ARTICULATED TWO TIER CAR TRANSPORTER WAGON (CARTIC 4)

36RE

DESCRIPTION & MAINTENANCE INSTRUCTIONS

Nº 73

FOR SPARES LIST SEE SEPARATE SCHEDULE ISSUED BY MECHANICAL ENGINEER (DESIGN) DERBY.

DESCRIPTION OF UNIT.

Each Cartic unit consists of four articulated vehicles mounted on five E.S.C.C. Ridemaster bogies. The outer vehicles only are fitted with standard B.R. buffing and drawgear to enable the units to be coupled to a similar unit or other rolling stock.

The vehicles are designed to work as a fixed set and should a fault develop on any one vehicle which renders it unfit for service, then the whole unit must be withdrawn until the fault has been rectified or the defective vehicle has been replaced by an identical vehicle from another unit. In the event of a defective brake however, isolation can be carried out using the procedure given on Page 27.

Units for British Rail have air operated brakes; certain of the P.O. units have a through vacuum pipe in addition to air brakes. The outer vehicles of the unit have standard brake hose couplings, connections between intermediate vehicles being permanent.

There are fixed loading plates between the vehicles over the articulating bogies and standard hinged extension plates at the outer ends enabling cars to be driven through the units to the next vehicle.

Each unit is supplied with 56 adjustable double wheel chocks for securing the rear wheels of the cars.

Access to the top deck is by ladders at diagonally opposite corners on each of the four vehicles in a unit.

General particulars are as follows :-

Overall length of unit - 203'-5" over buffers.

Bogie centres of individual vehicles in unit - 46'-6"

Clear inside width at waist (bottom deck) - 7'-1"

Clear inside width (top deck) - 7'-6.1/8"

Maximum available inside height for cars (bottom deck) - 5'-0"

Maximum height of car to be loaded in bottom deck - 4'-9½" @ 8'-11" Wheelbase.

Continued.....

Maximum height of car to be loaded on top deck - To be determined with relation to appropriate loading gauge and position of car on Cartic.

Bogies - Cast Steel Ridemaster Bogies with 2'-8" dia. wheels, 4.7/8" dia. journal roller bearing wheel sets. 6'-6½" wheelbase.

Total tare of unit - 61T - 1C.

Maximum load - 8 tons/vehicle. (32 tons/unit)

Minimum negotiable curve - 3 chains.

Brakes - Air operated push rod type (i.e. 1 brake block per wheel) Screw hand brake to outer bogies only.

Maximum Running Speed - 75 m.p.h.

Units conform to the W3 Gauge.

4 x 8 TON ARTICULATED CAR TRANSPORTER

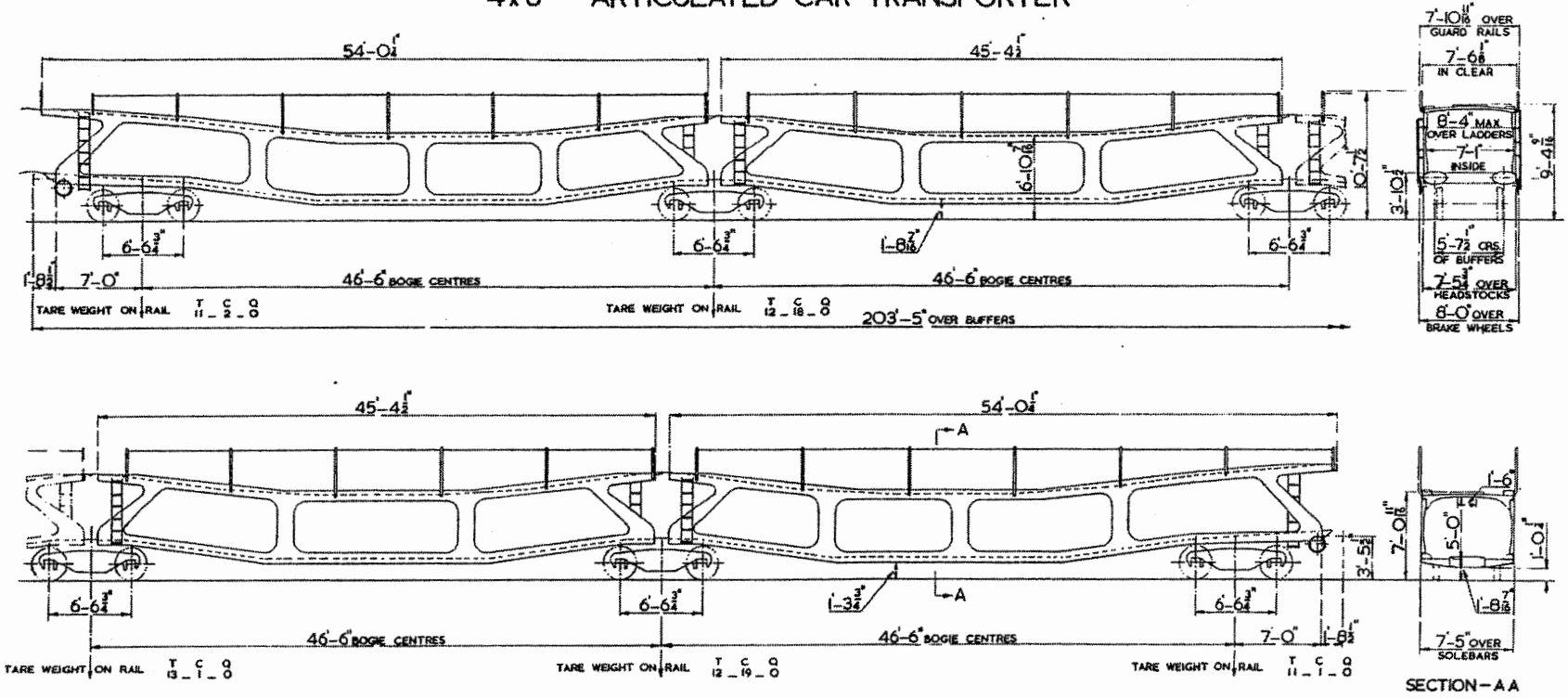


FIG 1

4x8TON ARTICULATED CAR TRANSPORTER

(VEHICLE DATA)

LETTERED	TEL-CODE	LOT No.	QTY.	VEHICLE NUMBERS
CARTIC 4	CARTIC 4	30770	8	M95001, M95051*, M95052, M95002; M95003, M95053*, M95054, M95004; M95005, M95055*, M95056, M95006; M95007, M95057*, M95058, M95008; M95009, M95059*, M95060, M95010; M95011, M95061*, M95062, M95012; M95013, M95063*, M95064, M95014; M95015, M95065*, M95066, M95016.

ASTERISK INDICATES INTERMEDIATE VEHICLE CARRYING NO BRAKE EQUIPMENT.

TOTAL TARE:- 61T. - 1C.
MIN. CURVE:- 3 CHAINS.
BRAKE:- SCREW TO OUTER BOGIES, AIR TO EACH BOGIE.
FLOOR:- CHEQUERED PLATE, EXPAMET RUNWAYS.
BODY:- STEEL.
WHEELS:- 2'-8" DIA. (B.R. PROFILE)
JOURNALS:- 4 7/8" DIA.
BUFFER HEADS:- 24"x12 1/2" (SPECIAL).
BUFFERS:- SELF CONTAINED.
COUPLINGS:- SCREW.
CHOCKS:- DOUBLE, ADJUSTABLE AS REQD.(56 REQD PER UNIT)
LOADING PLATES:- HINGED AT OPPOSITE CORNERS.

