STARTER, NO 3, MK 1, FV 546101 AND MK 2, FV 546165

TECHNICAL HANDBOOK - FIELD AND BASE REPAIRS

Errata

Note: This Page 0, Issue 4, supersedes Page 0, Issue 3. Redundant items removed.

The following amendments are to be made to this regulation;-

1. a. Page 2, Issue 2, Sub-para 3.j.

After 'field coils',

Add: 'Check that pole shoes are marked both radially and longitudinally, to ensure that they are refitted in their exact former positions.'

b. Page 3, Issue 1, Para 8

Insert new sub-para:-

'd. Lightly grease clutch plates with grease XG 271 before re-assembly.'

2. a. Page 4, Issue 1, Para 14.b.

Delete existing sub-para.

Insert: 'Remove and discard lubricating wick and pads. Remove any swarf in reservoir and housing and fit new pads and wick. To obtain maximum absorption new pads and wicks should be soaked in Oil OM-13 for at least 24 hours before use.'

1x3.

2

POWER
P 324/11

ELECTRICAL AND MECHANICAL
ENGINEERING REGULATIONS
(By Command of the Defence Council)

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STARTER, NO 3, MK 1, FV 546101 AND MK 2, FV 546165

TECHNICAL HANDBOOK - FIELD AND BASE REPAIRS

Errata

Note: This Page 0, Issue 5, supersedes Page 0, Issue 4. Para 3 has been added.

Amend as follows:

1. a. Page 2, Issue 2, sub para 3.j.

After 'field coils'

Add: 'Check that pole shoes are marked both radially and longitudinally, to ensure that they are refitted in their exact former positions.'

b. Page 3, Issue 1, para 8

Insert new sub para:

'd. Lightly grease clutch plates with grease XG 271 before re-assembly.'

2. Page 4, Issue 1, para 14.b.

Delete existing sub para.

Insert: 'Remove and discard lubricating wick and pads. Remove any swarf in reservoir and housing and fit new pads and wick. To obtain maximum absorption new pads and wicks should be soaked in oil OM 13 for at least 24 hours before use.'

3. Page 5 Issue 2, para 16.b.

a. Add after 'coil resistance typical values:-' No 3 Mk 1

b. After 'Auxiliary series winding'

Delete: '1.12
Insert: '0.50'

c. After 'Shunt winding'

Delete: '2.4
Insert: '1.12

STARTER, NO 3, MK 1, FV 546101 AND MK 2, FV 546165

TECHNICAL HANDBOOK - FIELD AND BASE REPAIRS

SUBJECT INDEX

Note: These Pages 1-2, supersede Pages 1-2, Issue 1; dated 21 Nov 67. Heading and SUBJECT INDEX has been amended.

LIST OF FIGURES

GENERAL

1. This regulation details the procedure for carrying out field and base repairs. The stripping sequence should be closely followed. General information on overhaul and testing is contained in Pwr A 311 and A 450. Special tools are listed in para 17 and illustrated in Figure 11.

ASSOCIATED PUBLICATIONS

2. Pwr P 322/11 Technical Description Starter, No 3, Mk 1, FV 546101 & Mk 2, FV 546165
Pwr A 311 Testing of armatures, d.c. dynamos and starters.
Pwr A 450 Rotating electrical machines a.c. and d.c.
Wksp N 251 Painting vehicles, equipment and stores.

STRIPPING AND REASSEMBLING

Dismantling, see Fig 1

3. Proceeed as follows and remove:-

a. Screws, nuts and washers securing CE cover and withdraw cover carefully to avoid damage to seal.

b. Brush connections, withdraw brushes and retain in pairs.

c. Plunger nut, using special tool LV6/MT2 78666 (Fig 11).

d. DE shield securing screws and washers, free shield and withdraw armature and shield together.

e. Connecting straps between main terminals negative brush-gear arm and solenoid fixed contact.

f. Connections to solenoid switch, solenoid coil leads to 'A' pin of the 3-pin plug and thermal trip. Withdraw switch complete.

g. All connections to brush-gear.

h. Screws securing CE shield, break joint carefully and separate yoke and shield.

j. Pole shoe screws and field coils. CHECK THAT POLE SHOES ARE MARKED BOTH RADIALLY AND LONGITUDINALLY, TO ENSURE THAT THEY ARE REFITTED IN THEIR EXACT FORMER POSITIONS

Note: Pole shoes must only be removed if coil renewal is necessary.

Armature assembly

4. a. Secure armature in a vice or clamp; remove pinion securing and lock nuts and withdraw DE shield and pinion sleeve together.

Note: Do not separate sleeve and shield unless renewal of pinion, bearing and/or oil seal is necessary.

b. Remove plunger stop, using the key shown in Fig 10, take out plunger and spring assembly.

c. Withdraw pinion spring, clutch and pressure plates, compensating washers, and backing plates from clutch housing.

CE shield and brushgear

5. a. Remove screws securing brush-gear plates to CE shield, ensure that shaped insulating washers and bushes are not damaged, take off brush-gear plates.

b. Thermal trip should only be removed if faulty.

6. Assemble in reverse order and note the following points:-

a. Before refitting external plunger nut and washer, ensure that slot in washer is correctly located over peg in CE bearing pin.

b. Thermal trip is located on underside of one arm of negative brush-gear plate; when securing brush leads to the arm, ensure that securing screw does not protrude and damage the trip.

c. Apply sealing compound H1/8030-99-220-2110 to mating faces of CE and DE shields before assembly to yoke.

d. Renew or anneal sealing washers LV6/MT4 5305-99-804-1017 to DE shield securing screws.

e. Ensure sealing rings (securing bolts) and gasket are serviceable before refitting CE cover.

Pinion

7. Proceed as follows:-

a. Withdraw pinion from DE shield.

b. Examine the spring and neoprene sealing ring for damage. With spring compressed to 0.65 inches, pressure must be 6.2 lb.

c. New pinion must be free from burrs and checked with inner race for smoothness of action.

d. Re-pack inside of pinion sleeve with XG 271.

e. To assist in fitting pinion to DE shield, the following precautions must be taken:-

(1) Gap between the sleeve bearing surface and square thread to be built up to sleeve diameter (using strips of tape or other suitable material), this will assist in feeding the sleeve through the oil seal into the bearing and prevent the lips of the oil seal dropping into the gap. Tape can be removed as sleeve enters bearing.

(2) Hold felt lubricating pad below bearing surface as pinion sleeve enters bearing.

Clutch, see Fig 2

8. Before assembling check the following:-

a. Initial pressure springs have a free length of 0.312 in.

b. Springs seat correctly in clutch race with largest diameter in ring recess.

c. Clutch and pressure plates are free of cracks.

d. LIGHTLY GREASE CLUTCH PLATES WITH GREASE XG271 BEFORE RE-ASSEMBLY.

9. Assemble clutch in the following order:-

Backing plates, compensating washers, bronze, and steel plates alternatively.

10. Special tool LV6/MT2 78672 must be used if removal and replacement of clutch housing is necessary (Fig 4).

11. Adjust and test clutch as follows:-

a. Secure armature in a clamp or vice.

b. Assemble pinion and sleeve assembly to armature shaft and tighten retaining nut.

c. Mount special tool, LV6/MT2 78671 (Fig 3) on pinion. Check clutch for slip at 120-140 lbs ft. Slip clutch at least 10 times and finally adjust to slip at 100 - 120 lbs ft by interposing or removing compensating washers as required.

Solenoid switch, see Fig 5

12. During dismantling ensure trigger spring does not fly out after removing trigger catch. If contact refacing is necessary not more than 1/64 in. of metal should be removed. Readjust air gaps to tolerances shown.

