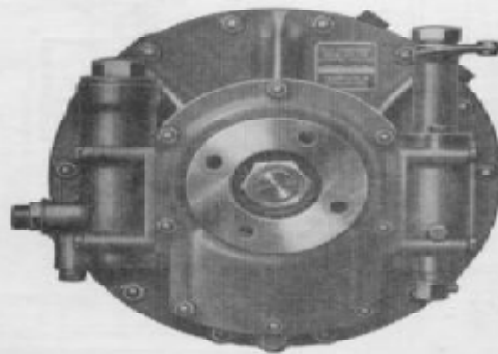


*P. DePuyter*

**MARINE GEARBOX  
TYPE M.R. 10A**



*Stern view of Gearbox*

**SELF-CHANGING GEAR CO., LTD.  
LYTHALLS LANE, COVENTRY, ENGLAND**

TELEPHONE : COVENTRY 89081

TELEGRAMS : SELPCHANGE, COVENTRY

**PATENTS**  
BRITISH PATENT — No. 555133  
and other patents pending

## GENERAL DESCRIPTION

## GENERAL DATA

## GEAR RATIOS :

Ahead 1 : 1  
Astern 1 : 1.

## POWER CAPACITY :

Ahead 436 lb./ft. at 2,250 r.p.m.  
Astern 233 lb./ft. at 1,500 r.p.m.

## CAPACITY FOR PROPELLER THRUST :

3,000 lb.

## GEARBOX OPERATION :

By oil pressure from engine-driven pump.  
Normal oil pressure 60 lb. per square inch.

## LUBRICATION :

Automatic, from pressure control system.  
Recommended grades of oil: to Admiralty Specification O.E. 30 H.D.

Alternatively any high grade straight mineral oil of Redwood (No. 1) Viscosity 100/140 seconds at 140°F.

## WEIGHT DRY :

137 lb.

## DESCRIPTION OF GEARBOX

## GENERAL

The gearbox is bolted directly to the power unit and comprises a multi-plate clutch for ahead drive and a planetary gear for astern drive which is operated by a cone clutch.

These clutches are operated by oil pressure supplied by a pump external to the gearbox and driven by the engine, the control being in the form of a rotary selector valve carried on the side of the gearbox.

The engine-driven pump which delivers engine oil for clutch actuation also provides oil for lubrication of the gearbox, the overflow of oil from the gearbox sump is returned by gravity to the engine sump for recirculation. A fine-gauze filter with pre-loaded bypass valve is included in the pressure circuit and this is mounted on the side of the gearbox.

## RUNNING GEAR

*Ahead Drive (See Figure 1)*

The ahead drive is obtained by engagement of the multi-plate clutch, by this means the drive is transmitted from the engine crankshaft to the gearbox output shaft through adaptor-gearbox to crankshaft (23782), input coupling (23741), planet carrier dog coupling (23750), clutch plates (23754) (23760) and forward clutch member (23745) which is mounted on the splines of the gearbox output shaft.

*Astern Drive (See Figure 2)*

The astern drive is obtained by engagement of the cone (23737) with lining (23751) which is fitted in a conical recess in the intermediate casing (23762). By so doing the internally toothed annulus gear, which is integral with the cone, is held stationary. Rotation of the planet carrier (23748) causes the planets which are in mesh with the annulus gear, to rotate about their axes. These planets are paired with other planets (23761) which are in mesh also with the sun gear (23740) on the output shaft.

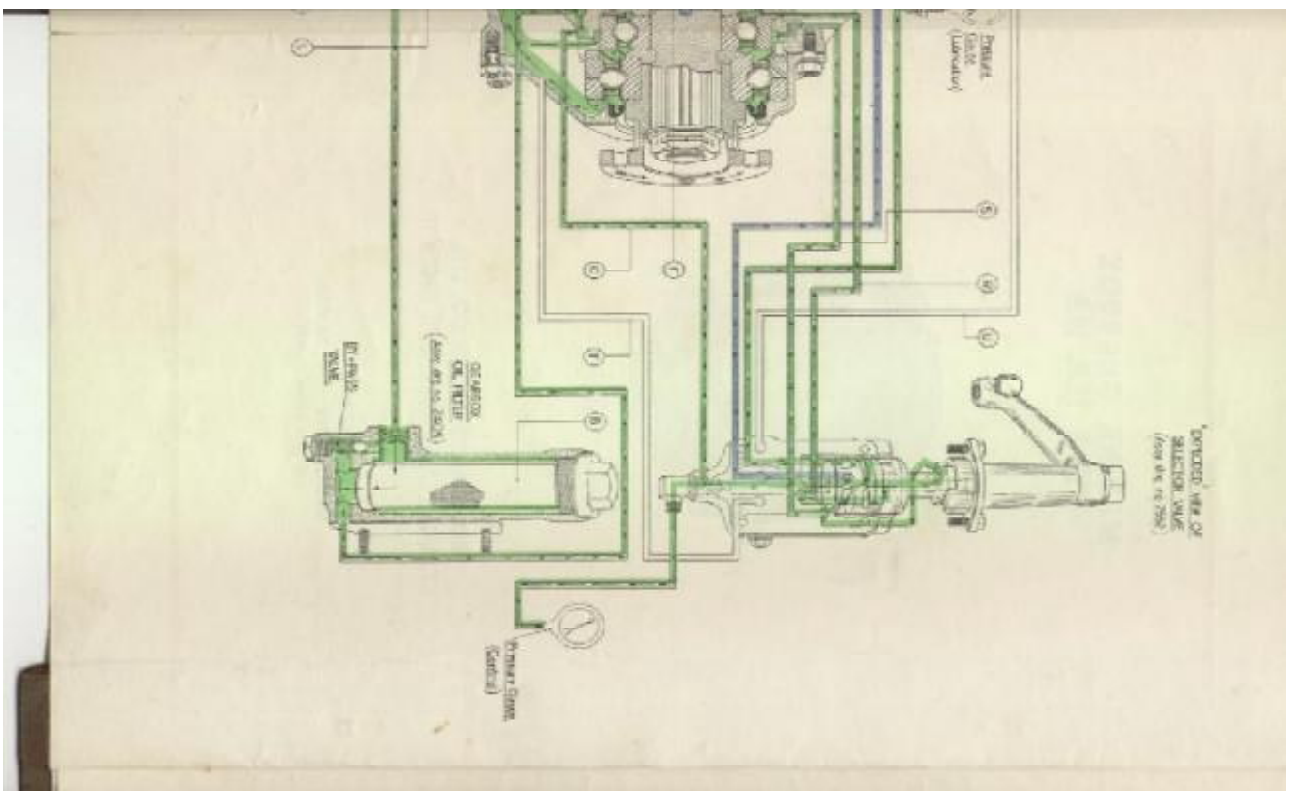
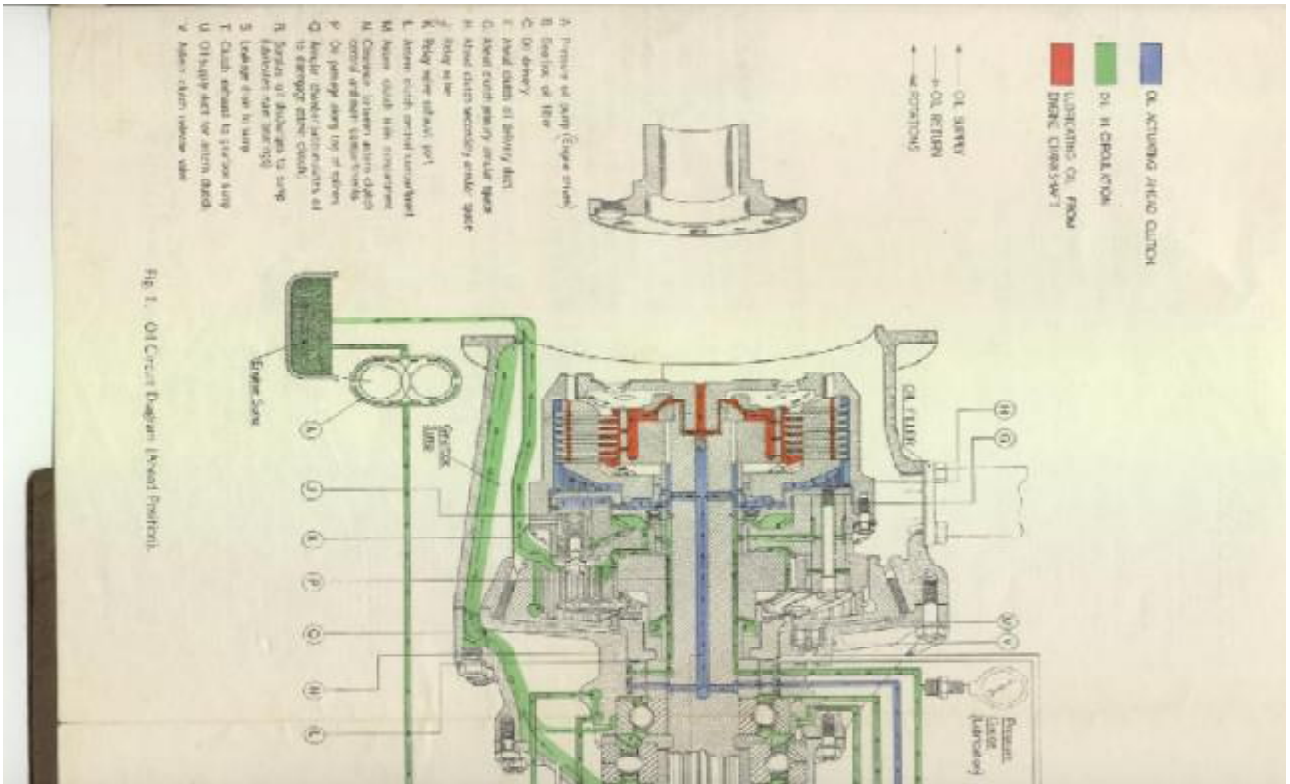
In this way a reverse drive is imparted to the sun wheel and the output shaft, which is splined in it.

