

Section 2

POWER-DRIVEN PUMPS

LOCKHEED AIRCRAFT HYDRAULIC EQUIPMENT

4090 M.19187 G.2508 11/44 1050 T.B.L. 30

SECTION 2

POWER DRIVEN PUMPS

LIST OF CHAPTERS

(Breaks in numerical sequence are due to the removal of obsolete chapters)

- 2 Engine-driven pumps, Mk. 6, Series I,
Part No. AIR 8000,
Mk. 7, Part No. AIR 41000
Mk. 9, Part No. AIR 68000**
- 3 Engine-driven pump, Mk. 8,
Part No. AIR 43000**

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(A.L. 90, June 57)

Chapter 2

ENGINE DRIVEN PUMPS

Mk. 6, Series 1, Part No. AIR 8000

Mk. 7, Part No. AIR 41000

(AL. 87) MK. 9, PART NO. AIR 68000

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I Engine driven pumps, Mk. 6, Series 1, Part No. AIR 8000 and Mk. 7, Part No. AIR 41000 I
	<i>(AL. 87) AIR 68000</i>

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SCHEDULE I ENGINE DRIVEN PUMPS, Mk. 6, SERIES I, PART No. AIR 8000 and Mk. 7 PART No. AIR 41000 AIR 68000.

Ref. No. on Diagram 1 (1)	Part and Description (2)	Dimension, New (3)	Permissible Worn Dimension		Clearance, New (6)	Permissible Worn Clearance (7)	Remarks (8)
			Interchange- able Assembly (4)	Selective Assembly (5)			
1	LINER FOR ROLLER Liner (bore) RACE ON BEARING	<u>1.6530</u> 1.6525	1.6533	1.6535	<u>0.000</u> -0.001	0.0005	
	Bearing	<u>1.6535</u> 1.6530			1.6528		
2	BEARING IN LINER Liner (bore) FOR END COVER	<u>1.6530</u> 1.6525	1.6533	1.6535	<u>0.000</u> -0.001	0.0005	
	Bearing	<u>1.6535</u> 1.6530			1.6528		
3	BEARING ON BEARING ECCENTRIC SHAFT	<u>0.5907</u> 0.5902	0.5907	0.5907	<u>0.0003</u> -0.0005	0.0003	
	Shaft dia. for bearing	<u>0.5907</u> 0.5904			0.5904		
4	OIL THROWER ON Oil thrower (bore) ECCENTRIC SHAFT	<u>0.5630</u> 0.5620	0.5630	0.5630	<u>0.002</u> 0.000	0.0020	
	Eccentric shaft	<u>0.5620</u> 0.5610			0.5610		

5	ECCENTRIC SHAFT	Dia. of eccentric	$\frac{0.6816}{0.6811}$	0.6809	0.6809	—	—
6	ECCENTRIC SHAFT	End-float	—	—	—	$\frac{0.023}{0.003}$	$\frac{0.0230}{0.0030}$
7	ECCENTRIC SHAFT	Projection of shaft IN FIXING FLANGE from fixing flange	$\frac{1.8470}{1.8210}$	$\frac{1.8470}{1.8210}$	$\frac{1.8470}{1.8210}$	—	—
8	ECCENTRIC SHAFT	Width of splines	$\frac{0.1235}{0.1220}$	0.1150	0.1150	—	—
9	PLUNGER IN CYLINDER FOR RADIAL PUMP						
	<i>Part No.</i>						
	<i>suffix</i>						
	N	Cylinder bore	$\frac{0.4135}{0.4133}$	See	Remarks	$\frac{0.0004^*}{0.0002}$	0.0004
	N	Plunger dia.	$\frac{0.4131}{0.4130}$	See	Remarks		
	OR						
	W	Cylinder bore	$\frac{0.4140}{0.4138}$	See	Remarks	$\frac{0.0004^*}{0.0002}$	0.0004
	W	Plunger dia.	$\frac{0.4136}{0.4135}$	See	Remarks		
	OR						
	X	Cylinder bore	$\frac{0.4145}{0.4143}$	See	Remarks	$\frac{0.0004^*}{0.0002}$	0.0004
	X	Plunger dia.	$\frac{0.4141}{0.4141}$	See	Remarks		

*Plunger and cylinder to be selectively assembled to obtain this clearance

Plungers and cylinder bores must be free from surface imperfections. Salvage schemes are described in Vol. 2, Part 3, Sect. 2, Chap. 2 of this Air Publication.

This leaf issued with A.L. No. 72, November, 1953

A.P.1803B, Vol. 2, Part 2, Sect. 2, Chap. 2

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SCHEDULE I (continued)

ENGINE DRIVEN PUMPS, Mk. 6, SERIES I, PART No. AIR.8000 and Mk. 7, PART No. AIR.41000

AIR 68000

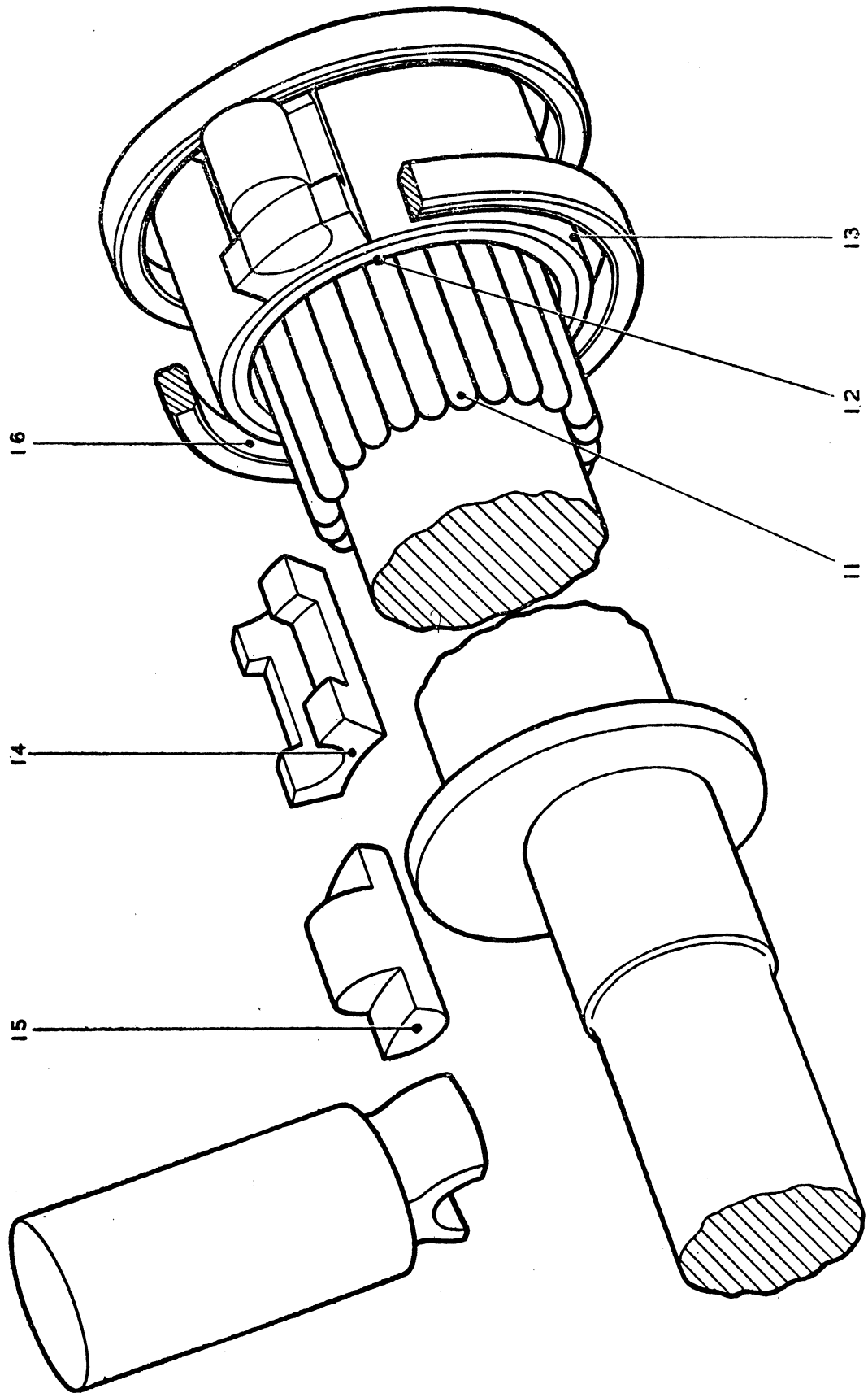
Ref. No. on Diagram 1	Part and Description		Dimension, New	Permissible Worn Dimension		Clearance, New	Permissible Worn Clearance	Remarks
				Interchange- able Assembly	Selective Assembly			
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)
10	PIN FOR SHOE IN PLUNGER	Plunger bearing bore	$\frac{0.25025}{0.24975}$	0.25125	0.25125	$\frac{0.0010}{0.00025}$	0.0020	
		Pin dia.	$\frac{0.2495}{0.24925}$	0.24925	0.24825			
11	NEEDLE BEARING	Dia. of rollers	$\frac{0.1182}{0.1180}$	0.1180	0.1180	—	—	
12	BEARING RING	Bore	$\frac{0.9190}{0.9185}$	0.9192	0.9192	—	—	
13	BEARING RING	o/d of bearing	$\frac{1.1500}{1.1490}$	1.1470	1.1370	—	—	
14	SHOE	Thickness between pin and bearing ring	$\frac{0.0500}{0.0480}$	0.0450	0.0410	—	—	Critical dimension measured in conjunc- tion with the bearing ring and pin
15	PIN FOR SHOE	Thickness of milled portion	$\frac{0.1250}{0.1240}$	0.1230	0.1170	—	—	