13. Test data:-

a. Force required to overcome return spring: 75 - 85 ozs.

b. Force required to overcome total spring pressure: 25 - 29 lb.

c. Force required to overcome trigger spring applied at tripping face; switch in 'OFF' position: 7.5 - 10.5 ozs.

d. Switch must operate on both contacts at 15V max.

e. Apply a test of short duration at twice normal voltage to ensure correct operation of trigger catch.

f. Typical current consumption at normal voltage is 3.2 - 4.0A and the hold-on current 1.6 - 2.0A.

g. Outer case of thermal trip is clamped to brushgear plate arm and is live to one of the trip connections; ensure trip is not short circuited by an incorrect connection.

h. Trip which is sealed and non-adjustable can if suspected of faulty operation be given the following functional test:-

(1) Pass a current of approximately 8A through trip, allow a warming up period, trip should cut out at approximately 44°C (case temperature).

(2) Continue test until case temperature stabilises (approximately 55°C); at this point trip should make and break at about 2 second intervals. Vehicle electric light bulbs provide a suitable load and visual indication.

DE bearing and oil seal, see Fig 6

14. a. Take out DE shield filler plug, and spring. Using mandrel (Fig 9) press out bearing [illegible] that lubricating wick and

2. a. Page 4, Issue 1, Para 14.b.

Delete existing sub-para.

Insert: 'Remove and discard lubricating wick and pads. Remove any swarf in reservoir and housing and fit new pads and wick. To obtain maximum absorption new pads and wicks should be soaked in Oil OM-13 for at least 24 hours before use.'

14
B.

Note: These Pages 5-6, Issue 3, supersede Pages 5-6, Issue 2, dated Jul 76. Paras 14.e. and 16.b. have been amended.

c. Mount new bearing on mandrel with arrow pointing away (aperture furthest) from mandrel cap. Insert larger end of mandrel into DE shield from the outside. Before pressing bearing into housing ensure aperture is in line with filler plug hole. Press bearing in from outside of DE shield until bearing is in line with inner face of bearing housing.

d. Remove mandrel, ensuring bearing is correctly positioned in relation to aperture in reservoir. To prevent ingress of swarf mask aperture with a shaped fibre piece 1/32 in. thick.

e. Using face plate and adaptor plate (Figs 7 and 8), mount DE shield in a lathe, and bore bearing to a diameter of 1.379-1.380 in. Face off the outer end of the bearing only. If the inner end of this bearing is machined this can result in oil leaks.

f. Fit a new oil seal using mandrel and washer (Fig 6) to press it in. Recess of shield and face of seal should be smeared with sealing compound H1/8030-99-220-2370 before fitting.

g. Remove masking piece (sub para d); refill reservoir with oil OMD-75 and allow 15 minutes for absorption; fit spring and filler plug, and remove any surplus oil from inside of shield. Reservoir should be topped up before starter is fitted to engine or returned to stores.

CE bearing

15. a. Remove plunger assembly, and trip plate.

b. To remove old bushes tap a 7/8 inch thread and jack out.

c. New bushes are oil-less and must be soaked in oil for 24 hours prior to use. Care must be taken when pressing bushes in; they are manufactured of sintered material.

d. Refit trip plate and lock screws by swaging; refit plunger and spring assy.

TESTS

Test data

16. a. Brushes and springs:-

Brush spring pressure:	32 - 40 oz
Minimum brush length:	0.5 in.

b. Coil resistance, typical values for No 3 Mk 1:-

Auxiliary series winding:	0.50 ohms
Shunt winding:	1.12 ohms
Solenoid switch:	6.5 ohms

c. Light running test:-

Voltage	Current	Speed
23.5V	150 - 200A	3,600 rev/min

d. Lock torque test:-

Voltage	Current	Torque
8.2V	1880 - 1980A	90 lbf ft

The above figures relate to a battery of 194 Ah capacity.

e. Running torque:-

Voltage	Current	Torque	Speed
16.8V	920 - 980A	35 lbf ft	1,750 rev/min

f. Engagement test 1st contact:-

Voltage	Current	Speed	Armature pressure (initial)
24 V	120A	400-600 rev/min	40 lbf

g. Seal test:-

Using an 'Outfit 'A' Seal testing', Z4/WC 52765 proceed as follows:-

(1) Remove blanking plug from CE cover.

(2) With a suitable adaptor connect up pump and raise pressure to 6 lbf/in^2; if pressure falls to less than 5.75 lbf/in^2 after 15 minutes, check for location of leaks by immersing in water.

SPECIAL TOOLS

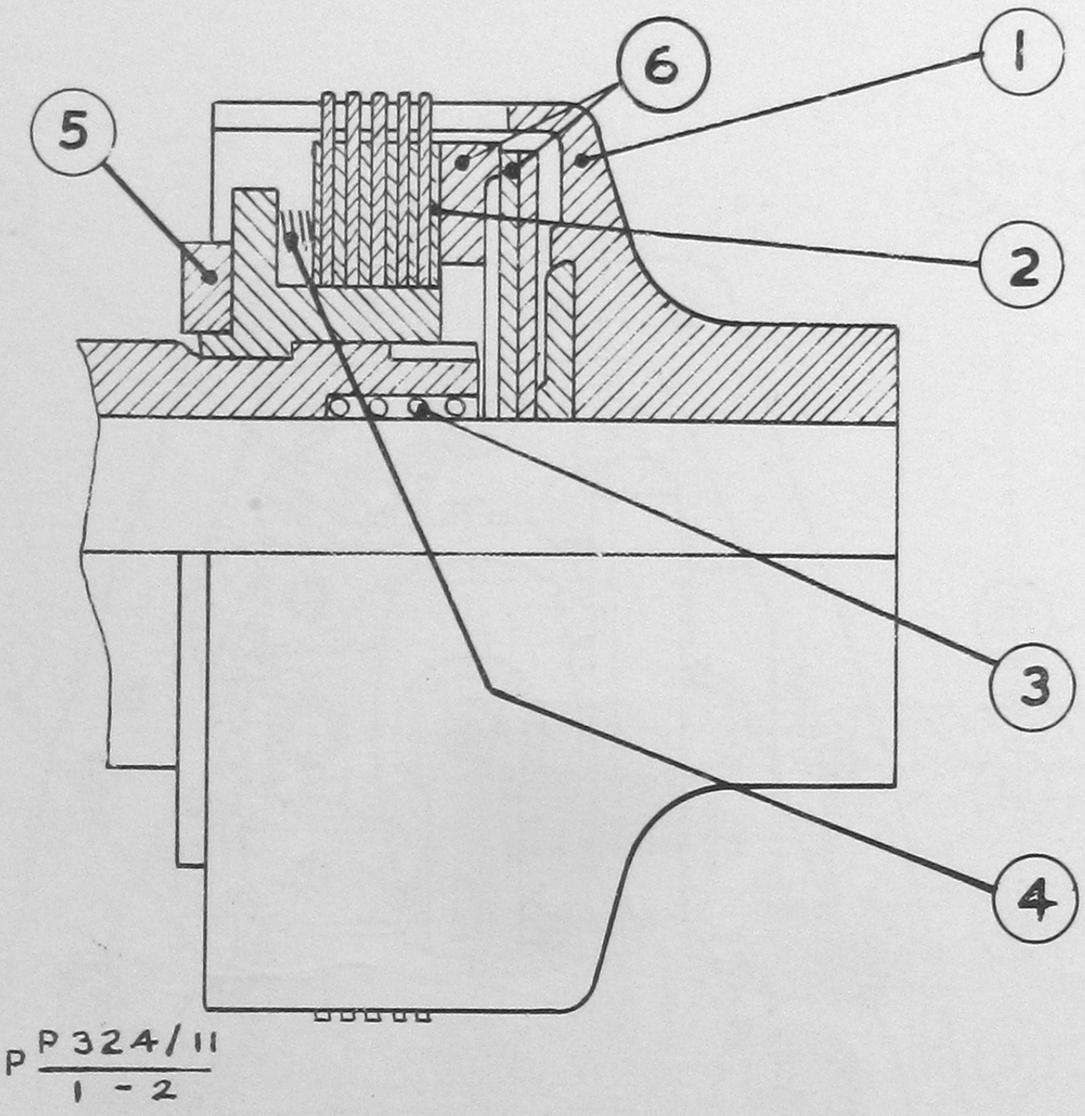
17	LV6/MT2	78671	Bar, torque, clutch testing
	LV6/MT2	78666	Key for plunger nut
	LV6/MT2	78674	Face plate, rebushing, end shields
	LV6/MT2	78673	Jig, pressing, clutch housing