The output shaft is supported at the forward end by a bush (23758) carried on the input coupling which is rigidly bolted to the adaptor. The rear end of the shaft is carried in a ball bearing (11507).

The thrust load from the propeller is taken by the thrust bearing (11552) mounted on the boss of the gearbox output coupling (23739).

*NOTE.—Reference numbers used in the description refer to Fig. 3.*

PLEASE TURN OVER



## GENERAL DESCRIPTION

## HYDRAULIC OPERATION AND LUBRICATION

The actuation of the clutches is effected by oil delivered under pressure from an engine-driven pump (A) which delivers engine oil through an external pipe to the gearbox filter (B) after passing through the filter the oil is delivered to the central passage (C) in the selector valve. The position of the valve lever determines whether the oil supply is connected to the ahead clutch or the astern clutch. In the midway position it is shut off from both (See Figure 3).

The oil pressure is controlled by the action of spring (D) which bears down on the plunger (E). When the pump delivers more oil than is required for clutch actuation, the pressure will tend to rise above the pre-set figure which is approximately 60 lb. per square inch for normal control. At this pressure the plunger (E) will be forced upwards against the spring pressure until oil escapes from the central passage into the lubricating system of the gearbox. If the pressure continues to rise when the lubricating system is supplied, the plunger (E) rises still further until oil is allowed to escape into the gearbox sump.

## 'AHEAD' CLUTCH ACTUATION (See Fig. 1)

When the selector valve is moved to the "ahead" position, oil is forced through the oil muff or gland which encircles the shaft adjacent the ball bearing, whence it is forced through a duct (F) in the shaft, entering the ahead clutch at (G). The pressure thus applied in the annular space (G) moves the piston and the clutch plates into contact, and thus seals the larger annular compartment (H) which is connected with the relay valve (J). The compartment (G) also is connected by a duct with valve (I), and the pressure raised in this compartment when the piston engages the clutch plates, acts on the spring-loaded piston of the valve, which then moves out and connects the ducts of (G) and (H) together, so that the pressure applied in (G) now extends over the whole area of the piston, forcing it into full engagement with the clutch plates.

When the selector valve is returned to the "neutral" position (see Figure 3), the pressure is removed from (G) and from the relay valve (J) which now returns under the action

of the spring, and in so doing connects the clutch compartment (H) with an exhaust port (K) which allows the oil in the clutch to escape under centrifugal action.

With the oil pressure now removed the clutch plates are parted by the spring action of the separating rings (22303).

## 'ASTERN' CLUTCH ACTUATION (See Fig. 2)

When the selector valve is moved to the "astern" position, oil is forced into the central compartment (L) of the astern clutch, and causes it to move into contact with the lining thus sealing the main compartment (M), at the same time oil is forced, under pressure, into compartment (M) from compartment (L) through clearance (N) until the pressure is applied over the entire area of the cone.

To enable the oil pressure to be released quickly from compartment (M) when "neutral" is selected a unidirectional release valve (V) allows the oil to by-pass clearance (N) to exhaust.

## 'NEUTRAL' (See Fig. 3)

The pressure is shut off from both clutches when the selector valve is moved to the "neutral" position.

## LUBRICATION

Oil supplied from the central passage of the selector valve to the lubricating system enters the muff, and thence passes through the clearance at the top of the shaft splines at (P) to the planet bearings. Tappings are also taken to the annular chamber (Q) where the action of the lubrication pressure disengages the astern clutch, when the actuation pressure is released. Oil discharged from the clearance between the muff and the sleeve on which it is carried lubricates the ball bearings on the output shaft.

The bush (23758) at the forward end of the output shaft is lubricated by oil tapped from the engine crankshaft, the same oil being used to lubricate the clutch plates. Oil discharged into the gearbox sump is returned to the engine sump for recirculation.

## GENERAL DESCRIPTION

## OPERATION

It will be understood, from the foregoing description, that the oil pressure for actuation of the clutches in the gearbox is supplied by the engine-driven pump, and it therefore follows that the engine must be running before the gearbox clutches can be operated. It is equally important that the engine idling speed should not be too high when the clutches are being engaged.

The selector lever on the gearbox has an inbuilt spring-loaded detent (21134) (Figure 3), which ensures that the selector valve port registers accurately with the ports in the

valve body communicating with the oil ducts in the gearbox.

The movement of the gear control lever should be quick and positive, and it must not be allowed to dwell in any intermediate position.

## IMPORTANT

**The engine must be running before the gearbox clutches can be operated to engage 'Ahead' or 'Astern' gear.**

## MAINTENANCE INSTRUCTIONS

## OIL FILTER

The filter is situated on the port side of the gearbox, and contains a gauze cartridge, which should be withdrawn for cleaning at frequent intervals. With the engine stopped, the large hexagonal cap (22204) should be unscrewed, and the gauze withdrawn. It should be cleaned by soaking in paraffin. A fine brush may be used to remove carbon or sludge from the mesh of the gauze, but no rag or waste may be used for this purpose.

When replacing the gauze care should be taken to see that the lower end is inserted in the recess provided at the bottom of the filter casing. The cap should be screwed down securely with the copper-asbestos washer in place. It should be remembered that the filter is under pressure from the pump, when the engine is running, and it is therefore advisable to test for leakage at the cap, by starting up the engine after the filter gauze has been replaced. The frequency of cleaning the filter will best be determined by experience, but it is recommended that it should be cleaned at least every 50 hours running.

## CLUTCH PLATES AND CLUTCH LININGS

No adjustments are required to be made to the clutches. Provision is made for the clutch plates to wear to approximately minus .020 inches below their original thickness, i. e., .010 inches off each face. Allowance is also made for the cone lining to wear to approximately two-thirds of its initial thickness. An indication of worn linings will be prolonged slip on engagement, and, if allowed to develop, it may be found that slip occurs when the engine throttle is opened after engagement.

Normally the clutch should be fully engaged within less than five seconds of moving the control valve. If this period is exceeded, or there is any suspicion of slip when the throttle is opened, this must not be allowed to continue or extensive damage will result. The remedy is to instal new clutch plates or linings, for which purpose the gearbox must be removed and a replacement gearbox fitted.

## REMOVAL OF GEAR BOX FROM ENGINE

Having disconnected the control valve linkage, the oil supply to the filter unit, and having removed the bolts from the output coupling flange, the nuts securing the forward end of the intermediate casing (23762) should be removed and the gearbox withdrawn from the engine.