16	SHOE RETAINING RING	Bore	$\frac{1.5020}{1.5010}$	1.5040	1.5140	—	—				
17	PIN FOR SHOE AND SHOE RETAINING RING	Total clearance between pin and retaining rings	—	—	—	$\frac{0.009}{0.001}$	0.0210*				
18	DELIVERY VALVE	Valve lift	$\frac{0.2400}{0.1000}$	$\frac{0.2400}{0.1000}$	$\frac{0.2400}{0.1000}$	—	—				
19	DELIVERY VALVE SPRING	Free length	$\frac{1.0400}{1.0200}$	$\frac{1.0400}{1.0200}$	$\frac{1.0400}{1.0200}$	—	—				
20	END FLOAT OF BEARING RING BETWEEN ECCENTRIC SHAFT AND RETAINING DISC	Shaft length affected	$\frac{0.8060}{0.8040}$	0.8100*	0.8160*	$\frac{0.010}{0.004}$	0.0200				
		Length of bearing ring	$\frac{0.8000}{0.7960}$	0.7900	0.7860	—	—				
		Width of disc	$\frac{0.1250}{0.1240}$ and $\frac{0.1000}{0.0800}$	0.1240*	0.1240*	—	—				
							0.0800*	0.0800*	—	—	

*This clearance not to vary by more than 0.005 in. between both rings of any one pump.

*Refer to repair ARD 469

*Discs showing deep scores and/or surface damage are to be renewed



Scrap view of eccentric bearing

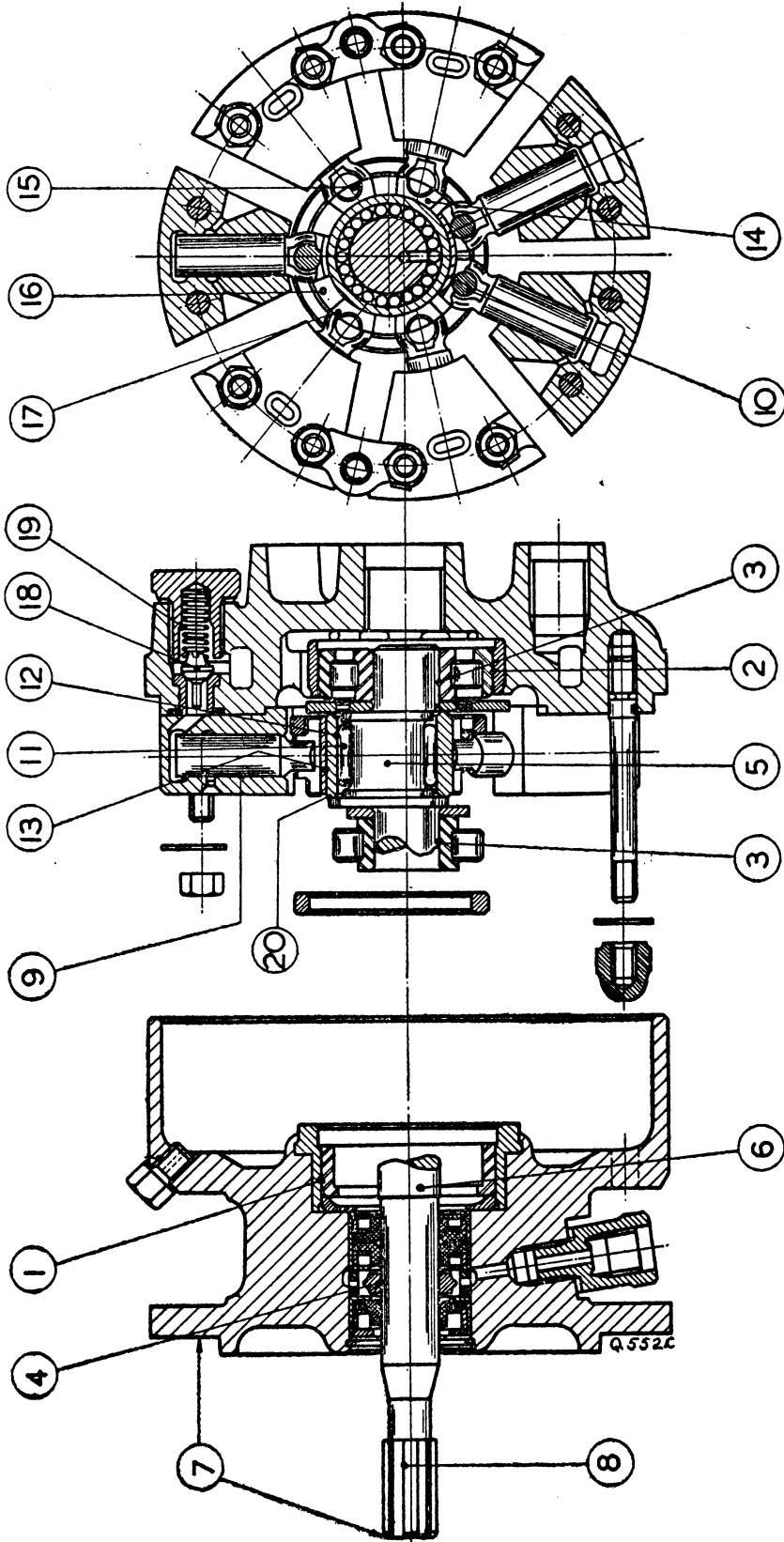


Diagram 1.—Lockheed pump, Mark 6, Series I

Chapter 3

ENGINE-DRIVEN PUMP, Mk. 8

Part No. AIR 43000

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(A.L. 90, June 57)

