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M T - 4 FRICTION DRAFT GEAR
SERVICE INSPECTION,
MAINTENANCE AND RECLAMATION MANUAL

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SERVICE INSPECTION, MAINTENANCE AND RECLAMATION MANUAL

CARDWELL M T - 4 FRICTION DRAFT GEAR

CONTENTS

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SECTION I

1. MK 50 DRAFT GEAR

1.1 The essential parts of the Cardwell M T - 4 Friction Draft gear are shown in fig.1 below. Views of all components in isometric along with part number for indenting spares are given in the next page, fig 2.

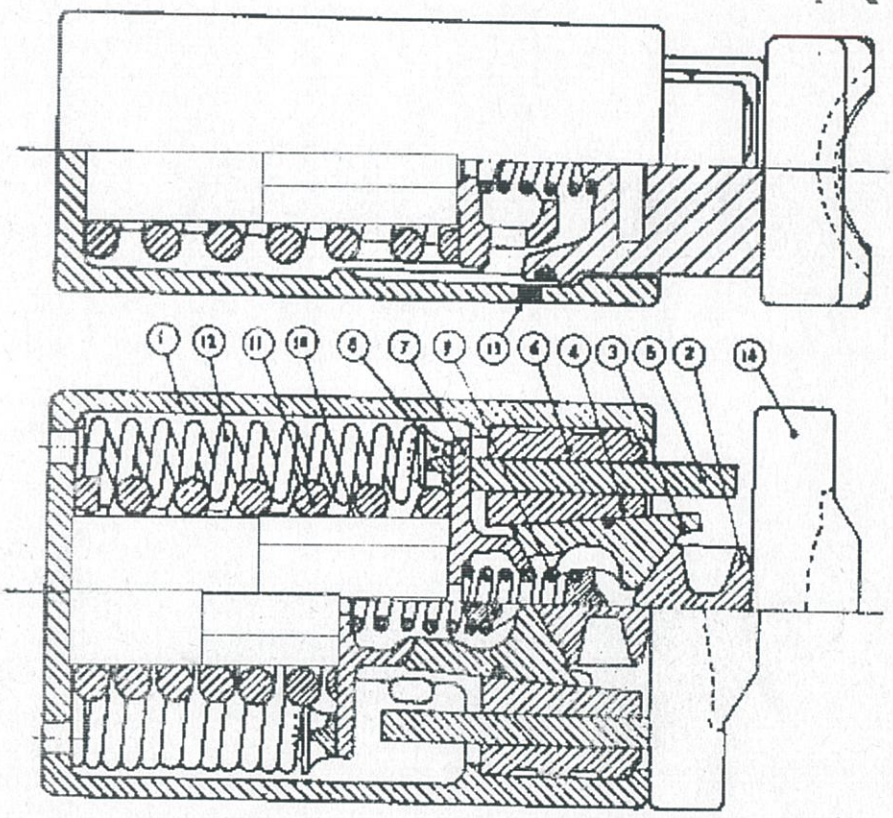

FIG. 19

1. HOUSING
2. CENTRE WEDGE COMPLETE
3. WEDGE SHOE COMPLETE
4. TAPERED STATIONARY PLATE
5. MOVABLE PLATE
6. OUTER STATIONARY PLATE
7. SPRING SEAT
8. CORNER SPRING SEAT
9. RELEASE SPRING
10. INNER COIL SPRING
11. OUTER COIL SPRING
12. CORNER COIL SPRING
13. SHORTENING DEVICE
14. FOLLOWER

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Section II

MT 4 Draft gear in wagon

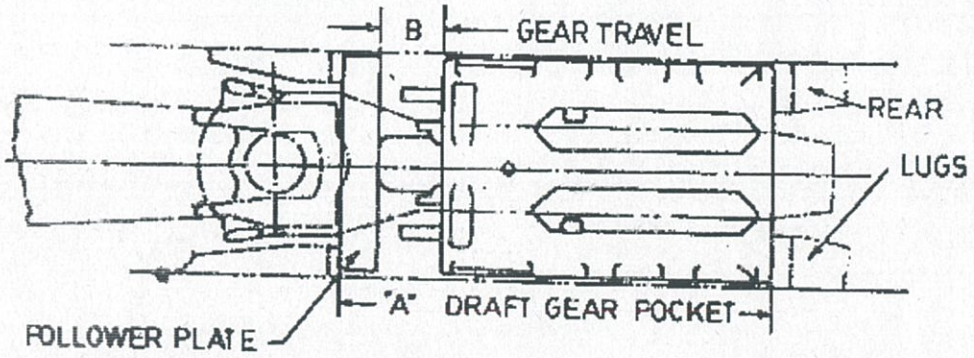
2. Examination and Measurement of Draft Gears while in the Draft Gear pocket of the car to determine if they are fully released or in a stuck condition.

2.1 Normal and fully released Draft Gear in the wagon and Internal Spring Forces

A normally released Draft Gear would appear as shown in fig 3 where the follower plate is against the Front Lugs, the Housing is against the Rear Lugs and the components of the Friction Clutch are fully returned to their neutral position. The internal spring forces in a normal fully released M T - 4 Draft Gear will be from 7,000 kg to 10,000 kg.

It is possible for a slight gap to be seen at either the front or rear Draft Lugs when the Draft Gear is in a normal fully released position, e.g. in an enlarged Draft Gear Pocket. The normal fully released Draft Gear travel for the M T - 4 Draft Gears as shown in Figure would be as indicated below

TYPE DRAFT GEAR	WHEN "A" IS	DIM "B" IS
M T - 4	(24 5/8")	(3 ¼")
	625.5 mm	82.6mm



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2.2 PARTIALLY STUCK GEAR

A partially stuck Draft Gear would appear as in Figure 4 where the Draft Gear is loose in the pocket.

