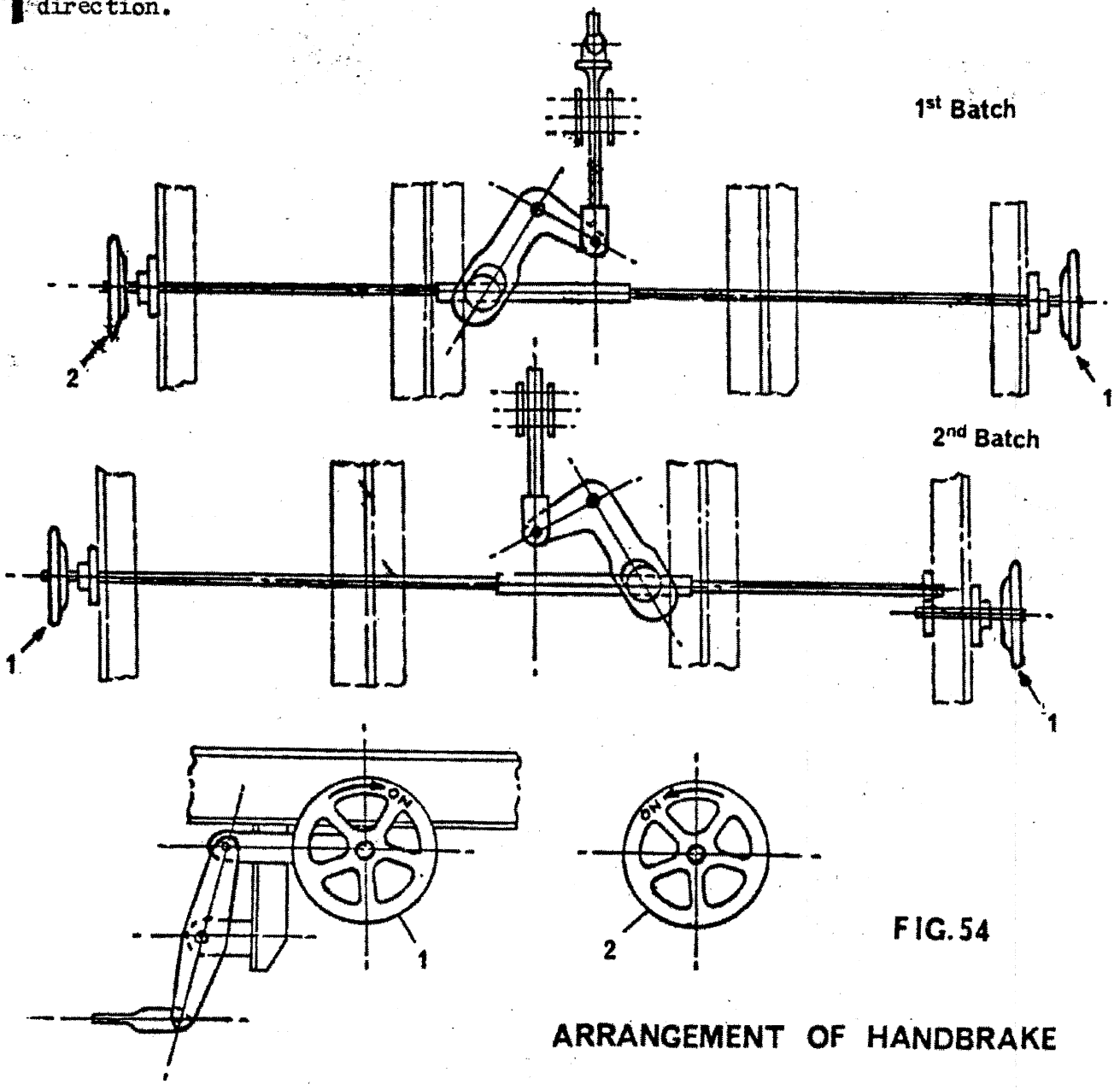
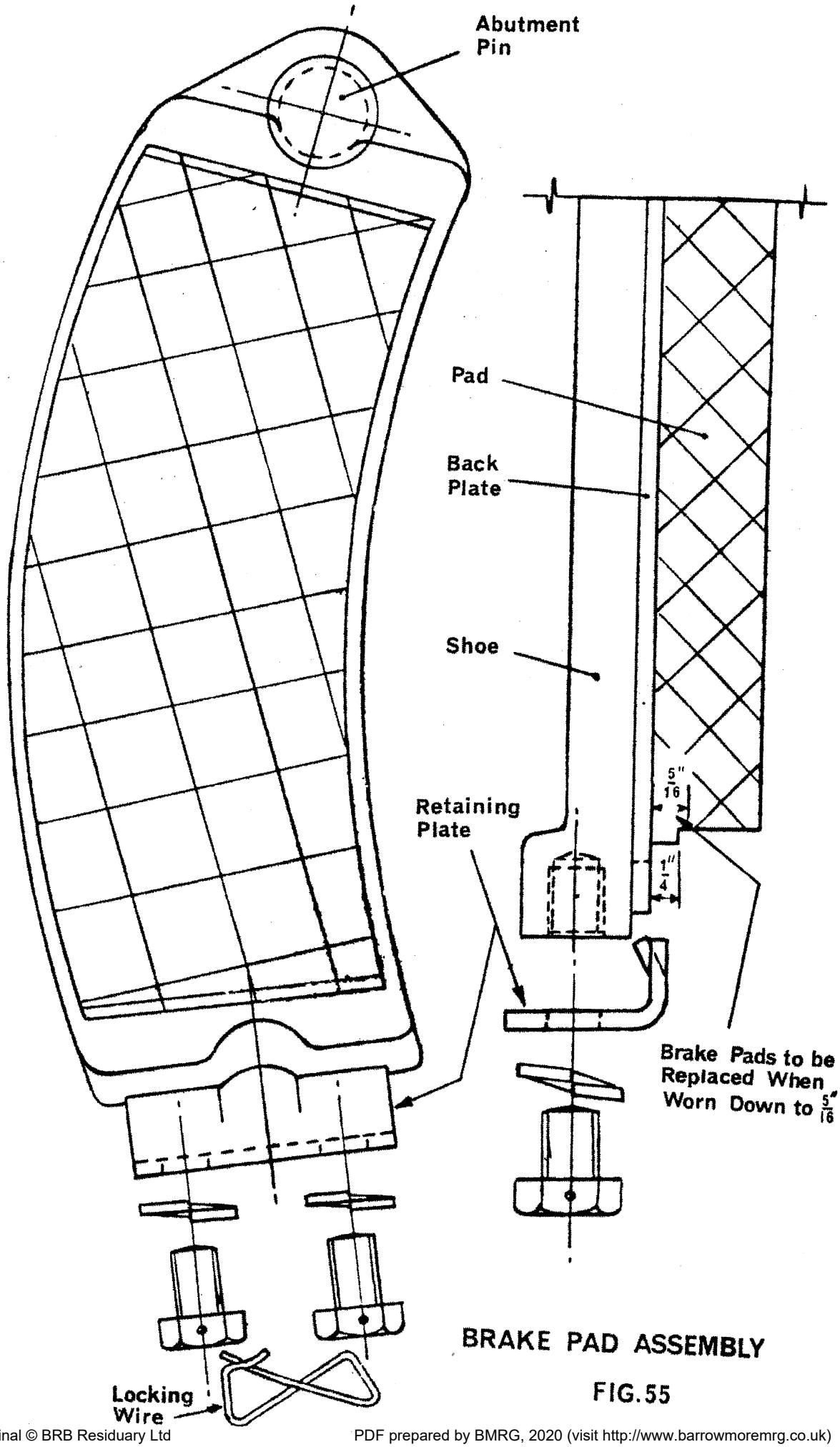


FIG. 54

ARRANGEMENT OF HANDBRAKE



BRAKE PAD ASSEMBLY

FIG.55

BRAKE PADS

The Brake pads must not be allowed to wear less than 5/16" thick, this thickness is indicated by the step on the pads, plus 1/16" (See Fig. 55) 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.

To renew brake pads, first remove the retaining plate, which is located at the bottom of the pad, by unscrewing the two 1/2" dia setscrews, the pad can then be slid downwards clear of the abutment pin.

A new brake pad can then be placed against the face of the shoe with the friction side facing the Braking Disc. The pad can then be slid upwards until the recess in the end of the pad locates beneath the setscrews on the brake shoe.

A new retaining plate should then be fitted ensuring that the circular projection is located in the lower recess of the brake pad, and the retaining plate set screws tightened to 50 lbf ft.

The set screws heads must be securely fastened by locking wire.

The Brake Pad Specification is to Ferodo 659F.

Monthly Maintenance of Brake Pads to be carried out in accordance with Engineering Instruction No. WF13

FREIGHTLINER TRAINS

FAULT 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) All hoses properly connected. Pressure gauge on locomotives. For obvious air leaks.	Open cocks (handles horizontal). Connect hoses. If no pressure - locomotive defective. Seal as necessary.
2. Brake fails to apply on one vehicle	Distributor isolating cock is open. (The handle to be in a vertical position).	Note : 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 on one bogie.	Brake cylinder and hoses for leakage. Variable load valve.	Replace as necessary. Release bogie control rod from bell crank. Depress free end of bell crank as far as it will go. Fully apply brake. Check air pressure at Schrader check valve is 13 p.s.i. Lift free end of bell crank as far as it will go. Fully apply brake. Check air pressure at Schrader check valve is 55 p.s.i.

Continued .....

FAULT	CHECK	ACTION
3. Brake Fails to apply on one bogie Contd.		If these pressures are not obtained change variable load valve.
	Brake cylinder & levers jammed.	Lubricate or replace components as necessary.
4. Brake does not release on one vehicle or bogie	Handbrake is released.	Release handbrake.
	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.
5. Brakes not fully released at end of train. (Brake pipe pressure gauge shows less than 72.5p.s.i.)	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.

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.

Continued ....

Continued.

FAULT	CHECK	ACTION
IMPORTANT (CONT'D)	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 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.	
6. Locomotive Drivers Safety Device Low main reservoir pressure device operates during charging (Brake pipe vented)		Move Drivers Brake valve handle to **EMERGENCY** position and hold there until main reservoir pressure is restored. Return handle to **RUNNING POSITION.**
7. The main reservoir pipe isolating cock, when closed, does not effect the working of the brake, but this cock must be placed in the open position. (Handle in line with pipe) when in service, otherwise the brake release times will be slightly increased as the auxiliary reservoir cannot be charged from the main reservoir pipe.		

NOTE : All pressures quoted above are nominal.

