

FRICITION ROLL DRIVES AND ASSOCIATED BRACKETS

PIECE-PART DATA AND REPLACEMENT PROCEDURES

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of friction roll drives and associated motor brackets. It also covers approved procedures for replacing these parts.

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

1.03 Part 2 of this section covers the piece part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of the above apparatus. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called "Piece Part Data."

1.04 Part 3 of this section covers approved procedures for the replacement of the parts covered in Part 2. This information is called "Replacement Procedures."

1.05 The code designation of a friction roll drive is stamped in red near the left end of either the top or bottom channel. The side of the drive on which this designation appears is the front of the drive.

1.06 Procedures for reconditioning the bearings of the worm case housing (gear case) are covered in Section 159-720-814, procedures for installing bushings in the ends of friction roll drive shafts are covered in Section 159-720-811 and procedures for installing the oil retainer ring on the gear case of friction roll drives are covered in Section 159-720-813.

1.07 Due to the number of different types of drives, a figure in the section may be used to indicate item numbers for several dif-

ferent types of drives in addition to the drive actually illustrated. This procedure is followed to keep the section to as small a size as practicable although it is recognized that in some cases all the item numbers that appear on the figure may not apply to all the drives covered by the figure. Therefore, reference should be made to the tables shown on pages 45 to 60, inclusive, of the section for final information regarding the parts for a particular drive.

2. PIECE PART DATA

2.01 The figures included in this part show the various piece parts in their proper relation to other parts of the drive or motor bracket. The parts on the individual figures are designated by means of item numbers. These item numbers are used for reference purposes only, the piece part being shown for the corresponding item number on the tables shown on pages 45 to 60 inclusive. Do not specify the item numbers shown on the figures for ordering information. The piece part numbers of the various parts are given together with the names of the parts as listed by the Western Electric Company Merchandise Department. When these names differ from those in general use in the field the latter names in some cases are shown in parenthesis.

2.02 When ordering piece parts for replacement purposes, give both the number and name of the piece part. For example: "P-170374 Gear Case." Do not refer to the B.S.P. number or to any information shown in parenthesis following the piece part numbers.

2.03 Piece part data and replacement procedures for vertical drive shaft couplings are covered in Section 159-735-801 covering piece part data and replacement procedures for vertical drive shafts and associated apparatus.

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2.04 The piece part data for coded friction roll drives are given in the figures indicated in the following table. The motor brackets are shown in Fig. 75.

DRIVE	GEAR CASE EXTERNAL PARTS		GEAR CASE INTERNAL PARTS		BEARING BOX EXTERNAL PARTS		BEARING BOX INTERNAL PARTS		ALARM MECHANISM
	WORM END	NON WORM END	WORM END	NON WORM END	WORM END	NON WORM END	WORM END	NON WORM END	
1A	17	-	20	-	17	-	-	-	11
1C	17	-	20	-	17	-	-	-	11
1D	17	-	20	-	17	-	-	-	11
1E	17	-	20	-	17	-	-	-	11
2A	53	-	56	-	53	-	-	-	11
3A	17	19	20	21	17	19	-	-	11
3C	17	19	20	21	17	19	-	-	11
3D	17	18	20	20	17	18	-	-	11
3E	17	18	20	20	17	18	-	-	11
3F	17	19	20	21	17	19	-	-	11
4A	53	55	56	57	53	55	-	-	11
4B	53	54	56	56	53	54	-	-	11
17A	17	-	20	-	17	-	-	-	11
17B	29	-	32	-	29	-	32	-	12
17E	29	-	32	-	29	-	32	-	12
18A	17	19	20	21	17	19	-	-	11
18B	17	18	20	20	17	18	-	-	11
18C	29	31	32	34	29	31	32	34	12
18D	29	30	32	33	29	30	32	33	12
18G	29	31	32	34	29	31	32	34	12
18H	29	31	32	34	29	31	32	34	12
18J	29	30	32	33	29	30	32	33	12
19A	17	-	20	-	17	-	-	-	11
19B	29	-	32	-	29	-	32	-	12
19E	29	-	32	-	29	-	32	-	11
20A	17	19	20	21	17	19	-	-	11
20B	17	18	20	20	17	18	-	-	12
20C	29	31	32	34	29	31	32	34	12
20D	29	30	32	33	29	30	32	33	12
20G	29	31	32	34	29	31	32	34	12
20H	29	30	32	33	29	30	32	33	12
21A	17	-	20	-	17	-	-	-	11
21B	17	-	20	-	17	-	-	-	11
21C	17	-	20	-	17	-	-	-	11
21D	17	-	20	-	17	-	-	-	11
21E	29	-	32	-	29	-	32	-	12
21F	29	-	32	-	29	-	32	-	12
21G	29	-	32	-	29	-	32	-	12
21H	29	-	32	-	29	-	32	-	12
21R	29	-	32	-	29	-	32	-	12
22A	53	-	56	-	53	-	-	-	11
22B	53	-	56	-	53	-	-	-	12
22C	58	-	61	-	58	-	61	-	12
23A	17	19	20	21	17	19	-	-	11
23B	17	18	20	20	17	18	-	-	11
23C	17	19	20	21	17	19	-	-	11
23D	17	18	20	20	17	18	-	-	11
23F	17	19	20	21	17	19	-	-	11
23G	29	31	32	34	29	31	32	34	12
23H	29	30	32	33	29	30	32	33	12
23J	29	31	32	34	29	31	32	34	12
23K	29	30	32	33	29	30	32	33	12
23L	29	31	32	34	29	31	32	34	12
23T	29	31	32	34	29	31	32	34	12
23U	29	30	32	33	29	30	32	33	12
23W	17	18	20	20	17	18	-	-	11
24A	53	55	56	57	53	55	-	-	11
24B	53	54	56	56	53	54	-	-	11
24C	53	55	56	57	53	55	-	-	12

DRIVE	GEAR CASE EXTERNAL PARTS		GEAR CASE INTERNAL PARTS		BEARING BOX EXTERNAL PARTS		BEARING BOX INTERNAL PARTS		ALARM MECHANISM
	WORM END	NON WORM END	WORM END	NON WORM END	WORM END	NON WORM END	WORM END	NON WORM END	
24D	53	54	56	56	53	54	-	-	12
24E	58	60	61	62	58	60	61	62	12
24F	58	59	61	61	58	59	61	61	12
25A	17	-	20	-	17	-	-	-	11
25B	29	-	32	-	29	-	32	-	12
25E	29	-	32	-	29	-	32	-	12
26A	17	19	20	21	17	19	-	-	11
26B	17	18	20	20	17	18	-	-	11
26C	29	31	32	34	29	31	32	34	12
26D	29	30	32	33	29	30	32	33	12
26G	29	31	32	34	29	31	32	34	12
26H	29	30	32	33	29	30	32	33	12
35A	29	-	35	-	29	-	35	-	12
45A	63	-	65	-	63	-	65	-	12
46A	63	64	65	66	63	64	65	66	12
47A	67	-	69	-	67	-	69	-	12
48A	67	68	69	70	67	68	69	70	12
49A	29	31	35	36	29	31	35	36	12

2.05 The following D-specification drives are the same as coded drives indicated except for the worms, worm wheels, and where asterisked, retractile springs on the governor.

D-Spec. Drive	Coded Drives	Worm	Worm Wheel
*D-18616	18A	P-170011	P-170014
*D-18617	19A	P-170011	P-170014
*D-18618	25A	P-170011	P-170014
*D-18619	1A	P-159205	P-159206
*D-18620	3A	P-159205	P-159206
*D-18621	3C	P-159205	P-159206
*D-18622	2A	P-159205	P-159206
*D-18623	4A	P-159205	P-159206
D-44970	21C	P-159205	P-159206
D-86114	18G	P-170011	P-170014
D-86115	26C	P-170011	P-170014
D-86116	26G	P-170011	P-170014
D-86503	17E	†	P-170014
D-90206	24E	P-170538	P-159206
D-90207	24C	P-170538	P-159206
D-90208	45A	†	†
D-90209	23G	P-170538	P-159206
D-90212	21E	P-170538	P-159206
D-90213	21R	P-170538	P-159206
D-90214	23T	P-170538	P-159206
D-90215	46A	†	†
D-90216	35A	†	†
D-156693	25E	†	†

* When it is necessary to order a retractile spring shown as Item 107 in Fig. 11, order governor retractile spring per D number of drive.

† When it is necessary to order a worm or worm wheel and the piece part number is not given, order the worm or worm wheel per D number of drive.

2.06 The following D-specification drives with the exception of D-95727 drive, are drives which have been converted in the field from double unit drives to single unit drives and the parts on one side of the drive have been replaced by parts of another drive. Order parts according to the code of side of the drive affected as stamped or as indicated in the following table.

*No. of Converted Drive	Drives Equivalent to Converted Drive
D-86646	Front Side - 21E Rear Side - 21A
D-88718	Front Side - 19B Rear Side - 19A
D-95629	Front Side - 22C Rear Side - 22A
†D-95727	Both Sides - 21D
D-95831	Front Side - 22C Rear Side - 2A
D-95853	Front Side - 21E Rear Side - 1A
D-96748	Front Side - D-90212 Rear Side - D-18619
D-156728	Front Side - D-156727 Rear Side - 3C

* Do not order parts by the D-number of the drive. Before conversion the D-86646, D-88718, D-85629, D-95727, D-95831, D-95853, D-96748 and D-156728 drives were the No. 23A, 20A, 24A, 21D, 4A, 3A, 3A per D-18620 and 3C drives respectively.

† Order all parts of the D-95727 drive the same as for the No. 21D drive except the roll guard on the gear case, left end, which has been changed to P-154451 and the roll guard on the bearing box, right end, which has been changed to P-170506.

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2.07 The following D-specification drives are the same as coded drives indicated except that the worm and non worm ends are reversed.

<u>D-Spec. Drive</u>	<u>Similar To Coded Drive</u>
D-47916	18G
D-78012	18C

2.08 The following D-specification drive is the same as the coded drive indicated except for parts of the drive shown in the table:

<u>D-Spec. Drive</u>	<u>Coded Drive</u>	<u>Friction Roll Assemblies</u>
*D-80526	21E	D-80526

* When it is necessary to order a friction roll assembly and the piece part is not given, order the assembly per D number of drive.

2.09 The following D-specification drives are the same as coded drives indicated except for parts of drives shown in table.

<u>D-Spec. Drive</u>	<u>Coded Drive</u>	<u>Bearing Box</u>	<u>Spur Gear Assembly</u>	<u>*Spur Gear</u>
D-140276	45A	D-140276-1	D-140276-3	D-140276-4
D-140277	46A	D-140276-1	D-140276-3	D-140276-4

* The spur gear referred to in the fifth column is the spur gear that meshes with the spur gear assembly.

2.10 The following D-specification drives are the same as coded drives indicated in the table except that one or both vertical shaft couplings are replaced by thrust collars shown in Fig. 14.

<u>D-Spec. Drive</u>	<u>Coded Drive</u>	<u>Couplings Replaced at</u>
D-140486	35A	Both Ends
D-140658	35A	One End

2.11 Wherever Bristo setscrews are specified for replacement purposes throughout the section, Allen hexagon socket cup-point set-screws of the same size may be substituted.

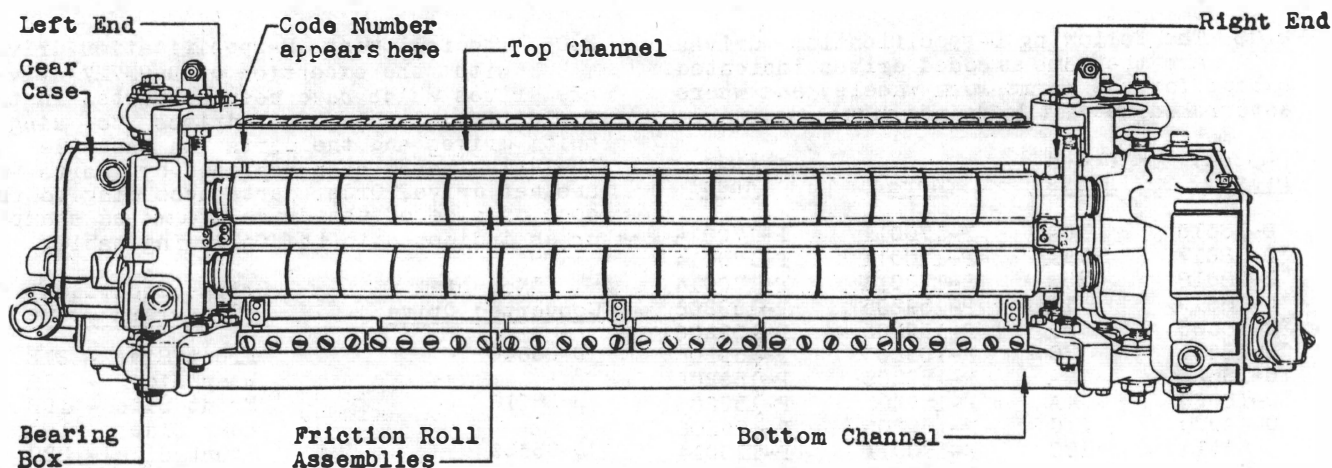


Fig. 1 - Illustrating Front of Friction Roll Drive

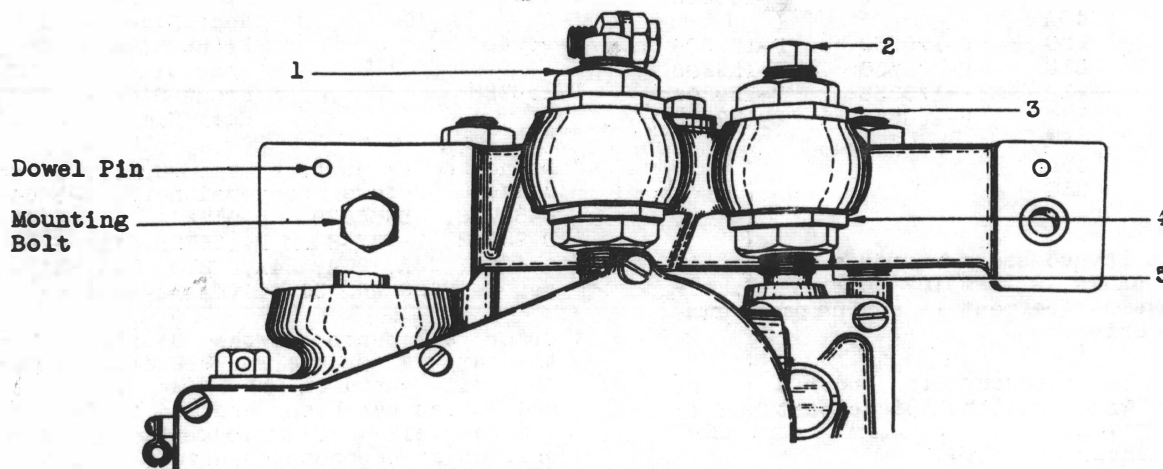
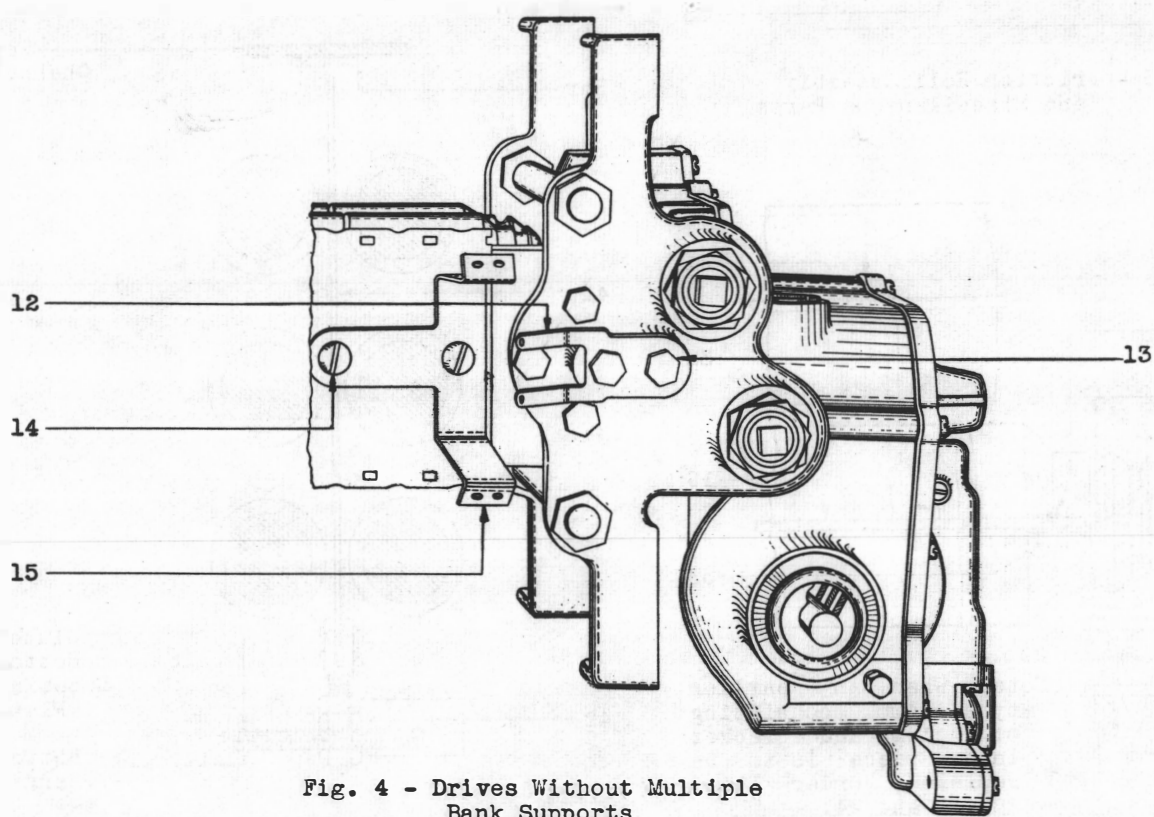
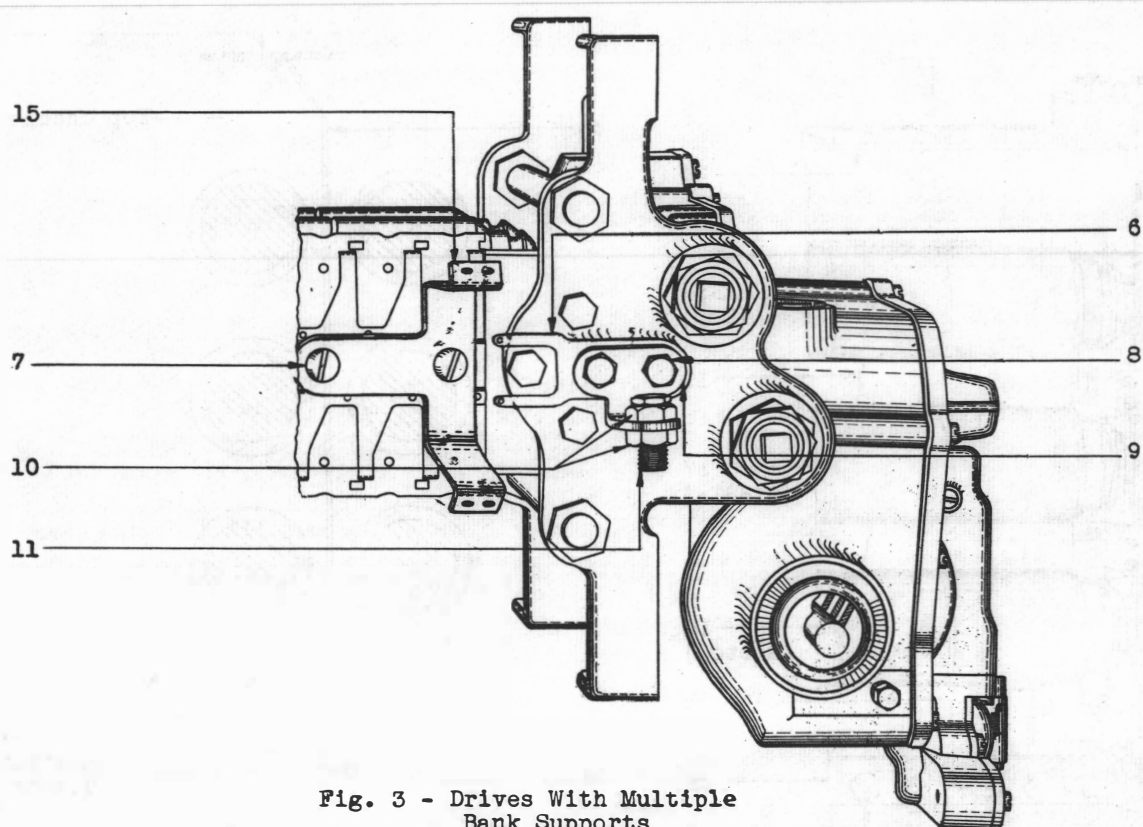


Fig. 2 - Eccentric Bushing Assembly



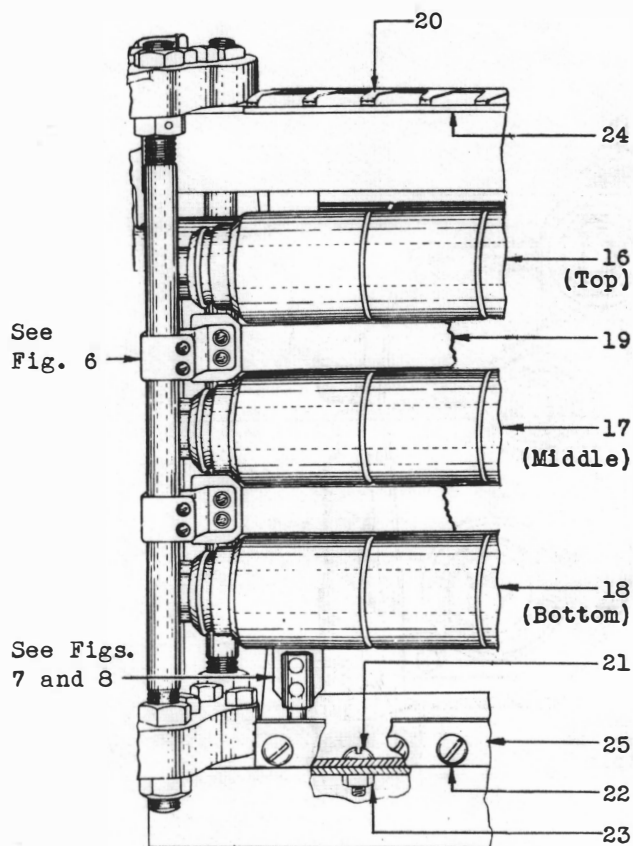


Fig. 5 - Friction Roll Assembly and Miscellaneous Parts

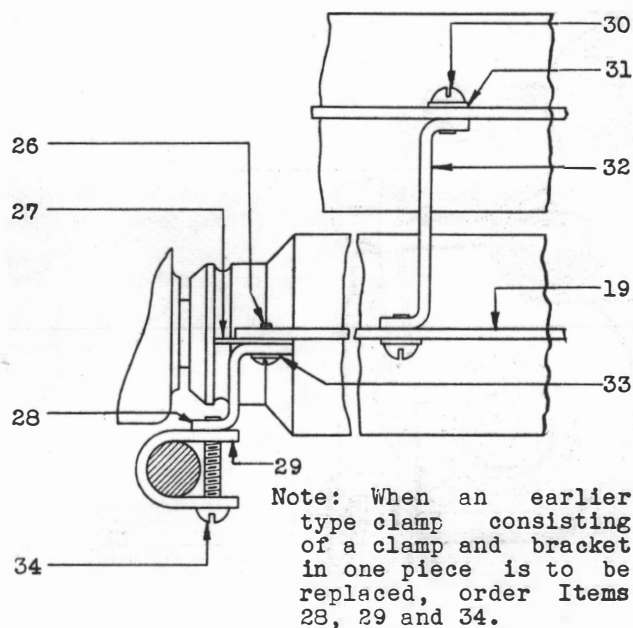


Fig. 6 - Roll Guard and Supports

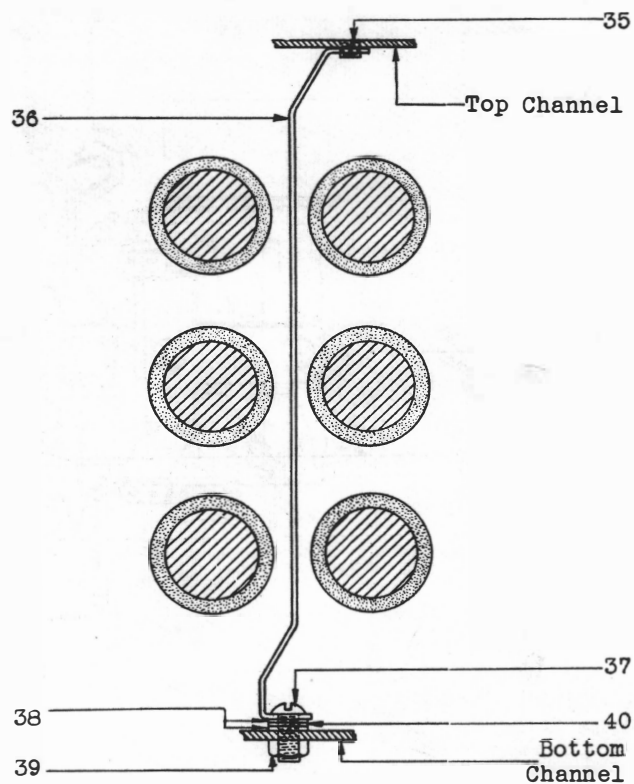


Fig. 7 - Guard Plate Assembly

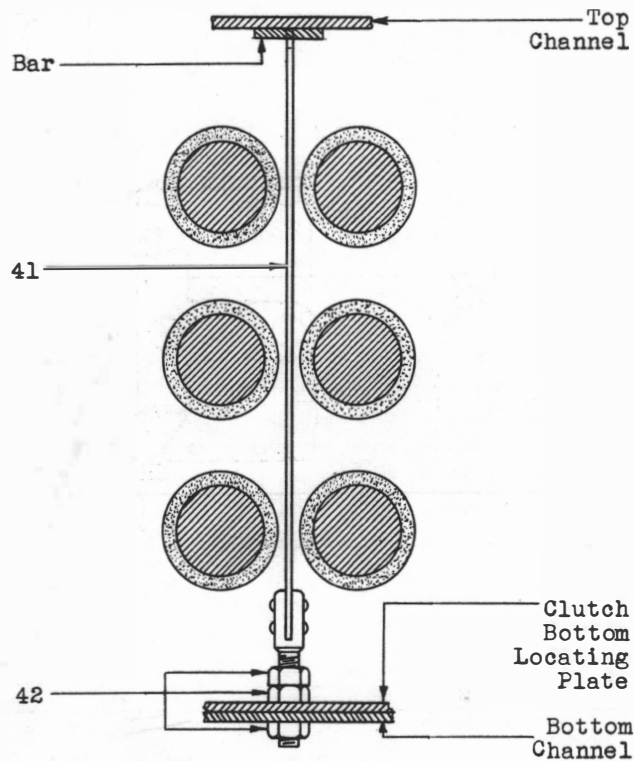


Fig. 8 - Guard Plate Assembly

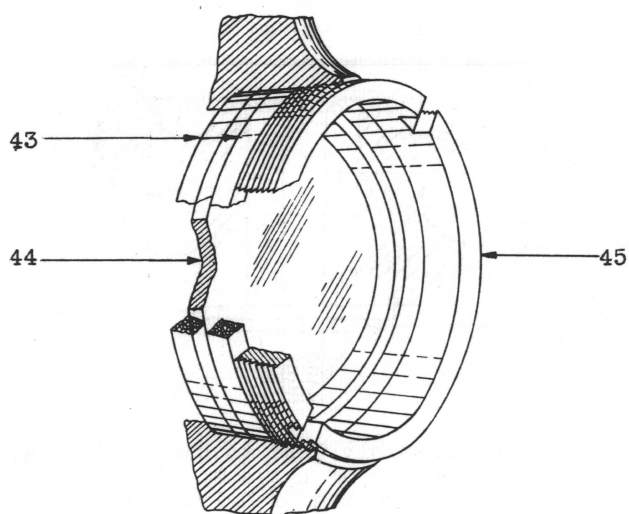


Fig. 9 - Oil Sight Assembly

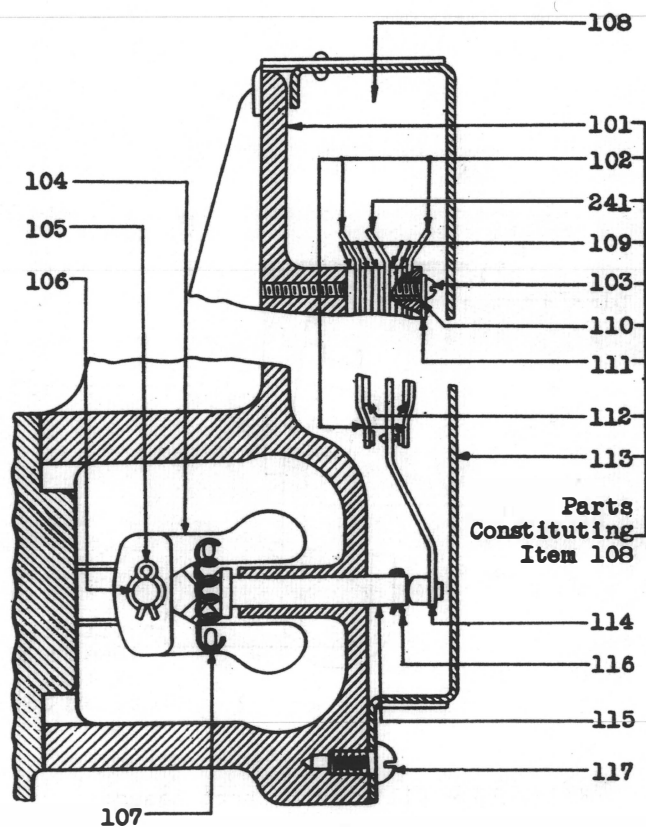


Fig. 11 - Cast Weight Alarm Mechanism

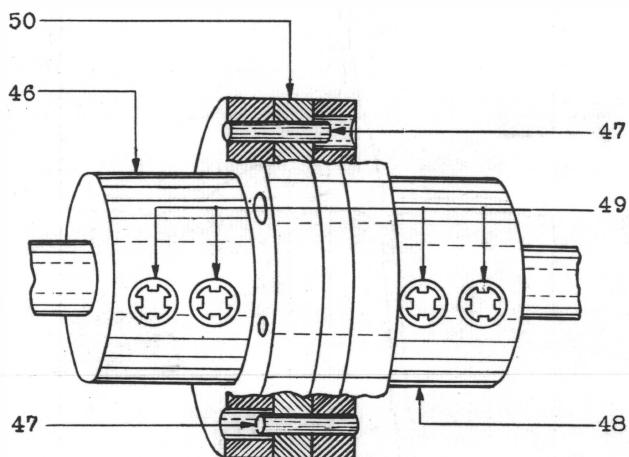


Fig. 10 - Motor Coupling Assembly

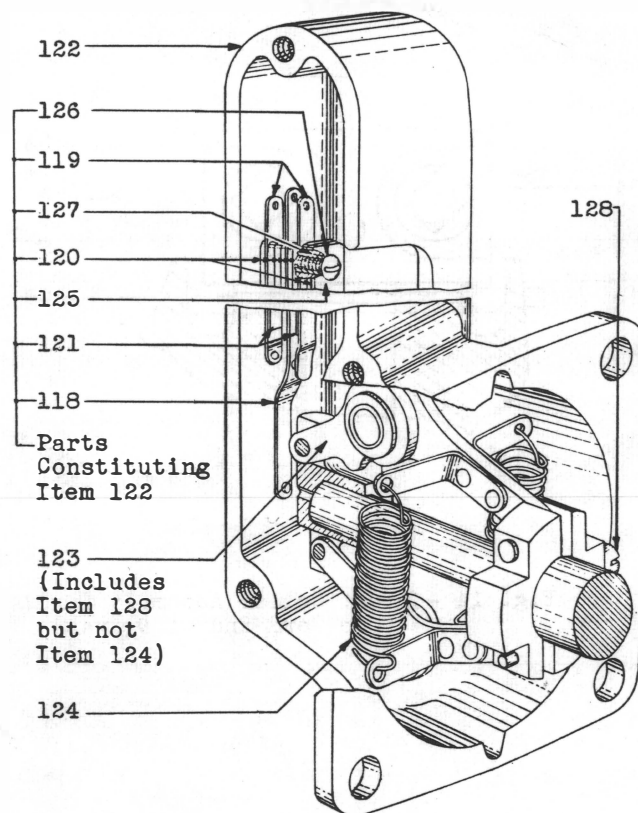


Fig. 12 - Link Type Alarm Mechanism

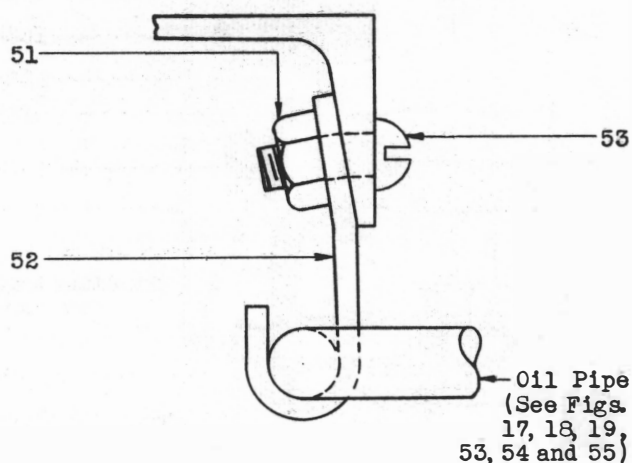


Fig. 13 - Oil Pipe Support Assembly

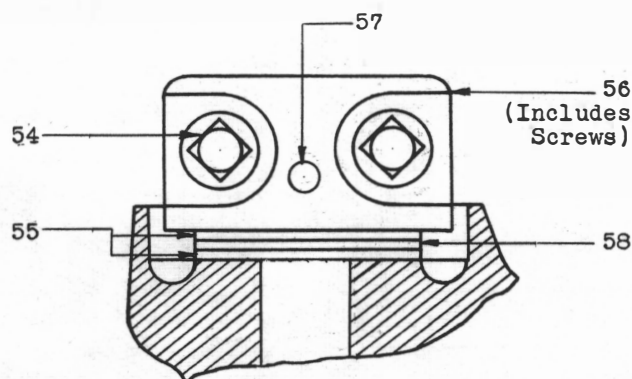


Fig. 14 - Thrust Collar Assembly
(Non Worm End of Drives)

