PBR 10

BRITISH RAILWAYS - WESTERN REGION

# MKIII SLEEPING CARS

# MECHANICAL

CM & EE TECHNICAL TRAINING UNIT
THE MILL,
BRISTOL STREET
SWINDON

# MARK III LOCOMOTIVE HAULED SLEEPING CARS.

## INTRODUCTION MECHANICAL.

BRITISH RAILWAYS - WESTERN REGION.

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## INTRODUCTION MECHANICAL.

NOTE:-

These notes are intended to be read in conjunction with the detailed descriptions of the coach distributor, bogie design, secondary air suspension, and various valve detail contained in the High Speed Train, Part II, D.T.S.63.

C.M. & E.E. Technical Training Unit,
The Mill,
Bristol Street,
SWINDON.

# MARK III LOCOMOTIVE HAULED SLEEPING CARS.

## Introduction.

The now well established body/bogie structure of the Mark III B.R. coach as applied to H.S.T. and locomotive hauled stock is now being adopted for the modernisation of the B.R. sleeping car fleet of vehicles.

The building authorised at the time of writing will be:-

120 12 berth cars (lot 30960).

90 13 berth cars (lot 30961).

The 12 berth cars will include at No. 2 end of the vehicle, an attendant's compartment and at the opposite end two fully equipped toilet compartments (No. 1 end).

The 13 berth cars will have no attendants accommodation.

On both types each compartment is equipped with two berths, the upper berth in eachcase being retractable into partition face to provide single berth first class accommodation. An inter communicating door is fitted in the "wardrobe" wall of each compartment to provide family accommodation if required.

The Mk III standard 23m (75' 5") steel shell is common to both vehicles, air conditioning, electrical, water and air supply being identical. The brake/suspension systems follow the same pattern as that fitted to the Mk.III locomotive hauled stock, with Davies and Metcalfe supplying the brake equipment and Westinghouse the suspension equipment.

The bogie is the standard Mk. III, i.e. the BT10, equipped with disc brakes, automatic brake piston stroke "slack" adjusters and wheelslide blow-down equipment.

The weight of both vehicles is approximately 40 tons, the primary spring fitted to the bogies being dissimilar and not interchangeable with that provided for the more lightly loaded Mk. III day coaches.

Load proportional braking is not provided as the load/empty weight differential does not warrant application.

In the sleeping car installation the load proportional feature of the distributor is supplied with a constant pressure signal derived from the auxiliary reservoir via a limiting/reducing valve. This allows the standard Mk. III locomotive hauled stock distributor to be inter-changeable with the

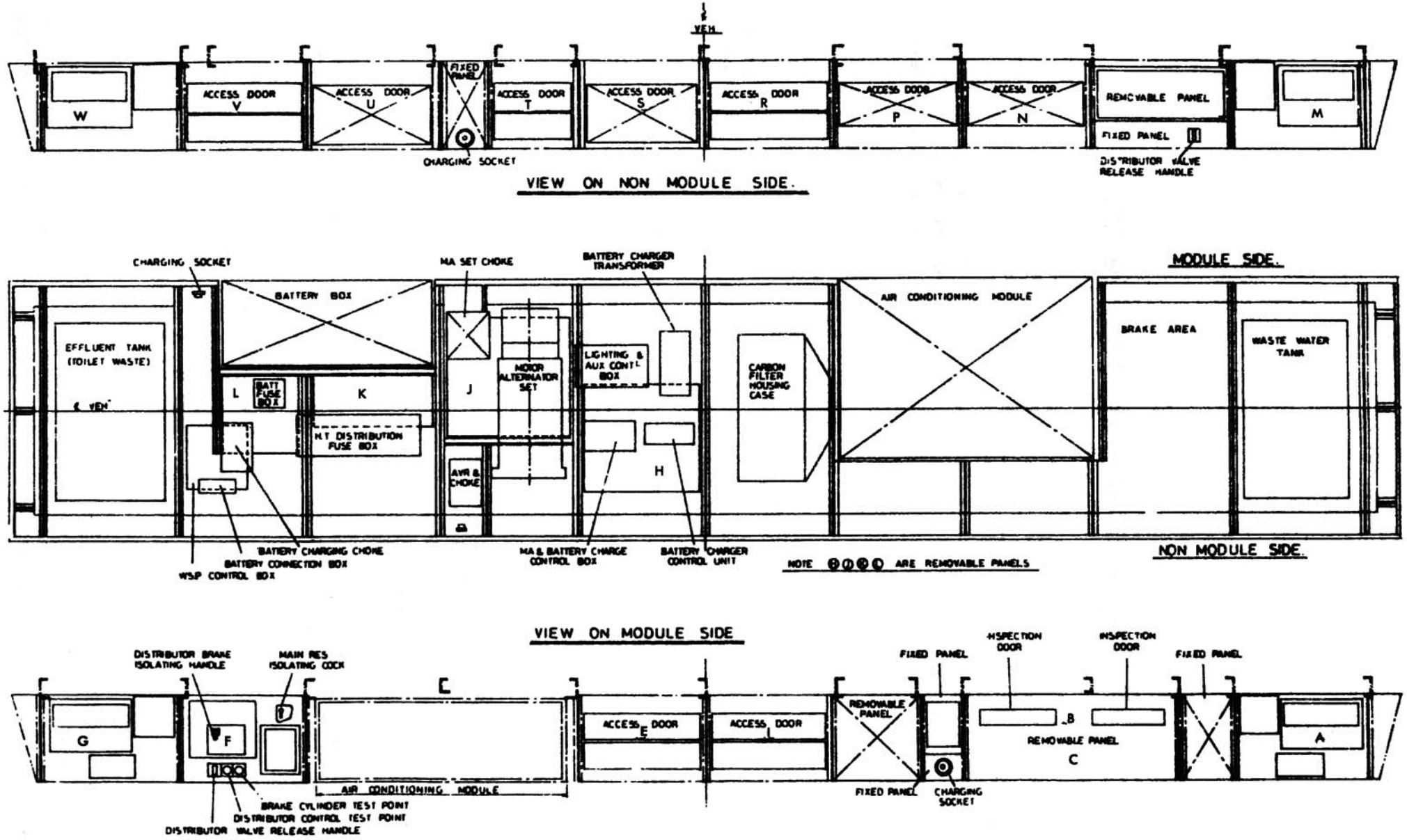



FIG .1. GENERAL ARRANGEMENT OF EQUIPMENT ON UNDERFRAME

SC applications. It will be appreciated that the total weight of the SC vehicle approaches the gross condition for a standard MK. III coach and there is no appreciable difference between tare and gross.

Body Structure.

British Railways research structural analysis computer programme, together with a critical approach to the design features, provided a minimum weight all welded, fully stressed steel body structure which eminently successful on H.S.T. and locomotive hauled passenger and catering vehicles stock is now being applied to the modern sleeping car requirements of B.R.

The sole bars are a 5mm thick box section, shaped to form the lower edge of the bodyside. There are no central longitudinals between bolsters, these being replaced by corrugated steel floor sheets running the full length of the vehicle. These, together with the sole bars, carry the mandatory buffing load of 200 tons.

All longitudinal bodyside rails are continuous members rolled from 2mm thick steel sheet, when attached to the skin form a box section. The vertical pillars are recessed to take the rails, allowing close fitting welded joints which are self-locating during assembly and also form box sections.

In order to make the skin fully effective as a load carrying part of the structure, and to prevent unsightly bodyside distortion, the skin is of 2mm thick sheet, as compared with 1.6mm of conventional stock.

Roof purlins have been eliminated by the use of 1.6mm roof sheets with longitudinal corrugation, the carlines again forming box sections with the roof sheets, with the exception of the diaphragm carlines.

To meet the requirement of compatibility with existing stock, standard buckeye buffing and drawgear components are fitted.

Underframe Equipment.

Air conditioning equipment is underslung as on Mk. III stock, as a module, incorporated in the panelled skirt between the bogies. Other items of equipment as illustrated in the plan view of Figure 1 are readily available by way of access doors or removable panels.

Automatic air brake control equipment, distributor, reservoirs etc., are being housed within the underskirt padding with access panels for maintenance and testing.

Equipment requiring daily/regular use, such as brake release, isolating cocks, charging cocks, etc., are readily accessible along the skirt located as shown in Figure 1.

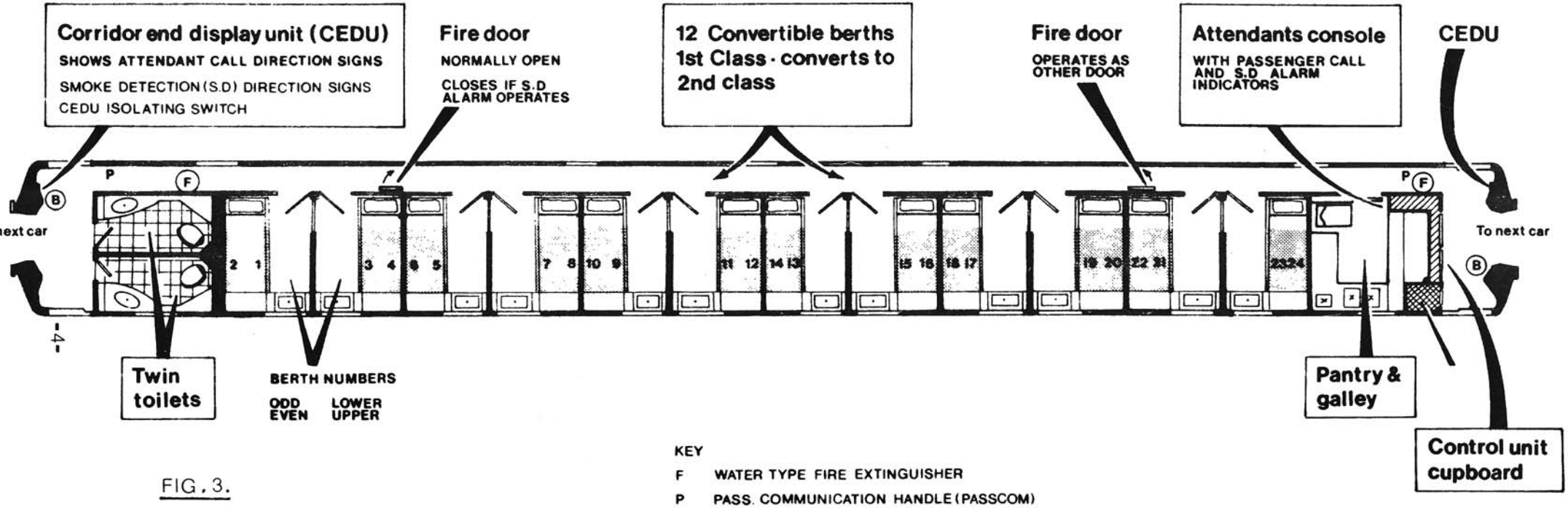
It will be noted that the terminology adopted for these vehicles refers to Module side (air conditioning module removal access) and conversely, non-module side, whilst "Toilet End" and "Attendant's End" has been adopted. It would be correct, however, to refer to No. 1 end (toilet) which is No. 1/2 berth end and No. 1 axle end of vehicle.