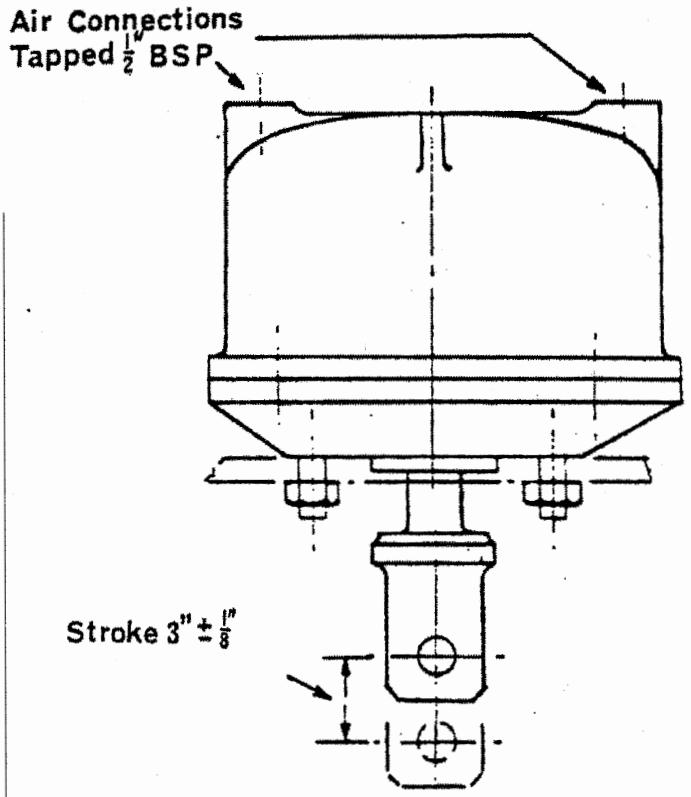


FIG. 56

8"x 3" BRAKE CYLINDER AXLE MOUNTED DISC BRAKE

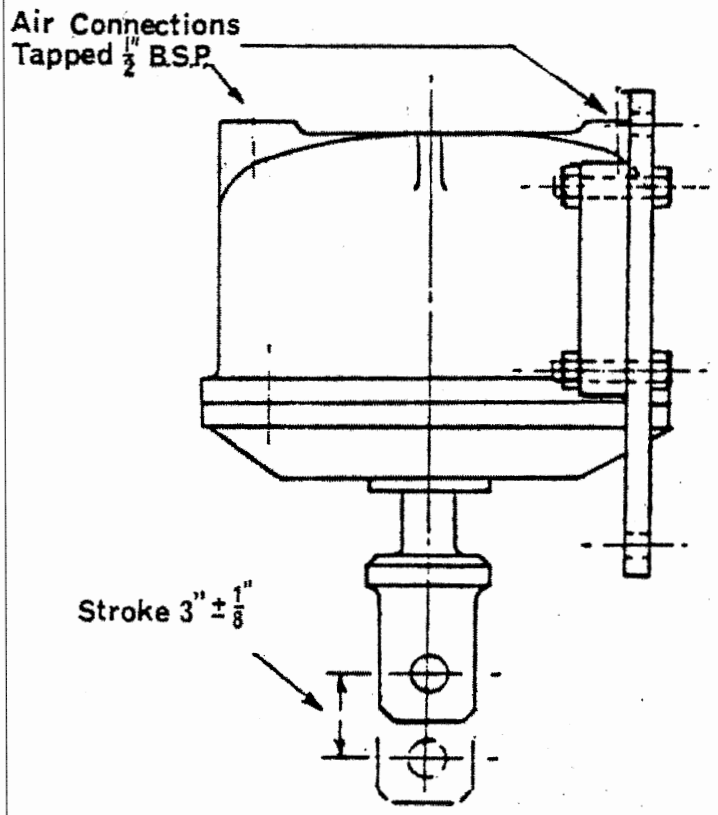


FIG. 57

8"x 3" BRAKE CYLINDER WHEEL MOUNTED DISC BRAKE

BRAKE CYLINDERS 1ST BATCH (SEE FIGS 58 & 59)

BRAKE CYLINDER PISTON STROKE & PAD CLEARANCES

(a) The clearance between each Brake Pad and Brake Disc to be 1/8" this gives a piston stroke of 13/32".

The Westinghouse Brake cylinder has a working stroke of $1\frac{1}{2}" \pm \frac{1}{8}"$ giving a Pad Clearance of 15/32" before the slack adjuster comes into operation.

The Davies and Metcalfe Brake Cylinder has a working stroke of $\frac{5}{8}"-\frac{3}{4}"$ giving a Pad Clearance of 7/32" before the Slack adjuster comes into operation.

(b) If the piston stroke is less than that stated with the brake fully applied, check :-

(1) That the pads are applied hard to both sides of the brake disc.

(2) That nothing is trapped between pads and discs.

(3) That the various brake levers and pins are not binding or rubbing.

(4) For oversize brake pads.

(5) That brake is fully applied by checking brake cylinder pressure.

(6) For Faulty brake cylinder.

(c) If the piston stroke or Pad Clearance is greater than that stated with the Brake fully applied, check :-

(1) That Pads are not worn below minimum thickness (5/16").

(2) That one or more pads are not missing or displaced.

(3) For worn or defective brake levers and pins.

(4) For faulty brake cylinders.

RESETTING THE BRAKE CYLINDER SLACK ADJUSTER :

(1) WESTINGHOUSE (SEE FIG. 58)

Pull the re-setting ring at the bottom of the Brake Cylinder to disengage the Slack Adjuster Ratchet.

Maintain Pull on the ring and rotate the Handwheel anticlockwise until the push rod is drawn right in.

Release the ring and check that Handwheel cannot be rotated further.

(11) DAVIES & METCALFE (SEE FIG. 59)

Pull the re-setting ring situated at end of Piston Rod to disengage locking pin from Handwheel.

Maintain Pull on the ring and rotate the Handwheel clockwise until the Piston Rod is drawn right in.

Release the ring and check that the locking pin is engaged in one of the Holes in the Handwheel to stop rotation.

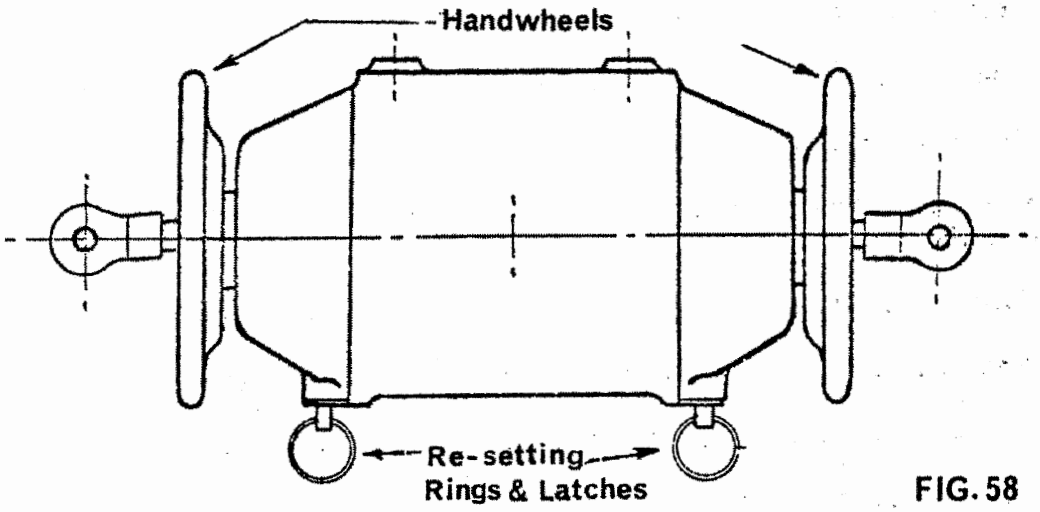


FIG. 58

WESTINGHOUSE AIR BRAKE CYLINDER

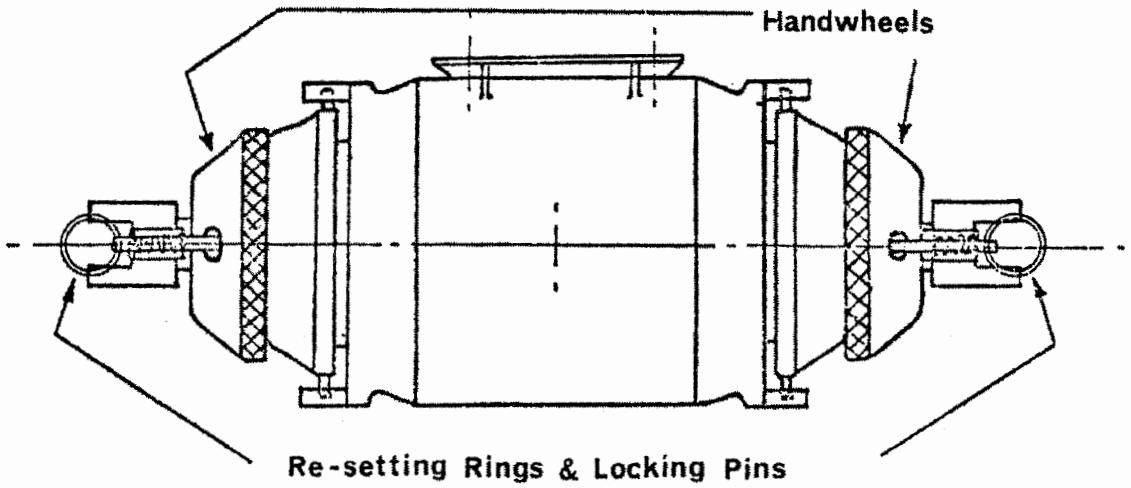
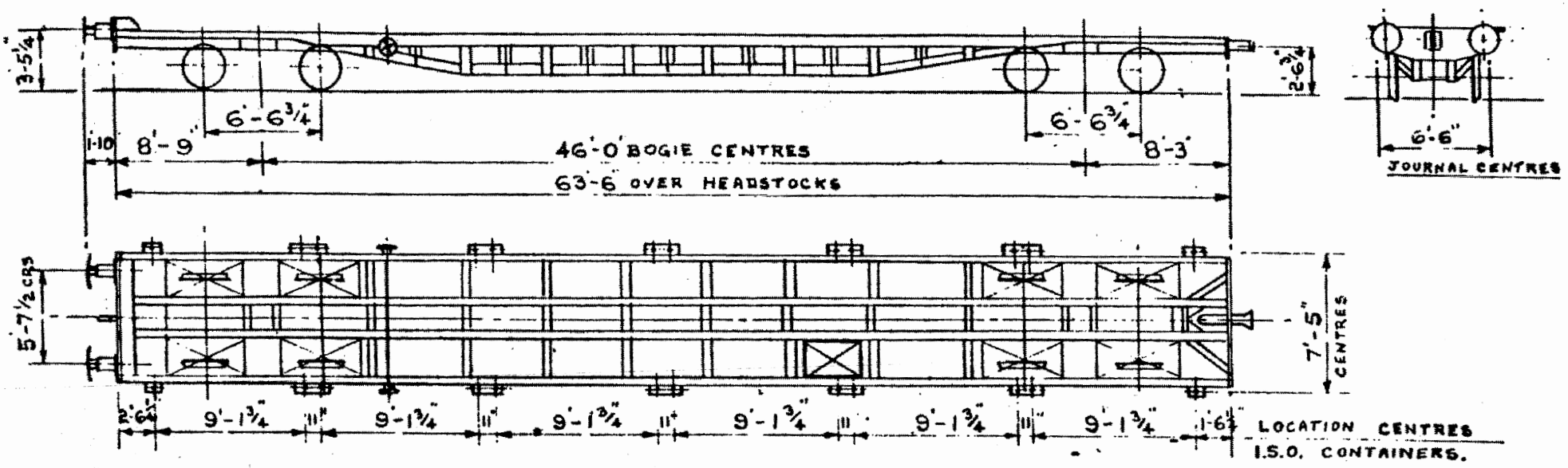