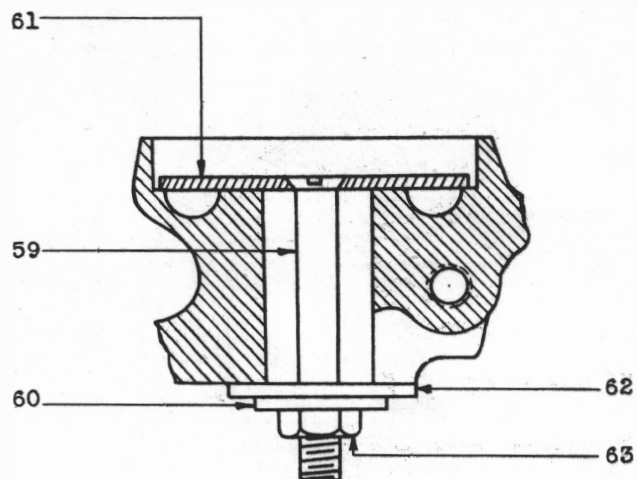


Fig. 15 - Assembly Used to Close Vertical
Shaft of Drive Opening
(Worm End of Drives, and
Non-Worm End of Converted
Drives)

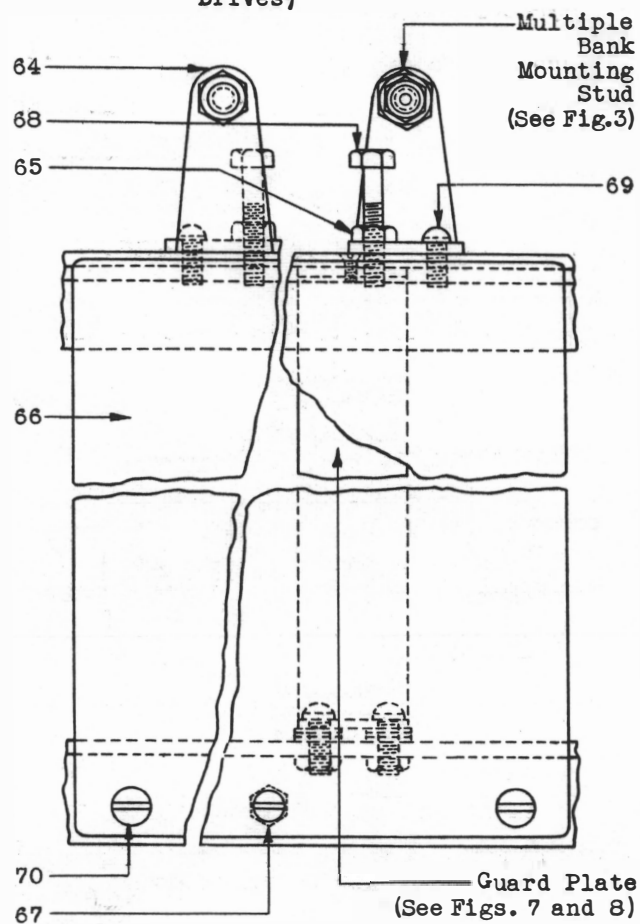


Fig. 16 - Guard Plate Cover and
Bracket Assembly

SINGLE SPEED DRIVES WITH EXTERNAL OIL PIPES

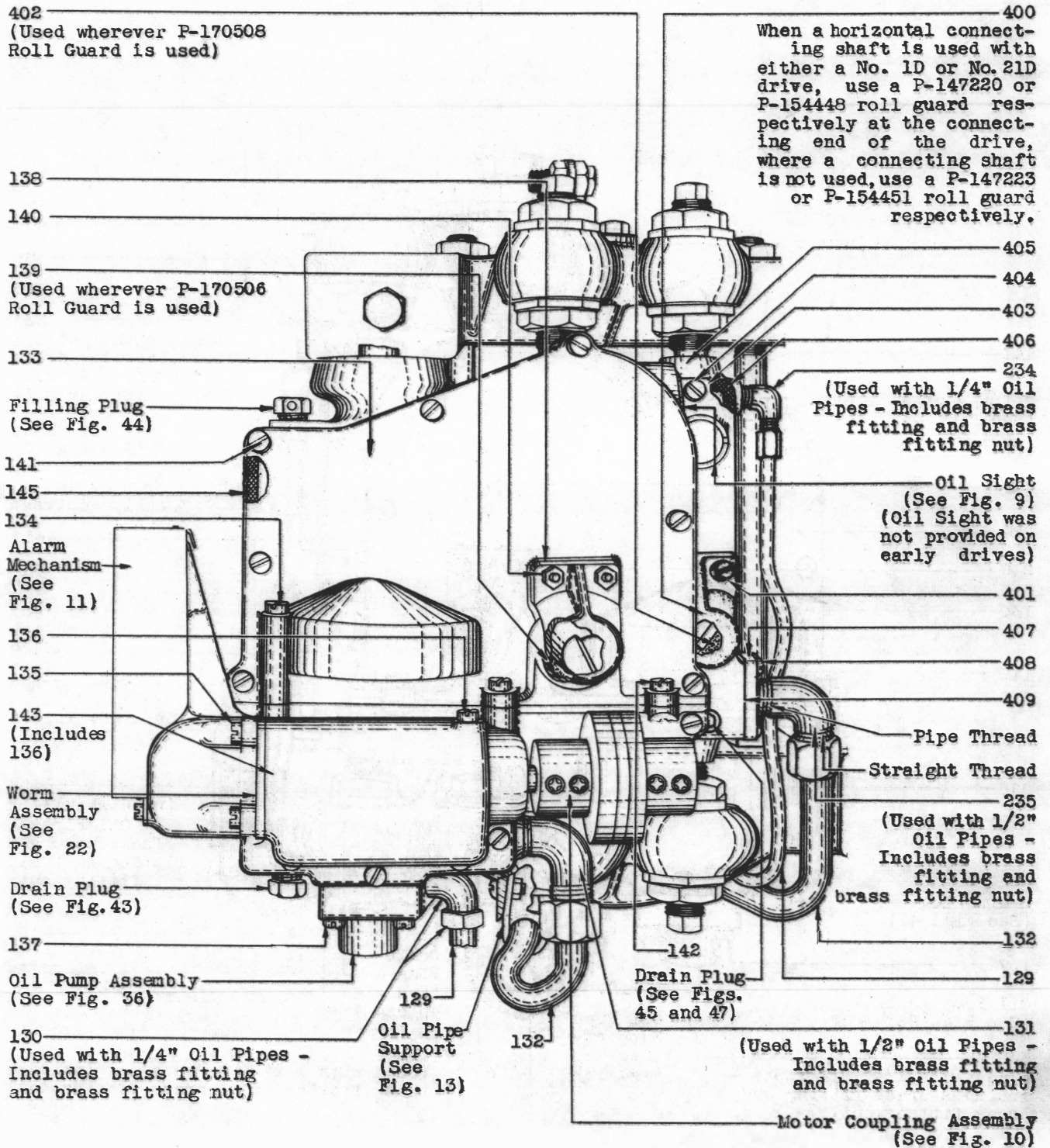


Fig. 17 - External Parts - Gear Case and Bearing Box
Worm End of Drives (1 and 3 Types and Nos.
17A, 18A, 18B, 19A, 20A, 20B, 21A, 21B, 21C,
21D, 23A, 23B, 23C, 23D, 23F, 23W, 25A, 26A,
and 26B Drives)

SINGLE SPEED DRIVES WITH EXTERNAL OIL PIPES

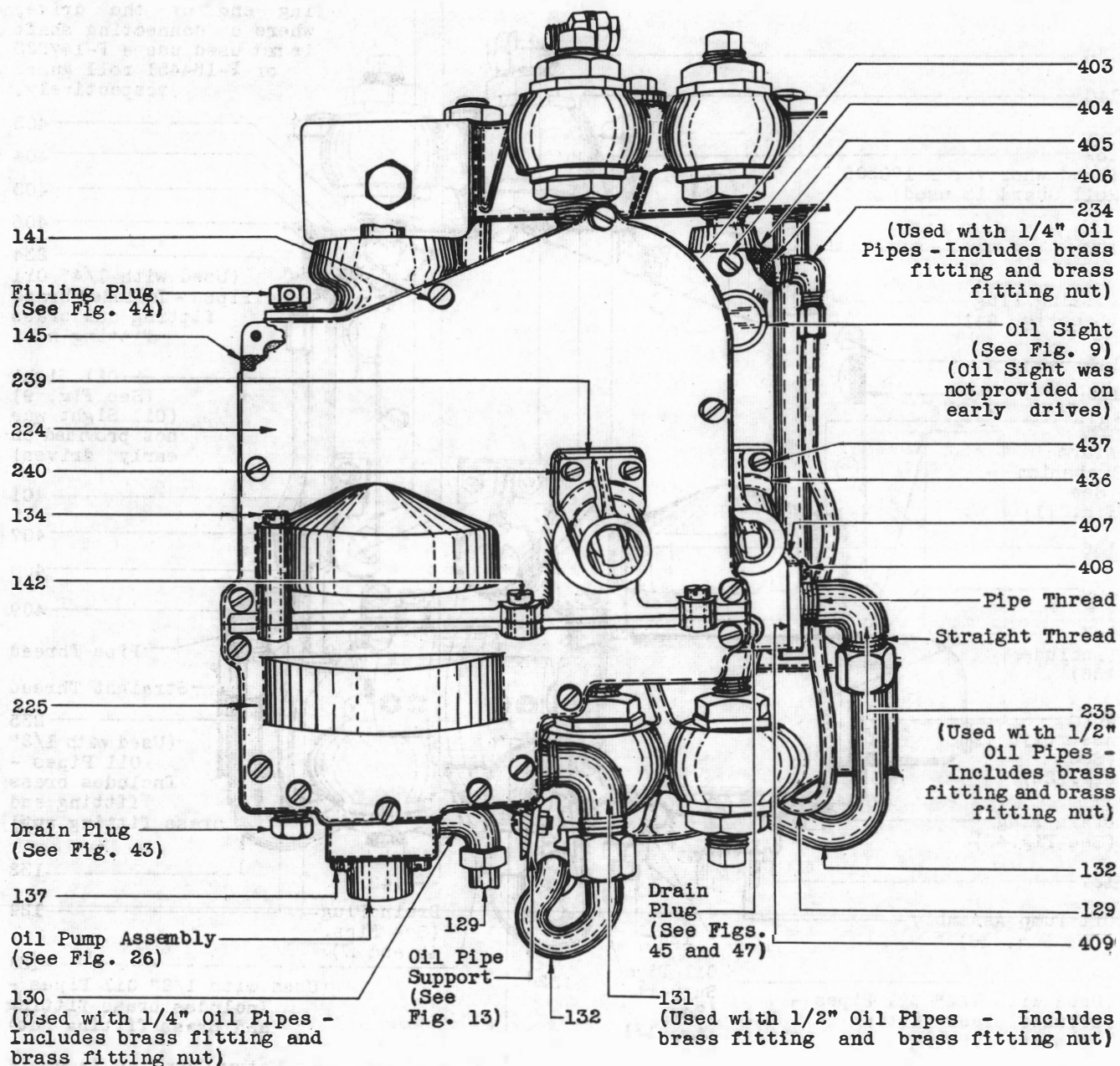


Fig. 18 - External Parts - Gear Case and Bearing Box
Non Worm End of Converted Drives
(Nos. 3D, E, 18B, 20B, 23B, D, W and 26B Drives)

SINGLE SPEED DRIVES WITH EXTERNAL OIL PIPES

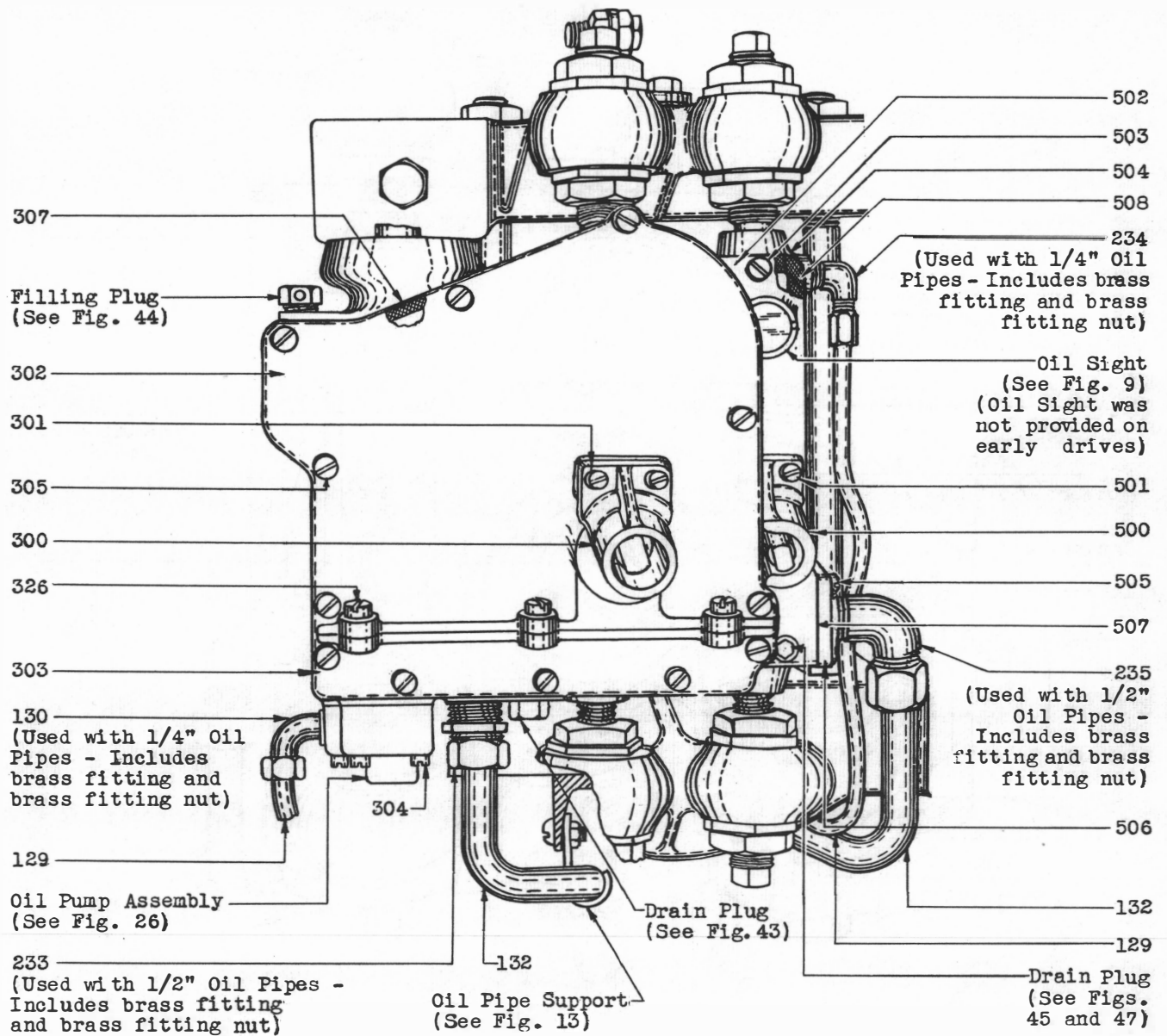
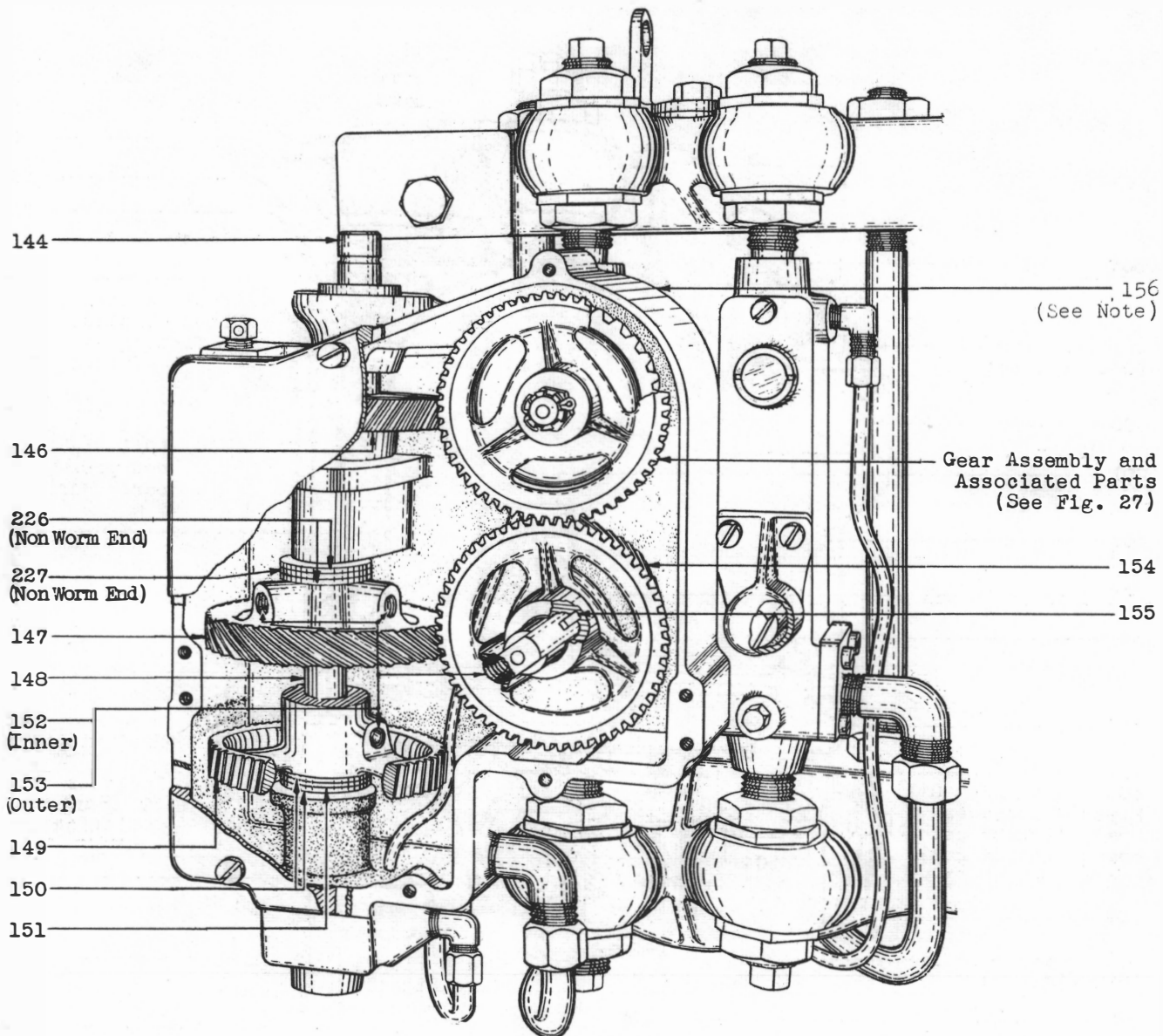


Fig. 19 - External Parts - Gear Case and Bearing Box
Non Worm End of Drives
(Nos. 3A,C,F, 18A, 20A, 23A,C,F and 26A Drives)

SINGLE SPEED DRIVES WITH EXTERNAL OIL PIPES



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

Fig. 20 - Internal Parts - Gear Case

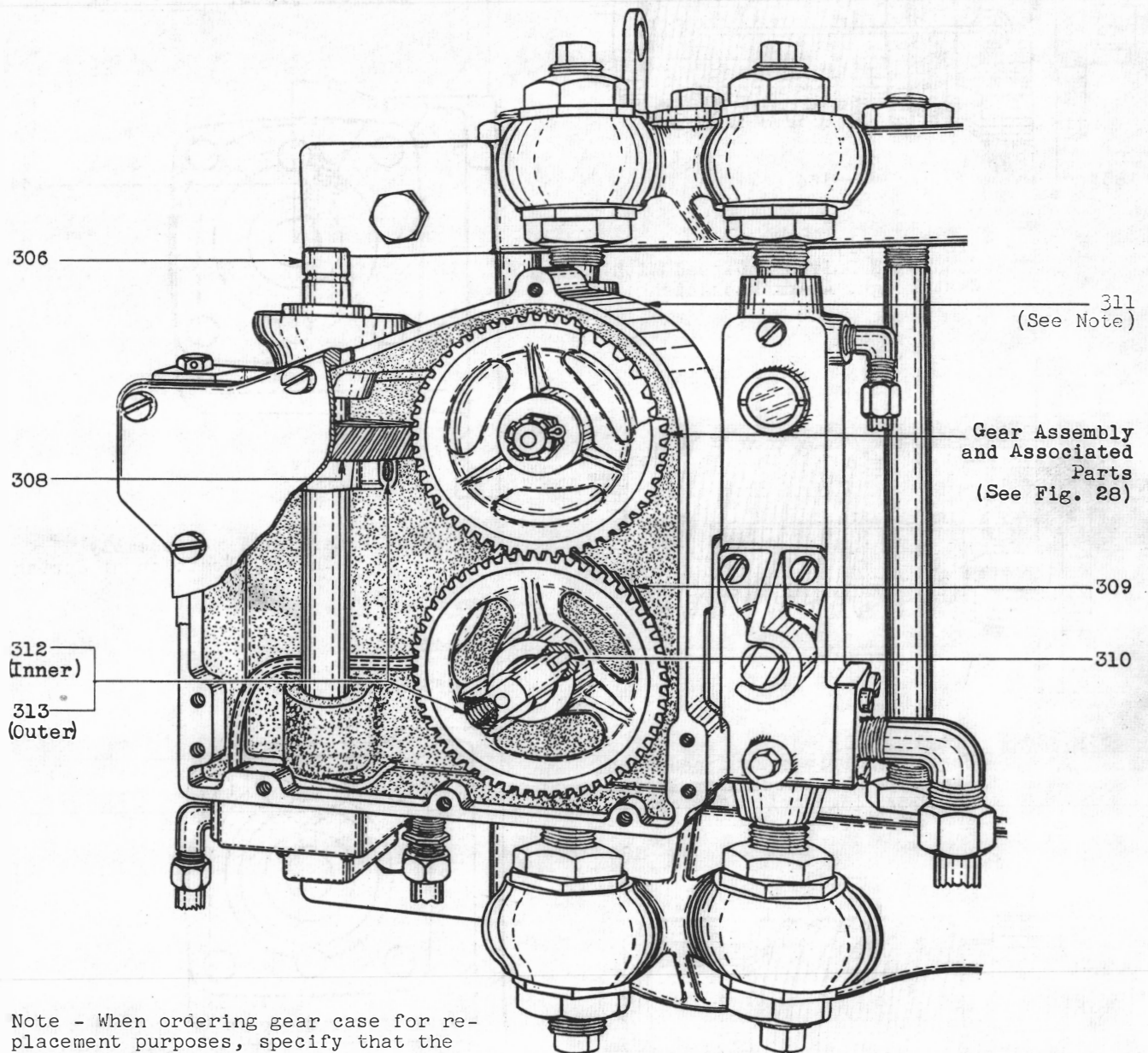
Worm End of Drives

(1 and 3 Types and Nos. 17A, 18A, B, 19A, 20A, B, 21A, B, C, D, 23A, B, C, D, F, W, 25A, 26A and B Drives)

Non Worm End of Converted Drives

(Nos. 3D, E, 18B, 20B, 23B, D, W and 26B Drives)

SINGLE SPEED DRIVES WITH EXTERNAL OIL PIPES



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

Fig. 21 - Internal Parts - Gear Case
Non Worm End of Drives
(Nos. 3A, C, F, 18A, 20A,
23A, C, F and 26A Drives)

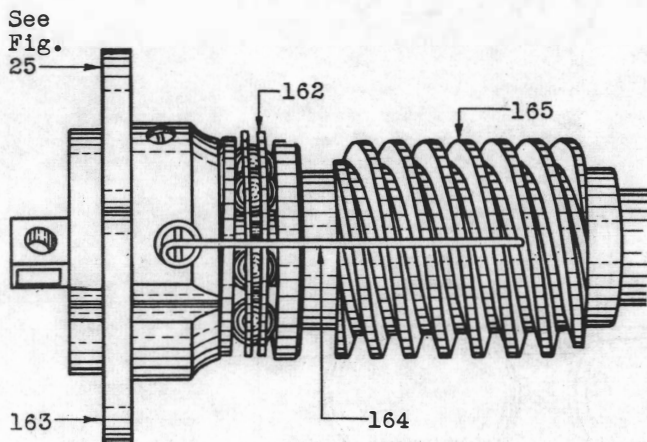


Fig. 22 - Worm Assembly
Used With Drives Equipped With
Cast Weight Alarm Mechanism

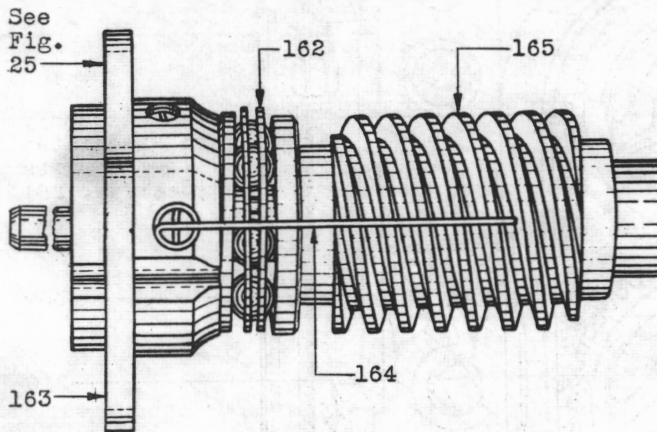


Fig. 23 - Worm Assembly
Used With Drives Equipped With
Link Type Alarm Mechanism (Except
Nos. 35A, 45A, 46A, 47A, 48A
and 49A Drives)

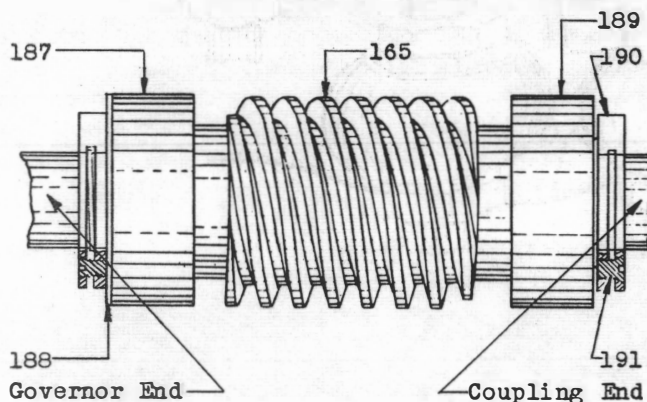


Fig. 24 - Worm Assembly
(Nos. 35A, 45A, 46A, 47A,
48A and 49A Drives)

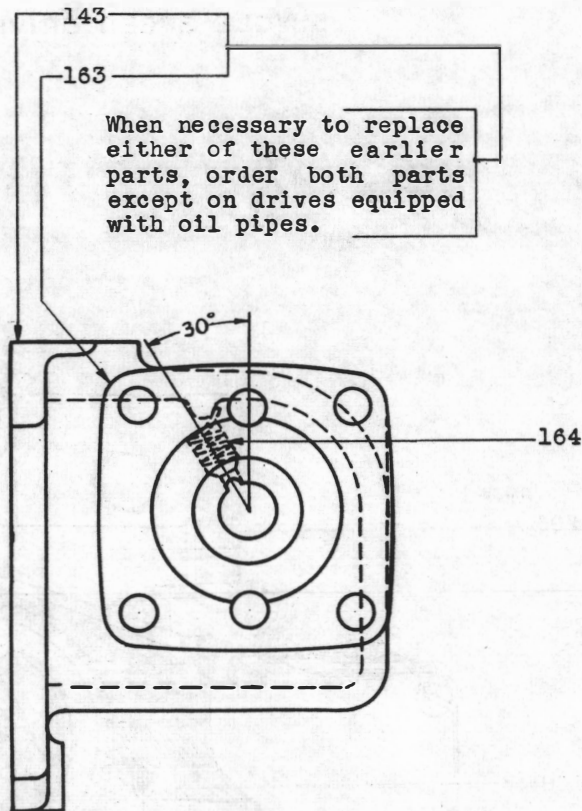


Fig. 25(a) - Earlier Type Assembly
Showing Position of Spring

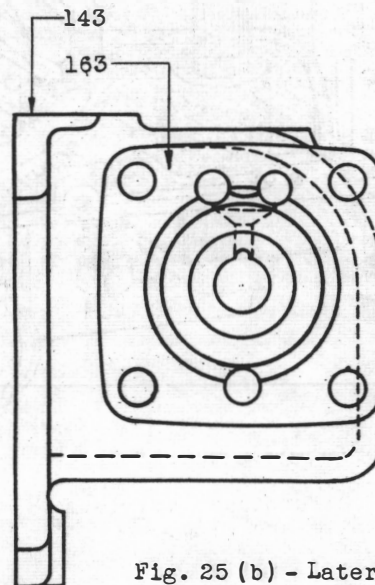


Fig. 25(b) - Later Type Assembly

Fig. 25 - Worm Case Housing Assembly
and Housing Assembly

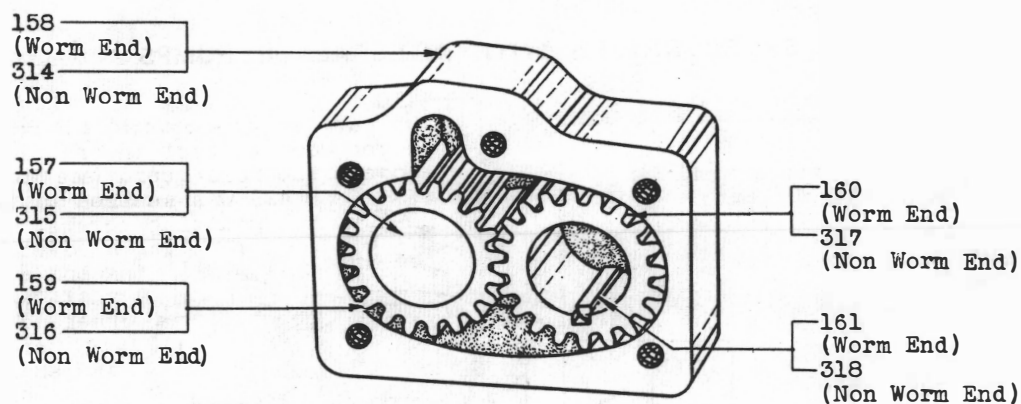
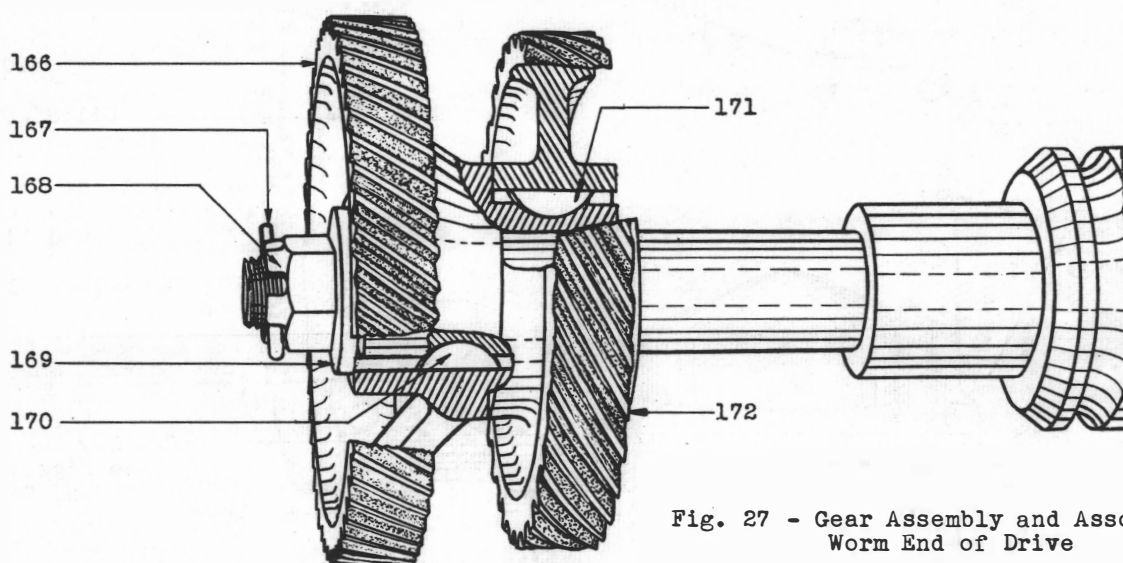
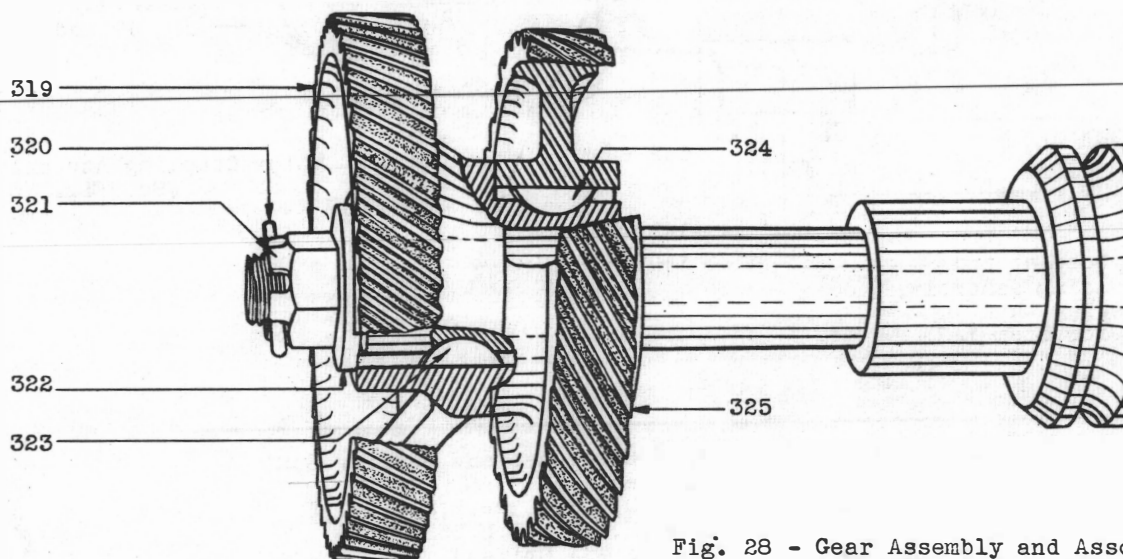