THIS DATA APPLIES TO B.R. UNITS

SEE PAGE 5 FOR DETAILS OF PRIVATE OWNERS UNITS

FIG 1A

The general data shown on Page 4 for the British Rail units is also applicable to the Private Owners Units. The following are additional particulars of the individual units :-

Owner	Total No of Units	Vehicle Nos	Tyre Profile	Remarks
Silcock and Colling Ltd.	31	0001 to 0031	0001 to 0007 have B.R. profile. 0008 to 0031 have Heumann Profile	
M.A.T. Ltd.	13	401 to 413	401 to 407 have B.R Profile. 408 to 413 have Heumann Profile	M.A.T.units have a through vac pipe in addition to the air brake

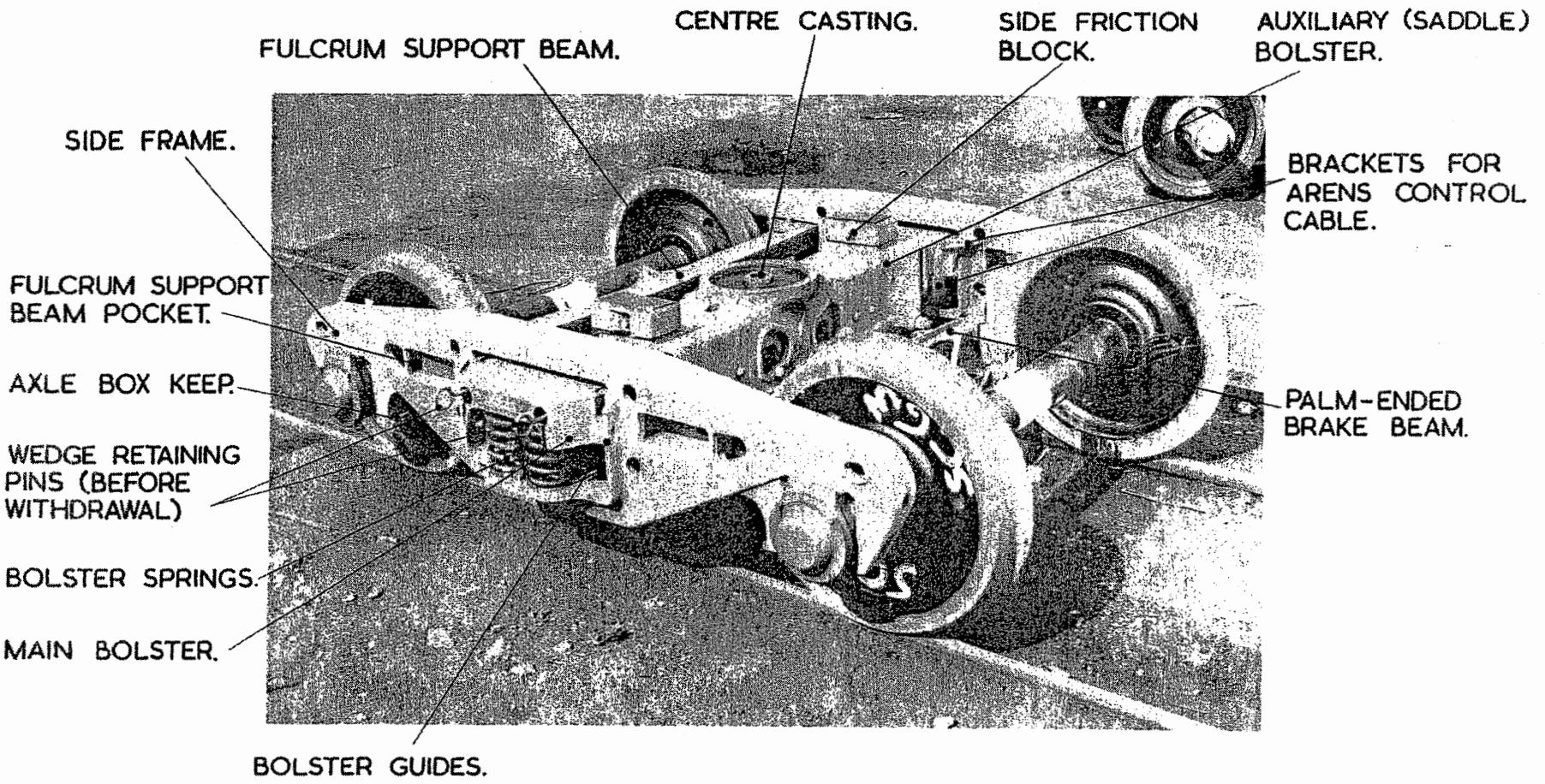


FIG 2. RIDEMASTER BOGIE – OUTER BOGIE POSITION (NON-ARTICULATING)

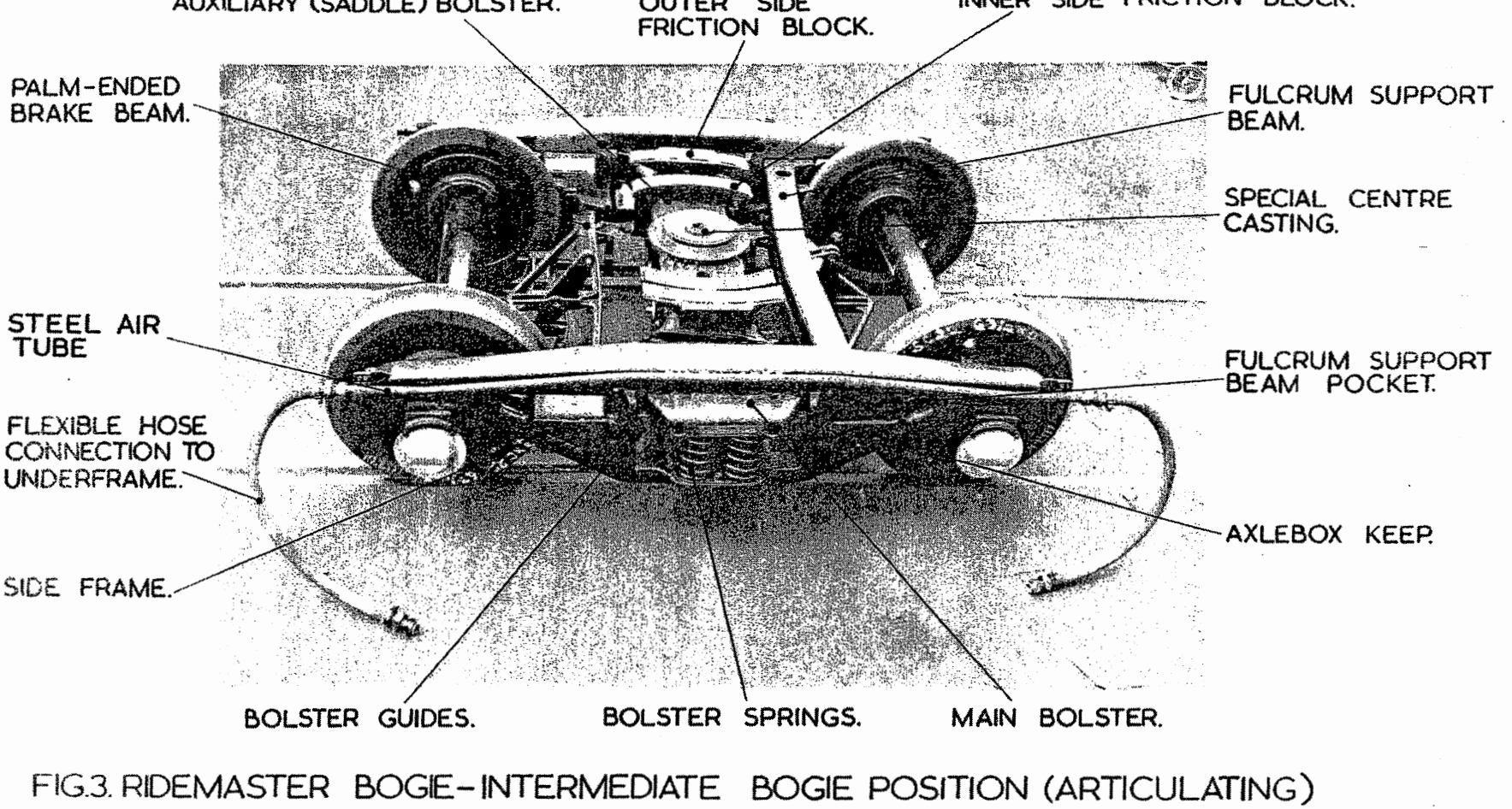


FIG.3. RIDEMASTER BOGIE-INTERMEDIATE BOGIE POSITION (ARTICULATING)

