INSTRUCTION BOOKLET No. 78
(12th EDITION)

Nos. 7 and 8
TELEPRINTERS

MAINTENANCE INSTRUCTIONS

Creed & Company Limited

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(Printed . . . . . May 1955)

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CONTENTS

THE No. 7 TELEPRINTER

Introduction

This instruction manual applies to No. 8 Teleprinters and to the receiving parts of No. 7 Teleprinters only. Supplementary maintenance instructions for the keyboard on the No. 7 Teleprinter and for auxiliary or alternative units are published separately as follows :

1. Instruction Booklet 47K : applicable to the 'N' type (non-storage) keyboard.
2. Instruction Booklet CTK/78 : applicable to the 'CTK' (Commercial Typewriter) keyboard.
3. Instruction Booklet R/5 : applicable to the Reperforating Attachment.
4. Technical Information Supplement No. 30 : applicable to the 'Overlap' pattern cam unit.

The present edition incorporates all maintenance information published in Technical Information Supplements issued since the last edition, with the exception of the T.I.S. referred to above. Instructions for the old Type I Page Attachment Unit, Scissor Spring Pattern Typehead Clutch, Operating Magnet Unit S.1832B and Non-Orientation Cam Unit have all been omitted, as these units are no longer in general production having been superseded by improved units.

COMBN NO.	LETTERS CASE	FIGURES CASE	START	CODE ELEMENTS	STOP
1	A	—	O	●●OOO	●
2	B	?	O	●OO●●	●
3	C	:	O	O●●●O	●
4	D	WHO ARE YOU?	O	●OO●O	●
5	E	3	O	●OOOO	●
6	F	OPTIONAL	O	●O●●O	●
7	G	OPTIONAL	O	O●O●●	●
8	H	OPTIONAL	O	OO●O●	●
9	I	8	O	O●●OO	●
10	J	BELL	O	●●O●O	●
11	K	(	O	●●●●O	●
12	L	)	O	O●OO●	●
13	M	.	O	OO●●●	●
14	N	,	O	OO●●O	●
15	O	9	O	OOO●●	●
16	P	0	O	O●●O●	●
17	Q	1	O	●●●O●	●
18	R	4	O	O●O●O	●
19	S	'	O	●O●OO	●
20	T	5	O	OOOO●	●
21	U	7	O	●●●OO	●
22	V	=	O	O●●●●	●
23	W	2	O	●●OO●	●
24	X	/	O	●O●●●	●
25	Y	6	O	●O●O●	●
26	Z	+	O	●OOO●	●
27	CARRIAGE RETURN		O	OOO●O	●
28	LINE FEED		O	O●OOO	●
29	LETTERS		O	●●●●●	●
30	FIGURES		O	●●O●●	●
31	SPACE		O	OO●OO	●
32	ALL SPACING		O	OOOOO	●

MARK ELEMENT ●
SPACE ELEMENT O

FIGURE 1. START-STOP CODE

CIRCUITS AND CIRCUIT DIAGRAMS

Diagrams giving details of the electrical circuits and components employed on Nos. 7 and 8 Teleprinters are given in Figs. 2-7.

Fig. 2 depicts the basic internal wiring connections, the lower part of the figure showing the relative positions of the components, viewing the main base from underneath, the names and values of the components being listed in the table at the bottom. The schematic diagrams at the top of the figure show the wiring connections between the components, the signal circuit being above the motor circuit.

Fig. 3 shows schematically the connections for the 9-way signals plug and cord, and Fig. 4 similarly depicts the connections for the 12-way plug and cord.

Figs. 5 and 6 are illustrations of the shape and dimensions of the 9-way and 12-way plugs.

Fig. 7 shows the End-of-Line Indicator circuit superimposed on the motor circuit.

A. SIGNAL CIRCUIT

ELECTROMAGNET

The electromagnet is fitted with two 'P' type coils, the resistance and inductance of each coil being 363 ohms and 4-4½ henries respectively. These coils are terminated on block X, Figs. 3 and 4, which provides facilities for strapping them in parallel or series, and for connecting across them a .5 μF. + 330-ohm capacitor-resistor, when this is required.

The main types of circuit arrangements that are obtainable are as follows :

(a) **Single Current.** In this case the coils are connected in parallel by strapping X_2 - X_3 and X_4 - X_5.

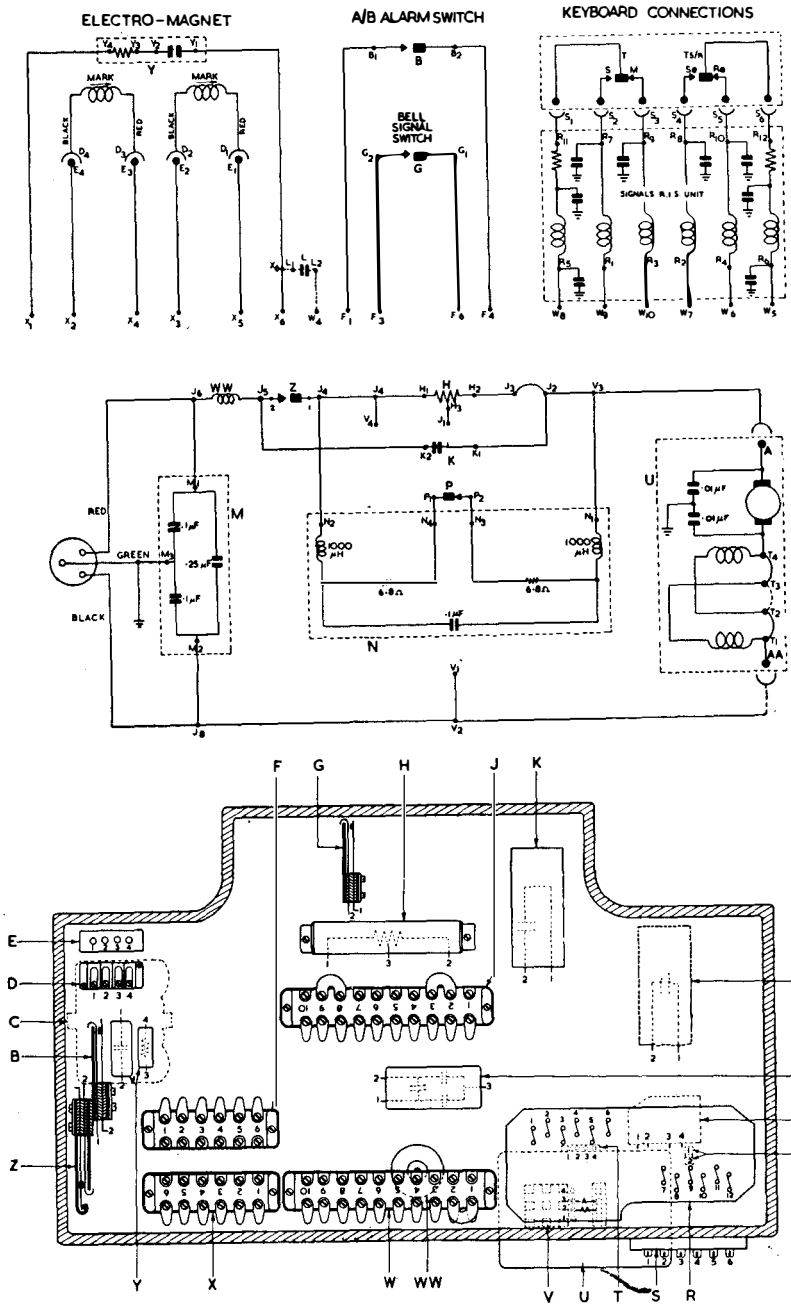
(b) **Double Current.** The coils are connected in parallel as for single current, but the .5 μF. + 330-ohm capacitor-resistor is connected across the coils by strapping X_1 - X_2 and X_5 - X_6.

(c) **V.F. Working.** For applications in which the Teleprinter is to be used with B.P.O. type V.F. telegraph converters 9 (AC) or 10 (DC), 'P' type coils may be used provided that they are connected in series by strapping X_3 - X_4, and that the 2-μF. capacitors in the V.F. unit, which shunt the electromagnet windings, are replaced by 1-μF. capacitors. A centre-tap is available, in this case, at X_3 or X_4.

The arrow and word "mark" written beside the electromagnet coils are intended to indicate that the armature will move to mark when a current flows through the coils in the direction of the arrow.

SIGNALS R.I.S. UNIT

Radio interference suppression for the keyboard transmitter and send-receive switch is provided by a self-contained R.I.S. unit R, Fig. 2, located on the receiver main base. The leads from this unit are all terminated on a separate block W (see also Figs. 3 and 4).



A	MOTOR PLUG PIN	H	GOVERNING RESISTOR 500Ω + 500Ω	S	KEYBOARD CONTACTS
AA	MOTOR PLUG PIN	J	TERMINAL BLOCK	T	MOTOR FIELD STRAPPING BLOCK
B	ANSWER-BACK ALARM SWITCH	K	CAPACITOR ·5μF	U	AC/DC SERIES MOTOR
C	RECEIVING ELECTRO-MAGNET	L	CAPACITOR 2μF (OPTIONAL)	V	MOTOR CONNECTION BLOCK
D	ELECTRO-MAGNET CONTACTS	M	R.I.S. CAPACITOR ·1 + ·1 + ·25μF	W	TERMINAL BLOCK
E	ELECTRO-MAGNET CONNECTION BLOCK	N	GOVERNOR R.I.S. UNIT	WW	INDUCTOR 1000μH
F	TERMINAL BLOCK	P	GOVERNOR BRUSH BLOCK	X	TERMINAL BLOCK
G	BELL SIGNAL SWITCH	R	SIGNALS R.I.S. UNIT	Y	CAPACITOR ·5μF RESISTOR 330Ω
				Z	STARTER SWITCH

FIGURE 2. INTERNAL WIRING DIAGRAM

NOTE : Strapping arrangements for blocks F and X are shown in figures 3, 4

ALARM CIRCUITS

The standard alarm equipment consists of a Bell Signal Switch, item G, Fig. 2, which is provided for use with an external bell and power supply.

Two optional alarm switches may also be used :

1. An Answer-Back Alarm Switch, item B, Fig. 2, for 'M' keyboards only.
2. A Tape-Out Alarm Switch for 'N' and 'CTK' keyboards when fitted with a Reperforating Attachment.

The method of wiring the Bell Signal Switch and Answer-Back Alarm Switch is indicated in Figs. 3 and 4. The Tape-Out Alarm Switch is wired to terminals F_2 and F_3.

If desired, an extension alarm bell circuit may be supplied by means of a twin-lead cord connected between terminals F_3 and F_6.

SHUNTED CAPACITOR WORKING

Teleprinters designed for shunted capacitor working are equipped with an additional 2 μF. capacitor L, Fig. 2, connected between terminals W_4 and X_6, as depicted by the dotted lines in Fig. 4.

The external connections to the capacitor are completed in the terminal unit, via contact No. 8 of the 12-way plug.

B. MOTOR CIRCUIT

MOTOR

The standard motor for the No. 7 and No. 8 Teleprinters, the circuit for which is given in Fig. 2, is a single voltage A.C. /D.C. motor which is supplied to cover any nominal voltage in steps of 5 volts from 90-250 V.

A motor field strapping block T, Fig. 2, is provided on the side of the motor casting for strapping the field windings in parallel for A.C. and in series for D.C. supplies.

MAINS SUPPLY PLUG AND CORD

The 3-pin motor plug is connected, through a three-way cord, to block J, Fig. 2, provision being made to lead the cord in from the right or left of the machine main base casting according to local requirements.

The red (live) pin of the motor plug is connected to the red lead of the motor cord, which ends at terminal 6 of the 10-way block J. The black (neutral) pin is connected by the black cord lead to terminal J8, and the large uncoloured pin is connected to the teleprinter frame by the green cord lead. The socket of this latter pin should be earthed.

Since the polarity of the mains does not affect motor performance, the above connections may be used with D.C. supply systems, irrespective of whether the positive or negative side of the mains supply is earthed.

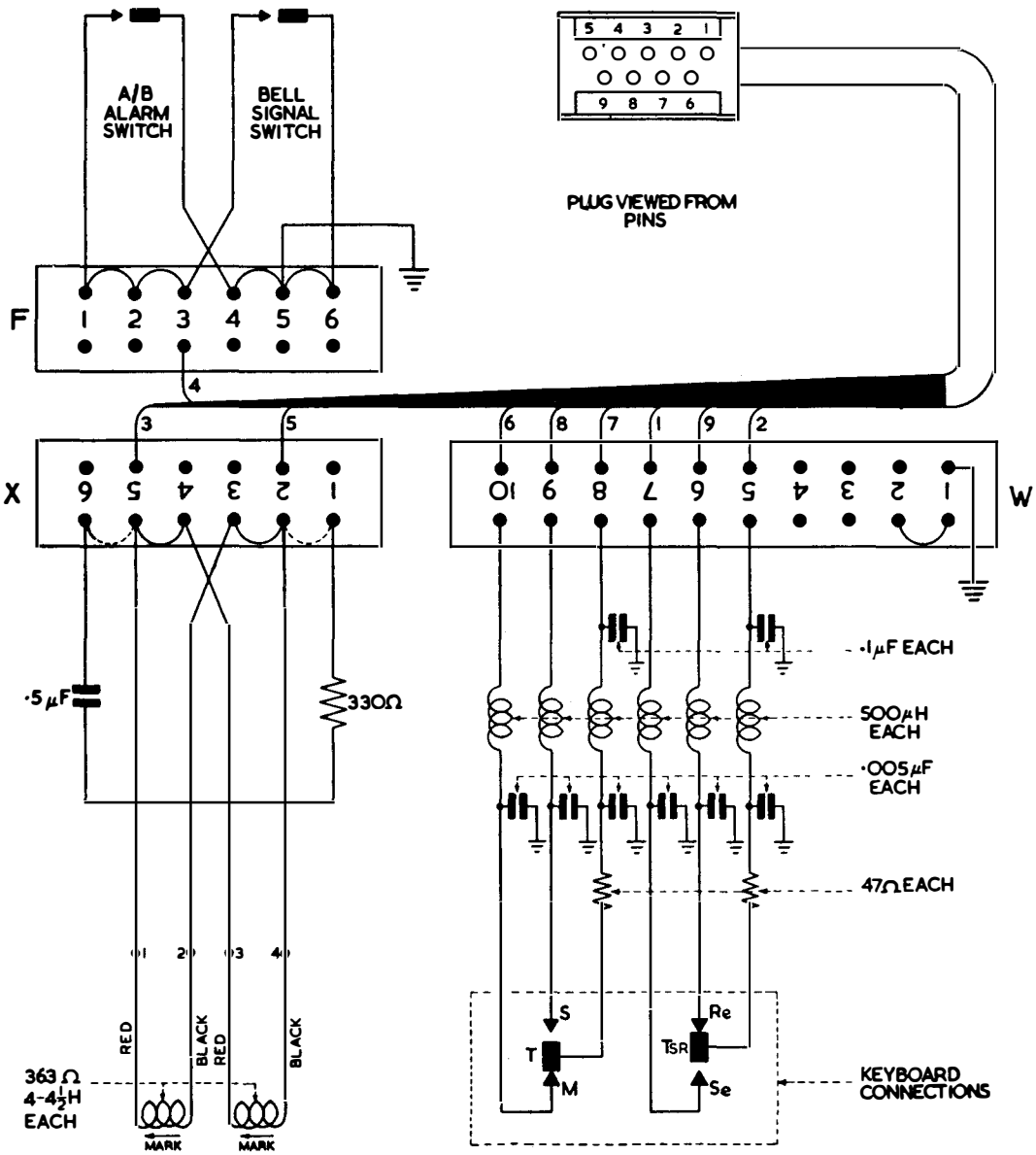


FIGURE 3. CONNECTIONS TO 9-WAY PLUG AND CORD

NOTES: 1. On this and the following circuit diagrams "mark" (←) is used to indicate that when current flows through the coils in the direction of the arrow the armature is moved to the marking stop.