All toilet waste products from these vehicles will be retained on the vehicle for extraction by vacuum pump systems on return to the servicing depot. To meet this modern requirement a tank is underslung within the skirt at No. 1 end.

# Mk. 3 Sleeping cars Interior

FIG. 2.

**12 BERTH WITH PANTRY · SLEP**




KEY

F WATER TYPE FIRE EXTINGUISHER

P PASS. COMMUNICATION HANDLE (PASSCOM)

**Note** PASSCOM HANDLES ALSO IN:

BERTHS

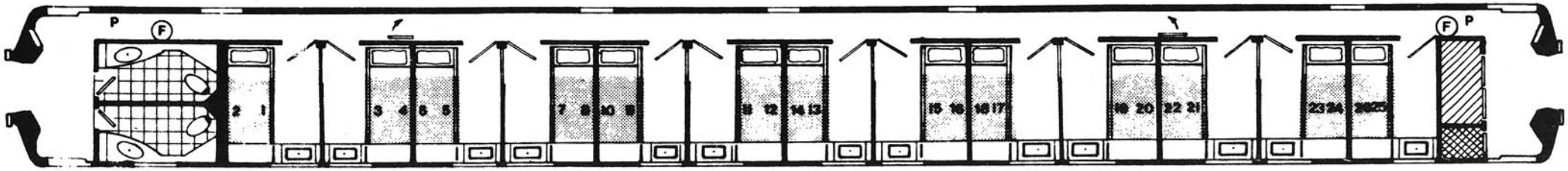
TOILETS

PANTRY

FIG. 3.

**13 BERTH · SLE**

**Same features except pantry and galley**



Waste water from sinks and wash handbasins discharged direct to the track.

The capacity of the tank will be 120 gallons, the content normally being removed from either side of the vehicle through a totally enclosed pipe system to the depot sewage system. In an emergency they can be gravity emptied centrally through the flushing drain in the base of each tank.

Disposition of Berths and Fitments.

The modular approach has again been adopted for the design of the vehicle interior. In this instance the ruling modular length is fixed by longitudinal and transverse floor rails into which the compartment partitions are inserted (Fig. 2 and 3).

Window inserts, bodyside panelling, ceiling panels etc., are all governed by this modular design and have simplified and quick methods of fixing, which reduces construction/refurbishing.

The light fittings, indicators and call buttons (passenger/attendant) and wiring within the two vehicles is common.

The upper bunk in each berth or compartment is designed to recess into the partition to provide a flush compartment wall suitable for one person occupancy. A vanity unit with accommodation shelf and luggage rack are provided together with the usual wardrobe and shaving facilities.

It will be noted that all compartments are completely sealed one from another, each main partition having a steel sheet inserted between the decorative panelling. The communicating door dividing partition does not have a steel insert; corridor fire doors (retained open in normal use by a magnetic catch) are released to close in the event of a fire/smoke detection.

Gangways.

As on MK III stock already in service it will be seen that the gangways are attached to the drawhook through non-metallic fittings which enable them to move transversely with the drawhooks when the vehicles are transversing curves thus allowing them to maintain full width walkways under all conditions. This design will also reduce the noise level to a minimum.

Special Features.

The vestibule interior finish is in coloured glass-reinforced plastic designed with ease of cleaning and maintenance in mind.

The toilet module is manufactured in three parts, complete with furnishings and plumbing which can be easily assembled in the vehicle with the floor and ceiling added in a manner so as to cater for building tolerances. Again, prime consideration has been given to maintenance, ease of cleaning and hygiene.

If it should be necessary to carry out any repairs on the water tank, this can be lifted out of the vehicle through the roof without disturbing the toilet.

## WATER SUPPLY AND WASTE REMOVAL.

### Introduction.

The water for these vehicles is retained in four fifty gallon tanks carried in the roof section two at each end of the vehicle. The lavatory flush supply is taken from two interconnected blow moulded tanks situated above the toilet compartments which, using the traditional foot pedal operated flush valve, discharges effluent to the 120 gallon effluent tank situated inboard of the No. 1 bogie position.

The water supply for compartment wash hand-basin and for the attendants services (where fitted) is taken from the remaining two fifty gallon tanks fitted at No. 2 end of the vehicle. On the 12 compartment vehicles one of these tanks is made from stainless steel to allow a level detector switch to be mounted on its side. Both tanks are again interconnected to provide 100 gallon total capacity.

The waste return from all wash hand-basin sink units and toilet hand-basins is piped direct to track.

The general arrangement of waste and effluent pipes and tanks is shown in Figure 18 .

### General Services.

Figures 5 to 7 depict in schematic form the sequence of fitting of compartments and the area in which the equipment is to be found as relating to the 13 compartment vehicles, whilst Figues 7 to 12 show similar detail as applied to 12 compartment vehicles with attendants accommodation.

These diagrams should be read in conjunction with Figure 4 (water heater cupboard on both vehicles) and Figure 12 which shows the pipe system as contained in the attendants compartment.

### Cold Water Supply.

"Drinking" water is delivered to the overhead tanks by way of the four conventional filler spouts, two at each end of the vehicle. Each pair of tanks has an overflow pipe fitted, which interconnects with the tank drain and water heater drain.

### Filling the System.

The header tanks will fill the cold water system by gravity via a filter and maintenance stop cock. The pressure pump will be stationery but will allow sufficient flow to pass the non-return valve to fill the system. This will take approximately 15 minutes. Any air in the system will vent through the auto-vent valve fitted at the toilet end of each vehicle.

The water heater supply will pass via a Legris right angle stop cock and non-return valve to the water cylinder. When the cyliner is approximately two-thirds full the float switch contacts will close and the pressure pump will run. In this filling condition the square "D" HP pump pressure switch contacts, which are in parallel with the flow switch, will remain closed and the system will be pressurised to the preset 13 lbs/in$^2$.

### System Filled-Cold Water Draw off Required.

With the system filled as above the pressure switch contacts will be open, the pump will be stopped and there will be no flow of water in the

system which would affect the flow switch immediately above the pressure pump.

As soon as any draw-off is made from the CW system there will be a flow of water over the flow switch, which will close the contacts FS and restart the pressure pump thus maintaining an adequate flow rate at the issuing tap.

System Filled - Hot Water Draw off Required.

With the system filled closure of the float switch will allow the immersion heater to be energised and the water temperature will be raised. It must be noted that the rate of temperature rise is determined by the element rating which is in turn determined by the capability of the hauling locomotive. This is therefore restricted to 4 KW per vehicle which provides a heating rate of $1^{o}$ rise in temperature per 60 $\pm$ 10 seconds.

The heating element will be de-energised on attaining a temperature of 75 $\pm$ $5^{o}$

If the system when filled and heated is unused the pressure will be raised to 13 lbs/in$^2$ at which pressure the pressure switch will shut the pump down and will remain so until tap flow has dropped the pressure below a lower setting of 9 lbs/in$^2$.

An excess pressure safety valve is fitted, piped to drain to track, and set to open at approximately 16 lbs/in$^2$ and should reset to close at approximately 14 lbs/in$^2$.

It will be noted that a safety valve which does not reseat correctly can drain the total water capacity to track.

Interconnection of CW and HW Circuits.

A non-return valve is fitted above the water heating cylinder. This ensures that expanding heated water does not syphon back through to the cold water circuit. Any appreciable rise in CW temperature could be attributed to defect of this NRV.

It will ne noted that the HP pump pressure switch is connected across the cold and the hot circuits, migration of hot to cold is however negligible through this interconnection which had to be added to prevent "hunting" of the pump, which switched on by the flow switch was immediately switched off by the pressure switch. If water is being drawn from hot to cold system there will therefore be a flow through the flow switch which will retain the pump running until the demand/flow ceases.

It will also be seen that the HP pump pressure switch will start the pump if any demand is made on either the hot or cold system.

Low Water Condition.