Locally manufactured tools

18 Adaptor plate
Mandrel and seal plate
Key for plunger stop

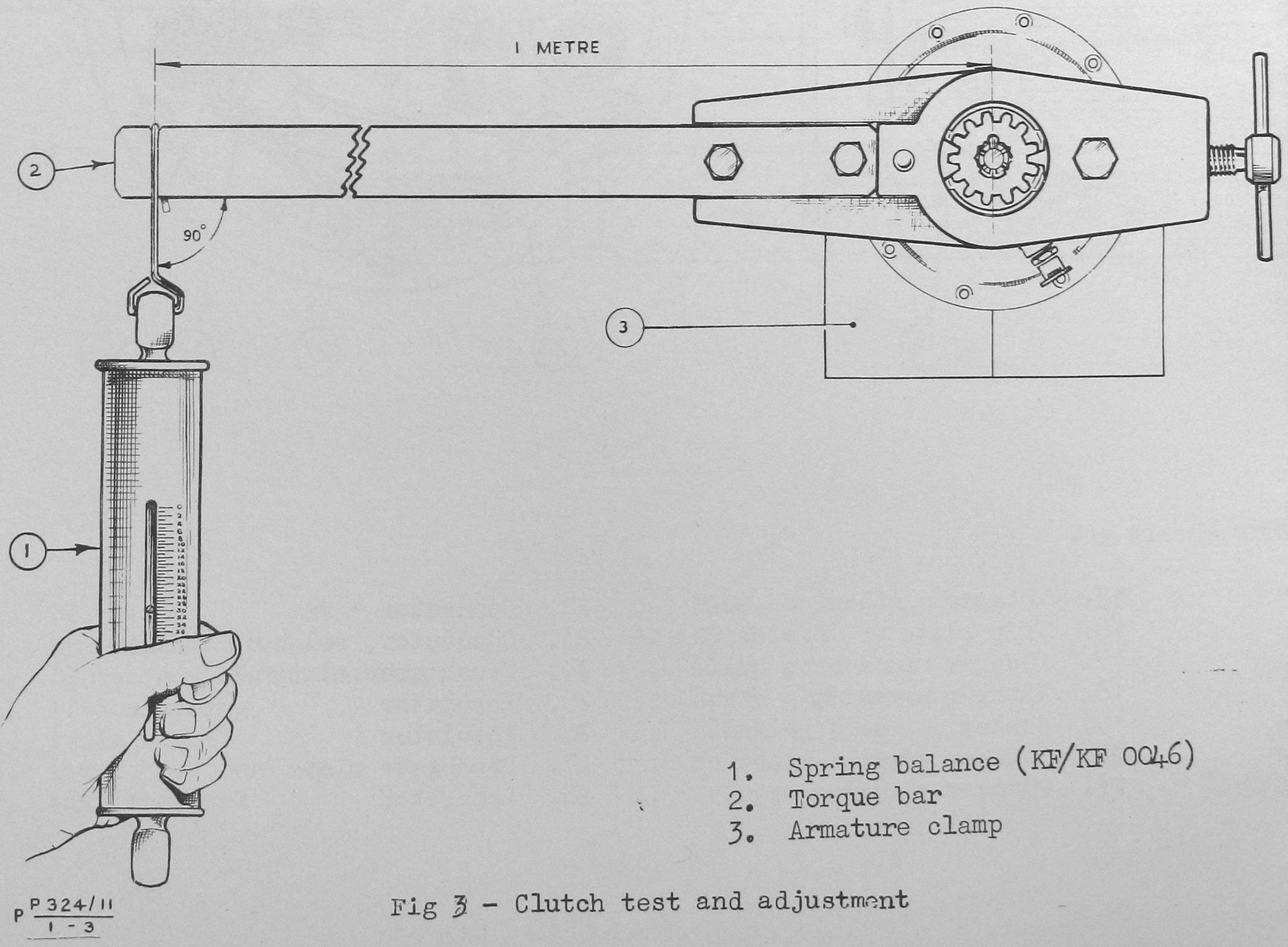
PAINTING

19 Painting must be carried out in accordance with Wksp G 500.



1. Clutch housing
2. Compensating washers
3. Pinion spring
4. Initial pressure springs
5. Clutch race and ring
6. Backing plates