SCHEDULE I

ENGINE-DRIVEN PUMP, Mk. 8, Part No. AIR 43000

Ref. No. on Diagram	Part and Description		Dimension New	Permissible Worn Dimension		Clearance New	Permissible Worn Clearance	Remarks	
				Interchange- able Assembly	Selective Assembly				
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	
1	DOWELS IN BODY AND INLET HEAD	Body and inlet head	i/d	$\frac{0.5008}{0.5000}$	0.5010	0.5014	$\frac{0.0004}{-0.0008}$	0.0006	
		Dowel	o/d	$\frac{0.5008}{0.5004}$	0.5004	0.4994			
2	BEARINGS IN LINER	Liner	i/d	$\frac{2.4412}{2.4407}$	2.4412	2.4417	$\frac{0.0007}{-0.0003}$	0.0007	
		Bearing	o/d	$\frac{2.4410}{2.4405}$	2.4405	2.4400			
3	SEAL IN BODY	Body	i/d	$\frac{4.5635}{4.5620}$	4.5650	4.5665	$\frac{-0.0175}{-0.0360}$	-0.0150	
		Seal, fitted	o/d	$\frac{4.5980}{4.5810}$	4.5800	4.5770			
4	INLET HEAD IN BODY	Body	i/d	$\frac{4.5635}{4.5620}$	4.5650	4.5665	$\frac{0.0040}{0.0015}$	0.0060	
		Inlet head	o/d	$\frac{4.5605}{4.5595}$	4.5590	4.5560			

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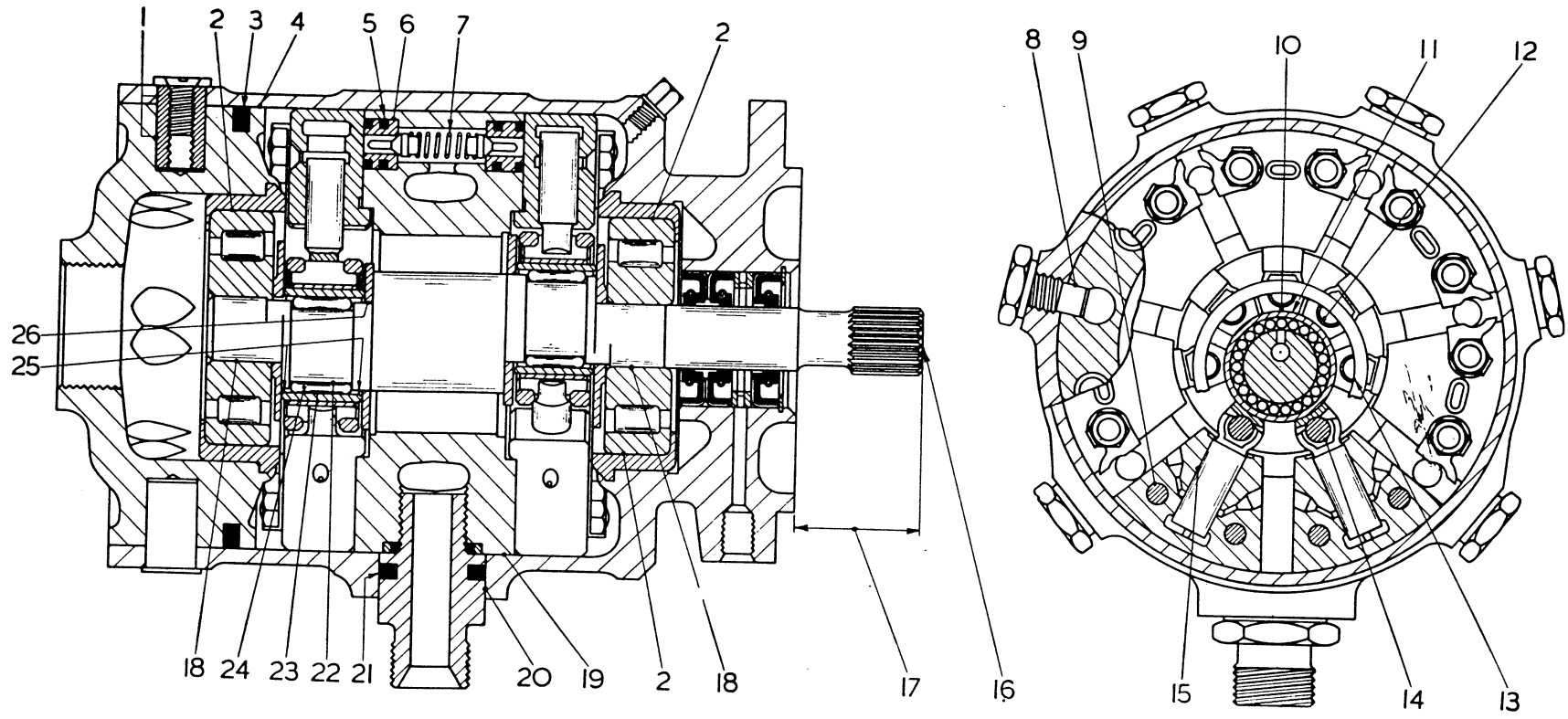


Diagram I. Engine-driven pump, Mk. 8, Part No. AIR 4300

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SCHEDULE I (continued)

ENGINE-DRIVEN PUMP, Mk. 8, Part No. AIR 4300

Ref. No. on Diagram	Part and Description			Dimension New	Permissible Worn Dimension		Clearance New	Permissible Worn Clearance	Remarks
					Interchange- able Assembly	Selective Assembly			
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)
5	SEAL IN COLLECTOR RING	Collector ring	i/d	$\frac{0.5008}{0.5000}$	0.5020	0.5030	$\frac{-0.0116}{-0.0225}$	-0.0100	
		Seal, fitted	o/d	$\frac{0.5225}{0.5124}$					
6	DELIVERY VALVE SEAT IN COLLECTOR RING	Collector ring	i/d	$\frac{0.5008}{0.5000}$	0.5020	0.5030	$\frac{0.0028}{0.0010}$	0.0040	
		Valve seat	o/d	$\frac{0.4990}{0.4980}$					
7	DELIVERY VALVE SPRING	Free length		$\frac{1.0400}{1.0200}$	$\frac{1.0400}{1.0200}$	$\frac{1.0400}{1.0200}$	—	—	Loaded to $1\frac{1}{2}/1\frac{1}{4}$ lb., spring length to be 0.73 in.
8	SCREWED DOWELS IN COLLECTOR RING	Collector ring	i/d	$\frac{0.3133}{0.3125}$	0.3138	0.3142	$\frac{0.0010}{-0.0002}$	0.0015	
		Screwed dowel	o/d	$\frac{0.3127}{0.3123}$					

SCHEDULE I (continued)

ENGINE-DRIVEN PUMP, Mk. 8, Part No. AIR 43000

Ref. No. on Diagram (1)	Part and Description (2)			Dimension New (3)	Permissible Worn Dimension		Clearance New (6)	Permissible Worn Clearance (7)	Remarks (8)
					Interchangeable Assembly (4)	Selective Assembly (5)			
9	STUDS IN CYLINDERS	Cylinder	i/d	$\frac{0.2190}{0.2180}$	0.2190	0.2240	$\frac{0.0160}{0.0100}$	0.0160	
		Stud	o/d	$\frac{0.2080}{0.2030}$	0.2030	0.2020			
10	SHOE	Thickness between pin and bearing ring		$\frac{0.0500}{0.0460}$	0.0450	0.0420*	—	—	On assembly the total clearance between pin for shoe and retaining ring is :— $\frac{0.0130}{0.0010}$ new 0.0210 Permissible worn *Parts worn to these dimensions may only be used providing all corresponding mating parts are within new limits. (For mating parts see items 10, 11, 12, 13, col (3))
11	BEARING RING	Bearing ring	o/d	$\frac{1.1500}{1.1490}$	1.1470	1.1410*	—	—	
12	PIN FOR SHOE	Thickness of milled portion		$\frac{0.1250}{0.1240}$	0.123	0.120*	—	—	
13	SHOE RETAINING RING	Ring	i/d	$\frac{1.5020}{1.5010}$	1.504	1.510*	—	—	