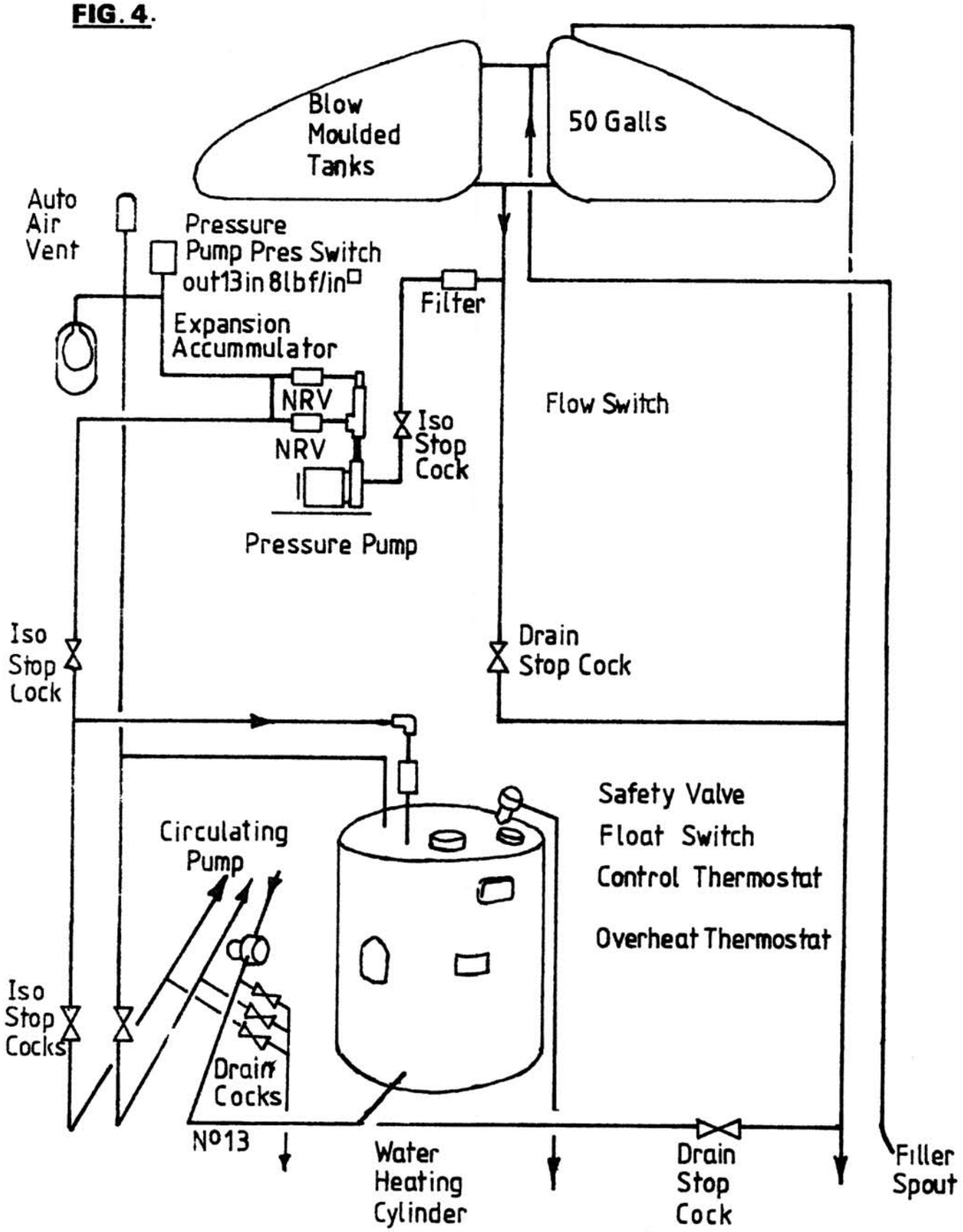
If the system water level runs low the pressure pump will initially continue to tun. This will not adversely affect this particular pump. If the system continues to use water the cold water will stop issuing from the taps. Continued use of the hot water will eventually lower the level in the HW cylinder until the float switch contacts open, resulting in the heater being de-energised and the circulating pump being stopped. The float switch will also stop the main system pressure pump.

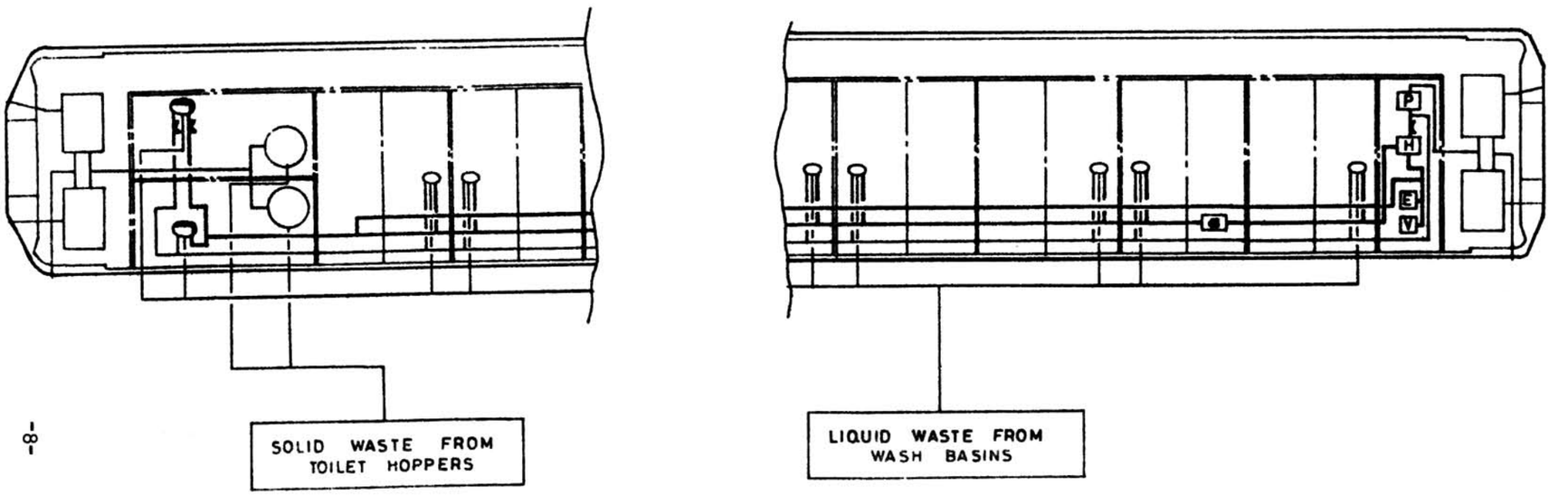
It must be noted that the domestic type hot water circulating pump must not be run without water in the system.



ARRANGEMENT OF EQUIPMENT IN WATER HEATER CUPBOARD

**FIG. 4.**

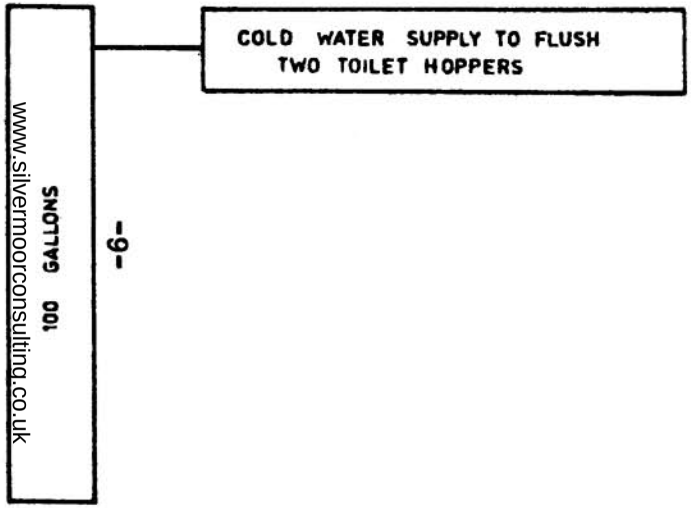







SCHEMATIC ARRANGEMENT OF WATER PIPES FOR 13 BERTH SLEEPING CARS.

FIGURE 5






SUPPLY REQUIREMENTS FROM TOILET END WATER TANKS.

(13 BERTH)



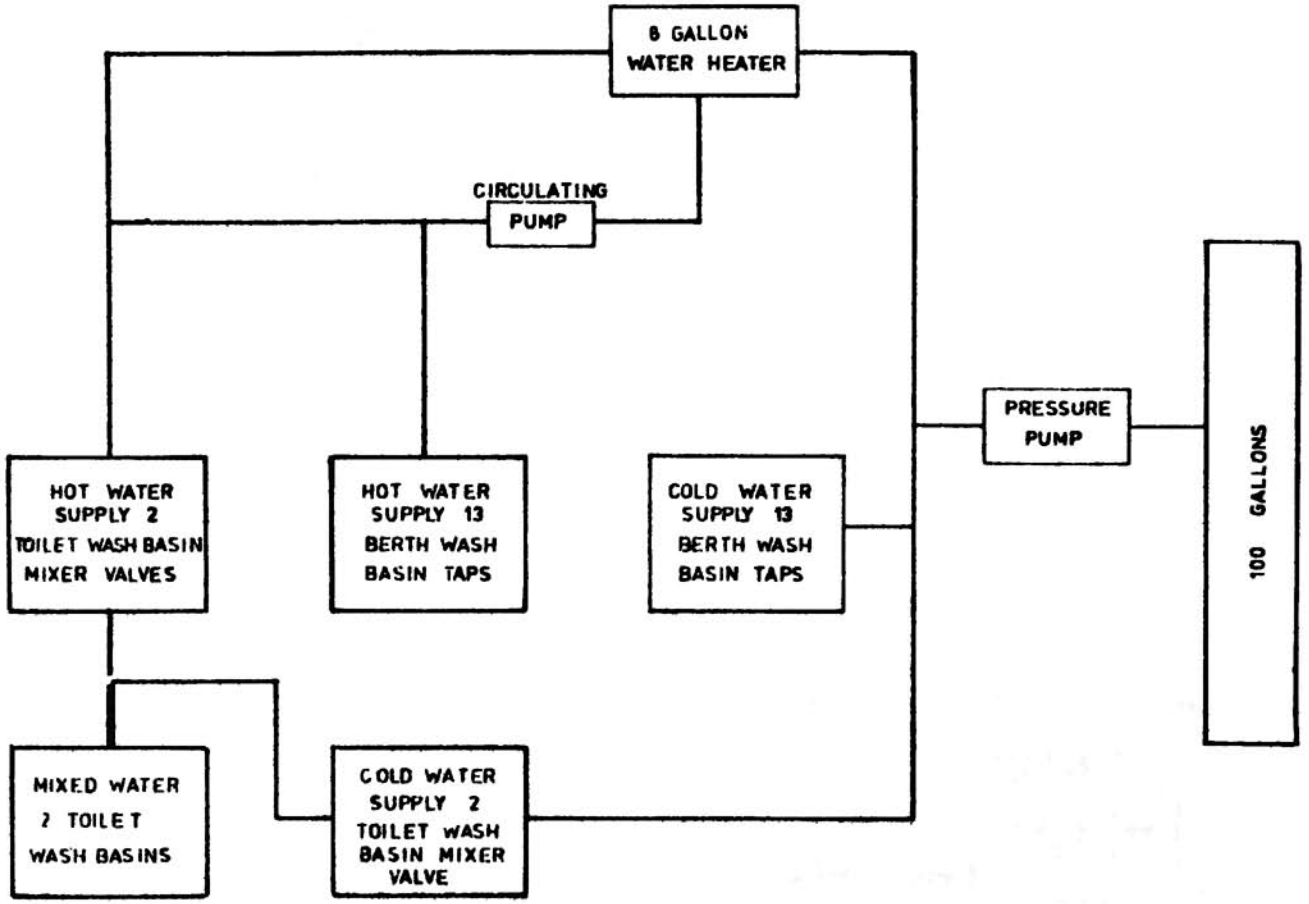
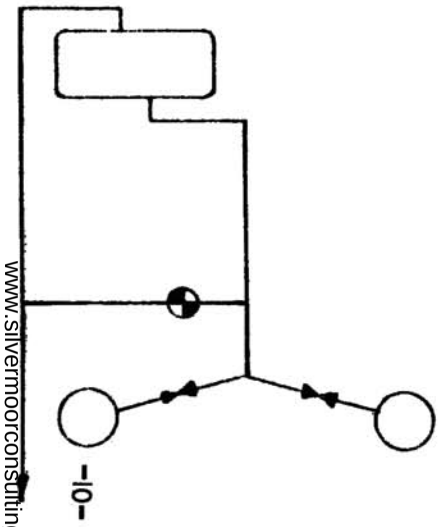