2. For double current working: Strap XI-X2, X5-X6.

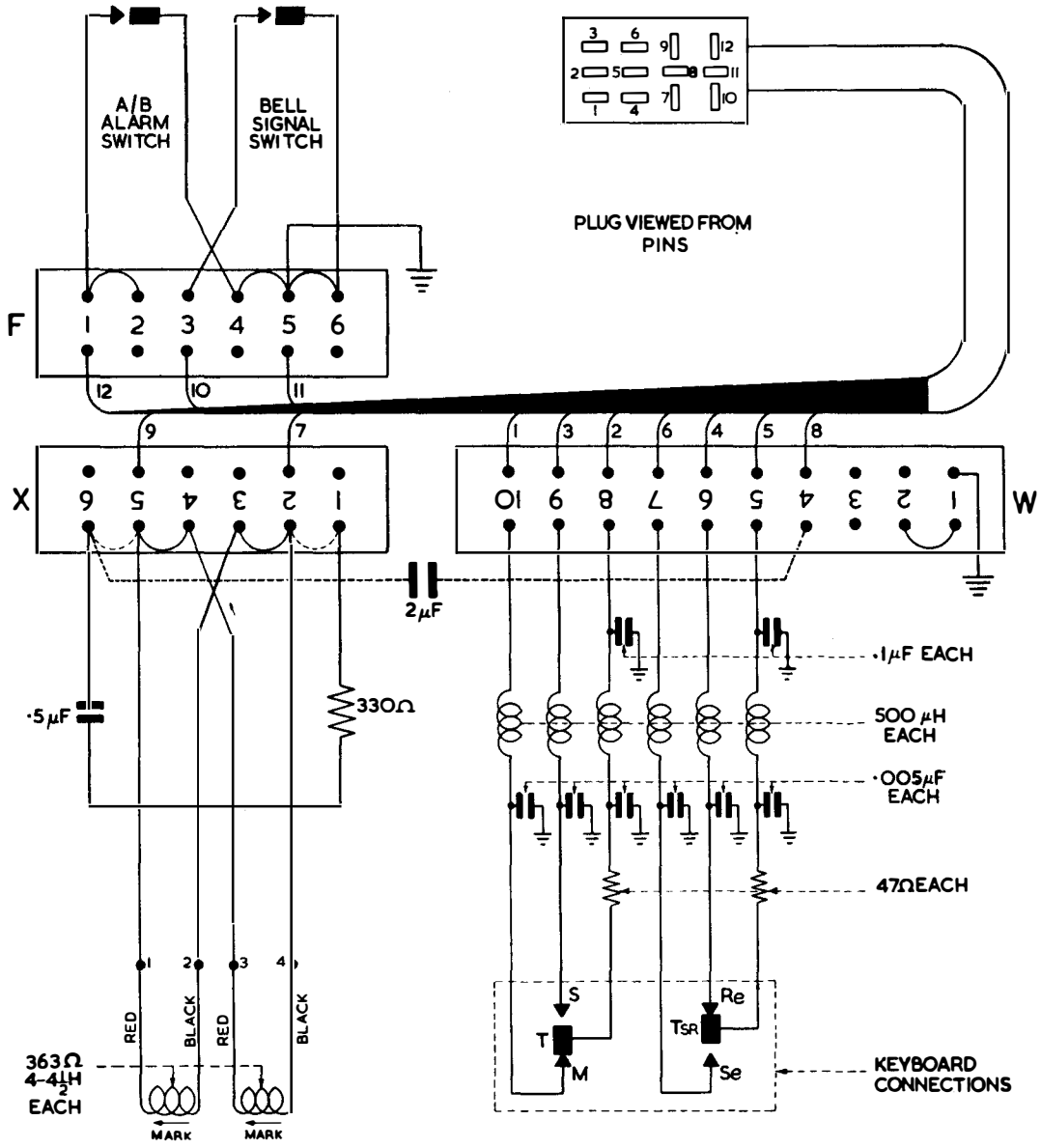
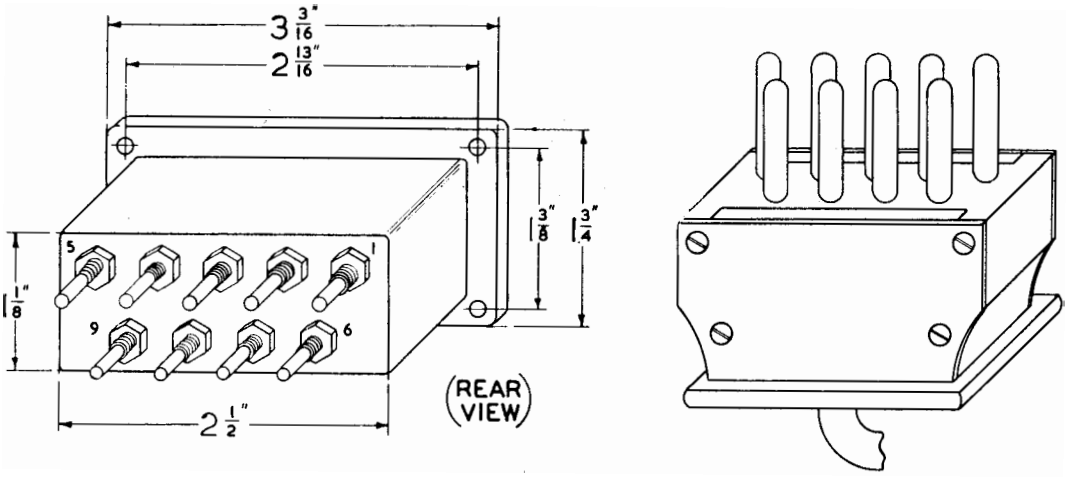


FIGURE 4. CONNECTIONS TO 12-WAY PLUG AND CORD

NOTES : 1. On this and the following circuit diagrams "mark" (←) is used to indicate that when current flows through the coils in the direction of the arrow the armature is moved to the marking stop.

2. For double current working : strap X1-X2, X5-X6.



9-WAY SOCKET NO. 52 9-WAY PLUG NO. 903

FIGURE 5. 9-WAY PLUG AND SOCKET

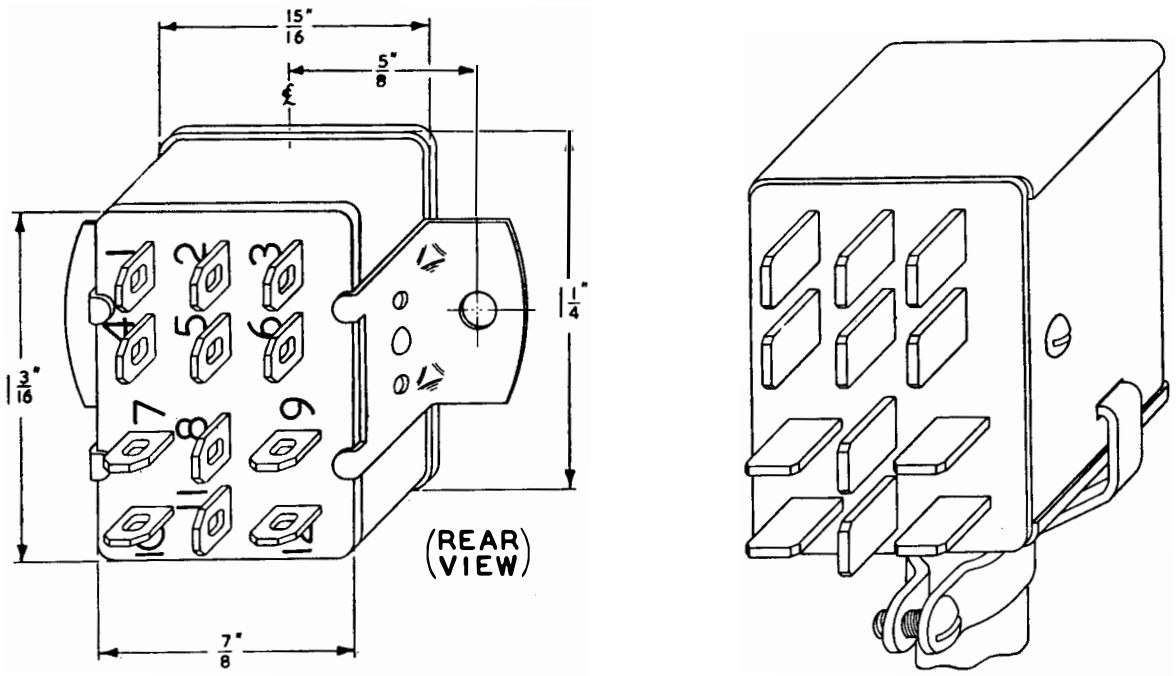
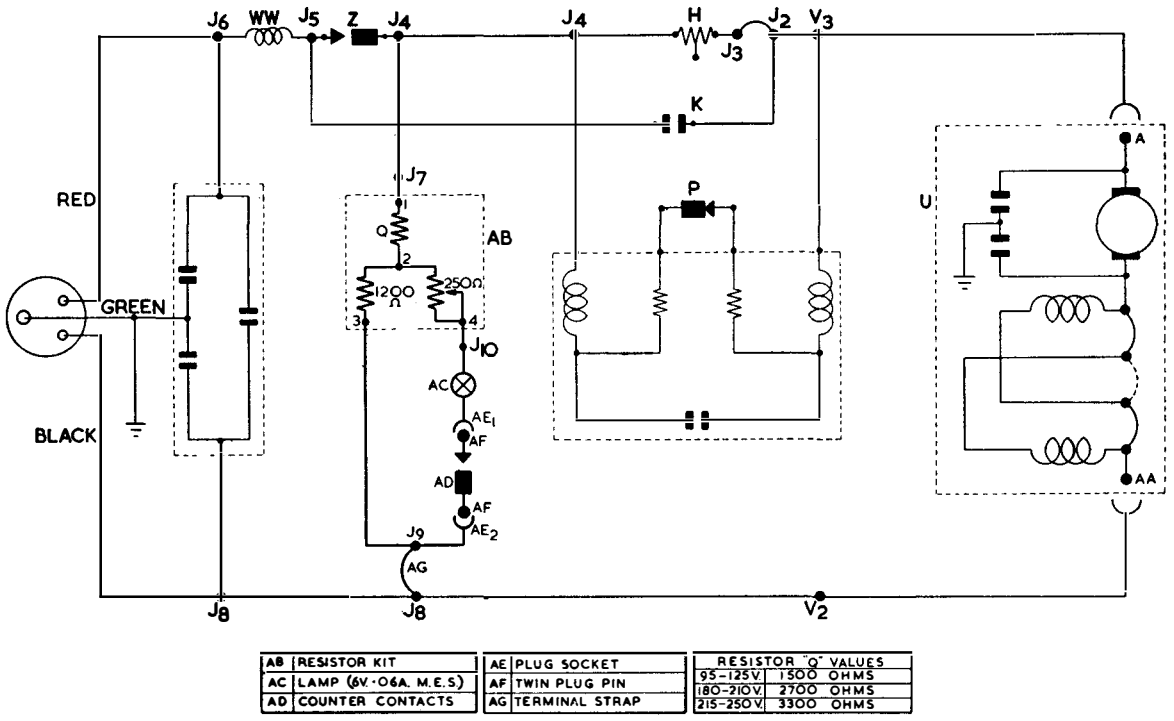


FIGURE 6
12-WAY PLUG AND SOCKET



AB	RESISTOR KIT	AE	PLUG SOCKET	RESISTOR "Q" VALUES	
AC	LAMP (6V·06A. M.E.S.)	AF	TWIN PLUG PIN	95–125V	1500 OHMS
AD	COUNTER CONTACTS	AG	TERMINAL STRAP	180–210V	2700 OHMS
				215–250V	3300 OHMS

FIGURE 7. END-OF-LINE INDICATOR CONNECTIONS

NOTE: Letters on this diagram which are not included in the above table are given in the table at the foot of Fig. 2.

GOVERNOR RESISTOR

The governor resistor H, Fig. 2, consists of two 500-ohm sections with a centre-tap. These sections may be strapped in series or in parallel for mains supplies of 180-250 volts, A.C./D.C., and 90-135 volts A.C./D.C. respectively, in accordance with the following instructions:

(a) Series arrangement — strap J_2 - J_3.

(b) Parallel arrangement — strap J_1 - J_2, J_3 - J_4.

6-VOLT END-OF-LINE INDICATOR

An End-of-Line Indicator unit, if fitted, is connected to terminals 7, 9 and 10 of block J, Fig. 2. Details of the indicator circuit are given in schematic form in Fig. 7, superimposed in heavy lines on a diagram of the motor circuit.

The unit may be used on any mains supply having a voltage between 95 and 250 volts, provided that the value of resistor Q is chosen in accordance with the table at the foot of Fig. 7. A variable resistor is used to adjust the resulting voltage across the lamp to 6 volts.

The counter mechanism contacts AD are located on the keyboard. These are connected to the remainder of the indicator circuit, which is on the receiver, by means of a twin lead 'OZ' type plug AF, which engages with two square-flanged sockets mounted on the indicator lamp support bracket.

The unit is supplied with mains power by means of the strap AG, and of a wire link between terminals J_4 and J_7.

Removal of the strap and the wire link isolates the indicator circuit from the mains supply, and it may then, if desired, be fed from an independent power source connected to terminals J_7 and J_9.

MAINTENANCE INSTRUCTIONS

WHEN INSTALLING

All machines are properly lubricated, adjusted and tested before they leave the factory. They should, however, be checked before being placed in circuit, to ensure that they have not been affected by transport, storage or unpacking. Special attention should be given to the following points :

1. Effects of Transport.

Check the machine carefully to ensure that it is not damaged in any way by transport shocks. All machines are packed to withstand reasonable shocks, but it is advisable to check this point.

2. Lubrication.

Check that all important lubricating points are adequately lubricated. (See the Lubrication Instructions on page 59.)

3. Connecting Plugs.

Check the following points on the connecting plugs :

(a) The terminal connections between the cords and plugs must be good, i.e. all screw terminals or nuts must be tight, and all soldered joints sound.

(b) The outer sleeving of the cords must be securely clamped by the plugs.

(c) The plugs must make good contact and be firmly engaged with the sockets into which they are plugged.

(d) The terminal connections to the sockets must be tight and sound.

4. Earth Connection.

If any part of the power or signalling circuit is connected to earth, ensure that the earth connection is a good one and free from extraneous interference.

5. Security of Machine Mounting.

Ensure that the table or stand on which the machine is mounted is sufficiently strong and rigid and that the machine is placed in a safe position on it.

6. Check of Operation.

(a) Turn the machine by hand and make a visual check of its operation, especially the finger setting movements on the cam unit.

(b) Switch on the power and check the operation of the machine 'in local.'

(c) After the above tests have been made, the machine may be installed in the circuit.

AFTER EVERY 300 HOURS OF OPERATION

1. General Cleaning and Lubrication.

1.1 Remove any paper fluff and dirt from all prominent parts of the machine.

1.2 Lubricate all main bearings and working faces. Clean and relubricate the platen spindle and running bar. Apply the lubricants thoroughly but sparingly. Remove surplus oil.

2. Motor and Governor.

2.1 Examine the motor brushes. If they have a life of less than 400 hours remaining, i.e. if they are less than $\frac{3}{8}$ in. (9.5 mm) long, change them as follows :

(a) Remove the brush box covers and the worn-out brushes, noting which track the brushes are working on.

(b) Slacken the fixing screws of one of the brush boxes, slide out the box slightly, and feed one end of a strip of fine glass paper 12"—18" (30—43 cm) long, between the commutator and the brush slide, with the abrasive surface facing the slide. Move in the slide until it is just clear of the glass paper and tighten the fixing screws.

(c) Insert a new brush of the correct grade in the box and replace the brush box cover. (For motors using a supply of less than 50 volts D.C., the correct brush is AA.2/3. For D.C. motors of higher voltage than this and for all A.C. motors, the correct brush is AA.1/2. These parts include brush springs. In order to obtain the maximum life from motor brushes, the spring should always be replaced at the same time as the brush.)

(d) Slowly draw the strip of glass paper in the normal direction of rotation, taking care to keep it taut. Repeat the process several times in the *same* direction until the surface of the brush takes the shape of the commutator.

(e) Remove the glass paper, brush box cover and brush. Slacken the brush box fixing screws again, and position the box so that there is a gap of .010—.015 in. (.25—.38 mm) between the brass brush slide and the periphery of the commutator. Tighten the fixing screws.

(f) Replace the new brush so that it is working on the other track to the one noted in paragraph (a). Replace the brush box cover.

(g) Repeat instructions (b)—(f) for the other brush.

N.B. On both A.C. and D.C. motors only two motor brushes should be used, and these should be placed opposite to each other, i.e. in contact with the same track. Whenever the brushes are changed, the track should be changed also, in the manner described above. The object of this procedure is to distribute the wear equally between the two tracks.

2.2 Remove all dust with a clean, dry rag, using a brush to remove the dust from between the segments of the commutator. No attempt should be made to remove the black, glazed surface.

2.3 Remove all traces of carbon dust from the base of the governor moulding. Special attention should be given to the surfaces between the slip rings, and between the inner slip ring and the boss. A soft cloth should be used to prevent damage to the anti-tracking varnish.

2.4 Check the condition of the governor contacts. These should not be touched unless they are badly worn, or it is impossible to obtain the correct motor speed (see below) by means of the speed adjustment. In either of these cases the brushes should be changed.

3. Adjustments.

3.1 Carry out all the 'double-asterisked' checks in the adjustment instructions on pages 23 to 38, paying special attention to the following points :

(a) The condition of the comb-setting fingers and the timing of the finger-setting and resetting movements.

(b) The weight-lifting arm pin on the starter switch control unit. This should be replaced if badly worn.

(c) The clutch torque. If the correct torque cannot be obtained by the adjustment, check the condition of the clutch lining and change this if necessary (see page 54).

3.2 Check that the pilot cam clutch torque is in accordance with the figures given in the Spring Tension Section on page 56.

3.3 Check the operation of the 'Bell' contacts. Clean and readjust these only if necessary.

4. Printing.

4.1 Check the quality of the printing. Clean the types if necessary.

5. Speed Test.

5.1 Test the speed of the motor with a fork stroboscope. The stroboscopic image is obtained from the governor cover, which is painted with five equally spaced white stripes. If the stroboscopic image appears to be stationary, the motor speed is correct. If it appears to move in a clockwise or anti-clockwise direction, then the speed is too fast or too slow respectively.

5.2 If the speed is incorrect, the cause may lie in the voltage of the supply, a break or short-circuit in the governor circuit, the governor contacts or in the governor speed adjustment. As the speed of the motor is accurately set before it leaves the factory, the adjustment should not be altered unless it is definitely decided that the fault does not lie elsewhere. Hence, check :

(a) the voltage of the supply ;

(b) the governor contacts ;

(c) the governor circuit. This may be quickly done by holding the magnet armature in the marking or left-hand position and short-circuiting the governor brush connections. In the case of series or universal motors, the speed should increase to considerably above its governed value, and the motor may have to be switched off before the speed will decrease. (Great care must be exercised to ensure that the magnet armature does not move from the

marking stop while the test is being made). In the case of the shunt motor, the speed should decrease to below its governed value. If the governor is removed, the converse of the above should take place.