FIG.59

DAVIES & METCALFE AIR BRAKE CYLINDER

FREIGHTLINER : END VEHICLE



CARRYING CAPACITY – 62 TONS

BRAKE – AUTO AIR DISC BRAKE
(VARIABLE LOAD VALVE) & HANDBRAKE

MIN CURVE – 3½ CHAINS

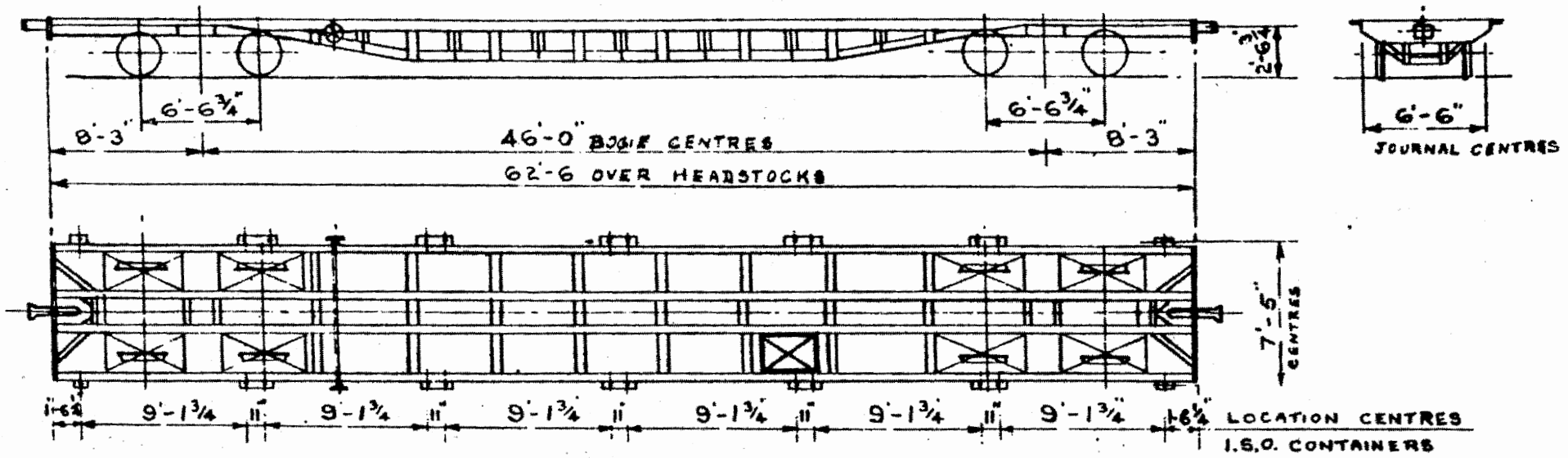
COUPLINGS – OUTER END – SCREW COUPLING
INNER END – BAR COUPLER

BUFFERS – SELF CONTAINED HYDRAULIC

SECURING DEVICES – HAND OPERATED PINS
RETRACTABLE TWIST LOCK

FIG.60

FREIGHTLINER : INTERMEDIATE VEHICLE



CARRYING CAPACITY – 62 TONS

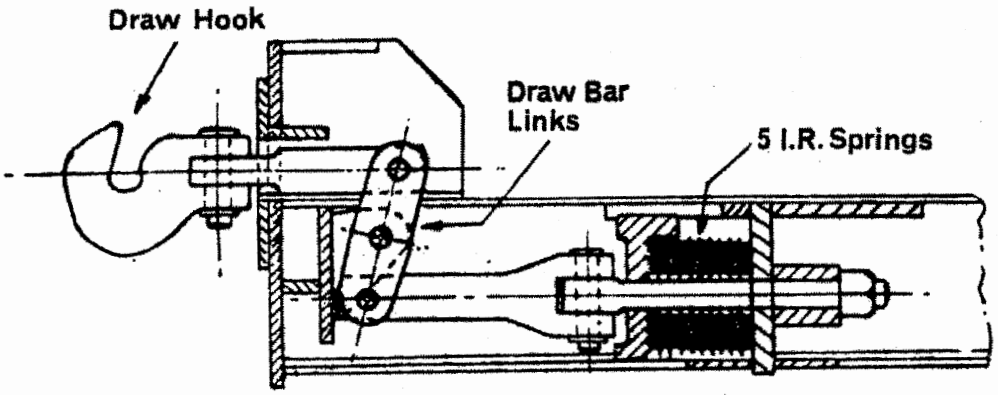
BRAKE – AUTO AIR DISC BRAKE
(VARIABLE LOAD VALVE) & HANDBRAKE

MIN CURVE – 3½ CHAINS

COUPLINGS – BAR COUPLER

SECURING DEVICES – HAND OPERATED PINS
RETRACTABLE TWISTLOCK

FIG.61



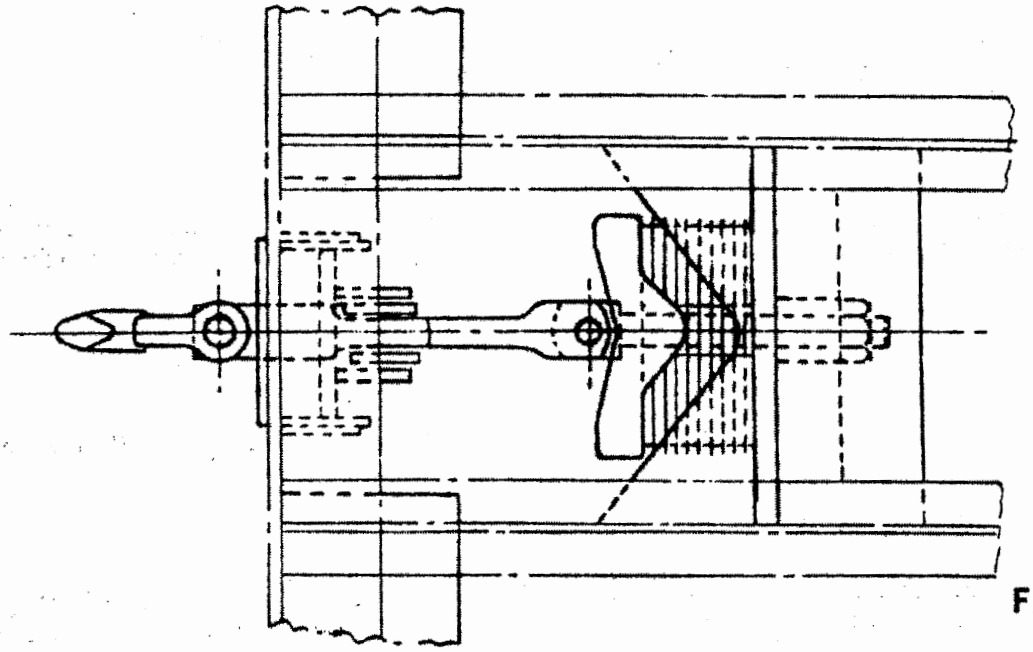


FIG.62

ARRANGEMENT OF DRAWGEAR

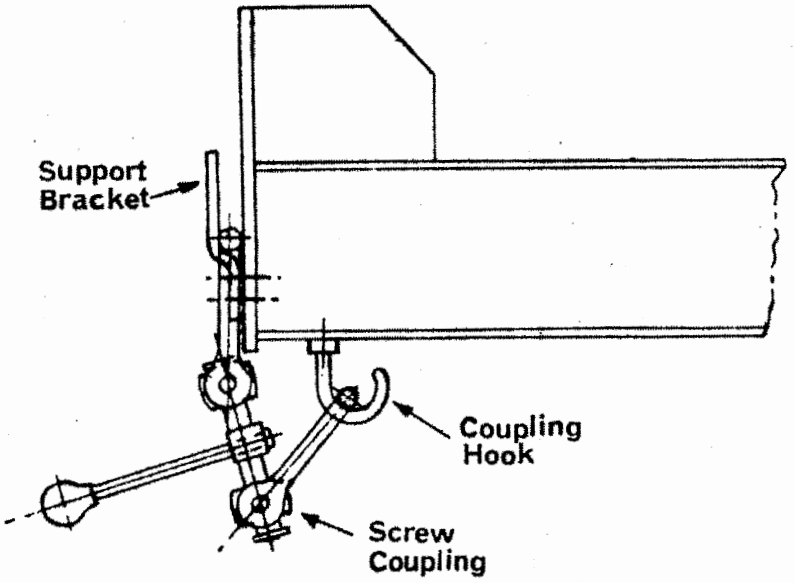


FIG.63

SCREW COUPLING STOWAGE

UNDERFRAMES :-

The structure is of trussed design, having welded assembly of standard rolled steel sections.

It was designed to have a low platform height, with a suitable length to carry the standard I.S.O. Container of 8ft x 8ft Section, in length multiples of 10ft, 20ft, 30ft and 40ft on selected B.R. Routes.

I.S.O. Containers of 8ft wide and 8'-6" in height can also be conveyed on these vehicles, but with further restricted B.R. Routes.

Monthly maintenance procedure to be carried out in accordance to Engineering Instruction No. WF 13

There are two types of underframes as follows :-

(a) Intermediate Vehicle; which are 62'-6" long over headstocks, and fitted with cast steel rigid Bar Couplers at each end of the underframe (SEE FIG. 61).

(b) End Vehicles; which are 63'-6" long over headstocks, and fitted with a cast steel rigid bar coupler at one end only. The other end of the underframe had to be built up, in order to carry the Buffers and Drawgear at the conventional height for operating with Locomotives or other vehicles (SEE FIG. 60).

BUFFERS

Buffers are of the Pneumatic Type with 1'-10" dia head and 1'-10" projection.