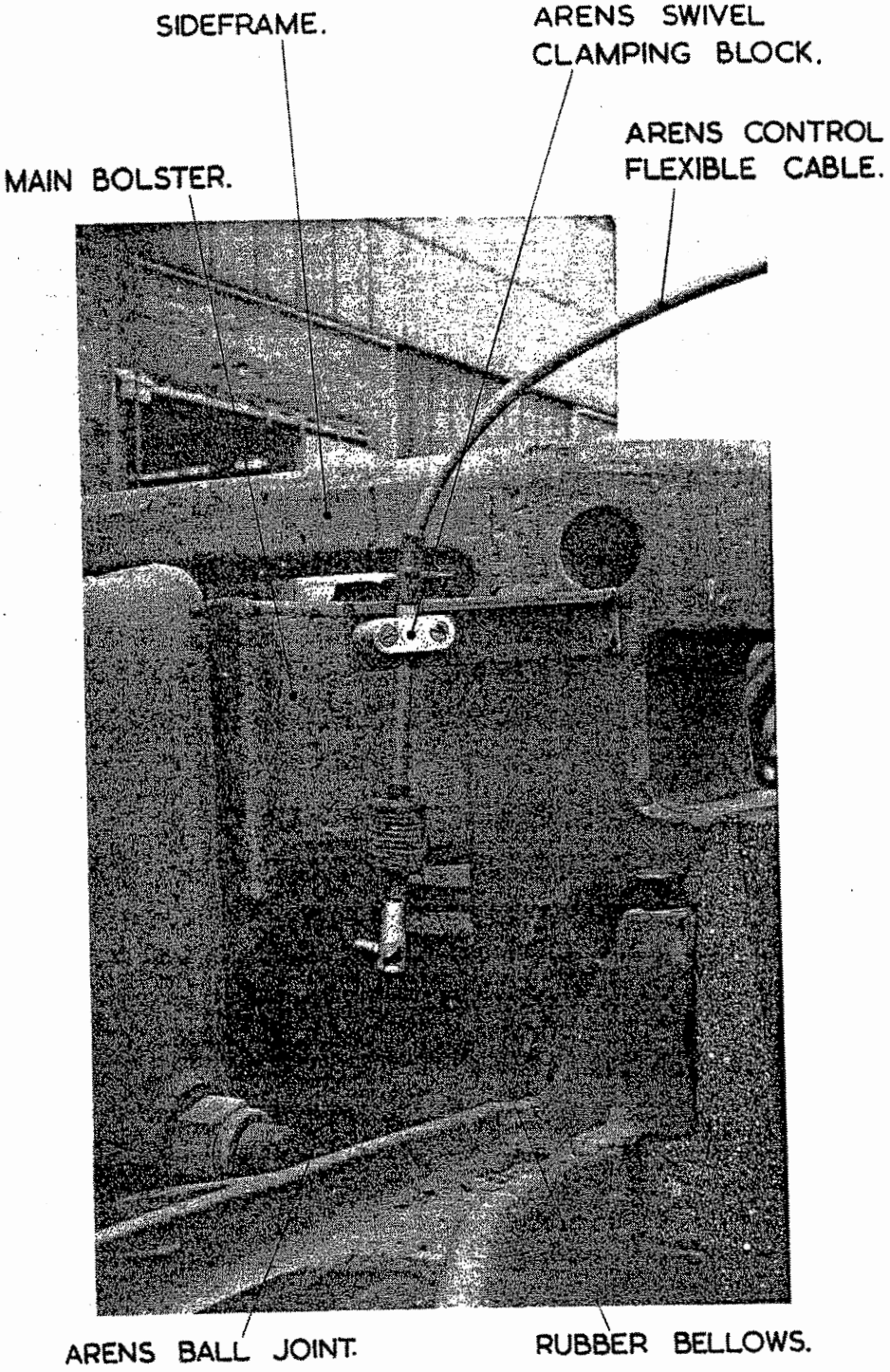


FIG. 4.

CONNECTION OF ARENS CONTROL FLEXIBLE CABLE AT BOGIE.

RIDEMASTER BOGIES.

1. Outer Bogies - Non Articulating.

This bogie is shown in Figure 2. It has a cast steel frame fitted with 2'-8" dia. wheels with 4.7/8" dia. journals and roller bearing axleboxes at 6'-6¾" (2 metre) centres.

The bogie frame is made up of four main castings :- two side frames, a main bolster and an auxiliary (or 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. 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. Retaining pins are inserted when assembling these wedges and care must be taken to ensure their withdrawal before the bogie is placed in service.

The auxiliary bolster also incorporates the bottom centre casting. It is fitted over the main bolster 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 auxiliary bolster to the central position as any lateral movement tends to distort the rubber.

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

Continued.....

Additionally there is a spring tensioned bolt providing a fixed (minimum) bearing pressure between the two friction surfaces. This tension is adjusted during assembly at Main Works and should not require re-adjustment during service.

The side friction blocks which are carried on the auxiliary bolster are spring loaded so that they are always in contact with those on the underframe. The wearing surfaces are of hardened steel and should be lubricated in the same manner as other types of vehicle. With the underframe assembled on the bogie the side bearers are under a load of 3,100 lbs. each and the springs have compressed 1" (two springs/sidebearer) There is approximately ½" further travel of the sidebearer caps to the solid condition.

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, and the top of the box is domed slightly to allow the sideframe to rock in a vertical plane. The clearance between axlebox and guide is adjusted to allow this.

The bogie brakework is of the simple push-rod type providing one brake block per wheel. The brake blocks are carried on palm-ended brake beams which run in guides cast on the inside of the side frames. Spring steel inserts are fitted tothese guides. The fixed fulcrum brake lever is carried by the fulcrum support beam, the ends of which fit into sockets cast in the side frames. Clearance is provided in these sockets to permit the movement of the side frames.

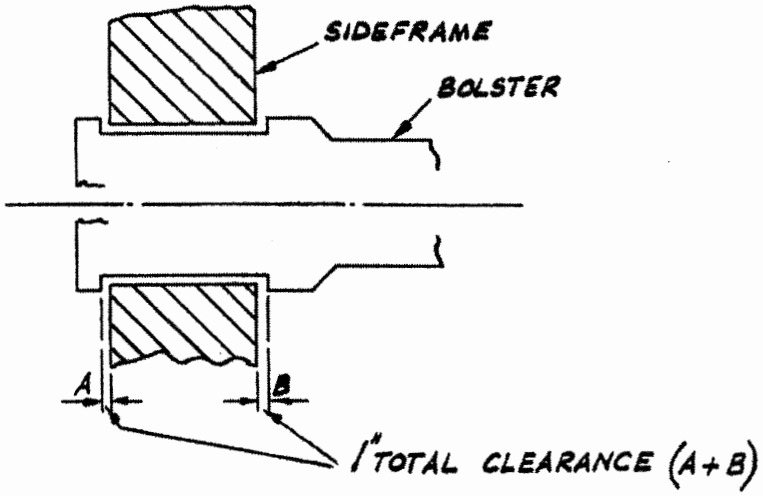
Continued.....

An Arens control flexible cable transmits to the variable load brake valve on the underframe the deflection of the bolster springs relative to the side frame. Detail of this is shown in Figure 4 and described further in the section on brakework.

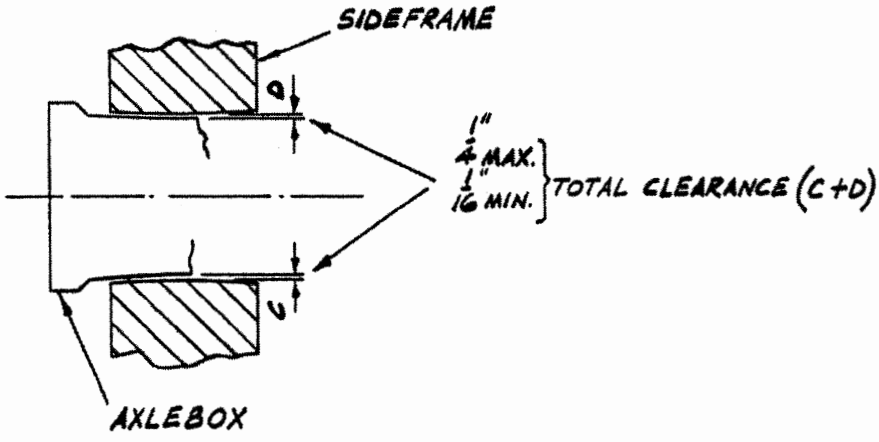
Maintenance of the bogies consists of regular inspection of clearances, checking for broken bolster springs and lubrication of axleboxes as necessary.

The recommended clearances are as follows :-

MAIN BOLSTER TO SIDE FRAME.
FIG.5.



AXLEBOX TO SIDE FRAME.
FIG.6.



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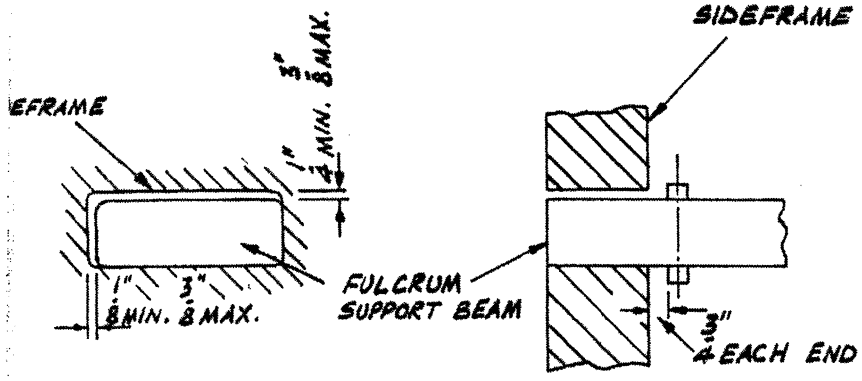
FULCRUM SUPPORT BEAM TO SIDE FRAME.
FIG.7.



2. Intermediate Bogies (Articulating)

The bogie is shown in Fig.3. The description of the outer bogie applies also to the intermediate bogie the only differences being as follows :-

(a) Stiffer bolster springs are fitted.

(b) The centre casting incorporated on the auxiliary bolster is a special type to accommodate the articulating castings.