5.3 If the items checked in 5.2 are correct but the speed is incorrect, the tension of the governor spring must be altered. Insert a small screwdriver through the hole in the governor cover, and turn the governor spring adjusting screw in a clockwise direction to increase the speed, or in an anti-clockwise direction to decrease the speed. It will be found that one complete turn of this screw will alter the speed by approximately 30 r.p.m.

6. Receiver Margin.

6.1 Check the receiver margin in accordance with Section H or I in the adjustment instructions according to whether single- or double-current operation is being employed.

AFTER EVERY 900 HOURS OF OPERATION.

1. General.

1.1 Carry out the maintenance procedure given above for 300 hours of operation.

2. Motor.

2.1 Check the condition and fit of the ballraces by listening to the noise of the motor. If the races sound faulty, or if there are indications that they have worked loose on the shaft or in their housings, dismantle the motor in accordance with the dismantling instructions on page 84 and fit new ball races, if necessary.

3. Adjustments.

3.1 Carry out all 'one-asterisk' checks in the adjustment instructions.

3.2 Check the following additional points :

(a) Play in armature pivot bearings (Electromagnet Unit).
(b) Play between link and armature stud (Electromagnet Unit).
(c) Play on cam rollers (Cam Unit).
(d) Condition of striking edge on finger-setting blade (Cam Unit).
(e) Condition of type retaining plate and springs (Typehead Unit).
(f) Play between types and rack slots (Typehead Unit).
(g) Condition of type stop and latch faces (Typehead Unit).
(h) Endplay and sideplay in bearings (Typehead Unit).
(i) Condition of type stop and latch faces (Typehead Unit).
(j) Play in pivot bearing and link system (Typehammer Unit).
(k) Freedom of change-over rods (Ribbon Brackets).
(l) Freedom of ribbon jumper in its guide slots and absence of damage or distortion of the ribbon jumper caused by operator changing ribbons (Control Lever Unit).
(m) Condition of clutch crosshead teeth (Page Attachment Unit).

4. Lubrication.

4.1 Apply appropriate lubricants to any bearings or working faces that have been revealed by the checks in the preceding paragraph to require lubrication.

AFTER 3,600 HOURS OF OPERATION.

1. Overhaul.

1.1 Overhaul the machine, removing the apparatus units from the main base and thoroughly cleaning them.

1.2 Remove all ball races, except those on tne motor, wash in white spirit, and re-lubricate with Creed Lubricant No. 4, taking special care that the grease is *thoroughly clean* before it is used in the ball race.

1.3 Carefully check the whole machine for wear, changing any parts that require changing.

2. Motor.

2.1 Dismantle the motor in accordance with the instructions in the section on 'Dismantling and Assembling' and carry out the following maintenance :

(a) Soak the ball races in white spirit and remove the old grease. Thoroughly dry the races and re-pack with Creed No. 4 Lubricant. (N.B. Oil should not be used in these bearings).

(b) Inspect the sealing gaskets, replace any which appear damaged and lightly smear all their surfaces with No. 4 Lubricant.

(c) Check the condition of the commutator. If it is pitted or badly worn, carry out instruction 2.2 below.

(d) When reassembling, smear a little Creed No. 4 Lubricant inside the ball-race housings.

(e) Inspect the motor brushes and replace by new ones if necessary in accordance with instruction 2.1 on page 16.

2.2 If the commutator is pitted or badly worn, carry out the following instructions :

(a) 'Skim up' the commutator in a lathe by means of a sharp, pointed tool.

(b) Check whether the mica insulation between the segments is .015 - .025 in. (.38 - .64 mm) below the surface of the commutator. This measurement may be obtained by laying a piece of wire of the appropriate gauge in the slots between the commutator segments, and observing its position in relation to the commutator surface.

(c) If the depth of the mica is less than this, it should be undercut, while the armature is still in the lathe, by means of a thin, square-edged tool. With the lathe at rest, the tool can be run along the commutator to cut the mica. Remove all mica dust with a brush.

(d) Take a light finishing cut, and then remove any burrs which may have arisen on the commutator.

(e) Polish the commutator with fine glass paper (emery cloth should not be used for this purpose). Obtain as high a degree of polish as possible, as this minimises brush wear.
N.B. Commutator grinding stones are not recommended.

2.3 Reassemble the motor and carry out instruction 2, page 16.

3. Lubrication and Adjustments.

3.1 Reassemble the receiver and lubricate it in accordance with the instructions in the Lubrication section, taking care, while the units are still off the main base, to lubricate those points which are inaccessible when the whole machine is reassembled.

3.2 Carry out all the adjustments in the Adjustment section.

4. Tests.

4.1 Carefully test the speed of the motor and correct it, if necessary, in accordance with instruction 5, page 17.

4.2 For single-current machines carry out the adjustments that apply in Section H, page 38.

4.3 For double-current machines carry out the appropriate adjustment in Section I, page 40.

N.B. The red mark on the orientation scale is the centre of the orientation range as measured in accordance with the above instructions just before the machine leaves the factory. As soon as the receiver has been readjusted or repaired in any way, the red mark may no longer represent the centralising position and should be removed.

FAULT FINDING PROCEDURE

The efficient localisation and correction of teleprinter faults depend upon a thorough knowledge of the principles of operation of the machine, together with some understanding of the circuit in which the teleprinter is being used. Without this knowledge, it is possible to restore a teleprinter temporarily to a working condition, but it is impossible to guarantee that it will continue to work satisfactorily for any length of time.

The reason for this is that a fault may sometimes be temporarily corrected by adding a compensating maladjustment to the machine, e.g. bias in the incoming signals may be compensated by biasing the electromagnet. Care must be taken to avoid such practices because the margin of the machine will thereby be reduced. A slight change in the circuit conditions, or in the adjustment of the remainder of the machine, will probably lead to a recurrence of the fault.

Standard adjustments should always be adhered to, and the cause of the trouble, except where it is immediately apparent, should be systematically localised.

The following instructions provide a systematic procedure for finding faults, which is applicable to a simple point-to-point arrangement of two No. 7 Teleprinters, but most of the procedure can be used, with very little alteration, for other arrangements.

PRELIMINARY LOCALISATION.

1. Speed.

Check whether the speed of each machine is correct (see page 17). If the speed of the home machine is too slow, its local record signals will be correct, but the fifth selecting finger will be set in error during reception from the distant machine. The reception of the distant machine will not be so badly affected. Correspondingly, if the speed of the home machine is too fast, the distant record will show the same type of failure.

If the speed of the home machine is incorrect, examine the condition of the motor in accordance with the instructions on pages 16 and 17. Typical governor and motor faults are given on page 22 in the table of receiver faults.

2. Send-Receive Switch.

If the automatic Send-Receive switch is in use, check whether the switch is responsible for the fault by shorting it out of circuit. It is advisable to examine the switch at this stage because a faulty switch is apt to mask other faults, and render them more difficult to localise.

3. Reception and Local Record.

Check the reception and local record at both ends. Proceed to localise the fault from the table in Fig. 46.

4. Further Localisation.

Before trying to localise the fault any further, it is advisable to verify in a more direct way, if facilities permit, that the result obtained from the table in Fig. 46 is correct. This can be done in a variety of ways, e.g. by plugging the faulty teleprinter through to a spare teleprinter, by changing keyboards, etc.

(a) If conditions 1 and 2 exist, first check that the signalling supply is correct when loaded and, in the case of double-current operation, that the voltages on the marking and the spacing contacts are equal when supplying current to the line. Then check the operation and adjustments of the transmitter in accordance with the Instruction Booklet applying to the particular keyboard in use.

(b) If conditions 3 or 4 exist, the mechanic at the distant end should be asked to check his transmitter.

(c) If condition 5 exists, the trouble may be found in the selecting, translating or printing mechanisms. Typical faults in these parts of the receiver are listed below.

(d) If condition 6 exists, the distant mechanic should be asked to check his receiver.

(e) If condition 7 exists, the received current should be checked. If this is unsatisfactory, the condition of the line and any equipment on the line should be examined.

RECEIVER FAULTS.

When the fault has been traced to the teleprinter receiver (i.e. by observing condition 5 above), its further localisation depends upon the nature of the fault. Faults on the receiver are of six main kinds:

1. Faults on the Selecting Mechanism.

These can be detected by observing whether the code is correctly reproduced on the five selecting fingers. Incorrect selection may take the form of the substitution of either marking for spacing elements ('extras') or spacing for marking elements ('failures').

If extras or failures are present, a careful check of the adjustment of the electromagnet and the selecting mechanism must be made. It is usually helpful, before checking the adjustments, to rotate the governor by hand and make a visual check.

2. Faults on Translating Mechanism.

These are conditions in which the correct code setting on the selecting fingers does not lead to the fall of the appropriate bellcrank on the combination head. Hence, to isolate these faults, the fall of the bellcranks must be observed.

3. Faults on Printing Mechanism.

When the correct bellcrank drops, but the appropriate character is either not clearly or not correctly printed, the fault may lie either in the clutch, the typehead, the typehammer unit or the ribbon feed mechanism.

4. Functional Faults.

When the correct functional bellcrank falls in response to an incoming functional code combination, but the page attachment or tape attachment function is not correctly carried out, the fault may lie in the control unit, or in the page attachment or tape attachment units. Faulty functioning of these units may also result in bad printing, over-printing, etc.

5. Motor, Governor and Starter Switch Faults.

Speed faults on the governor have already been dealt with above. Reference should be made to the Maintenance Instructions for checks on the functioning of the motor and governor.

6. Electrical Faults.

These can be localised with the aid of the teleprinter wiring diagrams given in the section on 'Circuits and Circuit Diagrams,' together with a wiring diagram of the circuit in which the teleprinter is being used.

TABLE OF RECEIVER FAULTS

All receiver faults, whether they are of the obvious kind that do not require systematic localisation, or are of the less obvious kind that do, produce specific fault symptoms on some part of the receiver.

The main kinds of fault symptoms with their possible causes are listed in the following table. This table is not meant to be exhaustive, or to convey the idea that all the faults listed are likely to occur on any given machine.

Fault	*Possible Causes*	*Adjustments*
	SELECTING MECHANISM	
A. Frequent failures on selecting fingers.	1. Spacing bias on electromagnet	1
	2. Finger setting blade too low	3 & 49
	3. Spacing reaction on armature	5
	4. Finger setting blade too far from pin	8
	5. Finger resetting adjustment wrong	13
	6. See Fault Section C	—
B. Frequent extras.	1. Marking bias on electromagnet	1
	2. Finger setting blade too high	3 & 49
	3. See also Fault Section C	—
C. Occasional extras and /or failures.	1. Bias on electromagnet	1
	2. Magnet strength incorrect	1
	3. Receiving cam sleeve loose	2
	4. Receiving pawls sluggish, pawl springs faulty	2
	5. Finger setting blade vertical adjustment faulty	3
	6. Detent adjustment faulty	6 & 48
	7. Reaction on armature faulty	5
	8. Finger setting blade horizontal adjustment faulty	8
	9. Finger setting blade worn or bent	—
	10. Finger springs with wrong tension	10
	11. Cam sleeve driving ratchet teeth broken	—
	12. Slackness of trip shaft bearings	3.1
	13. Cam rollers worn	—
D. First finger failing	1. Finger resetting adjustment wrong	13
	2. Finger spring tension incorrect	10
E. Fifth finger giving extras.	1. Receiving cam sleeve loose	2
	2. Fingers adjustments incorrect	—
	3. Fingers badly aligned	—
	TRANSLATING MECHANISM	
F. Correct bellcrank not dropping.	1. Finger lift adjustment not correct	11
	2. Bellcrank lift adjustment incorrect	14
	3. Combs sticky	—

Fault	*Possible Causes*	*Adjustments*
	TRANSLATING MECHANISM—*continued*	
G. Typehead spinning.	1. Bellcrank lift adjustment incorrect	14
	2. Bellcrank lifting collar worn	—
	3. Cam roller or cam track worn	—
H. Shift not properly working.	1. Shift lever spring binding on anchor pins	See page 56
	2. Shift lever binding on pivot	See page 56
	3. Springs on shift bellcrank weak	See page 56
	4. Shift lever spring too strong	See page 56
	PRINTING MECHANISM	
I. Bad impression.	1. Typehammer adjustments incorrect	17, 18
	2. Ink ribbon needs changing	—
	3. Height of ink ribbon jumper incorrect	20
	4. Ribbon feed or feed change mechanism faulty	—
	5. Distance between typehead and platen wrong	23
J. Typehead clutch not latching	1. Worn clutch lining	—
	2. Worn clutch band	—
	FUNCTIONAL FAULTS (PAGE ATTACHMENT UNIT)	
K. Carriage not returning.	1. Crosshead adjustment incorrect	24
	2. Dog spring too strong	See page 57
	3. Dog loose on pivot	—
	4. Engaging tooth of dog worn	—
L. Carriage partially returning.	1. Carriage return trip bellcrank spring weak	See page 57
	2. Trip bellcrank damaged or worn	—
M. Carriage returning with too much force.	1. Air valve adjustment faulty	32
N. Line Feed Failing.	1. Crosshead adjustment incorrect	24
	2. Dog spring too strong	See page 57
	3. Dog loose on pivot	—
	4. Engaging tooth of dog worn	—
	5. Line feed pawl worn	—
O. Irregular Line Feed.	1. Line feed adjustments incorrect	33
	2. Line feed pawl worn	—
P. Letter Feed Failing.	1. Carriage feed pawl adjustment incorrect	30
	2. Carriage retaining pawl adjustment incorrect	28
	3. Crosshead adjustment incorrect	24
	4. Carriage feed pawl tooth worn	—
	5. Spring drum teeth worn	—
	6. Letter feed dog engagement tooth worn	—
	7. Carriage return trip bellcrank preventing feed	—
Q. Non-feed function failing.	1. Crosshead adjustment incorrect	24
	2. Buffer spring adjustment incorrect	22
R. Overprinting.	1. Air valve adjustment incorrect	32
	MOTOR, GOVERNOR AND STARTER SWITCH UNITS	
S. Motor not starting.	1. Motor or governor brushes need renewing	See page 16
	2. Commutator requires cleaning	See page 19
	3. Starter switch unit adjustment incorrect	42–44
T. Motor not stopping.	1. Starter switch unit adjustment incorrect	42–44
U. Motor overheating.	1. Brush rocker adjustment incorrect	—
	2. Excessive load from teleprinter (check bearings)	—
V. Governor not governing.	1. Contacts require adjusting or changing	46, 47
	2. Governor brush broken	—
	3. Carbon dust between governor brush connections	—
	4. Carbon dust between slip rings	—
W. Excessive sparking.	1. Grooves in the commutator	See page 19
	2. Brush springs weak	See page 16
	3. Brushes worn	See page 16
	4. Disconnection in armature windings	—
	5. Brush rocker adjustment incorrect	—
X. Excessive brush wear.	1. Carbon dust between commutator segments	—
	2. Mica needs undercutting	See page 19
	3. Worn commutator	See page 19

ADJUSTMENT INSTRUCTIONS

N.B. (1) Screws and nuts that are painted red should not be slackened unless a specific instruction to this effect is given. The majority of such screws and nuts are located by a special gauge in the factory and if disturbed it will be necessary to return the parts affected to the factory for readjustment.

(2) It is inadvisable, at a routine maintenance visit, to disturb any adjustment unless it is incorrect. To simplify the checking of adjustments without disturbing them, each of the following adjustments is divided into distinct sections headed '*Check*' and '*Action*,' and a guide to the frequency with which these checks should be performed is given by placing one or two asterisks after some of them. 'Two-asterisk' checks should be performed after every 300 hours of operation ; 'one-asterisk' checks after every 900 hours of operation. Checks without asterisks may be left until the machine is overhauled, i.e. until after 3,600 hours of operation.

A. OPERATING MAGNET AND CAM UNIT

N.B. To avoid damage to the machine, especially after a complete overhaul when many of the adjustments will have been disturbed, a separation has been made between static and dynamic adjustments, the latter being left until after the machine is in correct static adjustment. Dynamic adjustments for the cam unit are given in Section G, Adjustments Nos. 48 and 49.

1. Operating Magnet (Fig. 14).

*Check.***

1.1 Disconnect the operating magnet link and, for single-current operation, remove the bias spring. With no current in the operating magnet windings, check the force, measured in front of the armature stop plate, required to move the armature from side to side. This force should be :

(a) 9—11 ozs. (255—312 grams) for double-current operation ; and

(b) 7—9 ozs. (198—255 grams) for single-current operation.

The forces in the two directions should not differ by more than 1 oz. (28 grams). Note the actual values obtained. They are required in adjustment 5.

Action.

1.2 If these conditions are not satisfied, loosen clamp screw A, Fig. 14, thereby releasing screw B. With no current in the operating magnet windings, adjust the field unit by means of the screw B, so that the force required to move the armature from side to side, measured in front of the armature stop plate, is the same for both directions.

1.3 Now adjust the field strength by means of the knurled screw F, until the change-over forces satisfy the check conditions in 1.1. Tighten clamp screw A.

2. Receiving Cam Sleeve.

*Check.***

2.1 Check that the cam sleeve rotates freely, but without sufficient end-play to be detected by hand. This end-play should not exceed .0015 in. (.038 mm).

Action.

2.2 If necessary, obtain the required condition by adjusting the two locknuts at the rear of the camshaft.

*Check.**

2.3 Check that the pawls engage with their ratchets with a clean, lively action, and independently of one another.

Action.

2.4 If this is not the case, check that the pawls are not distorted and that there is no dirt or grease causing the condition.

3. Finger Setting Blade (Vertical Adjustment) (Fig. 15).

N.B. This adjustment provides a coarse, static check and adjustment for the setting blade height. A more sensitive, dynamic adjustment is provided in section G, Adjustment No. 49.

*Check.**

3.1 Check that the trip shaft is free in its movement but has a minimum of endplay.

Action.