Draft Gear travel will be seen less than dimension (3 ¼") 82.55 mm as shown in figure 4 to confirm that the Draft Gear is partially stuck:

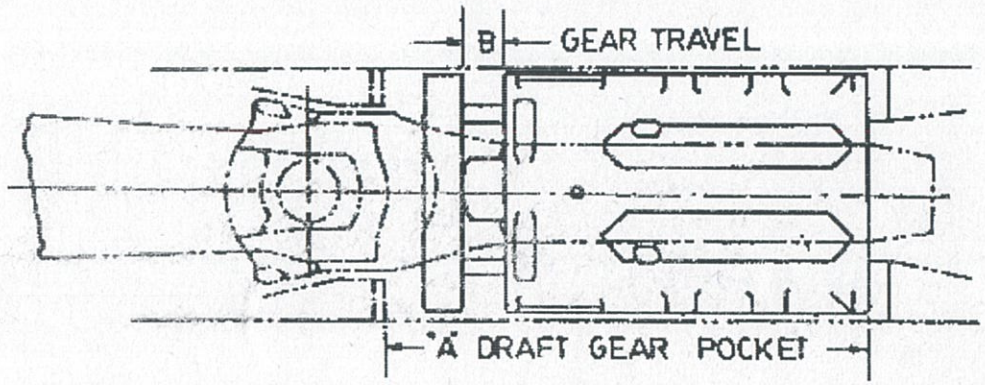

Figure 4 partially stuck Draft Gear

2.3 FULLY STUCK DRAFT GEAR AND INTERNAL SPRING FORCES

A fully stuck draft gear is one where the components of the friction clutch are jammed and flush with the open end of the housing. A large gap would appear as shown in Figure 5

The internal spring forces between 11,000 kgs and 23,000 kgs would propel the friction parts outward if the gear was to suddenly release.

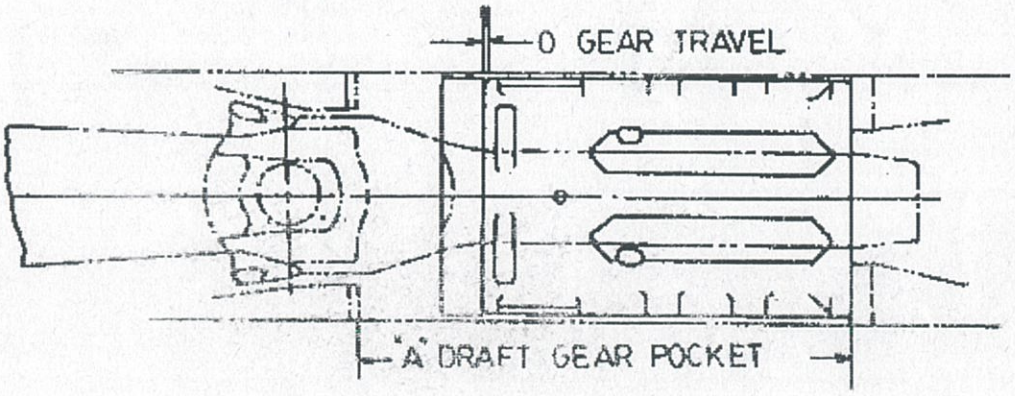

Figure 5 fully stuck Draft Gear

For instructions on safe handling of stuck Draft Gear see pages

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For Reclamation and safe handling of stuck Draft Gear see pages

SECTION III

Examination of M T - 4 Draft Gear in Wagon

3. EXAMINATION AND RECONDITIONING OF M T - 4 DRAFT GEAR DURING SERVICE LIFE.

3.1 All M T - 4 Draft Gears have a built-in "wear life gauge" (see fig. 6). This is known as "plate clearance" and can be observed by looking up at the gear while it is in the wagon (see figure 6). If the Draft Gear is out of the car, a straight edge can be placed on the center wedge (see Figure 6) of the Draft Gear.

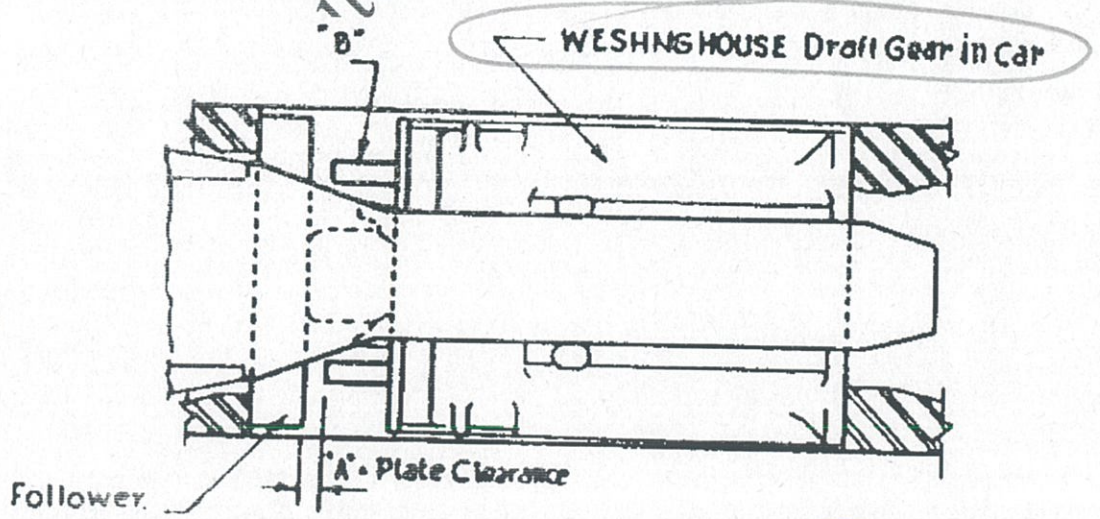
Both movable plates should be driven or forced down until solid before measurement is made.

The PLATE CLEARANCE is an indicator of the total surface wear of the friction components.

When the plate clearance has been reduced to zero, the Draft Gear, in effect, has lost much of its effectiveness to cushion. Once the gear reaches this stage, some of the parts will start to wear on the housing and cause considerable damage, rendering it impossible to recondition. It is recommended that the Draft Gear be inspected whenever car is in shop or on repair track or when the draft gears are removed from the car for any reason.