FIG.6.

SUPPLY REQUIREMENTS FROM NON TOILET END WATER TANKS.

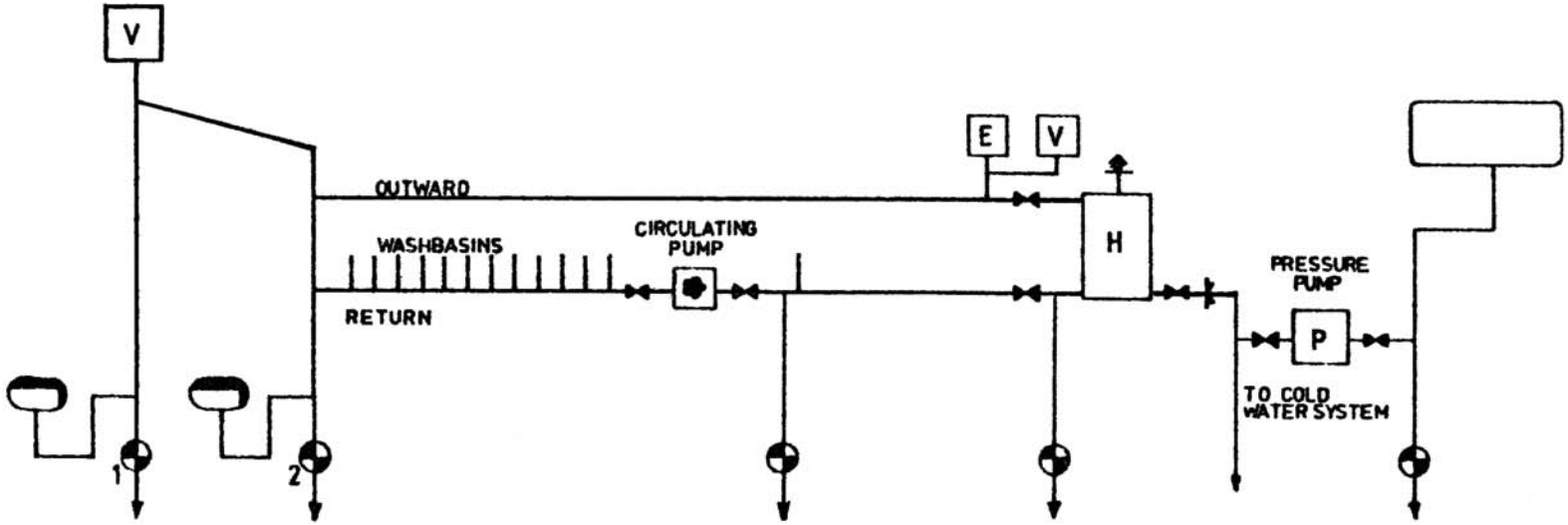
(13 BERTH)



TOILET ISOLATING AND DRAIN COCKS

NOTE

DRAIN COCKS 1 & 2 ARE THE SAME VALVES IN BOTH SYSTEMS




HOT WATER SYSTEM ISOLATING AND DRAIN COCKS (13 BERTH)

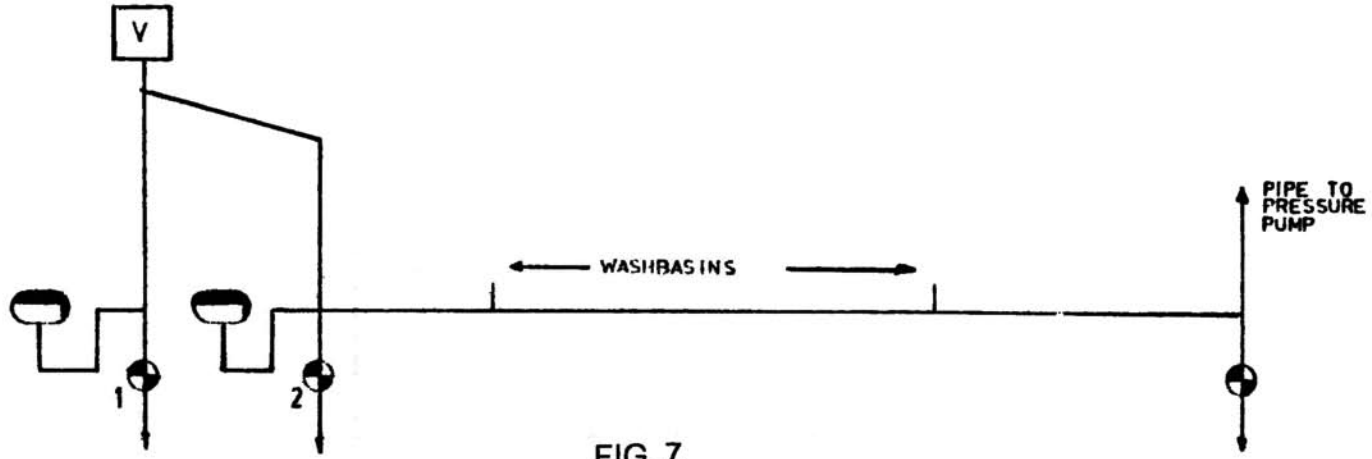



FIG.7.

COLD WATER SYSTEM ISOLATING AND DRAIN COCKS APPLIES TO BOTH 12 AND 13. BERTH VEHICLES.

## Drainage and Maintenance of the System.

As already mentioned the pump unit and isolating (stop) cocks are so positioned as to allow replacement of hot water cylinder as required. Similarly stop cocks are fitted to allow WHB tap maintenance and suitable drainage stop cocks are fitted to allow emptying of overhead tanks and hot water cylinder. The wash hand-basin pipe run along the vehicle is likewise provided for by drains on the cold, hot overflow and hot return, these being duplicated at both ends of the vehicle.

It will be noted that a diagram illustrating position of the various drain cocks will be affixed to the inner surface of the HW cupboard access door, as will instructions for use of stop cocks for chlorination purposes.

## Supply Wash Hand-basins in Compartments.

It must be emphasised to all artisans working on these vehicles that there is no requirement to disturb the tap fittings as affixed in the vitreous enamel basins. The control valve itself is fitted in an extension housing which is intercoupled between a valve control spindle arrangement (the tap handle) and the operating valve itself. The water will of course rise up the column through which the extension spindle operates to issue into basin.

For maintenance it is therefore only necessary to close the appropriate stop cock in the hot water cupboard to disconnect the flexible pipe coupled to the base of the operating valve (Fig. 11) and remove the valve, for repair or renewal, from the permanently retained actuating spindle and tap housing. A synthetic rubber nozzle type flow valve is fitted on all tap connections to restrict draw off at each individual tap thus preventing over demand on the system with resulting loss in flow rate at certain taps in the line.

## Special Service to Attendants Compartment.

The same supply system is provided from the water supply tanks (100 gallons) as on the 13 compartment vehicles, with identical arrangement of hot water cupboard, heating equipment positioned in the same side of the vestibule end of the wall adjacent to the non-corridor side door.