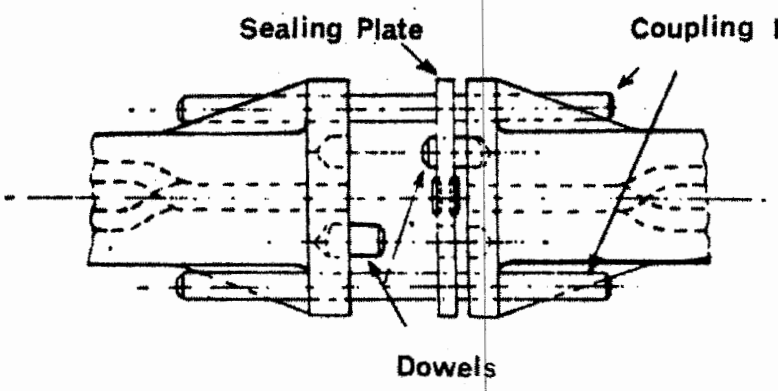
DRAWGEAR (SEE FIG. 62)

The Drawgear consists of a special design of coupling head with swivel joint, intermediate Drawbars, vertical Drawbar links, rubber springs and dividing plates.

The vertical Drawbar links were incorporated in order to reduce the length of the built up end of the underframe.

Due to the special design of the drawhook and no provision for a gedge slot a screw coupling cannot be fitted, therefore normal procedure is to utilise the locomotives coupling.

A special screw coupling is stored at the headstock of the built up end of the vehicle (SEE FIG. 63) for use in an emergency for coupling to the locomotive and for normal coupling of adjacent End Vehicles when trains are made up of more than one unit set of vehicles.



METHOD OF COUPLING INTERMEDIATE VEHICLES

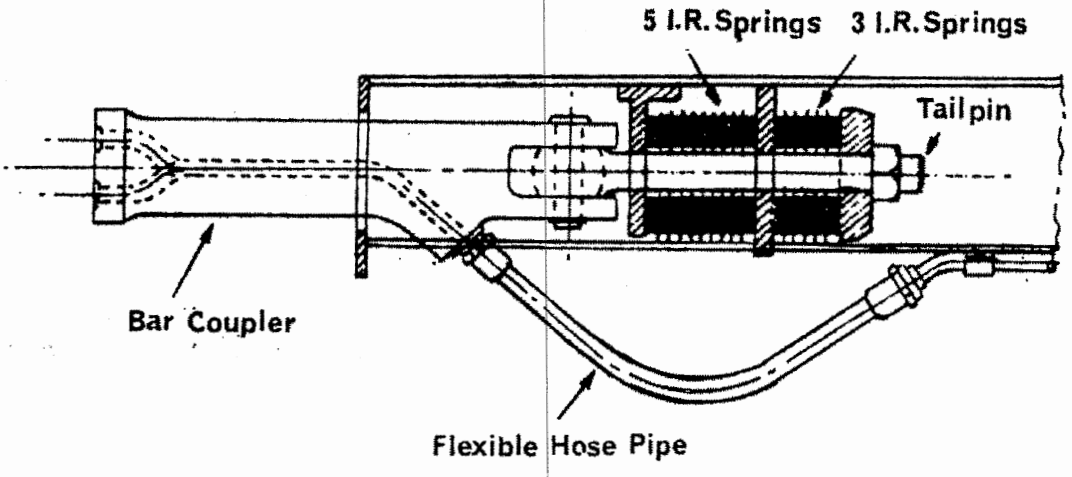
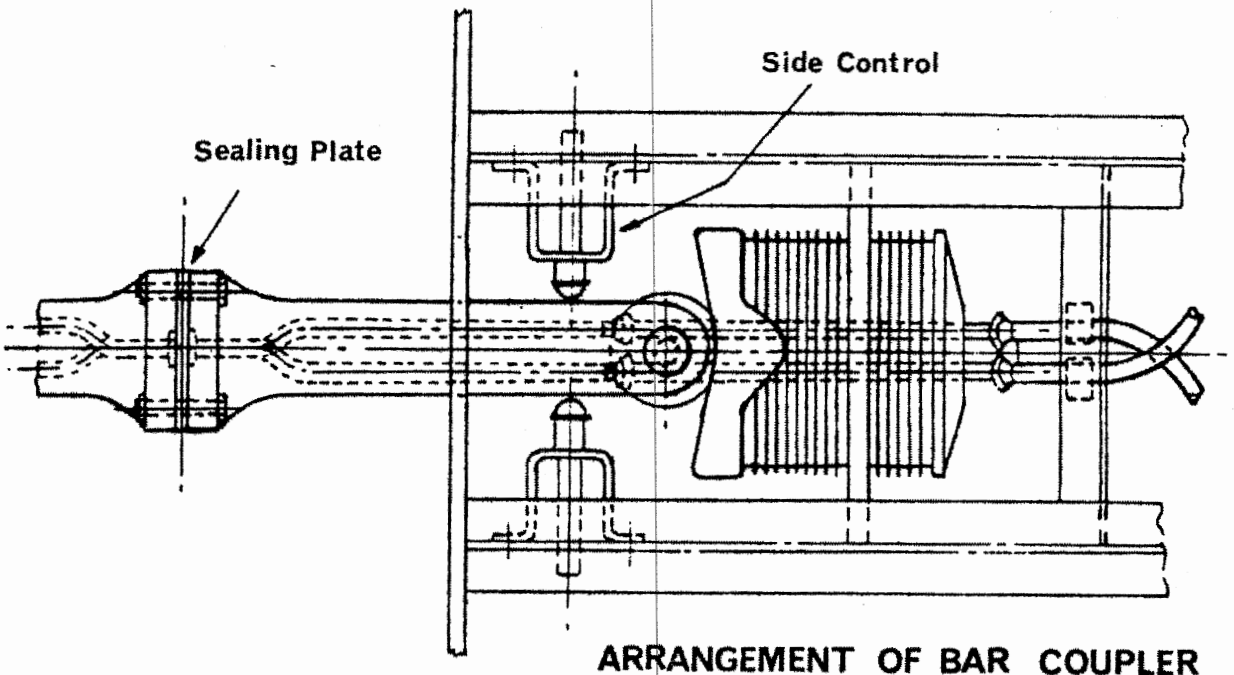


FIG. 64



ARRANGEMENT OF BAR COUPLER

LIMITS OF WEAR (Drawgear and Bar Coupler)

(a) At General Repair, the free height of the 5 I.R. springs (See Figs. 62 & 64) and the 3 I.R. springs (See Fig. 64) should be checked in accordance with Engineering Instruction No. G/475.

(b) Drawbar pins (Outer End) to be gauged for wear and examined for general condition. Pins to be scrapped if bent or worn in excess of 1/16".

(c) Bushes for drawgear pins to be examined and scrapped if worn in excess of 1/16".

(d) The bar coupler pin through the spherical bearing to be maintained to within the limits of 1.993" $\pm$ 0.002" dia. (imperial) or Ø50.620 max., Ø 50.570 min. (metric).

(e) Drawhook (See Fig. 62 A):- The minimum dimensions are as shown on Fig. 62 A. The nib to nose dimension should be maintained at 41^{+2} nom.

(f) The side control wearing plates on the bar coupler to be removed and replaced when wear exceeds 1/8".

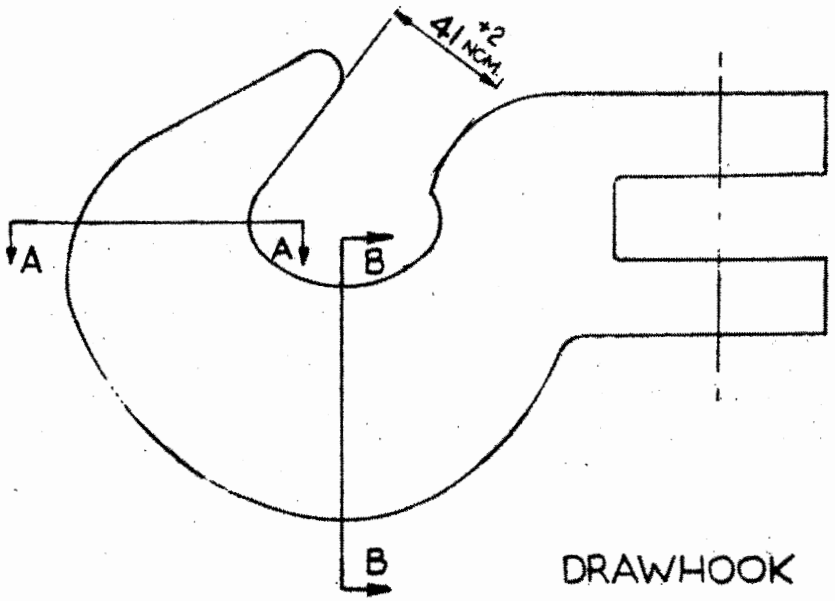
(g) The jaw end of the bar coupler to be checked for wear and restored by welding to nominal size.

(h) The spherical bearing assembly is to be renewed when the total axial float between the two components is equal to or greater than 4 mm. (See Fig. 64 A).

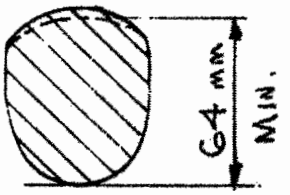
(i) The pin hole in the bar coupler must not exceed Ø55 mm in any direction. It must be repaired in accordance with Engineering Instruction WF.171.

(j) Side control plungers (See Fig. 64) should be examined for wear and general condition. If worn to flats of approximately 3/32", they must be reconditioned.

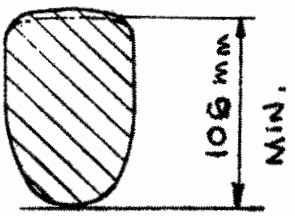
(k) The front and back follower on the tailpin assembly should be visually examined for general condition and replaced where excessive wear is observed. The meximum clearance between front follower casting and guides is 3/16" per side.