Fig 2 - Clutch assembly



1. Spring balance (KF/KF 0046)
2. Torque bar
3. Armature clamp

Fig 3 - Clutch test and adjustment

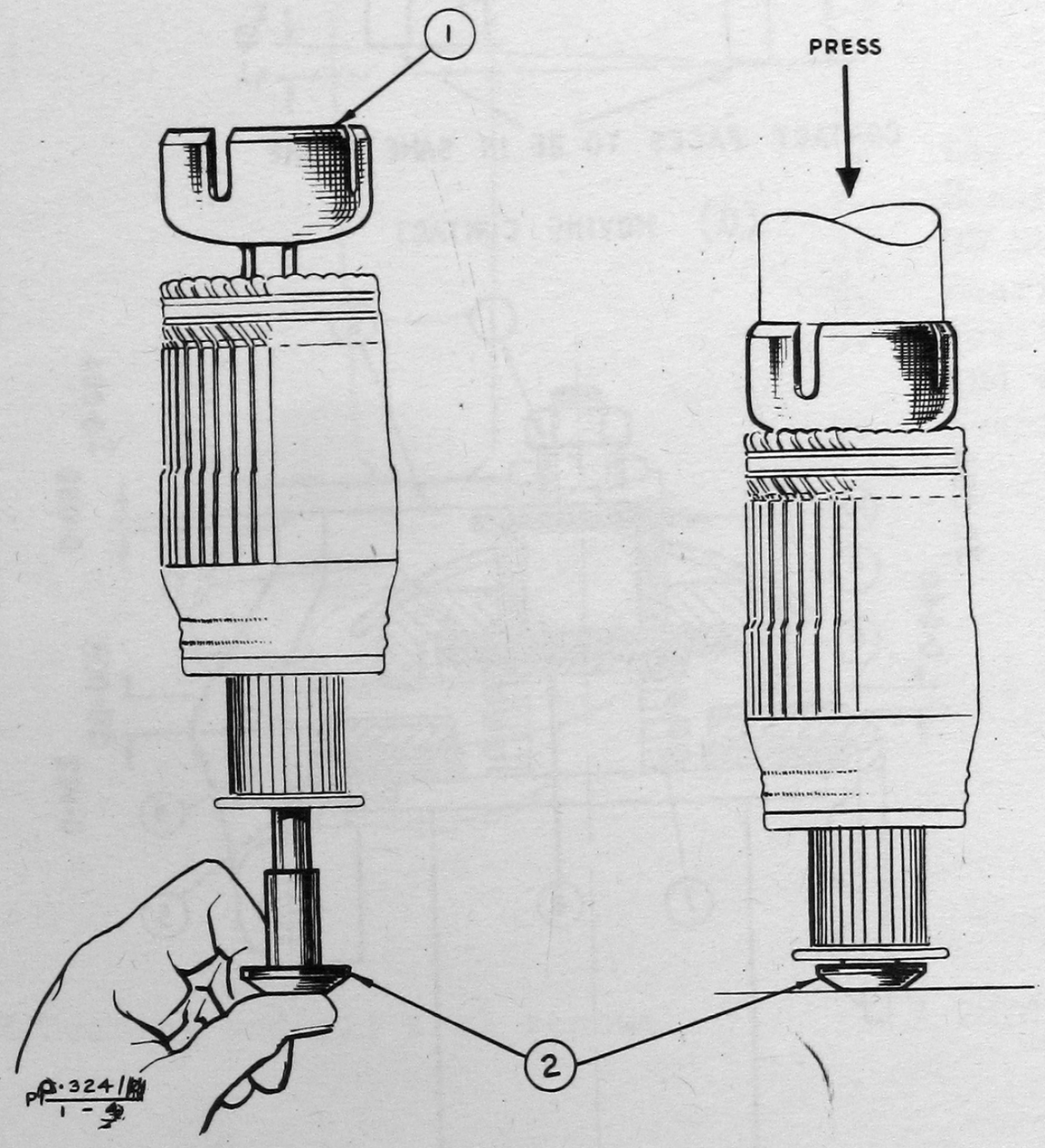


Fig 4 - Renewal of clutch housing

1. Clutch housing
2. Jig, pressing, clutch housing

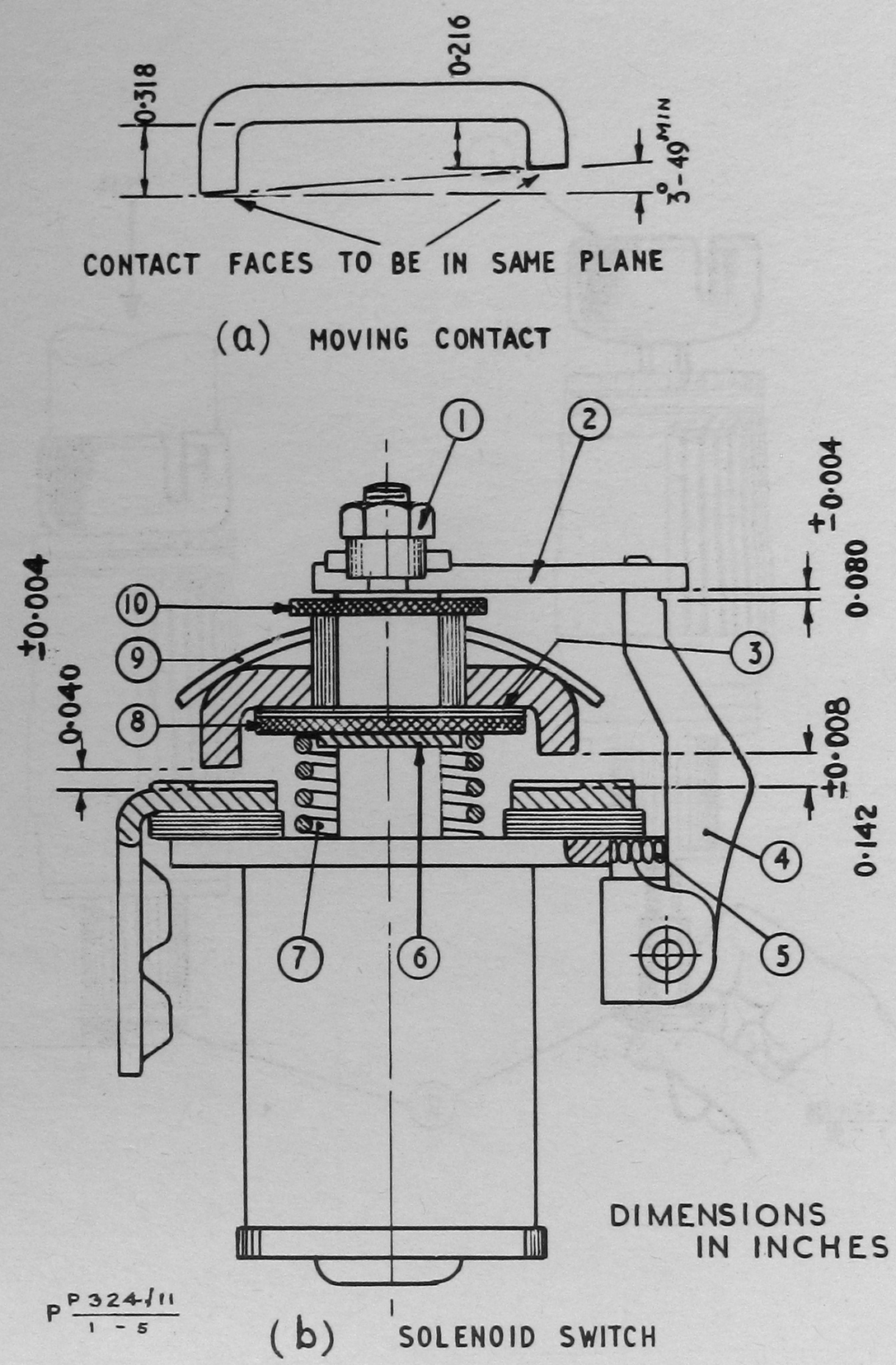
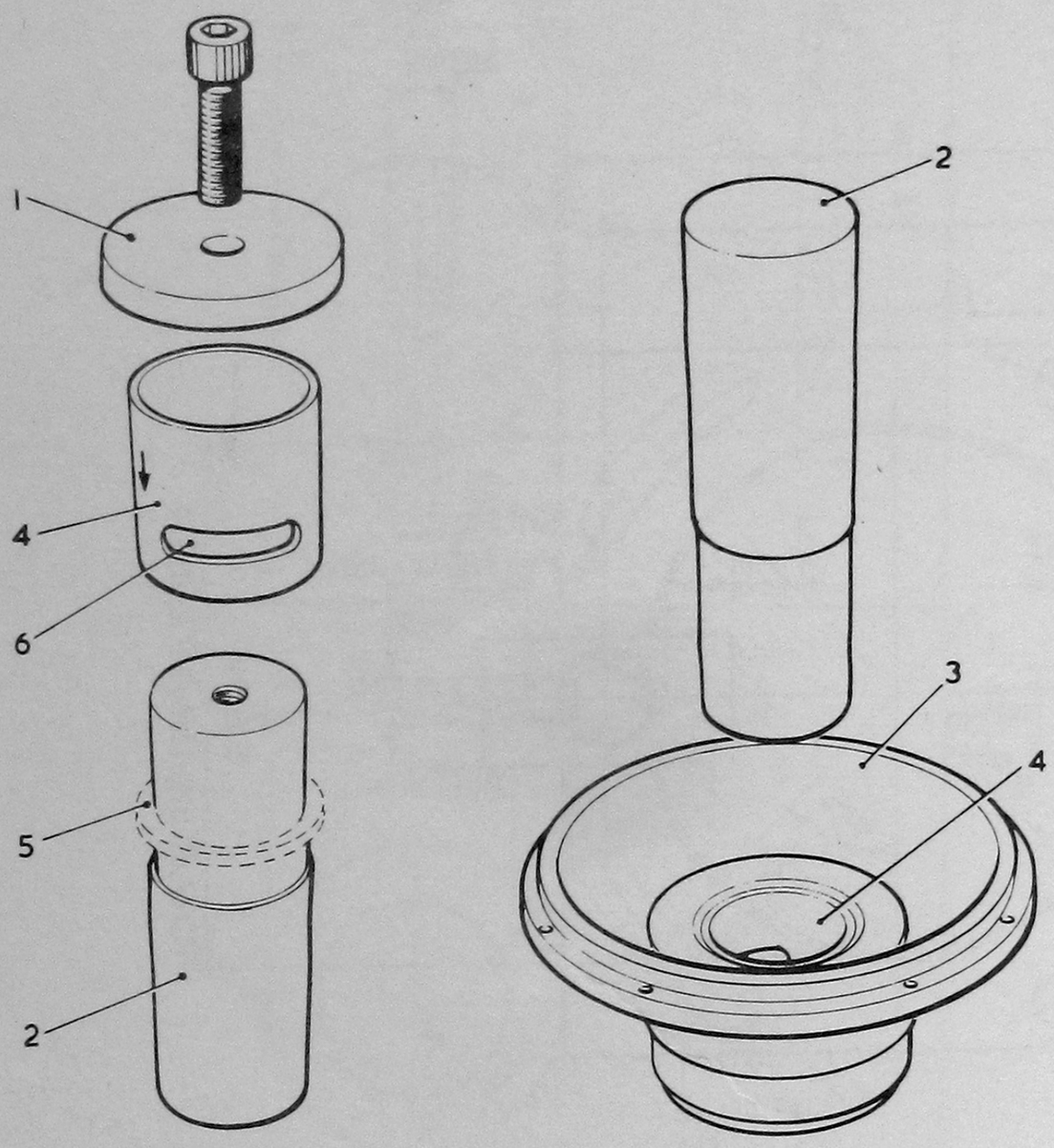