(c) Two pairs of side friction blocks are fitted to the auxiliary bolster, the outer pair being spring loaded as for the outer bogie and the inner pair being non-resilient. These blocks have hardened steel wearing surfaces as on the outer bogies. A gap of $\frac{1}{4}$" is to be maintained between the inner blocks and the respective bearers on the underframe end.

(d) Air brake pipes between the vehicles are carried along the bogie sideframe and thence via flexible hose connections to the underframe.

Articulating Arrangement and Alignment of Side Bearers at Bogie Positions.

Articulation is achieved, by inner and outer castings built into adjacent underframe ends mating together on the special centre casting provided on the intermediate bogies.

At outer bogie positions vehicles can be lifted and supported in the normal way. At intermediate bogie positions vehicles should be lifted at the ends of the headstocks and supported on the plate attached to the longitudinals behind the articulating castings.

Before the vehicles in a unit are separated the air pressure in brake and main reservoir pipes must be released.

Separating the individual vehicles in the unit involves the following work :-

(1) Uncouple the flexible hoses between the air pipes on the bogie sideframe and the vehicle underframe.

(2) Disconnect the Arens flexible control at the variable load brake valve on the underframe.

(3) Disconnect the brake pull rod between the bogie and underframe (One of the intermediate vehicles in each unit carries no brake gear and hence requires no disconnection, of Arens Control or brake pull rod.)

(4) Unbolt and remove the chequered steel loading plates bridging the gap between headstocks on both top and bottom decks.

(5) Remove centre pins from pivots (There is no cotter through these pins)

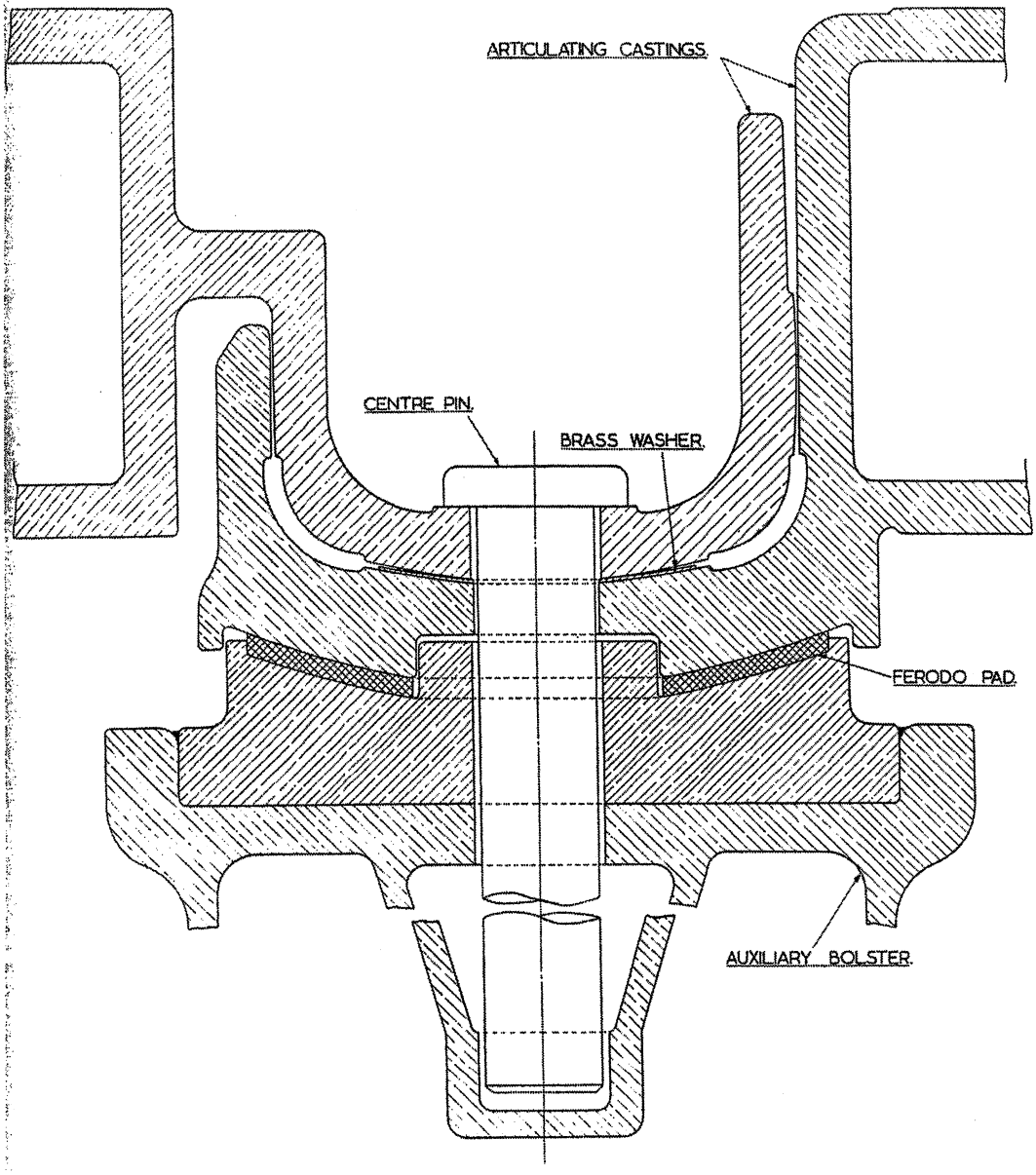
(6) Lift vehicle having inner articulating casting clear of casting on adjacent vehicle and withdraw wagon.

(7) Lift adjacent vehicle from its housing on the special centre casting and withdraw from bogie.

Coupling the vehicles together is a reversal of the above sequence, taking care to replace or renew the pad and washer in their correct position as shown in Fig.8.

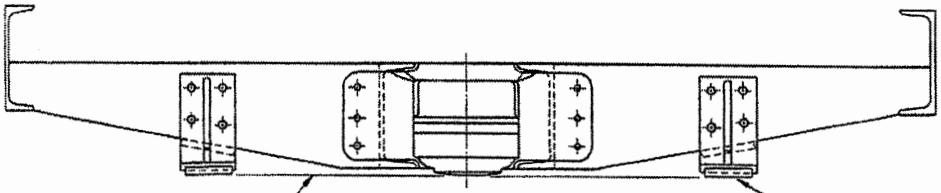
Whenever vehicles are lifted the alignment of the side friction blocks on the intermediate headstocks and the underframe bolsters must be checked and corrected if necessary. The outer bearers on the intermediate headstocks and the bearers on the frame bolster (outer bogie position) are fitted with phosphor-bronze liners which can be adjusted to give the correct alignment.

These features are shown in Figs. 9, 10 and 11. and adherence to the dimensions is important to ensure the correct loading on the resilient side friction blocks on the bogie.



ASSEMBLY OF ARTICULATING MOUNTING.