3.2 If not, adjust the cone-pointed trip shaft bearing screw to obtain this condition.

Check.

3.3 Connect the armature link, move the armature to the spacing position and commence to turn the machine slowly by hand. Immediately after the receiving cam is released, return the armature to the marking position and continue to turn the machine until the blade H, Fig. 15, is just in contact with the setting pin G in front of the middle finger.

3.4 Check whether the centre of the blade strikes across the centre of the pin.

Action.

3.5 If this is not so, slacken screw E which clamps the trip shaft lever F to the trip shaft D. Adjust the height of the blade to obtain the condition in 3.4, ensuring, at the same time, that the armature is held to the marking stop while the trip shaft is being reset. Clamp screw E.

3.6 Move the armature to the spacing stop, and continue to turn the machine by hand. Check that the blade H clears pin G.

4. Pilot Cam Detent (Fig. 16).

*Check.**

4.1 Check that the clearance between the plate R, Fig. 16, and the screwhead Q, i.e. dimension 'b', is .010—.020 in. (.25—.51 mm).

4.2 Check also that with the armature held against the spacing stop, the pilot detent lever E clears the lug on the pilot cam A by .013—.017 in. (.33—.43 mm), i.e. dimension 'a'.

Action.

4.3 If *either* of these checks is unsatisfactory, slacken screw B and position assembly C on the trip shaft to satisfy *both* conditions. Tighten screw B.

5. Reaction on Armature (Fig. 17).

*Check.**

5.1 Replace the operating magnet link. Check that the forces required to move the armature from side to side are equal and reduced by not more than 2 ozs. (57 grams) from the values obtained in check 1.1.

Action.

5.2 If this is not so, wedge the armature centrally in the armature stop gap with feeler gauges, remove screws K and the upper blade guide.

5.3 Apply a twist and/or set to the striker blade between the point L and the pivot until the lower face of the blade lies flat without detectable pressure on the lower blade guide. Replace the upper blade guide and screws K.

5.4 Remove the feeler gauges from the armature stop gap and repeat check 5.1.

6. Receiving Cam Detent (Figs. 18 and 19).

N.B. For a check on this adjustment with the motor running see Adjustment No. 48.

Check.

6.1 Set the sliding frame of the orientation device to mark 50 on the scale. Rotate the receiving cam until the pawls are fully engaged by the detent. Withdraw the detent from the pawls, allowing them to drop into engagement with the cam ratchets. Release the detent so that it comes to rest against the ends of the pawls as in Fig. 19.

6.2 Try to insert the narrower, .047 in. end A, Fig. 18, of adjustment tool TA.1123A, between the centre of the lug on retaining ring C and sickle lever B. It should be possible to do this without moving lever B.

6.3 Now try to insert the wider, .053 in., end of the tool between the lug and sickle lever in the same manner. This time lever B should move.

Action.

6.4 If the conditions in 6.2 and 6.3 are not both satisfied, release the screw which secures abutment lever E (Fig. 19). By means of screwdriver adjustment F, adjust the relative positions of detent G, Fig. 19, and sickle lever B, Fig. 18, to obtain the required conditions. Tighten the clamp screw.

7. Retention Lever (Figs. 20 and 21).

*Check.**

7.1 Disengage the detent from the pawls and rotate the cam slightly so that a spring balance may be applied to each pawl engagement face. It should require 2½—3½ ozs. (71—99 grams) to press the pawls back against the cam seating.

Action.

7.2 As the freedom of the pawls has already been checked in 2.2 it will be necessary, if check 7.1 is not satisfied, to change the pawl springs.

*Check.**

7.3 Complete the rotation of the cam until it is arrested again by the detent. Depress the pawls by means of a thin blade in the direction of the arrow in Fig. 20 without moving the cam. Check that there is an estimated clearance of .002—.004 in. (.05—.10 mm), i.e. dimension 'e', between the pawls and the detent.

Action.

7.4 " If this is not so, slightly loosen nut L, Fig. 21, which holds the eccentric M and adjust the eccentric to obtain the required condition. Tighten nut L. "

8. Finger Setting Blade (Horizontal Movement) (Figs. 17 and 22).

*Check.**

8.1 Turn the machine by hand and move the armature so that the blade strikes the pin, setting the five fingers in turn.

8.2 Check the clearance 'f', Fig. 22, between the fifth finger and either the stop plate or the resetting link, whichever is closer to the fingers. This should be .003—.020 in. (.08—.51 mm).

Action.

8.3 If this is not so, slacken screw S, Fig. 17, and alter the position of the setting blade in relation to its cam lever to obtain the required condition. Tighten screw S.

9. Setting Pin (Fig. 17).

*Check.**

9.1 Check that when the finger setting pin P, Fig. 17, is pushed forward to its farthest extent, it will return freely. Failure to do this may cause distortion of the fingers and the finger block.

Action.

9.2 If it does not, make sure that the pin is horizontal and not fouling the edge of the slot in the traversing link.

*Check.**

9.3 Turn the machine by hand and move the armature so that the blade strikes the pin, setting the five fingers in turn. Check whether the pin is central with each finger when it is at the fully set position. Check also that, in any selecting position, there is no danger of the pin fouling an adjacent unselected finger as it withdraws from pushing a finger forward.

Action.

9.4 If these conditions are not satisfied, slacken the clamping screw O, Fig. 17. Adjust the position of the setting pin P by sliding the bearing springs along the traversing link until the required conditions are obtained. Tighten screw O.

10. Finger Springs (Figs. 22 and 32).

Check.

10.1 Remove the right-hand ribbon-bracket. Rotate the machine by hand until the fingers are fully lowered. Remove the traversing link. Check that a force of 3—5 ozs. (85—142 grams) is required to set each finger inwards when applied in the direction of the arrow in Fig. 22.

Action.

10.2 If this condition is not satisfied, check the springs. Place each spring on a flat surface so that its ends are touching the surface (see Fig. 32 (b)). A force of 8—9 ozs. (227—255 grams) should be required to depress the centre flat. Replace the finger springs in the manner shown in Fig. 32 (a). Replace the traversing link.

11. Finger Lift (Fig. 23).

*Check.**

11.1 Turning the machine by hand, set up the N combination, i.e. – – 34 –. Continue turning until the fingers are in their uppermost position and the selected bellcrank has dropped into the slot in the discs.

11.2 Check whether the clearance between the bellcrank and the left-hand side of the slot (viewing the slot from the bell-crank lifting collar end of the combination head) is greater than .012 in. (.30 mm), and whether the clearance between the bellcrank and the right-hand side of the slot is greater than .006 in. (.15 mm).

Action.

11.3 If this is not so, turn the cam until the fingers are lowered. Release the clamp screw H, Fig. 23, and adjust the finger lift by means of eccentric B until the required condition is obtained.

11.4 When this adjustment is obtained, check that the shoulder of the finger plunger and its link both clear the underside of the finger block, when the fingers are fully raised, by at least .006 in. (.15 mm). If not, readjust the finger lift until this is so, and check 11.2 is simultaneously satisfied.

12. Comb Stop Plate (Fig. 25).

Check.

12.1 The correct position of the comb stop plate is that it should just touch the lowest of the comb extensions when the extensions are dropped. This cannot be checked without disturbing the adjustment. The adjustment should not require attention until the machine is overhauled, however, when the procedure in 12.2 should be carried out.

Action.

12.2 Turn the machine by hand and set up an all spacing combination. Continue to turn until the bellcrank lifting lever has just released the combs and the comb extensions have dropped. Slacken screw M, Fig. 25, allowing the comb stop plate to drop. Raise the plate until it just touches the lowest of the extensions, this condition being detected by a slight movement of the extension. Tighten screw M.

13. Finger Resetting (Figs 22 and 24).

*Check.**

13.1 Remove the typehammer link and replace the right-hand ribbon bracket. Check that, when the fingers are reset, there is a minimum gap of .015 in. (.38 mm) between the fingers and the ends of the comb extensions, i.e. dimension 'g', Fig. 22.

13.2 Check also that, when the fingers are fully reset, they have a further movement of at least .005 in. (.13 mm), i.e. dimension 'h', Fig. 24.

Action.

13.3 If either of these conditions is not obtained, slacken screw J, Fig. 24, and adjust screw K to satisfy both conditions.

14. Bellcrank Lift (Figs. 25 and 26).

*Check.**

14.1 Set up the N combination on the fingers (– – 34 –), thereby allowing the top bellcrank to fall. With the bellcrank lifting lever on the straight part of the cam track and with the backlash

taken up by pressing the bellcrank lifting collar in the direction of withdrawal, check that there is a clearance of .006—.008 in. (.15—.20 mm), i.e. dimension 'j', Fig. 25, between the fallen bellcrank A and the lifting collar B.

Action.

14.2 If this is not so, loosen clamping screw E, Fig. 26, and with the machine in the same position in which the check was made, adjust the bellcrank lifting lever eccentric D to obtain the required condition. Tighten screw E.

Check.

14.3 With the bellcranks fully lifted, lift each comb extension to see that the combs are free and return snappily under the action of their springs.

14.4 Check also that the force required to lift each bellcrank, applied at the typehead end, is between 1 and $1\frac{3}{4}$ ozs. (28—50 grams).

Action.

14.5 If either of these conditions is not satisfied, and if no other cause can be found, the springs should be tested using the information given in the Spring Tension table.

B. PRINTING MECHANISMS

15. Type Retaining Springs (Figs. 27 and 28).

Check.

15.1 Check that a force of 7—8 ozs. (198—227 grams) applied to a type in the direction of the arrow in Fig. 27, at the three positions marked A in Fig. 28, will move the type $\frac{1}{8}$ in. (3.18 mm) from its rest position.

Action.

15.2 If, at any point, the force required to move the type is too low, measure the tension of each spring in accordance with the information given in the Spring Tension table.

15.3 If the force to move the type is too high, it may be due to a bent type, bent type racks, rough edges or dirt.

16. Typehead Support Bracket (Fig. 27).

*Check.**

16.1 Check the amount of play between the face of the bearing bush in the bracket G and the shoulder on the typehead spindle F, i.e. dimension 'l'. This should be .001—.005 in. (.03—.13 mm).

Action.

16.2 If this is not so, add or remove shims at L until the correct end play is obtained. Not more than thirteen shims should be required.

17. Typehammer Unit (Fig. 29).

*Check.**

17.1 Set up the N combination (– – 34 –) on the fingers, turn the machine by hand until the N bellcrank has fallen and then latch the typehead on this bellcrank.

17.2 Check the clearance 'm', Fig. 29. This should be $\frac{1}{32}$ in. (.8 mm) for page teleprinters and $\frac{1}{16}$ in. (1.6 mm) for tape teleprinters.

Action.

17.3 If this is not so, alter the positions of the two nuts D and E and lock them again.

*Check.**

17.4 Turn the machine by hand until the typehammer is fully forward. Check whether the centre of the typehammer head is aligned with the centre of the type bar.

Action.

17.5 If not, release screw F and move leaf spring G to obtain the condition. Tighten screw F again.

18. Typehammer Overthrow Stop (Fig. 30).

*Check.**

18.1 Take up the end play in the typehead towards the combination head and check whether the outer face of the stop lug is clear of the ends of the types by .005—.010 in. (.13—.25 mm).

18.2 Turn the machine by hand and set up a non-printing combination, latching the typehead manually. With the typehammer moved fully forward, press lightly with the thumb on the rear of the hammer head to take up back lash.

(a) If the hammer frame is now clear of the stop plate lug, check whether the contour of the frame is parallel, as judged by eye, with the radius of the stop lug face.

(b) If the frame is in contact with the stop lug, check whether the frame is in contact with the whole radius of the lug.

Action.

18.3 If any of the conditions in 18.1 and 18.2 are not satisfied, slacken the locknuts for screws H and J, Fig. 30, and fully withdraw the screws. Loosen the fixing screws L and K and change the position of the stop plate to satisfy all the conditions. Tighten screws L and K. Screw in the abutment screws H and J until they touch the abutment lugs M and N and clamp them with the locknuts.

19. Ribbon Feed (Fig. 23).

Check.

19.1 Check whether the ribbon feed pawl C, Fig. 23, feeds ratchet D round for approximately $1\frac{1}{4}$ teeth, allowing the retention pawl to retain a feed of one tooth when the set-back takes place.

Action.

19.2 If not, adjust the feed pawl by slackening the screw G and turning the eccentric sleeve F. When the correct adjustment has been obtained, reclamp the screw G.

Check.

19.3 Remove the left-hand ribbon bracket. Make sure that the right-hand ribbon feed change rod is lifted (the presence of ribbon on the spool will ensure this). Now check whether the jockey spring bears equally each side of the jockey bush when the ribbon driving shaft is pushed from side to side.

19.4 Check, also, that the ribbon change-over force is $\frac{3}{4}$—1 lb. (340—454 grams) in each direction. If this check is satisfactory, replace the left-hand ribbon bracket.

Action.

19.5 If either of the checks in 19.3 or 19.4 is not satisfied, slacken the jockey spring clamping screws.

(a) To obtain the condition in 19.3, adjust the length of the jockey spring.

(b) To obtain the condition in 19.4, tighten the clamping screws unequally, thereby causing the jockey spring to turn about the jockey pivot to bear on the jockey bush with the required pressure.

Replace the left-hand ribbon bracket.

20. Ribbon Jumper (Figs. 27 and 31).

*Check.**

20.1 Check whether the clearance between the ribbon jumper K, Fig. 27, and the steady plate J is .002 in. (.05 mm). Check also whether the ribbon jumper slides freely in its guides.

Action.

20.2 If either of these conditions is not satisfied, slacken nuts H, Fig. 27, and adjust steady plate J or guide bracket M to obtain the required conditions.

*Check.**

20.3 Check that there is sufficient clearance between the jumper and all parts of the paper platen.

Action.

20.4 If not, 'set' the jumper to obtain this.

*Check.**

20.5 Check that, when the type strikes the ribbon, the top edges of the type pad and the ribbon are level except when long fractional types are used (e.g. 7/), when the ribbon should be raised an additional $\frac{1}{32}$ in. (.8 mm).

Action.

20.6 If this is not so, adjust the ribbon lift as follows : turn the cam by hand until the traversing link is in its extreme position of movement towards the back of the machine. Slacken nut Q, Fig. 31, and adjust the abutting screw O until the ribbon is at the required height. Reclamp nut Q.

C. CONTROL UNIT

21. Control Lever Shoes (Fig. 33).

Check.

21.1 Allow the levers to rest against their bellcranks. Check whether the shoe on each control lever A rests approximately centrally on its bellcrank N and clears the combination head front plate M by an estimated amount of at least .010 in. (.25 mm), i.e. dimension 'kk', Fig. 33. Each shoe should engage its bellcrank by an amount no less than $\frac{3}{64}$ in. (1.2 mm).

Action.

21.2 If it is found that a control lever shoe touches the body front plate M, the shoe must be ground to give the required small clearance.

22. Buffer Plate and Spring (Fig. 33).

Check.

22.1 Turn the motor by hand until the bellcranks are fully raised. Check whether there is a clearance of .010—.015 in. (.25—.38 mm), i.e. dimension 'jj', between the underside of the buffer plate E and the top edges of the control levers A.

Action.

22.2 If this is not so, slacken the fixing screws D, Fig. 33, and adjust the buffer plate E (see inset) to obtain the dimension. Secure the plate with the fixing screws.

Check.

22.3 Turn the motor by hand and select any non-functional combination (e.g. – 234 –). Continue to turn until the cam is arrested by its detent. Check whether there is a clearance of .005—.015 in. (.13—.38 mm), i.e. dimension 'll', Fig. 33, estimated by observation, between the feed throwout lever trunnion and the control levers.

22.4 Select the combination – 234 – again and continue to turn the motor until the bellcranks fall. Check that in falling the control levers other than the 'Bell' control lever do not move the feed throwout lever. (In the case of the 'Bell' control lever, a slight movement of the feed throwout lever is unavoidable.)

Action.

22.5 If either of the conditions in 22.3 or 22.4 is not satisfied, slacken the fixing screws D and, without disturbing 22.1, adjust spring C to satisfy both 22.3 and 22.4.

D. PAGE ATTACHMENT UNIT

23. Latch (Figs. 34 and 36).

*Check.***

23.1 With the page attachment unit abutting against casting C, Fig. 34, measure the gap between the type face and the platen. This should be $\frac{1}{8}$ in. (3.2 mm), i.e. dimension 'nn', Fig. 36.

Action.

23.2 If this is not so, slacken screw D, Fig. 34, and adjust the position of casting C to obtain the required condition. Tighten screw D again.

*Check.***

23.3 Check that the latch functions properly, i.e. that it engages fully over pin A, Fig. 34, without any free play.

Action.

23.4 If this is not so, release screws F, Fig. 34, and alter the position of pin A by means of plate E to obtain the required condition. Clamp screws F.

24. Clutch Crosshead (Figs. 34, 37 and 38).

*Check.**

24.1 Turn the machine by hand until the traversing link is in its extreme position of movement away from the carriage. Check clearance 'p', Fig. 38. This should be .015—.025 in. (.38—.64 mm). (*N.B.* The dimension can be most easily seen from the rear of the machine.)

Action.

24.2 If this is not so, slacken clamping screw R, Fig. 37. Adjust eccentric P to obtain the required clearance. If the eccentric P provides insufficient adjustment, change the number of .015 in.

(.38 mm) buffer spacing plates behind the buffer B, Fig. 34. Not more than three plates should be used. (The part number of these plates is 1831/108A.)

25. Line Feed and Carriage Return Dogs (Fig. 38).

*Check.**

25.1 Remove the unit from the machine. Check whether there is a clearance of .010—.015 in. (.25—.38 mm) between the dogs and the clutch crosshead, i.e. dimension 'o', Fig. 38.

Action.