Fig 5 - Solenoid switch, contact adjustment

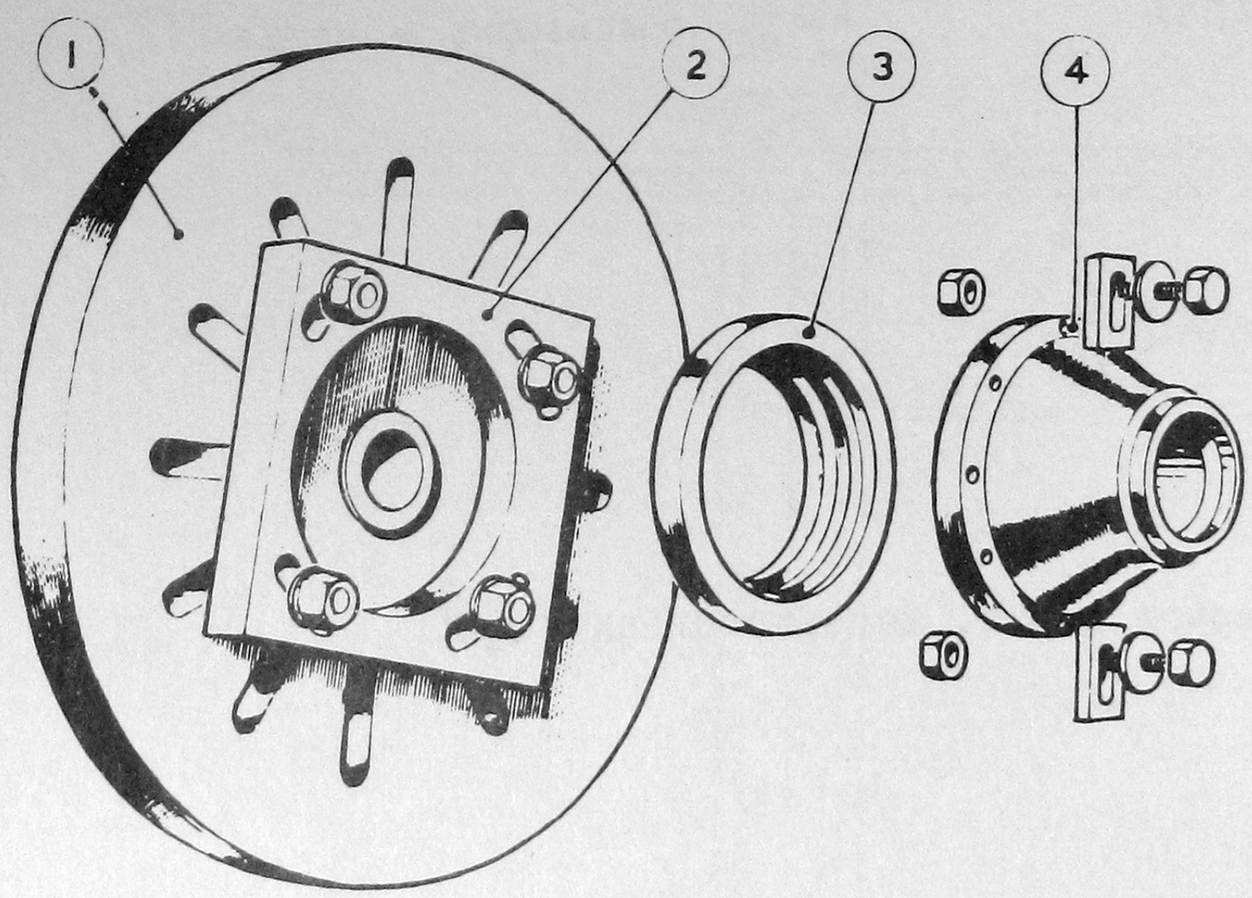
1. Bridge piece securing nut
2. Trigger catch
3. Adjusting washers
4. Trigger
5. Trigger spring
6. Return spring locating washer
7. Return spring
8. Plunger and spring seating washer
9. Flat spring
10. Insulating bush

Note: These Pages 11-12, Issue 2, supersede Pages 11-12, Issue 1. Fig 6 revised.



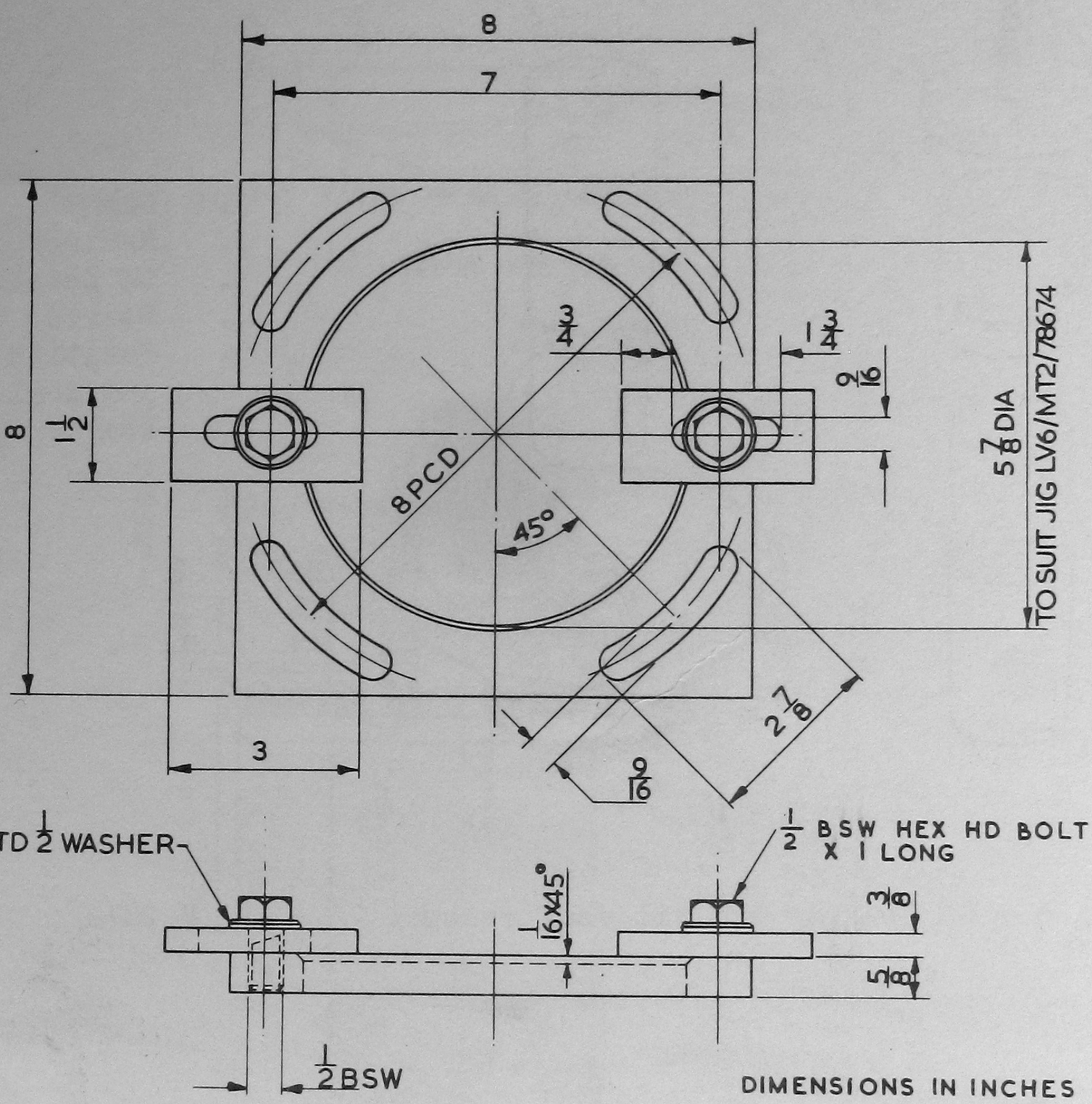
1. Cap
2. Mandrel
3. DE Shield
4. Bearing bush
5. Position of seal plate and seal
6. Bearing bush aperture