Fig. 26 - Oil Pump Assembly

Fig. 27 - Gear Assembly and Associated Parts
Worm End of DriveFig. 28 - Gear Assembly and Associated Parts
Non Worm End of Drive

SINGLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

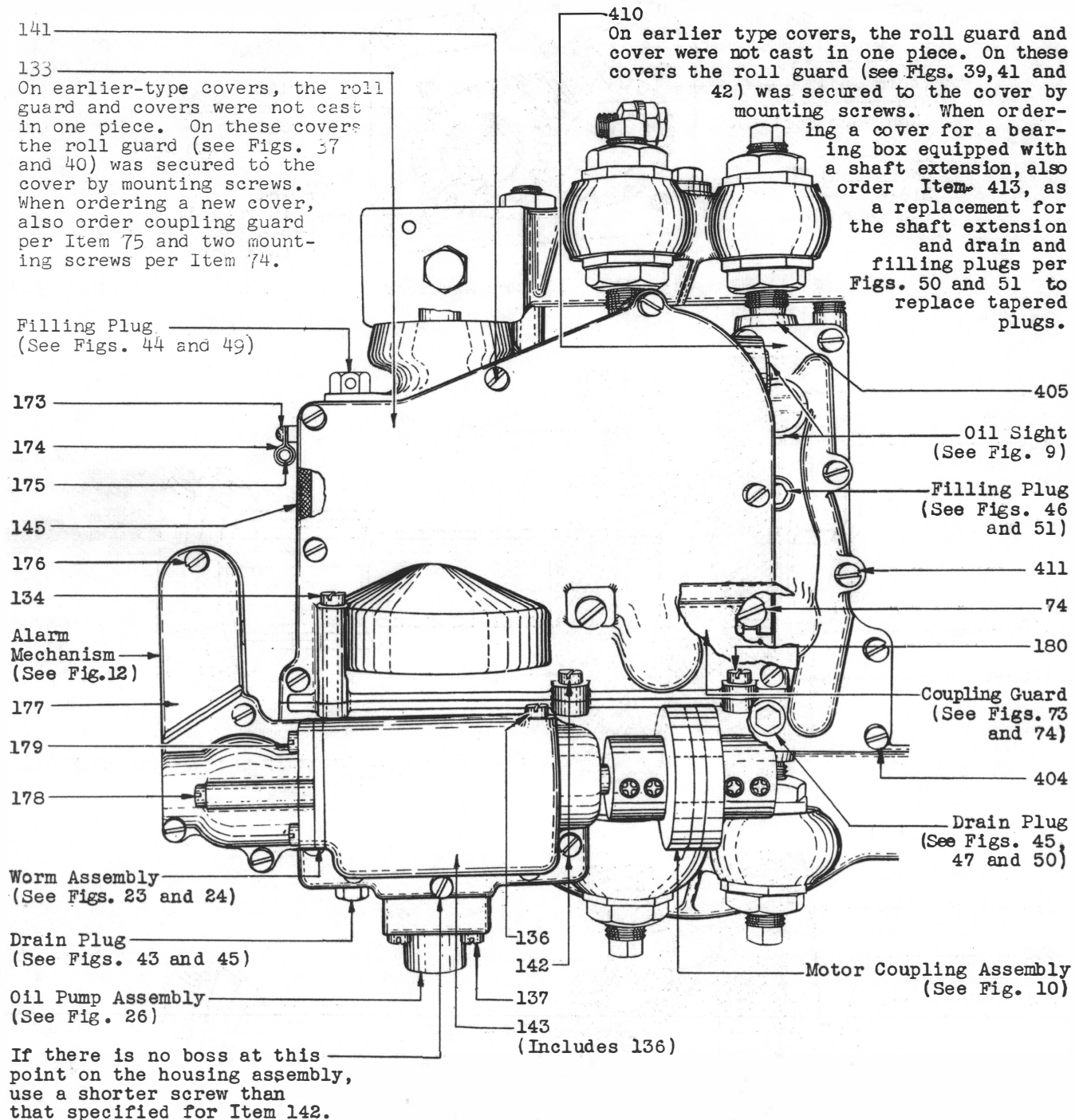


Fig. 29 - External Parts - Gear Case and Bearing Box
Worm End of Drives
(Nos. 17B,E,18C,D,G,H,J,19B,E,20C,D,G,H,
21E,F,G,H,R,23G,H,J,K,L,T,U,25B,E,
26C,D,G,H,35A and 49A Drives)

SINGLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

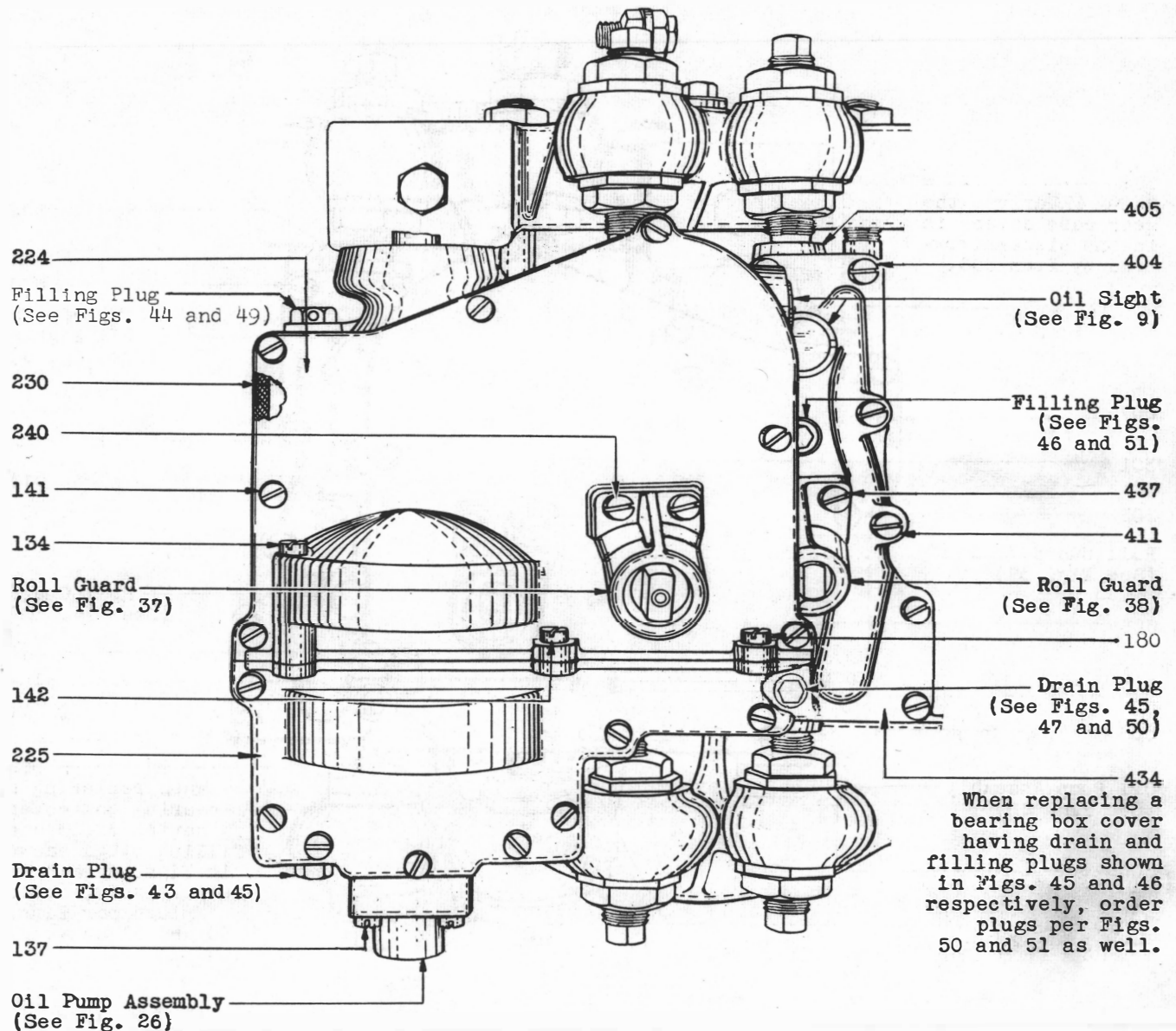


Fig. 30 - External Parts - Gear Case and Bearing Box
Non Worm End of Converted Drives
(Nos. 18D, J, 20D, H, 23H, K, U, 26D and H Drives)

SINGLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

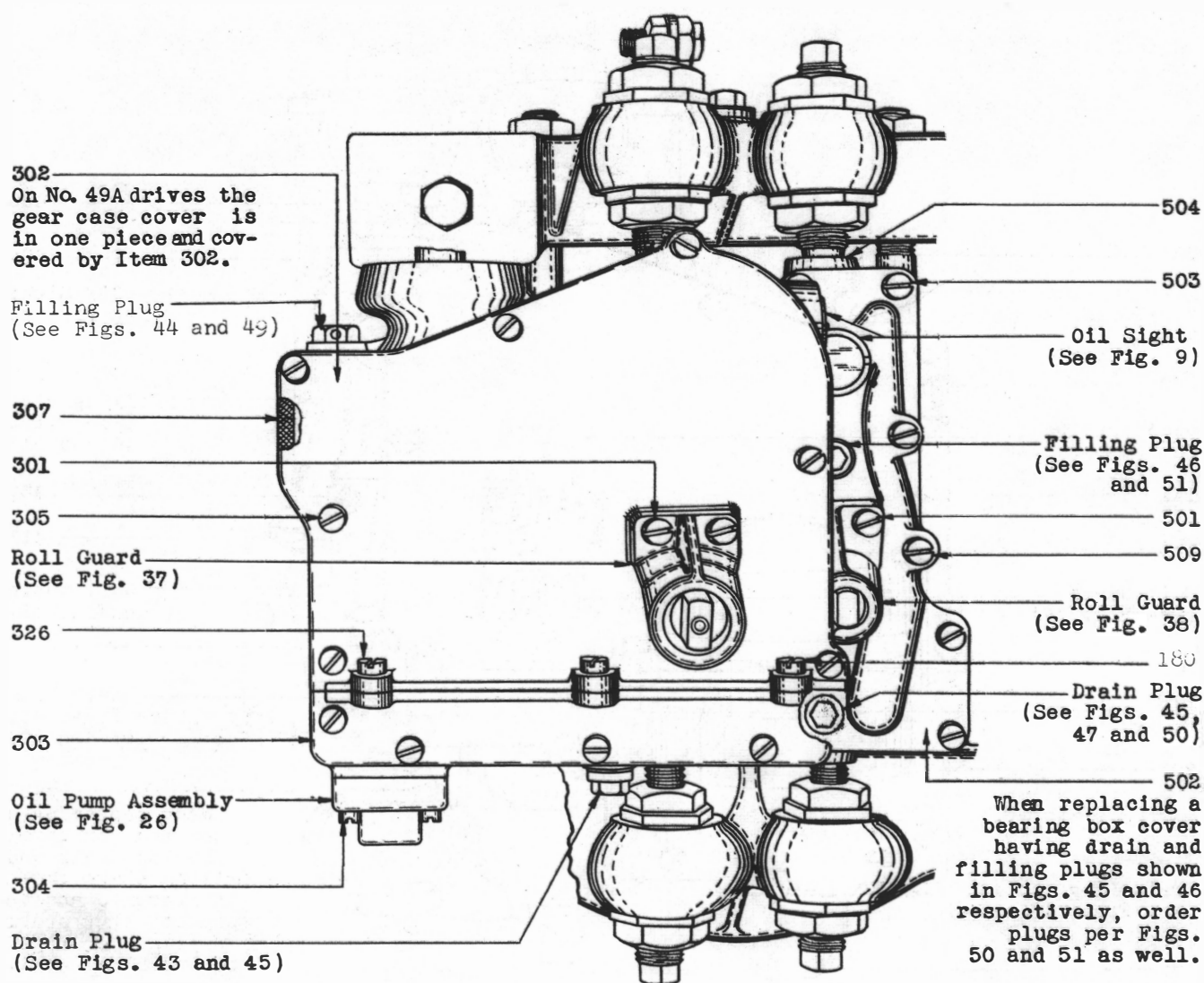
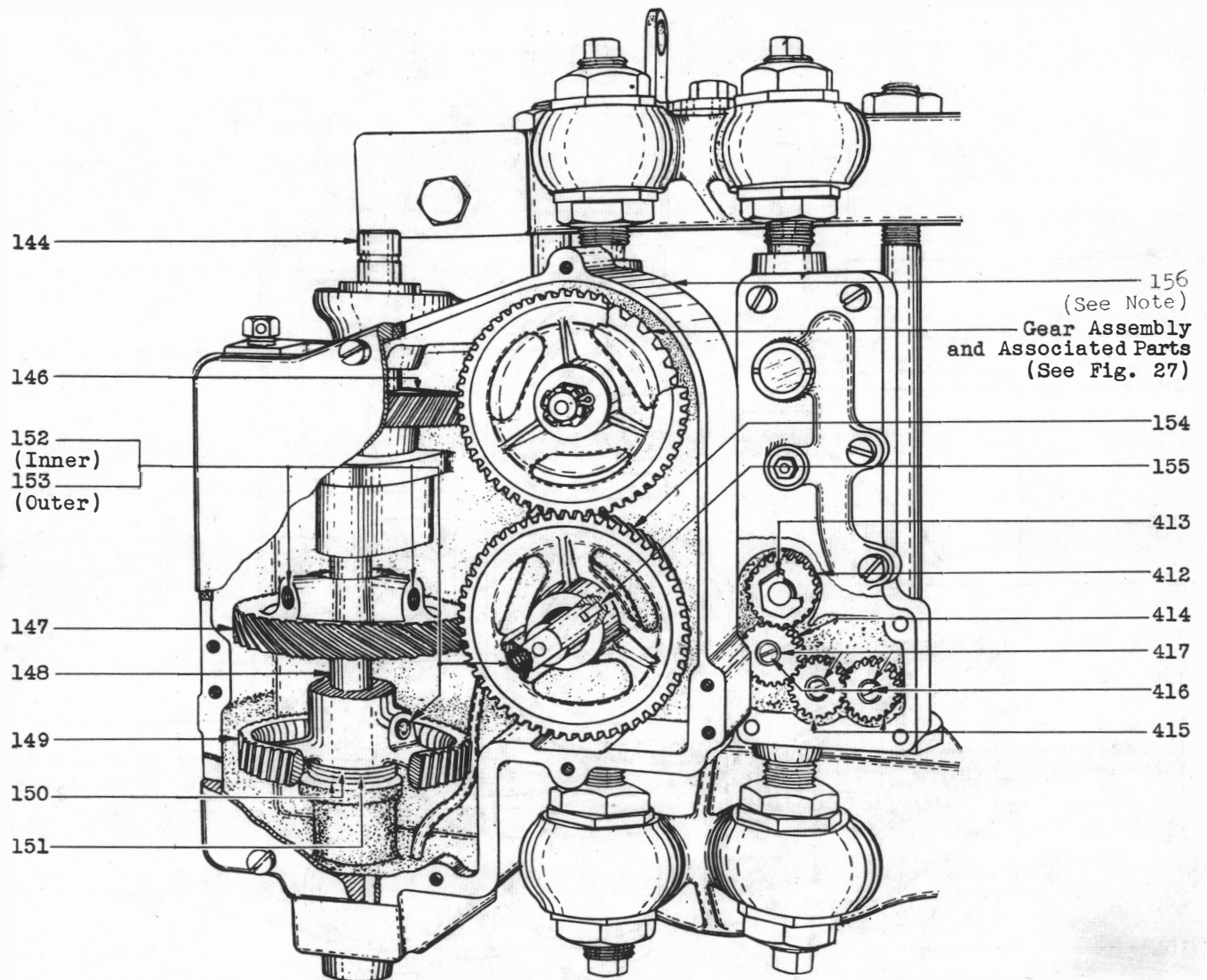


Fig. 31 - External Parts - Gear Case and Bearing Box
Non Worm End of Drives
(Nos. 18C,G,H,20C,G,23G,J,L,T,
26C,G, and 49A Drives)

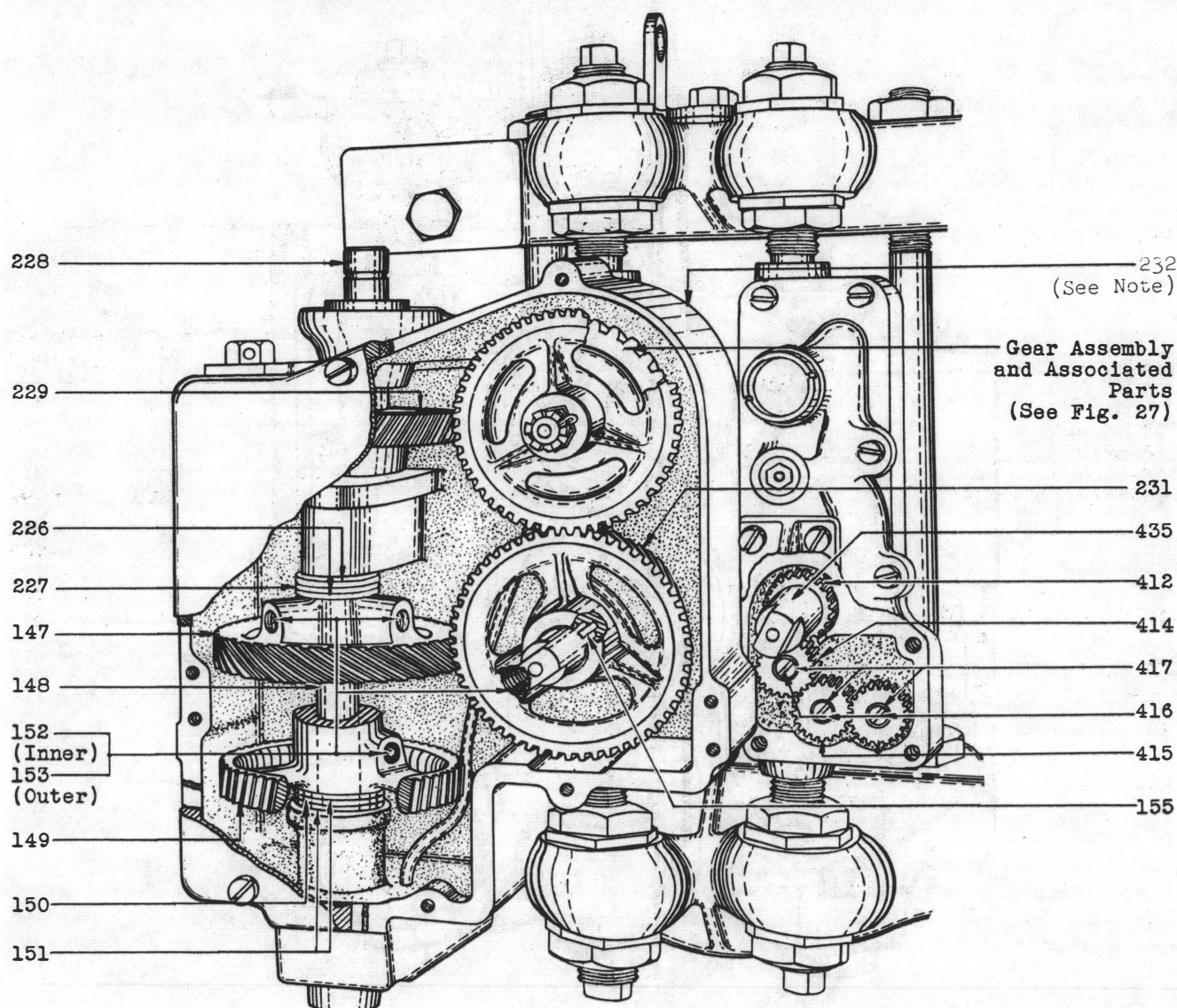
SINGLE SPEED DRIVES WITH INTEGRAL OIL PUMPS



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

Fig. 32 - Internal Parts - Gear Case and Bearing Box
Worm End of Drives
(Nos. 17B, E, 18C, D, G, H, J, 19B, E, 20C, D, G, H,
21E, F, G, H, R, 23G, H, J, K, I, T, U, 25B, E,
26C, D, G and H Drives)

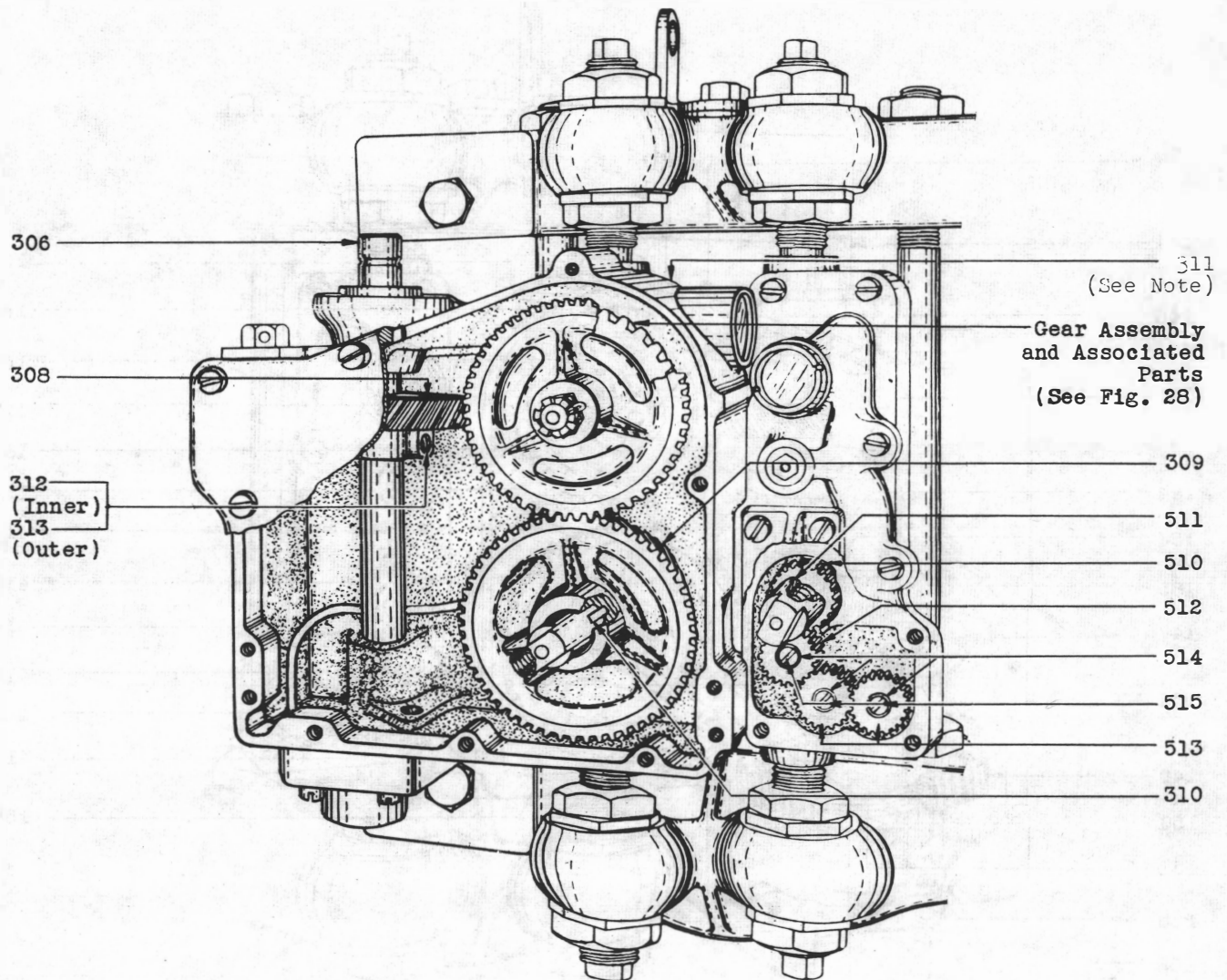
SINGLE SPEED DRIVES WITH INTEGRAL OIL PUMPS



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

Fig. 33 - Internal Parts - Gear Case and Bearing Box
Non Worm End of Converted Drives
(Nos. 18D, J, 20D, H, 23H, K, U, 26D and H Drives)

SINGLE SPEED DRIVES WITH INTEGRAL OIL PUMPS



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

Fig. 34 - Internal Parts - Gear Case and Bearing Box
Non Worm End of Drives
(Nos. 18C, G, H, 20C, G, 23G, J, L, T,
26C and G Drives)

SINGLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

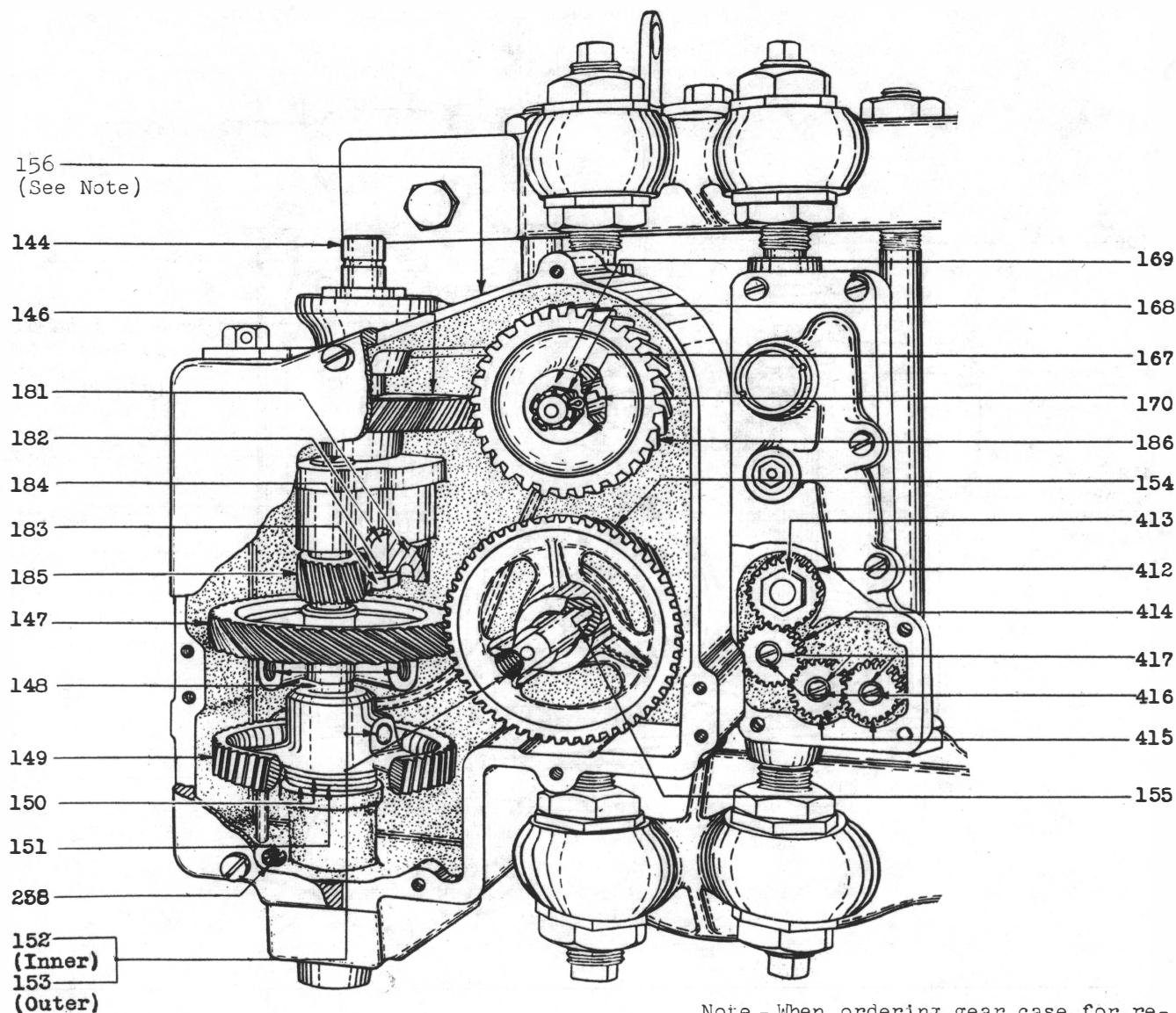


Fig. 35 - Internal Parts - Gear Case and Bearing Box
Worm End of Drives
(Nos. 35A and 49A Drives)

SINGLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

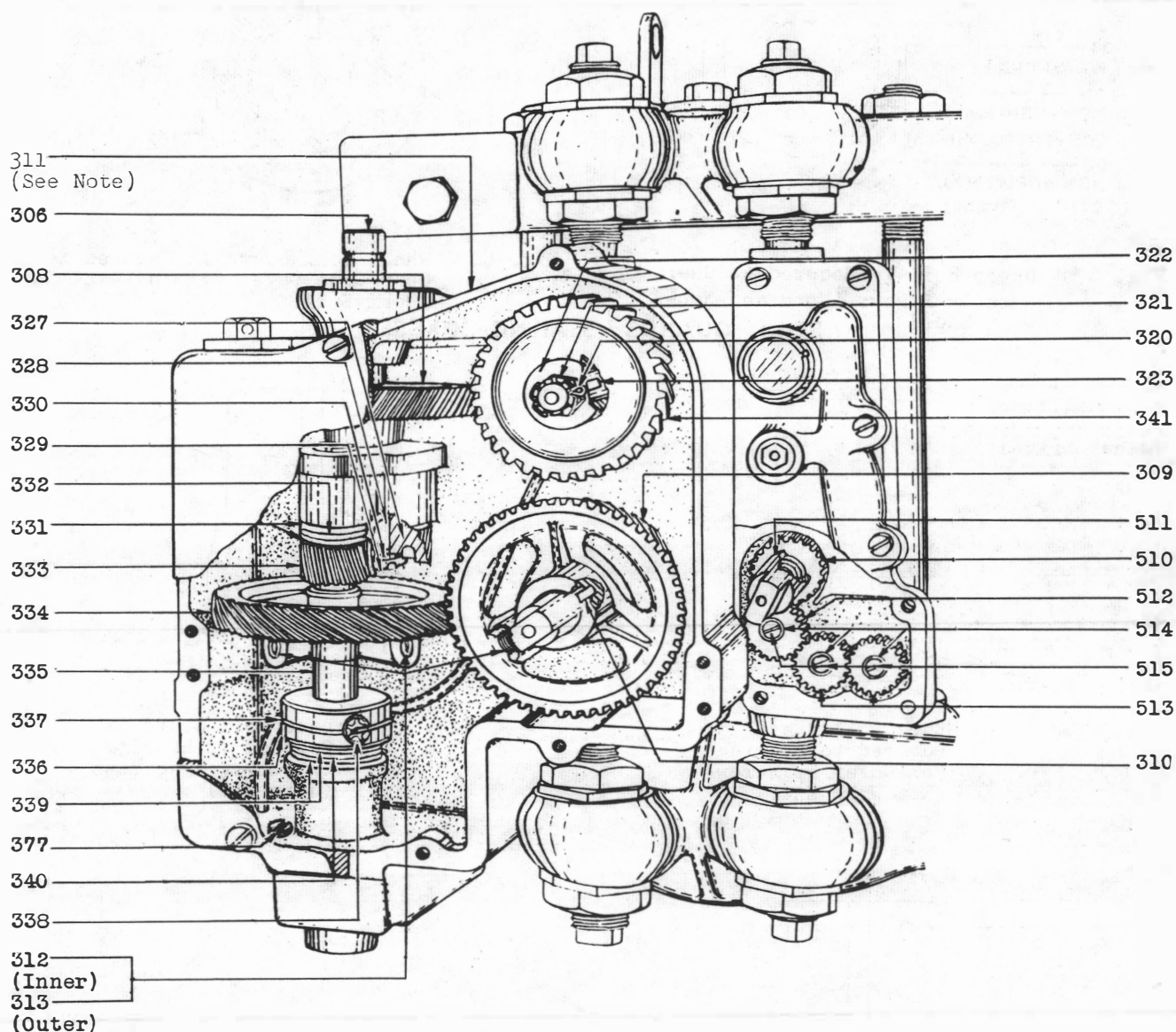


Fig. 36 - Internal Parts - Gear Case and Bearing Box
Non Worm End of Drives
(No. 49A Drive)