On high utilization cars, an initial on-car Draft Gear inspection should be made after the car has traveled 640000 KM and at 320000 KM intervals thereafter.

M T - 4 Draft Gears in general service should be inspected at 8-years intervals.



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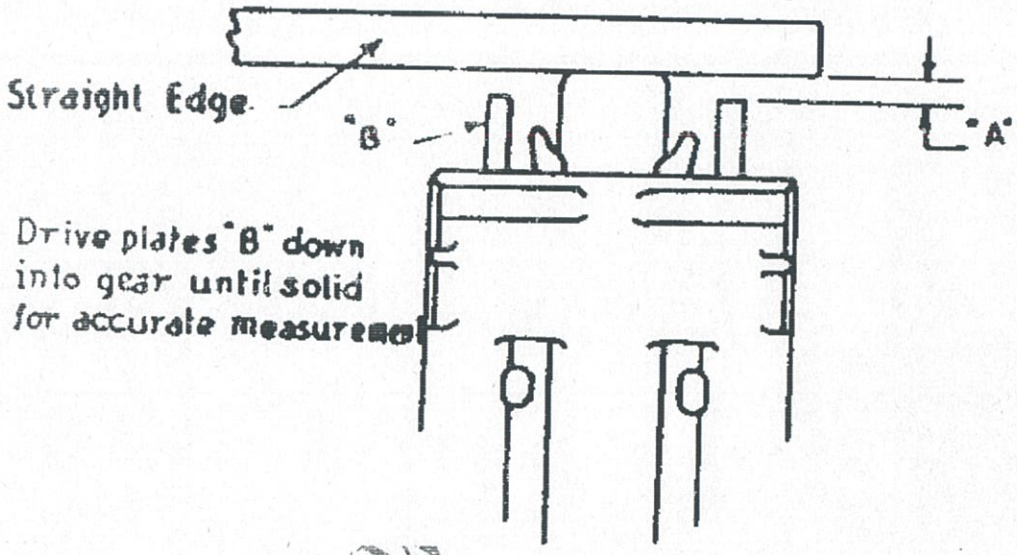
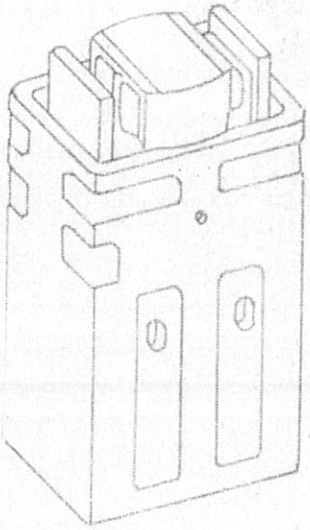
3.2 M T - 4 DRAFT GEAR HOUSING ACCEPTED FOR RECONDITIONING

Figure 7 sets the minimum dimensions for all M T - 4 Draft Gear Housings which are acceptable for reconditioning.



If the average plate clearance visible between the follower plate and movable plates exceeds 1/8 (3.25mm) inch, the remaining wear life of the gear is acceptable. To accurately measure the plate clearance when the gear and follower and hammered to force plate "B" into the gear until solid. Remove steel wedge after forcing plates "B" into gear. If dimension "A" is less than 1/8 (3.25mm) inch, the draft gear should be replaced.



Draft gear housing not meeting minimum dimensions cannot be reconditioned.

SECTION IV

REMOVAL OF M T - 4 DRAFT GEAR FROM WAGON POCKET

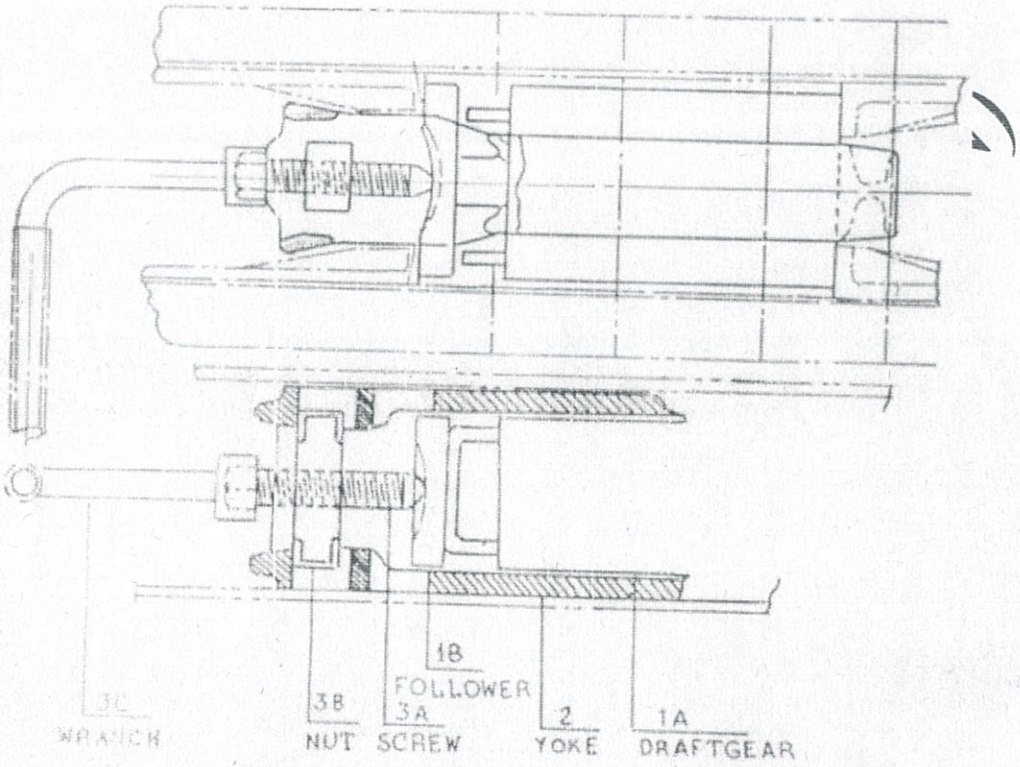


FIG 9

4. M T - 4 Draft Gear Removal Process with normal fully released Draft Gear by using Indian Railways Standard Screw.

INDIAN RAILWAY APPLICATION – REMOVAL OF DRAFT GEAR FROM WAGON POCKET

4.1 **NORMAL CONDITION:**

Remove Yoke Pin support, Drop Yoke Pin down and draw Coupler out of Wagon.