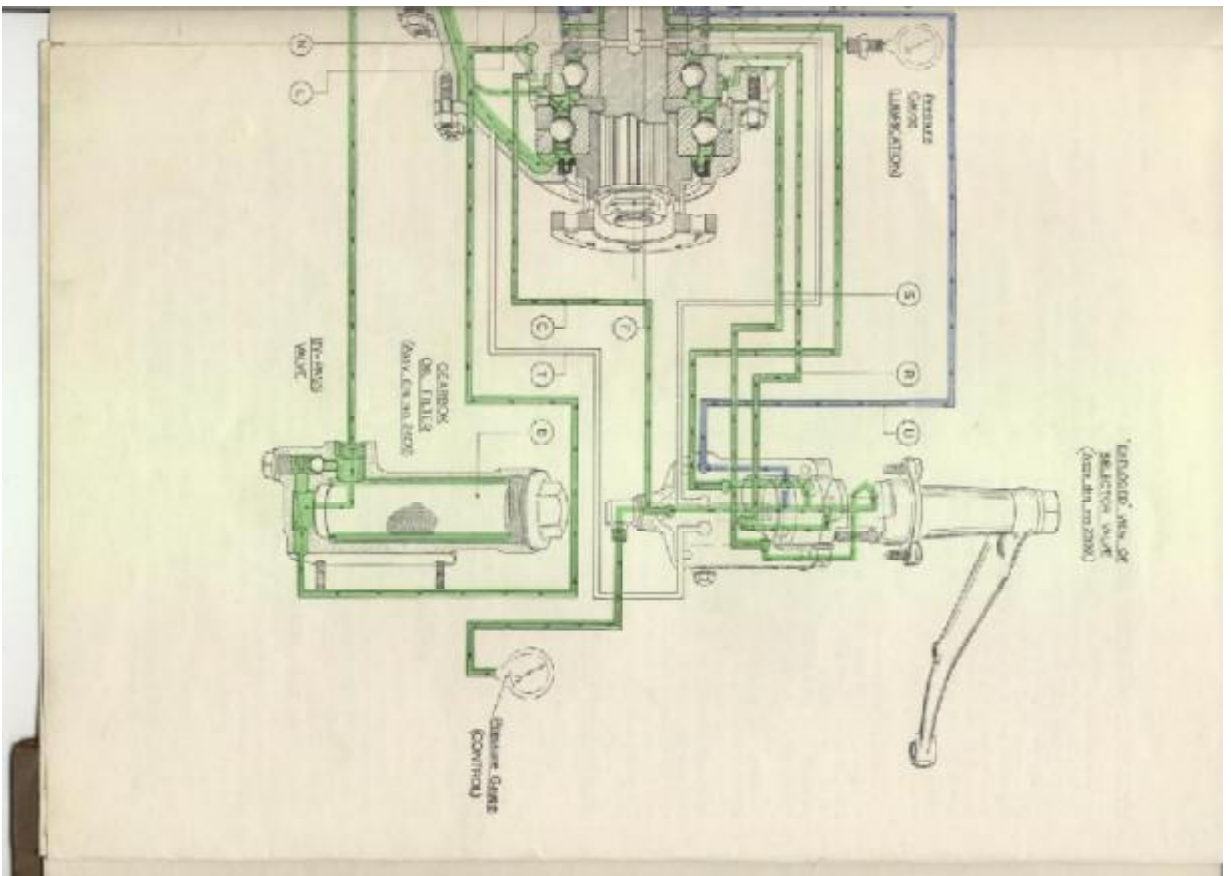
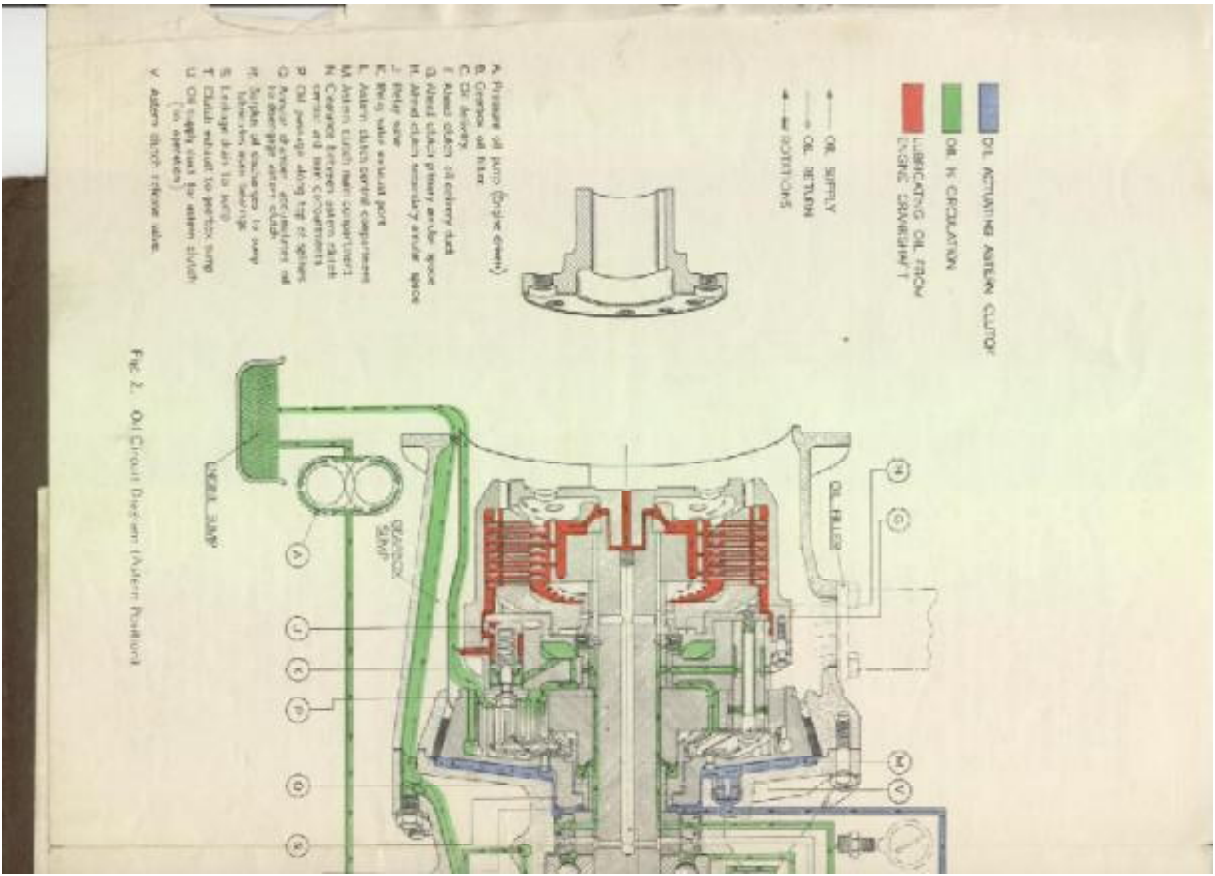
## DISMANTLING AND RE-ASSEMBLING GEAR BOX

## Dismantling Running Gear—

First remove the nuts (17937) securing the intermediate casing (23762) and detach this from the bearing housing (23734) using extractor No. T. (10243). This exposes the astern clutch lining (23751) which can be pressed out of its conical seating if required to be replaced.

To remove the nut (23766) retaining the ahead clutch and gear components the output coupling should be restrained against rotation. The tabs of locking plate (23767) should be disengaged from the teeth of clutch member (23745) before attempting to unscrew the nut. Having removed the nut the whole assembly of ahead clutch and planet carrier can be withdrawn from the shaft taking with it the clutch member and distance sleeves (23744) and (23743).

PLEASE TURN OVER



## MAINTENANCE

The split ring (22180) may be removed from its slot in the shaft and the sunwheel (23740) can be withdrawn followed by the astern clutch assembly (2306) and distance sleeve (22235).

At this stage the clearance between oil muff (23777) and sleeve (22174) can be checked by the use of feeler gauges. If the muff has to be removed the procedure is as follows:—

First remove nuts (17942) securing the end cover, then remove output coupling nut (22312) and withdraw from shaft the output coupling (23739) together with thrust bearing and end cover. Next remove the abutment washer (23757) from its slot in the shaft and press the shaft through the ball bearing (11507). The latter ball bearing may now be removed from the bearing housing (23734) and the oil muff can next be withdrawn. It is important to note that the muff should only be withdrawn in the direction of the output end of the housing.

**Dismantling Ahead Clutch and Pinion Assembly:**

To remove the planet pinions (23761), undo the tabs of the locking plates (23780) and remove screws (23770). The retaining plates (23747) can then be lifted off and the planet pinions removed from their bearings.