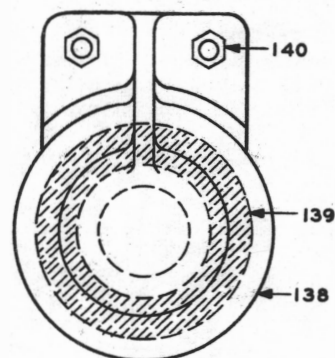
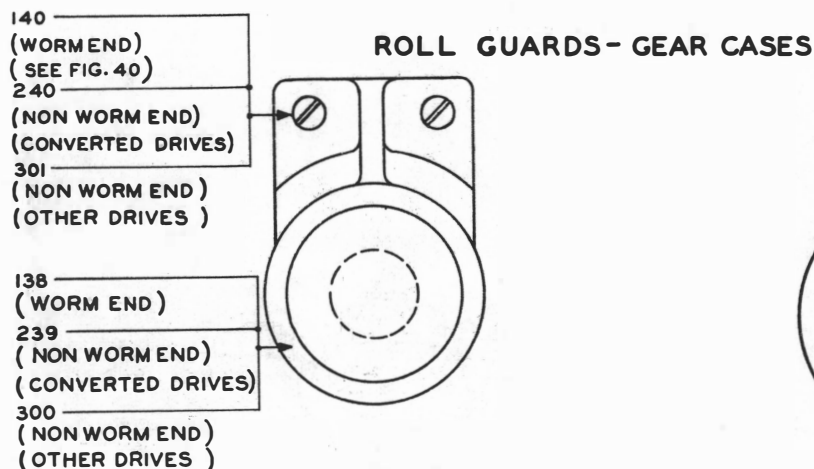


Fig. 37 - Where Roll Is Secured to Gear Case by Screws (Worm and Non-worm Ends)

Fig. 40 - Where Roll Guard Is Secured to Gear Case Cover by Studs and Nuts (Worm End)

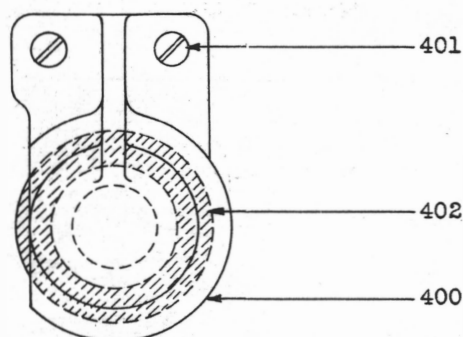
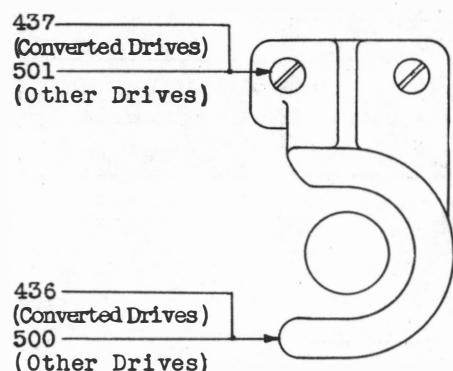


Fig. 38 - Where Roll Guard is Secured to Bearing Box Cover by Screws (Non Worm End)

Fig. 41 - Where Roll Guard is Secured to Bearing Box Cover by Screws (Worm End)

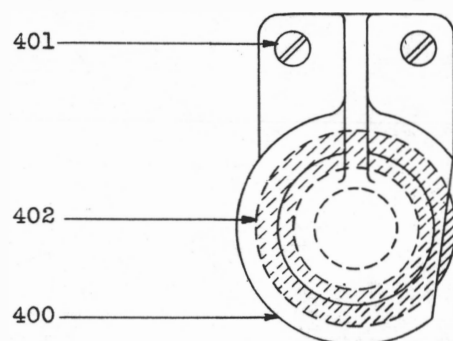


Fig. 39 - Where Roll Guard is Secured to Bearing Box Cover by Screws (Worm End)

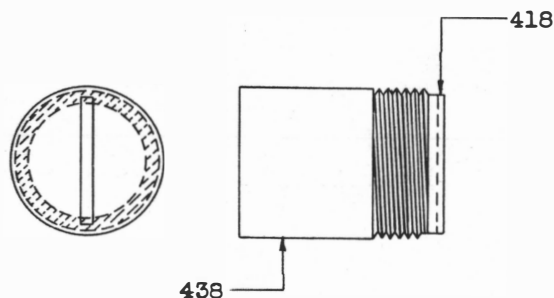


Fig. 42 - Where Roll Guard is Secured to Bearing Box Cover by Threads (Worm End)

DRAIN AND FILLING PLUGS - GEAR CASES

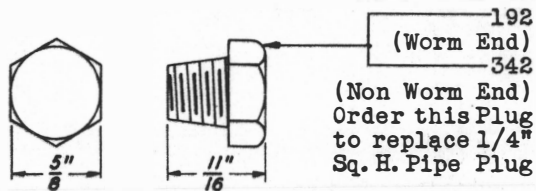


Fig. 43 - Drain Plug - Hex. H. Pipe Plug
Used Where Gear Case is Tapped For Pipe Plugs
(Formerly Used as Filling Plug)

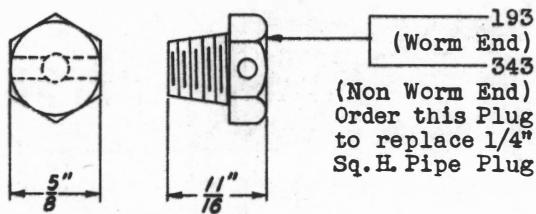


Fig. 44 - Filling Plug - Hex. H. Pipe Plug
(Vented Plug)
Used Where Gear Case is Tapped For Pipe Plugs

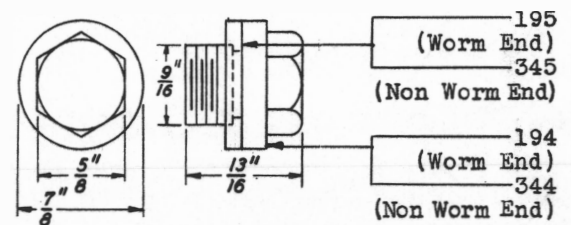


Fig. 48 - Drain Plug - Collar H. Plug
Used Where Gear Case is Tapped For Straight Thread Plugs
(Formerly Used as Filling Plug)

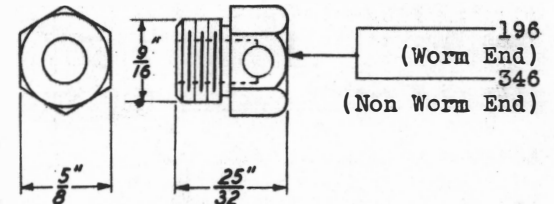


Fig. 49 - Filling Plug - Collar H. Plug
(Vented Plug)
Used Where Gear Case is Tapped For Straight Thread Plugs

DRAIN AND FILLING PLUGS - BEARING BOXES

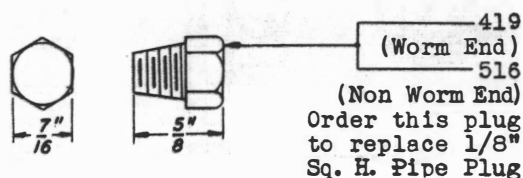


Fig. 45 - Drain Plug - Hex. H. Pipe Plug
Used Where Bearing Box is Tapped For Pipe Plugs
(Formerly Used as Filling Plug)

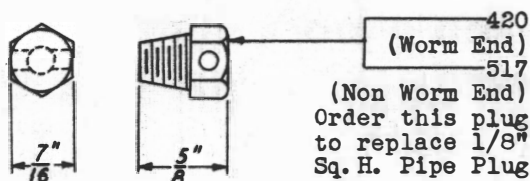


Fig. 46 - Filling Plug - Hex. H. Pipe Plug
(Vented Plug)
Used Where Bearing Box is Tapped For Pipe Plugs

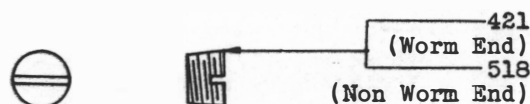


Fig. 47 - Drain Plug - Slotted Head
Used Where Bearing Box Cover is Tapped For Pipe Plugs and There is Insufficient Space For Hex. Wrench

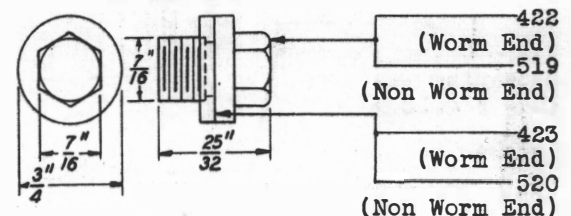


Fig. 50 - Drain Plug - Collar H Plug
Used Where Bearing Box is Tapped For Straight Thread Plugs
(Formerly Used as Filling Plug)

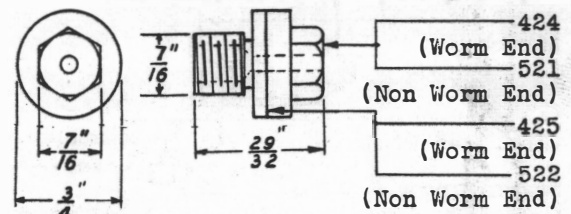


Fig. 51 - Filling Plug - Collar H. Plug
(Vented Plug)
Used Where Bearing Box is Tapped For Straight Thread Plugs

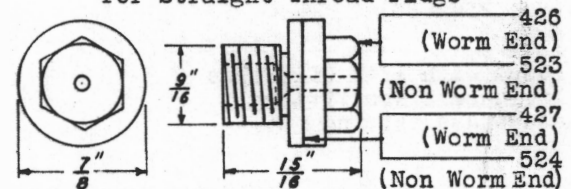


Fig. 52 - Filling Plug - Collar H. Plug
(Vented Plug)
(Nos. 45, 46, 47 and 48 Type Drives)

DOUBLE SPEED DRIVES WITH EXTERNAL OIL PIPES

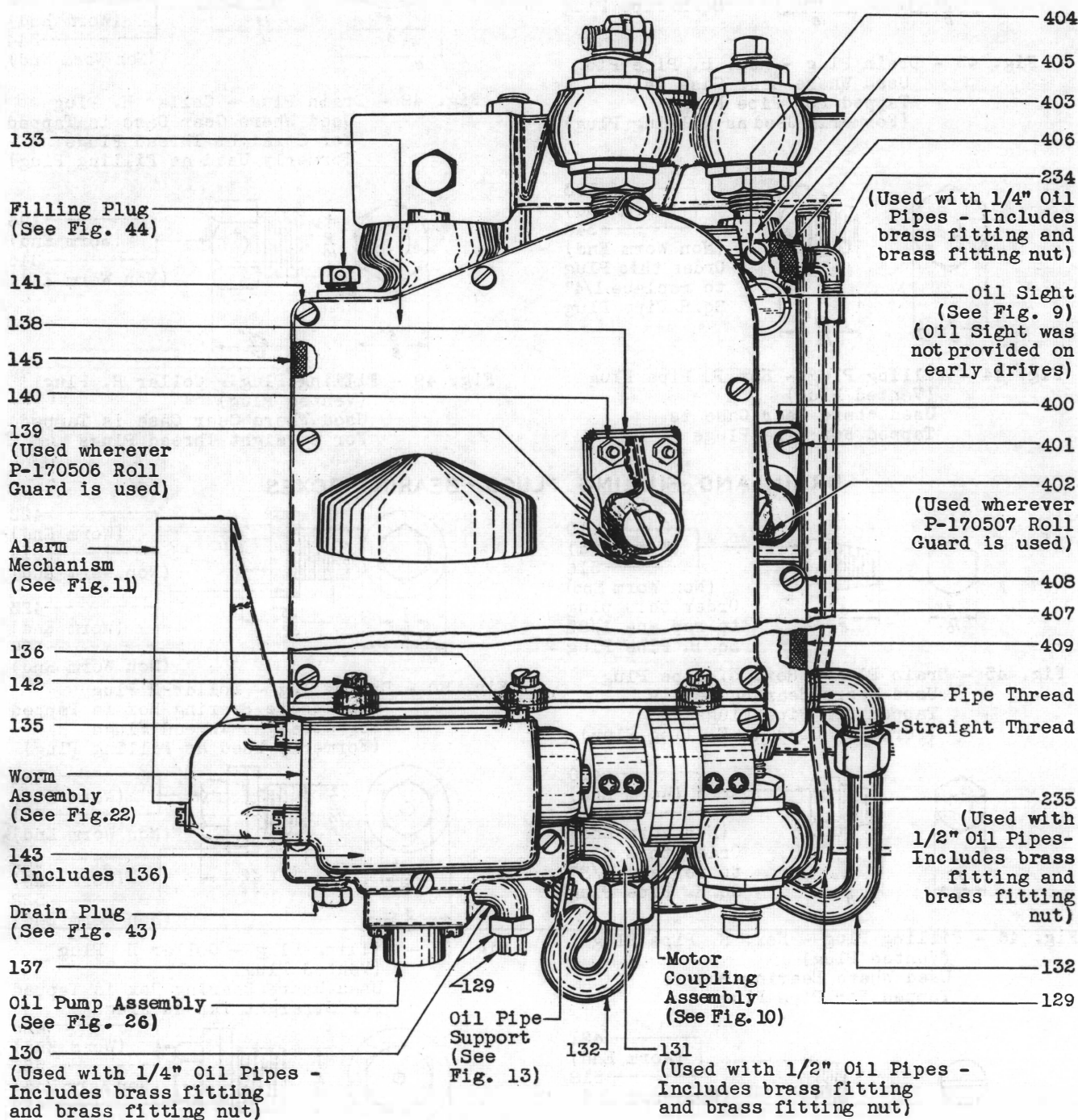


Fig. 53 - External Parts - Gear Case and Bearing Box
Worm End of Drives (Nos. 2A, 4A, 4B, 22A,
22B, 24A, 24B, 24C, and 24D Drives)

DOUBLE SPEED DRIVES WITH EXTERNAL OIL PIPES

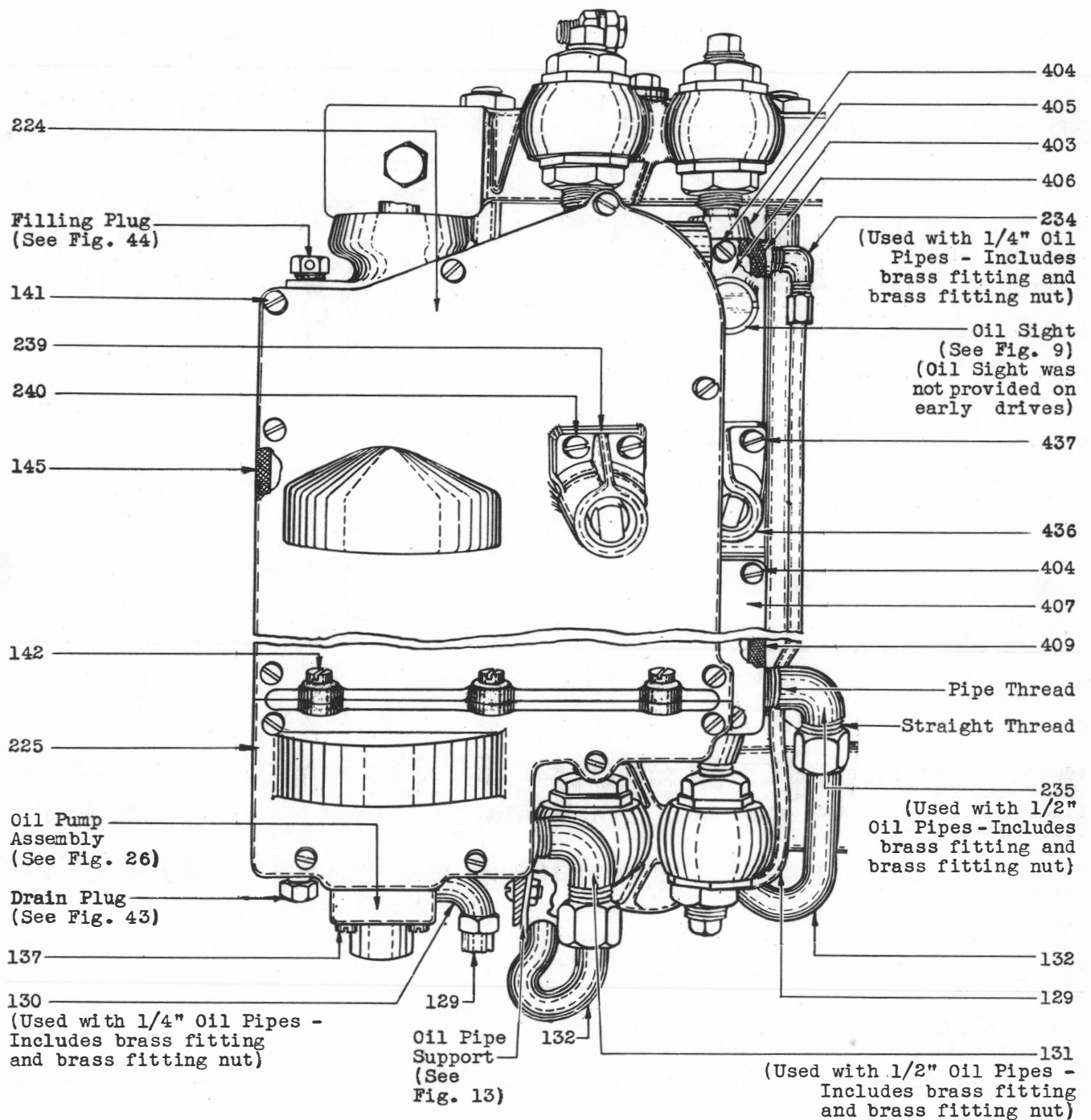


Fig. 54 - External Parts - Gear Case and Bearing Box
Non Worm End of Converted Drives
(Nos. 4B, 24B and D Drives)

DOUBLE SPEED DRIVES WITH EXTERNAL OIL PIPES

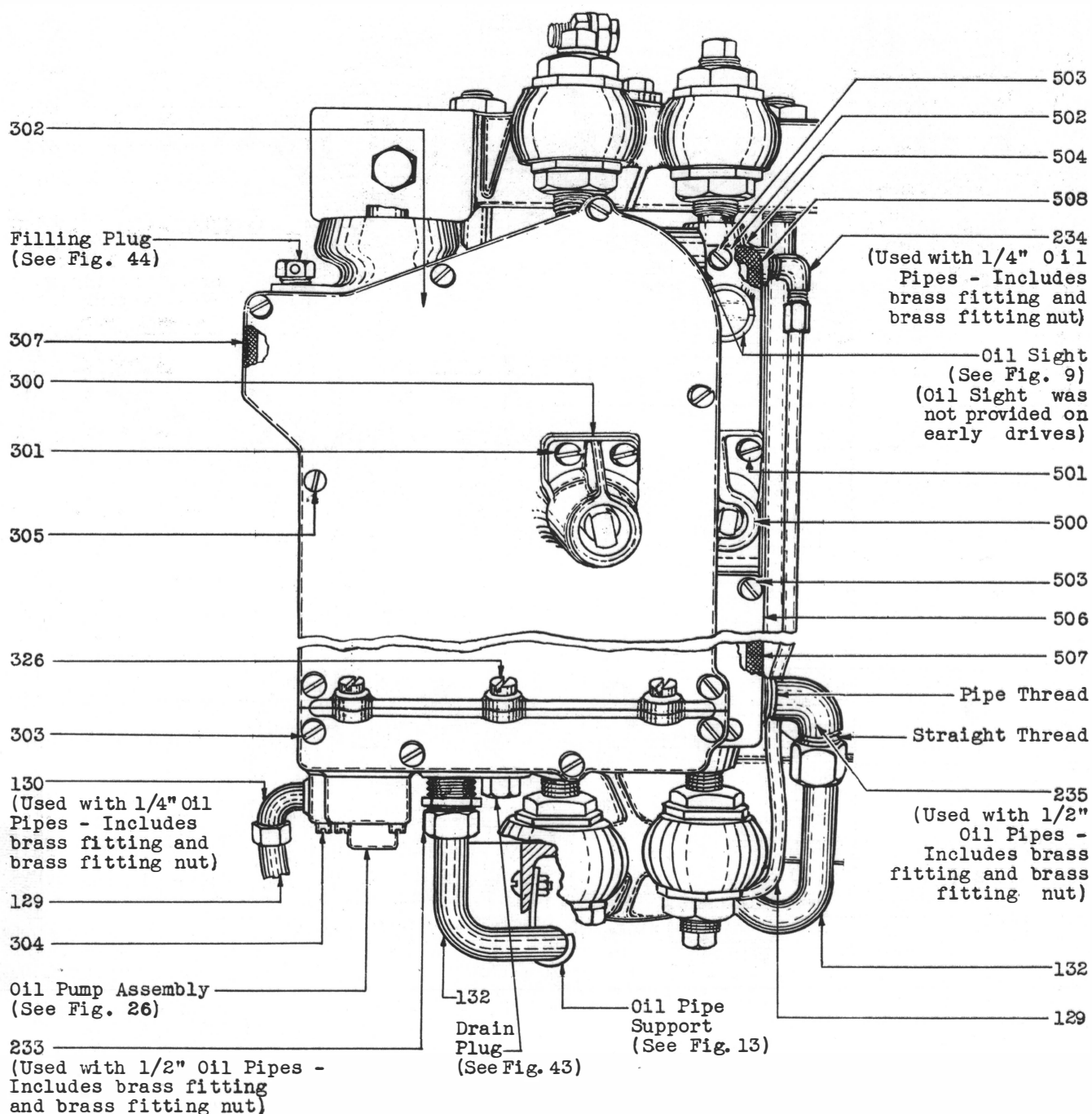


Fig. 55 - External Parts - Gear Case and Bearing Box
Non Worm End of Drives
(Nos. 4A, 24A and C Drives)

DOUBLE SPEED DRIVES WITH EXTERNAL OIL PIPES

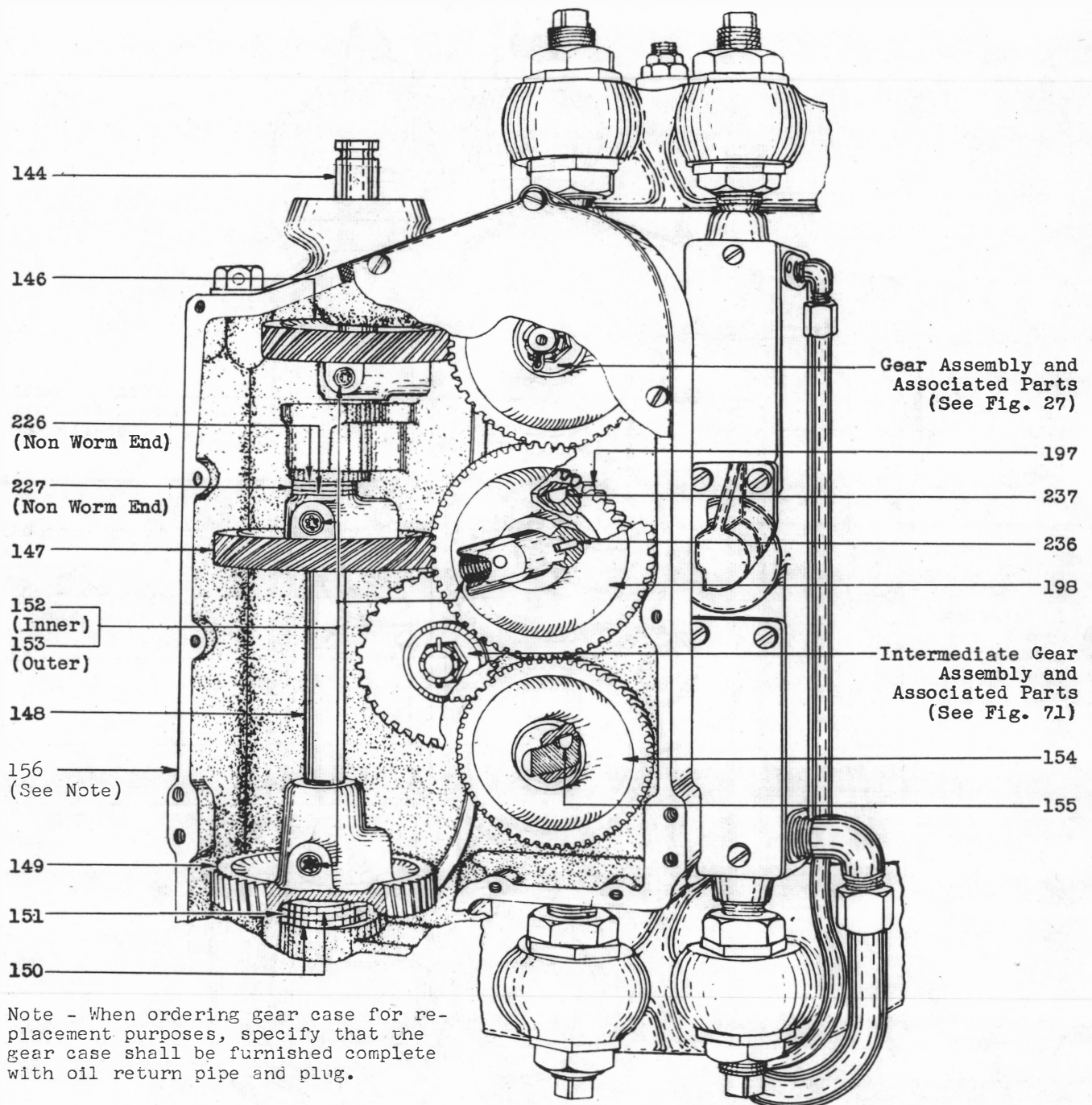
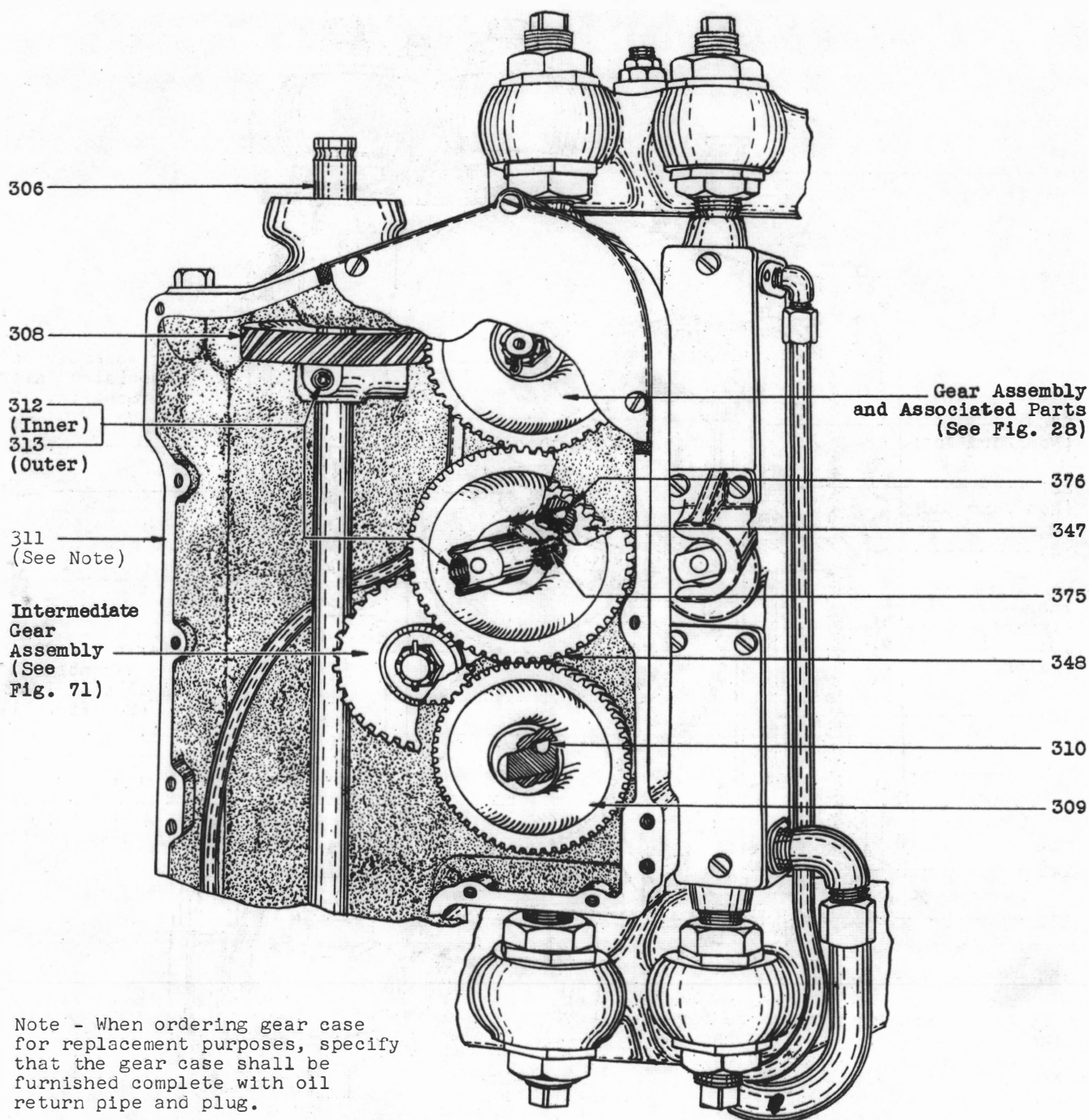


Fig. 56 - Internal Parts - Gear Case
 Worm End of Drives
 (Nos. 2A, 4A, B, 22A, B, 24A, B, C and D Drives)
 Non Worm End of Converted Drives
 (Nos. 4B, 24B and D Drives)

DOUBLE SPEED DRIVES WITH EXTERNAL OIL PIPES



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

Fig. 57 - Internal Parts - Gear Case
Non Worm End of Drives
(Nos. 4A, 24A and C Drives)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

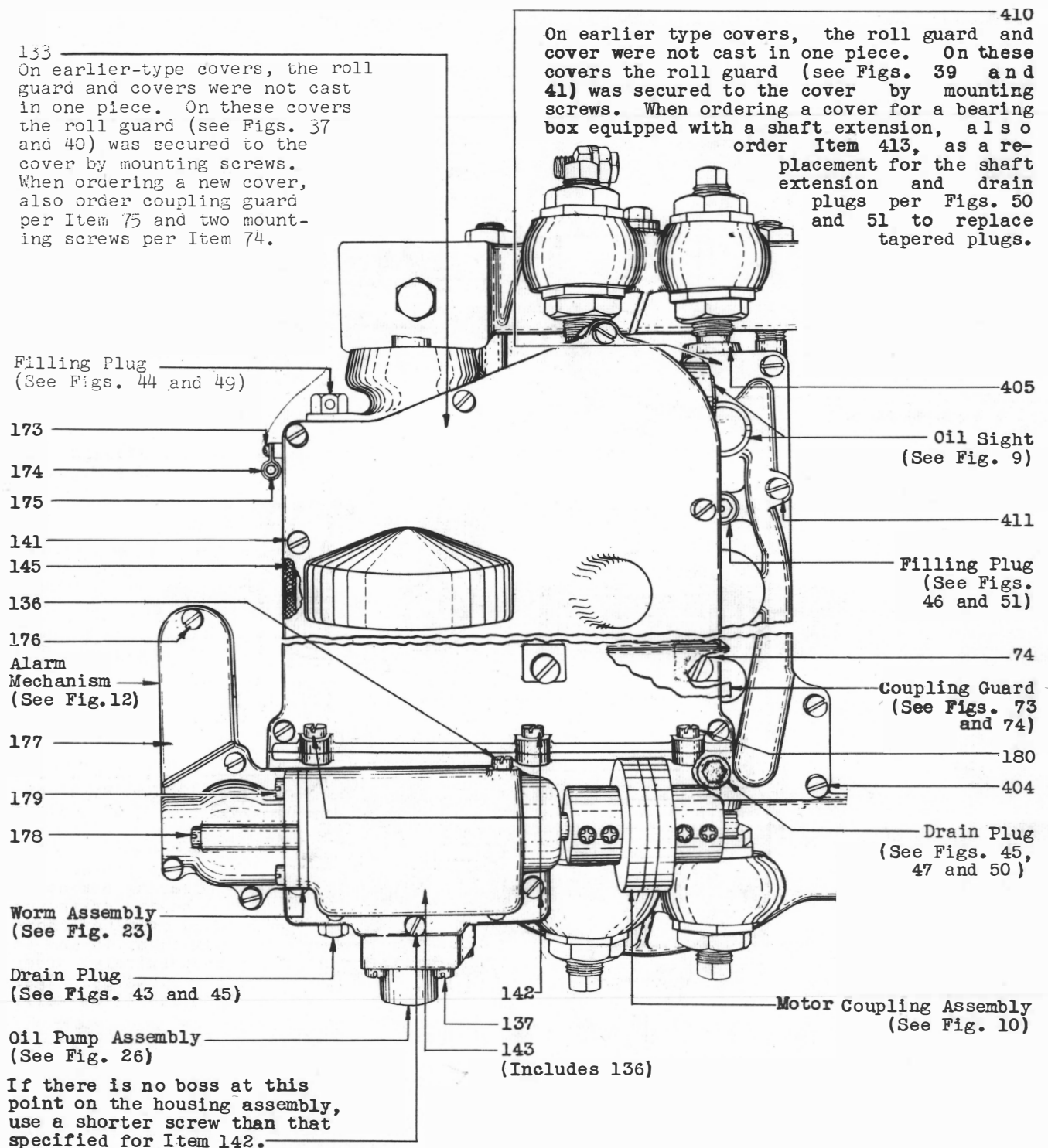


Fig. 58 - External Parts - Gear Case and Bearing Box
Worm End of Drive
(Nos. 22C, 24E and F Drives)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