Place suitable lifting/lowering jack under Yoke Support Plate. Holding Yoke Support in position with centre still cut and take out rivets.

Insert Nut (RDSO G 80) in the Yoke Pin Hole. Apply screw (RDSO G 80) from mouth and compress by means of wrench (RDSO G 80) so that Draft Gear with Follower is clear of the pocket length by about 6 to 8 mm.

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Lower support at Yoke Support Plate and take out Yoke with Draftgear and screw.

Unscrew and remove nut. Now Draftgear, Follower are loose in Yoke and they can be taken out separately.

4.2 FOLLOWER BROKEN

A broken Follower may remain within pocket only when it is cracked at centre, Split in two at about centre vertically or horizontally.

When cracked vertically but not split procedure as in above is applied.

When cracked and split horizontally procedure as in above is applied.

When cracked and split vertically jerk by Hammer or by pulling temporarily hand braked wagon, Yoke forwarded to make the Split Follower angle it self to loosen from pocket to enable lowering on table.

Any other type of Follower broakage will always result in a void to give least difficulty to lower Draft Gear.

INSTRUCTION AND RECOMMENDATIONS FOR SAFE REMOVEL OF STUCK OR DAMAGED DRAFT GEARS

WARNING: Wear safety equipment, including hard hat, safety glasses, Safety shoes, gloves and body protection.

5.1 Where yoke is not broken, the following procedure is recommended for safe removal when the gear is stuck or damaged.

5.1.1 Do not stand or work directly in front of coupler.

5.1.2 First move another car against coupler, forcing follower and draft gear against rear stops. Do not remove the yoke support plate. Securely weld draft gear housing and follower to yoke strap. (See fig. 27)

5.1.3 Torch cut gear housing in spring area to expose coil springs and torch cut each coil of every spring to eliminate the compressive force of springs (see fig. 28)

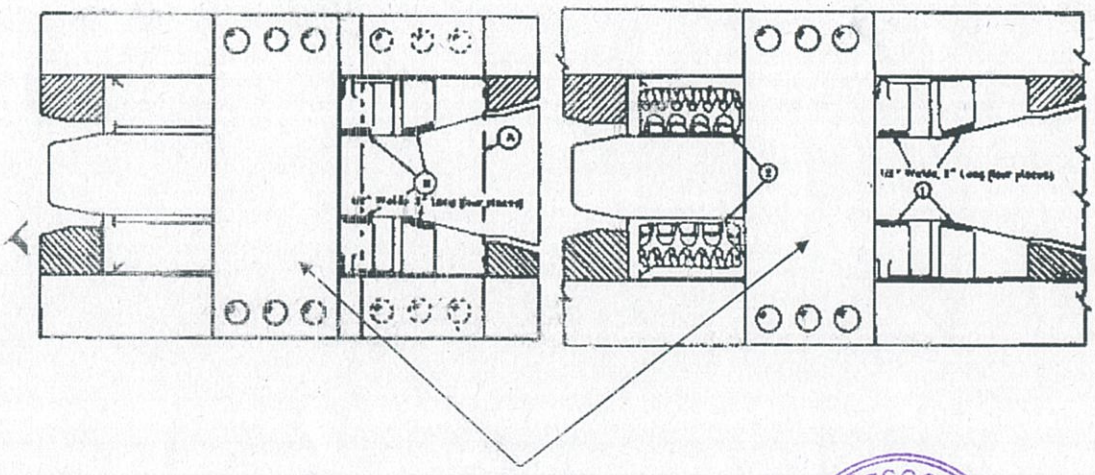
5.1.4 Remove coupler.

5.1.5 Position lift table or other lowering means under the support plate, yoke and draft gear.

5.1.6 Remove rivets or bolts from the yoke support plate.

5.1.7 Slowly lower unit to ground.

5.1.8 Scrap gear, yoke and follower.



Yoke Support Plate

5.2 Where yoke is broken and follower is in place, proper procedure for safe removal of stuck draft gear is as follows:

5.2.1 Do not stand or work directly in front of the coupler.

5.2.2 First, move another car against coupler, forcing follower and draft gear against rear stops. Do not remove the yoke support plate. Securely weld draft gear housing and follower to yoke strap (see fig. 27). If insufficient yoke strap is remaining, add a suitable bar or plate sufficient to weld housing and follower together (see fig. 29).

5.2.3 Torch cut gear housing in spring area to expose coil springs and torch cut each coil of every spring to eliminate the compressive force of springs. (See fig 30).

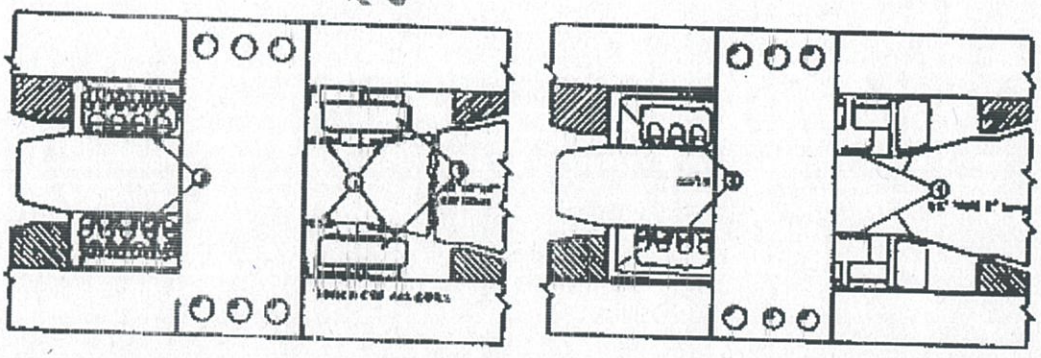
5.2.4 Remove coupler.