To open up the ahead clutch turn down tab washers (22260) and remove set screws (23779) when the dog coupling (23750) may be withdrawn from the planet carrier (23748) using extractor No. T. (10243). The piston (23749) can now be removed and the clutch plates withdrawn.

**EXAMINATION AND CLEANING**

If the gearbox has had a long period of service, it will be advisable to examine lubrication passages and oil pressure ducts for accumulations of carbon or other deposits carried through with the oil from the engine. Such deposits are likely to be found in the reservoir formed between the carrier (23748) and the plate (23759). The latter may be pressed out of the recess in the carrier after removal of the six retaining screws (23771), access to the plate for the purpose of pressing out being obtainable at three points, through

the bore in the carrier which normally carries the relay valve piston and through the other two counter-balancing holes which are spaced equi-distant from it.

The planet pins (23746) are a "press" fit in the carrier, and their removal should be avoided. It is necessary, however, to ensure that the oil passages in the pins and the carrier are free from deposit. This may be done by inserting cleaning wires through the radial holes in both parts. Should it be necessary to remove the pins, great care must be taken in replacing them to ensure that they are kept aligned with the bores in the carrier while being pressed into position. Also they must be brought exactly in line with the inner face of the carrier.

The opportunity should be taken to clean the relay valve piston and the ports and passages which open into its bore in the carrier. Make certain that the valve piston is quite free in its bore when re-fitting. The astern clutch release valve also should be examined to see that it is not gummed up. The small radial holes in the clutch hub (23745) should be cleaned out, as well as those in the muff sleeve (22174) and in the other distance sleeves. Sludge is likely to deposit between the internal teeth of the dog coupling (23750) and in the cavity behind the teeth in the cone (23737).

The selector valve may be examined by removing the upper portion from the valve body and withdrawing the rotor assembly. When the valve spring (22215) is removed the plunger (22216) should be free in its bore. If it is necessary to remove this plunger for cleaning, the pin (21132) should be filed flush and punched out, a new pin being used when re-fitting. The plunger cannot be withdrawn through the upper end of the rotor.

Certain gearboxes have selector valve rotor fitted with insert (25706) between the valve spring (22215) and the screwed plug (21126). Care should be taken to replace this part when re-assembling (see Figure 5).

When replacing the rotor assembly in the valve body it is important to ensure that the short sleeve (21133) is in position in its recess in the valve body.

The oil seal (11735) should be examined and replaced if necessary. Wearing parts such as bushes, clutch plates, astern clutch lining and oil muff should be carefully examined and replaced if necessary, reference being made to the list of wear allowance included at the end of this book.

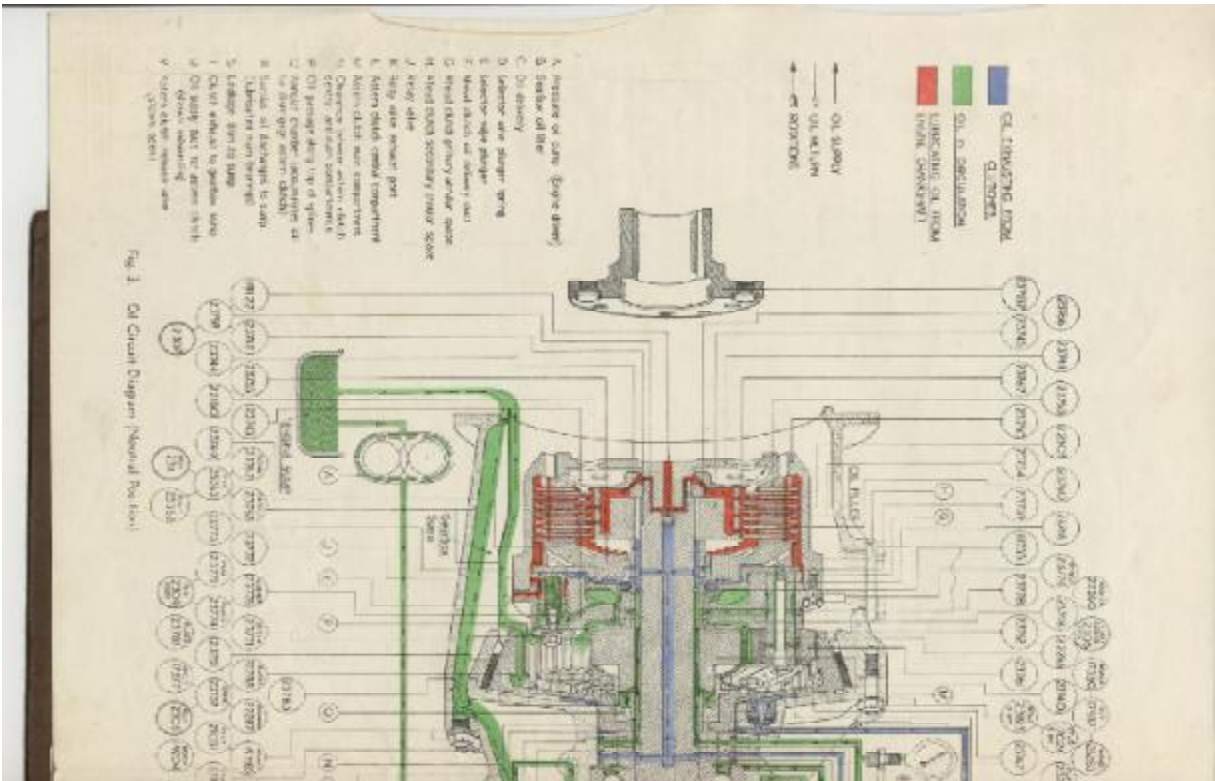
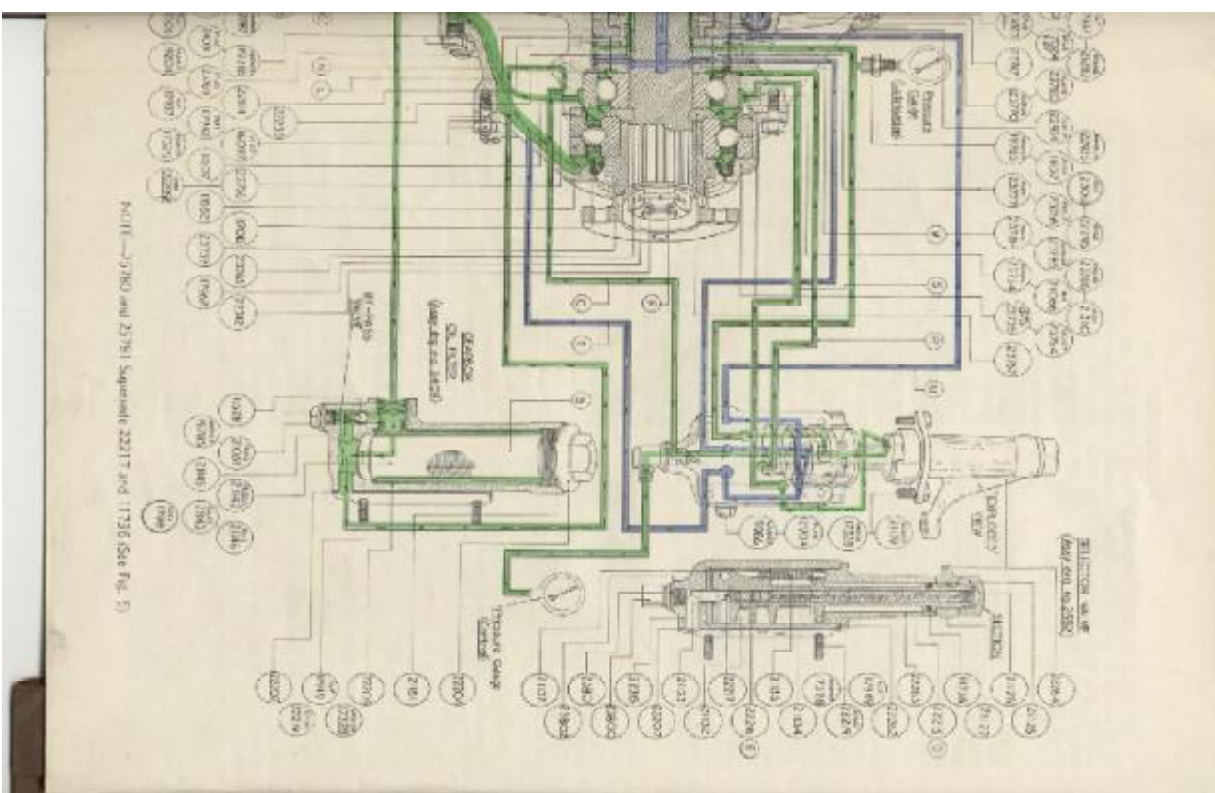


Fig. 3 Oil Circuit Diagram (Normal No. 10)



NOTE—2780 and 2781 Separate 22317 and 11736 (See Fig. 5)



MAINTENANCE

RE-ASSEMBLING THE GEARBOX

Assembling the Planet Carrier:

First assemble the planet bushes (22265) and planet pinions (23761) on to their axles (23746) with the latter in position in the planet carrier (23748), replace retainer plates (23747), fitting new locking plates (23780), screw up retainer bolts and lock by turning up the locking plate tabs.