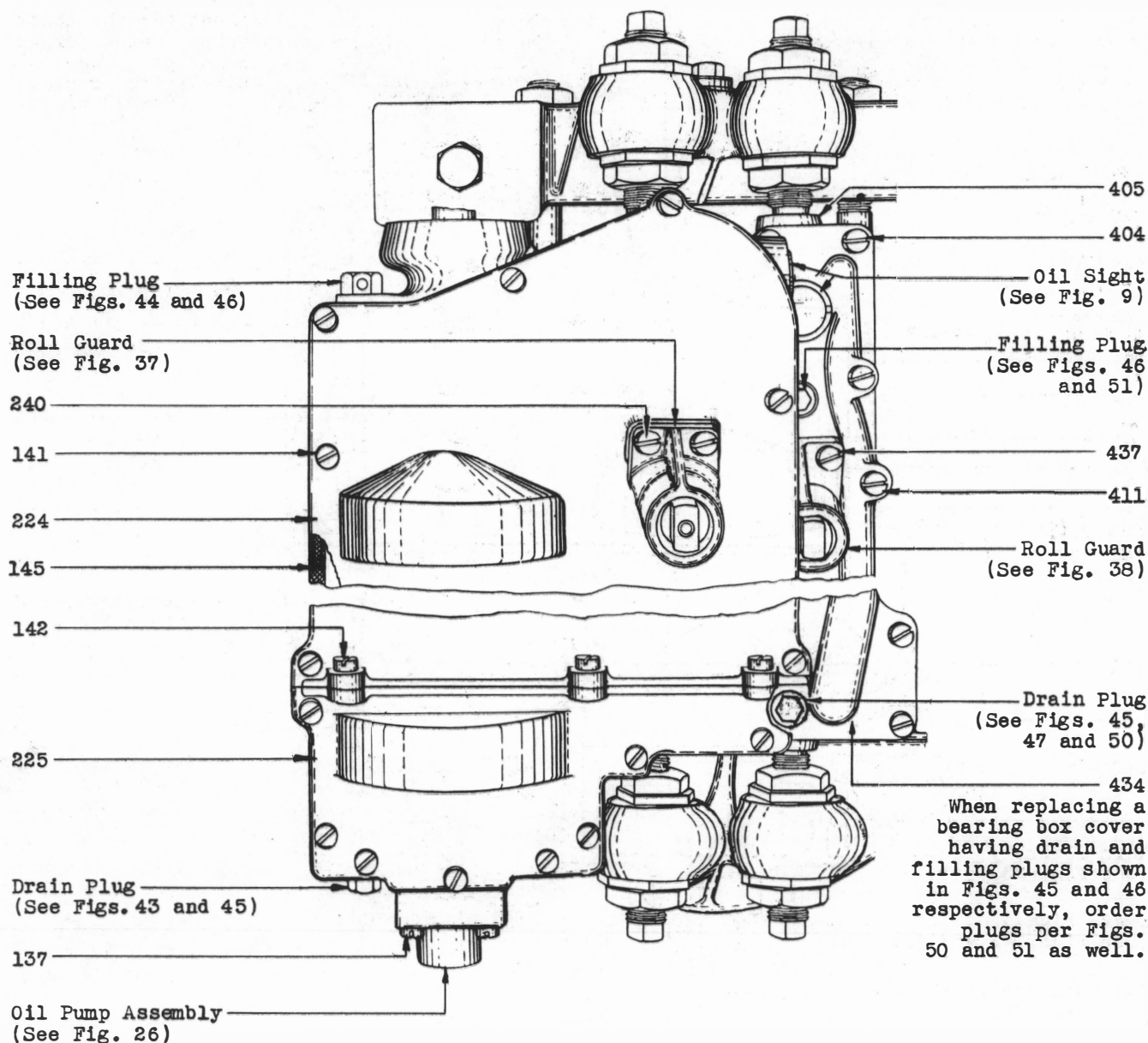


Fig. 59 - External Parts - Gear Case and Bearing Box
Non Worm End of Converted Drives
(No. 24F Drive)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

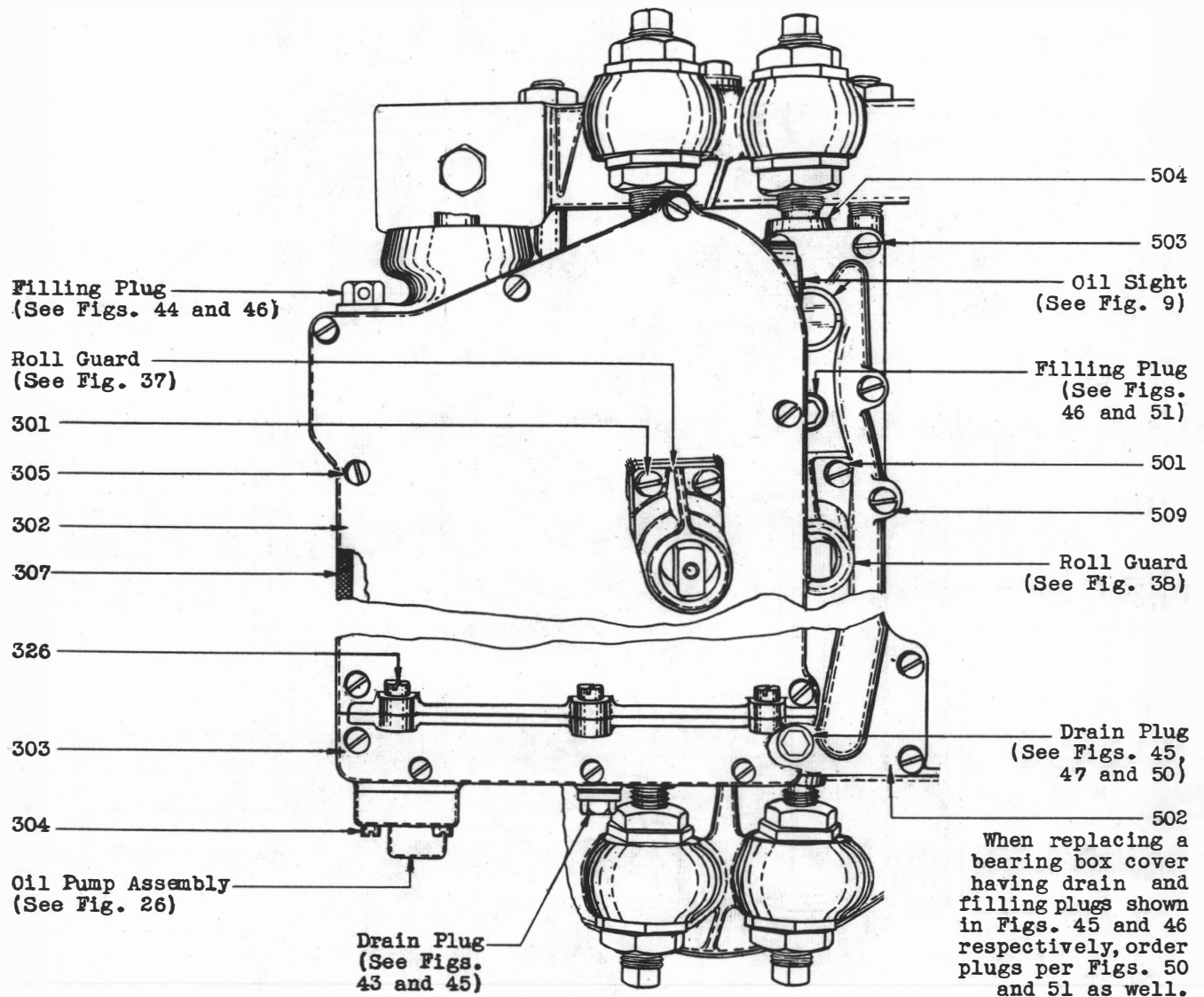


Fig. 60 - External Parts - Gear Case and Bearing Box
 Non Worm End of Drive
 (No. 24E Drive)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

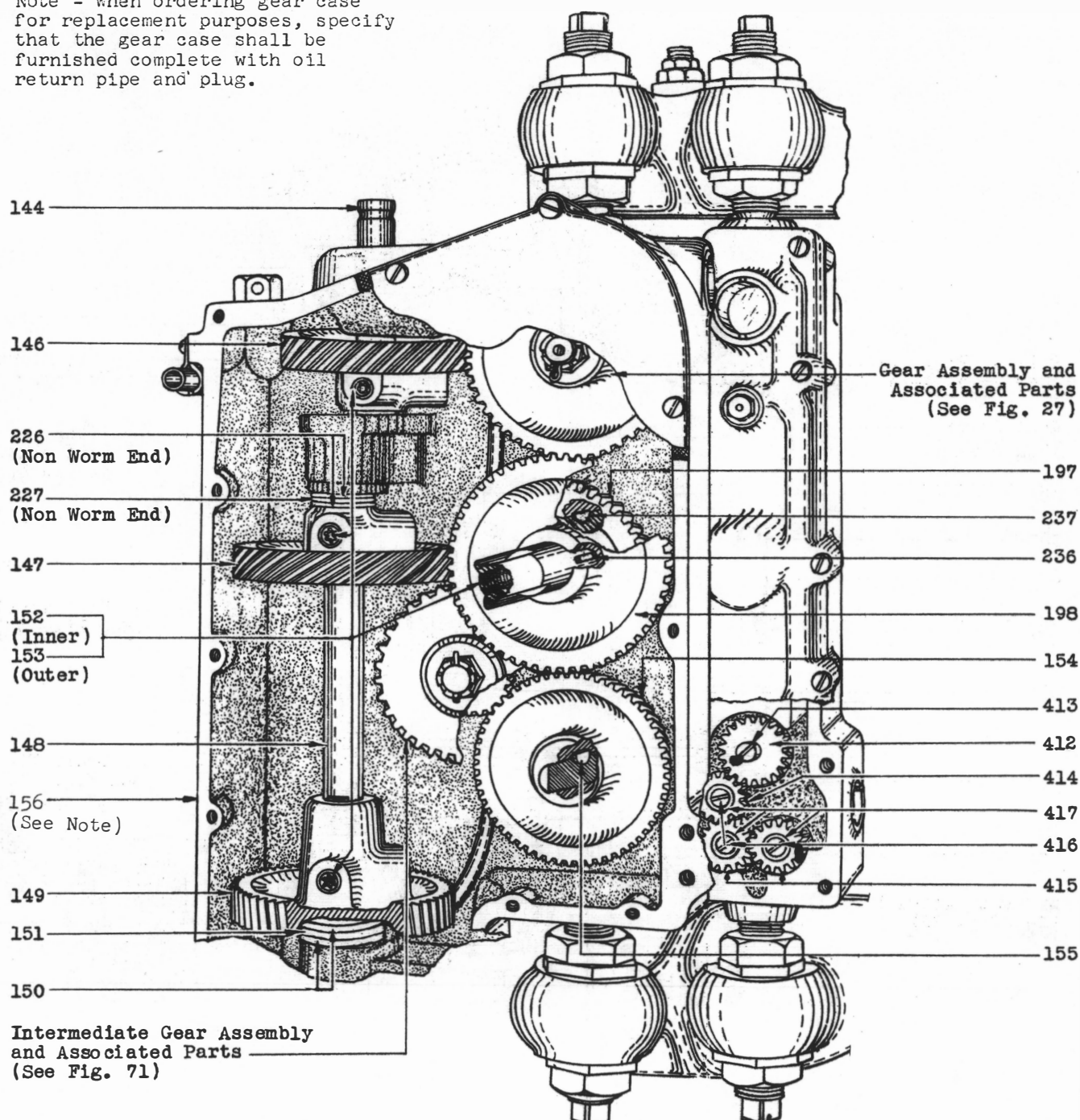


Fig. 61 - Internal Parts - Gear Case and Bearing Box
Worm End of Drives
(Nos. 22C, 24E and F Drives)
Non Worm End of Converted Drive
(No. 24F Drive)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

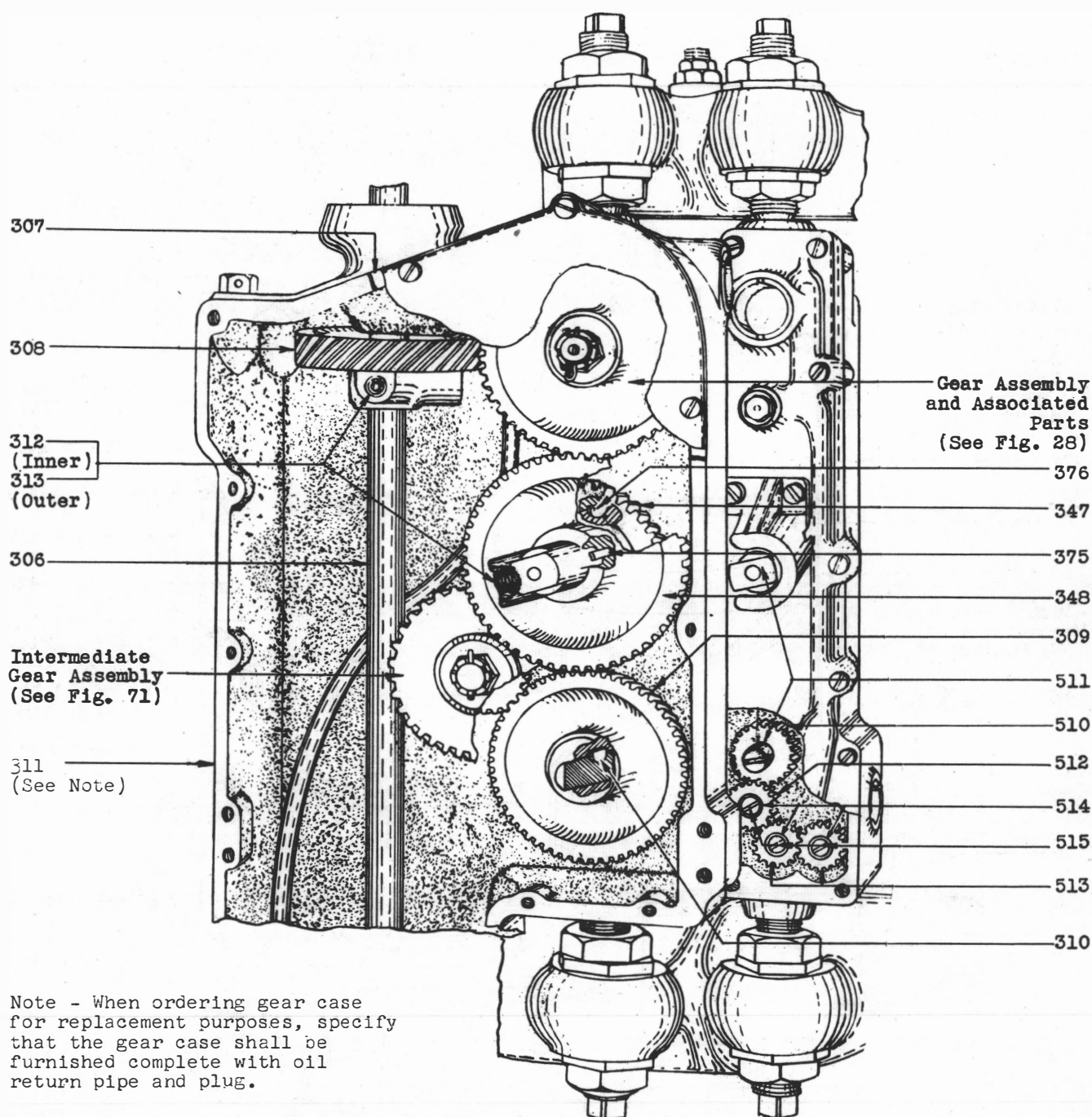


Fig. 62 - Internal Parts - Gear Case and Bearing Box
Non Worm End of Drive
(No. 24E Drive)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

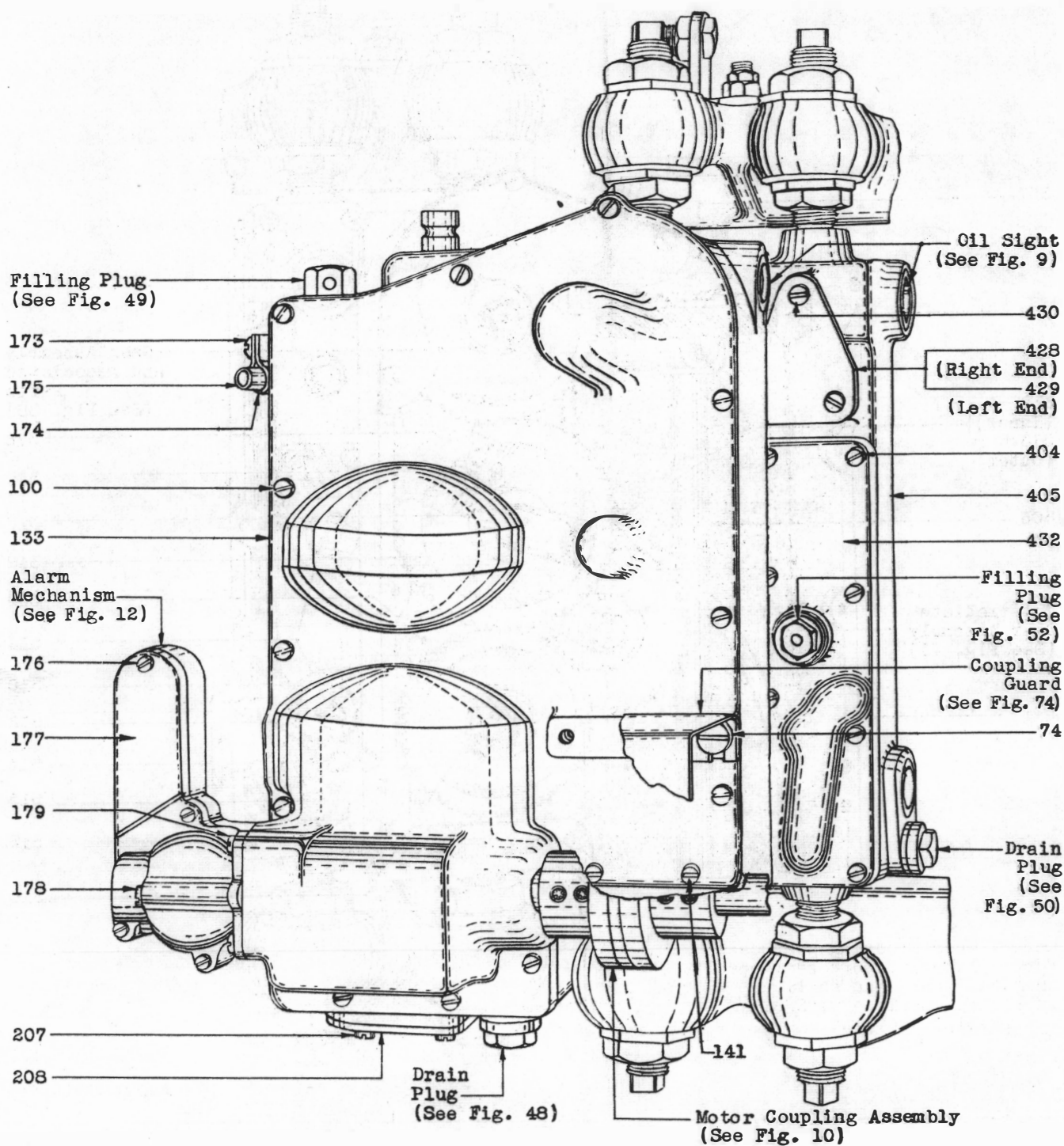


Fig. 63 - External Parts - Gear Case and Bearing Box
Worm End of Drives
(Nos. 45A and 46A Drives)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

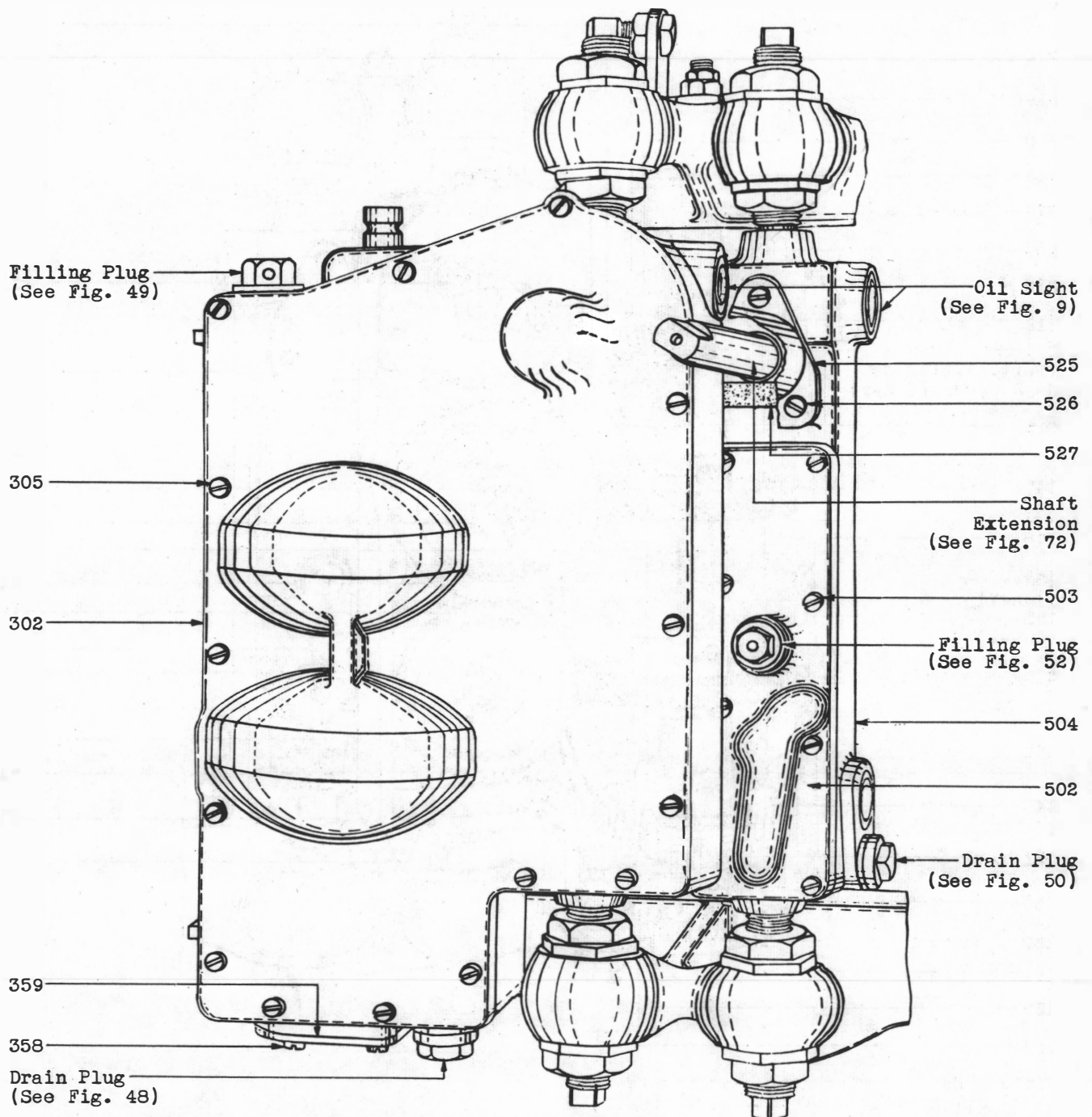
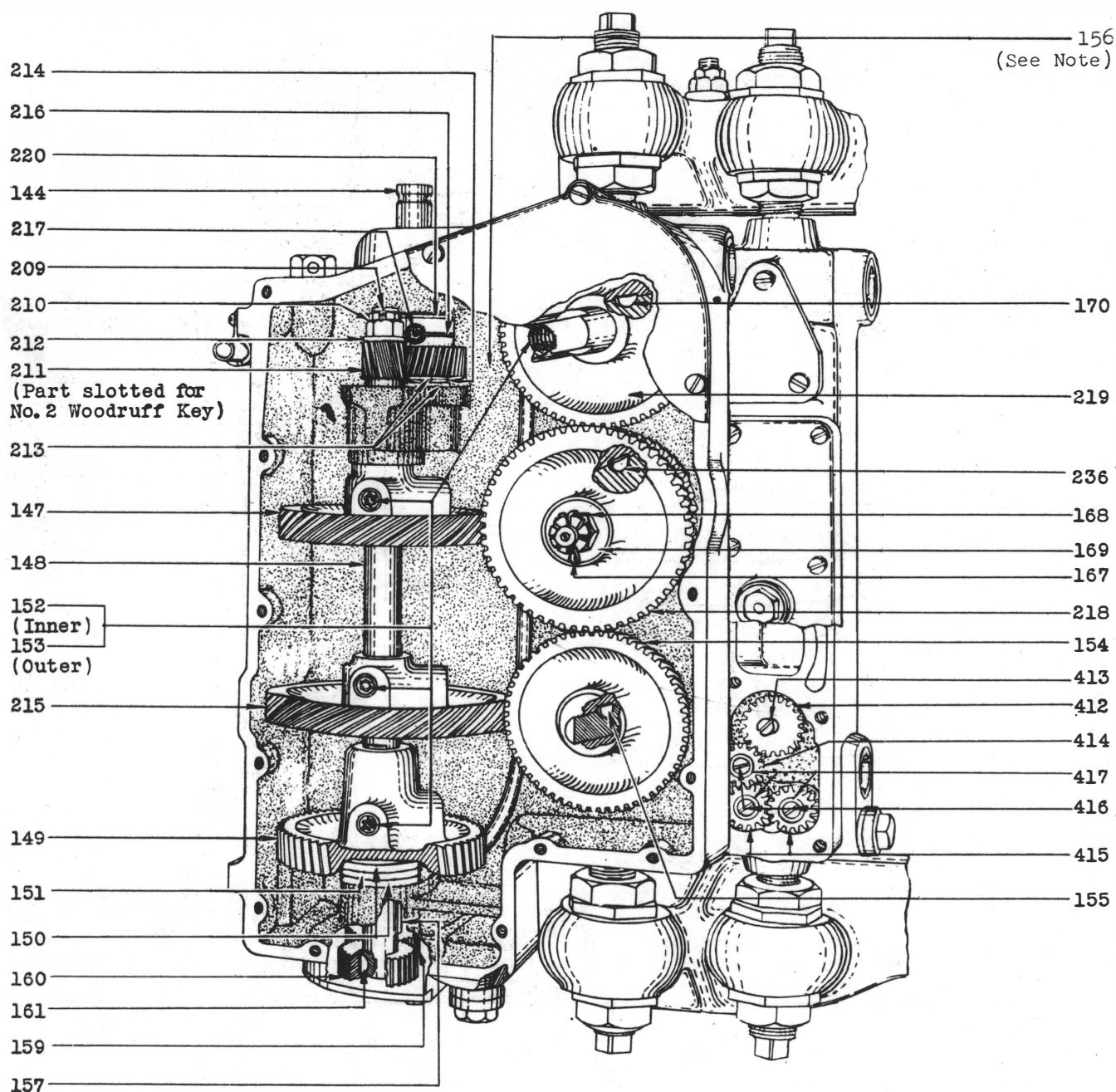


Fig. 64 - External Parts - Gear Case and Bearing Box
Non Worm End of Drive
(No. 46A Drive)

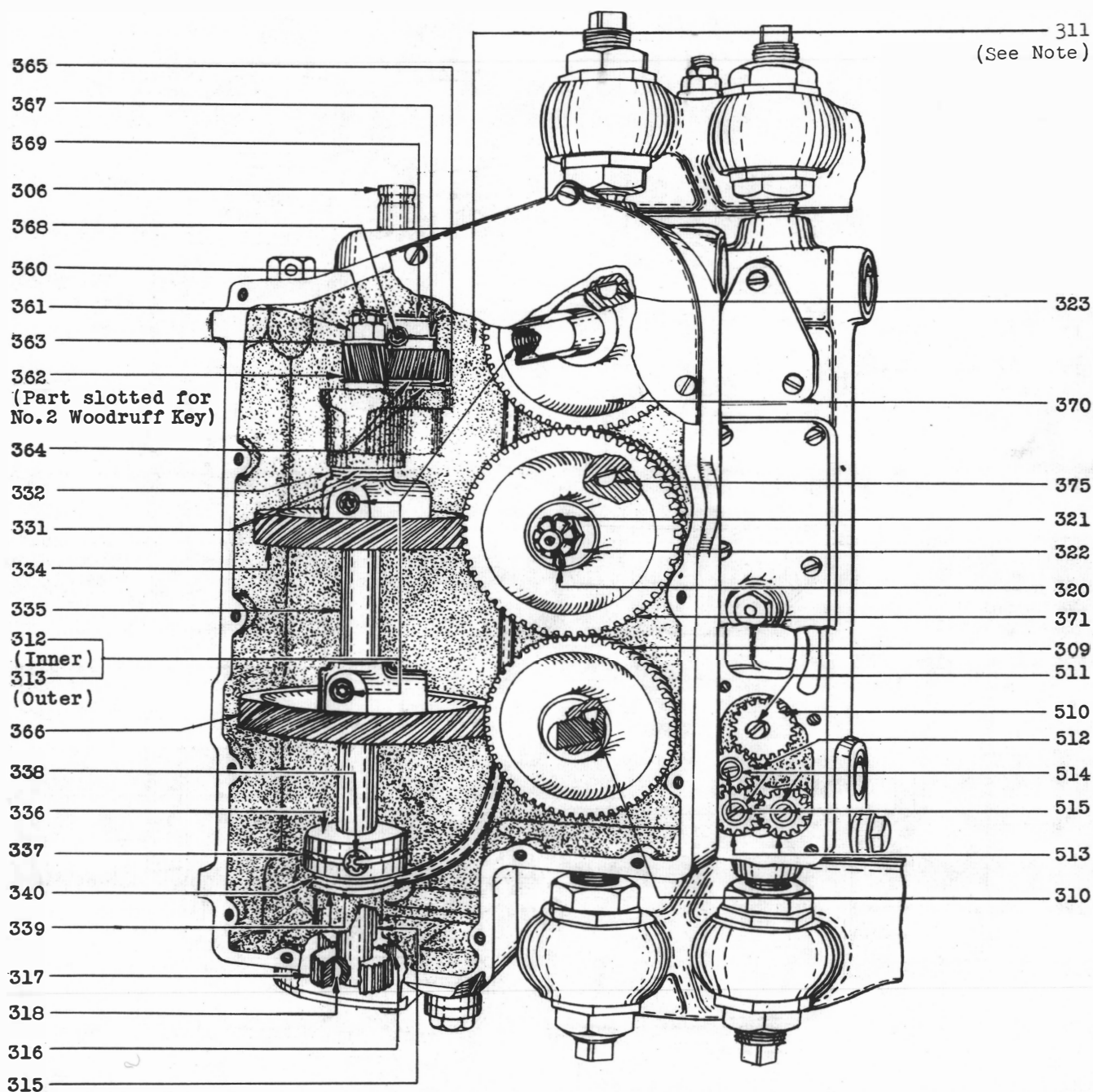
DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug

Fig. 65 - Internal Parts - Gear Case and Bearing Box
Worm End of Drives
(Nos. 45A and 46A Drives)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