(A.L. 90, June 57)

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SCHEDULE I (continued)

ENGINE-DRIVEN PUMP, Mk. 8, Part No. AIR 43000

Ref. No. on Diagram	Part and Description		Dimension New	Permissible Worn Dimension		Clearance New	Permissible Worn Clearance	Remarks
				Interchange- able Assembly	Selective Assembly			
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)
14	PIN FOR SHOE IN PLUNGER	Plunger, bearing bore	$\frac{0.25025}{0.24975}$	0.25125	0.25150	$\frac{0.00100}{0.00025}$	0.0020	
		Pin o/d	$\frac{0.24950}{0.24925}$					0.24925
15	PLUNGER IN CYLINDER		$\frac{0.4135}{0.4133}$	See remarks	See remarks	$\frac{0.0004*}{0.0002}$	0.0004	
	Part No. N	Cylinder bore	0.4133					
	N	Plunger o/d	$\frac{0.4131}{0.4130}$	"	"			
	W	Cylinder bore	$\frac{0.4140}{0.4138}$	"	"	$\frac{0.0004*}{0.0002}$	0.0004	*Plungers and cylinders are selectively as- sembled to maintain the clearance (ideal working clearance is 0.003 in.)
	W	Plunger o/d	$\frac{0.4136}{0.4135}$	"	"			
	X	Cylinder bore	$\frac{0.4145}{0.4133}$	"	"	$\frac{0.0004*}{0.0002}$	0.0004	Plungers and cylinders must be free from surface imperfec- tions. Salvage scheme for these parts is ARD.1509
	X	Plunger o/d	$\frac{0.4141}{0.4140}$	"	"			

SCHEDULE I (continued)

ENGINE-DRIVEN PUMP, Mk. 8, Part No. AIR 43000

Ref. No. on Diagram	Part and Description		Dimension New	Permissible Worn Dimension		Clearance New	Permissible Worn Clearance	Remarks
				Interchange- able Assembly	Selective Assembly			
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)
16	CRANKSHAFT	End float	—	—	—	$\frac{0.0310}{0.0040}$	$\frac{0.0350}{0.0020}$	
17	CRANKSHAFT	Projection from fixing flange	$\frac{1.5000}{1.4722}$	$\frac{1.5040}{1.4742}$	$\frac{1.5040}{1.4742}$	—	—	
18	CRANKSHAFT IN BEARINGS	Bearing	$\frac{0.6700}{0.6695}$	0.6700	0.6705	$\frac{0.0005}{-0.0005}$	0.0005	
		Crankshaft	$\frac{0.6700}{0.6695}$	0.6695	0.6690			
19	COLLECTOR RING IN BODY	Body	$\frac{4.5635}{4.5620}$	4.5650	4.5665	$\frac{0.0040}{0.0015}$	0.0060	
		Collector ring	$\frac{4.5605}{4.5595}$	4.5590	4.5560			
20	OUTLET PORT IN BODY	Body	$\frac{1.1262}{1.1250}$	1.1280	1.1291	$\frac{0.0030}{0.0009}$	0.0050	
		Outlet port	$\frac{1.1241}{1.1232}$	1.1230	1.1200			

(A.L. 90, June 57)

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SCHEDULE I (continued)

ENGINE-DRIVEN PUMP, Mk. 8, Part No. AIR 43000

Ref. No. on Diagram (1)	Part and Description (2)			Dimension New (3)	Permissible Worn Dimension		Clearance New (6)	Permissible Worn Clearance (7)	Remarks (8)
					Interchange- able Assembly (4)	Selective Assembly (5)			
21	SEAL IN BODY	Body	i/d	$\frac{1.1262}{1.1250}$	1.1280	1.1291	$\frac{-0.0148}{-0.0320}$	-0.0120	
		Seal fitted	o/d	$\frac{1.1570}{1.1410}$					
22	CRANKSHAFT	Eccentric	o/d	$\frac{0.7559}{0.7554}$	0.7552	0.7552	—	—	
23	BEARING RING	Bore		$\frac{0.9935}{0.9930}$	0.9930	0.9930	—	—	
24	NEEDLE ROLLERS	Roller	o/d	$\frac{0.1182}{0.1180}$	0.1180	0.1180	—	—	Permissible worn clearance will not be exceeded provided parts to starred dimensions are only used with corresponding mating parts that are within new limits. Retaining discs and thrust rings showing deep scores and/or surface damage are scrap
25	END FLOAT OF BEARING RING BETWEEN RETAINING DISC AND THRUST RING	Shaft length		$\frac{0.9020}{0.8980}$	0.9020	0.9050*	$\frac{0.0170}{0.0030}$	0.0200	
		Disc width		$\frac{0.1050}{0.1030}$	0.1020	0.1000*			
		Ring width		$\frac{0.0950}{0.0900}$	0.0890	0.0870*			
		Bearing ring length		$\frac{0.8000}{0.7950}$	0.7940	0.7920*			

SCHEDULE I (continued)

ENGINE-DRIVEN PUMP, Mk. 8, Part No. AIR 43000

Ref. No. on Diagram (1)	Part and Description (2)			Dimension New (3)	Permissible Worn Dimension		Clearance New (6)	Permissible Worn Clearance (7)	Remarks (8)
					Interchange- able Assembly (4)	Selective Assembly (5)			
26	CRANKSHANK IN THRUST RINGS	Thrust ring	i/d	$\frac{0.9270}{0.9260}$	0.9270	0.9275	$\frac{0.0005}{-0.0010}$	0.0005	
		Crankshaft	o/d	$\frac{0.9270}{0.9265}$	0.9265	0.9255			

(A.L. 90, June 57)

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Chapter 2

POWER DRIVEN PUMPS

Mk. 6, Series I, Part No. AIR 8000

Mk. 7, Part No. AIR 41000

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R E S T R I C T E D

INTRODUCTION

General

1. The operations described in this chapter may be undertaken only by approved Repair Depots which are specially equipped with the necessary test rig and tools. The pumps may not be dismantled or serviced by any other Unit except as allowed at Sect. 2, Chap. 2 of Vol. I, under the heading of "Servicing". Pumps bearing serial numbers below 4000, marked on the high-pressure end cover, will be repaired only by Messrs. Automotive Products.

2. The Lockheed Mk. 6 pump is a seven-cylinder fixed-stroke piston pump in which the pistons are actuated by rotation of an eccentric shaft. The pumps are fully described and illustrated in Vol. I, Sect. 2, Chap. 2 of this publication.

Essential equipment

3. In addition to normal workshop equipment, the following special equipment is required for the overhaul and salvage described in this chapter:—

- (1) A set of tools to Lockheed D.I.S. No. 8 (Tools), as listed in para. 4.
- (2) A copy of Lockheed D.I.S. No. 8.
- (3) A copy of Lockheed D.I.S. No. 8 (repair drawings).
- (4) A suitable test rig.
- (5) A special high-pressure Static Test rig to C.R.E.W. D.I.S. No. 2.
- (6) A bath of trichlorethylene for cleaning parts of the pump.