Fig 6 - DE bearing and oil seal renewal V 2870/1



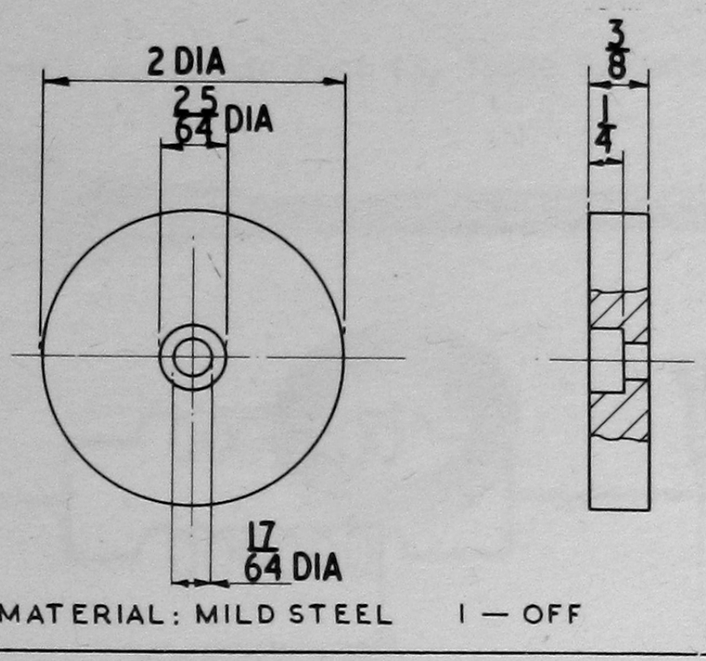
1. Lathe faceplate
2. Adaptor plate
3. Faceplate
4. DE shield

Fig 7 - Boring DE bearing

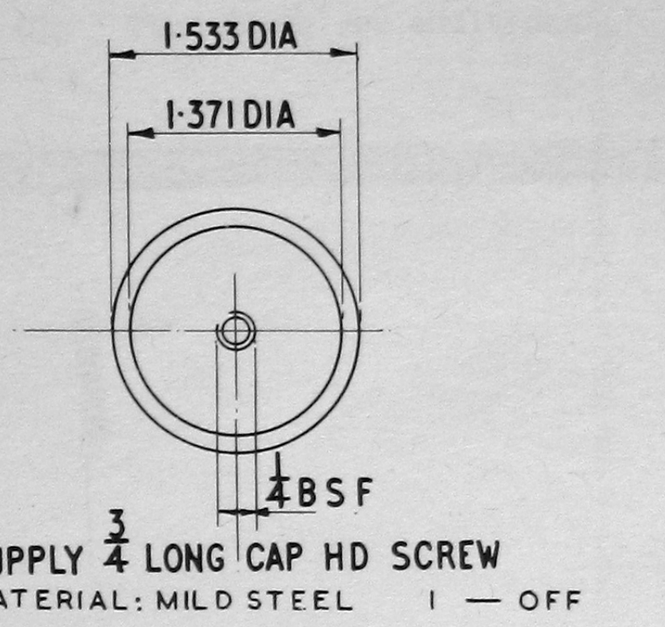


DIMENSIONS IN INCHES

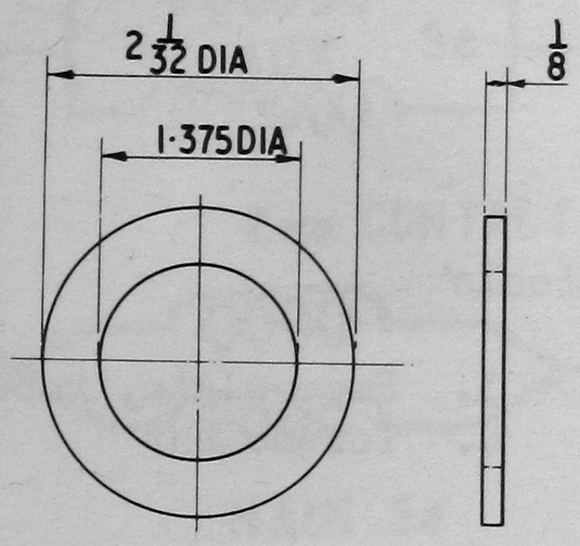
Fig 8 - Adaptor plate, manufacturing detail