Note: At this stage the ahead clutch is not refitted to the planet carrier; its re-assembly into the gearbox is described under the next heading.

Assembling the Running Gear:

First replace the oil muff assembly (2308) in the bearing housing (23734) and ensure that the two key inserts (23768) locate in the anchoring slots provided in the housing press ball bearing (11507) into the housing. Next fit the oil muff sleeve (22174) on to the output shaft (23742) sliding it on from the output end to approximately its final position, and then press the shaft back through the bearing until the slot for the abutment washer (23757) projects beyond the bearing face. Insert the abutment washer and press the shaft back through the bearing (11507) until the washer is thrust against the bearing face. The friction between these parts will prevent the washer falling out of the slot until the thrust bearing is fitted over it. Having assembled the thrust bearing (11582) in the end cover and pressed it home on the output coupling, the latter should be pressed home on the splines of the output shaft with the radial holes in the coupling aligned radially with the split pin hole in the shaft. The retaining nut should not be tightened up until the running gear has been completely assembled. If the thrust ring (23756) has been removed for any reason it is important to see that this is replaced together with its retainer pin (21066), before the coupling and thrust bearing are fitted on the shaft. The amount of shims (22235/6) to be inserted behind the ring should be such that all clearance between the ring and the bearing is taken up without preventing the end cover (23735), making a thorough and continuous joint with the housing (23734). This can be provided for by taking depth measurements before assembling, but should be checked when finally pulling up the nuts

(17942). From this point, assembly should proceed from the input end of the shaft. It is essential that the sleeves and other components assembled on this end of the shaft are absolutely clean and free from burrs, as they require to make a hydraulic seal by contact between adjacent ends.

Fit distance sleeve (22235), astern cone assembly and sunwheel (23740). Then fit split ring (22180) into the slot provided in the shaft.

Before fitting the planet carrier assembly to the shaft, the distance sleeve (23744) should be entered into the oil seal (11735), taking care not to damage the lip of the seal, also see that the sleeve is the right way round (i.e. the end with the large oil holes should be inserted in the seal). With the sleeve held firmly against the adjacent sleeve (23743) the whole assembly should be pushed along the shaft, taking care to pass it over the split ring, which should be a close fit in the sleeves when the two halves are pressed together. If the gearbox shaft is held vertically upward during this part of the assembly, it will be advisable to use some thick grease to retain the bush (23752) in the carrier as otherwise it is liable to fall out of place and may get in the way of sleeve (23743). The piston (23749) and its bush (23755) are next fitted, followed by the clutch member (23745) and clutch plates (23754) and (23760), and the separator rings (22303). The whole should then be secured by fitting the clutch nut (23766) and its locking plate (23767), the latter being locked by bending over one or more of its tabs between teeth of the clutch member. Note that when used clutch plates are re-fitted, they should, if possible, be re-assembled in the same order as they were removed, so that the same contacting surfaces are paired together. It is also recommended that a new locking plate (23767) be used if the re-use of the old one means bending the same tabs as were previously bent.

The teeth of the outer clutch plates (23754) are then aligned and the planet carrier dog coupling (23750) with the abutment plate (23753) in position inside it is fed back over the plates on to the spigot of the planet carrier (23748) and retained by setscrews (23776) which are in turn locked by new tab washers (22200).

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Part N  
17937  
17942  
17949  
22312  
3736  
3770  
3771  
3779

PLEASE TURN OVER

MAINTENANCE

The intermediate casing (23762) with the astern cone lining (23751) in position in the conical recess is then fitted to the bearing housing (23734) and secured by nuts (17937) with spring washers (17330). Care must be

taken to pull up evenly on these nuts, especially when fitting a new astern lining.

Finally the output nut (22312) is pulled up and locked by inserting the split pin (17967), and clearances checked by using Gauge (T 11290) (see Fig. 4).

The recommended tightening torques for the various nuts, etc. are as follows:—

Part No.	Description	Torque—lb. in.
17937	Nut $\frac{3}{8}$ " B.S.F. ... ..	200
17942	Nut $\frac{5}{8}$ " B.S.F. ... ..	100
17949	Nut $\frac{1}{2}$ " B.S.F. ... ..	50
22312	Output Shaft Nut ... ..	2500
23766	Forward Clutch Nut ... ..	3000
23770	Long Fixing Screw ... ..	85
23771	Short Fixing Screw ... ..	50
23779	Bolt $\frac{1}{2}$ " B.S.F. ... ..	50