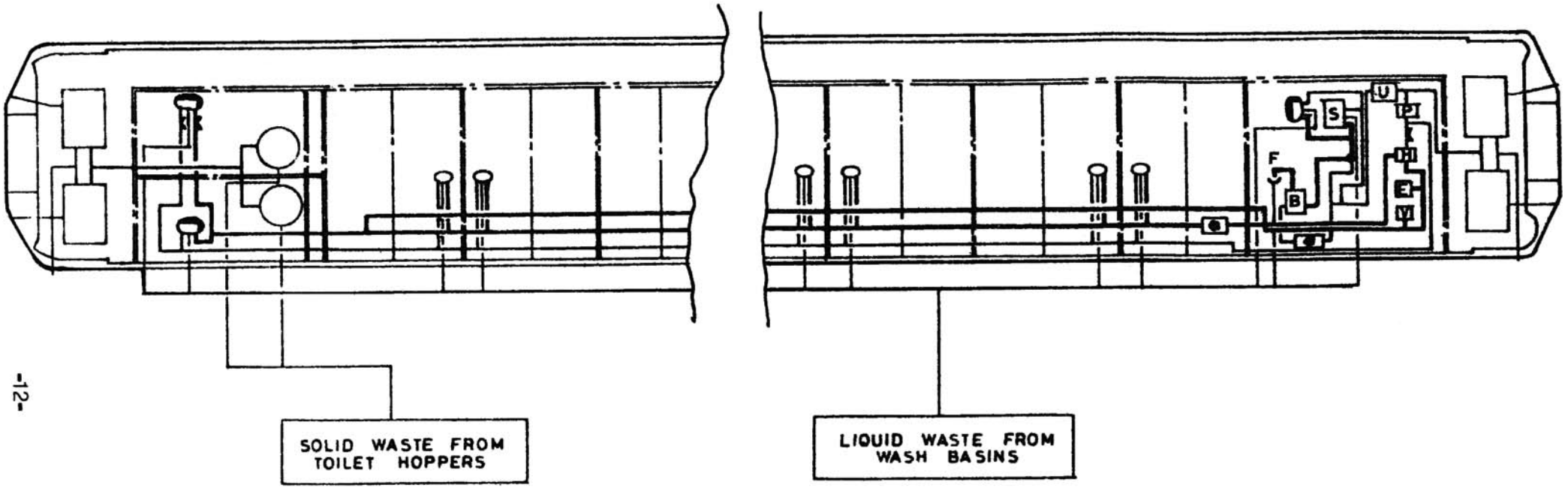
Against the other side of the vestibule end wall will be found the attendants pantry with Stills boiler and sink facilities. This is piped (diagramatatically) as shown by Figure 12.

The water supply will pass immediately through an ultra violet sterilizer (with suitable supply isolating cock), hence by gravity feed only to the twin sink facilities and to the single hand wash basin. The alternate leg of this supply passes via an isolating stop cock to the impeller type pump which supplies the Stills boiler. This is an electrically heated boiler fitted with the normal protection of solenoid (shut-off) valve linked to the boiler control system with the standard Stills diaphragm type pressure regulator which controls the rate of inflow to meet the pressure fluctuation dictated by the draw off heated water. The boiler is the Stills Rapide 4.5KW, horizontal boiler.

With the given 4.5KW rating, temperature of the water will rise 1°C in 18.5 seconds.

## Toilet Wash Hand-basin Supply.

Figure 13 shows the sequence of valves which are required to control the supply to the mixing control unit thence via the normal foot-operated diaphragm type valve to the spray head above the wash hand-basin.




SCHEMATIC ARRANGEMENT OF WATER PIPES FOR 12 BERTH SLEEPING CARS.

FIGURE 8 .

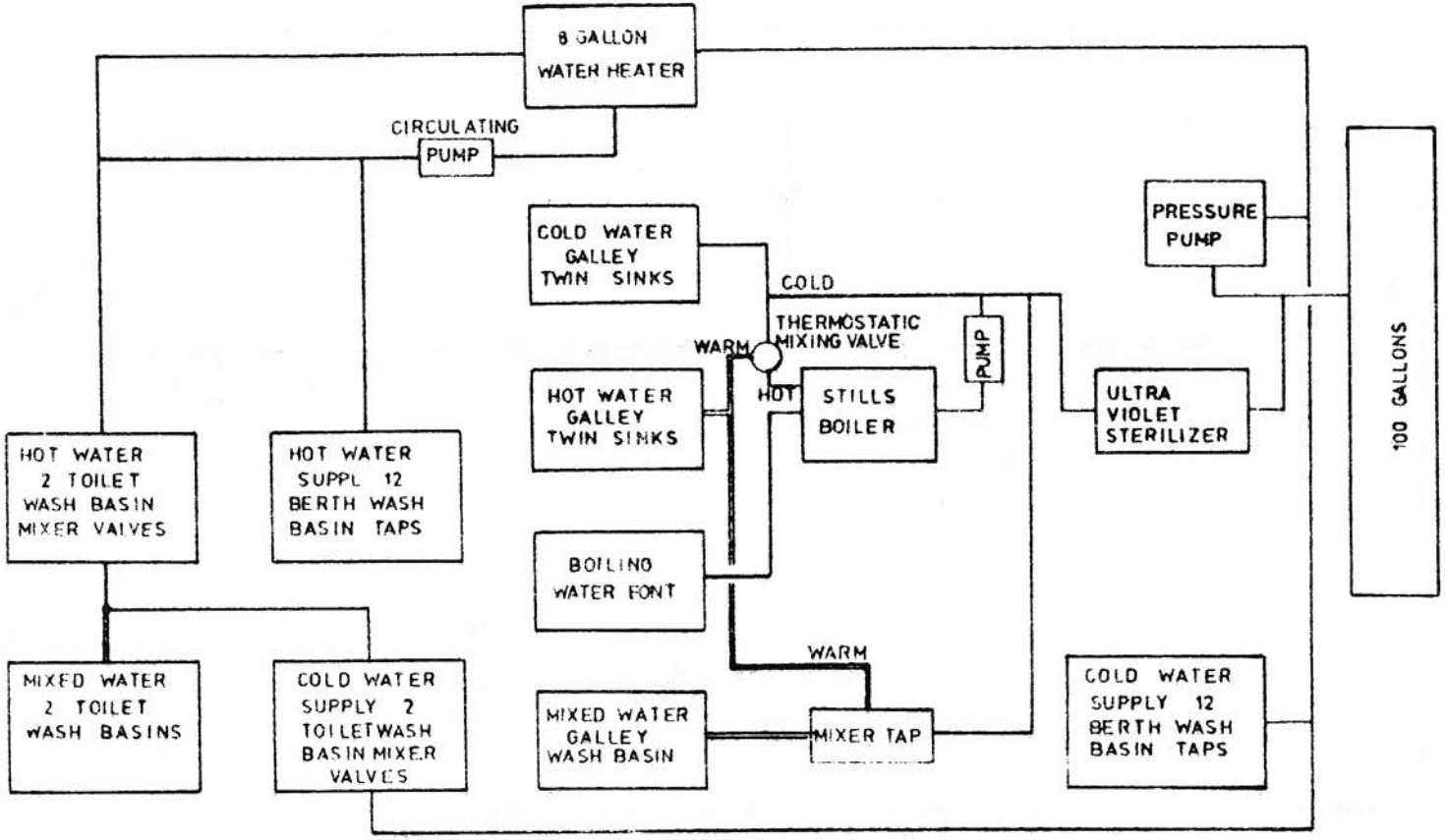



FIG.9.

SUPPLY REQUIREMENTS FROM NON TOILET END WATER TANKS

(12 BERTH)

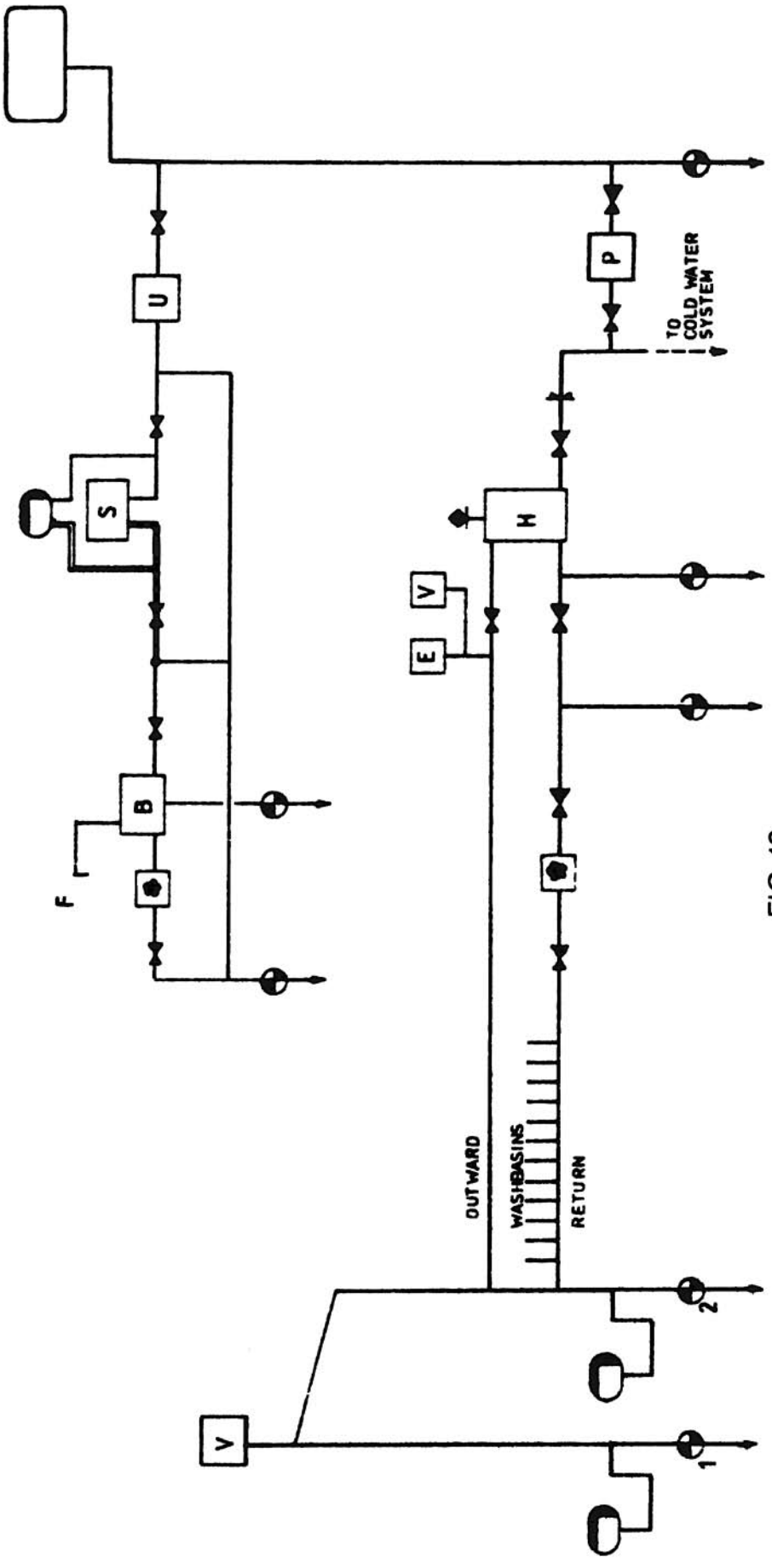



FIG. 10.