25.2 If this is not so, release the nut T at the back of the casting and, by means of the eccentric pin U, adjust the dogs to obtain the required clearance. Lock with nut T. Replace the unit on the machine and check that pin U is not fouled by the carriage return control lever when the latter is operated.

*Check.**

25.3 Check that the movement of the dogs under the action of their springs is lively.

Action.

25.4 If this is not so, check whether this is due to an accumulation of dirt and grease round the pivot.

26. Control Levers (Fig. 33).

*Check.**

26.1 Replace the unit on the machine if this was not done in the last adjustment. Check whether the control levers clear their associated feed dogs H and G on the page attachment unit by at least .010 in. (.25 mm), i.e. dimension 'mm', Fig. 33, when in their normal or unoperated position.

Action.

26.2 If this is not so, 'set' the control levers to obtain the condition.

27. Letter Feed Dog (Fig. 35).

*Check.**

27.1 Check whether there is a clearance of .006—.010 in. (.15—.25 mm), i.e. dimension 'n', Fig. 35, between the non-feed lever G and the plate when the non-feed lever is not selected.

Action.

27.2 If this is not so, position the adjustable plate M on the letter feed dog N to obtain the clearance.

28. Carriage Retaining Pawl (Fig. 39).

*Check.**

28.1 Remove the unit from the machine. Operate the crosshead until the carriage is in its extreme left-hand position. Check that the retaining pawl F has engaged the correct tooth in the ratchet wheel G, as shown in Fig. 39.

28.2 Check that, with the carriage retained by the retaining pawl as above, there is a clearance between the platen end plate E and stop D of not less than .010 in. (.25 mm), i.e. dimension 'q', Fig. 39.

Action.

28.3 If this clearance is incorrect, slacken clamping screw A (on the back of the frame, behind the letter feed levers). Adjust the retaining lever forward until a .010 in. feeler gauge can be inserted between the platen end plate E and the stop pin D. Push the carriage to the left against the gauge, and adjust the eccentric B until the retaining pawl is touching the face of its tooth. Clamp screw A.

29. Adjustable Platen Stop (Fig. 40).

Check.

29.1 Depress the carriage return key and ensure that the carriage is in its extreme right-hand position. Examine the engagement between the retention pawl F and the first tooth on the spring drum ratchet G. The pawl must engage at the inter-section of the tooth slope and the flat portion of the wheel as shown in the enlarged drawings.

Action.

29.2 ~~If this is not so, slacken the clamping screw H and adjust the position of the stop K to obtain the required condition. Tighten screw H.~~

30. Carriage Feed Pawl (Fig. 41).

*Check.**

30.1 Feed the carriage a few spaces to the left. Check whether there is a clearance of .005—.008 in. (.13—.20 mm) between the feed pawl and the next tooth of the ratchet wheel, i.e. dimension 'r', Fig. 41.

Action.

30.2 If this is not so, slacken the clamping screw P, and adjust the eccentric pivot N to obtain the required clearance.

31. Pawl Throwout Lever (Fig. 42).

Check.

31.1 Move the carriage approximately to its mid-position. Hold the crosshead to the right (so that the feed pawl is as high as possible) and measure the clearance between the feed pawl and the operating edge of the pawl throwout lever, i.e. dimension 'rr'. This clearance should be .001—.005 in. (.03—.13 mm).

Action.

31.2 If this is not so, slacken the clamping screws R and adjust the tail of the throwout lever Q until the required condition is obtained.

32. Air Valve (Fig. 43).

*Check.**

32.1 Check whether the apertures in the air valve that appear at the extremes of the carriage travel are equal.

Action.

32.2 If they are not, loosen screw W and adjust the position of the air valve lever X relative to the air valve V to obtain this condition. Tighten screw W.

33. Line Feed (Figs. 44, 45 and 47).

Check.

33.1 Check that the line feed positioning disc B, Fig. 47, is clamped between the knurled knob A and the hexagonal nut so that the maximum eccentricity of the eccentric Q, Fig. 44, is at right angles to the gaps in the disc. This adjustment is set before the machine leaves the factory and should not normally require attention.

33.2 For sprocket feed carriages, check that the typing lines up with the printed matter on the form.

Action.

33.3 If 33.2 is not satisfied, adjust the retention lever eccentric K, Fig. 44, to obtain the required condition.

*Check.**

33.4 Turn the knurled knob A, Fig. 45, to the double-line feed position. Place the carriage on the machine, engage the line feed dog in the clutch crosshead and turn the machine by hand until the line feed pawl is just bedding in the bottom of its tooth but has not rotated the ratchet, i.e. until it occupies the position shown in Fig. 45. Check whether there is a clearance of .005—.010 in. (.13—.25 mm), i.e. dimension 't', between the eccentric Q and the feed pawl G.

Action.

33.5 If this is not so, slacken screws E, F and G, Fig. 47. Adjust plate P, Fig. 44, until the clearance is obtained. Tighten screws E, F and G, Fig. 47.

*Check.**

33.6 Continue to turn the machine until the feed pawl is fully down, i.e. until the setting pin is opposite the fifth finger. Check whether, in this position, the retention roller M (Fig. 44) bottoms fully in a tooth.

Action.

33.7 If not, slacken locknut H, Fig. 44, and withdraw screw J. Slacken the clamping screws for stop plate O and move the plate away from the feed pawl. Slacken screw D, Fig. 47, and turn the eccentric C to obtain the required condition. Tighten screw D and the nut on the end of screw D. Continue to turn the machine and confirm that, as the feed pawl rises, there is no further rotation of the platen in either direction.

33.8 Push the stop plate O, Fig. 44, against the feed pawl and tighten its clamping screws. Adjust screw J until it just touches the back of the stop plate. Reclamp with nut H.

34. Chariot Rail and Chariot.

Check.

34.1 Check that the chariot is free in all positions without undue shake.

Action.

34.2 If this is not so, slacken the fixing screws for the carriage support bar and adjust the position of the bar to obtain the required condition. Tighten the fixing screws.

Check.

34.3 Check whether, when the carriage is in its extreme right-hand position, the flat spring at the right-hand end of the chariot is lightly in contact with the track rail.

Action.

34.4 If this is not so, 'set' the flat spring to obtain the condition.

Check.

34.5 Check whether the centre of the chariot is within $\pm\frac{1}{32}$ in. from the centre of the casting as follows:

(a) Place a roll of paper in the chariot. Pass the end of the paper under the tension roller but not under the platen. Hold the roll with one hand and pull the end of the roll taut with the other.

(b) Push the roll against the left-hand chariot end plate, and note the clearance between the paper and the right-hand end plate.

(c) Push the roll against the chariot right-hand end plate and note the clearance between the paper and the left-hand carriage end plate.

(d) Check whether the two clearances measured in (b) and (c) differ by less than $\frac{1}{16}$ in.

Action.

34.6 If this check is not satisfied, adjust the position of the chariot with respect to the paper carriage by means of the two pivot screws until the required condition is obtained.

35. Carriage Spring Tension (Fig. 42).

Check.

35.1 Place the carriage in its extreme left-hand position. Using a 4 lb. spring balance, measure the force necessary just to prevent the carriage from moving when the carriage return key is depressed. This should be between $2\frac{1}{2}$ and $3\frac{1}{4}$ lbs. (1.1 and 1.5 kg.).

Action.

35.2 If the tension is incorrect, loosen the screw clamping the spring drum spindle (this screw is in the frame at the back of the unit). Do not slacken the screw more than is necessary to rotate the spindle.

35.3 To *decrease* the spring tension, actuate the pawl by means of the pin T. To *increase* turn the screw S clockwise. Tighten the screw on the back of the frame.

36. Bell (Fig. 48).

Check.

36.1 Check that the bell rings when the carriage is fifty-five characters along the line.

Action.

36.2 If this is not so, slacken screw J and adjust trigger plate H to obtain the required condition. Reclamp screw J.

37. Pressure Rollers.

N.B. With the Langitex platen, it is very necessary to relieve the pressure of the pressure rollers on the platen when the machine has to be left idle for considerable periods ; otherwise, irregularities will be formed on the surface of the platen and the feeding of the paper will be impaired.

Check.

37.1 Check that the pressure rollers are pressing firmly against the platen. Measure the forces, applied at the ends of the pressure roller bearings, required to just lift the rollers off the platen. These four forces must satisfy the following conditions :

(a) Each force must be between 3 and 4½ lbs. (1.36 and 2.04 Kg.),

(b) No two forces must differ by more than ½-lb. (.23 Kg.).

Action.

37.2 If either of these conditions is not satisfied, the springs should be 'set' accordingly.

E. TAPE ATTACHMENT UNIT

38. Latch (Figs. 34 and 36).

*Check.***

38.1 With the tape attachment unit abutting against casting C, Fig. 34, measure the gap between the type face and the platen. This should be ⅛ in. (3.2 mm), i.e. dimension 'nn', Fig. 36.

Action.

38.2 If this is not so, slacken screw D, Fig. 34, and adjust the position of casting C to obtain the required condition. Tighten screw D again.

*Check.***

38.3 Check that the latch functions properly, i.e. that it engages fully over pin A, Fig. 34, without any free play.

Action.

38.4 If this is not so, release screws F, Fig. 34, and alter the position of pin A by means of plate E to obtain the required condition. Clamp screws F.

39. Feed Link (Figs. 51, 52 and 53).

*Check.**

39.1 Turn the machine by hand until the setting pin is opposite the first finger, i.e. the feed lever is in the extreme left-hand position. Press the feed lever trunnion in an anti-clockwise direction as in Fig. 51.

39.2 Check whether the clearance between the feed link head U, Fig. 51, and the trunnion T is .010—.015 in. (.25—.38 mm), i.e. dimension 'v'.

Action.

39.3 If this is not so, slacken the screw locking the eccentric W, Fig. 52, and adjust the eccentric to obtain the required clearance. Tighten the locking screw.

*Check.**

39.4 With the non-feed lever unselected, i.e. with a character combination set up on the combination head, check whether there is an engagement of 1/16 in. (1.6 mm) between the feed link head U and the feed lever trunnion T, i.e. dimension 'w'.

Action.

39.5 If this is not so, slacken screws AA and readjust the height of the feed link guide AB to give the required engagement. Tighten screws AA.

*Check.**

39.6 Check that, with the non-feed lever still unselected, the clearance between the non-feed lever V, Fig. 53, and the upper edge of the stop AE, i.e. dimension 'ww', Fig. 53, is .005—.010 in. (.13—.25 mm).

Action.

39.7 If this is not so, slacken screws AD, Fig. 53, and adjust the height of the stop AE to obtain the required clearance. Tighten screws AD.

40. Retention Roller (Fig. 49).

*Check.**

40.1 With the feed lever in an extreme left-hand position, check whether there is a clearance of not less than .005 in. (.13 mm) between the face of the feed pawl and the tooth face, i.e. dimension 'u', Fig. 49.

Action.

40.2 If there is not, loosen the screw that locks eccentric L and adjust the eccentric to obtain the required condition. Lock the screw. Check the adjustment by turning the tape feed knob in an anti-clockwise direction and observing whether there is a slight movement.

41. Counter Return Lever (Fig. 50).

N.B. This adjustment applies only to tape attachment units fitted with an End-of-Line Indicator.

*Check.**

41.1 Check that with the carriage return lever unoperated :

(a) the spur wheel engages fully with the teeth of the counter rack ; and

(b) the face Q, Fig. 50, of the counter lever is level with the upper face of the feed link R.

Action.

41.2 If either of these conditions is not satisfied, slacken the locknuts on eccentrics P and S and move eccentric S to the left.

41.3 With the spur wheel fully engaged with the teeth in the rack and the left-hand extension of lever Q touching the bottom of the spur wheel spindle, adjust eccentric P so that the face Q is level with the upper face of feed link R. Tighten the locknut for eccentric P.

41.4 Adjust eccentric S so that, with lever Q in the same position as in 41.3, the eccentric touches the vertical arm of the lever. Tighten the locknut for eccentric S.

41.5 Turn the tape feed knob until the rack is in the extreme left-hand position. Set up the carriage return combination on the machine (- - 4 -) and check the operation of the counter return lever The rack should move smoothly to its position of rest.

41.6 Set up a non-functional combination on the machine. Check that the spur wheel either falls cleanly into engagement with a tooth on the rack or rests upon the top of a tooth so that, after the tape feed spindle has been rotated through a distance equal to one feeding operation, the spur wheel will fall cleanly into engagement with the rack.

*Check.**

41.7 Check that, when the tape feed spindle is fed through 55—56 letter positions after a carriage return signal, the switch contacts close.

Action.

41.8 If this is not so, set the contacts to obtain the required condition.

F. STARTER SWITCH, MOTOR AND GOVERNOR

42. Starter Trip (Figs. 54, 55, 56 and 57).

Check.

42.1 With the starter trip lever B, Fig. 54, engaged in the electromagnet link C (see inset), move the armature so that the spring extension D to the trip lever is in its right-hand position viewed from the front of the machine.

42.2 With the weight-arm pin fully engaged in the hole in the worm wheel, check that the end of the trip spindle P, Fig. 56, projects through the support M, Fig. 55, in such a way that it touches but does not set the leaf spring N.

Action.

42.3 If this is not so, adjust the spindle longitudinally after unscrewing the screw O, Fig. 56. When reclamping, make sure that the screw is located on the flat provided on the spindle. Note particularly that the tip of the spindle P is not binding on the sides of the clearing hole in the support bracket M, owing to the presence of dirt or grease.

Check.

42.4 With the weight-arm pin R, Fig. 57, engaged in a hole in the worm wheel E, Fig. 55, and the armature in the marking position, check clearance 'x', Fig. 55. This should be .005—.010 in. (.13—.25 mm).

Action.

42.5 If this dimension is incorrect, slacken screw F and slide the trip boss G along the spindle. Clamp screw F, taking care that its end is located on the flat provided on the spindle.

43. Starter Weight (Figs. 54 and 57).

Check.

43.1 With the weight at the bottom of its drop, check that the weight-lifting arm is free to move either side of dead centre without any tendency to bind or jam on the link. This is to ensure that the weight-lifting arm pin will not fail to engage with a hole in the disc in cases when the weight-lifting arm, in dropping, reaches dead centre or passes beyond it.

43.2 Check that, as the motor is switched off, the pin of the weight-lifting arm is clear of the shroud S, Fig. 57, and that the hole immediately under that in which the pin rests is just emerging from behind the shroud.

Action.

43.3 If the switch is breaking too early, slacken clamping screw T, and move the weight-lifting arm down the rod and reclamp. Slacken screw X and lower the positioning collar Y to rest on the top of the weight and reclamp.

43.4 If the switch is breaking too late, move the collar up a little, and raise the weight accordingly.

Check.

43.5 Check that, with the weight-lifting arm AA in its lowest position, the spring extension D, Fig. 54, passes freely into the slot in the boss A.

Action.

43.6 If this is not so, set the lever B slightly by means of a pair of pliers.

44. Force to Trip Starter (Figs. 55, 56 and 57).

*Check.**

44.1 Check that the trip spindle is clear of dirt and grease.

44.2 Lift the weight and engage the weight-lifting arm pin R, Fig. 57, in the hole exposed at the top of the shroud. Check that the force required to disengage the pin from the worm wheel and to allow the weight to drop, when applied at the end of the trip spindle P, Fig. 56, lies between 2 and 3 ozs. (57—85 grams).

44.3 Check that, when the end thrust spring N, Fig. 55, is removed, the force does not exceed $\frac{3}{4}$ oz. (21 grams).

Action.

44.4 If the check in 44.3 is unsatisfactory, this indicates that the trip spindle is not perfectly free in its guides.

45. Motor Governor Brushes.

*Check.***

45.1 If the governor brushes are new, check that the tip of the back of the governor brush spring, when the governor is removed, is $\frac{3}{4}$ in. (1.9 cm.) from the motor support plate.

45.2 Check also that the governor brush backing spring lies flat against the governor brush spring.

Action.

45.3 If either of these conditions is not satisfied, set the springs to obtain them.

*Check.***

45.4 If the governor brushes are worn, check the force which they exert on the governor slip rings. This should be $4\frac{1}{2}$—$5\frac{1}{2}$ ozs. (128—156 grams).

Action.

45.5 Set the springs to compensate for brush wear. This may be done by measuring the distance between the tip of the back of the worn governor brush spring and the motor support plate, removing the governor, and pushing back the brush by means of a spring balance to the position it occupies when in contact with the governor. Replace the governor, ensuring that it is pushed on to the motor shaft as far as it will go.

46. Governor Contacts—Series Governing (Fig. 58).

*Check.***

46.1 Extend the governor spring A until the contact arm saddle E is just touching the stop face of the contact arm stop spring D. Check whether dimension 'l', Fig. 58, is .015—.020 in. (.38—.51 mm).

Action.

46.2 If this is not so, extend the governor spring as in 46.1, this time using the governor contact adjusting clamp TA.1110.

46.3 Slacken screw C just enough to free contact screw F, and adjust screw F to obtain the required dimension. Tighten screw C. Relax the governor spring A and remove the adjusting clamp.

47. Governor Contacts—Shunt Governing (Fig. 59).

*Check.***

47.1 With the contact arm E held against the insulated plug B by the governor spring, check dimension 'm', Fig. 59. This should be .020—.025 in. (.51—.64 mm).

Action.

47.2 If this is not so, slacken screw C just enough to free contact screw D, and adjust contact screw D to obtain the required dimension. Tighten screw C.

Check.

47.3 Check that a force of 30—32 grams is required to move the contact spring A.

Action.