**Fig. 66 - Internal Parts - Gear Case and Bearing Box
Non Worm End of Drive
(No. 46A Drive)**

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

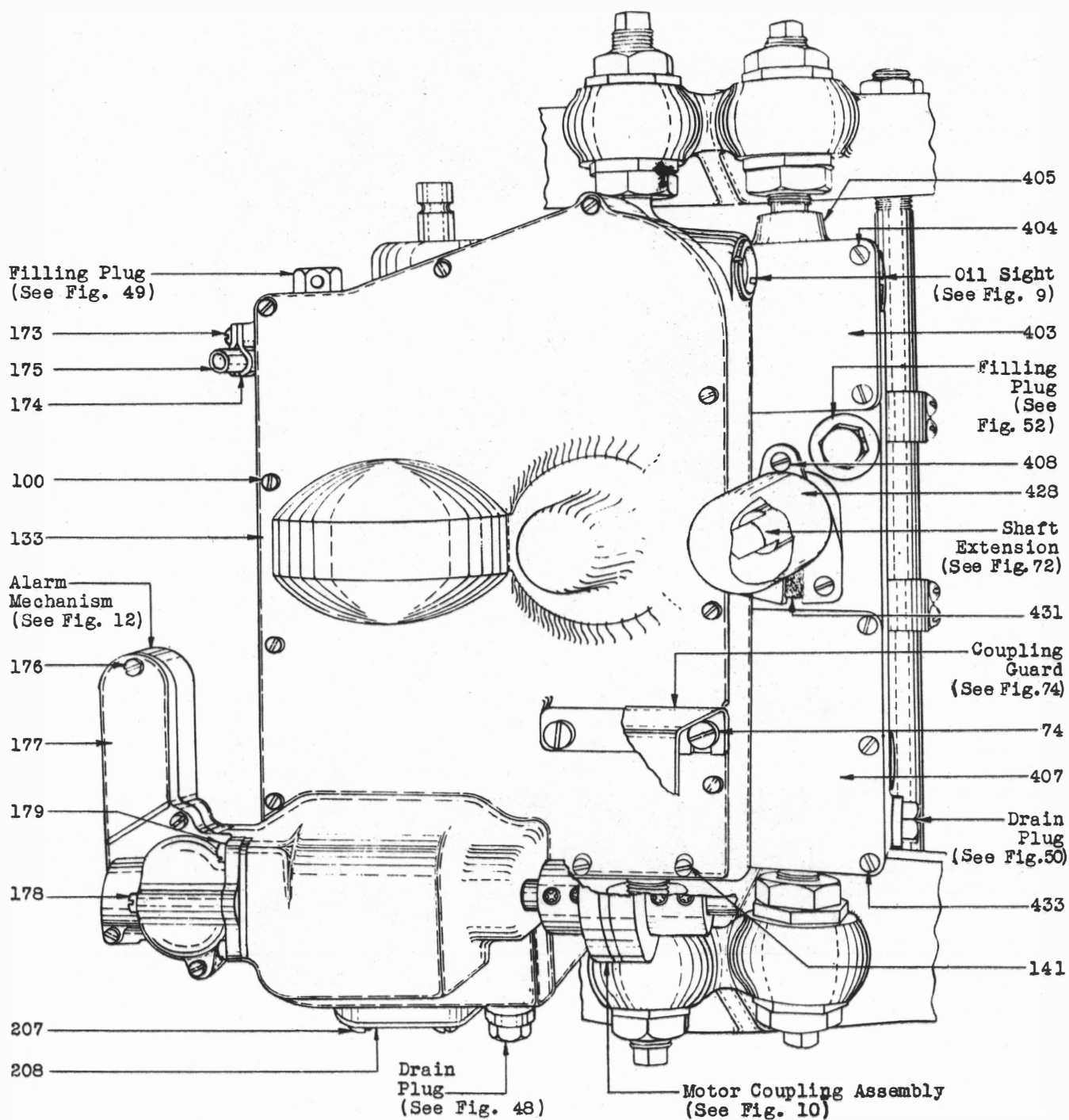


Fig. 67 - External Parts - Gear Case and Bearing Box
Worm End of Drives
(Nos. 47A and 48A Drives)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS

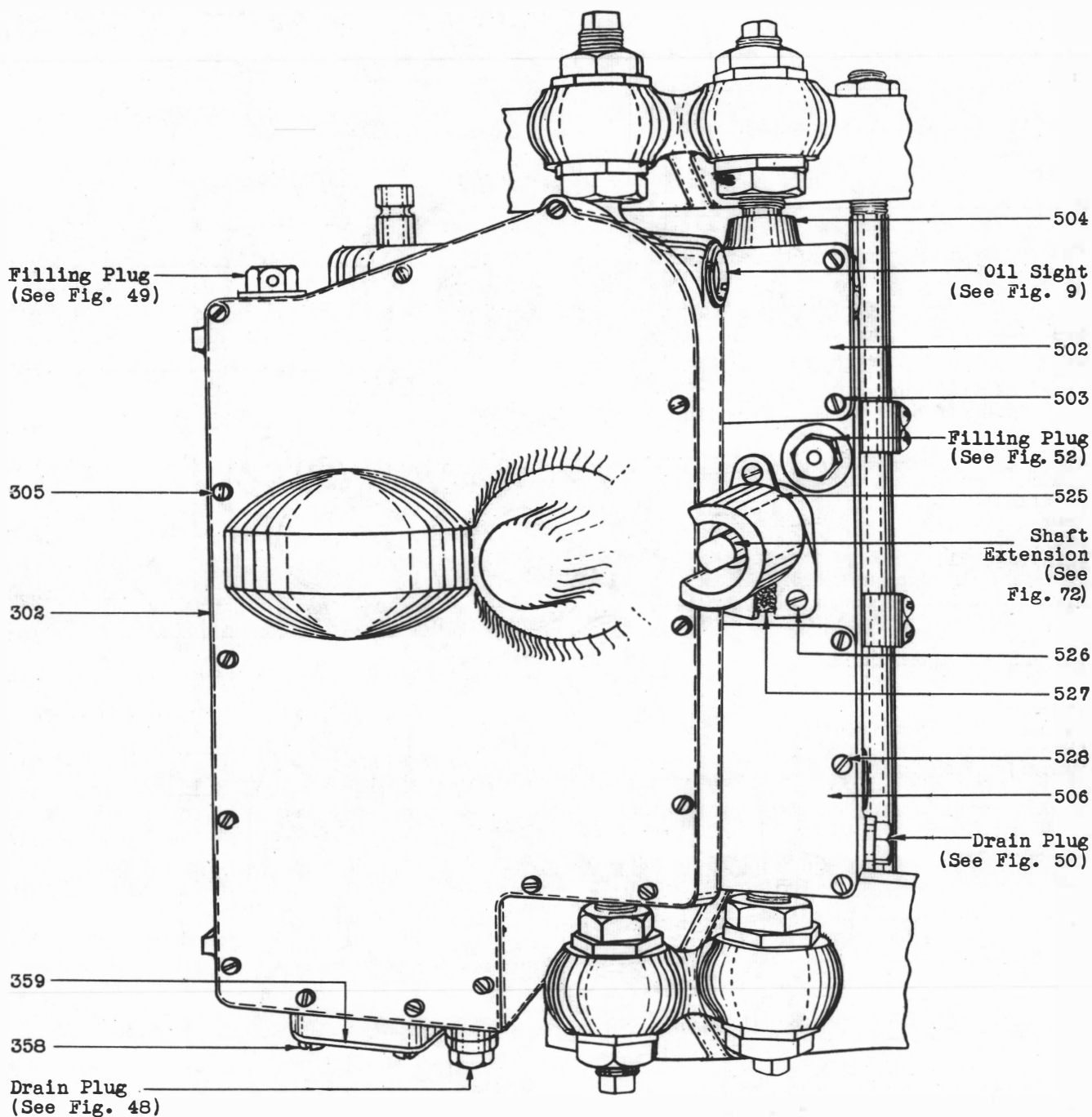
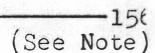


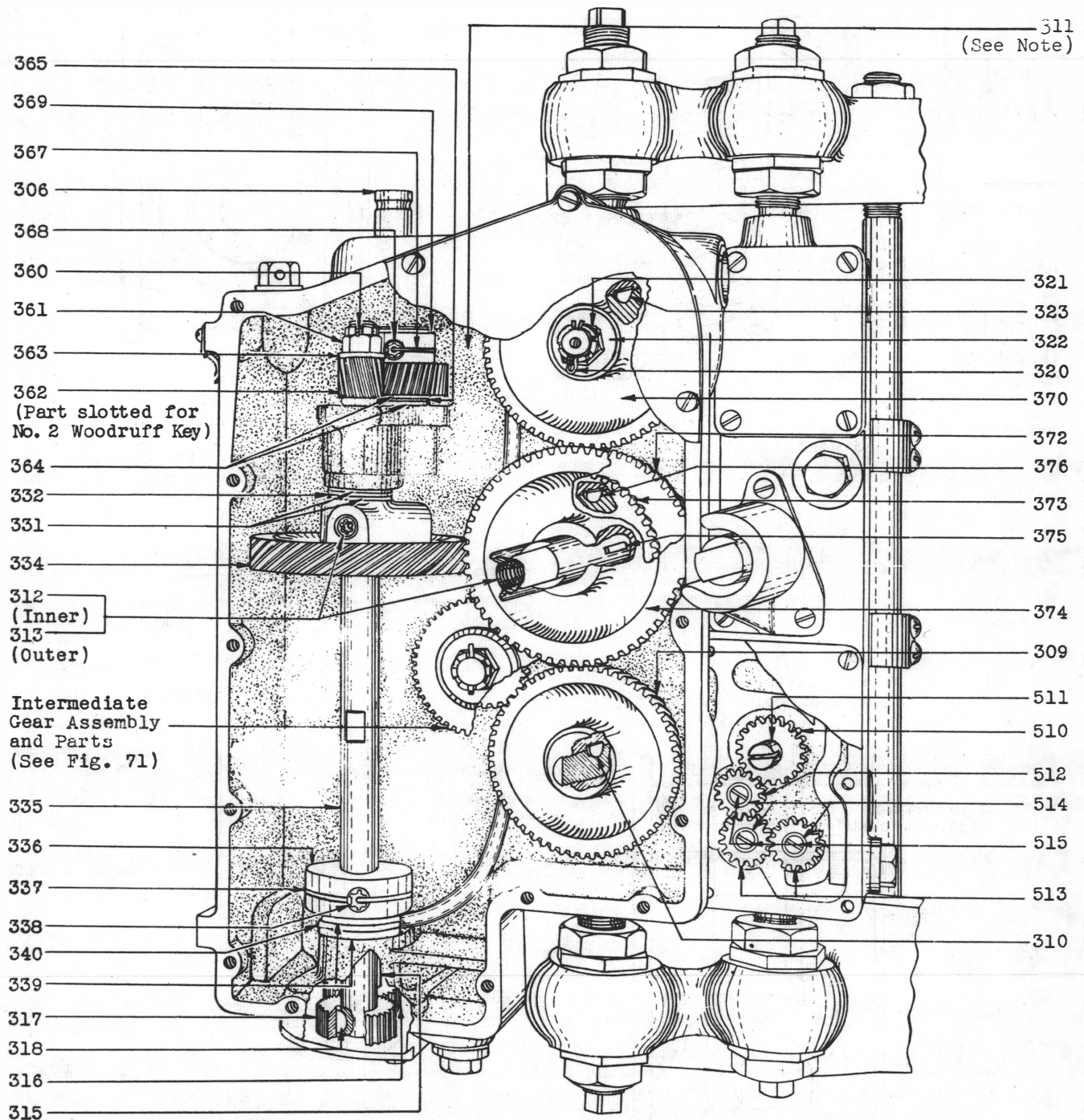
Fig. 68 - External Parts - Gear Case and Bearing Box
Non Worm End of Drive
(No. 48A Drive)



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

Worm End of Drive
(Nos. 47A and 48A Drives)

DOUBLE SPEED DRIVES WITH INTEGRAL OIL PUMPS



Note - When ordering gear case for replacement purposes, specify that the gear case shall be furnished complete with oil return pipe and plug.

**Fig. 70 - Internal Parts - Gear Case and Bearing Box
Non Worm End of Drive
(No. 48A Drive)**

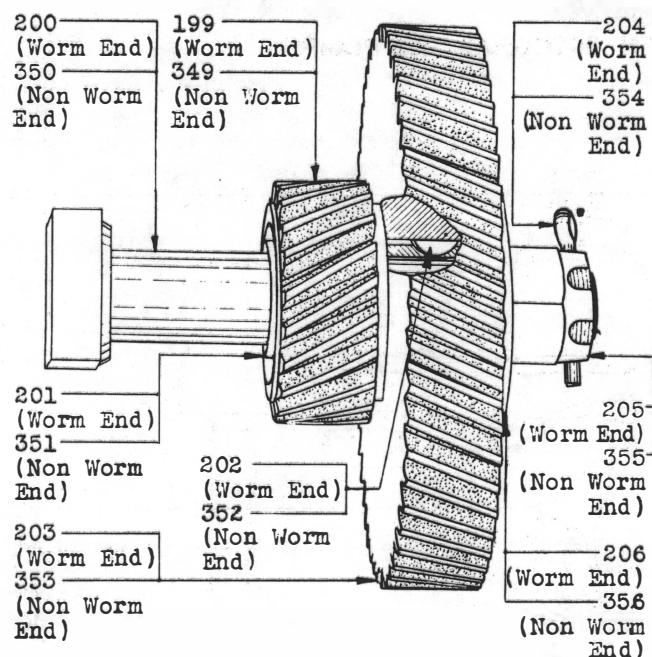


Fig. 71 - Intermediate Gear Assembly and Associated Parts

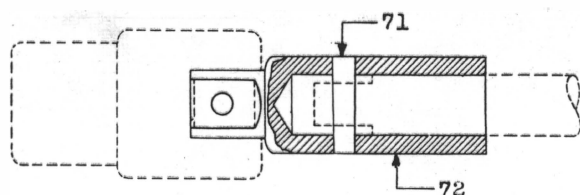


Fig. 72 - Shaft Extension
Used on early Nos. 45A,
46A, 47A and 48A Drives

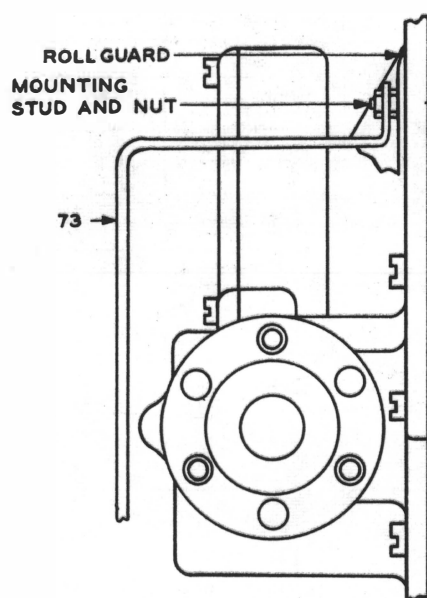


Fig. 73 - Coupling Guard (Where Coupling Guard Is Secured by Studs and Nuts)

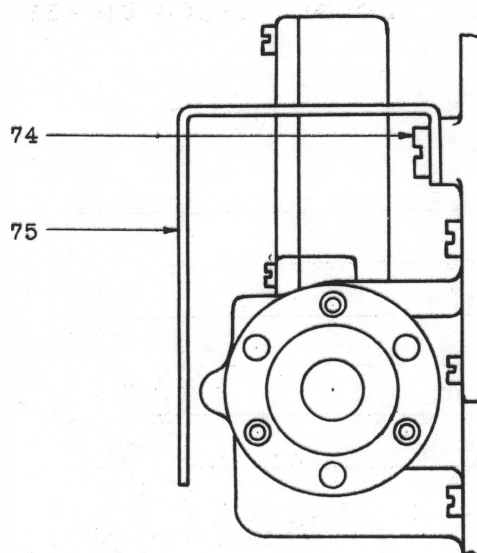


Fig. 74 - Coupling Guard
(Where Coupling Guard is
sprung over the Shoulders
of the Coupling Guard
Mounting Screws)

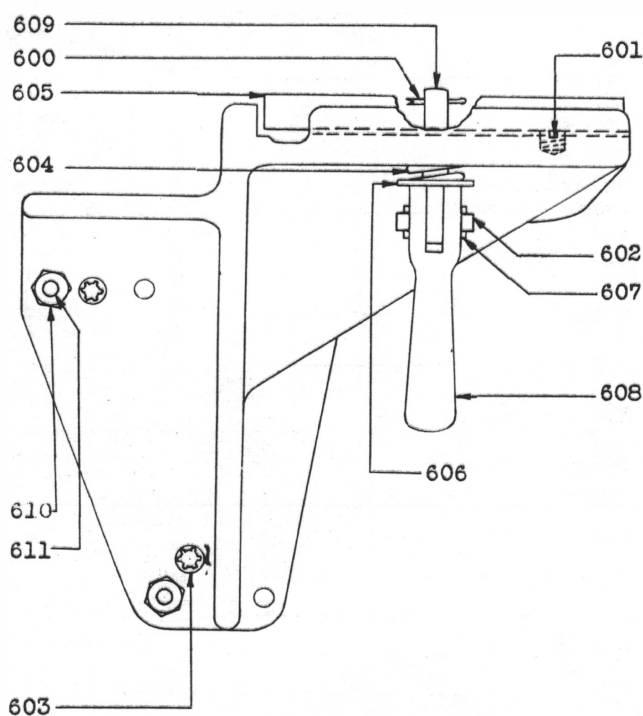


Fig. 75 - 1, 2, 4 and 5 Type Brackets

ITEM NO.	PIECE PART NUMBER	NAME	DRIVE CODE - MISCELLANEOUS PARTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
			1A	1C	1D	1E	2A	3A	3C	3D	3E	3F	4A	4B	17A	17B	17E	17F	18A	18B	18C	18D	18G	18H	18J	19A	19B	19F	20A	20B	20C	20D	20G	20H	21A	21B	21C	21D	21E	21F	21G	21H	21R	22A	22B	22C	23A	23B	23C	23D	23F	23G	23H	23J	23K	23L	23T	23U	23V	23W	24A	24B	24C	24D	24E	24F	25A	25B	25E	26A	26B	26C	26D	26G	26H	26J	26K	26L	26M	26N	26P	26Q	26R	26S	26T	26U	26V	26W	26X	26Y	26Z	26AA	26AB	26AC	26AD	26AE	26AF	26AG	26AH	26AI	26AJ	26AK	26AL	26AM	26AN	26AO	26AP	26AQ	26AR	26AS	26AT	26AU	26AV	26AW	26AX	26AY	26AZ	26BA	26BB	26BC	26BD	26BE	26BF	26BG	26BH	26BI	26BJ	26BK	26BL	26BM	26BN	26BO	26BP	26BQ	26BR	26BS	26BT	26BU	26BV	26BW	26BX	26BY	26BZ	26CA	26CB	26CC	26CD	26CE	26CF	26CG	26CH	26CI	26CJ	26CK	26CL	26CM	26CN	26CO	26CP	26CQ	26CR	26CS	26CT	26CU	26CV	26CW	26CX	26CY	26CZ	26DA	26DB	26DC	26DD	26DE	26DF	26DG	26DH	26DI	26DJ	26DK	26DL	26DM	26DN	26DO	26DP	26DQ	26DR	26DS	26DT	26DU	26DV	26DW	26DX	26DY	26DZ	26EA	26EB	26EC	26ED	26EE	26EF	26EG	26EH	26EI	26EJ	26EK	26EL	26EM	26EN	26EO	26EP	26EQ	26ER	26ES	26ET	26EU	26EV	26EW	26EX	26EY	26EZ	26FA	26FB	26FC	26FD	26FE	26FF	26FG	26FH	26FI	26FJ	26FK	26FL	26FM	26FN	26FO	26FP	26FQ	26FR	26FS	26FT	26FU	26FV	26FW	26FX	26FY	26FZ	26GA	26GB	26GC	26GD	26GE	26GF	26GG	26GH	26GI	26GJ	26GK	26GL	26GM	26GN	26GO	26GP	26GQ	26GR	26GS	26GT	26GU	26GV	26GW	26GX	26GY	26GZ	26HA	26HB	26HC	26HD	26HE	26HF	26HG	26HH	26HI	26HJ	26HK	26HL	26HM	26HN	26HO	26HP	26HQ	26HR	26HS	26HT	26HU	26HV	26HW	26HX	26HY	26HZ	26IA	26IB	26IC	26ID	26IE	26IF	26IG	26IH	26II	26IJ	26IK	26IL	26IM	26IN	26IO	26IP	26IQ	26IR	26IS	26IT	26IU	26IV	26IW	26IX	26IY	26IZ	26JA	26JB	26JC	26JD	26JE	26JF	26JG	26JH	26JI	26JJ	26JK	26JL	26JM	26JN	26JO	26JP	26JQ	26JR	26JS	26JT	26JU	26JV	26JW	26JX	26JY	26JZ	26KA	26KB	26KC	26KD	26KE	26KF	26KG	26KH	26KI	26KJ	26KK	26KL	26KM	26KN	26KO	26KP	26KQ	26KR	26KS	26KT	26KU	26KV	26KW	26KX	26KY	26KZ	26LA	26LB	26LC	26LD	26LE	26LF	26LG	26LH	26LI	26LJ	26LK	26LL	26LM	26LN	26LO	26LP	26LQ	26LR	26LS	26LT	26LU	26LV	26LW	26LX	26LY	26LZ	26MA	26MB	26MC	26MD	26ME	26MF	26MG	26MH	26MI	26MJ	26MK	26ML	26MN	26MO	26MP	26MQ	26MR	26MS	26MT	26MU	26MV	26MW	26MX	26MY	26MZ	26NA	26NB	26NC	26ND	26NE	26NF	26NG	26NH	26NI	26NJ	26NK	26NL	26NM	26NO	26NP	26NQ	26NR	26NS	26NT	26NU	26NV	26NW	26NX	26NY	26NZ	26OA	26OB	26OC	26OD	26OE	26OF	26OG	26OH	26OI	26OJ	26OK	26OL	26OM	26ON	26OO	26OP	26OQ	26OR	26OS	26OT	26OU	26OV	26OW	26OX	26OY	26OZ	26PA	26PB	26PC	26PD	26PE	26PF	26PG	26PH	26PI	26PJ	26PK	26PL	26PM	26PN	26PO	26PP	26PQ	26PR	26PS	26PT	26PU	26PV	26PW	26PX	26PY	26PZ	26QA	26QB	26QC	26QD	26QE	26QF	26QG	26QH	26QI	26QJ	26QK	26QL	26QM	26QN	26QO	26QP	26QQ	26QR	26QS	26QT	26QU	26QV	26QW	26QX	26QY	26QZ	26RA	26RB	26RC	26RD	26RE	26RF	26RG	26RH	26RI	26RJ	26RK	26RL	26RM	26RN	26RO	26RP	26RQ	26RR	26RS	26RT	26RU	26RV	26RW	26RX	26RY	26RZ	26SA	26SB	26SC	26SD	26SE	26SF	26SG	26SH	26SI	26SJ	26SK	26SL	26SM	26SN	26SO	26SP	26SQ	26SR	26SS	26ST	26SU	26SV	26SW	26SX	26SY	26SZ	26TA	26TB	26TC	26TD	26TE	26TF	26TG	26TH	26TI	26TJ	26TK	26TL	26TM	26TN	26TO	26TP	26TQ	26TR	26TS	26TT	26TU	26TV	26TW	26TX	26TY	26TZ	26UA	26UB	26UC	26UD	26UE	26UF	26UG	26UH	26UI	26UJ	26UK	26UL	26UM	26UN	26UO	26UP	26UQ	26UR	26US	26UT	26UU	26UV	26UW	26UX	26UY	26UZ	26VA	26VB	26VC	26VD	26VE	26VF	26VG	26VH	26VI	26VJ	26VK	26VL	26VM	26VN	26VO	26VP	26VQ	26VR	26VS	26VT	26VU	26VV	26VW	26VX	26VY	26VZ	26WA	26WB	26WC	26WD	26WE	26WF	26WG	26WH	26WI	26WJ	26WK	26WL	26WM	26WN	26WO	26WP	26WQ	26WR	26WS	26WT	26WU	26WV	26WW	26WX	26WY	26WZ	26XA	26XB	26XC	26XD	26XE	26XF	26XG	26XH	26XI	26XJ	26XK	26XL	26XM	26XN	26XO	26XP	26XQ	26XR	26XS	26XT	26XU	26XV	26XW	26XZ	26YA	26YB	26YC	26YD	26YE	26YF	26YG	26YH	26YI	26YJ	26YK	26YL	26YM	26YN	26YO	26YP	26YQ	26YR	26YS	26YT	26YU	26YV	26YW	26YX	26YY	26YZ	26ZA	26ZB	26ZC	26ZD	26ZE	26ZF	26ZG	26ZH	26ZI	26ZJ	26ZK	26ZL	26ZM	26ZN	26ZO	26ZP	26ZQ	26ZR	26ZS	26ZT	26ZU	26ZV	26ZW
1	P-146243	Lock Nut	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓</																																																																																																																																																																																																																																																																																																											

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DRIVE CODE - GEAR CASE - NON WORM END

[illegible]

[illegible]

SECTION 159-720-801

[illegible]

DRIVE CODE - BEARING BOX - WORM END (ALSO NON WORM END OF CONVERTED DRIVES)

3. REPLACEMENT PROCEDURES**3.01 List of Tools, Gauges and Materials**

<u>Code No.</u>	<u>Description</u>
<u>Tools</u>	
45B	Hex. Single-End Socket Wrench
245	3/8" and 7/16" Hex. Open Double End Flat Wrench
246	1/2" Hex. Open Single End Flat Wrench
271	13/16" Hex. Open Single End Flat Wrench
295	5/16" Bristo Set Screw Wrench (4 flutes)
296	3/8" Bristo Set Screw Wrench
344	Offset Screwdriver
388A	3/16" and 1/4" Hex. Open Double End Offset Wrench
453A	Swivel Spanner Wrench
521A (2 required)	Offset Screwdriver
-	R-6200 Oil Pipe Bender (1/2" Oil Pipe)
-	R-8020 Oil Pipe Bender (1/4" Oil Pipe)
-	Ball Peen Hammer - 1 Lb.
-	Knife
-	Combination Pliers
-	6-1/2" P-Long Nose Pliers
-	3/32" Pin Punch
-	Hack Saw (Frame)
-	3" Cabinet Screwdriver
-	4" Regular Screwdriver
-	5" Regular Screwdriver
-	KS-19053, L1
-	KS-19053, L1 Double Grip Screwdriver

<u>Code No.</u>	<u>Description</u>
-	R-62706 Forming Tool (1/4" Oil Pipe)
-	R-62944 Forming Tool (1/2" Oil Pipe)
-	KS-6367 7/16" and 5/8" Hex. Open Double End Flat Wrench
-	KS-8097 5/16" and 5/8" Offset Box Wrench
-	R-1317 5/8" Hex. Offset Socket Wrench
-	R-1770 1/2" and 9/16" Hex. Open Double End Flat Wrench
R-2485	Allen Socket Screw Wrench
R-2812	Allen Socket Screw Wrench
-	R-5850 5/8" and 3/4" Hex. Open Double End Offset Wrench
-	R-6440 3/8" Square Wrench
-	3/4" and 7/8" 12 Point Box Wrench - Williams
-	15/16" and 1" Hex. Flat Open Double End Engineer's Wrench

Gauges

- R-8550 Steel Scale - 6"

Materials

- KS-14666 Cleaning Cloth or replaced
D-98063 Cloth

- KS-6824 Sealing Compound

- KS-7860 Petroleum Spirits

- Quick Drying Paint (To match apparatus)

- Receptacles for Drained Oil

3.02 Before stopping a drive to make any of the replacements specified herein, ascertain whether it is necessary to make any of the associated circuits busy. Circuits which are so affected shall be made busy in the approved manner.

SECTION 159-720-801

3.03 When it is necessary to remove a gear case or bearing box cover or an oil pipe or any part that will cause oil leakage in order to effect the replacement of any part, allow the oil in the gear case or bearing box to drain into a suitable container. To do this, remove the drain and filling plugs with the No. 245, No. 388A, the KS-6367, KS-8097 or the R-6440 wrench, depending on the size of the plug and shape of the plug head.

3.04 If a gear case cover is removed for any reason and the gear case is equipped with an oil screen, remove the oil screen as experience has indicated that it is no longer needed.

3.05 After the changes have been made, any part on which a seal may have been broken should be cleaned and resealed as outlined in the section covering this apparatus. In some cases it may be more economical to replace screws that have been removed from sealed joints with new screws rather than clean old screws.

3.06 After the gear case or bearing box has been reassembled, insert and seal the drain plug in place. Where the drain plug is a taper plug, insert the plug 1/4 of its length into the gear case or bearing box. Then paint the remaining threads with the KS-6824 sealing compound and tighten the plug in place. Where the plug is not a taper plug, do not apply the sealing compound to either the plug or gasket. Take care in tightening the plug not to tighten it too tight to avoid shifting the position of the gear case. Where a paraprene gasket is used, an effective seal will not be obtained when the plug is excessively tightened due to the gasket tending to be squeezed out of place. Paraprene gaskets may be recognized as such by a strong sulphur odor when the gaskets are new.

3.07 After the sealing compound has hardened, touch up the joint with a quick drying paint that matches the original finish.

3.08 After the replacement of any part that requires the draining of the oil, fill the gear case or bearing box with oil to the level specified in the section covering this apparatus and insert and tighten the filling plug finger tight, except where the plug is a taper plug and is mounted in the face of the cover. In this case, seal the plug as outlined in 3.06.

3.09 After making any replacement of parts of a friction roll drive or associated motor bracket the part or parts replaced shall meet the readjust requirements involved as specified in the section covering this apparatus. Other parts whose adjustments may have been disturbed by the replacing operations shall be checked to the test requirements and an overall operation check shall be made of the drive before restoring the circuits to service.

3.10 No replacement procedures are specified for screws or other small parts when the operation consists of a single simple operation.

3.11 Guard (Coupling)

(a) Where Guard Is Secured by Screws: To replace a guard, loosen the mounting screws, when necessary, with the 4-inch regular screwdriver and remove the guard. Substitute the new part and tighten the mounting screws securely.

(b) Where Guard Is Secured by Studs and Nuts: To replace a guard, loosen the nuts using the No. 45B wrench and remove the guard. Substitute the new part and tighten the nuts securely.

Coupling Assembly, Pins and Washer

3.12 Coupling Assembly: To replace a coupling assembly remove the guard as outlined in 3.11 and remove the motor. To do this, remove the plugs that furnish the source of power for the motor. Operate the clamping handle located under the bracket and remove the motor and associated coupling assembly from the motor bracket. Take care not to break the motor stop alarm wires. If necessary, disconnect the wires. If the washer requires replacement, remove it and substitute the new part. To replace a coupling assembly, remove the Bristo set screws from the assembly with the No. 295 wrench and remove it from the shaft. Note the condition of the coupling assembly and pins. If the assembly appears satisfactory but the pins are worn, replace the pins as outlined in 3.13. If the assembly appears worn, replace it. Remove the Bristo set screws from the defective part and insert them in place in the new part. Mount the coupling assembly in place but do not tighten the set screws and remount the motor in place.

Slide the coupling that was just mounted forward on its shaft until it is in its correct position and then tighten the set screws securely in place.

3.13 Pins: To replace a pin, place the coupling assembly in a vise with the pins projecting downward. Drive the defective pin from the coupling with the pin punch and ball peen hammer. Remove the coupling assembly from the vise. Make the necessary substitution of parts and proceed as follows. Hold the pin in place in the coupling assembly so that the pin is perpendicular to the assembly and place the parts in the vise with the pin against one of the jaws of the vise and the coupling assembly against the other jaw. Close the jaws of the vise against the pin and the coupling assembly forcing the pin in its proper position. Remount the assembly in place as outlined in 3.12.

3.14 Washer: To replace the washer, remove the motor as outlined in 3.12 and remove the washer. Substitute the new part in place over the pins and remount the motor.

Alarm Mechanism and Parts

3.15 General: To replace any part of an alarm mechanism proceed as outlined in paragraphs 3.17 to 3.22. Where the cover of the link type alarm mechanism is in one piece, split the cover into two parts as outlined in 3.16 before removing the cover, except when the cover is to be replaced in which case do not split it.

3.16 Splitting Housing Cover When Mounted on Drive: Starting at the long side of the housing cover, scribe a line across the cover, 60° with the long side, to a point just above the boss for the mounting screw on the short side of the cover. Saw the cover along this line with a hack saw to a depth of approximately 1/16" deep. Do not saw the cover all the way through. Remove the cover mounting screw at the top with the 4" regular screwdriver and insert the blade of a 5" regular screwdriver between the cover and the housing at a point directly to the rear of the top screw hole. With the screwdriver in this position as shown in Fig. 76A, force the cover from the housing until the cover snaps off at the sawed slot.

Note: In performing this operation it may be necessary to pry the cover and

housing slightly apart in order to permit the screwdriver to be inserted. This may be done by inserting the 4" regular screwdriver in the opening provided for access to the alarm spring retaining screws. Do not loosen the cover mounting screws to permit the screwdriver to be inserted as the seal around the lower portion of the cover will be broken.