5.2.5 Position lift table or other lowering means under the support plate, yoke and draft gear.

5.2.6 Remove rivets or bolts from the yoke support plate.

5.2.7 Slowly lower unit to ground.

5.2.8 Scrap gear, yoke and follower.



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5.3 Where yoke is broken and follower is broken, the recommended procedure for safe removal of stuck draft gear is as follows:

5.3.1 Do not stand or work directly in front of coupler.

5.3.2 First, move another car against coupler, forcing follower and draft gear against rear stops. Do not remove the yoke support plate. Securely weld draft gear housing and follower to yoke strap (see fig 27). Add a suitable bar or plate sufficient to weld housing and follower together (see fig. 29)

Follow steps through of instructions where the yoke is broken.

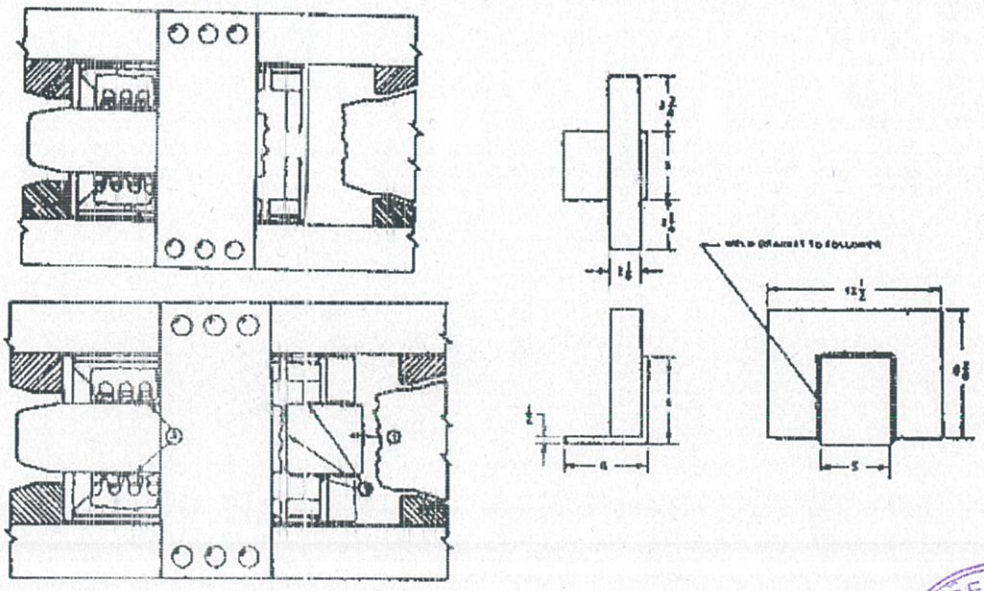
5.4 Where yoke is broken and follower is missing, proper procedure for safe removal of stuck draft gear is as follows:

5.4.1 Do not stand or work directly in front of the coupler.

5.4.2 First, move another car against coupler, forcing the draft gear towards the stops as far as possible.

5.4.3 Remove a section of the yoke strap with the torch to permit installation of a follower and bracket (see fig. 31). For suggested bracket and follower, see fig. 32. IMPORTANT: The follower with the bracket must installed with a lift table or fork truck to eliminate anyone putting their hands near the open end of this stuck draft gear. Once lifted into place, securely weld the bracket to the draft gear housing (see fig. 33)

Follow steps through of instructions where yoke is broken.



Section V

Dismantling the Draft Gear

5. SUMMARISED GUIDE TO DISMANTLE MT 4 FRICTION DRAFT GEAR

5.1 BES/16-134 for proper pressing fixtures.

5.2 A press of 20 tones minimum is required.

5.3 Press down with fixture "D" and insert the two pins.

5.4 Remove movable plate's one side.

5.5 Remove wedge shoe same side.

5.6 Remove movable plates other side.

5.7 Remove wedge shoe same side.

5.8 Turn and remove centre wedge.

5.9 Remove release spring.

5.10 Remove both tapered stationary plates.

5.11 Remove both outer stationary plates.

5.12 Apply fixture "C" and press to remove pins.

5.13 Remove spring seat.

5.14 Remove all coil springs and corner spring seats.

5.15 See figures 10 to 18 for pictorial guidance in pages 10 to 14.

5.16 Reverse the above procedure for assembly.

5.17 See figure 25 for method of application of shorteners.

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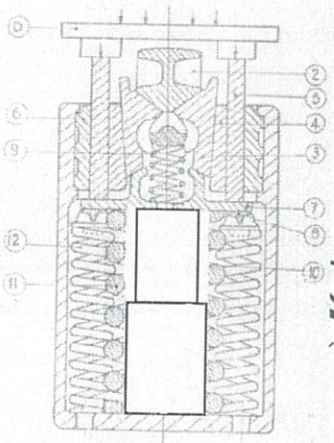
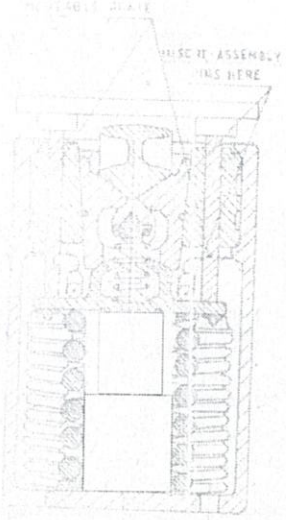
PLACE AND CENTRE THE GEAR UNDER PRESS. APPLY FIXTURE "D" BRIDGING THE MOVABLE PLATES. APPLY PRESSURE THROUGH MOVABLE PLATE ONLY (FIG. 11) FULLY COMPRESS THE GEAR



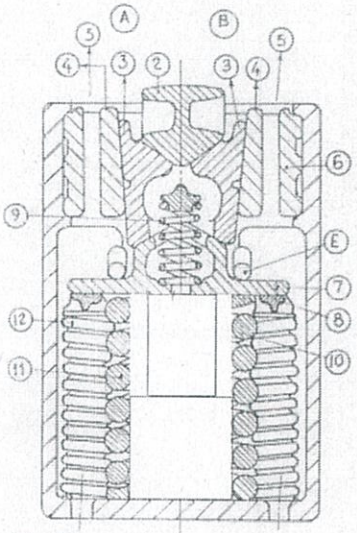
(FIG. 11)



INSERT THE ASSEMBLY PINS THROUGH THE HOLES IN THE HOUSING SO AS TO HOLD THE SPRING SEAT COMPRESSED UNDER THE PINS SUPPORTED AT BOTH WALL OF THE HOUSING (FIG. 12) RELEASE PRESS AND REMOVE FIXTURE.