47.4 If this is not so, set the contact spring A and the backing strip F to obtain the required force.

G. ADJUSTMENTS WITH THE MOTOR RUNNING

48. Receiving Cam Detent Check (Figs. 18 and 19).

*Check.**

48.1 With the motor running, insert the smaller end of adjustment tool TA.1123A (of diameter .047 in.) between sickle lever B, Fig. 18, and the lug on the retaining ring C, ensuring that the pin rests in the middle of the lug. Check that the detent G, Fig. 19, is not withdrawn from the pawls D.

48.2 Repeat the test using the larger end of the adjustment tool (of diameter .053 in.). Detent G should now be withdrawn from the pawls D.

Action.

48.3 If either of these tests is not satisfied, refine adjustment 6.4.

49. Finger Setting Blade—Final Check.

*Check.***

49.1 With the motor running, and the magnet armature on the marking stop, insert a .013 in. (.33 mm) feeler gauge between the armature and the spacing stop and hold the feeler gauge against the stop by means of the armature. If the receiving cam detent has not already released, release it and check that all-marking combinations only are set up on the fingers.

49.2 Repeat the above procedure with a .009 in. (.23 mm) feeler gauge. This time all-spacing combinations only should be set up on the fingers.

Action.

49.3 If either of these conditions is not satisfied, readjust the height of the finger setting blade and then check adjustments 4 and 5 again.

50. Typehammer Shackle (Fig. 29).

Check.

50.1 Check that the printing is neither too heavy nor too light.

Action.

50.2 If this is not so, remove the typehammer from the machine, screw up the typehammer rod C, Fig. 29, until the spring enclosed in the shackle is closed right up and then release for approximately one turn. Replace the typehammer on the machine. Secure it with the screw and washer.

51. Starter Throw-out Bracket.

*Check.***

51.1 Allow the weight to operate the switch and set the motor running. Check that, when the motor has switched off, the leading edge of the throw-out bracket is clear of the weight-lifting arm by .005—.010 in. (.13—.25 mm).

Action.

51.2 If this is not so, slacken the screws which secure the bracket and move it to the required position. Lock in this position with the fixing screws.

51.3 Test the foregoing adjustment by removing the switch cover and short-circuiting the motor contact blades in order to make the switch inoperative. (Unless an insulated screwdriver is available, this should be done by depressing the rear spring stirrup.) Check that, as the weight-lifting arm encounters the cam face of the throw-out bracket and disengages the weight-lifting arm pin from the worm wheel, it thereby allows the weight to drop. This must occur before the switch arm and the weight-lifting arm link become jammed. Remove the short circuit and replace the cover.

52. Clutch Torque.

N.B. Alternative figures are given in the following adjustment for the clutch torque according to whether the clutch drum is fitted with a .026 in. thick clutch band 2843/15 or a .019 in. thick clutch band 2843/8.

*Check.***

52.1 Select the letter 'J' on the combination head, so that the typehead clutch latches on the J bell-crank with the large gap in the types uppermost.

52.2 Apply a 0—12 oz. spring balance to the typehead by placing the hook of the balance over a type and tension the balance to 6 ozs. (for .019 in. band) or 9 ozs. (for .026 in. band). Hold the balance firmly in this position.

52.3 Depress the space bar or operate the magnet armature to space. The spring balance should now give a reading of:

(a) 7—9 ozs. (198—255 grams) for the .019 in. clutch band.

(b) 10—12 ozs. (284—340 grams) for the .026 in. clutch band.

Action.

52.4 If the reading is too high and a new clutch lining has just been fitted, the machine should be run continuously until the clutch pressure is reduced to within the limits specified in 52.3.

52.5 If the reading is incorrect, and a new clutch lining has not just been fitted, check the band and lining for wear and other possible causes of incorrect pressure.

53. Ribbon Change-over Mechanism.

*Check.**

53.1 Remove the ribbon spools and check that each feed change rod falls freely into contact with the feed change spindle.

53.2 Hold the electromagnet armature on the spacing contact, switch on the motor and allow the machine to 'run away'. Check that the ribbon driving shaft alternates between its two positions due to both rods having fallen.

Action.

53.3 If the check in 53.2 is not satisfied, check whether there is an accumulation of dirt or grease round the feed change rods, wear at their lower ends, binding of the rods, or stiffness of the change rod bellcranks.

*Check.**

53.4 Check also whether the bias spring bears equally each side of the jockey bush as the ribbon driving shaft automatically alternates.

Action.

53.5 If this is not so, remove the left-hand ribbon bracket and readjust the length of the bias spring slightly to obtain the required condition. Carry out check 19.4 and, if satisfactory, replace the ribbon bracket.

54. Short and Long Line Tests.

*Check.**

54.1 With the teleprinter running, depress the C.R., L.F. and LETTERS keys and confirm that the carriage has returned to the extreme right of its travel. Depress the letter 'A' key, followed by the C.R., L.F. and Letter 'A' in quick succession. Repeat this procedure several times, and confirm that in all cases the characters are printed immediately under each other.

54.2 Move the carriage to the extreme left of its travel. Depress the C.R., L.F., LETTERS, Letter 'A' and SPACE key in quick succession. The carriage should now have returned to the right and printed the character immediately below the 'A' of the short line test. Repeat this procedure a number of times.

Action.

54.3 If either of the above checks is unsatisfactory, check adjustment 35 again. If still unsatisfactory, check whether this is due to excessive friction or a damaged part.

H. SINGLE-CURRENT ADJUSTMENTS

N.B. (a) The adjustments provided in this section apply to receivers fitted with the 'adjustable field' type electromagnet S.2848A, with a single bias spring, and an orientation cam unit.

(b) The adjustment for the magnet field, viz. adjustment 1.1, gives optimum results only on circuits employing a signalling supply of 60—120 volts and 40 mA receive current. If an adjustment for voltages and currents outside this range is required, it will be necessary either to experiment or to apply to Creed and Company for a special investigation to be made.

(c) Different adjustment procedures are given in the following instructions for short and long lines. By a 'short' line will be meant one whose capacitance is less than that of 20 km. of 20-lb./loop mile copper underground cable. A 'long' line, correspondingly, will be one whose capacitance is greater than this. If there is any doubt as to whether the line is 'short' or 'long', according to the above definition, adjustment procedure 57, which is provided to cover this case, should be followed.

(d) It is assumed that the source of signals for these adjustments is either a T.D.M.T. (or other high-grade source) or a correctly adjusted keyboard transmitter. The measurement of receiver tolerance is assumed to be made with the orientation device. If a T.D.M.T. is used for this purpose, however, the orientation device lever should be initially set at 50.

(e) If no keyboard is fitted to the receiver, or if one is fitted but no local record is required, the 'long line' procedure should be used irrespective of the length of the line.

55. Short Lines.

55.1 Check that the electrical connections are for single-current working (see page 9).

55.2 Set the orientation lever to 15.

55.3 Determine the approximate setting for the bias spring adjustment by transmitting a succession of Rs from the *local* transmitter and increasing the tension of the bias spring from zero until correct selection just occurs.

55.4 Refine adjustment 55.3 as follows. Determine the lowest setting of the orientation lever for which the receiver correctly selects both 400 Rs. and 400 Ys. Let this setting be x_1.

55.5 Move the orientation lever towards 100. Determine the highest setting of the lever for which the receiver correctly selects 400 Rs and 400 Ys. Let this setting be y_1.

55.6 Increase the bias spring tension in steps of two or three divisions and repeat the tests in 55.4 and 55.5 until $y_1—x_1$ is a maximum. Lock the adjustment with the clamp nut.

55.7 Repeat adjustments 55.4 and 55.5 for signals from the *distant* transmitter. Let the upper and lower settings of the orientation lever in this case be y_d and x_d.

55.8 Set the orientation device in the centre of the range found in 55.7, i.e. on $\frac{1}{2}(x_d+y_d)$.

56. Long Lines.

56.1 Carry out adjustments 55.1 and 55.2.

56.2 Determine the approximate setting for the bias spring adjustment by transmitting a succession of Rs from the *distant* transmitter and increasing the tension of the bias spring from zero until correct selection just occurs.

56.3 Refine adjustment 56.2 as follows. Determine the lowest setting of the orientation lever for which the receiver correctly selects both 400 Rs and 400 Ys. Let this setting be x_d.

56.4 Move the orientation lever towards 100. Determine the highest setting of the lever for which the receiver correctly selects 400 Rs and 400 Ys. Let this setting be y_d.

56.5 Increase the bias spring tension in steps of two or three divisions and repeat the tests in 56.3 and 56.4 until $y_d—x_d$ is a maximum. Lock the adjustment with the clamp nut.

56.6 Set the orientation lever in the centre of the range found in 56.5, i.e. on $\frac{1}{2}(x_d+y_d)$.

57. Lines of Unknown Characteristics.

57.1 Adjust the bias spring tension to give maximum tolerance to *distant* signals as in adjustments 56.1—56.5.

57.2 Check the margin to *local* signals as in adjustments 55.2—55.5.

57.3 If the local margin is adequate, centralise the orientation lever to the settings for *distant* signals found in 57.1.

57.4 If the local margin is inadequate, increase the bias spring tension two or three divisions of the bias adjustment nut.

(a) If the local margin is thereby increased, the receiver should be adjusted as for 'short lines', i.e. in accordance with adjustment 55.

(b) If the local margin is decreased still further, the line is too long (i.e. the line capacitance is too great) for satisfactory operation.

58. Short Lines (Alternative Method).

N.B. The 'short lines' procedure in adjustment 55 is designed to give optimum results. The following simpler procedure may be used, however, in cases where a slight loss of distant margin (not more than 5 per cent) can be tolerated.

58.1 Place the machine in a purely resistive circuit, e.g. in the base workshop.

58.2 Transmitting signals from a T.D.M.T. or a correctly adjusted keyboard transmitter, adjust the bias spring tension until the optimum margin is obtained for successions of 400 Rs and 400 Ys. Clamp the bias adjustment locknut.

58.3 Place the machine in the line circuit in which it normally operates.

58.4 Measure the margin to signals from the distant end and centralise this by means of the orientation device.

I. DOUBLE-CURRENT ADJUSTMENTS

59. Adjustment with T.D.M.T.

59.1 Check that the electrical connections are for double-current working (see page 9).

59.2 Connect the receiver to the T.D.M.T. and set the orientation device lever on 50.

59.3 Transmit a succession of Rs and slowly turn the control knob on the T.D.M.T. so as to shorten the start signal. Determine the shortest start signal for which the receiver correctly registers 400 transmitted characters.

59.4 Leaving the margin control knob in this position, transmit 400 Ys. If the machine fails to select correctly, lengthen the start signal until it just selects correctly. Note this reading, i.e. the percentage shortened start signal for which the receiver correctly registers 400 Rs and 400 Ys. Let this be x per cent.

59.5 Slowly turn the control knob in the opposite direction and determine, as in 59.3 and 59.4, the longest start signal for which the receiver correctly registers 400 Rs and 400 Ys. Let this be y per cent.

59.6 If x and y are unequal, the setting of the orientation lever should be changed and tests 59.3 and 59.4 repeated until they are equal.

(The correction to be applied to the orientation device setting is as follows :

(a) If the bias is towards shortened start, move the orientation lever towards zero by $\frac{1}{2}(x-y)$ divisions.

(b) If the bias is towards lengthened start, move the orientation lever towards 100 by $\frac{1}{2}(y-x)$ divisions.

It may be necessary to repeat these corrections.

60. Adjustment without T.D.M.T.

60.1 Carry out adjustment 59.1.

60.2 Check the adjustment of the striker pattern keyboard that is to be used as a source of signals.

60.3 Connect the output of the transmitter to the receiver (e.g. by working the transmitter and receiver 'in local').

60.4 Transmit a succession of Rs and move the orientation lever towards zero to determine the lowest position for which the receiver correctly registers 400 transmitted characters.

60.5 Leaving the orientation lever in the position found in the last adjustment, transmit 400 Ys. If the machine fails to select correctly, move the lever towards 100 until the receiver just selects correctly. Note the reading, i.e. the orientation setting for which the receiver just correctly selects 400 Rs and 400 Ys. Let this setting be x.

60.6 Move the orientation lever past 50 towards 100 and determine, as in 60.4—60.5, the highest orientation setting for which the receiver correctly selects both 400 Rs and 400 Ys. Let this setting be y.

60.7 The difference between x and y provides an approximate measure of the overall adjustment of the receiver. If the orientation range obtained in this way is less than the required amount, the adjustment of the machine should be checked.

60.8 Set the orientation device lever in the centre of the range determined in 60.7, i.e. on $\frac{1}{2}(x+y)$. Check that this position is between 40 and 60. If this is not the case, check the machine adjustments.

SUMMARY OF ADJUSTMENTS

N.B. It cannot be too strongly emphasised that a periodic check of the state of adjustment of the teleprinter will not only reduce the frequency of faults but also prolong the life of the machine.

A summary of the principal adjustments is provided below to enable this check to be performed with the minimum expenditure of time and labour. This summary is intended to serve as a reminder of the full text of the adjustments given on pages 23 to 38, but it is not meant to replace it. The teleprinter adjustments should be checked at least once in accordance with the full text before the summary is used for this purpose.

'<'='less than' '>'='greater than'

'⩽'='not less than' '⩾'='not greater than'

Check	*Nature of Check*	*Force or Clearance*		*Figure*
	A. OPERATING MAGNET AND CAM UNIT			
**1.1	Operating Magnet changeover force ..			
	(a) Double Current	9–11 ozs.	255–312 grs.	—
	(b) Single Current	7–9 ozs.	198–255 grs.	—
**2.1	Cam sleeve end play	⩾.0015″	⩾.038 mm.	—
*2.3	Action of pawls	—	—	—
*3.1	Trip shaft end play	—	—	—
*4.1	Endwise adjustment of plate assembly on trip shaft	.010–.020″	.25–.51 mm.	16 'b'
*4.2	Clearance between pilot cam detent and pilot cam	.013–.017″	.33–.43 mm.	16 'a'
*5.1	Reaction on armature (reduction of change-over forces)	⩾ 2 ozs.	⩾ 57 grs.	17
6.1–6.3	Detent engagement using double-ended pin	.047–.053″	1.19–1.35 mm.	18, 19
*7.1	Force to press pawls back against cam seating	2½–3½ ozs.	71–99 grs.	20 (see arrow)
*7.3	Vertical clearance between detent and pawls when pressed back against cam seating	.002–.004″	.05–.10 mm.	20 'e'
*8.2	Clearance between fifth finger and stop plate whichever is nearer to fingers ..	.003–.020″	.08–.51 mm.	22 'f'
*9.3	Pin central with fingers at fully set positions	—	—	17
10.1	Force to set each finger inwards ..	3–5 ozs.	85–142 grs.	22 (see arrow)
*11.2	Finger Lift :			
	(a) Clearance between bellcrank and L.H.S. of slot	>.012″	>.30 mm.	23
	(b) Clearance between bellcrank and R.H.S. of slot	>.006″	>.15 mm.	23
*13.1	When fingers reset :			
	(a) gap between fingers and ends of comb extensions	⩽.015″	⩽.38 mm.	22 'g'
	(b) further movement of fingers ..	⩽.005″	⩽.13 mm.	24 'h'
*14.1	Clearance between fallen bellcrank and lifting collar	.006–.008″	15–.20 mm.	25 'j'
	B. PRINTING MECHANISMS			
15.1	Force to move types ⅛″ from rest position	7–8 ozs.	198–227 grs.	27, 28
*16.1	Typehead unit endplay	.001–.005″	.03–.13 mm.	27 'l'
*17.2	Clearance between hammer head and types :			
	(a) for Page Teleprinters	1/32″	.8 mm.	29 'm'
	(b) for Tape Teleprinters	1/16″	1.6 mm.	29 'm'

Check	*Nature of Check*	*Force or Clearance*		*Figure*
	B. PRINTING MECHANISMS—*continued*			
*18.1	Clearance between typehammer stop lug and types	.005–.010″	.13–.25 mm.	30
19.1	Ribbon feed pawl to feed ratchet round approximately 1¼ teeth	—	—	23
*20.1	Clearance between ribbon jumper and steady plate	.002″	.05 mm.	27
*20.5	Top edges of type pad and ribbon to be level	—	—	31
	C. CONTROL UNIT			
22.1	Clearance between underside of buffer plate and top edges of control levers ..	.010–.015″	.25–.38 mm.	33'jj'
22.3	Clearance between feed throwout lever trunnion and control levers	.005–.015″	.13–.38 mm.	33 'll'
	D. PAGE ATTACHMENT UNIT			
**23.1	Latch adjustment gap between type and platen	⅛″	3.2 mm.	36 'nn'
*24.1	Horizontal clearance between clutch cross-head and dogs	.015–.025″	.38–.64 mm.	38 'o'
*25.1	Vertical clearance between clutch cross-head and dogs	.010–.015″	.25–.38 mm.	38 'o'
*27.1	Clearance between non-feed lever and adjustable plate on letter feed dog ..	.006–.010″	.15–.25 mm.	39 'q'
*28.2	Clearance between platen end plate and stop	≮.010″	≮.25 mm.	39 'q'
*30.1	Clearance between feed pawl and next tooth of ratchet wheel	.005–.008″	.13–.20 mm.	41 'r'
31.1	Clearance between feed pawl and pawl throwout lever with feed pawl as high as possible	.001–.005″	.03–.13 mm.	42 'rr'
*32.1	Air valve apertures equal at extremes of travel	—	—	43
*33.4	Clearance between pawl and eccentric with pawl at bottom of ratchet tooth (line feed)	.005–.010″	.13–.25 mm.	45
35.1	Force just to prevent carriage moving ..	2½–3¼ lbs.	1.1–1.5 kg.	42
	E. TAPE ATTACHMENT UNIT			
**38.1	Latch adjustment gap between type face and platen	⅛″	3.2 mm.	36 'nn'
*39.2	Clearance between feed link head and trunnion	.010–.015″	.25–.38 mm.	51 'v'
*39.4	Engagement between feed link head and trunnion	1/16″	1.6 mm.	52 'w'
*39.6	Clearance between non-feed lever and feed link	.005–.010″	.13–.25 mm.	53 'ww'
*40.1	Clearance between feed pawl and ratchet tooth	≮.005″	≮.13 mm.	49 'u'
*41.7	End-of-Line Switch operates after 55-56 letter positions	—	—	50
	F. STARTER SWITCH, MOTOR AND GOVERNOR			
42.4	Clearance between starter trip extension and trip boss	.005–.010″	.13–.25 mm.	55 'x'
43.2	Starter weight adjustment	—	—	—
*44.2	Force to trip starter (with end thrust spring in place)	2–3 ozs.	57–85 grs.	56