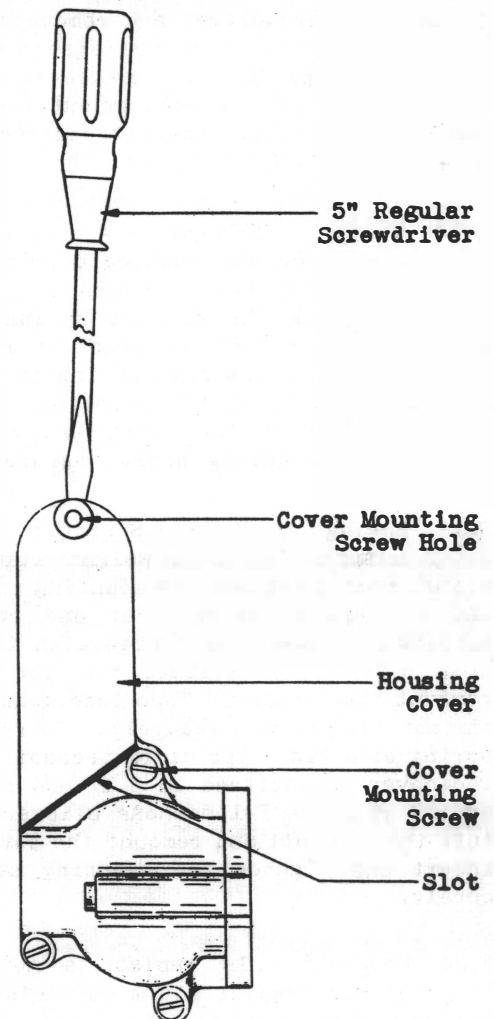


Fig. 76A - Illustrating Splitting of Alarm Housing Cover

3.17 Housing Cover: To replace a cover that is sealed, remove the cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver and remove the cover. The replacing cover is in one piece. In order to eliminate the necessity of breaking oil seals to gain access to the alarm springs or wiring, with the resultant possibility of introducing oil leaks, break the cover into two parts at the slot as follows. Place the

straight portion of the cover up to the slot in a vise. Close the vise to hold the cover securely in place. Hit the cover sharply with the ball peen hammer at a point above and in a direction away from the slot until the cover is broken into two pieces. In mounting these pieces, seal the lower piece in accordance with approved procedures. Do not seal the upper piece. To replace a cover that is not sealed, remove the mounting screw with the 3" cabinet screwdriver and remove the cover. Substitute the new part and tighten the screws securely in place. If any seals have been broken clean the surfaces as outlined in 3.05 and refill with oil to the required level as outlined in 3.08.

3.18 Housing: To replace a housing, remove the cover and housing mounting screws with the 4" regular screwdriver as outlined above. Remove the contact spring assembly as outlined in 3.22 and mount it in the new housing. Mount the new housing in place and insert and tighten the mounting screws securely. Remount the cover and insert and tighten the mounting screws securely.

3.19 Spring (Retractable Spring): To replace a spring on cast weight alarm mechanisms, remove the housing mounting screws with the 4" regular screwdriver and remove the housing. Remove the spring with the P-long nose pliers. Substitute the new part and remount the housing. Then insert and tighten the mounting screws securely. To replace the spring of a link type alarm mechanism, remove the cover as outlined in 3.17 and remove the spring with the P-long nose pliers. Substitute the new part and remount the cover. Then insert and tighten the mounting screws securely.

3.20 Governor: To replace a governor of either type of alarm mechanism, remove the cover as outlined above and remove the governor housing mounting screws with the 4-inch regular screwdriver. If a governor of the cast weight alarm mechanism is to be replaced, remove the cotter pin and springs with the P-long-nose pliers. Substitute the new part. If this part interferes with the housing, file off a portion of the arm as shown in Fig. 76B. Remount the springs and insert the cotter pin and spread the ends to secure it in place. If the governor of a link-type alarm mechanism is to be replaced, remove the clamping screws with the 4-inch regular screwdriver and slide the governor off the shaft. Substi-

tute the new assembly and insert and tighten the screws securely. Remount the governor housing securely in place.

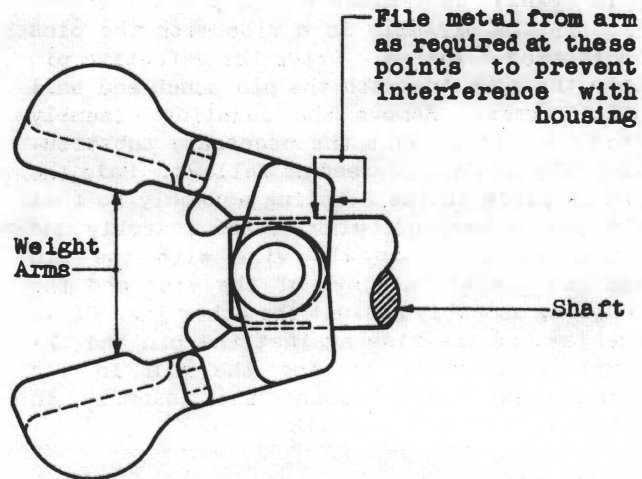


Fig. 76B Weight Arms of Cast Weight Alarm Mechanism

3.21 Pin (Plunger Pin): To replace a pin on alarms having cast weight governors, remove the housing as outlined in 3.18 and remove the cotter pin from the plunger pin with the P-long nose pliers. Remove the pin and substitute the new part. Insert the cotter pin through the pin and remount and secure the housing as outlined in 3.18.

3.22 Contact Spring Assembly: To replace any part of the contact spring assembly, remove the housing cover as outlined in 3.17 and remove the spring assembly mounting screws with the 3" screwdriver. Make the necessary replacement of parts, reassemble the contact spring assembly and insert and tighten the mounting screws securely.

Worm and Associated Parts

3.23 General: To replace the worm or any of the associated parts of any drive, remove the coupling assembly and alarm housing as outlined in 3.12 and 3.18, respectively. In replacing parts of No. 45A, 46A, 47A or 48A drives, remove the gear case cover as outlined in 3.50. After making the necessary replacement of parts, remount the parts that were removed and clean and reseal the parts as outlined in 3.05 wherever seals were broken and refill the gear case as outlined in 3.08.

3.24 Spring (All Drives Except Nos. 35A, 45A, 46A, 47A, 48A and 49A Drives):

To replace the spring that may be located in the housing assembly, remove the spring from its mounting hole and substitute a new one. If the housing is associated with the No. 17B, 18D, 19B, 20C, 20D or 23J Drive, the lead end of the spring must bear against the side of the rib in the worm case housing assembly in such a position that it does not touch the worm case housing assembly or housing assembly adjacent to the 1/4" oil hole. On other drives which are equipped with a spring, the lead end of the spring shall be tensioned against the side of the rib in the worm case housing assembly as shown in Fig. 25.

3.25 Housing Assembly (All Drives Except Nos. 35A, 45A, 46A, 47A, 48A and 49A Drives):

To replace the housing assembly break the seal and remove the housing assembly. If a spring is mounted in the housing remove it and mount it in the new housing unless both the housing assembly and worm case housing is being replaced as a unit (see Fig. 25(b)). In this case, discard the spring. Substitute the new part taking care that the spring, if furnished, is mounted as outlined in 3.24 and tighten the mounting screws securely. Mount the spring in place in the housing assembly as outlined in 3.24.

3.26 Thrust Bearing (All Drives Except Nos. 35A, 45A, 46A, 47A, and 49A Drives):

To replace the bearing, remove the housing assembly as outlined in 3.25 and slide the thrust bearing off the worm shaft. Substitute the new part and remount the housing assembly as outlined in 3.25.

Note: If the shaft is equipped with a washer adjacent to the bearing, remove the washer when replacing the bearing.

3.27 Worm (All Drives Except Nos. 35A, 45A, 46A, 47A, 48A and 49A Drives):

To replace a worm, remove the housing assembly and thrust bearing as outlined in 3.25 and place them on the new worm. Reassemble the parts as outlined in 3.26.

3.28 Clamp Nut (Nos. 35A, 45A, 46A, 47A, 48A and 49A Drives):

To replace a clamp nut, on all these drives except the Nos. 35A and 49A drives, remove the gear case cover. On the No. 35A and 49A drives, remove the worm case housing as outlined in 3.32. With either the gear case cover or

worm case housing removed, slide the worm assembly out of the cover or housing, remove the clamp nut lock screw with the 3" cabinet screwdriver and remove the clamp nut with the 15/16" wrench. Substitute the new part and insert and tighten the lock screw securely.

3.29 Washer (Nos. 35A, 45A, 46A, 47A, 48A and 49A Drives):

To replace the washer between the clamp nut and ball bearing, remove the clamp nut as outlined in 3.28 and remove the washer. Substitute the new washer and remount and tighten the clamp nut securely.

3.30 Ball Bearing (Nos. 35A, 45A, 46A, 47A, 48A and 49A Drives):

To replace a ball bearing, remove the clamp nut and washer, if used, from the end on which the bearing is to be replaced, and remove the bearing. Substitute the new part and remount the washer and clamp nut securely in place.

3.31 Worm (Nos. 35A, 45A, 46A, 47A, 48A and 49A Drives):

To replace a worm, remove the clamp nuts, washer and ball bearings and place them on the new part. Then secure the parts as outlined in 3.30.

3.32 Worm Case Housing (All Drives Except Nos. 45A, 46A, 47A and 48A Drives):

To replace the worm case housing, remove the worm case housing mounting screws with the 4" regular screwdriver or No. 344 screwdriver and remove the worm case housing. Remove the worm assembly from the worm case housing. Place the housing assembly and worm assembly in the new housing taking care that the spring is positioned as outlined in 3.24. Mount the housing in place against the gear case, pressing the housing up against the gear case cover to insure proper seating. Tighten the mounting screws securely. Be sure that the worm rotates freely before mounting the worm case housing.

Oil Sight Assembly

3.33 To replace any part of the lower oil sight assembly, remove the oil sight clamping ring with the No. 453A wrench, make the necessary substitution of parts. If the glass is not to be replaced, clean it at this time. Remount and securely tighten the parts in place.

3.34 To replace any part of the upper oil sight assembly proceed as outlined in 3.33 except that it is unnecessary to drain the gear case or bearing box.

Roll Guards and Associated Felt Washers

3.35 Roll Guards: To replace a roll guard that is not threaded into the cover, remove the mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. If the guard is sealed, insert the screwdriver under the edge of the guard and pry it off the housing. To remove a roll guard that is secured to the cover by threads, insert the 5" regular screwdriver into the slot in the cover and loosen the guard. With the

guard loosened, remove it with the fingers. Substitute the new guard and, if necessary, seal it before mounting it in place.

3.36 Felt Washers: To replace a felt washer in a roll guard, remove the guard and pry out the washer that is located in the base on the roll guard. Soak the new washer in the KS-6824 sealing compound and insert it in place in the guard. Remount the guard in place.

Oil Pipe Supports, Oil Pipes and Associated Parts

3.37 Oil Pipe Supports: To replace an oil pipe support, proceed as follows. Raise the brush rod associated with the rack in front of the oil pipe support manually until the rack clears the support. Hold the support mounting screw nut with one hand and remove the support mounting screw with the 4" regular screwdriver. Remove the support. Substitute the new support and insert and securely tighten the mounting screw and nut. Restore the brush rod to normal by operating the down drive armature manually and guide the brush rod down by hand.

3.38 Compression Sleeves and Compression Nuts: If a compression sleeve or a compression nut is to be replaced, replace the entire assembly. To do this proceed as follows. Back off the compression nut with the No. 271 wrench (for the large nuts) or the No. 246 wrench (for the small nuts). Cut off the portion of the oil pipe between the end of the compression sleeve furthest from the free end of the oil pipe and the end of the oil pipe with the hack saw. If the pipe is not long enough to do this replace the pipe as outlined in 3.40 to 3.45 inclusive. Make sure that the cut is made squarely across the pipe. If necessary form the pipe as outlined in 3.41. Remove any burrs on the end of the pipe with a knife. Slide the compression nut over the end of the oil pipe. Place the compression sleeve over the end of the oil pipe and slide the sleeve back on the pipe about 1/4". Do not use sleeves that are bent or distorted. Insert the end of the oil pipe into the elbow or connector as required until it strikes the inside of the elbow or connector. Mount the oil pipe in place and securely tighten the compression nut.

Note: To insure a tight joint at the union it is important that the copper pipe enter the brass fitting straight and without any strain. If necessary, bend the pipe to meet this condition. Avoid sharp bends and kinks.

3.39 Elbows and Connectors: To replace an elbow or connector, back off the compression nut as outlined in 3.38. Remove the oil pipe from the elbow or connector and remove the defective part from the gear case

or bearing box with the combination pliers. Substitute the new part, sealing it with the KS-6824 sealing compound and tighten it securely in place. Remount the oil pipe in place and securely tighten the compression nut.

3.40 Oil Pipes: If it is necessary to replace an oil pipe, replace the oil pipe and the compression sleeves and nuts at each end of the oil pipe as a unit. To do this proceed as follows: Remove the oil pipe supports and compression nuts as outlined in 3.37 and 3.38. Mount the new compression nuts and sleeves on the new oil pipe as outlined in 3.38.

3.41 Before substituting the new oil pipe, check to see that the ends of the pipes are not burred and are perfectly round. If the end of the pipe is not round, insert the R-62706 or the R-62944 forming tool in the pipe and turn it with a rotary motion. Use the R-62706 tool on 1/4" pipes and the R-62944 tool on 1/2" pipes.

3.42 Tighten each compression nut finger tight and then tighten each nut with the specified wrench but not tight enough to crush or dent the copper tube or sleeve.

Note: To insure a tight joint at the union it is important that the copper pipe enter the brass fitting straight and without any strain. If necessary, bend the pipe to meet this condition. Avoid sharp bends and kinks.

3.43 If a 1/2" pipe is to be replaced and an eccentric bushing prevents the pipe from being assembled into the brass fitting straight and without strain, bend the pipe as required with the R-6200 oil pipe bender.

3.44 If a 1/4" pipe is to be replaced and the pipe will not enter the brass fitting due to the fitting being screwed into the casing at an angle, insert the R-8020 oil pipe bender into the pipe as far as it will go and bend the pipe as required.

3.45 With the pipes satisfactorily fitted in the elbows or connectors, remount the pipe supports on the bottom channel as outlined in 3.37.

Oil Pump and Associated Parts Mounted in Gear Case

Drives with Pump Housing

3.46 Spur Gears and Associated Stub Shaft: To replace a spur gear or stub shaft, remove the oil pump housing mounting screws with the No. 344 screwdriver and remove the housing from the gear case. If the gear to be replaced is mounted on the shaft in the housing, remove it and substitute the new gear. If the stub shaft is to be replaced,

remove the spur gear and remove the shaft. Substitute the new part and mount the spur gear in place on the shaft. If the stub shaft is not removable, replace the housing as outlined in 3.47. If the spur gear is mounted on the lower vertical shaft, slide it off the Woodruff key. Substitute the new gear, taking care that the keyway in the gear is placed over the key in the shaft. Then clean and reseal the surfaces where the seals were broken as outlined in 3.05 and remount the oil pump housing securely in place.

3.47 Oil Pump Housing: To replace an oil pump housing, proceed as outlined in 3.46 to remove the housing from the gear case. Remove the spur gears and shaft from the housing as outlined in 3.46 and mount the parts in the new housing. Securely mount the housing in place on the gear case.

Drives with Oil Pump Covers

3.48 Oil Pump Cover: To replace an oil pump cover, remove the oil pump cover mounting screws with the No. 344 screwdriver. Remove the cover, taking care that the stub shaft and associated spur gear do not drop out of the gear case. Substitute the new cover and insert and tighten the mounting screws securely.

3.49 Spur Gear and Associated Stub Shaft: To replace a spur gear or associated stub shaft, remove the cover as outlined in 3.48, allowing the shaft and gears to drop out of the gear case. In replacing either the spur gear or stub shaft, remove the gear from the shaft and substitute the new part. Then place the assembly in the gear case and remount the cover as outlined above. If the spur gear mounted on the lower vertical shaft is to be replaced, slide it off the Woodruff key. Substitute the new gear, taking care that the keyway on the gear is placed over the key in the shaft. Then reassemble the other spur gear on the shaft and mount the assembly in the gear case. Remount the cover as outlined in 3.48.

Gear Case Cover and Associated Gasket

3.50 Gear Case Cover: To replace a gear case cover, remove the gear case cover mounting screws, with the No. 344 screwdriver or the 4" regular screwdriver and loosen the cover by tapping it lightly. On Nos. 45A, 46A, 47A and 48A drives on which the gear case cover and worm case housing are cast in one piece, it will be necessary to remove the coupling assembly as outlined in 3.12 before removing the cover. On these drives, the governor housing and worm assembly will be removed with the gear case cover. Remove these parts from the cover as outlined in 3.12 and 3.18 and mount them on or in the new cover. Clean and reseal the parts wherever seals have been broken as

outlined in 3.05 and mount the new cover in place on the gear case and insert and tighten the mounting screws securely. Then remount the coupling assembly.

3.51 Gasket: To replace a gasket, remove the gear case covers as outlined in 3.50 and remove the gasket. In some cases, it may be necessary to remove the lower gear case cover to remove the gasket. Clean and reseal the sealed surfaces as outlined in 3.05. Substitute the new part and remount the gear case cover securely in place.

Gear Case - Internal Parts

(Single Speed Drives - Except Nos. 35A and 49A Drives)

3.52 General: To replace a gear, shaft or washer, remove the gear case cover as outlined in 3.50. If the part to be replaced is mounted on the upper or lower vertical shaft, remove the coupling assembly and worm case housing as outlined in 3.12 and 3.32. After making the necessary replacements, remount the parts that were removed as outlined in these paragraphs and clean and reseal parts as outlined in 3.05 wherever a seal has been broken and then refill the required level as outlined in 3.08.

3.53 Gears (A) and (B): In general, gears (A) and (B) make up an assembly and are mounted on the upper friction roll shaft. However, in some cases gear (B) is omitted. When the gear assembly is used, the rear gear (B), is keyed to the hub of the outer gear, (A), with a Woodruff key while the outer gear, (A), is keyed to the friction roll shaft. When only gear (A) is used, it is also keyed to the friction roll shaft. To replace either gear (A) or (B), where furnished, straighten and remove the cotter pin from the friction roll shaft with the P-long nose pliers. Remove the castellated nut from the shaft with the R-1317 wrench and remove the washer. Slide the gear or gear assembly off the shaft and remove the Woodruff key from the shaft. If both gears are defective, replace them as an assembly. If either gear is defective, separate the assembly. If gear (A) is to be replaced, remove the Woodruff key from the hub of the gear and place it in the slot of the new gear. Slip gear (B) onto the hub of gear (A) so that the keyway in the gear slides over the key in gear (A).

3.54 Before placing the gears on the shaft, rotate the friction roll so that the keyseat is uppermost and place the Woodruff key in the slot. Then slide the gear onto the shaft so that the keyway in the hub of the gear is at the top permitting the gear to slip over the Woodruff key. If the gear binds on the key, it is an indication that the key has slipped out of place. To check this and to guide the gear over the key, rotate the gear and shaft 1/4 turn in a

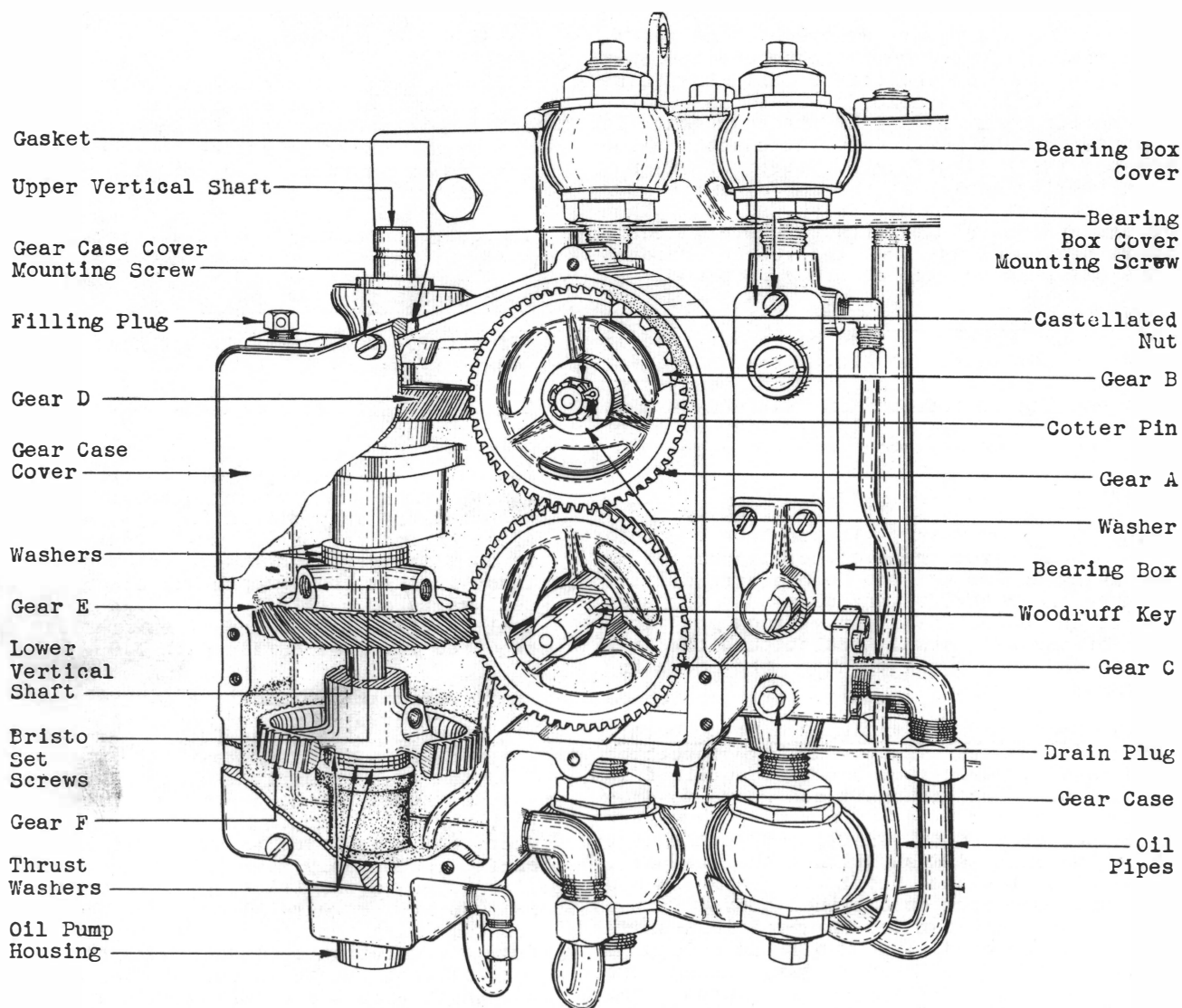


Fig. 77 - Gear Train Assembly for Single Speed Drives

counter-clockwise direction and with a finger behind the gear keep the key located properly in the slot. If the gear still jams on the key, back off the gear and shift the key into position, then while holding the key in this position, slip the gear over the key. Before securing the gear make sure that the gear hub rests against the shoulder of the shaft.

3.55 Place the steel washer and castellated nut over the end of the shaft and tighten the nut securely with the R-1317 wrench. Then insert the cotter pin in place and spread the split end with P-long nose pliers.

3.56 Gear (C): To replace gear (C), remove gears (A) and (B) as outlined

above. Remove the outer Bristo set screws from the hub of the gear and loosen the inner screws with the No. 296 wrench. The removal of the set screws may be facilitated if the No. 245 wrench is used to turn the No. 296 wrench. Then slide the gear off the shaft. Remove the inner Bristo set screws and insert them in the new gear.

3.57 Substitute the new gear on the shaft guiding it as outlined in 3.52 and insert and tighten the Bristo set screws securely. Remount gears (A) and (B) as outlined in 3.53 to 3.55 inclusive.

3.58 Gears (E) and (F) and Lower Vertical Shaft: To replace gear (E), (F) or the lower vertical shaft proceed as follows:

The following paragraphs, 3.59 to 3.68 primarily apply to the worm end of the drive and the non worm end of converted drives. When replacing parts at the non worm end of the drive except in the case of a non worm end of a converted drive the procedures outlined in these paragraphs also apply except that all references to gear (F) should be disregarded.

3.59 Remove the oil pump from the gear case as outlined in 3.40. Measure and record the distance the lower vertical drive shaft extends beyond the outside bottom surface of the gear case with the endplay taken up in a downward direction. Do this with the R-8550 steel scale.

3.60 Remove the outer Bristo set screws and loosen the inner screws in gears (E) and (F) with the No. 296 wrench. Slide the shaft downward through the casting enough to remove the part that is to be replaced. If gear (E) is to be replaced, remove it from the gear case. Remove the inner Bristo set screws from the gear and insert them in the new gear. Place the new gear on the shaft. If gear (F) is to be replaced, remove gears (E) and (F) and remove the Bristo set screws from gear (F) and insert them in the new gear. Place the new gear, then gear (E) on the shaft. If the thrust washer or lower shaft is to be replaced, remove gears (E) and (F) and the part to be replaced. Make the necessary replacement of parts and assemble in the reverse order. When removing the washers note the number used and their positions so that they may be correctly reassembled on the shaft.

3.61 Raise the lower vertical shaft to its original position with respect to the lower surface of the gear case as outlined in 3.59 and with gear (F) resting on the thrust washers, tighten the inner Bristo set screws securely. Do this so as to insure that the shaft will not rub on the bottom of the pump housing and that the Woodruff key which secures the spur gear of the pump will clear the bottom of the gear case.

3.62 Remount the oil pump and insert and fasten the oil pump mounting screws securely.

3.63 With gears (E) and (F) mounted on the shaft, raise gear (E) until it is in alignment with gear (C) on the friction roll shaft, and tighten the inner and outer Bristo set screws securely with the No. 296 wrench against the flats of the shaft. The alignment of the gears may be considered satisfactory if the horizontal center lines of the driving and driven gears are within 1/64" of each other. This alignment may be checked by placing the R-8550 steel scale on edge on the upper surface of the driving gears (gears (D) and (E)) and then on the under surface. Then insert and tight-

en the outer Bristo set screws in gears (E) and (F).

3.64 Gear (D) and Upper Vertical Shaft: To replace gear (D) or the upper vertical shaft, remove the lower vertical shaft as outlined above.

3.65 Remove the vertical drive shaft coupling from the upper vertical shaft as outlined in the section covering this apparatus.

3.66 To replace gear (D), remove the outer Bristo set screws and loosen the inner Bristo set screws with the No. 296 wrench. Slide the shaft downward enough to clear gear (D). Remove gear (D) from the gear case and remove the inner Bristo set screws and insert them in the new gear. Substitute the new part in the gear case. To relocate the shaft, place the lower half of the eccentric coupling against the shaft with the coupling pin in the slot of the shaft. Slide the shaft down through the parts until the coupling rests on the thrust washers.

Note: When the drive is not furnished with a coupling that connects the drive with a vertical drive shaft gear (D) is usually not furnished.

3.67 Remount the lower clamping portions of the eccentric coupling on the upper vertical shaft as outlined in the section covering this apparatus. Remount the lower vertical shaft and the gears mounted on it as outlined above and remount the gears mounted on the friction roll shafts.

3.68 With the friction roll gears satisfactorily secured and with the pin in the lower clamping portions of the eccentric coupling engaging the slot in the upper vertical shaft when the lower surfaces of the clamping portions are resting on the thrust washers, raise gear (D), if used, until it is in alignment with gear (B) as outlined in 3.66 and tighten the Bristo set screws.

Single Speed Drives Nos. 35A and 49A Drives

3.69 General: To replace a gear, shaft or washer, remove the gear case cover as outlined in 3.50. If the part to be replaced is mounted on the upper or lower vertical shaft, remove the coupling head assembly and worm housing as outlined in 3.12 and 3.32. After making the necessary replacements, remount the parts that were removed in accordance with these paragraphs and clean and reseal parts as outlined in 3.05 wherever a seal has been broken, and then refill to the required level as outlined in 3.08.

3.70 Gear (A): To replace gear (A) straighten and remove the cotter pin from the shaft with the P-long nose pliers. Remove

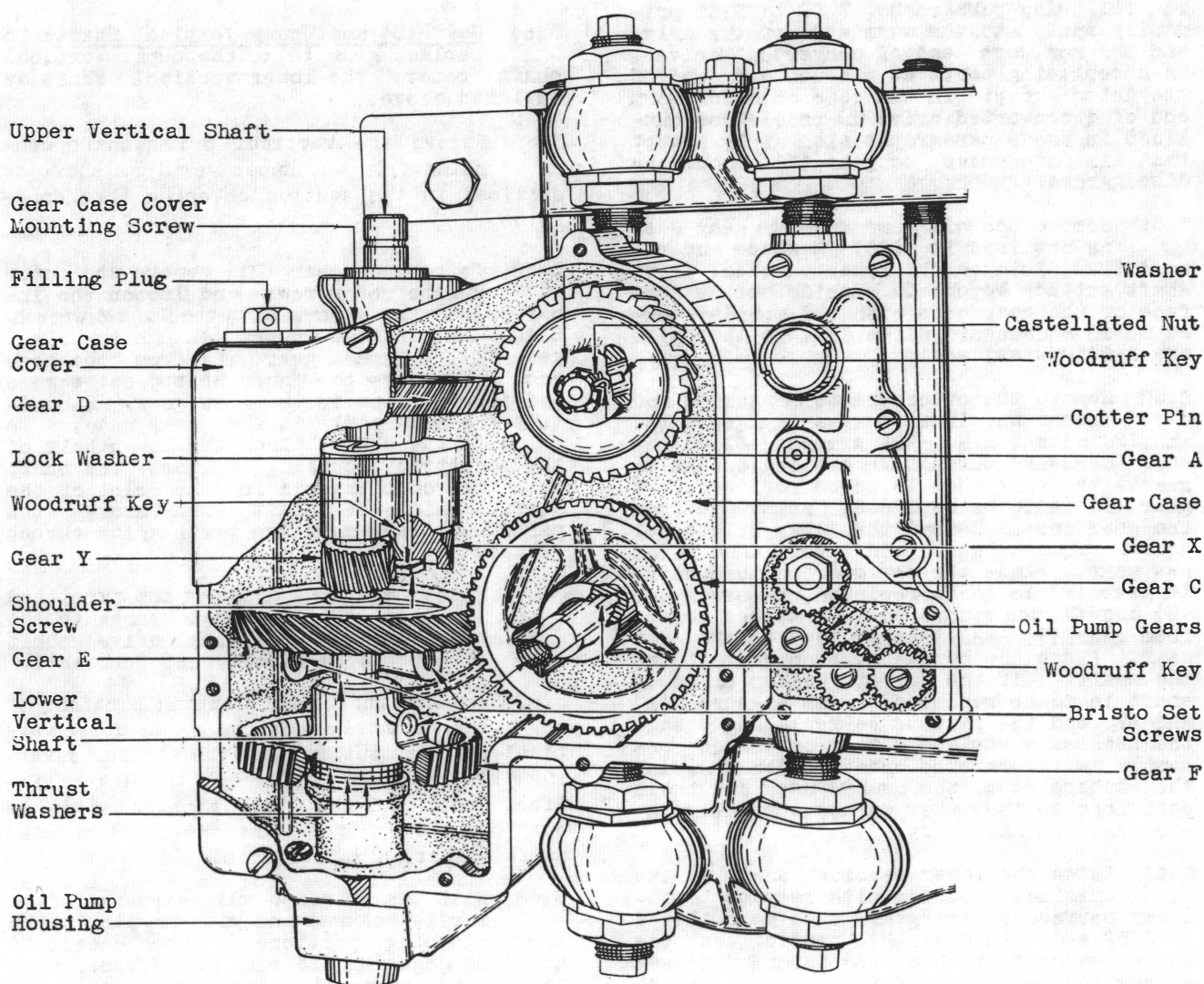


Fig. 78 - Gear Train Assembly for Worm End
of Nos. 35A and 49A Drives

the castellated nut with the R-1317 wrench and remove the washer. Slide the gear off the shaft. Substitute the new gear on the shaft guiding it as outlined in 3.54 and re-mount the steel washer and castellated nut over the end of the shaft and tighten the nut securely with the R-1317 wrench. Insert the cotter pin in place and spread the split end with the P-long nose pliers.

3.71 Gear (C): To replace gear (C), remove the outer Bristo set screw from the hub of the gear and loosen the inner screw with the No. 296 wrench. Slide the gear off the shaft. Remove the inner Bristo set screws from the gear to be replaced and insert them in the new gear. Substitute the new gear on the shaft guiding it as outlined in 3.54 and insert and tighten the set screws securely.

3.72 Gears (E), (F), (Y), Thrust Collar, Thrust Washers and Lower Vertical Shaft: To replace any of the parts mounted on the lower vertical shaft proceed as follows: Measure the distance the shaft projects below the gear case as outlined in 3.58 and 3.59. In general these procedures apply to the worm end of the drive which is equipped with gear (F), however, they also apply to the nonworm end on which a thrust collar is furnished instead of gear (F). Remove the outer Bristo set screws from gears (E) and (F) (or the set screw spring clip and Bristo set screw in the thrust collar, if furnished) with the No. 296 wrench and loosen the inner Bristo set screws with the same wrench. The removal of the screws will be facilitated if the No. 246 wrench is used to assist in turning the No. 296 wrench.

Gear (Y) consists of a gear and shaft in one piece. This shaft is secured to the lower vertical shaft by a left-hand thread. To remove the gear, insert the side of the blade of a No. 521A screwdriver in the slot in the gear that projects through the casting and turn the shaft until the slot in the gear is in such a position that the screwdriver will rest against the edge of the gear case. Insert the blade of another No. 521A screwdriver in the slot in the bottom of the lower vertical shaft and hit the handle of the screwdriver smartly turning the shaft in a clockwise direction while holding gear (Y) rigidly in place with the first screwdriver. After the shaft of gear (Y) is loose, separate the two shafts and lower the lower vertical shaft through the gear case. The amount this shaft is lowered is dependent on the part to be replaced. If either gear (E) or (F) or the thrust collar is to be replaced lower the shaft just enough to clear the part while holding gear (Y) in position. If gear (Y) or the thrust washers mounted above gear (Y) on the non worm end are to be replaced, remove gear (E) and gear (F) or the thrust collar as required, and lower gear (Y) until the shaft clears the casting in the gear case. Substitute the necessary new part and reassemble the parts as follows. Mount the upper thrust washers (nonworm end) on the upper part of the shaft of gear (Y). Insert the end of the shaft of gear (Y) up through the casting. Then while holding gear (Y) in place with one hand, mount the three thrust washers, (a steel, a phosphor bronze and then another steel washer), on the lower casting. Then if the worm end of the drive is being reassembled place gear (F) in position with the mounting holes for the Bristo set screws above the teeth of the gear. If the non worm end of the drive is being reassembled place the thrust collar in position on the thrust washers. Place gear (E) on gear (F) or the thrust collar with the mounting holes for the Bristo set screws below the gear teeth and insert the lower vertical shaft up through the gear case, thrust washers, gear (F) or thrust collar and gear (E). Engage the threading on the lower vertical shaft and gear (Y) and while holding the gear rigidly in place, turn the shaft in a counter-clockwise direction with the No. 521A screwdrivers until the parts are tight. Check and position the lower vertical shaft as outlined in 3.59 and, if gear (F) or a thrust collar is used, tighten the Bristo set screw securely. Realign gear (E) with gear (C) as outlined in 3.63 and securely tighten the inner Bristo set screw. Insert and securely tighten the outer Bristo set screws in both gears (E) and (F) and remount the spring clip in the thrust collar. Remount the oil pump assembly as outlined in 3.62.