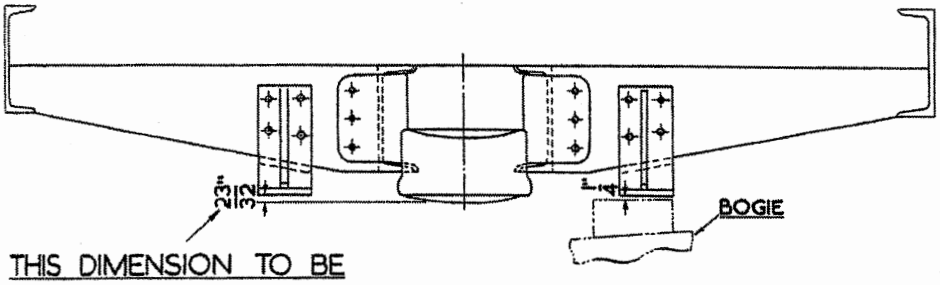
FIG. 8



ALIGNMENT OF CENTRE CASTING & SIDE BEARINGS

INTERMEDIATE POSITION

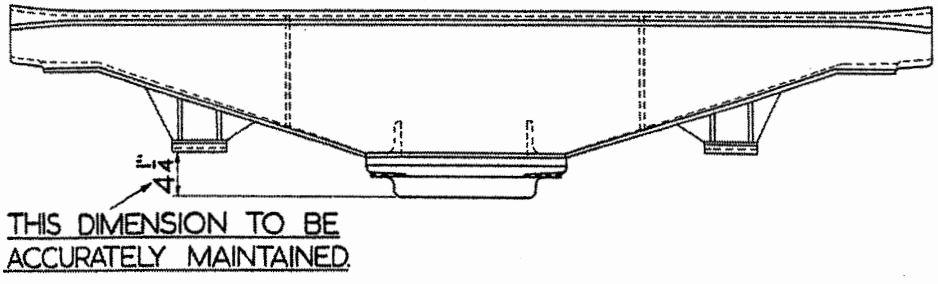
FIG. 9



ALIGNMENT OF CENTRE CASTING & SIDE BEARINGS

INTERMEDIATE POSITION

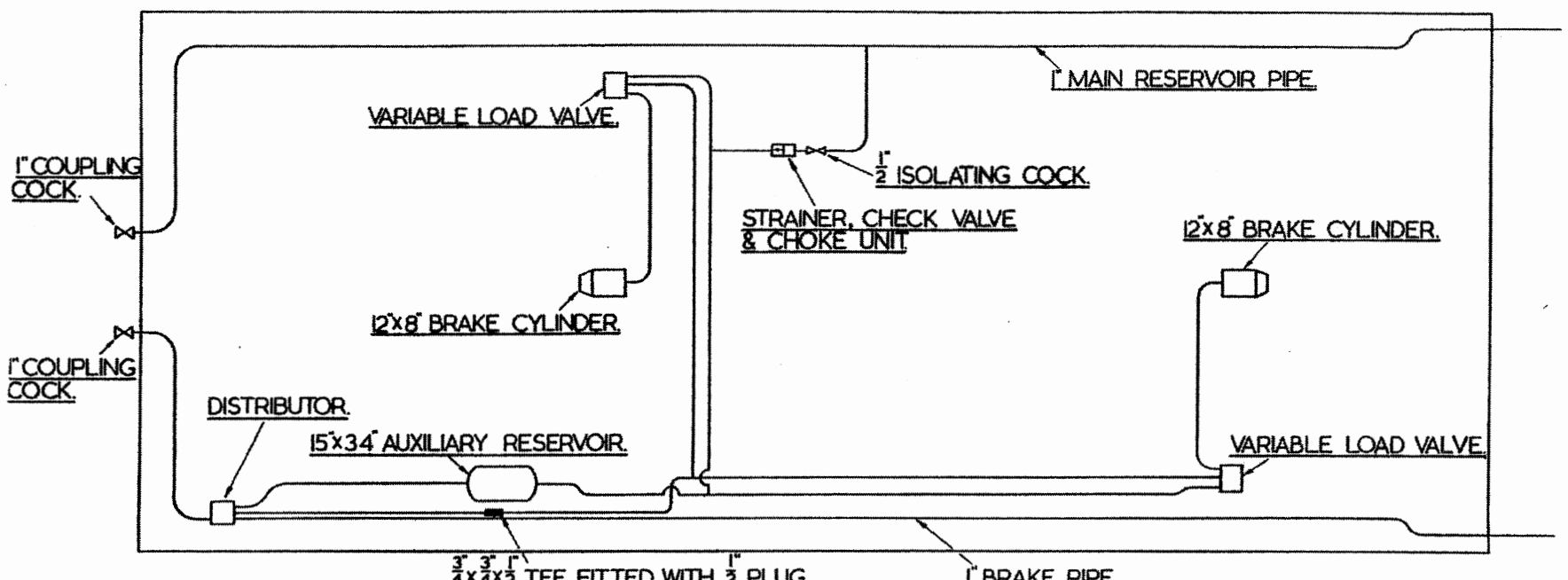
FIG. 10



ALIGNMENT OF CENTRE CASTING & SIDE BEARINGS

END POSITION

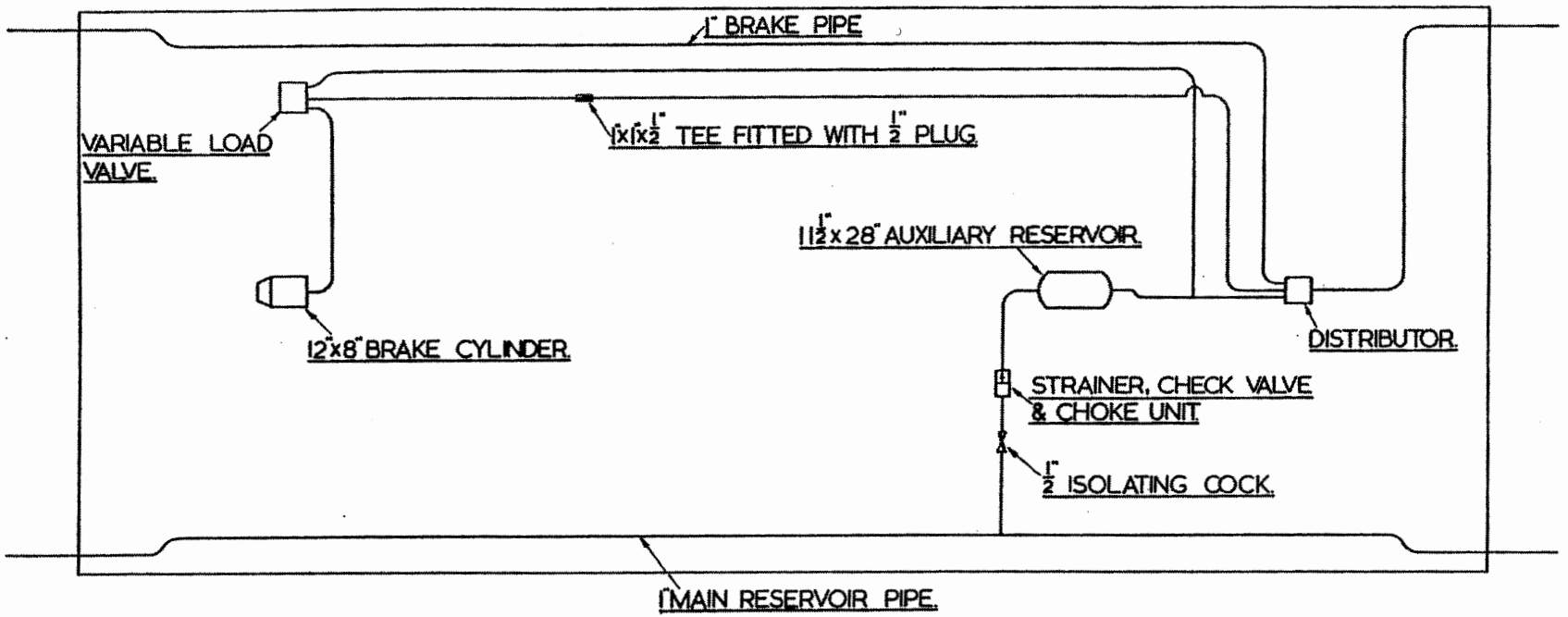
FIG. 11



SCHEMATIC BRAKE LAYOUT

OUTER VEHICLE

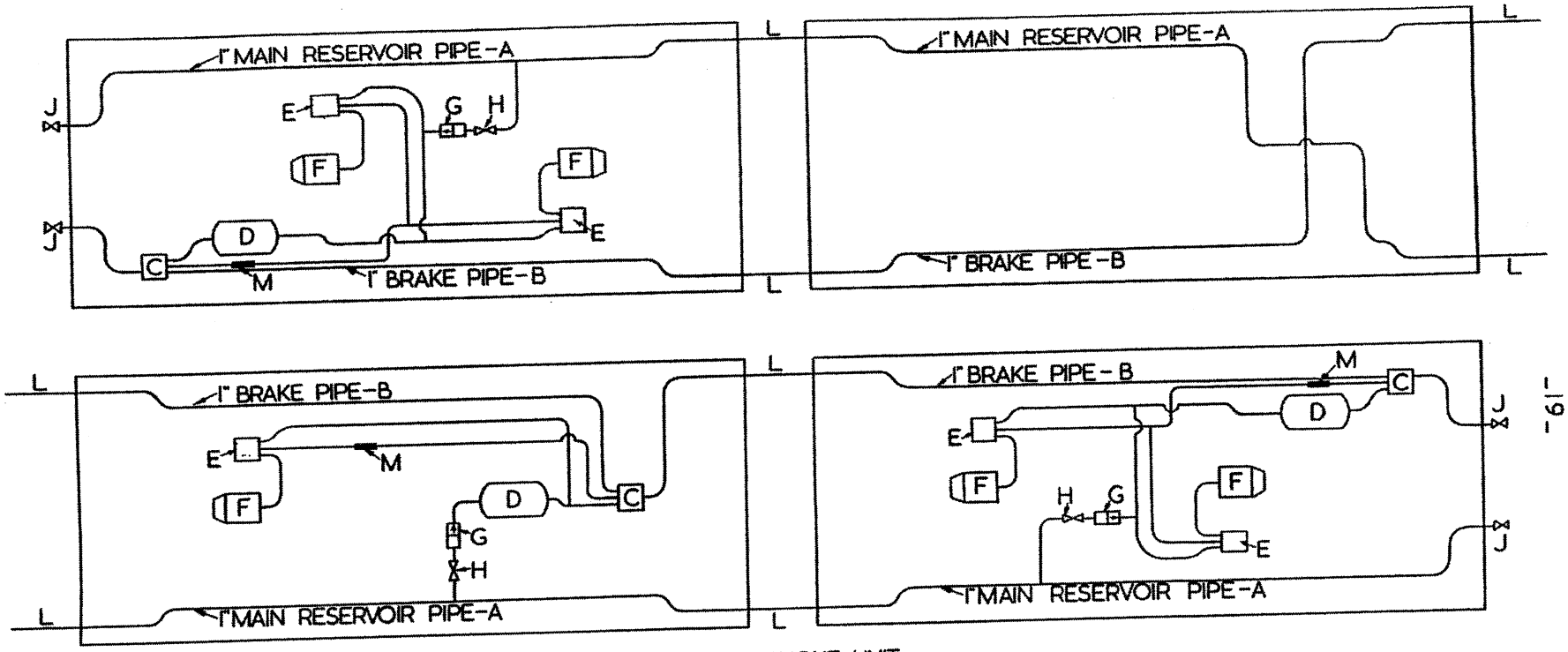
FIG. 12



SCHEMATIC BRAKE LAYOUT

INTERMEDIATE VEHICLE

FIG. 13



A – MAIN RESERVOIR PIPE.
B – BRAKE PIPE.
C – DISTRIBUTOR.
D – AUXILIARY RESERVOIR.
E – VARIABLE LOAD VALVE.
F – BRAKE CYLINDER.
G – STRAINER, CHECK VALVE & CHOKE UNIT.
H – MAIN RESERVOIR ISOLATING COCK.
J – END COUPLING COCKS.
L – FLEXIBLE HOSE CONNECTIONS BETWEEN VEHICLES AT INTERMEDIATE BOGIE POSITIONS.
M – TEE FITTED WITH $\frac{1}{2}$" PLUG.

DIAGRAMMATIC LAYOUT OF BRAKE EQUIPMENT

CARTIC SET

FIG. 14

BRAKE DESCRIPTION.

The units are fitted with an air brake operating to each bogie and a screw hand brake to the outer bogies only. The air system used is the Westinghouse Two Pipe Graduable Release Automatic Air Brake.

Schematic diagrams of the layout for outer and intermediate vehicles and for the complete unit are shown in Figs. 12, 13 and 14.

Double-acting slack adjusters of the S.A.B. type are incorporated in the brake rigging.

The following are the main components on each unit :-

(a) Main Reservoir Pipe.
(b) Brake Pipe.
(c) Distributor (3 per unit)
(d) Auxiliary Reservoir (3 per unit)
(e) Variable Load Valves (5 per unit)
(f) Brake cylinders (5 per unit)
(g) Strainer, Check Valve and Choke Unit (3 per unit)
(h) Main Reservoir Isolating Cock (3 per unit)
(j) End Coupling Cocks (Outer Vehicles only)
(k) Flexible Hose Connections at outer ends.
(l) Flexible Hose Connections between vehicles at Intermediate bogie positions.

Description and Function of Component Parts.

(a) Main Reservoir Pipe. is charged at 100 p.s.i. from the locomotive and is maintained at this pressure to charge the auxiliary reservoirs.

(b) Brake Pipe supplies air from the locomotive to control the brakes on the train. The brake is applied by reducing the brake pipe pressure. Full brake application is obtained when the brake pipe pressure is reduced to approximately 46 p.s.i. Reductions in brake pipe pressure below 46 p.s.i. have no effect and the pressure is only reduced below this value in a breakaway or in an emergency when the quickest brake application is required. Recharging the brake pipe from 46 p.s.i. to 70 p.s.i. reduces the brake cylinder pressure in proportionate steps and releases the brake.