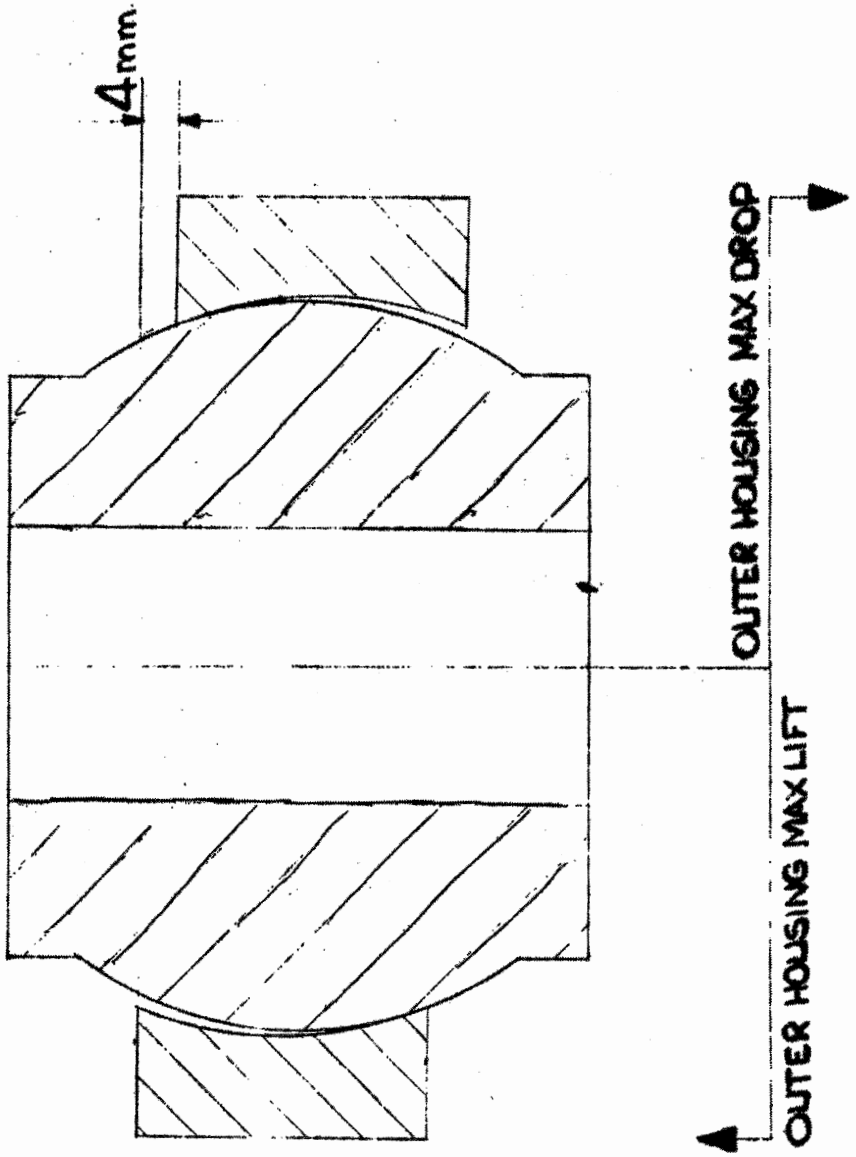
DRAWHOOK FIG. 62 A



SECT. A-A



SECT. B-B



SPHERICAL BEARING — SCRAPPING LIMIT

FIG. 64 A

COUPLING AND UNCOUPLING OF INTERMEDIATE WAGONS FOR ARRANGEMENT OF BAR COUPLER (SEE FIGS. 64 & 65)

Wherever possible wagons should be coupled and uncoupled on reasonably straight track. Where this is not possible it will be necessary to align the couplers by suitable means before bringing the vehicles together.

When couplings have been disconnected, the mating faces and the sealing plate should be protected with polythene sheet or bags of suitable strength properly secured to the coupling head to ensure complete protection.

(a) TO UNCOUPLE

1. Release air pressure from both the brake pipe and the main reservoir pipe.

   The air pressure in the brake pipe can be released by the locomotive driver making an emergency brake application or, if no locomotive is attached to the train, by opening the brake pipe coupling cock at one end of the train.

   If there is air pressure in the main reservoir pipe, open the main reservoir pipe end coupling cock on the wagon next to the locomotive (or static air supply) and the air pressure will then exhaust through the vent hole in the locomotive (or static air supply) end cock when this is in the closed position. Alternatively a spare main reservoir end coupling hosepipe can be coupled to the hose on the end wagon and the end coupling cock opened.

2. Ensure that the air brakes on the vehicles to be moved have been released by pulling release cords on each wagon as necessary. Ensure that sufficient hand brakes have been applied to prevent movement of vehicles as appropriate.

3. Remove split pins from the four 1.1/8" dia. bolts securing the coupling. Remove nuts, washers and bolts, and then part vehicles either manually or with the aid of a locomotive. As the parting of the vehicles is carried out, care should be taken to ensure that the loose sealing plate is not dropped. This plate which is dowelled into the coupling faces, carries the four 'O' rings which provide the seals round the pipe connections in the two faces.

(b) TO COUPLE

1. Ensure that the four 'O' rings carried in the grooves of the sealing plate are in good condition, and that the faces of the sealing plate and the two couplers are clean and free from rust and particles of foreign matter, etc.

2. Attach sealing plate, by means of the dowel, to one of the coupler faces, taking care to ensure that the 'O' rings are not dislodged.

(b) TO COUPLE (Contd.)

3. Bring the two vehicles together by manual means or with a locomotive, ensuring that the dowels in the faces of the coupler engage with the holes in the sealing plate attached to the second coupler, and that the 'O' rings remain in position. In carrying out this operation, it is necessary to support the two couplers level in the horizontal plane with packings in the headstock opening, or by means of two coupling rods to Drg. F-A4-500 Inserted through the securing holes of the coupler heads (SEE FIG. 64).

4. Insert four bolts, removing the two coupling rods if fitted, and fit plain washers and nuts, and tighten the nuts with a torque spanner set at 960 lbf ins.

5. If necessary the nuts should then be further tightened with a socket spanner to bring a slot in the castellated nut in line with the split pin hole. Insert split pins as shown in Fig. 65 and open to secure.

6. Charge system with air and test coupling joint/s.

NOTE : In an emergency, and in the absence of a torque spanner, the nuts, on recoupling should be tightened sufficiently by the socket spanner so as to ensure that there is no leakage at the coupling. The vehicle should then be green carded for the coupling nuts to be tightened by torque spanner at the end of journey.

Recommended tools for coupling and uncoupling are as follows :-

(a) Adjustable torque wrench
Britool part No. EVT.1700/R
$\frac{1}{2}$" square drive O/A length 22$\frac{1}{2}$"
Range 300 - 1700 lbf ins.

(b) Converter
Britool part ESHP
$\frac{1}{2}$" square socket x $\frac{3}{4}$" square plug.

(c) Socket 1.1/8" British STD Bihexagonal
Britool part No. HB1670
1.670" A/F 2.324 OD.

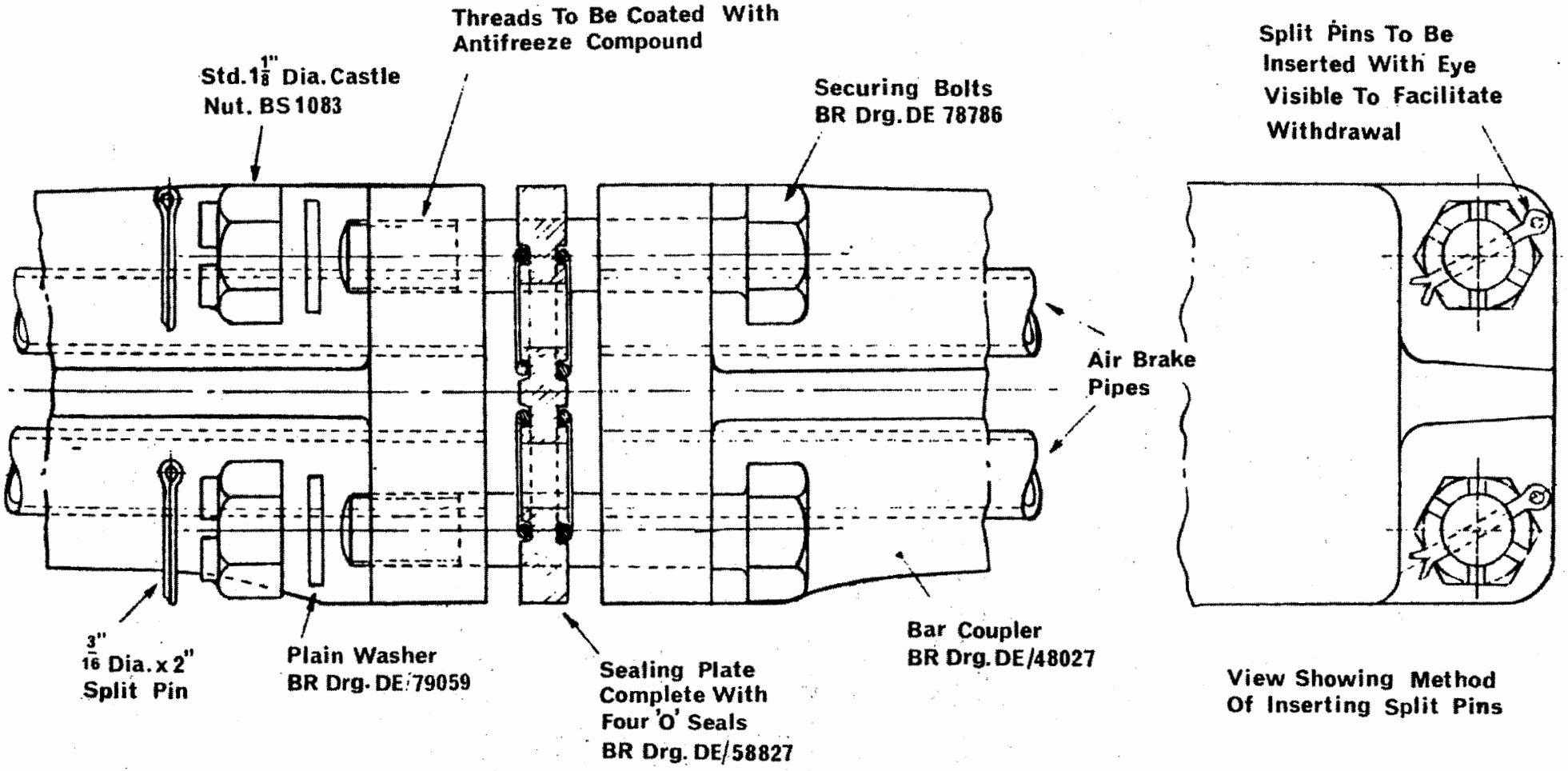
(d) Swivel handle
Britool part No. H79
$\frac{3}{4}$" square drive O/A length 17"

(e) Std. 1.1/8" open-end spanner.

NB. (i) Britool part numbers are shown; other manufacturers of equivalent performance and size are acceptable.