3.73 Shoulder Screw, Lock Washer, Gear (X) and Woodruff Key: To replace the shoulder screw, remove gear (Y) as outlined

in 3.72. Hold the upper vertical shaft in position and remove the screw with the 7/8" box wrench or 4" regular screwdriver as required. Hold the lock washer in place on the shaft and substitute the new shoulder screw, tightening it securely with the specified tool. To replace the lock washer, remove the shoulder screw and washer. Substitute the new washer. Remount and tighten the shoulder screw securely. To replace gear (X), remove the shoulder screw and lock washer and remove gear (X). Gear (X) is keyed to the shaft by means of a Woodruff key and it may be necessary to force the gear downward in order to remove it. Examine the Woodruff key at this time and if it is defective, replace it. Substitute the new part on the shaft sliding the keyway in the gear over the Woodruff key. Remount the lock washer and shoulder screws as outlined above. Take care when doing this to tighten the screw securely so that gear (X) rests against the shoulder of the shaft.

3.74 Gear (D): To replace gear (D), remove the lower vertical shaft as outlined in 3.72 and gear (X) as outlined in 3.73. Remove the vertical drive shaft coupling. Remove the outer Bristo set screws and loosen the inner Bristo set screws on gear (D) with the No. 296 wrench. Slide the shaft downward enough to clear gear (D). Remove the gear from the gear case, remove the inner Bristo set screws and insert them in the new gear. Substitute the new part and insert the shaft through the gear. Remount the vertical drive shaft coupling and align gear (D) as outlined in 3.66. Then remount and align the other parts that were removed as outlined in 3.72.

3.75 Upper Vertical Shaft: To replace the upper vertical shaft, remove gear (D) as outlined in 3.74 and drop the shaft until it clears the casting. Remove the shaft from the gear case. Mount the new shaft in place in the gear case. Mount gear (X), the washer and shoulder screw on the shaft so outlined in 3.73. Mount gear (D) in place and align it as outlined in 3.74. Remount and realign the vertical shaft coupling.

Double Speed Drives (Except Nos. 45A, 46A, 47A and 48A Drives)

3.76 General: To replace the gears, shafts or washers; remove the coupling assembly, gear case cover, and worm case housing as outlined in 3.12, 3.50 and 3.32. After making the necessary replacements, remount the parts that were removed in accordance with these paragraphs and clean and reseal parts as outlined in 3.05 wherever a seal has been broken and then refill to the required level as outlined in 3.08.

3.77 Gears (A) and (B): To replace either gear (A) or gear (B), straighten and remove the cotter pin from the upper friction roll shaft with the P-long nose pliers.

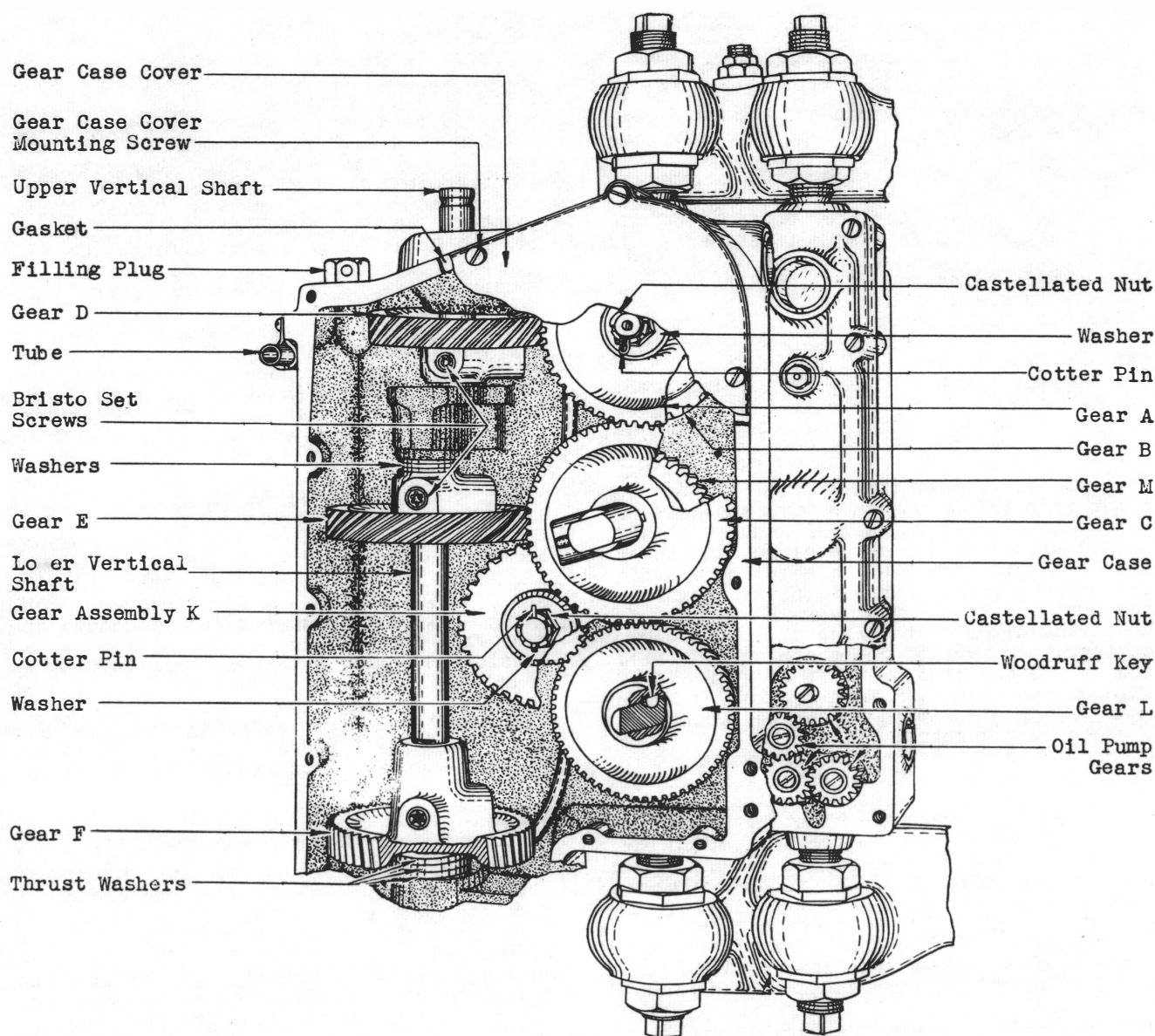


Fig. 79 - Gear Train Assembly for Double Speed Drives
(Except Nos. 45A to 48A Drives)

Remove the castellated nut from the shaft with the R-1317 wrench and remove the washer. Slide the gear assembly off the shaft. The gear assembly consists of two spiral gears, (A) and (B); the rear gear (B) being keyed to the hub of the outer gear (A) with a Woodruff key while the outer gear (A) is keyed to the friction roll shaft. After removing the gear assembly, remove the Woodruff key from the shaft. If both gears are defective, replace them as an assembly. If either gear is defective, separate the assembly. If gear (A) is to be replaced, remove the Woodruff key from the hub of the gear and place it in the slot of the new gear. Slip gear (B) onto the hub of gear

(A) so that the keyway in the gear slides over the key in gear (A). Reassemble the gears as outlined in 3.54.

3.78 Gears (C) and (M): To replace gear (C) or (M), remove gears (A) and (B) as outlined above. Remove the outer Bristo set screws in the hub of gear (C) and loosen the inner screws with the No. 296 wrench. Slide the gear assembly off the shaft. Slide gear (M) off the hub of gear (C) and, if gear (M) is defective, substitute a new gear. If gear (C) is defective, slide gear (M) off the hub and remove the Woodruff key and Bristo set screws. Substitute the key in the keyseat of the new gear. Slide gear

(M) onto the hub of gear (C) with the keyway in gear (M) over the Woodruff key. Remount gears (C) and (M) on the friction roll shaft as outlined in 3.54 and insert and tighten the Bristo set screws securely. Remount gears (A) and (B) as outlined in 3.77.

3.79 Gear Assembly (K), Intermediate Shaft and Associated Parts: To replace a part of gear assembly (K), or any part associated with the intermediate shaft, remove gears (A), (B), (C) and (M) as outlined above and proceed as follows. Straighten and remove the cotter pin from the shaft with the P-long nose pliers. Remove the castellated nut from the shaft with the R-1317 wrench and remove the washer. Slide the gear or the gear assembly off the shaft. To replace either gear of the assembly, slide the larger gear off the Woodruff key in the hub of the smaller gear. If the larger gear is defective, substitute a new gear. If the smaller gear is to be replaced, remove the Woodruff key from the hub of the gear. Slip the larger gear onto the hub of the smaller gear with the keyway in the larger gear over the Woodruff key. Place the gear assembly over the sleeve on the intermediate shaft with the small gear toward the gear case casting. If the sleeve is defective, remove the gear assembly from the intermediate shaft and remove the sleeve. Substitute a new sleeve and remount the gear assembly. If the intermediate shaft is defective, remove the gear assembly and sleeve. Drive the shaft from the gear case with the ball peen hammer and substitute the new part. Reassemble the sleeve and gear assembly on the shaft. Remount the washer and castellated nut, tightening the nut securely. Insert the cotter pin in place and spread the split end with the P-long nose pliers. Remount gears (C), (M), (A) and (B) as outlined above.

3.80 Gear (L): To replace gear (L), remove gears (A), (B), (C) and (M) and gear assembly (K) from the friction roll and intermediate shafts as outlined above. Remove the castellated nut as outlined above. Substitute the new part with the keyway in the new gear over the Woodruff key in the shaft. Remount the washer and castellated nut on the shaft and tighten the nut securely. Insert the cotter pin in place and spread the split end with the P-long nose pliers. Remount the gears that were removed as outlined above.

3.81 Gears (D), (E) and (F), Upper and Lower Vertical Shafts and Thrust Washers: To replace gear (D), (E), (F), the upper or lower vertical shaft or a thrust washer, remove the gears mounted on the friction roll and intermediate shafts as outlined above and proceed as outlined in 3.58 to 3.67 inclusive to make the necessary replacement of parts. With the gears on the upper and lower vertical shaft reassembled as outlined in these paragraphs, reassemble

the friction roll shaft gears as outlined above.

Double Speed Drives (Nos. 45A and 46A Drives)

3.82 General: To replace the gears, shafts or washers, remove the coupling assembly and gear case cover as outlined in 3.12 and 3.50. After making the necessary replacement of parts, remount the parts that were removed as outlined in these paragraphs and clean and reseat parts as outlined in 3.05 wherever a seal has been broken. The replacement procedures outlined in 3.83 to 3.90 inclusive primarily apply to the worm end of the drive. When replacing parts on the non worm end of the drives, these procedures also apply, except that all references to gear (F) shall be disregarded.

3.83 Gear (A): To replace gear (A), remove the outer and inner Bristo set screws from the hub of the gear with the No. 223 wrench and remove the gear from the shaft. If the Woodruff key in the slot is defective, replace it at this time. Mount the new gear in place on the shaft. Insert and secure the inner and outer Bristo set screws in the new gear.

3.84 Gear (C): To replace gear (C), remove gear (A) as outlined in 3.83. Straighten and remove the cotter pin from the shaft with the P-long nose pliers. Remove the castellated nut with the R-1317 wrench and remove the washer. Gear (C) which consists of two gears may now be removed from the shaft. If the Woodruff key in the slot on the shaft is defective, replace it at this time. Before substituting the new gear on its shaft, rotate the friction rolls so that the slot is uppermost. Then slip the gear onto the shaft so that the keyway in the hub of the gear is at the top permitting the gear to slip over the Woodruff key. If the gear binds on the key, it is an indication that the key has slipped out of place. To check this and to guide the gear over the key, rotate the gear and shaft 1/4 turn in a counter-clockwise direction and with a finger behind the gear keep the key located properly in the slot. If the gear still jams on the key, back off the gear and shift the key into position, then while holding the key in this position, slip the gear over the key. Before securing the gear, make sure that the gear hub rests against the shoulder of the shaft. Place the steel washer over the end of the shaft, and over the washer place the castellated nut and tighten it securely with the R-1317 wrench. Then insert the cotter pin in place and spread the split end with the P-long nose pliers. Remount gear (A) as outlined in 3.83.

3.85 Gear (L): To replace gear (L), remove the cotter pin, castellated nut and washer as outlined in 3.84 and slide the gear off the shaft. If the Woodruff key is defective, replace it at this time. Substitute the new gear and assemble the parts that were removed as outlined in 3.84.

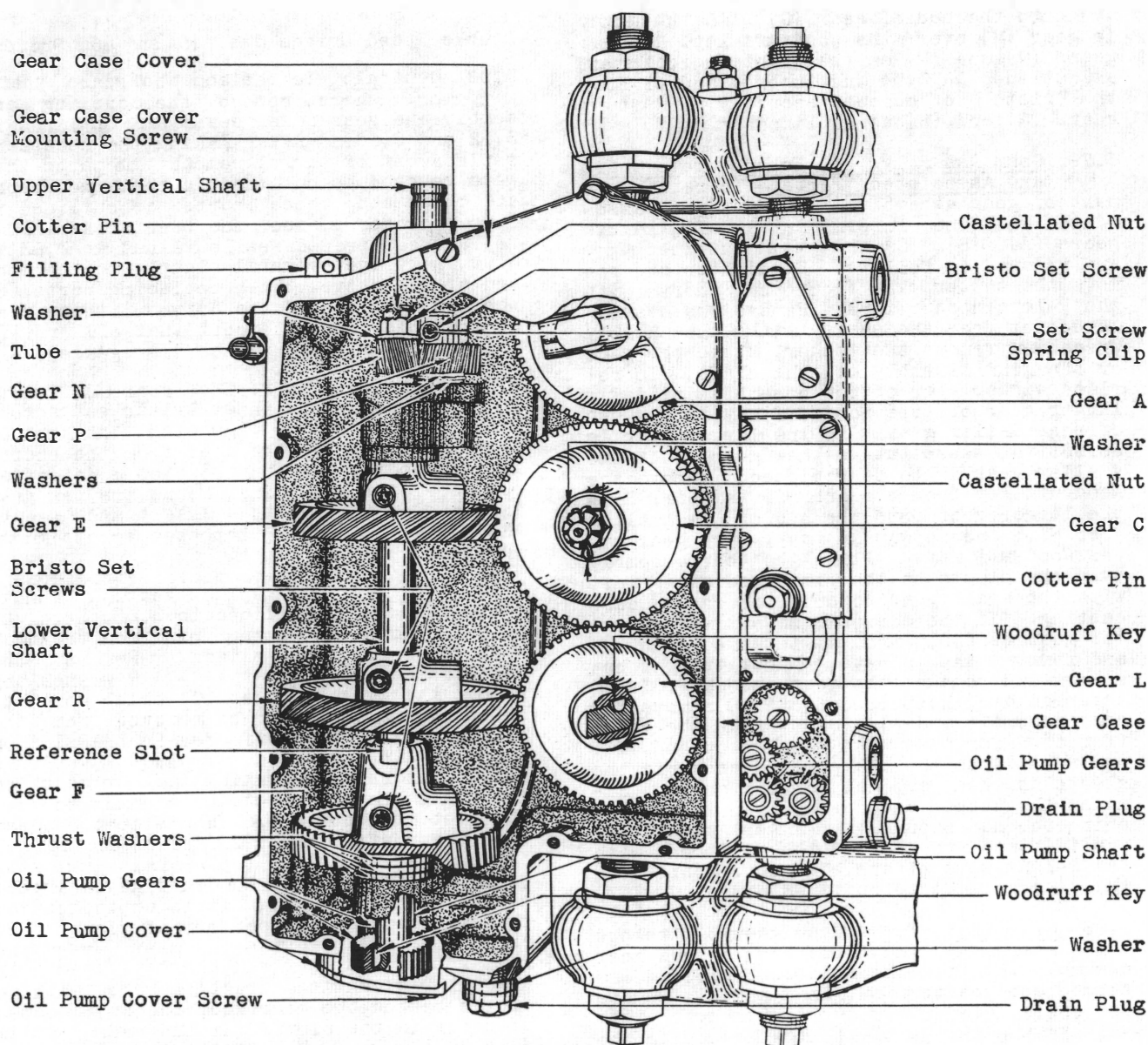


Fig. 80 - Gear Train Assembly Double Speed Drives
(Nos. 45A and 46A Drives)

3.86 Gear (N) and Woodruff Key: In order to replace gear (N) or any part mounted on the upper or lower vertical shafts, remove the oil pump cover screws with the No. 344 screwdriver, and remove the cover. Remove the castellated nut from the lower vertical shaft with the R-1770 wrench and remove the washer just below the nut. Then remove gear (N) from the lower vertical shaft, sliding it off the Woodruff key on the shaft. It may be necessary to rotate either or both gears (P) and (N) to effect its removal. If the Woodruff key is to be replaced, remove it at this time. Substitute the new part and remount the washer and castellated nut as outlined above.

3.87 Gears (E), (R) and (F) and Thrust Washers (Worm End): To replace gear (E), (R), (F) or a thrust washer, remove gear (N) as outlined above. Remove the outer Bristo set screws from the hubs of the gears mounted on the lower vertical shaft and loosen the inner screws with the No. 296 wrench. Then slide the shaft downward through the casting until the gear or the thrust washer to be replaced can be removed. If a thrust washer is to be replaced, note the positions of the washers so that they will be remounted in their original positions. To replace gear (E), remove gears (R) and (F), and to replace gear (F), remove gear (R) as well as

gear (E). To replace a thrust washer, remove all the gears before removing the washer. Substitute the new part and remount the thrust washers and gears that were removed as outlined above.

3.88 Gears (E), (R), Set Screw Spring Clip, Thrust Collar and Thrust Washers (Non Worm End):

To replace gear (E) or (R), set screw spring clip, thrust collar or thrust washer, remove gear (N) as outlined above. Remove the set screw spring clip and the outer Bristo set screws mounted in the hub of the gears and in the thrust collar mounted on the lower vertical shaft and loosen the inner Bristo set screws with the No. 296 wrench. Slide the shaft downward through the casting until the part to be replaced can be removed. If a thrust washer is to be replaced, note the positions of the washers so that they will be returned in their original positions. To replace gear (E), remove gear (R) and to replace the thrust collar remove gear (R) as well as gear (E). To replace the thrust collar or thrust washer, remove all the gears before removing the part. Substitute the new part and remount the thrust washers and gears that were removed as outlined above. Raise the vertical shaft until it just clears the bottom of the gear case so that it will not rub on the oil pump cover when it is remounted. Before securing gear (F) on the worm end, raise or lower the gear until the upper edge of the hub is in alignment with the lower edge of the upper reference slot on the vertical shaft. Before securing the thrust collar on the end of the shaft raise or lower the collar until the upper edge of the collar is in alignment with the lower edge of the lower slot. Tighten the inner and outer Bristo set screws securely while holding the gear in this position. Remount the oil pump cover and insert and tighten the mounting screws securely. Then remount gear (N) as outlined in 3.86 and align the gears that were removed as outlined in 3.52.

3.89 Lower Vertical Shaft: To replace the lower vertical shaft, remove gears (N), (E), (R), (F) or thrust collar and the thrust washers as outlined above. Remove the shaft from the gear case. Remove the spur gear from the lower end of the shaft and the Woodruff keys from the upper and lower ends of the shaft and assemble them on the new shaft. Then place the spur gear on the Woodruff key. Insert the shaft up through the bottom of the gear case. Place the thrust washers on the shaft in their original positions and remount gears (F), (R), (E) and (N) as outlined above.

3.90 Set Screw Spring Clip, Gear (P), Thrust Washers and Upper Vertical Shaft: To replace the set screw spring clip, gear (P), a thrust washer, or the upper vertical shaft, remove the lower vertical shaft as outlined in 3.89. Remove the vertical drive shaft

coupling as outlined in the section covering this apparatus. Remove the set screw spring clip from gear (P) with the P-long nose pliers. If the spring clip is defective, replace it. If gear (P) or the thrust washers are defective, loosen the Bristo set screw that holds gear (P) to the upper vertical shaft with the No. 296 wrench. Slide the shaft down through the gear case and remove the gear. If the washers are defective, replace them. Substitute the new gear and remove the Bristo set screw from the defective gear and place it in the new gear. Insert the shaft up through the gear and place the lower half of the eccentric coupling against the shaft with the coupling pin in the slot of the shaft. Slide the shaft down until it rests on the thrust washers. With the shaft in position and with the gear resting on the thrust washers, tighten the Bristo set screw securely. Then remount the set screw spring clip. Reassemble the lower vertical shaft and gears as outlined above. To replace the upper vertical shaft, loosen the Bristo set screw in gear (P) as outlined above. Remove the lower vertical shaft as outlined in 3.89 and remove the upper vertical shaft from the gear case. Insert the new shaft through the gear case casting and up through the washers and gear (P). Locate the shaft as outlined above and secure the gear on the shaft with the Bristo set screw and remount the set screw spring clip. Reassemble the lower vertical shaft and gears as outlined above.

Double Speed Drives (Nos. 47A and 48A Drives)

3.91 General: To replace the gears, shafts or washers, remove the coupling head and gear case cover as outlined in procedures 3.12 and 3.50. After making the necessary replacements, remount the parts that were removed as outlined in these procedures. The replacement procedures covered in this procedure apply primarily to the worm end of the drive. When replacing parts on the non worm end of the drives these procedures also apply except that all references to gear (F) shall be disregarded.

3.92 Gear (A): To replace gear (A), straighten and remove the cotter pin from shaft with the P-long nose pliers. Remove the castellated nut with the R-1317 wrench and remove the washer. Slide the gear off the shaft. Substitute the new gear and remount the steel washer and castellated nut over the end of the shaft and tighten the nut securely with the R-1317 wrench. Insert the cotter pin in place and spread the split end with the P-long nose pliers.

3.93 Gears (C), (S) or (M): To replace gear (C), (S) or (M) it will be necessary to remove gear (A) from the top friction roll shaft, gears (C), (S) and (M) from the middle friction roll shaft and gear assembly (K) from the intermediate shaft. To do this, proceed as follows. Remove gear (A) as outlined above. Remove the outer

Bristo set screw from the hub of gear (C) and loosen the inner Bristo set screw with the No. 296 wrench. Straighten and remove the cotter pin from the intermediate shaft with the P-long nose pliers and slide the gears off the friction roll and intermediate shafts. With the gear assemblies removed from the shaft proceed as follows to make the necessary replacement of parts. Slide gears (S) and (M) off the hub of gear (C). If gear (C) is to be replaced, remove the

Woodruff key and Bristo set screws and place the inner Bristo set screws in the new gear. Place the key in the keyseat of the new gear. Slide gears (S) and (M) on the hub of the new gear with the keyway in gear (M) over the key on gear (C). To replace either gear (S) or (M) slide gear (S) off the hub of gear (M). Make the necessary replacement of parts removing the Woodruff key from the hub of gear (M). If this gear is to be replaced, mount it in the keyway of the new gear. Slide gear (S) over the Woodruff key in the hub of gear (M) and reassemble gears (S) and

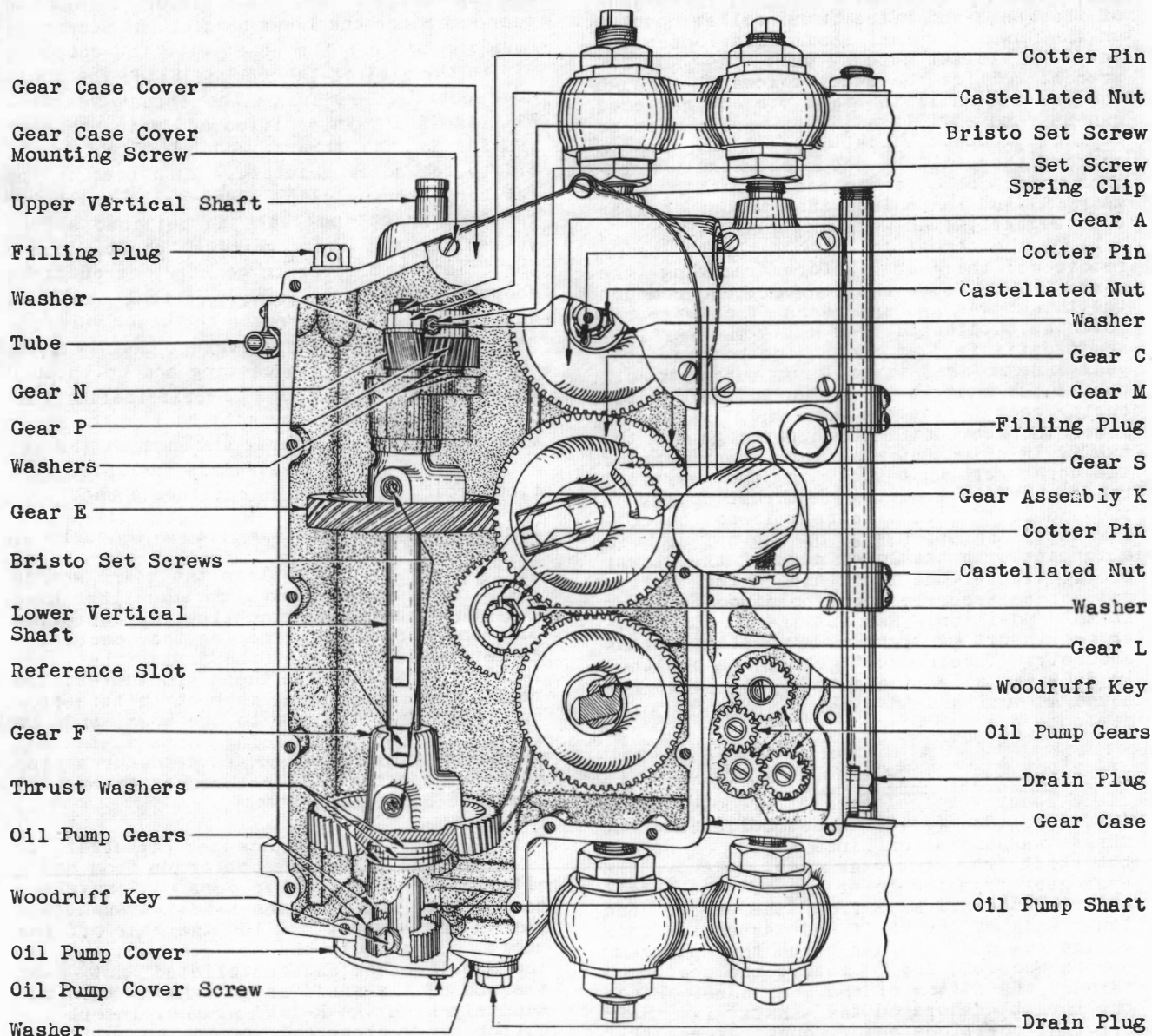


Fig. 81 - Gear Train Assembly Double Speed Drives
(Nos. 47A and 48A Drives)

(M) on the hub of gear (C). Rotate the friction roll so that the keyseat in the shaft is uppermost. Slide the assembly of gears on the friction roll and intermediate shafts over the Woodruff keys as outlined in 3.84.

3.94 Gear Assembly (K): To replace gear assembly (K) or any part of the assembly, remove gears (A), (C), (M) and (K) as outlined above. Follow the procedures outlined in 3.79, for the replacement of parts similar to gear assembly (K) in other double speed drives.

3.95 Gears (N), (E), (F) and (P) and Upper and Lower Vertical Drive Shafts: To replace gear (N), (E), (F) or (P) or an upper or lower vertical drive shaft, follow the procedures outlined in 3.86 to 3.90 for the same parts except that gear (R) covered by this procedure is not furnished on the Nos. 47A and 48A drives. After making the necessary replacements, reassemble the gears and shafts as outlined in the above mentioned paragraphs.

3.96 Gear Case: If a gear case is to be replaced, refer the matter to the supervisor.

Bearing Box and Associated Parts

3.97 Bearing Box Cover: To replace a bearing box cover, remove the bearing box cover mounting screws with the No. 344 screwdriver or the 4" regular screwdriver. Remove any connecting shafts in accordance with the section covering this apparatus. Then remove the cover and substitute the new part. Insert and tighten the cover mounting screws securely.

3.98 Gaskets: To replace a gasket, remove the associated bearing box cover as outlined in 3.97 and remove the gasket. Substitute the new part and remount the cover securely in place.

3.99 Oil Pump Gears and Extension Shaft: To replace an oil pump gear or replacement shaft remove the gear mounting screw with the 4" regular screwdriver or the shaft with the KS-6367 wrench. Remove gears other than the one to be replaced if it will facilitate the replacement of the part. Substitute the new part and insert and securely tighten the mounting screw on shaft.

3.100 Bearing Box: If the bearing box is to be replaced refer the matter to the supervisor.

Friction Rolls

3.101 If a friction roll is to be replaced, refer the matter to the supervisor.

Miscellaneous Parts

3.102 Guard Plate, Guard Plate Assembly: To replace a guard plate or guard plate assembly, remove the guard plate mounting nut on the side of the bottom channel with the No. 236 wrench or the No. 245 wrench as required, and remove the guard plate. Substitute the new part and fasten it securely in place. Check the clearance between the friction rolls and the guard plate as outlined in the section covering this apparatus.

3.103 Multiple Bank Bracket: To replace a multiple bank bracket, remove the multiple bank as outlined in the section covering piece part data and replacement procedures for panel multiple banks. Hold the multiple bank stud lock nut of the bracket to be replaced with the R-5850 wrench and remove the multiple bank stud with the KS-6367 wrench. Mount and tighten the lock nut and stud on the new bracket. Remove the multiple bank bracket mounting screws with the No. 246 wrench and remove the bracket. Substitute the new part and insert and tighten the mounting screws securely. Then remount the multiple bank as outlined in the section noted above.

Motor Mounting Brackets and Associated Parts

3.104 General: To make any replacement of parts mounted on a bracket, remove the motor from the bracket as outlined in 3.12. It is recommended that brackets that are pinned should be replaced by the Western Electric Company.

3.105 Motor Handle: To replace the motor handle, straighten and remove the cotter pins in the bearing pin with the P-long nose pliers. Remove the bearing pin and the handle. Substitute the new part and insert the pin in place. Then insert the cotter pins.

3.106 Motor Handle Mounting Pin, Washers and Spring: To replace the motor handle mounting pin, remove the motor handle as outlined above. Remove the cotter pins from the other end of the mounting pin with the P-long nose pliers. If the mounting pin is secured by a taper pin instead of a cotter pin, drive out the taper pin with the ball peen hammer and pin punch. Then remove the mounting pin. When the pin is removed, the washers and motor handle spring will be removed at the same time. Mount the parts on the new pin and substitute it in place on the bracket. Secure the handle as outlined above. If either the washers or spring is defective, remove the mounting pin as outlined above and make the necessary replacement of parts.

3.107 Gib and Spring: To replace the gib, remove the motor bracket mounting pin as outlined in 3.106 and remove the gib. If the spring is defective, remove the spring.

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Substitute the new part and remount the gib. Then remount the motor handle pin and handle as outlined in 3.106.

3.108 Aligning Screws and Lock Nuts: To replace an aligning screw, note the setting of the screw and proceed as follows. Remove the Bristo set screw with the No. 296 wrench and substitute the new part in the frame or on the bracket to the depth to which the replaced part was previously adjusted.

3.109 Before replacing any part covered herein, check whether the replacing part is coated with a protective film of grease. If it is, remove the grease with KS-7860 petroleum spirits and then lubricate the part, if required, as outlined in the section covering this apparatus.

3.110 Wherever the No. 295 or 296 Bristo set-screw wrenches are specified throughout the section (for use on Bristo setscrews), reference shall be made to the R-2485 or R-2812

Allen hexagon socket setscrew wrenches as alternates where socket setscrews are used.

3.111 Wherever D-98063 cleaning cloth is specified throughout the section, KS-14666 cleaning cloth shall be substituted.

3.112 Replacement of Coupling Guard Mounting Screws by Studs and Nuts: Coupling guards on drives equipped with external oil pipes are secured by screws sealed into the gear case cover. To eliminate the need of breaking the seal each time the coupling guard is removed, studs and nuts may be used. When this modification is to be used, proceed as follows. Remove the mounting screws. Remove the sealing compound from the screw holes as covered in 3.05. Apply fresh compound to the longer threaded portions of the studs and insert and tighten the studs in the gear case cover. Allow the sealing compound to harden and then mount the nuts on the studs.