(c) Distributor (See Fig.15)

The distributor is the Westinghouse P4P-EL type complete with pipe bracket. It controls the application and release of the brake on the vehicle in response to pressure changes in the brake pipe. The distributor is fitted with an isolating cock controlled by a handle for use in isolating the brake. (See page 27 for isolating procedure) The handle is vertical for normal operation and horizontal for brake isolated. A release valve is fitted for use in manually releasing the brake on individual vehicles. It is operated by the normal cord method from either side of the vehicle. The distributor is mounted on a pipe bracket and secured by three bolts enabling the distributor to be changed without breaking any pipe joints.

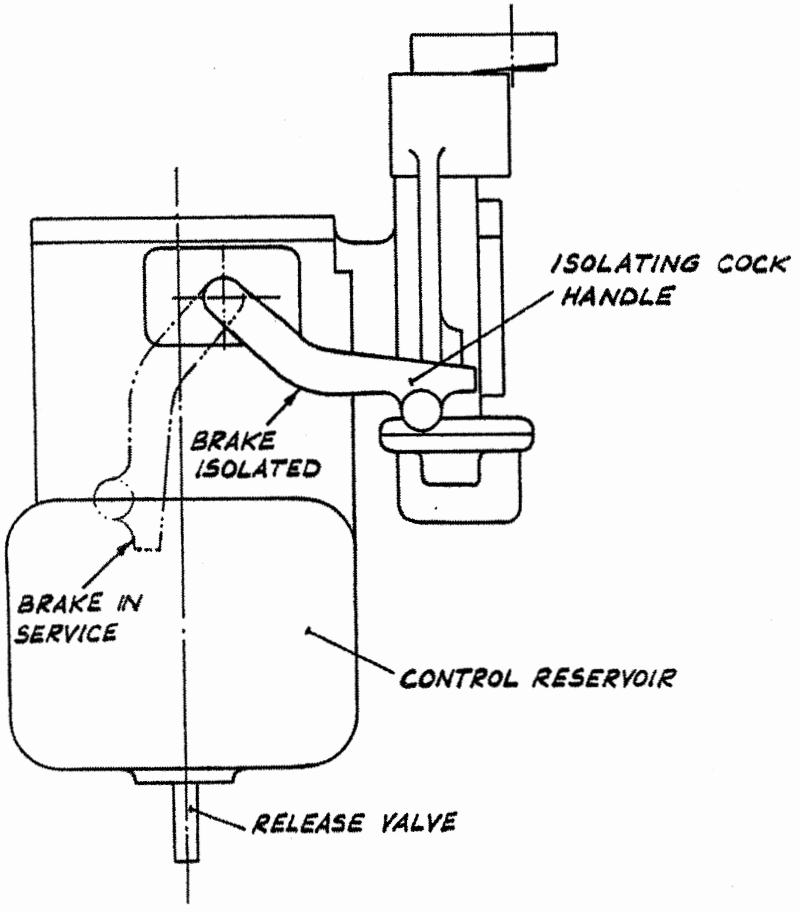


FIG. 15.

Continued.....

(d) Auxiliary Reservoir. The auxiliary reservoir is charged with air from the main reservoir pipe at 100 p.s.i. The auxiliary reservoir supplies air to the distributor, to the variable load valves and to the brake cylinders via the variable load valves, in accordance with the pressure relayed from the distributor.
When necessary the auxiliary reservoir can be vented to atmosphere by placing the distributor isolating valve in the horizontal or "isolated" position (See Fig. 15)

(e) Variable Load Valves. (See Fig.16) These are fitted, one to control each brake cylinder. They relay air from the auxiliary reservoir in proportion to the load on the bogie. The deflection of the bogie bolster relative to the sideplate is transmitted to the variable load valve by means of an Arens control flexible cable (See Fig.17) The relevant brake data is as follows :-
Outer Bogies. Variable load valve to transmit pressure of 55 lbs/sq.in. when vehicle is under maximum load; i.e. bolster spring deflection of 1.3/16" from tare position and to transmit pressure of 38 lbs/sq.in. under tare conditions, when full service brake application or emergency brake application is made.
Inner Bogies. Variable load valve to transmit pressure of 55 lbs/sq.in. when vehicle is under maximum load; i.e. bolster spring deflection of 1.3/8" from tare position, and to transmit pressure of 34 lbs/sq.in. under tare conditions, when full service brake application or emergency brake application is made.