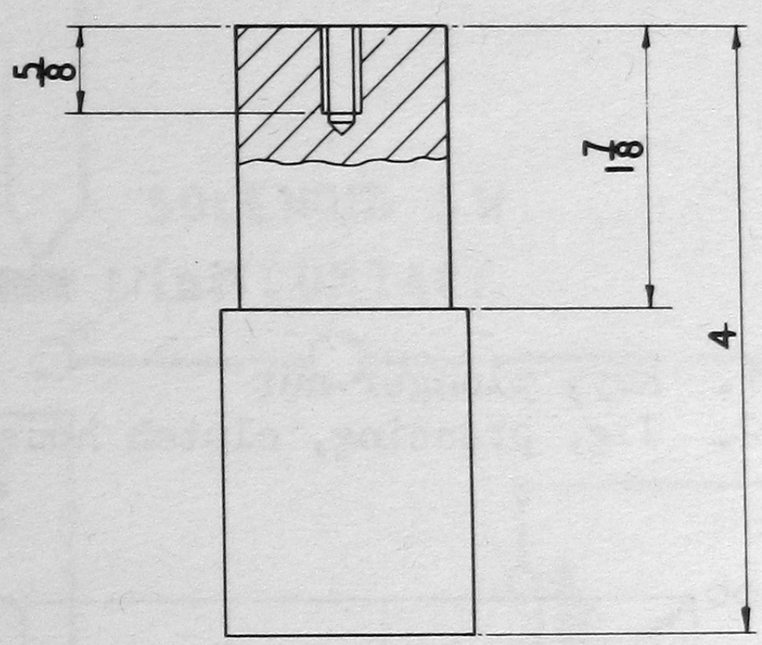
MATERIAL: MILD STEEL 1 — OFF



3/4 LONG CAP HD SCREW
MATERIAL: MILD STEEL 1 — OFF



MATERIAL: MILD STEEL 1 — OFF



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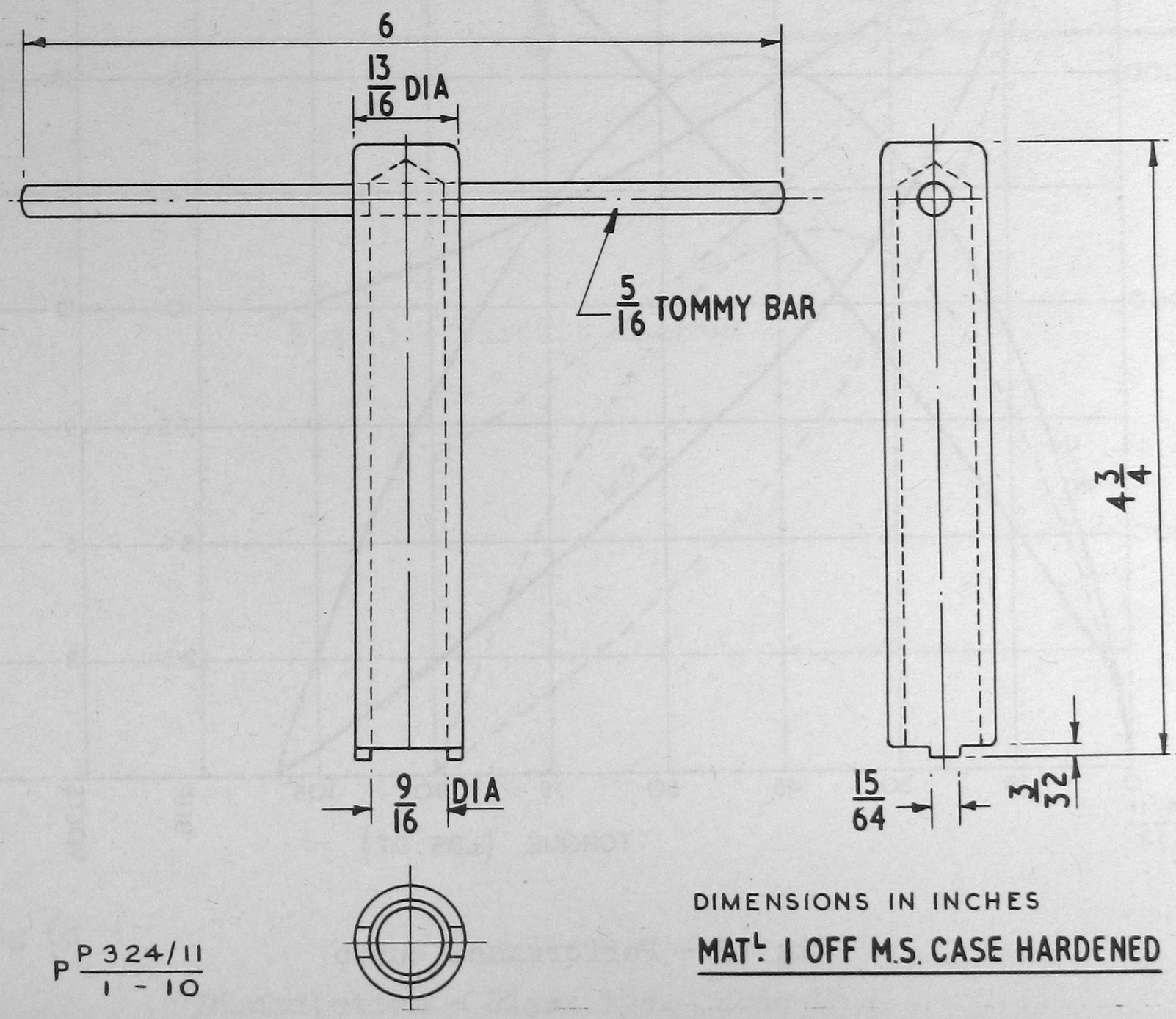
DIMENSIONS IN INCHES