HOT WATER SYSTEM ISOLATING AND DRAIN COCKS (12 BERTH)

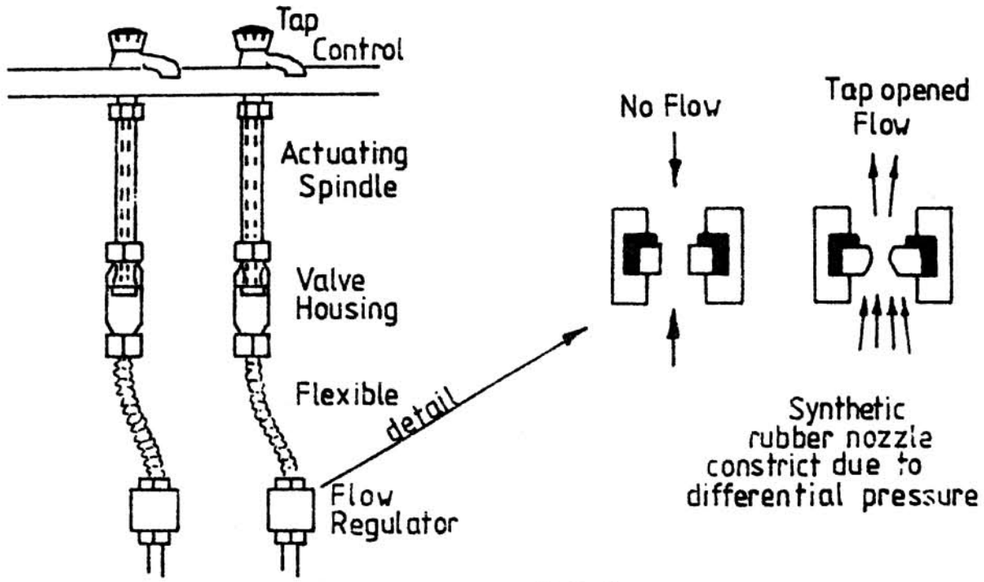


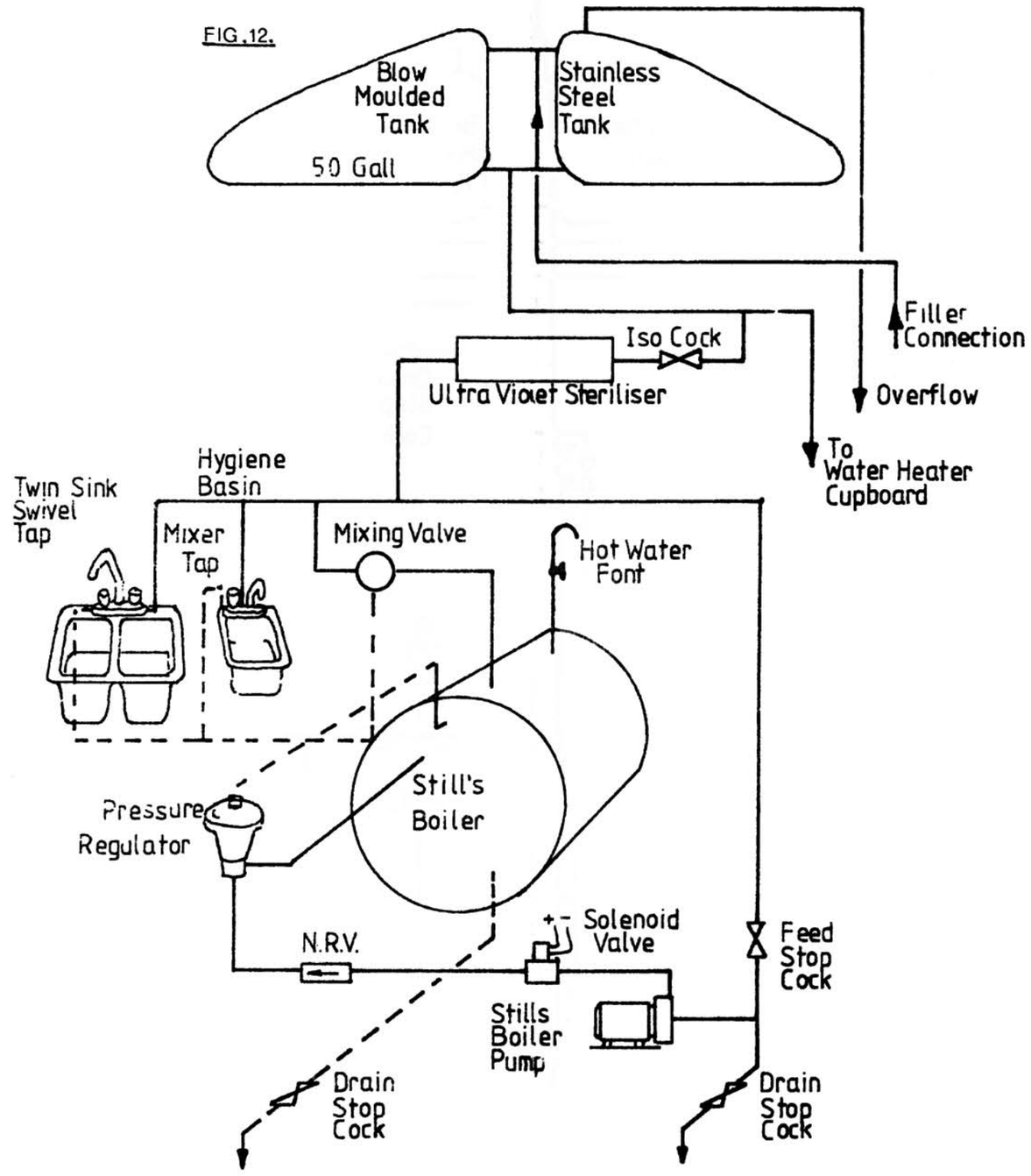

FIG. 11.

| | | | |
|---|---|---|---|
| | NON RETURN VALVE | —— | HOT WATER |
| | SAFETY VALE | | |
| | ISOLATING COCK | | WATER TANK FILLER |
| S | TWIN SINKS | | DRAIN COCK [15mm] |
| | MIXER VALVE | | OVERFLOW |
| | WATER TANK | B | STILLS BOILER |
| | TOILET | F | FONT |
| | | H | 8 GALL WATER HEATER |
| | PUMP | P | PRESSURE PUMP |
| E | EXPANSION VESSEL | U | ULTRAVIOLET STERILIZER |
| | BASIN - TAPS | V | AUTO VENT |
| | BASIN - MIXING TAP | | |
| —— | COLD WATER | | |

## ATTENDANTS COMPARTMENT

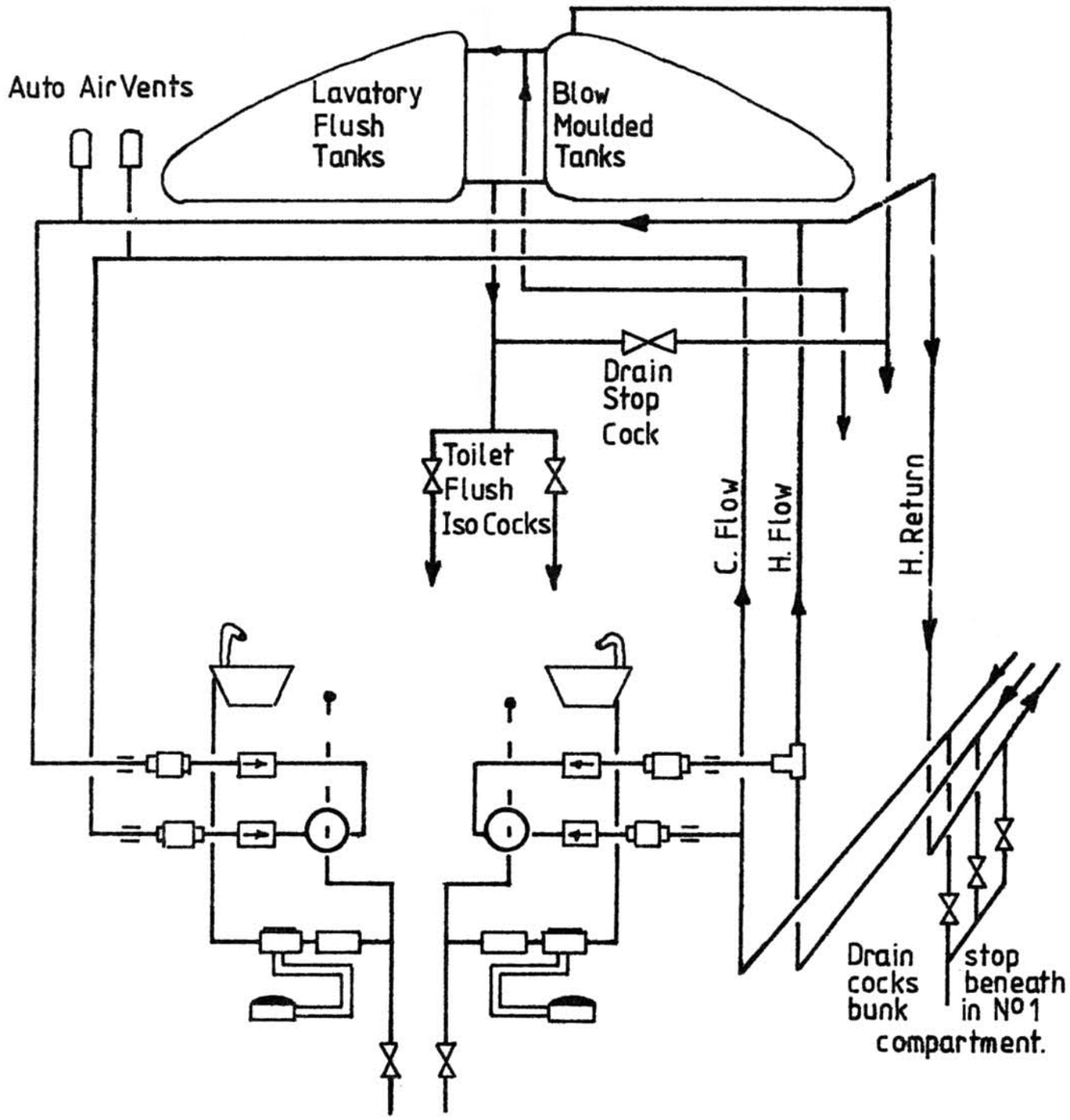
## 12 COMP$^{T}$ VEHICLE WITH STILLS BOILER