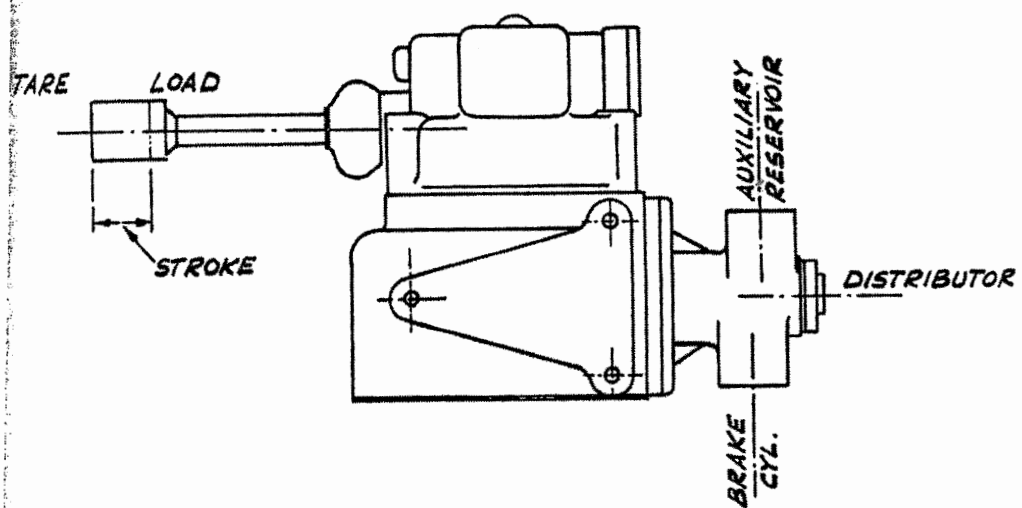


FIG. 16

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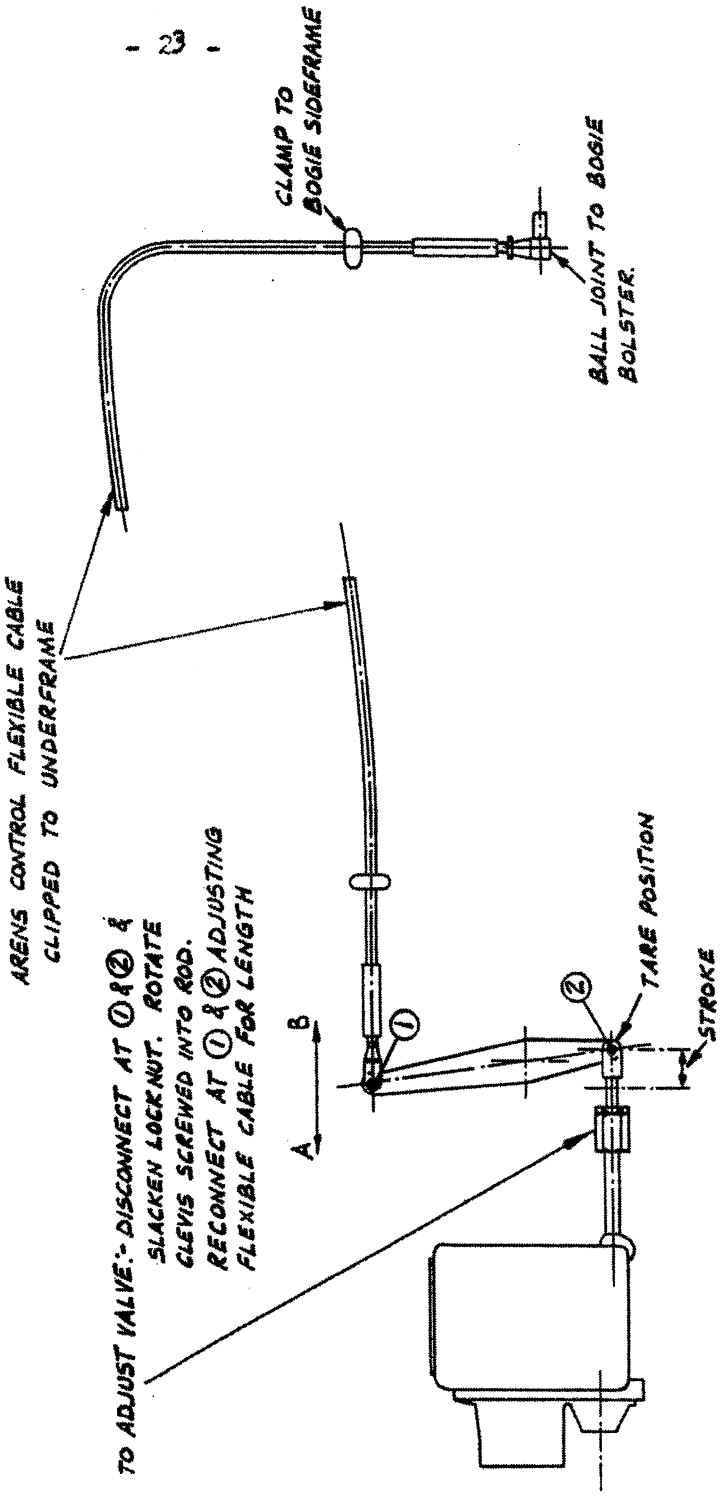

FIG.17.

(f) Brake Cylinders. One brake cylinder is fitted to operate the brake gear to each bogie and is rigidly secured by bolts to a trimmer in the underframe. They are Westinghouse 12" dia. and 8" stroke type and incorporate a plug in the body which can be removed and a test gauge fitted when checking the setting of the variable load valves.

(g) 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 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. It shuts off the air feed from the Main reservoir pipe for maintenance purposes and 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. This cock can also be used in case of Main Reservoir Pipe defect (See Page 25 (3))

(j) End Coupling Cocks. End cocks are fitted to the headstock end of the brake pipe and main reservoir pipe on outer vehicles only.
The operating handle is upright when the cock is closed and horizontal when open.
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 main reservoir pipe coupling cock is painted yellow and the brake pipe cock is painted red.

(k) Flexible hose connections at outer ends. These are fitted to the end cocks of the outer vehicles and enable interconnection between adjacent units. The hosepipe connected to the brake pipe is fitted with a 1" coupling head and has no identification band. That connected to the main reservoir pipe is fitted with a $\frac{3}{4}$" coupling head incorporating a self-sealing valve and has a white identification band.

(l) Flexible hose connections between vehicles at intermediate bogie positions. These hoses connect between unions on the copper pipe on the underframe and the steel pipe attached to the bogie sideframe. They are allof the same size and type and have unions at both ends.

CARTIC UNITS

FAULT FINDING CHART - BRAKES.

See Figs.12, 13 and 14 for Schematic Brake Diagrams.

Fault.	Check.	Action.
(1) No air pressure in either or both of Brake Pipe and Main Reservoir Pipe.	Pressure Gauge on Locomotive. All hoses properly connected. All coupling cocks open except at rear end of train. Obvious air leaks.	If no pressure, then Loco is defective. Connect hoses. Open Cocks.(Handle horizontal). Seal as necessary.
(2) Brake fails to apply on one vehicle.	Distributor Isolating Cock open. (Handle in vertical position.)	Open Cock. If this Cock has to be opened, allow time for recharging of Brake Pipe, then re-apply brake. If this fails to rectify fault, check air pressure at test point between distributor and variable load valve. If there is no pressure, change distributor. If this test point is under pressure, check variable load valves and brake cylinders.
(3) Brake is slow to release on one vehicle and slow to re-charge after application.	Main Reservoir Isolating Cock open.	Open Cock. (Handle in line with pipe). N.B. - with this cock closed the Auxiliary Reservoir is charged through the Distributor and the vehicle is working as a one-pipe system only.

Fault.	Check.	Action.
(4) Brake fails to apply on one Bogie.	Brake cylinder and levers jammed. Brake cylinder and hoses for leakage. Variable load valve.	Release brake gear. Lubricate or replace components as necessary. Replace as necessary. Release Arens Control from top of fulcrum lever. Move top of lever in direction 'A', (see Fig.17) as far as it will go, and hold in position. Fully apply brake so that distributor is delivering air at 55 p.s.i. Check that air pressure at brake cylinder test point is 13 p.s.i. Move top of lever in opposite direction 'B' as far as it will go, and hold in position. Re-apply brake. Check that air pressure at cylinder is 55 p.s.i. If these pressures are not obtained, replace variable load valve.
(5) Brake does not release on one vehicle or bogie.	Handbrake released. Brake cylinders or levers jammed. Operation of Distributor.	Release handbrake. Pull release cord to release brake cylinder pressure. Release brake gear. Lubricate or replace components as necessary. Pull release cord to release brake cylinder pressure. If pressure is not released, change distributor.

Fault.	Check.	Action.
(6) Brakes not fully released at rear end of train.	Brake pipe pressure at rear end of train. If gauge shows less than 70 p.s.i., ensure that Driver's brake valve 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 faults, rather than one large one.
(7) Locomotive Driver's Safety Device. Low main reservoir pressure device operates during charging. (Brake pipe vented).		Move Driver's brake valve handle to emergency position and hold there until reservoir pressure is restored. Return handle to running position.

N.B.- Pressures given are nominal.

If time does not permit repairs or replacements to be carried out, it may be necessary to isolate the brake on a vehicle. Procedure is as follows :-

(a) Close main reservoir isolating cock (Handle to be at right angles to pipe).
(b) Close isolating cock on the distributor. (Handle to be in horizontal position).
(c) Full release cord on distributor to vent control reservoir.
(d) Check that the brake has been fully released and brake blocks are clear of the wheels.