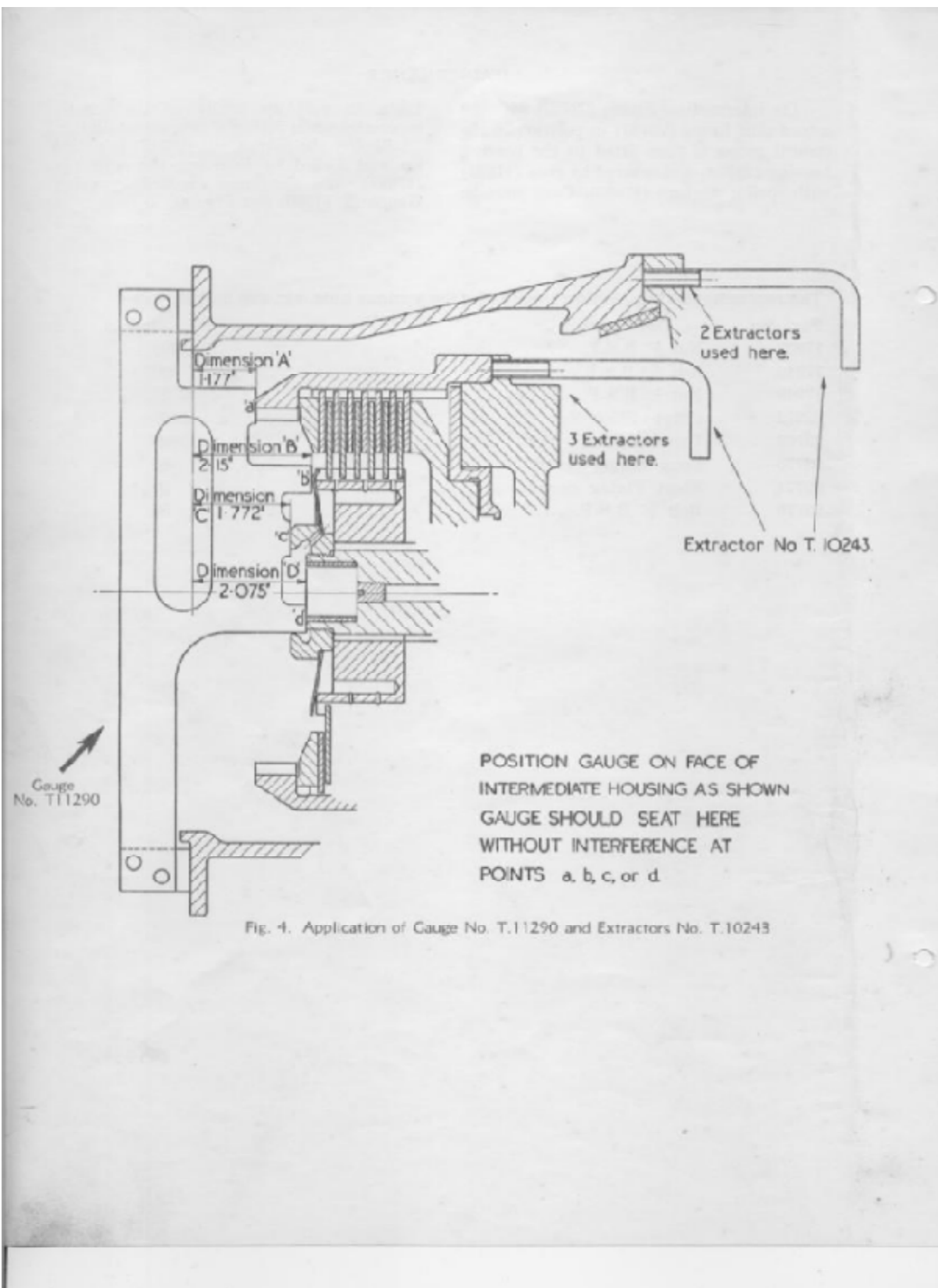


Fig. 4. Application of Gauge No. T.11290 and Extractors No. T.10243

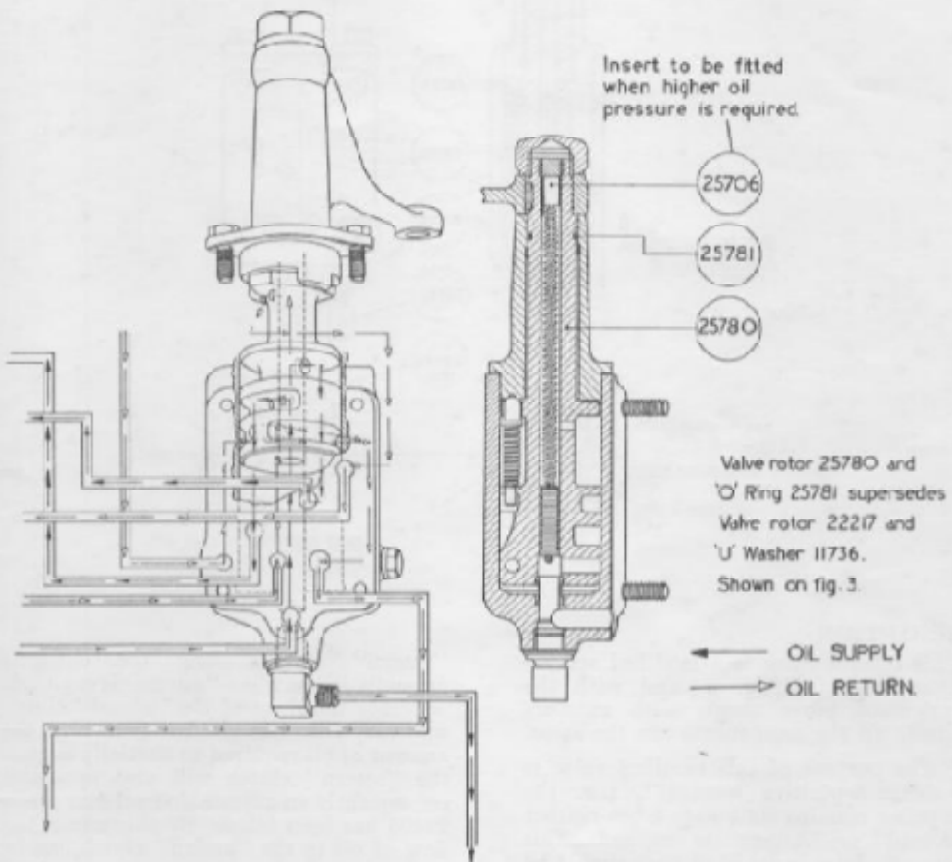
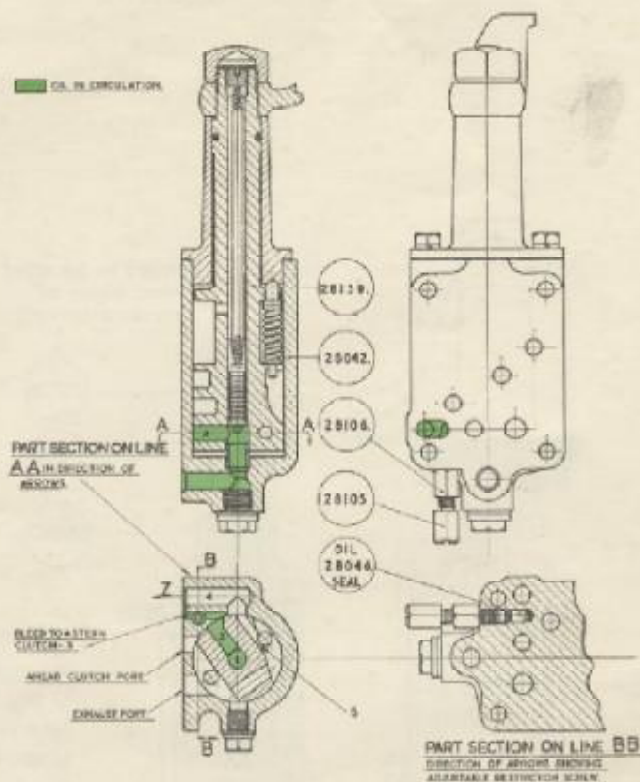


Fig. 5

MODIFIED CONTROL VALVE



DESCRIPTION

This control valve is a modified version of that shown on fig. 3, and with the exception of parts shown with numbers attached, all the components are the same.

The purpose of this modified valve is to obtain a positive "neutral", i. e. the propeller remains stationary when neither "Ahead" or "Astern" is engaged. This state of affairs is achieved very simply by tapping off a supply of oil and directing it to the "astern" clutch. This clutch is then partially applied, thus counteracting the drag caused by the "ahead" clutch when "neutral" is engaged.

Referring to fig. 6 above, which shows the selector valve with "neutral" engaged, the oil enters the central passage 1 and passes along passage 2 whence it is bled off via passage 3, finding its way into the gearbox in the direction of arrow Z. Inside the gearbox the oil is led to the

"astern" clutch along the channels normally in use when "astern" is engaged.

Since the drag of the "ahead" clutch will vary from one gearbox to another the amount of oil required to partially engage the "astern" clutch will also vary and consequently an adjustable restrictor screw 28105 has been fitted. By this means the flow of oil to the "astern" clutch can be regulated to suit any particular gearbox.

It should be noted that, provided the usual attention is given to cleaning the valve rotor passages when the valve is dismantled, there is no danger of the "astern" clutch becoming fully engaged when in "neutral" since passage 3 is also connected via passages 4 and 5 to exhaust.

Finally, the instructions for examination and cleaning of the selector valve, given under the heading "Examination and Cleaning," apply equally well to this modified valve as to the earlier one.

## MODIFIED CONTROL VALVE

### SETTING INSTRUCTIONS

The adjuster screw 28105 is situated on the underside of the control valve, as shown on fig. 6 overleaf. The purpose of this screw is to alter the amount of oil being fed into the reverse clutch, setting up an oil drag to counterbalance the drag from the ahead plate clutch.

First, unscrew the adjuster screw locking nut 28106, and then screw out the adjuster screw 28105 until this can be turned in or out by hand. The engine should then be started and allowed to run at idling speed. If the gearbox output coupling revolves in the forward direction, the adjuster screw should be unscrewed until the output coupling comes to rest, and vice versa, if the gearbox output coupling (with the engine still idling) revolves in the astern direction, the adjuster screw should be screwed in.

The setting of the adjuster screw is very fine and should be done carefully. Whilst making adjustment, the control valve lever should be moved into gear, and then back into neutral.

As an example, we will assume that, with the engine running at idling speed, the gearbox coupling revolves in the ahead

direction. The adjuster screw has been loosened so that it can be screwed in or out by hand, and the control lever is in the neutral position. We should then slightly screw out the adjuster screw for about one turn. The gearbox control lever should then be moved into the astern position momentarily, and then back into neutral position. This procedure is repeated until a positive neutral is obtained.

If, with the engine running at idling speed and the gearbox control lever is in neutral position, the input coupling revolves in the astern direction, then the adjuster screw must be screwed in and a positive neutral found in exactly the same manner as explained above.

Finally, having set the adjuster screw, the locknut 28106 must be screwed up firmly without altering the position of the screw.