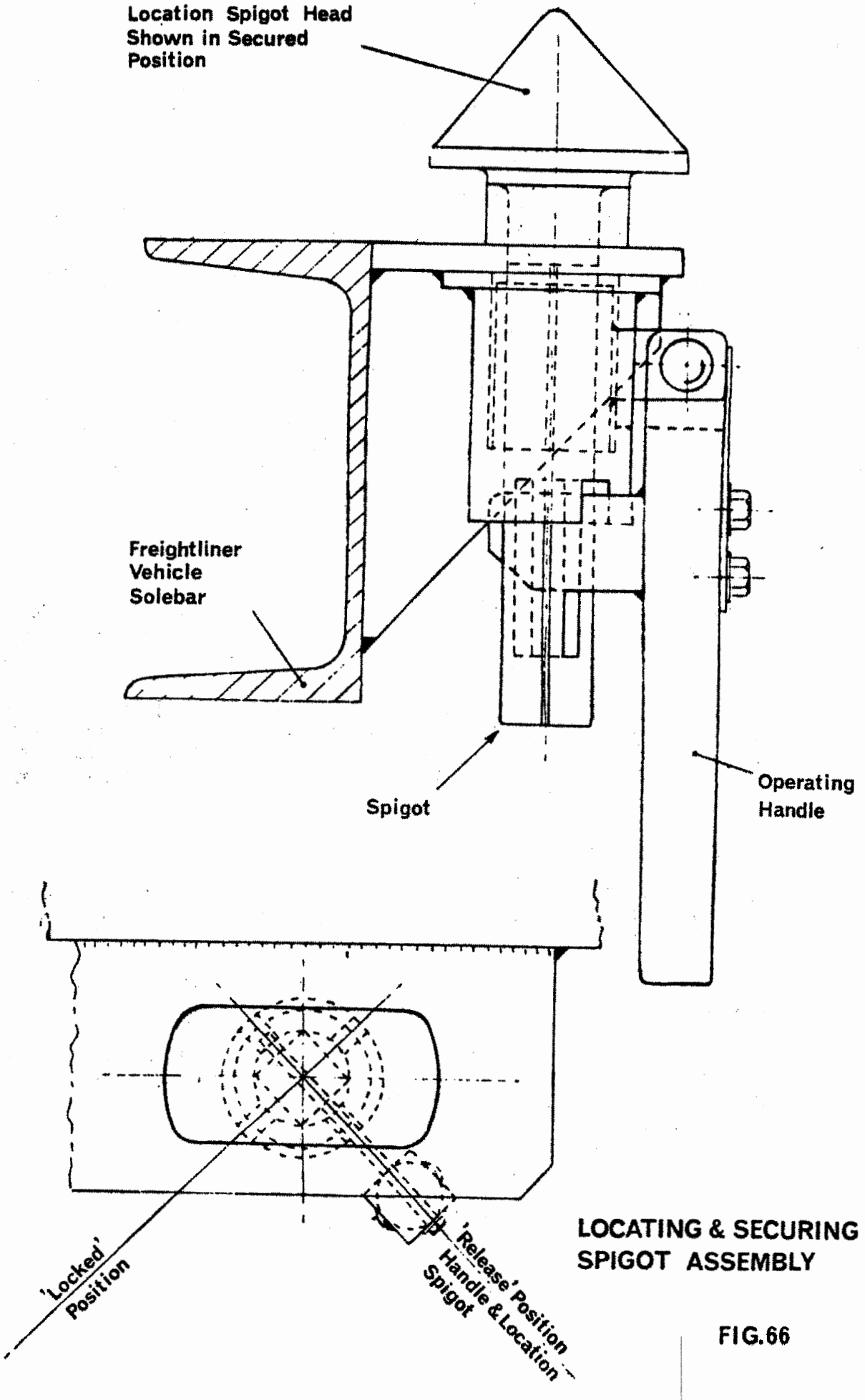
(ii) Under no circumstances must a nut be undone with a torque spanner.

The nuts and bolts fastening adjacent bar couplers are manufactured from special steel and when changing these for any reason, care should be taken to ensure that the correct replacement is fitted.



EXPLODED VIEW OF COUPLING SHOWING COMPONENTS

FIG. 65



LOCATING & SECURING SPIGOT ASSEMBLY

FIG.66

SECURING OF I.S.O. CONTAINERS

There are three types of Container securing devices fitted to freightliner vehicles thus :-

(a) Locating and Securing Spigot Assy. (FIG. 66)
(b) Retractable Twistlock Assy. Mk I. (FIGS. 67 & 68)
(c) Retractable Twistlock Assy. Mk II. (FIGS. 69 & 70)

It is the intention for all freightliner vehicles to be fitted with the Retractable Twistlock Assy. Mk II as soon as possible, securing on all four corner castings of each container.

(a) LOCATING & SECURING SPIGOT (SEE FIG. 66)

The container is positioned accurately by means of the spigots, which fit into the I.S.O. sockets provided on the freightliner underframe, and engage into the recesses in the bottom of the corner casting of the containers.

For position of location points (SEE FIG. 60 & 61).

To Secure I.S.O. Containers on the vehicle

The locating and securing spigots must be fitted into the I.S.O. sockets provided on the underframe to suit the size of container being loaded, and placed in the release position for loading of the containers.

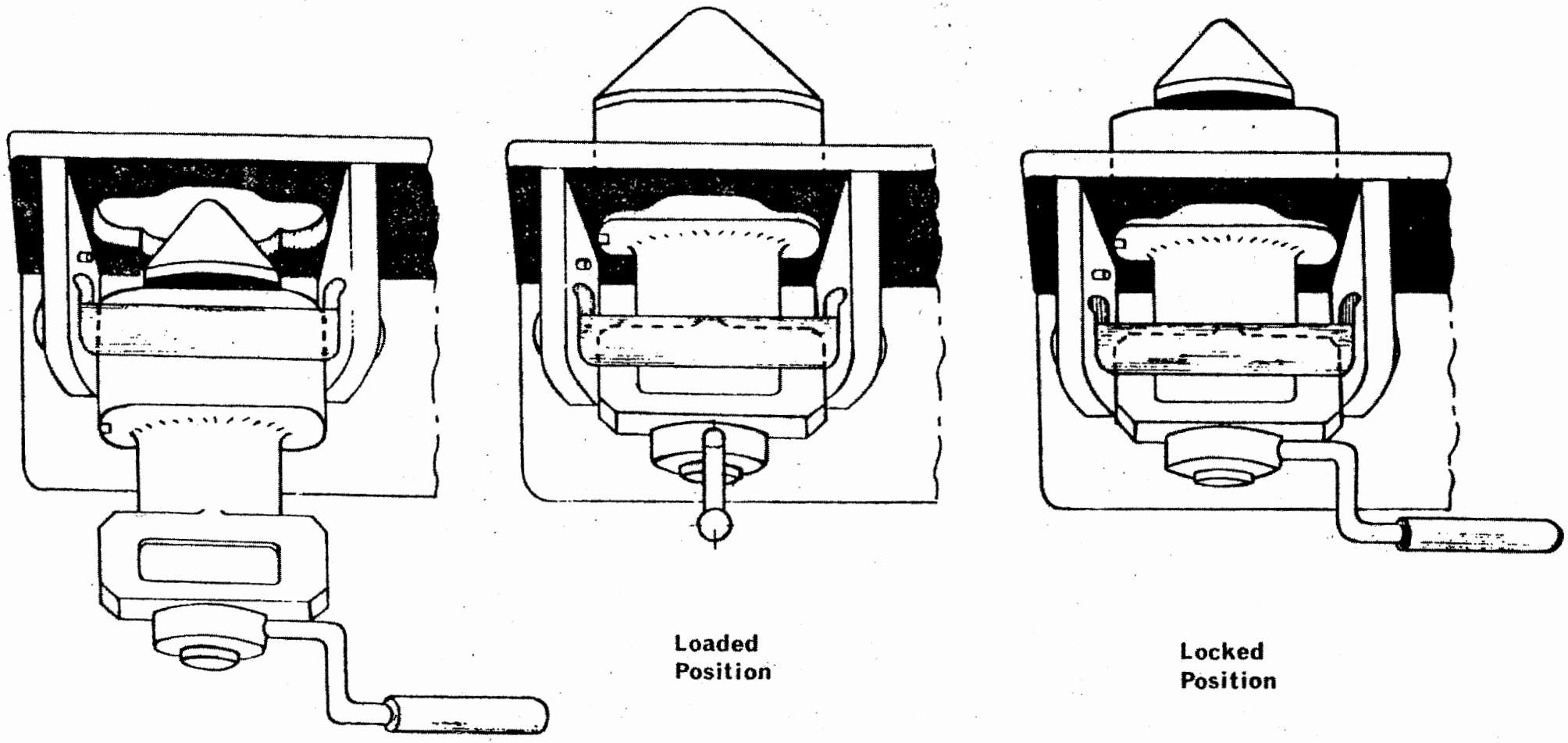
When the container is located on the wagon, the operating lever of the spigot (SEE FIG. 66) is raised in a horizontal position rotated 90° degrees in a left-hand direction, then replaced in its vertical position. This is then in the locked position and secures the spigot in the corner casting of the Container.

To release the Container

The operating lever of the spigot (SEE FIG. 66) must be raised in a horizontal position rotated 90° degrees in a Right-Hand direction and then replaced in its vertical position.

The location spigot is now in the release position inside the container corner casting, and the container can now be lifted off the vehicle.

Unless another I.S.O. Container of the same length is being loaded, the location spigot securing pin must be withdrawn, and the locating spigots removed. These two items must then be replaced in the receptacle provided on the freightliner underframe.



Retracted Position

Loaded Position

Locked Position

RETRACTABLE TWISTLOCK ASSEMBLY (Mk.I) FIG.67

(b) RETRACTABLE TWISTLOCK ASSEMBLY MK. I (SEE FIG. 67 & 68)

This is an improved type of twistlock fitting of retractable design.

The advantages of this design is the elimination of loose items, which in service tend to get misplaced or lost.

To Secure I.S.O. Containers on the vehicle

The centre assembly of the twistlock is raised from the retracted or stowed position.

This operation is carried out by first lifting the gravity locking cross shaft, the centre assembly is then pulled slightly forward and pushed upwards and back, this action ensures that the bottom of the rear face of the centre assembly engages in a slot in the back plate of the main housing (SEE FIG. 68) thus supporting the entire centre assembly. The twistlock operating levers must be pointing outwards from the vehicle, thus ensuring the twistlock heads are in the loading position, and acting as location points ready to accept the Containers.

When the container has been loaded, the twistlock operating levers are turned through 90^{o} degrees (this places them in line with the vehicle) this operation locks the twistlock head in the corner casting of the container.

To release the Container

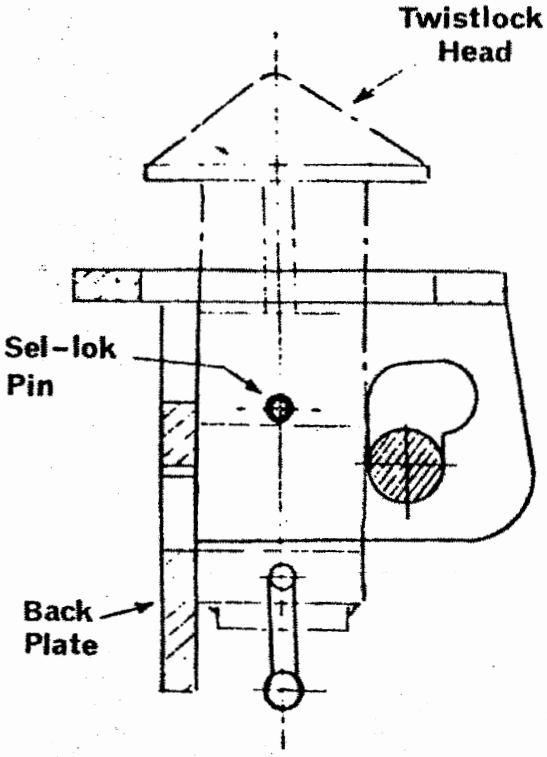
The twistlock operating levers are turned through 90^{o} degrees, the levers will now be pointing outwards from the vehicle and the twistlock heads will be unlocked inside the corner castings. The container can now be lifted off the vehicle.