Special tools

4. The following special tools are required and are listed in Lockheed D.I.S. No. 8 (Tools):—

TABLE I
Special tools

Stores Ref.	Part No.	Description
37J/3213	AG.1297	Gauge, concentricity.
37J/3214	AJ.5247	Handle, rotor, for assembly.
37J/3217	AJ.4811	Jaws, vice, assembly.
37J/3225	FPT.10179	Box, stud, No. 1 B.A.
37J/3226	FPT.10143	Box, stud, $\frac{1}{4}$ in. B.S.F.
37J/3227	FPJ.7966	Drift, assembly, roller race.
37J/3228	FPJ.8469	Drift, assembly, roller race.
37J/3229	FPJ.8468	Drift, assembly, roller race.
37J/3230	FPJ.8472	Fixture, valve assembly.
37J 3231	FPG.7860	Gauge, valve lift.
37J/3232	FPT.11378	Screw, holding end-cover.
37J/3233	FPT.12016	Extractor, inner races, main bearings in end cover.
37J/3234	FPT.12099	Extractor, outer races, main bearings in end cover.
*37J/3235	—	Gauge, dial, end play, Alpha Mercer, type $\frac{1}{1000}$ in.
37J/3236	AG.9256	Holder, for dial gauge checking end play.
37J/3237	FPT.12048	Drift, distance washer, and outer race main bearing in fixing flange.
32J/3238	FPT.12049	Drift, seals, fixing flange.
*37J/3240	—	Gauge, dial, end play, John Bull, type B, $\frac{1}{1000}$ in.

**Item 37J/3240 is an alternative to 37J/3235*

R E S T R I C T E D

RECONDITIONING PROCEDURE

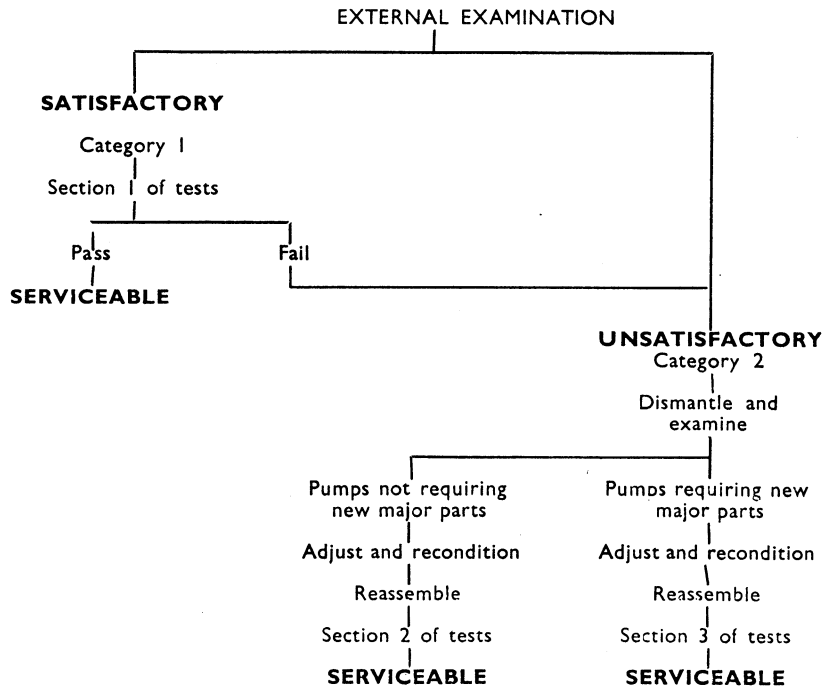
General

5. For the purpose of reconditioning, pumps are divided into two categories:—

Category 1—Pumps which, on external examination, appear satisfactory. These are to be subjected to Section 1 of the tests and returned to service if they pass, or put in Category 2 if they fail.

Category 2—Pumps which, on external examination, appear unsatisfactory, and pumps of Category 1 which fail to pass Section 1 of the tests. All pumps in this category must be reconditioned. If no new major parts as defined in para. 7 are fitted, the pumps are to be subjected to Section 2 of the tests. All pumps which have new major parts fitted must be subjected to Section 3 of the tests.

6. The following chart summarizes the reconditioning procedure:—



Major parts

7. The following are defined as major parts:—

TABLE 2
Major parts

Stores Ref.	Description	Part No.
37J/434	Cylinder and plunger, group	AIR.29958
37J/392	Pin, retaining plunger	AIR.24266
37J/406	Shoe	AIR.24268
37J/404	Rotor	AIR.24248
37J/396	Ring bearing	AIR.24256
37J/379	Bearing, roller journal	AIR.35466
37J/403	Roller, needle Hoffman RYBAN	AIR.24258

R E S T R I C T E D

Standard of repair

8. The pump, after repair, is to conform to the standard in accordance with the requirements set out in this Schedule, and to have modifications incorporated in accordance with the classification as notified in the Z leaflets in Vol. 2, Part 1 of this publication.

Modifications

9. If any modification to a pump is incorporated during repair, the Issue number of the G.A. Drawing which shows the introduction of the modification, is to be stamped on the pump.

External examination

10. Clean the pump externally and examine as follows:—

- (1) Inspect the pipe connections for cleanliness.
- (2) Inspect the seals for damage, one being located on the seven holding-down cap-nuts and the others in the seven valve screws.
- (3) Examine the fixing flange for breakage, cracks, distortion and signs of heating.
- (4) Examine the driving shaft shear neck and splines for signs of distortion, wear and heating.
- (5) Examine for signs of leakage at the cover joint and at the valve screws.
- (6) Test the concentricity and projection of the splined shaft, using the gauge 37J/3213.
- (7) Fit the handle 37J/3214 on the splines and test the pump shaft for freedom of rotation.
- (8) Examine for any other external damage.

If the pump passes the above inspection, it must be washed out with hydraulic fluid to D.T.D.585 and subjected to Section 1 of the tests (*para.* 26). If it fails to pass the above examination it must be dismantled.

Note . . .

The above information is given for guidance and may not include all points to be examined. In all other respects the requirements of the Supervising Inspector must be met.

Dismantling

11. The procedure for dismantling the pump is as follows:—

- (1) Remove all locking wires together with their seals.
- (2) Using a standard spanner, remove the cap-nuts and gaskets from the body studs, and discard the gaskets. Hold the pump over a suitable wooden box and tap the splined portion of the shaft with a hide mallet to separate the parts of the pump body. The pump may now be dismantled easily.
- (3) Using Seeger circlip pliers (Stores Ref. 1B/4428), remove the circlip and withdraw the dust shield from the fixing flange cover.
- (4) Using the drift 37J/3238, remove the Gits seals, oil thrower and distance piece assembly, ensuring that the land which locates the Seeger circlip is not damaged.
- (5) Using the drift 37J/3237, remove the distance piece and the outer race of the roller bearing from the fixing flange cover.
- (6) Remove the locking plates and springs, which lock the No. 1 B.A. cylinder holding-down nuts, unless the modified locking arrangement of tab-washers is incorporated.

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- (2) *Running in.* Run the pump for 10 min. at 1,000 r.p.m. and 1,000 lb. per sq. in.
- (3) *Calibration test.* Proceed as described in para. 24. If the pump fails to pass this test, remove the seven valve screws and gaskets, springs and valves and examine for dirt or pick-up on either the valve or valve seat. Clean these parts, replace and repeat Section 1 of the tests.
- (4) *Leakage test.* Proceed as described in para. 25. If the pump fails to pass this test, renew the seals; the pump may be passed as serviceable if it then passes the leakage test (*para. 25*).

Section 2 of tests

27. The following test apply to Category 2 pumps, as defined in para. 5. Easement times will be added later.

- (1) *High-pressure static test.* This test is made on cover AIR.29792 after sub-assembly with the delivery valves. The cover is to be tested on the high-pressure static rig at 1,000, 2,000, and 3,000 lb. per sq. in. and no leakage is permitted.
- (2) *Endurance test.* Run the pump as follows:—
 - 10 min. at 1,000 r.p.m. and 1,000 lb. per sq. in.
 - 30 min. at 3,000 r.p.m. and 0 lb. per sq. in.
 - 30 min. at 3,000 r.p.m. and 3,000 lb. per sq. in.
 - 5 min. at 3,750 r.p.m. and 0 lb. per sq. in.
 - 5 min. at 3,750 r.p.m. and 3,000 lb. per sq. in.
- (3) *Calibration test.* Proceed as described in para. 24.
- (4) *Leakage test.* Proceed as described in para. 25. If the pump fails to pass this test, renew the seals; the pump may be passed as serviceable if it then passes the leakage test (*para. 25*).