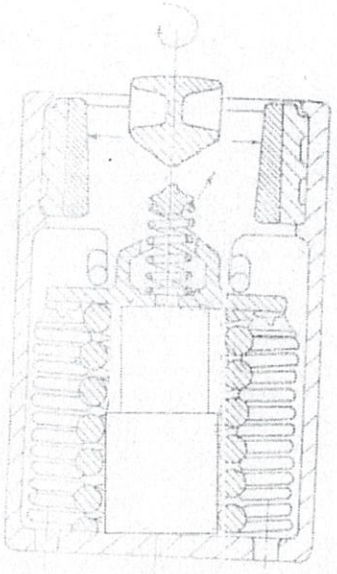
(FIG. 12)

REMOVE MOVABLE PLATE AT ONE SIDE. SLIDE TAPER PLATE TO END STATIONARY PLATE AND REMOVE WEDGE SHOE AT THIS SIDE. SEE (FIGURE 13). REPEAT PROCESS TO REMOVE MOVABLE PLATE AND WEDGE SHOE AT OTHER SIDE ALSO. SUITABLE FORCEPS (TONGS) CAN BE DEVISED BY SHOP IN A MANNER CONVENIENT FOR LIFTING THESE FORGINGS.



(FIG. 13)

MOVE BOTH TAPER STATIONARY PLATES AS FAR OUTSIDE AS POSSIBLE. ROTATE CENTRE WEDGE DIAGONALLY ACROSS OPENING BETWEEN TAPER PLATES AND LIFT THE CENTRE WEDGE OUT TO REMOVE SEE (FIGURE 14).



(FIG. 14)

REMOVE RELEASE SPRING. REMOVE BOTH TAPER STATIONARY PLATES AND BOTH END STATIONARY PLATES. APPLY FIXTURE "C" ON TO SPRING SEAT AND RELEASE PRESS. SEE FIG. 15 AND.

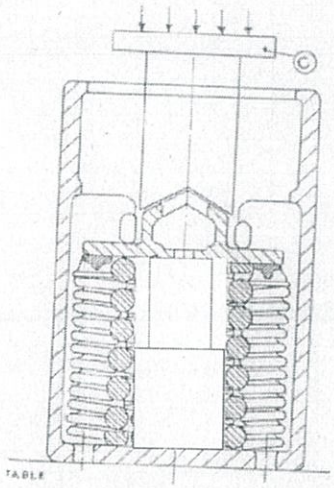


FIG. 15

REMOVE SPRING SEAT. REMOVE INTERMEDIATE AND CENTRE COIL SPRINGS FIG 16

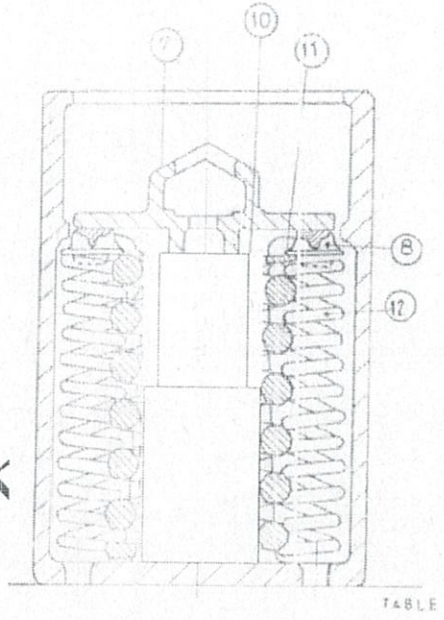


FIG 16

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REMOVE CORNER SPRING SEATS AND CORNER COIL SPRING FIG 17

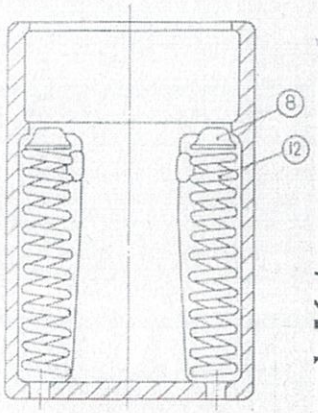

FIG. 17

REMOVE HOUSING FROM TABLE FIG 18

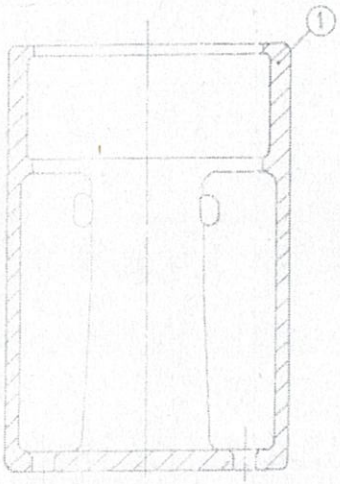

FIG 18

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SECTION VI

INSTRUCTIONS FOR INSPECTION, DISASSEMBLY AND ASSEMBLY OF CRAC, TIANJIN, PRC "M T - 4" DRAFT GEAR FOR RECONDITIONING

6.1 Preliminary Inspection (Visual)

6.1.1 Check for "Stuck" Draft Gears.

(Gears not extended to full length of pocket).