FIG. 12.



# TOILET END SUPPLIES (All Vehicles)

**FIG. 13.**



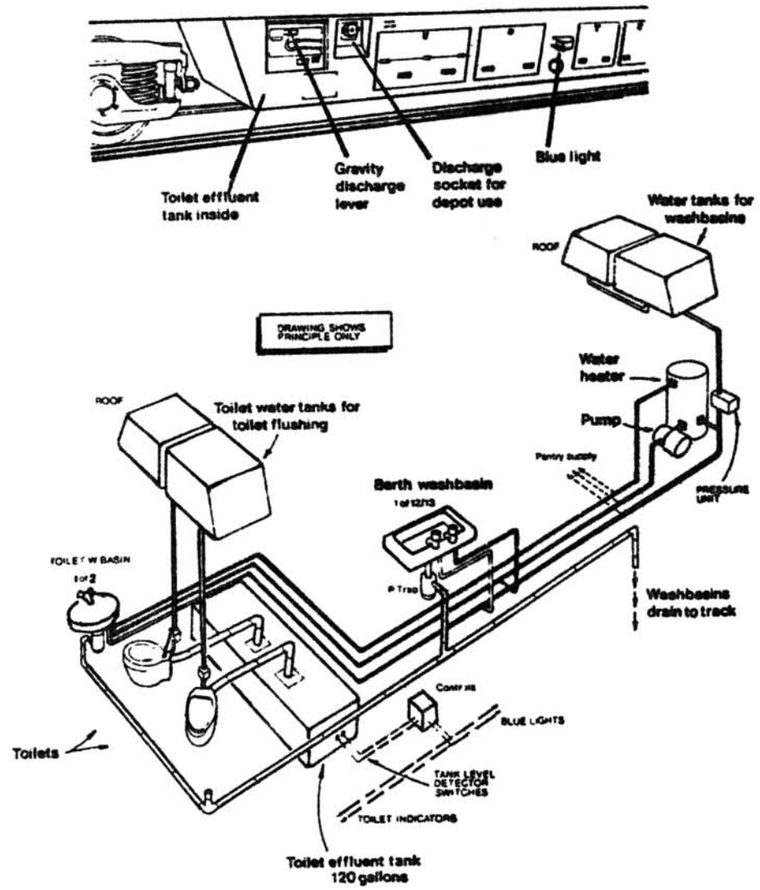




FIG. 14. TOILET & WATER SUPPLIES

It will be seen that flow control valves of the same pattern and principle as thatshown in Figure 11 are fitted in advance of the mixing control on the hot and cold supply line.

A check valve or non-return valve prevents any back flow from either leg.

Drain valves are situated as shown to allow drainage of this end of the vehicle system, thus taking care of any fluid trapped when standing on an incline.

On the non-corridor side toilet, on test it was found that the flow tended to continue upwards rather than pass to the toilet mixing valve at that side. To rectify this condition a spade or tongue is positioned in the "T" (on the hot pipe only) for the purpose of deflecting the flow to the mixing valve.

Toilet Effluent Removal.

Figure 18 shows the location of the effluent pipe as it runs to the effluent tank (120 gallon capacity) situated adjacent to No. 1 bogie.

This tank will normally be emptied by means of a vacuum extractor system from the socket indicated. This is piped to the base of the tank and has no interconnection with the emergency emptying point, (seen with elbow from end of tank turning at right angles through the floor of the vehicle skirt).

Control of the emergency effluent valve is by means of a Bowden cable, this "Gravity Discharge" control is accessible through a door which, (fitted with budget locks) has a perspex cover fitted to allow visual checking of the position of handle.

The effluent waste tank is fitted with a liquid switch which at $^{7}/_{8}$ full condition activates a blue indicator light at each side of the vehicle (external) and illuminates the toilet "Out of Order" sign adjacent to the toilet doors, together with seven "Toilet Engaged" signs along the corridor.

The tank is heavily lagged and fitted with an 800W heater. The emergency discharge valve is also lagged and fitted with a heater.

Operation of Nu mat Foot Operated Valve.

Under normal circumstances, with the foot operated valve in the "closed" position, chambers A and B are full of water.

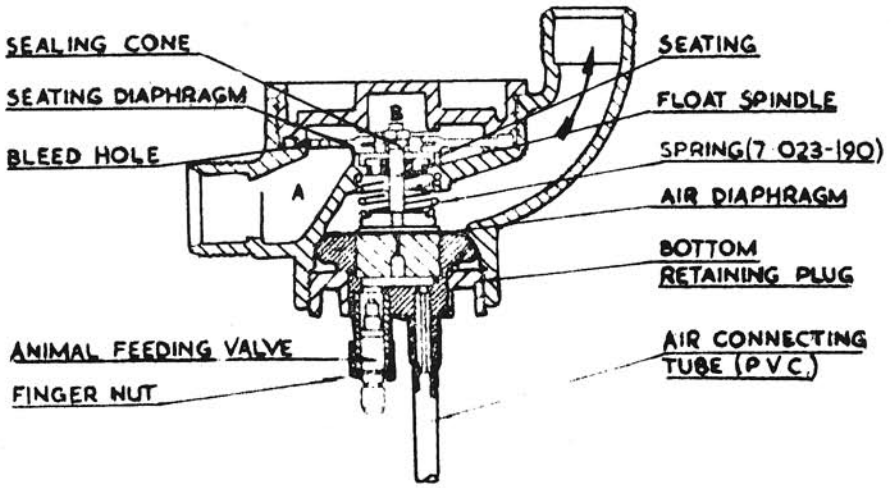
A small bleed hole in the seating diaphragm links the two chanbers and the diaphragm is maintained in the "closed" position.

Depression of the foot pad displaces air from chamber C through the air connecting tube and into the lower chamber of the foot-operated valve. The resulting air pressure lifts the air diaphragm, which in turn raises the float spindle. The sealing cone, which is pushed on to the end of the spindle is displaced from its seat in the seating diaphragm. As a result any water in chamber B is allowed to escape and the seating diaphragm rises and water flows to the spray. On release of the foot pad, the air pressure under the air diaphragm is reduced and the spring (7-023-190) pulls the sealing cone back into place in the seating diaphragm.

Water passing through the bleed hole from chamber A to B causes a pressure on the top of the seating diaphragm and water ceases to flow to the spray.

The animal feeding valve is fitted to make good any air losses from the system. It is not basically called upon to act, but occasionally air will be

'NU-MAT' FOOT OPERATED VALVE




MAIN CONTROL VALVE

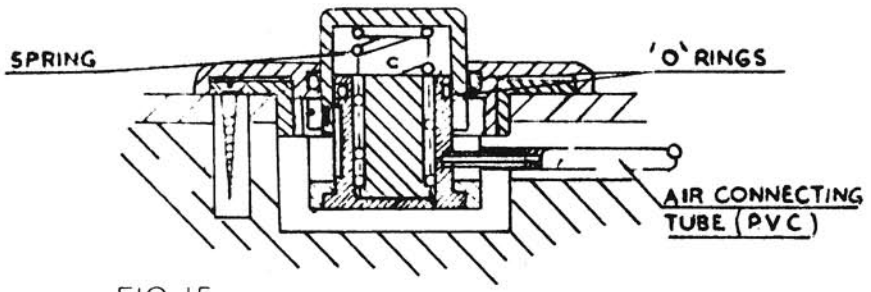



FIG.15.

FOOT PAD

drawn through it to relieve a partial vacuum caused when the foot pad is released.

## AIR SYSTEMS - BRAKES AND SUSPENSION.

### Introduction.

Air is supplied from the locomotive in the conventional way by the main reservoir pipe which provides the service and brake actuating air for the vehicles, and is retained in suitable reservoir capacities at a constant pressure of 7 bar.

Brake control is effected by the normal auto air brake pipe, continuous throughout the length of the train.

This pipe when in the running condition is maintained by the locomotive at a pressure of 5 bar. Variation of this pressure between 'running' 5 bar and 'full service' 3.35 bar will vary the direct air pressure created in the brake actuating cylinders.