It should be explained to the Coxswain, owner of the boat, or any person who is going to operate the gear, that the control lever must be momentarily engaged in the opposite gear to that which he has been using before finally going into neutral position.

M.R. 10α PARTS LIST

PART No.	DESCRIPTION	No. OFF PER BOX	REMARKS
	<b>RUNNING GEAR</b>		
2307	ASSEMBLY OF OIL PLUG AND BUSH IN OUTPUT		
	SHAFT, comprising: ... ..	1	
19122	Plug ... ..	1	
23742	Output Shaft ... ..	1	
23758	Bush ... ..	1	
2306	ASSEMBLY OF ASTERN CLUTCH, comprising ...	1	
17377	Rivet ... ..	20	
22287	Diaphragm ... ..	1	
22288	Bush ... ..	1	
23737	Cone ... ..	1	
2305	ASSEMBLY OF PLANET CARRIER, comprising: ...	1	
26346	Planet Bush ... ..	6	
23746	Planet Pin ... ..	6	
23747	Planet Retaining Plate ... ..	3	
23748	Planet Carrier... ..	1	
23759	Carrier Plate ... ..	1	
23761	Planet ... ..	6	
23770	Long Fixing Screw ... ..	6	
23771	Short Fixing Screw ... ..	6	
23772	Relay Valve ... ..	1	
23773	Spring—Relay Valve ... ..	1	
23774	Cover Plate ... ..	1	
23775	Peg ... ..	1	Sub-Assembly 2309
23776	Washer ... ..	1	
23778	Grub Screw ... ..	6	
23780	Locking Plate for Planets ... ..	3	
23781	Locking Plate for Cover Plate ... ..	3	
17967	Split Pin—Output Shaft ... ..	1	
22174	Distance Sleeve—Oil Muff ... ..	1	
22180	Split Ring—Output Shaft ... ..	1	Pair
22235	Distance Sleeve—Astern Clutch ... ..	1	
22260	Tabwasher—Carrier Dog Coupling ... ..	12	
22295	Oil Ring—Oil Muff ... ..	3	
22303	Separating Ring—Clutch Plates ... ..	5	
22312	Nut—Output Shaft ... ..	1	
23739	Output Coupling ... ..	1	
23740	Sunwheel ... ..	1	
23741	Input Coupling ... ..	1	
23743	Flanged Distance Sleeve—Forward Clutch ...	1	
23744	Distance Sleeve—Forward Clutch ... ..	1	
23745	Forward Clutch Member ... ..	1	
23749	Piston—Forward Clutch ... ..	1	

## MR. 10c PARTS LIST (Continued)

PART No.	DESCRIPTION	No. OFF PER BOX	REMARKS
23750	Planet Carrier Dog Coupling ... ..	1	
23751	Lining—Astern Clutch ... ..	1	
23752	Bush—Planet Carrier ... ..	2	
23753	Abutment—Clutch Plates ... ..	1	
23754	Clutch Plate Outer ... ..	7	
23755	Bush—Forward Clutch Piston ... ..	1	
23757	Abutment Washer ... ..	1	
23760	Clutch Plate—Inner ... ..	6	
23765	Washer—Output Shaft ... ..	1	
23766	Forward Clutch Nut ... ..	1	
23767	Forward Clutch Locking Plate ... ..	1	
23768	Insert—Oil Muff ... ..	2	Sub-Assembly No. 2308
23777	Oil Muff ... ..	1	
23799	Setscrew—Carrier Dog Coupling ... ..	12	
1798	ASSEMBLY OF FILTER BASKET, comprising ...	1	
21142	Inner Sleeve ... ..	1	Not supplied separately
21143	Filter Gauze ... ..	1	
21146	Filter Ring ... ..	1	
11528	Relief Valve Ball ... ..	1	
19785	Washer for Plug ... ..	1	
21031	Plug ... ..	1	
21145	Relief Valve Spring ... ..	1	
21151	Washer for Filter Cap ... ..	1	
22204	Filter Cap ... ..	1	
22205	Filter Casing ... ..	1	
	<b>SELECTOR VALVE</b>		
12904	Plug ... ..	1	
19986	Washer ... ..	1	
21125	Cap Nut ... ..	1	
21126	Screwed Plug ... ..	1	
21127	Key ... ..	1	
31132	Valve Pin ... ..	1	
21133	Sleeve ... ..	1	
21134	Spring Plunger ... ..	1	
21135	Spring ... ..	1	
21137	Washer ... ..	1	
21139	Hex. Head Setscrew ... ..	2	
22215	Valve Spring ... ..	1	
22216	Valve Plunger ... ..	1	
25780	Valve Rotor ... ..	1	
22263	Pillar ... ..	1	
22264	Selector Lever ... ..	1	
22315	Casing for Selector Valve ... ..	1	
22800	Elbow Union ... ..	1	



## M.R. 10c PARTS LIST (Continued)

PART No.	DESCRIPTION	No. OFF PER BOX	REMARKS
23801	Washer for Elbow Union ... ..	1	
23802	Shim for Elbow Union ... ..	4	
25706	Insert for Valve Rotor ... ..	1	
	<b>BEARINGS</b>		
11507	Main Bearing—Output Shaft ... ..	1	
11582	Thrust Bearing—Output Shaft ... ..	1	
	<b>OIL SEALS</b>		
11706	Oil Seal—End Cover ... ..	1	
11735	Oil Seal—Planet Carrier ... ..	1	
25781	“O” Ring—Selector Valve Rotor ... ..	1	
	<b>CASINGS AND COVERS</b>		
2310	<b>ASSEMBLY OF PIN RELEASE VALVE AND BEARING HOUSING, comprising:</b>		
	Bearing Housing, comprising:	1	
21066	Retainer Pin for Thrust Ring ... ..	1	
23734	Bearing Housing ... ..	1	
23784	Plug—Release Valve ... ..	1	
23785	Diaphragm—Release Valve ... ..	1	
23786	Washer—Release Valve ... ..	1	
19204	Washer—Bearing Housing ... ..	2	
19785	Washer for Drain Plug ... ..	1	
21031	Drain Plug ... ..	1	
22285	Shim .003" thick ... ..	3	
22286	Shim .005" thick ... ..	3	
23735	End Cover ... ..	1	
23756	Thrust Ring ... ..	1	
22934	Parker Kalon Screw ... ..	4	
22935	Name Plate ... ..	1	
11637	1" Gas Union ... ..	1	
19785	Washer ... ..	1	
	<b>B.S.F. STUDS</b>		
16097	$\frac{3}{8}$ " Stud—End Cover to Bearing Housing ... ..	8	
17024	$\frac{3}{8}$ " Stud—Bearing Housing to Casing ... ..	8	
22219	$\frac{1}{4}$ " Stud—Filter to Bearing Housing ... ..	4	
22219	$\frac{1}{4}$ " Stud—Selector Valve to Bearing Housing ... ..	4	
23769	$\frac{3}{8}$ " Stud—Bearing Housing to Casing ... ..	2	
23823	$\frac{3}{8}$ " Stud—Bearing Housing to Casing ... ..	4	
	<b>STANDARD B.S.F. NUTS (PLAIN)</b>		
17937	$\frac{3}{8}$ " Nut—Bearing Housing to Casing ... ..	14	
17942	$\frac{3}{8}$ " Nut—End Cover to Bearing Housing ... ..	8	
17949	$\frac{1}{4}$ " Nut—Filter to Bearing Housing ... ..	4	
17949	$\frac{1}{4}$ " Nut—Selector Valve to Bearing Housing ... ..	4	