6.1.2 Check for crack in housings.

6.1.3 Check for under minimum length housings.

6.1.4 Draft Gear not showing the above defects is dismantled.

6.2. Dismantling Process and Inspection

6.2.1 Sort out obvious scrap, component parts, i.e. parts which are torch cut, broken excessively worn, etc.

6.2.2 Inspect, with gauges, all springs for minimum free height. Inspect and sort out into groups.

6.2.3. Make two groups of serviceable components and springs and scrapped components and springs.

6.3 Weld Repair Reclamation Process

6.3.1 Sort out and scrap any housing cracked or distorted beyond gage dimension.

6.3.2 Magnaflux housings.

6.3.3 Drill and/or clean shortening plug holes.

6.3.4 Worn areas restored to dimensions by welding and grinding. See para.

6.3.5 Weld repair tags on housing for use.

6.4 Painting

6.4.1 Paint each housing with standard colour and allow to dry.

6.5 Assembly Line

6.5.1 Assemble units using reconditioning parts and new parts when needed.

6.5.2 Check for (7/16") 11.15mm minimum plate clearance.

6.5.3 Store Gears for use.

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Inspections of parts and gauging necessary to insure parts are within acceptable limits.

Housing Gauges – Initial inspection

6.6.1. Housing Re-con Gauge BES-17/019-2
No-Go Gauge to check min – length of housing
6.6.2. Housing Re-con Gauge BES-17/019-1
Go Gauge to check max housing for yoke and still clearance
6.6.3. Housing Re-con Gauge BES-17/019-6
No-Go Gauge to check min. housing wall thickness.
6.6.4. Housing Re-con Bottom Flatness Check.

Housing Weld Repair Gauges
Housing Worn Areas, That may need weld repair.

6.6.5. Re-con Gauge BES-17/019-5
No-Go Gauge to check to Centre wedge stop area.
6.6.6. Re-con Gauge BES-17/019-3
Go No-Go Gauge to check movable plate area.
6.6.7. Re-con Gauge BES-17/019-4&5
Go No-Go Gauge to check on the wedge area.
6.6.8. Housing Bottom Welding Instruction. ***
6.6.9. Centre Wedge Gauging
Gauge BES-17/020-1
6.6.10. Spring Seat Gauging
Gauge BES-17/020-5
6.6.11. Gauging Centre Wedge & Spring Seat for sorting
Gauge BES-17/021-1
6.6.12. Tapered Stationary Plate
Gauge BES-17/020-4
6.6.13. Outer Stationary Plate
Gauge BES-17/020-3
6.6.14. Wedge Shoe
Gauge BES-17/020-2
6.6.15 Gauging Springs.
Conner Coil and Release Gauge.
BES-17/020 - 7 and 8.
6.6.16 Outer Coil
Gauge EES-17/020 - 6
6.6.17 Corner Spring Seat Reclamation
6.6.18 Movable Plate Gauging
Gauge EES-17/020 – 9

*** Please refer fig.5.6.4. Page – if wear is 3.18mm or less housing may be built up by welding at this location. After weld repair hand grind to original cast surface for flatness level within ±0.8mm when checked by a straight edge.

6.7 After reclaiming the parts that are possible to be reclaimed the Reconditioned Draft Gear can be assembled again for use.

6.8 FOR ASSEMBLY REVERSE THE PROCEDURE IN PAGES 10 to 14.

6.9 Capacity Testing of Reconditioned Draft Gear.

6.9.1 The capacity of Draft Gear shall be determined in a test machine using a freely falling 27,000 lb tup to compress and release the Draft Gear.

Testing Procedure Shall be:

Draft Gear shall be cycled between compression and release as necessary to achieve its capacity. The total fall of the tup to be used in calculating the capacity shall be the sum of the free fall of the tup and the travel of the draft gear before recoil.

A capacity of 36,000 ft. lb. shall be achieved.

exercised while handling the equipment and Draft Gear since high pre-compression pressures are involved.

9.1.6 If an abnormal condition is present not certain of the condition of the Gear, do not proceed, but contact the Draft Gear manufacturer for further instructions. Extreme caution is necessary when working with Stuck Draft Gears because of the internal release forces of the springs. Any vibration could cause to suddenly release and forcibly propel friction components or tools in several directions.

9.2 HANDLING STUCK DRAFT GEAR FOR REUSE.

9.2.1 In case it is desired not to gas cut and scrap stuck draft gear as above the following procedures may be adopted.

9.2.2 Place the stuck Draft Gear in front of a wall or 50 to 75 mm facing another working Draft Gear with Follower. Force compressed air to clean any dust and mud from Draft Gear

9.2.3 Give sledgehammer blows with 8-10 kg hammer on the top front side fronts, edges and rear wall. The inside components will be forced out. Reexamine this Draft Gear for any broken or unserviceable part. Reuse or reclaim the Draft Gear for use.

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SECTION IX

SAFETY PRECAUTIONS

9.1. Safety Precautions

Caution: To avoid personal injury, care must be exercised in the following areas-

9.1.1 When working on or with Draft Gear, personal protection for head, eyes, hands and feet must be worn to protect from possible injury.

9.1.2 A visual inspection should always be made of the Draft Gear system to determine whether the Draft Gear is in a safe (fully released) condition or if it is in an unsafe (stuck gear) condition (see instruction and recommendations on inspection of Draft Gear on para to determine whether Draft Gear is fully released). "Stuck Gear" is a term used to describe a condition where friction or unseen broken parts prevent the components of the Friction Clutch from returning to their normal fully released position and filling out the draft pocket. A slight gap could also occur with a fully released Draft Gear, in an enlarged pocket, however, any gap in excess of (1/4") 6.38mm should be viewed the great caution. A "Stuck Gear" is dangerous because the slightest vibration could cause the Gear to suddenly release, forcibly propelling the friction components and Follower Plate outward.

THE STUCK GEAR CONDITION MAY BE HAZARDOUS WHEN THE GEAR HAS BEEN REMOVED FROM THE CAR AND YOKE.