Carrying out the above procedure on either of the outer vehicles results in two bogie brakes being isolated. The distributor on the intermediate vehicle controls the remaining bogie.
If fault is a large leak in the main reservoir pipe or the adjacent vehicle has only a brake pipe, the reservoir pipe may be isolated by closing the main reservoir coupling cock at the leading end. The brake on this vehicle and all trailing vehicles will be fully operative, but will be working as a one-pipe system and release times will be increased.

Continued.....

IMPORTANT :

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

BRAKE TESTS.

The tests are for a unit of 4 wagons and a test rig should be provided with a means for :-

(a) Charging the brake pipe to 70 p.s.i. ± 2 p.s.i.
(b) Isolating the brake pipe feed.
(c) Venting the brake pipe on the unit to atmosphere.
(d) Charging the M.R. pipe to 100 p.s.i.
(e) Isolating the feed to the M.R.pipe.

Pressure gauges are required for reading :-

(i) Brake Pipe pressure on the unit.
(ii) M.R. pipe pressure on the unit.
(iii) Dummy Cylinder pressure (dummy cylinder capacity is formed by piping between distributor and variable load valve; connect a gauge to the plugged tee connection, lettered "M" on Figure 14)
(iv) Brake cylinder pressure to each bogie (connect a gauge to the plugged air connection on each cylinder)

The test rig can be made up from isolating cocks, pressure gauges, a pressure limiting valve set at 70 p.s.i. and two hose couplings or a test rig incorporating a drivers brake valve can be used.

The following tests are to be carried out after the brake equipment and rigging has been installed and all pipes and fittings properly connected. (Great care must be taken during installation to ensure exclusion of all dirt and foreign matter from the pipes and fittings. Pipes should be blown out with steam and/or air before installation on the vehicles.)

Coupling of unit to test rig.

(a) Park the unit in the required position and chock the wheels if necessary (the handbrake should not be applied)
(b) With the air supply shut off, connect the test rig to the unit. Ensure that the connections are properly and tightly made. Check that both end coupling cocks at the far end are fully closed.

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(c) Connect pressure gauges to the brake pipe, M.R. pipe, dummy cylinder test points and to each of the five brake cylinders.

(d) Check that the three distributor isolating cocks on the unit are open, cock handles to be downwards at 30° to the vertical (See Figure 15) and that the ½" isolating cocks between the M.R. pipe and strainer check valve and choke units are open (cock handles to be in line with pipe)

Test "A" (Brake pipe and general leakage)

(1) See that the air feed to the M.R. pipe is shut off and that the M.R. pipe pressure is zero. Charge the brake pipe to 70 p.s.i. Wait for at least 4 monutes for the brake system to fully charge. During this time check all pipes and fittings for audible leaks. Check on M.R. pipe gauge for any rise in pressure above zero (this would indicate leakage through a strainer check valve and choke unit)

(2) Isolate the air feed to the brake pipe. Wait 1 minute (for temperature settlement) then note subsequent fall in brake pipe pressure over 2 minutes. This must not exceed 2 p.s.i. (i.e. 1 p.s.i per minute) and the brake must not apply (i.e. dummy cylinder pressure must remain zero) Excessive leakage must be located and corrected. (To find leaks, brush a lather of soft soap and water on all pipes and fittings. Bubbles will form at leak points)

(3) Reconnect the air feed to the brake pipe and wait 1 minute for recharge of brake system to 70 p.s.i.

Test "B" (Brake operation - "Empty")

(4) Check that brake pipe pressure is 70 p.s.i. then isolate brake pipe air feed and vent brake pipe to atmosphere. Check dummy cylinder pressure which should be 55 p.s.i. ± 2 p.s.i. Check the pressure at each brake cylinder. On an empty unit the brake cylinder pressure should be 38 p.s.i. for the cylinders to the 2 outer bogies and 34 p.s.i. for the cylinders to the three intermediate bogies. If

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necessary adjust the operating rod to each variable load valve to obtain these pressures (pushing rod in increases pressure and pulling out reduces pressure; adjustments then to be made as in Fig.17) and repeat tests 3 & 4 to recheck cylinder pressures.

(5) Close brake pipe vent and open brake pipe air feed. Wait 1 minute for brake system to recharge to 70 p.s.i. Make a partial brake application by carefully opening brake pipe vent and closing quickly when brake pipe pressure has fallen to 60 p.s.i. Check that the dummy cylinder pressure rises to about 20 p.s.i. and brake cylinder pressure to about 17-19 p.s.i. Check that all brake blocks are applied to the wheels.

(6) Re-open brake pipe air feed to recharge brake system. Check that dummy cylinder pressure and brake cylinder pressures fall to zero. Check that all brake blocks are clear of the wheels and that there is the correct amount of clearance between the actuating stop and the S.A.B. slack adjuster. (See separate instructions at end of brake test section for installation details of S.A.B. Slack adjuster.)

Test "C" (Brake operation - loaded)

(7) Loaded conditions may be simulated by manipulation of the variable load valve operating rod. Disconnect each valve linkage at point (1) shown on Fig.17 and proceed with the test described in Para. 5. The top of the fulcrum levers should be moved in direction "B" (Fig.17) the following amounts :-
2 valves to outer bogies - 1.3/16".
3 valves to intermediate bogies - 1.3/8".
The pressures in each of the brake cylinders should read 55 p.s.i. ± 2 p.s.i.

Test "D" (M.R. pipe leakage)

(8) Close the ½" isolating cocks between the M.R. pipe

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and the strainer, check valve and choke units. (cock handles to be at right angles to pipe)

(9) Charge the M.R. pipe to 100 p.s.i. then isolate the air feed to M.R. pipe. Wait 1 minute then note subsequent fall in M.R. pipe pressure over 2 minutes. This must not exceed 1 p.s.i. (0.5 p.s.i. per min.) Excessive leakage must be located and corrected.

DISCONNECTION OF 4 CAR UNIT AND RELEASE OF AIR PRESSURE.

(a) Isolate air feed to M.R. pipe but leave air feed to brake pipe open. Open the ½" isolating cocks between the M.R. pipe and the strainer, check valve and choke units. Check that the dummy cylinder and brake cylinder pressures are zero, then disconnect the gauges from the dummy cylinders and brake cylinders and tightly replace plugs.

(b) Isolate brake pipe air feed and vent brake pipe to atmosphere to fully apply the brake. Check the test points with soap and water lather. There must be no leakage.

(c) Pull the release cord attached to each distributor release valve handle and, when air is heard escaping, release the cord. Check that air continues to release, if not pull the cord again with a longer pull.
(The release valves will remain open and will close automatically when the brake system is recharged)

(d) Close the isolating cock on each distributor (Handles to be in the horizontal position) This will vent the air from the auxiliary reservoir. Re-open the isolating cock when all air has escaped.

(e) Disconnect the other gauges and the connections to the test rig.

(f) Before moving the unit check that all brake blocks are clear of the wheels.

N.B. IN NO CIRCUMSTANCES IS IT PERMISSIBLE TO LEAVE A BRAKE IN ACTION WHICH CANNOT BE RELEASED BY THE AIR SUPPLY BRAKE VALVE.

The preceding brake tests can be carried out using a locomotive fitted with a 2 pipe air brake system in lieu of the test rig. An additional pressure gauge is required in the connection between the M.R. pipe on the locomotive and the M.R. pipe on the unit.

The driver's brake valve can be used in the normal way to charge and release the system.

For tests "A","B" & "C" no pressure is required in the M.R. pipe on the unit and the end coupling cock of locomotive M.R. pipe should be closed. (The end coupling cock on the unit adjacent to locomotive remains open)

S.A.B. BRAKE REGULATOR CHECKING AND INSTALLATION.

The S.A.B. double-acting brake regulator is a brake slack adjuster which provides automatic adjustment of the clearances between the brake blocks and the wheels. Correct clearances are obtained when the distance between the slack adjuster barrel and the control rod stop is approx. $1\frac{3}{4}$".

To check the correct operation of the slack adjuster the brake should be fully applied and released 2 or 3 times. Check that all brake blocks are fully operative and that the clearance between the barrel and the stop remains constant. Ensure that all brake blocks are clear of the wheels when the brake is released.

If it is necessary to change a slack adjuster care must be taken to ensure that the pull rod incorporated in the slack adjuster is the correct length (This length varies on other types of vehicles) After fitting the replacement adjuster the control rod stop should be positioned to just touch the barrel. The brake should be fully applied and released several times, and the stop re-positioned to give approx. $1\frac{3}{4}$" clearance. The brake must then be re-applied and released 2 or 3 times to ensure that the clearance remains constant.

Replacement of worn brake blocks entails the disconnection of the slack adjuster from the bogie brakework. Fit new brake blocks and shorten the length of the slack adjuster by screwing the rod into the barrel until the slack adjuster can be reconnected to the bogie brakework. The brake should then be fully applied and released 2 or 3 times when the adjuster should return to its previous setting.