Check	*Nature of Check*	*Force or Clearance*		*Figure*
	STARTER SWITCH, MOTOR AND GOVERNOR—*continued*			
*44.3	Force to trip starter (with end thrust spring removed)	⊁ ¾ oz.	⊁ 21 grs.	55
**45.4	Force exerted by governor brushes on governor	4½–5½ ozs.	128–156 grs.	—
**46.1	Series governor contact gap	.015–.020″	.38–.51 mm.	58 'l'
**47.1	Shunt governor contact gap	.020–.025″	.51–.64 mm.	59 'm'
	G. ADJUSTMENTS WITH MOTOR RUNNING			
*48.1 48.2	Double-ended pin check of receiving cam detent release	.047, .053″	—	—
**49.1 49.2	Finger setting blade final check	.013, .009″	.33, .23 mm.	—
50.1	Check of printing	—	—	—
**51.1	Clearance between throw-out bracket and weight-lifting arm when motor is switched off	.005–.010″	.13–.25 mm.	—
**52.3	Clutch Torque:			
	(a) For .019″ band	7–9 ozs.	198–255 grs.	—
	(b) For .026″ band	10–12 ozs.	284–340 grs.	—
*53.2	Ribbon change-over adjustment	—	—	—
*54.1 54.2	Short and Long line tests for carriage spring tension	—	—	—

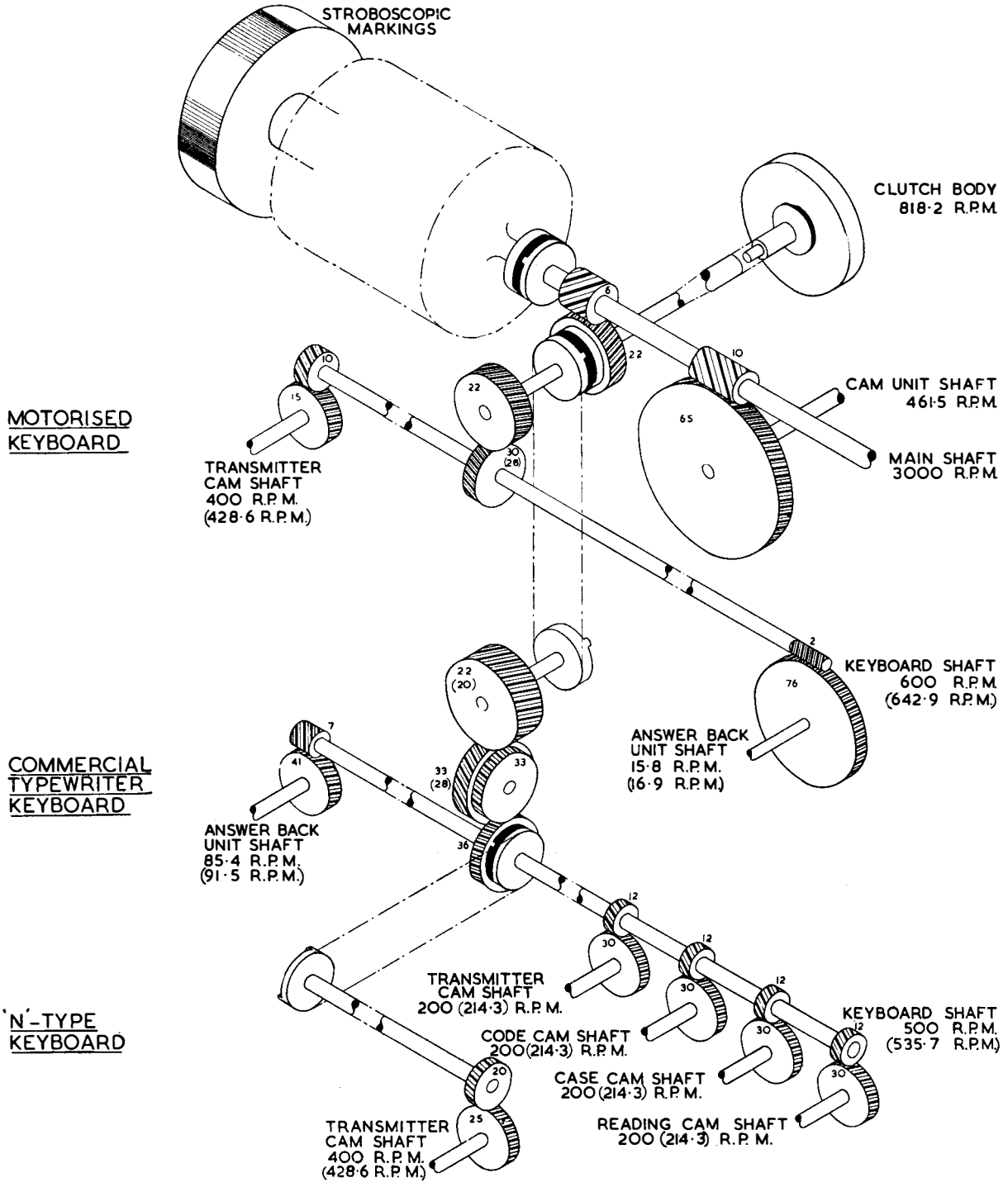


FIGURE 8. SHAFT SPEED DIAGRAM

Note 1. Figures shown on or next to gears denote the number of teeth.

Note 2. Where two tooth numbers or shaft speeds are shown, the figures in brackets refer to 'C' models only.

DISMANTLING AND ASSEMBLING INSTRUCTIONS

N.B. Do not touch the screws which are painted red. Most of these are abutment screws which have been set to gauge, and once they are slackened cannot be correctly re-adjusted without returning the unit to the factory.

A. TO DISMANTLE THE TELEPRINTER INTO UNITS

(Fig. 60)

1. Keyboard Unit.

1.1 Withdraw the two keyboard fixing screws, and remove the keyboard together with the coupling disc.

2. Page (or Tape) Attachment Unit.

2.1 Unlatch the page (or tape) attachment and lift it from its pivot.

3. Operating Magnet Unit Q.

3.1 Disconnect the electromagnet link from the armature.

3.2 Withdraw the two magnet unit fixing screws, and remove the operating magnet unit.

4. Main Shaft and Starter Switch Control Unit.

4.1 Remove the gear covers V and X over the main shaft.

4.2 Remove the screw which secures the mainshaft bearing to the cam unit.

4.3 Remove the two screws which secure the control unit plate to its casting.

4.4 Slacken the screw in the starter switch weight which holds the starter rod, and remove the mainshaft with the starter control unit and the motor coupling disc.

N.B. Do not, unless necessary, remove the starter switch stop plate from the front of the base, as the spring stirrup on the switch may jump out of engagement. If this happens, remove the switch cover at the side of the base casting and withdraw the three screws which fix the starter switch to the casting. Replace the spring with its stirrups and reclamp the starter switch. Replace the cover.

5. Governor Unit R and Motor Unit T.

5.1 Remove the governor clamp cover, slacken the screw on the clamping boss and remove the governor.

5.2 Slacken the clamping screw on the right-hand motor support plate. Remove the motor complete with left-hand motor support plate, taking care not to damage the governor brushes.

6. Ribbon Feed Brackets D and G.

6.1 Disengage the ink ribbon from the ribbon jumper.

6.2 Withdraw the two fixing screws from each bracket and remove the brackets.

7. Typehammer Unit F.

7.1 Withdraw the typehammer pivot fixing screw and remove the washer.

7.2 Remove the typehammer unit.

8. Typehead Unit E.

8.1 Withdraw the screw which holds the typehead support bracket.

8.2 Remove the support bracket by sliding it out of engagement with the ribbon jumper and remove shims.

8.3 Remove the typehead unit.

9. Cam Unit L.

9.1 *If a reperforating attachment is fitted,* remove the set collar which retains the perforator trip link, and lift the link clear of the cam unit.

9.2 Remove the three cam unit fixing screws.

9.3 Disengage the ribbon feed pawl from the ratchet wheel and slide the cam unit away to the right.

10. Control Lever Unit B.

10.1 Apply the safety-catch under the feed throwout lever to disengage the control levers from the bellcranks in the combination head.

10.2 Remove the two screws which secure the combination head to its casting and remove the type-hammer overthrow stop H together with its supports and the body clamp strap J.

10.3 Withdraw the two unit fixing screws and remove the control unit.

11. Combination Head Unit N.

11.1 *If a reperforating attachment is fitted*, remove the two screws, washers and nuts which secure the selector cable block to the right-hand side of the combination head frame. Lift the block clear of the combination head. Remove the two screws securing the suppression unit on the left-hand side of the combination head frame. Lift the suppression unit clear of the combination head.

11.2 Detach the spring of the answer-back rockshaft O from its anchor.

11.3 Withdraw the screw which secures the shaft bearing plate and remove the shaft from the machine.

(When reassembling, care must be taken not to damage the bearing end of the shaft when inserting it into the frame of the combination head.)

11.4 Withdraw the two unit fixing screws and remove the combination head unit.

12. Ribbon Driving Shaft Unit.

12.1 *If a Period of Operation Counter is fitted*, remove the nut on the top of the pillar securing the gear bearing bracket, withdraw the two screws holding this to the ribbon shaft bearing, and remove the gear bearing bracket complete with gear and jockey spring. Unscrew the pillar from the base, withdraw the other three fixing screws which hold the driving shaft bearings and remove the assembly.

(When reassembling, ensure that :

(a) the counter driving gear is above the centre line of the shaft ;

(b) the centre of the counter driving worm is in contact with the counter driving gear but the two do not bind ;

(c) there is a small gap between the counter driving gear and the counter star wheel when the counter is tightly clamped ; and

(d) the lower nut on the pillar is supporting the underside of the gear bearing bracket and the upper nut is clamped securely down to it.)

12.2 *If no Counter is fitted*, withdraw the four fixing screws which hold the driving shaft bearings and remove the assembly.

B. TO REMOVE INDIVIDUAL UNITS

(*Fig.* 60)

N.B. This section is provided to enable any unit to be removed with the minimum disturbance to other units.

1. To Remove the Typehead Unit E.

1.1 Remove the page (or tape) attachment unit.

1.2 Disengage the ink ribbon from the ribbon jumper and then follow the instructions in Section A, paragraph 8.

2. To Remove the Clutch Body (Figs. 61 and 62).

2.1 Carry out instruction 1 above.

2.2 Remove the typehammer overthrow stop.

2.3 Holding the governor stationary, unscrew the clutch body by means of the special spanner TA.1127.

2.4 When completely unscrewed from the combination head, pull the clutch body out of its ballrace, carefully noting the number of shims on the boss.

(When reassembling, ensure that :

(a) the correct number of shims are replaced between the clutch body and the ballrace. If there is any doubt about this, check whether the latch engagement, dimension 'c', Fig. 62, measured with the typehead pressed towards the combination head, is .055—.066 in. (1.40—1.68 mm). If difficulty is experienced in measuring this dimension, the following method of obtaining it may be employed :

(1) Set up the 'N' combination (– – 34 –).

(2) Rotate the governor slowly by hand, holding the typehead inwards, until the leading edge of the latch just touches, but is not deflected by, the selected bellcrank.

(3) In this position, measure the distance between the point B of the latch and the point of engagement of the latch and the bellcrank, i.e. dimension 'b'. (This measurement should be made by laying a steel rule along the sloping edge of the latch as shown in Fig. 61.)

(4) If the reading on the rule is between 4 and 4.75 mm., the latch engagement, i.e. dimension 'c', Fig. 62, will be correct.

(b) the driving spring of the typehead clutch engages inside the eye of the clutch band.

(c) the correct number of shims is assembled between the typehead support bracket and the casting.)

3. To remove the Cam Unit L.

3.1 Remove the keyboard and the page (or tape) attachment unit.

3.2 Remove the typehammer unit.

3.3 Disengage the ink ribbon from the ribbon jumper and remove the R.H. Ribbon Feed Bracket G. Remove the scale support.

3.4 Remove the main shaft W with the starter switch control unit Y and the motor coupling disc.

3.5 *If a reperforating attachment is fitted,* remove the set collar which retains the perforator trip link, and lift the link clear of the cam unit.

3.6 Disconnect the armature link from the operating magnet unit and then follow the instructions in Section A, paragraph 9.

4. To Remove the Control Lever Unit B.

4.1 Remove the page (or tape) attachment unit.

4.2 Remove the typehammer unit F.

4.3 Disengage the ink ribbon from the ribbon jumper.

4.4 Remove the typehead support bracket and the shims.

4.5 Remove the typehead unit E and then follow the instructions in Section A, paragraph 10.

5. To Remove the Reperforating Attachment (if fitted).

5.1 Remove the two screws, washers and nuts which secure the selector cable block to the right-hand side of the combination head frame.

5.2 Remove the two screws securing the suppression unit on the left-hand side of the combination head frame.

5.3 Remove the fixing screws of the two cable brackets and lift off the brackets.

5.4 Slacken the screws which secure the plunger casting to the side of the main casting.

5.5 Lift off the selector cable with plunger casting, cable brackets, suppression unit, and selector cable fixing block attached.

5.6 If it is required to remove the perforator trip push rod, this may be done by removing the set collar and lifting it off with the push rod link attached.

6. To Remove the Combination Head.

N.B. It is not normally necessary to remove the combination head casting.

6.1 Remove the keyboard and the page (or tape) attachment unit.

6.2 Disengage the ink ribbon from the ribbon jumper and remove the right-hand ribbon feed bracket G.

6.3 Remove the typehead support bracket and the shims, followed by the typehead unit E.

6.4 *If a Reperforating Attachment is fitted,* carry out instructions 5.1 to 5.3 above, and lift the selector cable out of the way.

6.5 Apply the safety catch under the feed throwout lever to disengage the control levers from the bellcranks.

6.6 Remove the two screws which secure the combination head on its casting and remove the type-hammer overthrow stop H together with its supports and the clamp strap J.

6.7 Slacken the screw which secures the comb stop plate K until the plate clears the comb extensions.

6.8 Follow Section A, paragraph 4, to remove the main shaft W with the starter switch control unit Y.

6.9 Remove the spring on the answer-back rockshaft O from its anchor and turn the shaft out of engagement with the bellcrank.

6.10 Remove the oil cover over the cam levers and remove the bellcrank lifting lever with its cam roller.

6.11 Withdraw the steady pin from the rear bearing block, followed by the rear bearing fixing screw, and carefully remove the combination head.

7. To Remove the Ribbon Driving Shaft Unit M.

7.1 Remove all units from the main casting as in Section A, with the exception of the Operating Magnet Unit, the Governor Unit and the Motor Unit.

8. To Remove the Ribbon Feed Brackets D and G.

8.1 Disengage the ink ribbon from the ribbon jumper.

8.2 To remove the R.H. ribbon feed bracket, withdraw the two fixing screws and withdraw the bracket.

8.3 To remove the L.H. ribbon feed bracket, withdraw the screw in the motor mounting which holds the R.I.S. box. Withdraw the two fixing screws and withdraw the bracket.

N.B. If either of these brackets is removed without the ribbon, an empty spool should be placed in position, or great care should be taken to ensure that the small bellcrank, normally held in by the ribbon, is retained in position by a finger. If the feed change rod is allowed to slip down as the bracket is being lifted, it may be damaged.

9. To Remove other Units.

9.1 To remove any of the following units, carry out the corresponding dismantling instructions in Section A :

(a) Keyboard Unit.
(b) Page (or Tape) Attachment Unit.
(c) Operating Magnet Unit Q.
(d) Main Shaft W with Starter Switch Control Unit Y.
(e) Governor Unit R and Motor Unit T.
(f) Typehammer Unit F.

C. TO DISMANTLE INDIVIDUAL UNITS

N.B. Do not touch the abutment screws.

1. Page Attachment Unit (Figs. 39, 63 and 64).

1.1 Remove the left-hand pivot screw and locknut. Remove the chariot. Unwind the carriage spring fully by slackening screw AN, Fig. 64, and moving pin AM, Fig. 64, to and fro.

1.2 Remove the screws AP securing the left-hand and right-hand bearing brackets and tap the brackets clear of the steady pin holes. (*N.B.* This must be done without straining the platen spindle.)

1.3 Lift off the carriage unit, platen spindle and bearing brackets all together.
(When reassembling, operate the crosshead until the spring drum ceases to turn, i.e. until the retention pawl engages the tooth adjacent to the blank, as illustrated in Fig. 39. Ensure that screws AH and AQ are loose but still held by their threads. Operate the lock bar lever W to the extreme left of its travel. Check that the carriage return key pin in engaging on the carriage return bellcrank and that the bellcrank is not jammed behind the pin. Move the platen to the extreme left-hand end of the spindle and ease the carriage into position, taking care not to use undue force. Push the end brackets on to the steady pins and then tighten screws AH and AQ.)