To Retract the Twistlock Centre Assembly

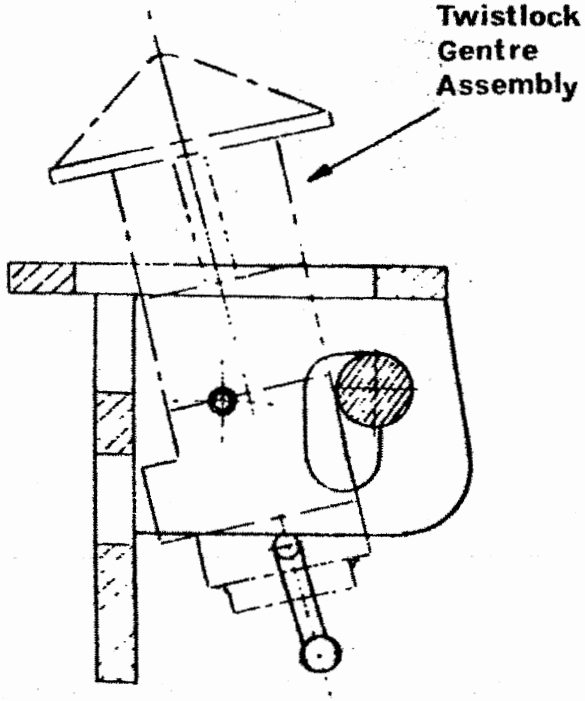
Unless another I.S.O. Container of the same length is being loaded the twistlock centre assembly must be retracted. To carry out this operation it is necessary to place the twistlock operating lever in the locked position (i.e. in line with the vehicle). The gravity locking cross shaft must now be lifted, and the centre assembly pulled slightly forward and allowed to fall (SEE FIG. 68). The twistlock head will now be below loading floor level and trapped in the back plate of the main housing, the gravity locking cross shaft will fall and the centre assembly will be secured in the correct retractable position (i.e. the operating lever in line with the vehicle).

NOTE :-

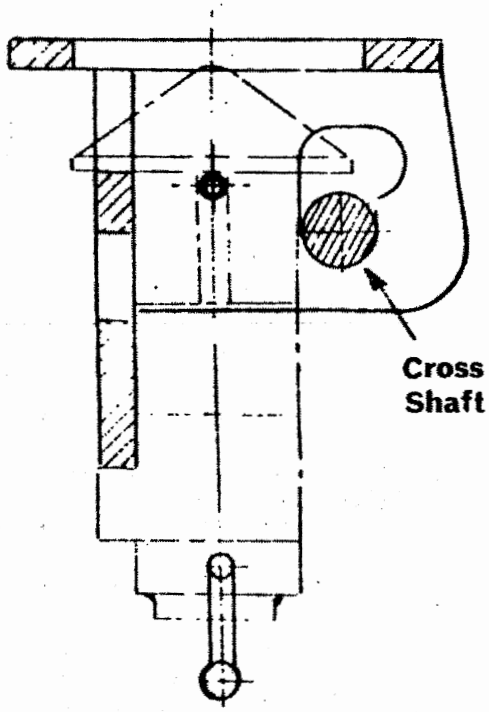
The twistlock centre assembly is held captive in the main housing by means of a "Sel-lok" pin, inserted in the main housing side plate and engaging in a groove machined in the twistlock centre assembly.



Locked
Position



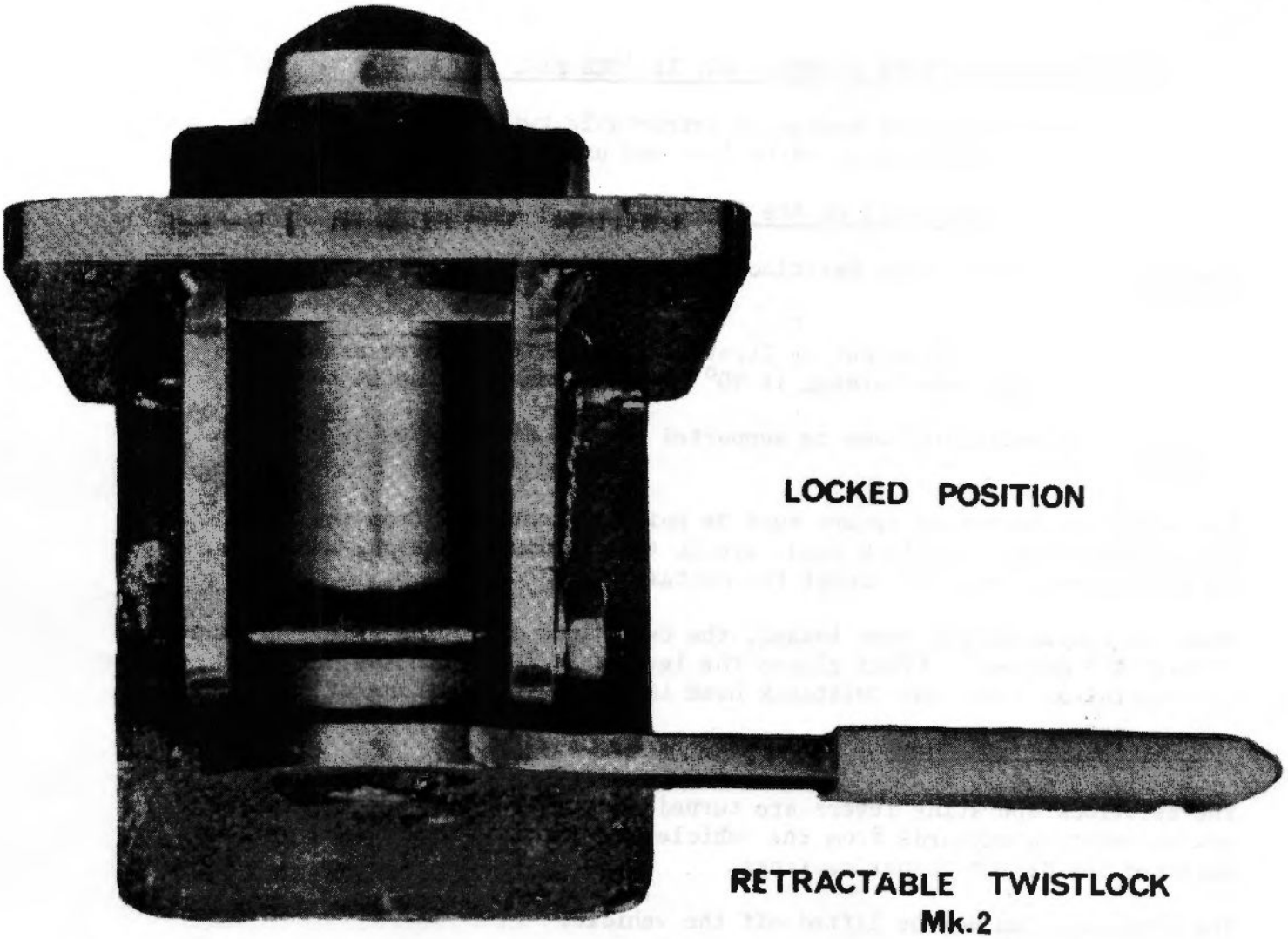
Cross Shaft Lifted, With
Twistlock Centre Assembly
Pulled Forword



Retracted
Position

OPERATIONS FOR RETRACTION OF TWISTLOCK CENTRE ASSEMBLY (Mk 1)

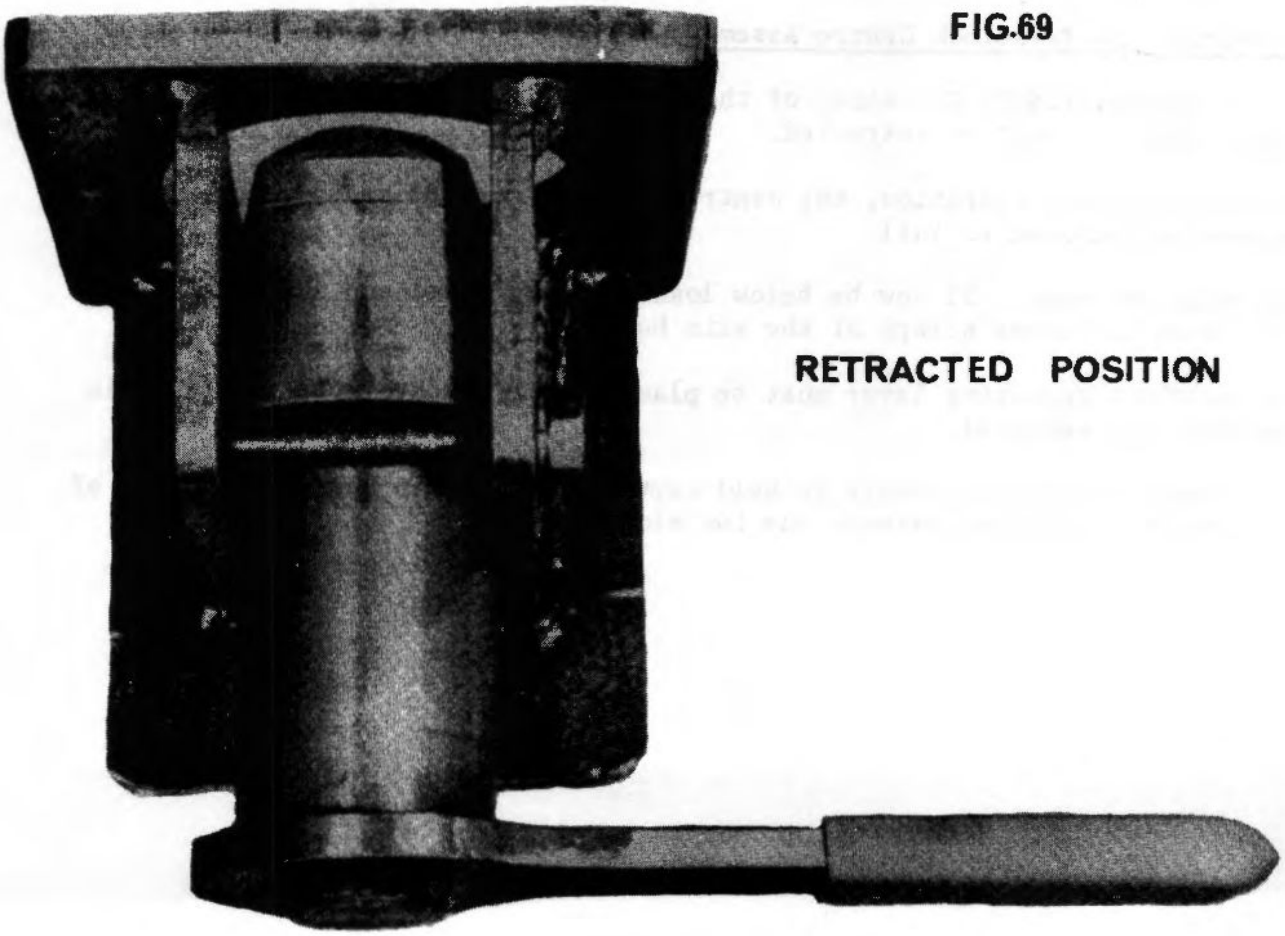
FIG. 68



LOCKED POSITION

RETRACTABLE TWISTLOCK
Mk.2

FIG.69



RETRACTED POSITION

(c) RETRACTABLE TWISTLOCK ASSEMBLY MK. II (SEE FIG. 69 & 70)

This is a further improved design of retractable twistlock assembly, to simplify the operations required to load and unload I.S.O. containers.