9.1.3 A "Stuck" Draft Gear that has already been removed from the car and Yoke can be deactivated as described in para 9.2, however, it is advisable to place a heavy object (such as another Draft Gear) closely in front of the open end of the Gear before beginning torch-cutting procedures as it may be possible for the Gear to release during the torch-cutting process, which can forcibly eject some of the parts from the open end. When torch cutting the housing and springs, always assume a safe position at either side of the Gear. Keep away from the open end of the Gear and carefully place gear in scrap.

9.1.4 The Yoke Support Plate should support the Draft Gear and Yoke combination until Such time as the Draft Gear and Yoke combination is ready to be lowered from the Draft Gear Pocket.

9.1.5 CRAC, Tianjin, PRC Hydrojack II device in fig 26 is recommended and hose and the spring load in the Draft Gear itself, extreme caution should be taken when handling equipment. Alternatively the standard Indian Railway Screw Method can be employed. In either case, caution has to be

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SECTION VIII

8. MT – 4 DRAFT GEAR HANDLING STORAGE AND TRANSPORTATION

8.1 M T - 4 Draft Gear Handling and Storage

M T - 4 Draft Gear are supplied pre-shortened for installation when new. The pre-shorteners shear in the initial impacts after which the Draft Gear occupies the full length of the pocket. When lifting single Draft Gear lift by hooking on Assembly hole and handle Draft Gear Vertical. Do not Drop Draft Gear from a height with Friction Parts Down. This can shear or Bend the shorteners giving temporary problems in wagon assembly. In such cases apply pre-shortener once again before assembly .in wagon.

The friction Parts are always kept clean when assembled. It is advisable not to store the draft gear in open for a very long period on muddy ground. The mud and water entering into the Draft Gear can make the Draft Gear clog and stuck during operation. Keep the Draft Gear Vertical preferably above ground or on the raised support inside shed. Before application into Wagon pocket clean inside and outside by forcing Compressed Air to take out Dust and Mud. Assembly holes on housing sides and Drain Holes on housing Bottom are provided for this purpose.

8.2 INSTRUCTION ON SAFE HANDLING OF DRAFT GEARS

When a Draft Gear with Follower Plate is installed into the pocket of a freight Car, it has ample initial spring load to provide a tight fit into the Draft Gear Pocket (see spring forces, para.1.1) when removing the Draft Gear from the Freight Car pocket, it is necessary to compress the Draft Gear approximately (1/4") 6.35 mm in order to clear the front and rear stops so that the Draft Gear and Yoke Assembly may be free to be lowered from the car. A CRAC, Tianjin, PRC Company Hydrojack II device is recommended to compress the Draft Gear for removal. Alternatively, the Indian Railway Standard Screw can be used.

SECTION VII

Draft Gear Pre-shortening, Assembly in Wagon Pocket and Pocket Maintenance

7. Draft Gear Pocket Maintenance:

M T - 4 Draft Gear are shipped from our Facility pre-shortened for easy installation into the Draft Gear pocket of wagon. Pre-shortners are used which shear upon initial impact and the Draft Gear will then lengthen to fill the Draft Gear pocket see fig. 25 next page

When the Draft Gear pocket length is within its limits the lugs of the centre wedge will not contact the rib of the Housing and would appear as fig.23. When the Draft Gear Pocket lengthens to (24.7/8") 631.8mm the retaining lugs of the Centre Wedge will contact the Housing Ribs as seen and Fig.24. In this undesirable condition, the lugs of the center wedge and other components of the friction package can be broken, which in turn may be the cause of a Draft Gear becoming stuck. Long Draft Gear pockets can result in damage to the striker face of the car or to the coupler. To correct this condition, it is necessary that shims be welded to the rear lugs of the Draft Gear pockets exceeding (24.3/4") 628.65mm to restore the pocket dimension to (24.9/16") 623.88mm or (24.5/8") 625.5mm.

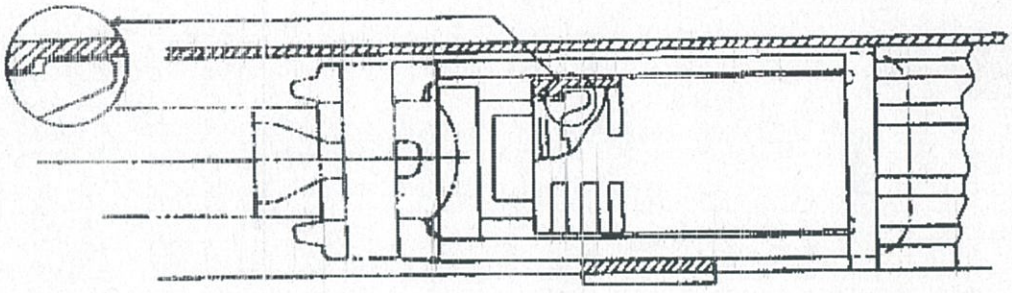

fig.

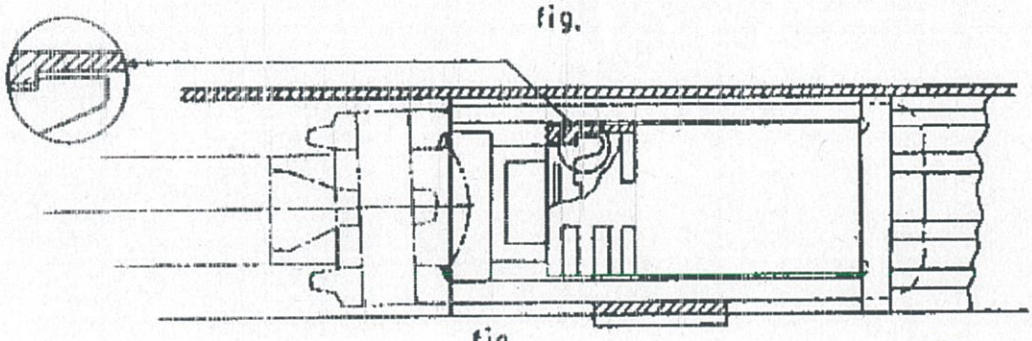

fig.