Section 3 of tests

28. The following tests apply to pumps in which new major parts have been fitted.

- (1) *High-pressure Static test.* Proceed as described in para. 27 (1).
- (2) *Running-in.* Run the pump as follows:—
 - 10 min. at 500 r.p.m. and 500 lb. per sq. in.
 - 10 min. at 1,000 r.p.m. and 1,000 lb. per sq. in.
 - 5 min. at 1,000 r.p.m. and 2,000 lb. per sq. in.
 - 5 min. at 1,000 r.p.m. and 3,000 lb. per sq. in.
- (3) *Check calibration test.* The pump is to deliver not less than:—
 - 80 cu. in. per min. at 600 r.p.m. and 3,000 lb. per sq. in.
 - 170 cu. in. per min. at 1,000 r.p.m. and 3,000 lb. per sq. in.
- (4) *Proof test.* Run the pump as follows:—
 - 10 min. at 2,000 r.p.m. and 0 lb. per sq. in.
 - 30 min. at 2,000 r.p.m. and 2,000 lb. per sq. in.
 - 30 min. at 1,600 r.p.m. and 3,000 lb. per sq. in.
- (5) Remove the cover to check the shoe clearance and the general condition of the pump.
- (6) *Endurance test.* Proceed as described in para. 27 (2).
- (7) *Calibration test.* Proceed as described in para. 24.
- (8) The pump is to be dismantled to permit the examination of internal parts as may be directed by the supervising Inspector. (Easement—dismantle a minimum of 1 in 20 pumps, the easement being applied gradually). For pumps not dismantled, omit tests (9) and (10).

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(9) *Proof test.* Run the pump as follows:—

10 min. at 1,000 r.p.m. and 1,000 lb. per sq. in.

20 min. at 3,000 r.p.m. and 3,000 lb. per sq. in.

5 min. at 3,750 r.p.m. and 3,000 lb. per sq. in.

(10) *Calibration test.* Proceed as described in *para. 24.*

(11) *Leakage test.* Proceed as described in *para. 25.* If the pump fails to pass this test, renew the seals; the pump may be passed as serviceable if it then passes the leakage test (*para. 25.*).

Preparation for despatch

29.

(1) Flush out the pump with clean hydraulic fluid to D.T.D.585 and allow it to drain. All open ports must then be protected by approved means against the ingress of foreign matter.

(2) Unprotected external surfaces must be properly cleaned and coated with an approved rust preventive to D.T.D.121 or its current equivalent.

(3) The fixing flange and shaft must be protected from damage by a hardwood block or suitable casing.

SPARE PARTS REQUIRED TO RECONDITION 100 PUMPS

30. The following Table 3 gives the average number of spare parts required to recondition 100 pumps.

TABLE 3
Spare parts for 100 pumps

Part No.	Stores Ref.	Description	Remarks	No. required per 100 pumps
AIR.21896	37J/335	Seal		200
AIR.24318	37J/384	Disc, blanking		10
AIR.24254	37J/386	Disc, withdrawal		20
AIR.24308	37J/389	Joint		100
AIR.34206	37J/455	Nut, cap	was 37J/390	50
AIR.24300	37J/391	Nut		300
AIR.24266	37J/392	Pin, retaining plungers		100
AIR.24310	37J/395	Plug, vent		60
AIR.24256	37J/396	Ring, bearing		20
AIR.24246	37J/397	Ring, distance		10
AIR.24314	37J/398	Ring, distance		5
AIR.28492	37J/399	Ring, oil seal		700
AIR.24270	37J/402	Ring, retaining shoe		30
Hoffman Ryban	} 37J/403	Roller, needle bearing		150
AIR.24258				
AIR.24248	37J/404	Rotor		20
AIR.24268	37J/406	Shoe	For Mk. 6 pump only	750
AIR.33810	37J/453	Stud 1 B.A. securing cylinder	was 37J/410	200
AIR.33808	37J/454	Stud ¼ in. B.S.F.	was 37J/411	100
AIR.24316	37J/412	Thrower, oil		10
ADS.32.R	27M/4169	Washer, joint		700
AIR.24312	37J/415	Washer, joint for vent plug		100
AIR.24296	37J/416	Washer, for cap nuts		700
AIR.30836	37J/419	Washer, tab		700
AIR.30688	37J/430	Adapter for mounting flange		35
AIR.35466	37J/379	Bearing		20