To secure I.S.O. containers on the vehicle

The centre assembly of the twistlock is raised from the retracted or stowed position.

This operation is carried out by first lifting up the centre assembly as far as it will travel, then turning it 90° degrees and allowing it to fall.

The centre assembly will now be supported on the side plates of the main housing.

The twistlock operating levers must be pointing outwards from the vehicle, thus ensuring the twistlock heads are in the loading position, and acting as location points ready to accept the container.

When the container has been loaded, the twistlock operating levers are turned through 90° degrees. (This places the levers in line with the vehicles), this operation locks the twistlock head in the corner casting of the container.

To release the Container

The twistlock operating levers are turned through 90° degrees the levers will now be pointing outwards from the vehicle and the twistlock heads will be unlocked inside the corner castings.

The container can now be lifted off the vehicle.

To Retract the Twistlock Centre Assembly

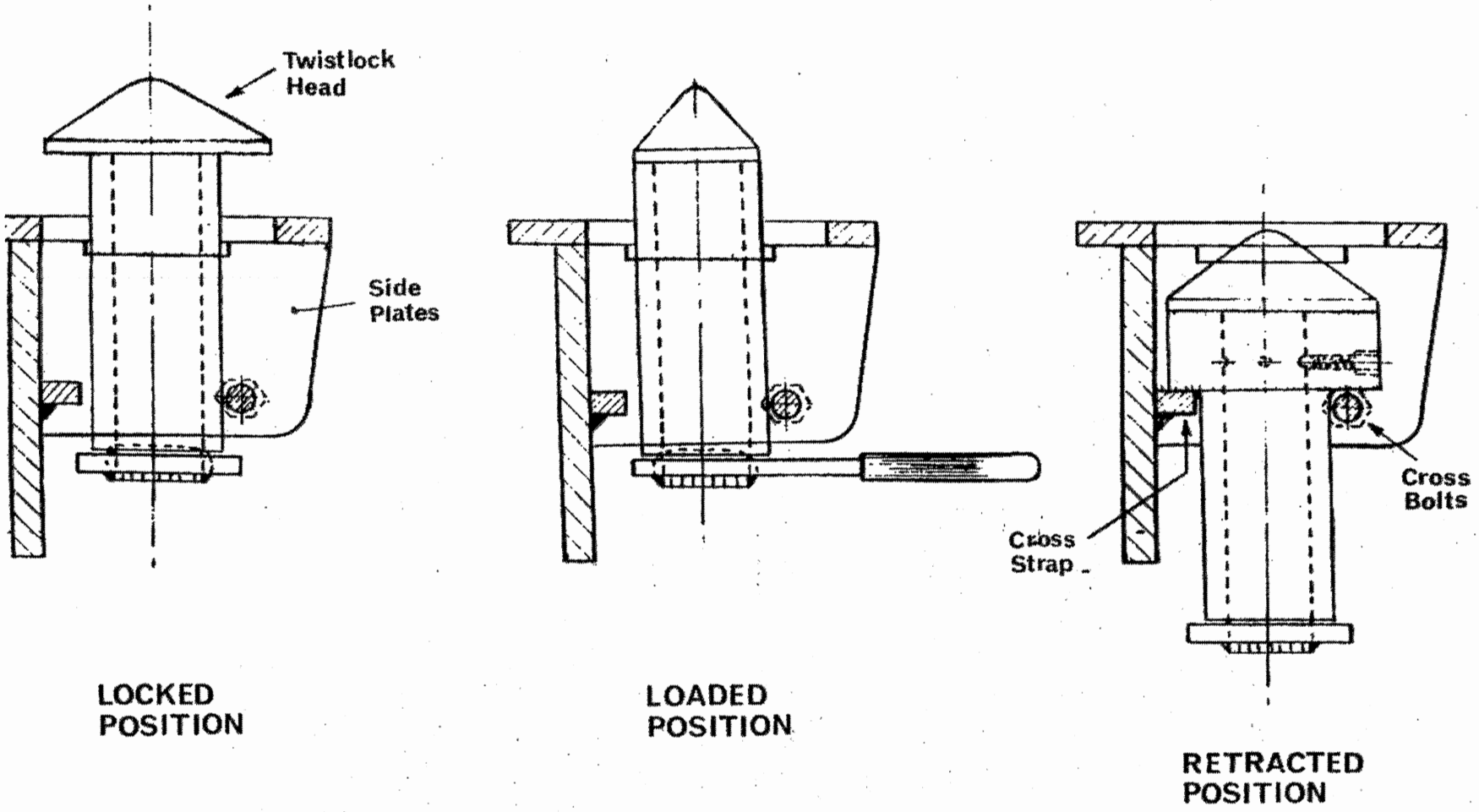
Unless another I.S.O. Container of the same length is being loaded the twistlock centre assembly must be retracted.

To carry out this operation, the centre assembly must be raised, turned 90° degrees and allowed to fall.

The Twistlock head will now be below loading floor level and supported on the cross bolt and cross straps of the main housing.

The Twistlock operating lever must be placed in the locked position (i.e. in line with the vehicle).

The Twistlock centre assembly is held captive on the main housing by means of the cross bolt secured between the two side plates.



RETRACTABLE TWISTLOCK ASSEMBLY (Mk.2)

FIG-70

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PAINTING & LETTERING

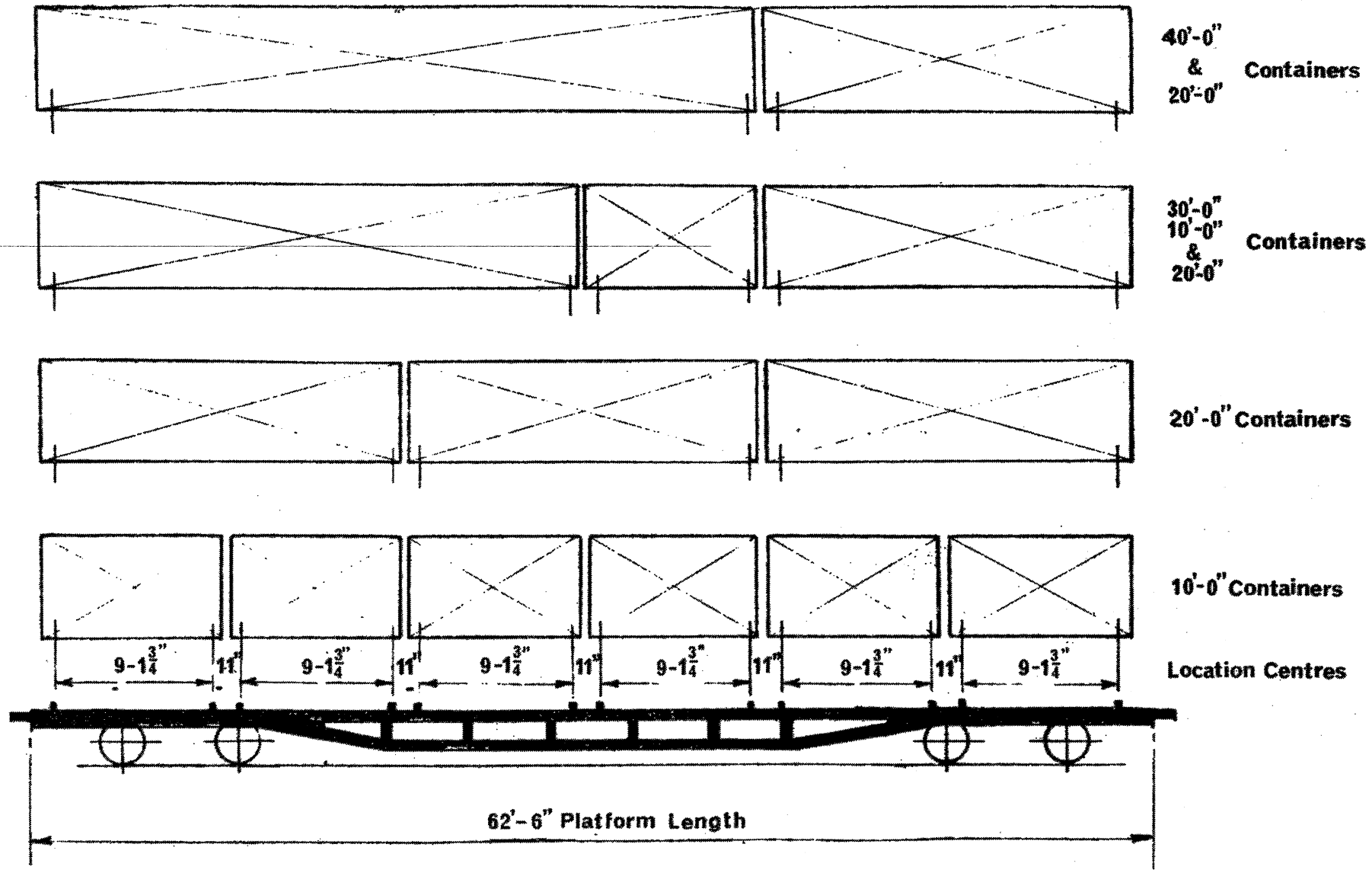
Painting to be generally in accordance with General Instruction No. 10 Section 1.

Bogies to be painted "Black".

Solebars and Headstocks to be painted "Blue"

Bar Couplers to be painted "Blue".

Wagons with a platform height of 3'-4½" (including camber) and below, to be painted with a ½" Horizontal white strip approximately 6" long on the Bogie side frame above the axleboxes R.H. end R.H. Bogie on each side of the vehicle (Engineering Instruction No. WF2.



VARIOUS SIZES OF CONTAINERS
POSITIONED OVER LOCATION POINTS

FIG.71