## M.R. 10α PARTS LIST (Continued)

PART No.	DESCRIPTION	NO. OFF PER BOX	REMARKS
	CASINGS AND COVERS <i>(Continued)</i>		
	S.C. SPRING WASHERS		
17330	$\frac{3}{8}$ " Washer—Bearing Housing to Casing ...	12	
17329	$\frac{3}{16}$ " Washer—End Cover to Bearing Housing ...	8	
17328	$\frac{1}{2}$ " Washer—Selector Valve Pillar to Casing ...	2	
17328	$\frac{1}{2}$ " Washer—Filter to Bearing Housing ...	4	
17328	$\frac{1}{4}$ " Washer—Selector Valve to Bearing Housing	4	
	PLAIN WASHERS		
25283	$\frac{1}{2}$ " Washer—Bearing Housing Lugs ...	4	
	PARTS SPECIAL TO P6M ENGINE		
2311	ASSEMBLY of CASING AND BAFFLE, comprising:	1	
23762	Intermediate Casing ... ..	1	
23763	Oil Baffle ... ..	1	
23562	$\frac{3}{8}$ " Rivet (Flat Head) ... ..	2	
25363	$\frac{3}{8}$ " Rivet (Flat Head) ... ..	2	
23752	Adaptor—Gearbox to Engine Crankshaft ...	1	
	GASKETS		
22207	Gasket—Selector Valve Casing ... ..	1	
22207	Gasket—Filter Casing ... ..	1	
22262	Gasket—Selector Valve Pillar ... ..	1	
23764	Gasket—End Cover ... ..	1	
23783	Gasket—Bearing Housing ... ..	1	
	TOOLS AND GAUGES		
T.10243	$\frac{1}{2}$ " B.S.F. Extractor Screw ... ..	3	
T.10387	11/16" and $\frac{1}{2}$ " B.S.F. Double ended Box Span- ner ... ..	1	
T.10388	$\frac{1}{4}$ " B.S.F. x 6" long Box Spanner ... ..	1	
	$\frac{1}{4}$ " B.S.F. Flat Box Spanner ... ..	1	
	$\frac{3}{8}$ " B.S.F. Box Spanner ... ..	1	
	$\frac{3}{8}$ " B.S.F. Box Spanner ... ..	1	
	$\frac{1}{2}$ " B.S.F. Flat Spanner ... ..	1	
	1" B.S.F. Box Spanner ... ..	1	
T.11290	Checking Gauge for Running Gear ... ..	1	

M.R. 10<sup>CI</sup> GEARBOX

## FITS, CLEARANCES AND REPAIR TOLERANCES

*All dimensions are given in inches. Dimensions quoted in these lists are given as a guides only.*

COMPONENT	PART NO.	DIMENSION		CLEARANCE		REMARKS
		New	Worn	New	Worn	
DISTANCE SLEEVE Oil Muff. Outside Dia.	22174	2.749 2.748		.0005 .003	.004	
DISTANCE SLEEVE Astern Clutch Outside Dia.	22235	1.993 1.99475		.00375 .006	.007	
PLANET BUSH Outside Dia.		1.05625 1.055		.006 .00825	.012	
Bore		.815 .81425		.000 .00125	.003	
BUSH—ASTERN CLUTCH Bore	22288	2.00075 1.99975		.00375 .006	.007	
Recess Dia.		2.626 2.6245		.001 .004	.006	
CONE—ASTERN CLUTCH  From Face to Boss to End of Taper (large end)	23737	1.30 1.35	1.32			Replace if Surface is Groved or Scored.
Land at top of Teeth		.07 .072	.05			Replace if Teeth are Badly Pitted or Ridged.
SUNWHEEL Dia. of Boss	23740	2.6235 2.622		.001 .004	.006	
Teeth						Replace if teeth are Badly Pitted or Ridged.
INPUT COUPLING Ground Dia.	23741	.873 .8715		.0015 .00425	.009	
FLANGED DISTANCE SLEEVE Outside Dia.	23743	1.98875 1.9975		.00075 .0035	.0065	

M.R. 10<sub>1</sub> GEARBOX

## FITS, CLEARANCES AND REPAIR TOLERANCES

*All dimensions are given in inches. Dimensions quoted in these lists are given as a guide only.*

COMPONENT	PART NO.	DIMENSION		CLEARANCE		REMARKS
		New	Worn	New	Worn	
DISTANCE SLEEVE Oil Muff. Outside Dia.	22174	2.749 2.748		.0005 .003	.004	
DISTANCE SLEEVE Astern Clutch Outside Dia.	22235	1.998 1.99475		.00375 .006	.007	
PLANET BUSH Outside Dia. Bore		1.05625 1.055 .815 .81425		.006 .00825 .000 .00125	.012 .003	
BUSH—ASTERN CLUTCH Bore Recess Dia.	22288	2.00075 1.99975 2.626 2.6245		.00375 .006 .001 .004	.007 .006 .006	
CONE—ASTERN CLUTCH  From Face to Boss to End of Taper (large end) Land at top of Teeth	23737	1.36 1.35 .07 .072	1.32  .05			Replace if Surface is Groved or Scored.  Replace if Teeth are Badly Pitted or Ridged.
SUNWHEEL Dia. of Boss Teeth	23740	2.6235 2.622		.001 .004	.003	Replace if teeth are Badly Pitted or Ridged.
INPUT COUPLING Ground Dia.	23741	.873 .8715		.0015 .00425	.009	
FLANGED DISTANCE SLEEVE Outside Dia.	23743	1.99875 1.9975		.00075 .0035	.0035	

**M.R. 10<sub>G</sub> GEARBOX (Continued)**  
**FITS, CLEARANCES AND REPAIR TOLERANCES**

COMPONENT	PART NO.	DIMENSION		CLEARANCE		REMARKS
		New	WORN	New	WORN	
FWD. CLUTCH DISTANCE SLEEVE Outside Dia.	23744	1.99925 1.998		.0005 .00275	.0045	
FORWARD CLUTCH MEMBER TEETH	23745					Replace if Teeth are Badly Ridged.
PLANET CARRIER Bore	23748	2.3135 2.312		.001 .004	.007	
PISTON—FORWARD CLUTCH Bore	23749	2.376 2.3745		.0015 .005	.008	Replace if Friction Face is Badly Scored
PLANET CARRIER DOG COUPLING Clutch Teeth	23750					Replace if Badly Ridged.
LINING—ASTERN CLUTCH Thickness	23751	.192 .187	.135			
BUSH—PLANET CARRIER Outside Dia. Bore	23752	2.3110 2.3095 2.001 1.9995		.001 .004 .00075 .0035	.007 .0065	
CLUTCH PLATE—Outer	23754	.127 .123				Replace 23754 if Oil Grooves are Worn Out. Re- place 23754 and/or 23760 when the Total Thickness of all Clutch Plates is 1.25.
CLUTCH PLATE—Inner	23760	.103 .1				

**M.R. 10c GEARBOX (Continued)**  
**FITS, CLEARANCES AND REPAIR TOLERANCES**

COMPONENT	PART NO.	DIMENSION		CLEARANCE		REMARKS
		New	Worn	New	Worn	
BUSH—FORWARD CLUTCH PISTON Outside Dia	23755	2.373		.0015	.008	
		2.371		.005		
Bore		2.00075		.0005	.0045	
		1.99975		.00275		
BUSH Bore	23758	.87575		.0015	.009	
		.8745		.00425		
PLANET WHEEL Bore	23761	1.06352		.006	.012	Replace if Teeth are Badly Pitted or Ridged.
		1.06225		.00825		
Teeth						
OIL MUFF Bore	23777	2.751		.0005	.004	
		2.7495		.003		
BEARINGS—OUTPUT SHAFT Total End Float	11507				.015	
Inner to Outer Race	11582				.015	
OIL SEAL—END COVER	11708	Replace if Rubber Lip is damaged or when				
OIL SEAL—PLANET CARRIER	11735	worn to size of part over which it fits.				
"O" RING—SELECTOR	25781	Replace if damaged or when worn to size				
VALVE		of part into which it fits.				
PILLAR Top Bore	22263	.8755		.00075	.005	
		.87475		.0025		
SELECTOR VALVE SLEEVE Outside Dia.	21133	.43875		.0005	.0025	
		.43825		.0015		
ROTOR Outer Dia.	25780	1.82425		.0005	.004	
		1.823		.00275		
Plunger Hole Dia.		.31275		.0015	.004	
		.31225		.0025		
Bottom Recess		.43775		.0005	.0025	
		.43725		.0015		
Top Bearing Dia.		.874		.00075	.005	
		.873		.0025		

M.R. 10 $\alpha$  GEARBOX (Continued)  
 FITS, CLEARANCES AND REPAIR TOLERANCES

COMPONENT	PART NO.	DIMENSION		CLEARANCE		REMARKS
		New	Worn	New	Worn	
PLUNGER Dia.	22216	.31075 .31025		.0015 .0025	.004	
CASING Bore	22315	1.62575 1.62475		.0005 .00275	.004	
Bore of Recess		.43775 .43725		.0005 .0015	.0025	
PLANET PIN Outside Dia.	23746	.81425 .81375		.000 .00125	.003	

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Printed by  
John Baxter & Sons (Hinckley) Ltd.  
Hinckley - - Leicestershire