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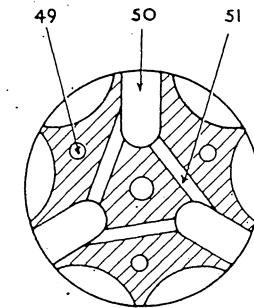
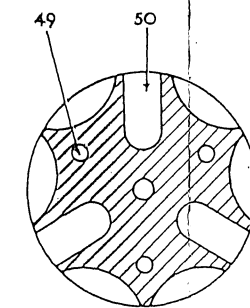
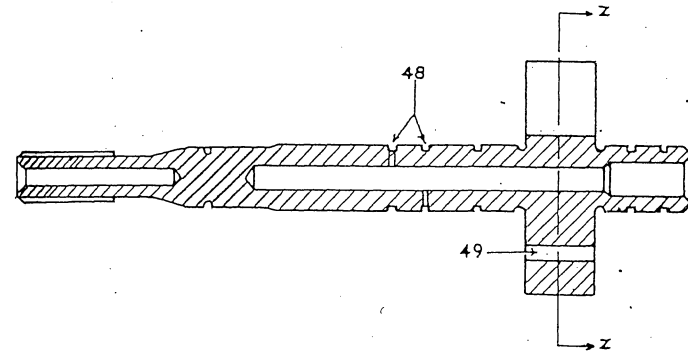
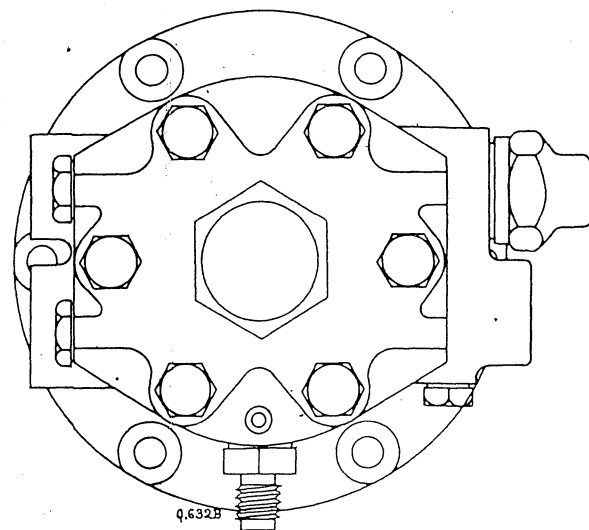
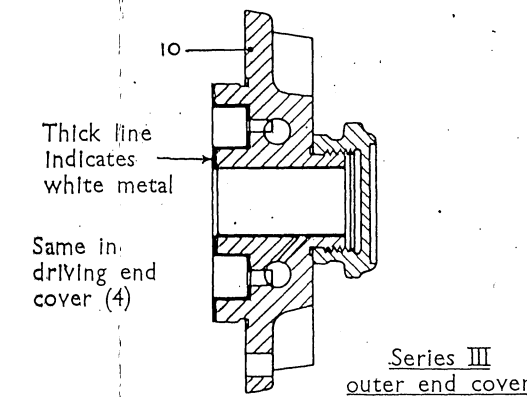
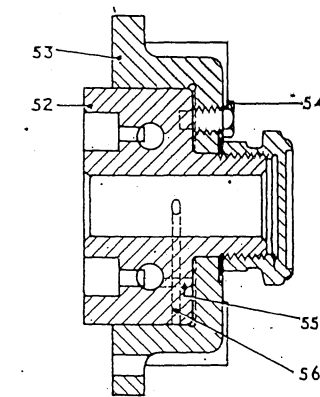
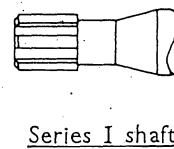
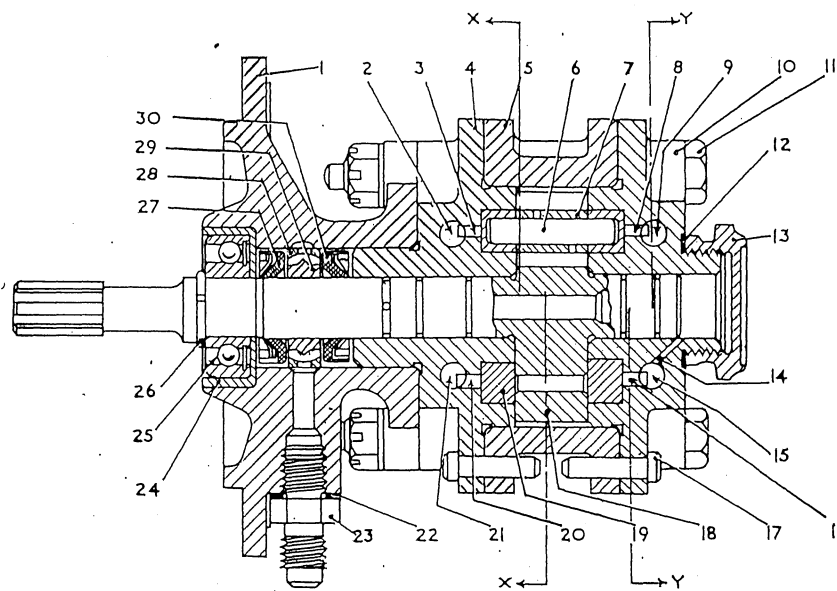
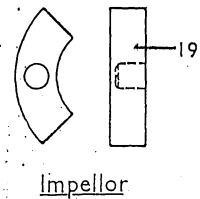
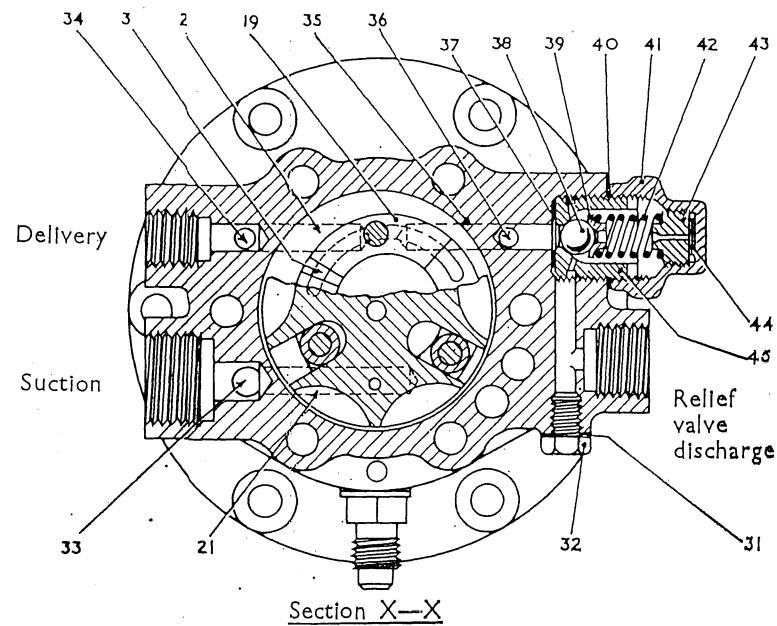
TABLE 3—continued
Spare parts for 100 pumps

Part No.	Stores Ref.	Description	Remarks	No. required per 100 pumps
AIR.30834	37J/433	Cover, driven end and delivery valve		20
AIR.29958	37J/434	Cyl. and plunger group		100
AIR.29440	37J/435	Disc, retaining		20
AIR.30920	37J/436	Flange, mounting group		20
AIF.29800	37J/439	Plug seating, for delivery valve stop		100
AIR.29798	37J/440	Seating for delivery valves in driven end cover		100
AIR.29796	27M/7018	Spring for delivery valve		70
AIR.29794	37J/443	Valve, delivery		75
ADS.32.L	27M/4284	Washer, joint for adapter		50
AIR.31208	37J/445	Ring, oil seal, inner Gits type		200
AIR.31206	37J/446	Ring, oil seal, outer, Gits type		100
ADS.101/AA	27M/4634	Circlip, Seeger type		10
AIR.37896	37J/458	Shoe	For Mk. 7 or Mk. 6	750
SALVAGE PARTS				
ARD.507	37J/447	Bush		25
ARD.509	37J/448	Plug, vent		5
ARD.531	37J/449	Washer, joint		5
ARD.820	37J/450	Seating		10
ARD.821	37J/451	Seating		5
ARD.1000	37J/456	Stud		50
ARD.824	37J/457	Seating	was ARD.822 37J/452	2
TRANSPORTATION PARTS				
ADS.145.A	37J/424	Plug, $\frac{3}{8}$ in.		100
ADS.145.G	37J/425	Plug, $\frac{9}{16}$ in.		100
ADS.145.K	37J/426	Plug, $\frac{3}{4}$ in.		100

R E S T R I C T E D

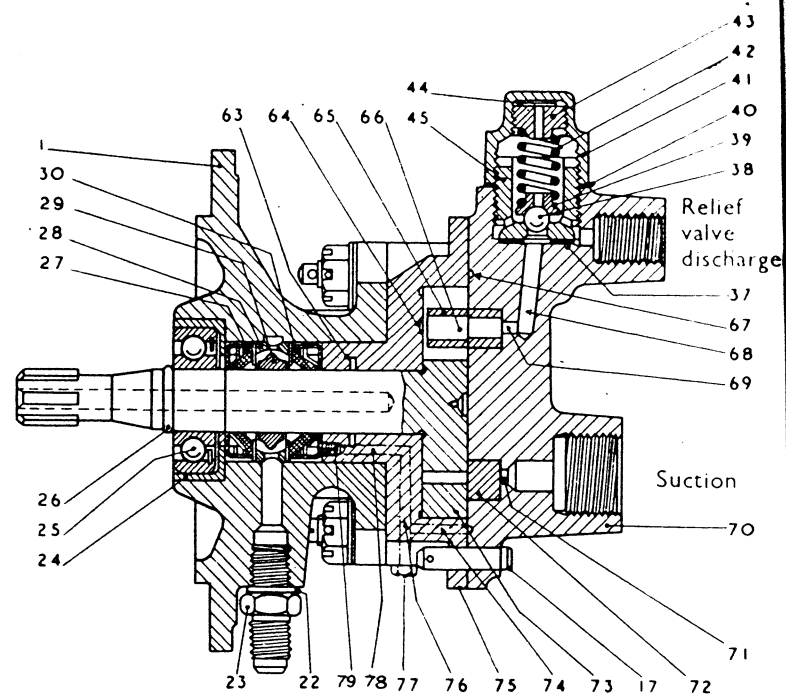
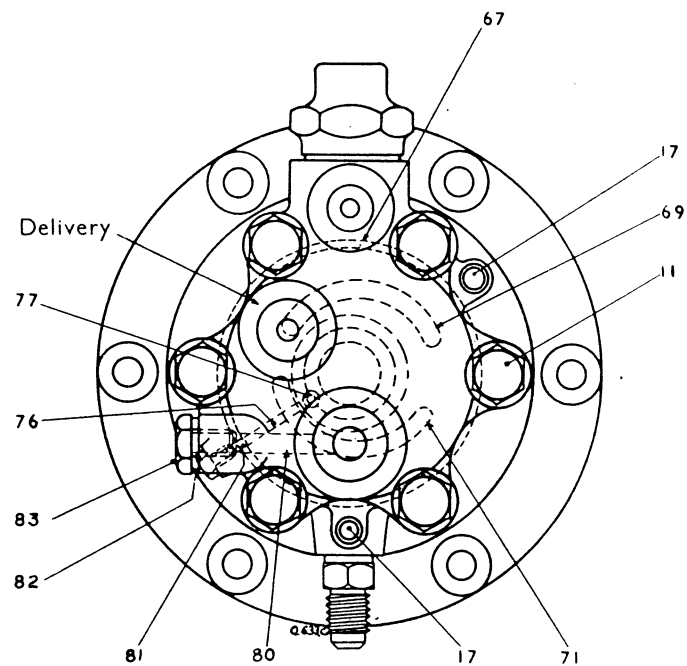
1. Mounting flange
4. Driving end cover
5. Centre block
6. Driving pin
7. Rollers
10. Rear end cover
11. Bolts
12. Washer
13. Cap nut
17. Dowels
18. Rotor
19. Impellers
22. Washer
23. Adaptor
24. Liner
25. Ball bearing
26. Circlip
27. Gits seal
28. Distance ring
29. Oil thrower
30. Gits seal
31. Washer
32. Plug
37. Washer
38. Ball
39. Ball retainer
40. Washer
41. Cap nut
42. Spring
43. Adjusting plug
44. Shims
45. Relief valve body
46. Washer
47. Plug
52. Annulus block
53. End cover
54. Plug