Fig 9 - Mandrel and seal plate, manufacturing detail



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DIMENSIONS IN INCHES

MAT'L 1 OFF M.S. CASE HARDENED

Fig 10 - Plunder stop key, manufacturing details

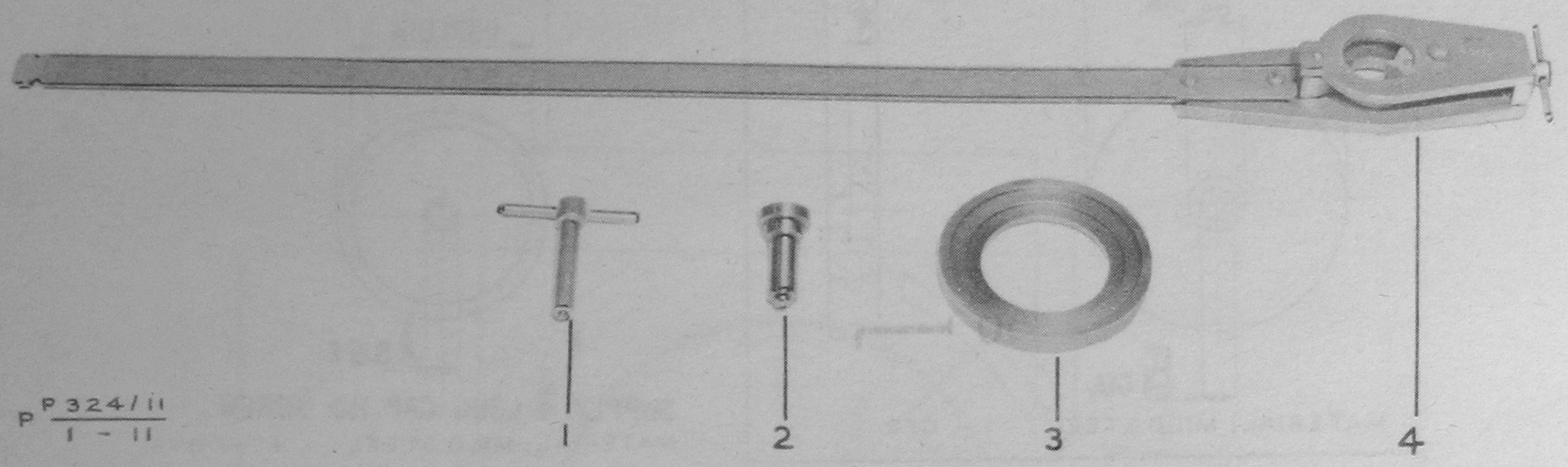

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Fig 11 - Special tools

1. Key, plunger nut
2. Jig, pressing, clutch housing
3. Face plate, rebushing
4. Torque bar

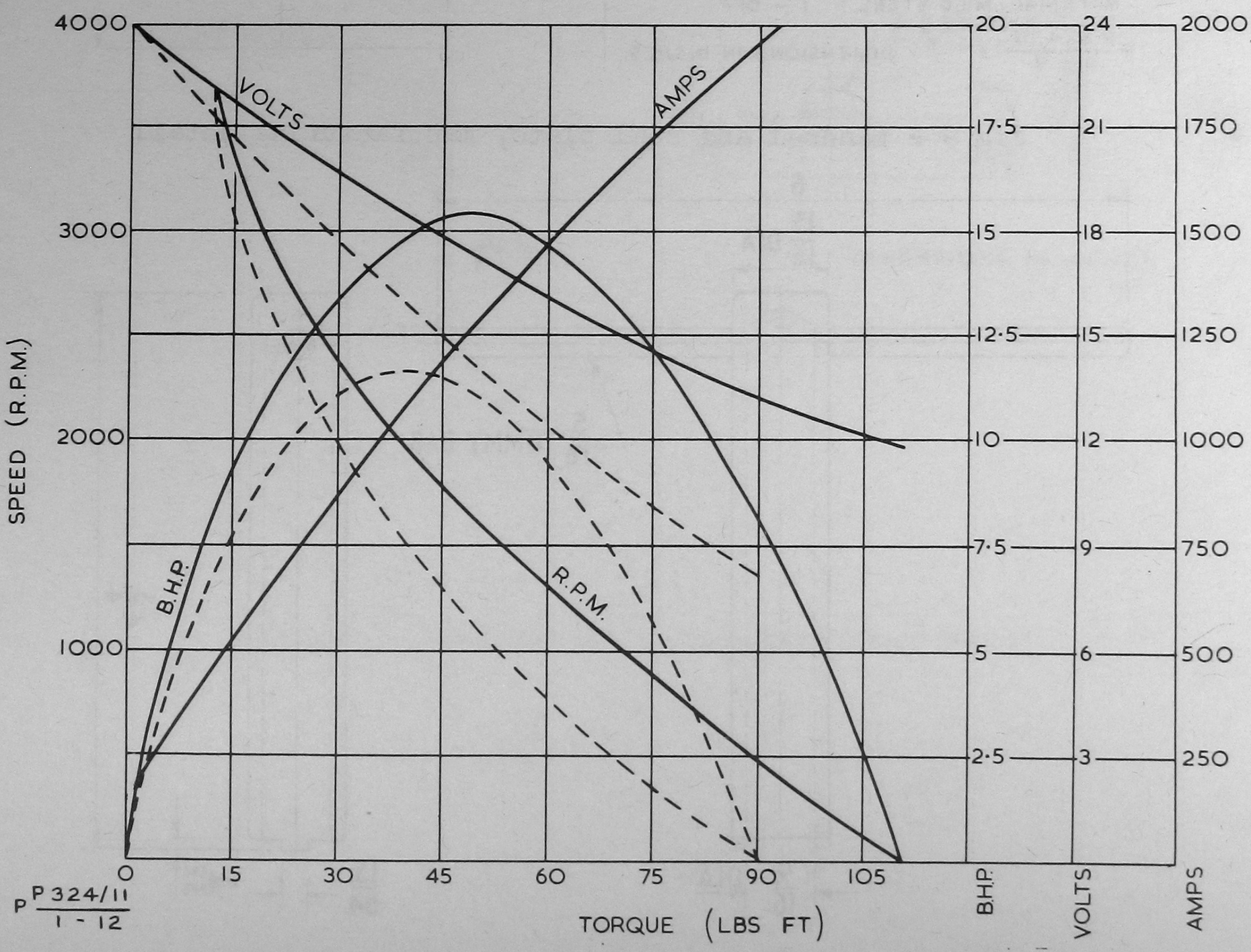

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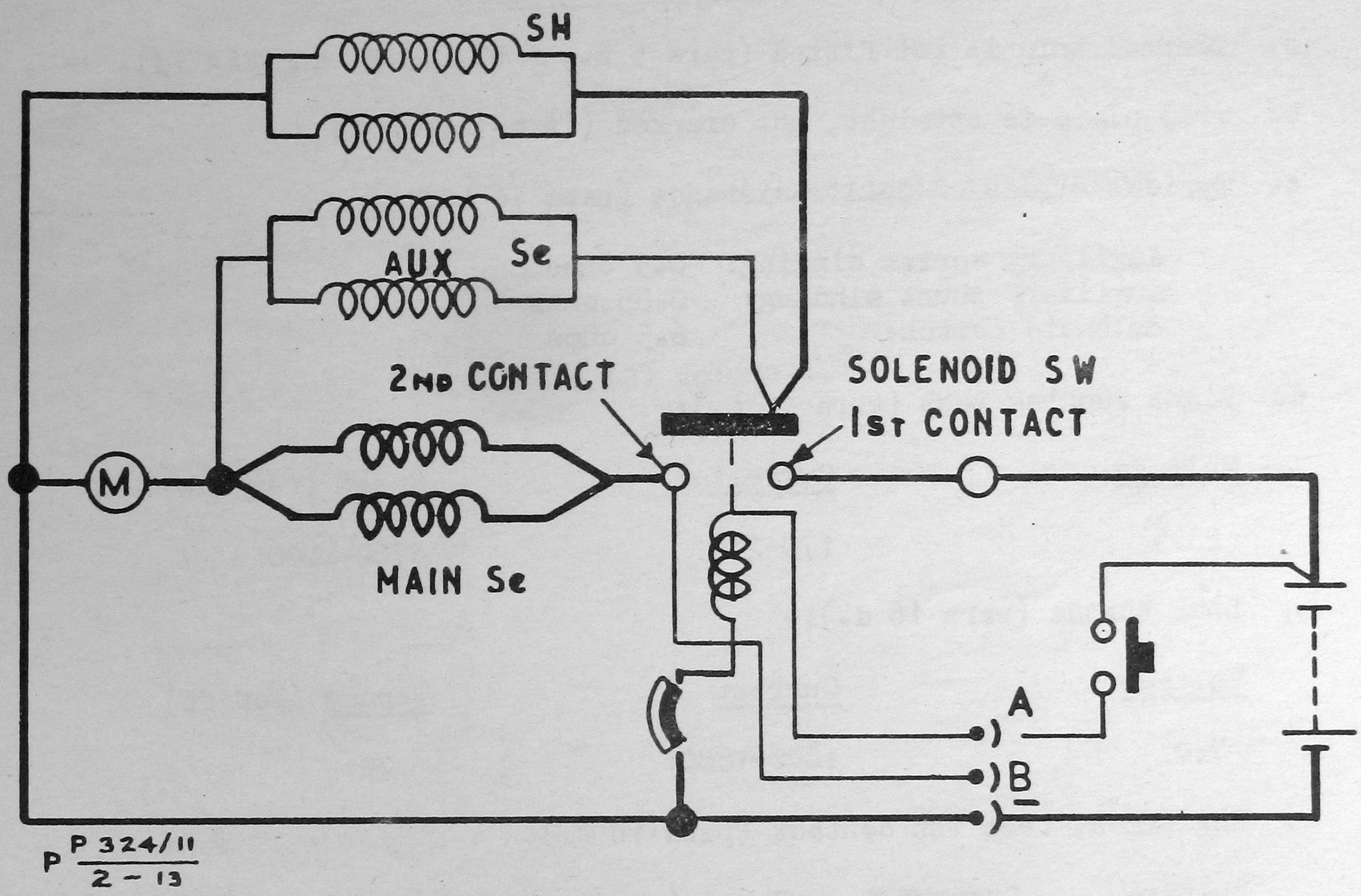
Fig 12 - Performance curve

Note: These Pages 15-16, supersede Page 15, Issue 1, dated 24 Nov 67. Para 20-22 are additional.



P P 324/11 / 2 - 13

Fig 13 - Circuit diagram

Starter No 3, Mk 2, FV 546165

20. This starter is identical with the No 3 Mk 1 except that its functional characteristics have been improved.

21. The important differences are as follows (paragraphs shown in brackets give corresponding data for the Mk 1 starter):-

a. Thermal trip is not fitted (para 5 b., 6 b., 13 h. and Fig 13).

b. Trip plate is straight, not cranked (item 16,Fig 1)

c. Typical values of coil resistance (para 16 b.):-

Auxiliary series winding:	0.5 ohms
Auxiliary shunt winding:	0.85 ohms
Solenoid switch:	6.5 ohms

d. Light running test (para 16 c.):-

Voltage	Current	Speed (rev/min)
23.5	170-270	3700-4200

e. Lock torque (para 16 d.):-

Voltage	Current	Torque (lbf ft)
7.0	1800-1880	75

f. Engagement test 1st contact (para 16 f.):-

Voltage	Current	Speed (rev/min)	Armature pressure (lb)
24	120-140	300-800	42 (initial)

22. In all other details of repair and test data the two starters are identical.

7a/10097
A Veh 32035

END