### Air System Layout - Davies and Metcalfe (Fig. 17).

The main reservoir pipe (7 bar) supplies air to the auxiliary reservoir 33 through an isolating cock 24 and a strainer/ check valve/choke unit 35, to the brake cylinders by the Metcalfe Oerlikon EST 4f/AL2b/s/HBG 31 distributor. For convenience a standard carrier bracket 32 is fitted which provides a flange upon which the distributor can be affixed without disturbing the pipework of the vehicle. The pipe may be fed into and through the reservoir capacity formed to the rear of the bracket, giving rigidity as well as the essential control-reservoir volume necessary for the operation of the distributor.

### The Automatic Air Brake Pipe Control.

The automatic air brake pipe controls the brake cylinder pressure through the action of the distributor 31. This brake control pipe is also connected through the distributor pipe bracket 32. A square D type pressure switch 46 is fitted on the A.A.B.P. This unit is held closed only when the A.A.B.P. is in excess of 15 $lbf/in^2$ (1.00 bar) which actuates WSDR to energise the wheelslide detection (electronic) at 110v, which in turn will actuate the W.S.P. blowdown valves on the vehicle. This ensures that the battery will not be excessively drained when there is no locomotive power source available. The time delay relay is sequenced in this circuit to open after 2 minutes (below 15 $lbf/in^2$ by which time in 'normal' working there should be no call for W.S.P. operation. A brake continuity test cock 43 is fitted.

### Passenger Communication.

Passenger communication handles 42 are provided along the interior sides of the coach, which will (when pulled) actuate EMERGENCY VALVE 41 to vent the A.A.B.P. to atmosphere. An isolating cock 23 is fitted for this system.

### The Brake Control System.

The ultimate pressure created and held in the brake cylinders 30 is maintained via flexibles 38 and electrically controlled pneumatic 'blow down' valves 29 one of which is fitted on each axle brake air line.

The air is passed to this line at a rate and to an ultimate pressure, determined by the DISTRIBUTOR.

The distributor has mounted integral to it the load proportional or VARIABLE LOAD VALVE which will determine the ultimate maximum brake cylinder pressure.

The variable load valve (AL2b on D. & M. distributor) is in turn instructed by a PRESSURE REDUCING VALVE 36 which will set the AL2b to deliver the required brake cylinder pressure. In the sleeping car installation the gross weight differs very little from tare and no account is taken of the VARIABLE LOAD/LOAD PROPORTIONAL condition, this pressure being pre-set by the pressure reducing valve setting. This relationship can be tested by use of schrader test points 26.

Control pressure 57 p.s.i.

Maximum brake cylinder pressure 35 minimum - 39 maximum p.s.i.

The S.A.B. Combined Brake Cylinder and Slack Adjuster.

The sleeping car vehicles are fitted with S.A.B. SAU2-190 brake cylinder/slack adjuster units, the cylinders having a 198 mm bore, the caliper unit leverage being 1.6 as on H.S.T. and Mk. III locomotive hauled trailer vehicles.

Pressure Reducing Valve (Fig. 16).

Brake Cylinder Pressure - Control of Pressure Range.

Due to the fact that the total weight of this design of sleeping car hardly differs from empty to load condition, there is no need to provide a variable brake cylinder pressure related to the load carried, i.e. the air suspension bellows pressure. Retaining the standard locomotive hauled stock type distributor with load proportionality (for interchangeability) does however require an air signal to determine the range of brake cylinder pressures delivered by the distributor. To provide this air signal a pressure reducing/limiting valve is fitted between the auxiliary reservoir and the load proportional valve.

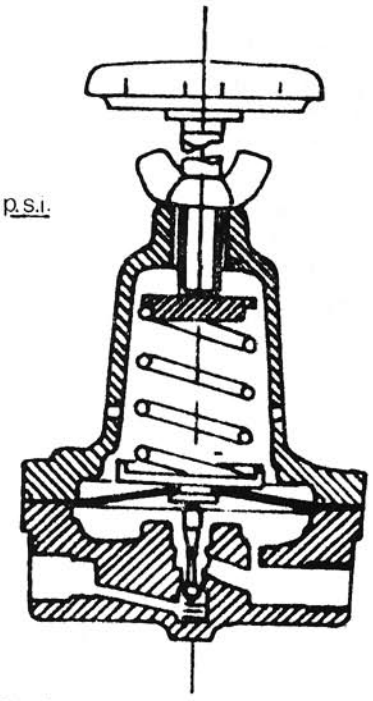



FIG. 16.

PRESSURE REDUCING VALVE

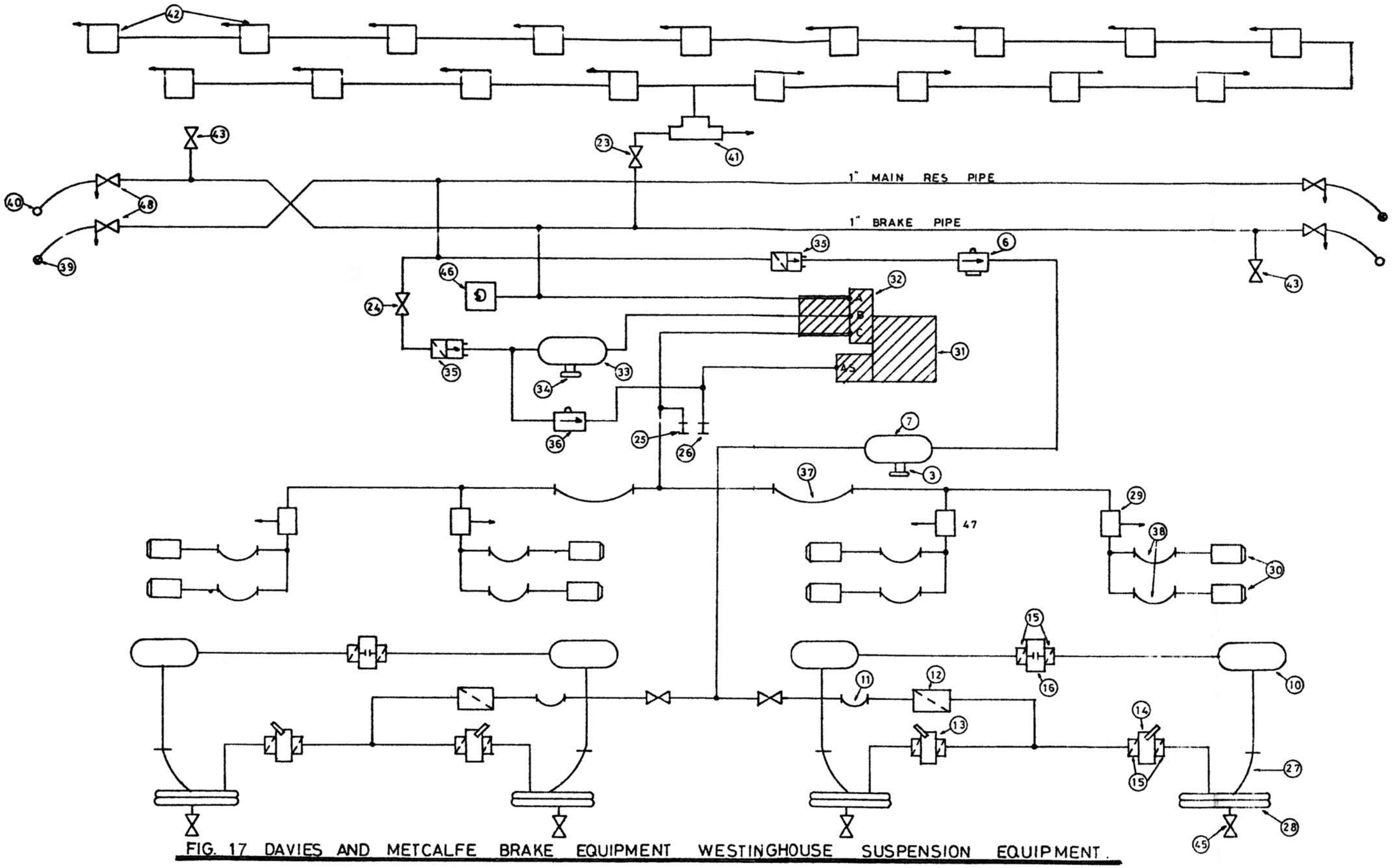



FIG. 17 DAVIES AND METCALFE BRAKE EQUIPMENT WESTINGHOUSE SUSPENSION EQUIPMENT.

| | |
|---|---|
| 31 | EST 41/AL2 b/S/ HBG TYPE DISTRIBUTOR |
| 32 | CARRIER BRACKET S 4C S TYPE 15 |
| 33 | AUXILIARY RESERVOIR |
| 34 | AUTO DRAIN VALVE TYPE 4 |
| 35 | STRAINER CHECK AND CHOKE UNIT TYPE 2 |
| 36 | PRESSURE REDUCING VALVE FF 3016 |
| 41 | EMERGENCY APPLICATION VALVE TYPE 1 |
| 42 | PASSENGER EMERGENCY VALVE TYPE 1 |

| | |
|---|---|
| 6 | CHARGING VALVE |
| 7 | SUSPENSION RESERVOIR |
| 10 | SURGE RESERVOIR |
| 12 | FILTER |
| 13 & 14 | HORIZONTAL LEVELLING VALVE |
| 15 | AIR LINE STRAINER |
| 16 | COMPENSATING VALVE |
| 46 | SQUARE 'D' PRESSURE SWITCH |

| | |
|---|---|
| 25 | SCHRADER TEST POINT BRAKE CYL PRESSURE |
| 26 | SCHRADER TEST POINT CONTROL PRESSURE 57 P.S.I. |
| 28 | AIR SPRING |
| 29 | W S P BLOWDOWN VALVE |
| 30 | SAB CAU 2 190 BRAKE CYLINDER |
| 23 | BRAKE CONTINUITY COCK |
| 47 | W S P BLOWDOWN VALVE |

# Mk 3 SLEEPER
# CONTROL UNIT CUPBOARD