This leaf issued with A.L.3, January, 1945



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FIG. 8 - GENERAL ARRANGEMENT OF MARK IV ENGINE DRIVEN PUMP.



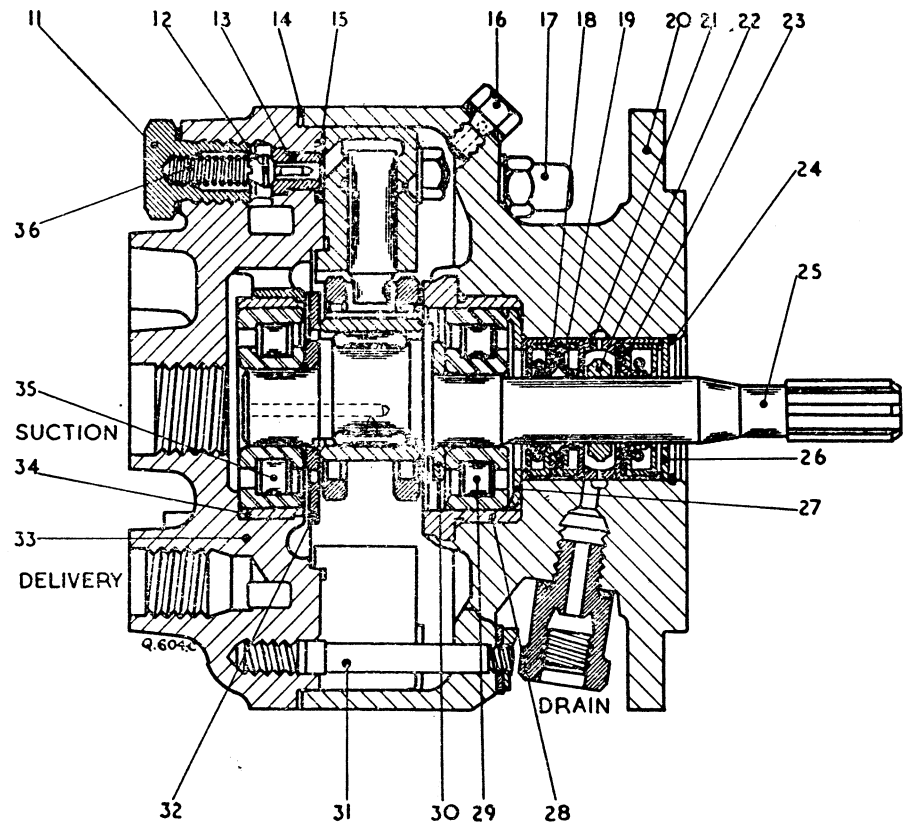
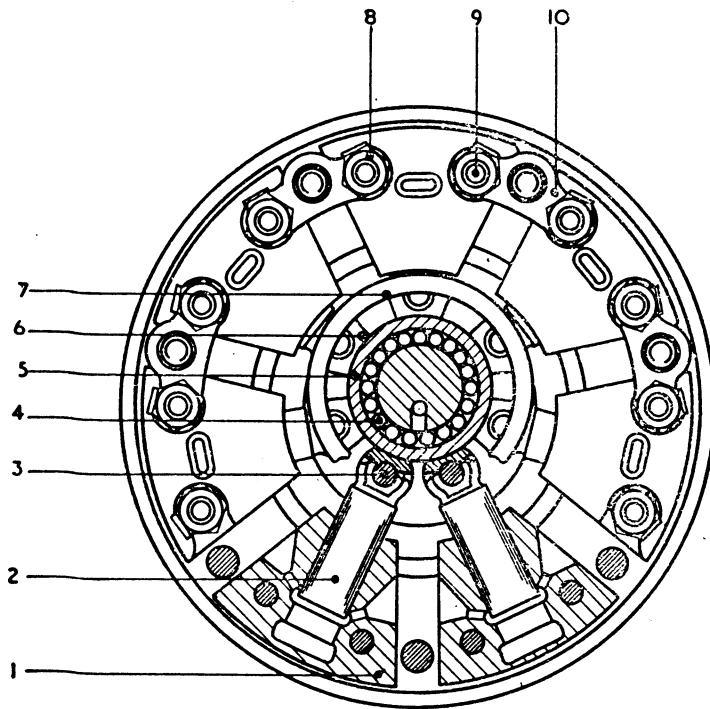
For true positions of passages 74, 76, 78, see end view

1. Mounting flange
11. Bolts
17. Dowels
22. Washer
23. Adaptor
24. Liner
25. Ball bearing
26. Circlip
27. Gits seal
28. Distance ring
29. Oil thrower
30. Gits seal
37. Washer
38. Ball
39. Ball retainer
40. Washer
41. Cap nut
42. Spring
43. Adjustable plug
44. Shims
45. Relief valve body
65. Rollers
66. Driving pins
70. Outer end cover
72. Impellers
73. Rotor
75. Driving end cover
77. Plug
79. Grubscrew
82. Washer
83. Plug

Fig. 9—General arrangement of Mark V engine-driven pump

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Fig. 2. General arrangement of Lockheed Mk. 6 pump



- 1 CYLINDERS
- 2 PLUNGERS
- 3 SHOE RETAINING PINS
- 4 NEEDLE ROLLERS
- 5 BEARING RING
- 6 SHOES
- 7 SHOE RETAINING RINGS
- 8 NUTS
- 9 STUDS

- 10 TABWASHERS
- 11 DELIVERY VALVE SCREWS
- 12 DELIVERY VALVES
- 13 DELIVERY VALVE SEATS
- 14 LOW PRESSURE SEAL
- 15 HIGH-PRESSURE SEALS
- 16 VENT PLUG
- 17 CAP NUTS
- 18 GITS SEAL

- 19 GITS SEAL
- 20 FIXING FLANGE
- 21 DISTANCE RING
- 22 OIL THROWER
- 23 GITS SEAL
- 24 CIRCLIP
- 25 ECCENTRIC SHAFT
- 26 DUST SHIELD
- 27 DISTANCE PIECE

- 28 LINER
- 29 ROLLER BEARING
- 30 WITHDRAWAL DISC
- 31 STUDS
- 32 RETAINING DISC
- 33 END COVER
- 34 LINER
- 35 ROLLER BEARINGS
- 36 VALVE SPRINGS