1.4 Remove the two screws and washers securing the carriage bell unit and remove the unit.

1.5 Remove the screw and washer securing the spring drum and take off the drum.

1.6 Remove the spring drum ratchet pawl after removing its screw and washer from the rear of the casting.

1.7 Remove the screws and washers securing the pivot support plate E, Fig. 63, and remove the plate. Remove the locking ring securing the lock bar lever W. Remove the nut, screw and felt securing the air valve connector Q to the valve adjuster. Remove the piston operating lever P with the air valve connector Q, valve adjuster and lock bar attached. Care must be taken not to lose the roller O.

1.8 Free the spring on the carriage return bellcrank U and remove the bellcrank, together with the line feed bellcrank and pawl. Remove the spacing washer at the rear of the bellcrank pivot.

1.9 Remove the screws AB, AH and AQ, Fig. 64. Release the springs on the feed and retention pawls, and lift off the support bar AC.
(When reassembling, do not tighten screws AH and AQ fully at this stage.)

1.10 Remove the two screws and washers AK and take off the dashpot.

1.11 *If it is necessary to dismantle the dashpot*, remove the three screws and washers securing bracket AL and the dashpot cover. Remove the bracket and cover. Remove the nut, spring washer and spacing washer securing the air valve rotor to the dashpot and remove the rotor.
(When reassembling, ensure that the bracket AL and the air valve rotor are in correct relationship to each other and to the dashpot.)

1.12 Remove the toggle pins which anchor the line feed and carriage return link springs to the feed link guide block. (The feed link guide block is immediately below the hinge lug AE, Fig. 64.)

1.13 Slacken the screws J, Fig. 63, clamping the right-hand link guide block and, after removing the screw from the left-hand guide block, take off the left-hand guide block. Pull the right-hand guide block forward to clear the ends of the links.

1.14 Remove the following parts :

(a) Carriage release link M and its feed dog (front link).

(b) Line feed link N and its feed dog (rear link), after disengaging the return spring from its anchor on the casting.

(c) Front feed lever T (after removing the locking ring).

(d) Spacing collar and spring washer behind the feed lever.

(e) Letter feed link and its feed dog (middle link).

(f) Pawl throwout lever.

(g) Remaining feed lever T and the carriage feed pawl. (There is a spacing washer between the feed pawl and the feed lever.)

(h) Retention pawl.

(i) Trip bellcrank, after removing the retaining screw and collar and disengaging the spring from the pin on the casting.

1.15 Dismantle the remainder of the page attachment unit, i.e. the assembly consisting of the carriage unit, platen spindle and end bearing brackets, as follows :

(a) Remove the screw and washer from the right-hand end of the platen spindle and remove the knob, followed by the right-hand bearing bracket.

(b) Slide out the platen spindle.

(c) Remove the screw A and the platen winding handle (if fitted). Slacken the set screw and remove the collar B. Remove the left-hand bracket.

1.16 Dismantle the carriage unit as follows (the following instructions apply to the friction feed carriage unit only—the dismantling of the sprocket feed unit is similar and presents no special difficulties) :

(a) Slacken the screws of the spring retaining plates and remove the springs and pressure rollers.

(b) Remove the small retaining plate H from the right-hand end and withdraw the pressure release lever from the left.

(c) Remove the two screws securing the paper knife and remove the knife.

(d) Remove the two screws securing the paper guide and remove the guide and the lubricators.

(e) Remove the screw securing the left-hand end plate and take out the platen.

1.17 It is not normally necessary to dismantle the carriage unit any further. If, however, the unit is stripped down, special attention should be given to the following points ;

(a) The roller block (the bearing in the left-hand end of the platen tube) has a left-hand thread.

(b) The number of shims between each release lever and the unit casting should be noted, and the same number replaced in each position. If there is any doubt about this, check that :

(i) the pressure release lever, in its unoperated position, has a free movement of approximately $\frac{1}{16}$ in.

(ii) when the pressure is released, by operating the release lever, both rollers turn freely in their bearings.

2. Operating Magnet Unit S.2848A.

2.1 Remove the nuts and the washer securing the armature link to the armature. Remove the two screws securing the unit to the machine main base and lift off the unit.

2.2 Slacken the four hexagon-headed screws holding the unit cover and remove the cover.
(When reassembling, it may be necessary to depress the adjustable magnet until the slot in its inclined end engages with the knurled adjusting screw on the cover.)

2.3 Remove the two screws, washers and spring washers securing the armature stop plate, with its attached parts, to the unit base casting. Remove the plate.

2.4 Unhook the rear bias spring.

2.5 Unhook the spring attached to the rear adjustable magnet. Remove the screw and washer securing the retaining plate. Remove the plate, with the retaining plate collar.
(When reassembling, check the adjustment of the vertical magnet adjustment plate. This should touch the magnet die-casting when the magnet is in full magnetic contact with the field laminations.)

2.6 Unhook the remaining front spring. Remove the screw securing the safety plate and remove the plate.

2.7 Lift off the field unit. (The coil leads will remain attached to the unit base casting by means of the spring contacts. If these are removed, a note should be made of where each lead belongs so that it may be correctly reassembled.)
(When reassembling, before the field unit is replaced on the main base, the following armature adjustments should be checked :

(1) The top of the armature should be approximately level with the top of the field laminations, with an estimated vertical end-play of .003—.005 in. (.08—.13 mm).

(2) The movement of the armature from side to side should be symmetrical with respect to the pole faces.

If either of these adjustments does not hold, it should be corrected as follows :

(a) Obtain the correct height for the armature by means of the top and bottom central adjustment screws, securing the screws by means of the nuts.

(b) Slacken the four screws securing the upper and lower armature bearing blocks so that the armature pivots are able to move freely in a lateral direction.

(c) Swing the armature clockwise and adjust the lateral position of the bearing blocks so that the armature touches diagonally opposite pole faces. Tighten the four bearing block fixing screws sufficiently to prevent free movement of the armature laterally.

(d) Swing the armature anti-clockwise.

(e) If the armature again touches diagonally opposite pole faces, the correct adjustment has been obtained and the four bearing block fixing screws may be tightened.

(f) If the armature touches only one pole face, measure the gap between the armature and the other pole face. Slacken the four bearing block fixing screws and adjust the bearing blocks laterally until the gap is halved. Tighten the bearing block fixing screws.

2.8 To dismantle the field unit, remove the four bearing block fixing screws. Remove the bearing blocks, followed by the armature and field coils.

3. Main Shaft and Starter Switch Control Unit.

3.1 Place a tommy bar through the hole in the main shaft and, with a spanner, remove the nut which holds the control unit to the shaft. Remove the shims, the control unit and the fibre spiral gear from the main shaft.

3.2 Withdraw the fixing screws in the bearing bracket for both metal spiral gears. Remove the spirals.

(When reassembling, it is important that the spacing collar should be replaced with its chamfered end farthest from the ballrace.)

N.B. The starter switch control unit should not be dismantled further unless absolutely necessary.

4. Motor (Fig. 65).

4.1 Slacken the screw securing the drip-proof cover and remove the cover.

4.2 Remove the brush box covers followed by the brushes, noting the position of each brush in its box. Slacken the two screws securing each brush box and remove the brush boxes, leaving them suspended on their connection wires.

4.3 Remove the two screws which secure the end-plate U to the motor body.

4.4 Remove the three screws which secure the trefoil-shaped clamp ring M to the inner clamp ring P. Remove ring M and gasket N.

4.5 Using a hide or wooden mallet, gently tap out the armature shaft from the commutator end, and remove the complete armature and end-plate assembly.

4.6 Remove the three screws which secure the trefoil-shaped clamp ring Y and remove the clamp ring, followed by gasket AA, special spring washer W and motor end-plate U.

4.7 Release the screw of locking collar V and remove V. Using bearing extractors, remove each ball race, and the clamp rings P and S, with their gaskets AE and AB.

(When reassembling the motor unit, replace the parts as follows :

(a) Replace the gaskets on their respective clamp rings, taking care to register the screw holes in each gasket/ring pair.

(b) Replace the clamp rings P and S, and their gaskets AE and AB, on the armature shaft. Replace the two ball races and the locking collar V, ensuring that the latter is pushed hard up against the race, and tighten the fixing screw.

(c) Obtain a piece of 6BA screwed rod, about three inches in length, and engage it for a few turns into one of the screw holes of clamp ring S.

(d) Smear a little Creed No. 4 Lubricant in the housing of ballrace T, and hold the armature shaft upright, commutator end downwards.

(e) Lower the motor end-plate into position on the shaft, passing the 6BA rod through one of the clamping screw holes in the end-plate U.

(f) Replace the special spring washer W on the ballrace, and lower the trefoil-shaped clamp ring, and gasket, into position, passing the rod through a screw hole.

(g) By means of the rod, raise the inner clamp ring S into contact with the end-plate U and insert two screws to hold it in place. Remove the rod and insert the third screw. Tighten the three screws, each in turn, a little at a time.

(h) Engage the 6BA rod for a few turns into one of the screw holes of clamp ring P. Replace the armature into the body of the motor, passing the rod through one of the clamping-screw holes in the commutator end-plate C.

(i) Rotate the tongue on end-plate U into register with the slot in the motor body and tap the shaft home. Press the end-plate U firmly into contact with the motor body and secure with its two clamping screws, tightening each in turn.

(j) Replace the trefoil-shaped clamp ring M, and gasket N, passing one screw hole over the 6BA rod. Secure M to ring P by the method given in (g) above. Ensure that the shaft rotates freely. If this is not so, tap the shaft with the mallet, at one end or the other as may be found necessary.

(k) Re-assemble the brush boxes to the rocker arm, adjusting their fixing screws E and K in their slots to give a clearance from the commutator of .010—.015 in. (.25—.38 mm) at 'a'. Clamp the fixing screws before removing the feeler.

(l) Replace the brushes in the channels from which they were removed.

N.B. If new brushes are to be fitted, carry out Instructions 2.1 and 2.2, pages 16 and 17.

(m) Replace the drip cover, reassemble the motor on the teleprinter, and replace the governor.

5. Governor Unit.

N.B. Do not dismantle the governor unless absolutely necessary.

5.1 When removing the governor spring, first withdraw the two screws which secure the spring anchor, and remove the anchor from its seating to release the tension of the spring.

5.2 If the governor contacts only are to be removed, apply the adjusting clamp provided in the tool kit to anchor the contact arm which holds the spring before removing the contacts.

6. Ribbon Feed Brackets.

6.1 The brackets can be dismantled after the spring clip above the crown wheel has been removed.

7. Typehead Unit (Figs. 66, 67 and 68).

7.1 Place the clutch end of the typehead unit into the bush L, Fig. 66, of the special clamp M. Tighten the clamp screw N over the typehead end.

Caution : Do not tighten the clamp screw against the clutch end as the taper end cannot then be driven out.

7.2 Fix the support block K firmly in a vice or hold it firmly by some other means. Place the unit and clamp assembly upon the support block in such a way that the typehead boss H rests on the block with the taper pin G directly above the slot J and with the thinner end of the pin upwards.

7.3 Knock out the pin. Open and remove the clamp. Withdraw the parts from the typehead spindle in the order shown in Fig. 68.

(When assembling, after the parts have been replaced on the spindle, tighten the clamp screw until the taper holes in the type boss and in the spindle are aligned when the 'N' type lies opposite the gap formed by the stop arm and latch arm, and then drive in the pin.

Loosen the three screws which clamp the assembly to the type boss. Adjust the typeracks so that the types are in line with the axis of the typehead spindle and so that the top type is in line with the gap between the latch and the type stop arm. Reclamp the screws).

7.4 Mark the position of any type on the type boss and on the type racks so that, on reassembly, the types and the racks will be in their original positions relative to the boss. Ensure also that a typehead chart is available before removing any of the types.

7.5 Hold the typehead with the type faces pointing upwards and unhook the type retaining springs G, Fig. 67, from the spring anchor plate. Lift the type retaining plate from the face of the typehead, complete with the three spring anchors and their attached springs.
(When reassembling, lower the type retaining plate, with the spring anchors and springs attached, on to the face of the typehead, allowing the springs to pass through the three holes in the type racks. Hook the three type retaining springs over the spring anchor plate by means of a spring hook, so that the open portion of each spring faces outwards. Smear a little Creed Lubricant No. 4 on the working faces of the ears on the stop plates M, Fig. 67.)

7.6 Remove the three type retaining springs G, Fig. 67, from their spring anchors K, and remove the spring anchors from the type retaining plate L.
(When reassembling, smear a little Creed Lubricant No. 4 between the engaging surfaces of the spring anchors and the type retaining plate.)

7.7 Remove the types.

7.8 Take off the three locknuts N securing the spring anchor plate F, remove the plate and remove the three locknuts D behind the plate.
(When reassembling, adjust the positions of the six locknuts so that the spring anchor plate is as near as possible to the end of the screws N—leaving sufficient thread on which to tighten nuts E —and is parallel to the clamp ring H.)

7.9 Remove the three sets of nuts C, spring washers B and washers A, which secure the clamp ring H, and take off the clamp ring.

7.10 Remove the three spacing collars, the rear type rack, the lubricator felt, and support ring.

7.11 Withdraw the three screws N, complete with their stop plates M. Take off the stop plate from each screw. Lift off the type rack J.

8. Cam Unit.

8.1 Remove the two screws which secure the trip shaft front bearing plate. Remove the plate, followed by the trip shaft.

8.2 Loosen the plate which secures the pilot cam detent and remove the detent and detent link.

8.3 Disconnect the release lever spring. Withdraw the screw which secures the release lever bearing bracket and remove the bracket after disengaging the pawl abutment link.

8.4 Disengage the retention lever spring. Slacken the tommy-headed screw which holds the retention lever bracket and remove the assembly.

8.5 Remove the screw which secures the finger setting blade and lever and remove the lever with the cam roller.

8.6 Remove the oil cover over the cam levers.

8.7 Remove the typehammer lever and the bellcrank lifting lever with their cam rollers.

8.8 Loosen the retaining plate at the feed lever end of the traversing link and remove the link together with the traversing lever and its cam roller.

8.9 Loosen the plate which secures the comb setting lever and remove the lever.

8.10 Remove the resetting lever spring and the resetting lever.

8.11 Loosen the plate which secures the carriage feed lever and remove the lever.

8.12 Remove the comb setting finger block after the fixing screw has been withdrawn. The setting fingers and finger springs can be removed from this sub-unit after the two screws in the front plate have been withdrawn.

(When reassembling, note that all the finger springs and bearing blades are inserted on the left of the fingers, with a bearing blade next to each finger, followed by two finger springs with their ends towards the finger. The extensions, top and bottom, on the springs and blades should protrude from the finger setting block. Ensure that the finger block is tight against the abutment face before tightening the fixing screw.)

8.13 Withdraw the screw which secures the pawl abutment shock-absorber to the casting and remove the shock-absorber with the detent.

8.14 Withdraw the two screws which secure the orientation scale support plate and remove the plate complete with scale, adjustable lever and link.

8.15 Withdraw one screw from the cam sleeve bearing block and two screws from the gear bearing block. Remove the receiving cam sleeve, together with the bearing blocks, the gear and the pilot cam. This assembly can then be further dismantled by removing the locking nuts at each end.
(When assembling the cam unit, ensure that the pawls are perfectly free and lively in their action and that the pawl spring is seating properly. See that the head of the pawl pivot engages with the notch in the thrust washer. Before replacing the cam unit on the machine, adjustments Nos. 7 and 10 should be carried out.)

9. Combination Head (Fig. 69).

9.1 Remove the bellcranks from the slots marked 'Z'. This is best achieved by first pushing the ends of the bellcranks into their slots to facilitate removal of their springs. These bellcranks should be kept separate. Note that two of these springs are stronger than the remainder and should also be kept separate.
(When assembling, ensure that each bellcrank is perfectly free before fitting a spring to it. It is advisable to distribute the load by spacing each spring 90 degrees from the previous one.)

9.2 Remove the bellcranks from the slots marked '★'. These bellcranks are marked 'O' and must be kept separate as well. Remove the remainder of the bellcranks after removing their springs.
(When reassembling, the marked bellcranks should be replaced first. Ensure that two bellcranks are placed in each loop of the bellcrank bearing oiling wick, and two bellcranks in each of the gaps between the wick loops, with the following exceptions: Figures shift has a loop, and Letters shift a gap to itself—see Fig. 69.)

9.3 Remove the typehead gear, the bellcrank lifting collar, and the rear bearing block. Tap out the combination head spindle complete with ballrace.
(When assembling, care must be taken to ensure that the ballrace is driven home fully and squarely into the body housing.)

9.4 Withdraw the three fixing screws from the bellcrank bearing and remove the remaining parts from the combination head body, carefully noting the order in which they are removed.
(When reassembling, the receiving combs are placed in the reverse order of their numbers, followed by the shift comb.)

10. Clutch Body.

10.1 Remove the clutch band and, if replacement is necessary, the clutch lining.
When fitting a replacement lining ensure that:

(a) the lining is lubricated properly. The new lining should be soaked for two hours in Creed No. 2 Lubricant and allowed to drain a further half-hour.

(b) the arrowheads of the weave point in the direction of rotation of the clutch body.

(c) the ends of the lining are butted together and not overlapped.

(When reassembling the clutch band, ensure that it is the correct way round, i.e. with the eye of the band on the left when the space between the ends is uppermost, as viewed from the printing point.)

D. TO REASSEMBLE THE TELEPRINTER

1. To reassemble individual units of the teleprinter, follow the instructions in Section C in the reverse order.
2. To replace the units on the main base, follow the instructions in Section A in the reverse order.
3. When carrying out dismantling instructions in the reverse order, pay attention to instructions included in round brackets and commencing: "When assembling . . . " These are included to deal with difficulties which arise in assembling but which do not arise in dismantling.
4. It should be noted that the combination head unit is the master unit and is steady-pinned in position on the base casting. The cam and control lever units are located relatively to the combination head frame.
5. When the machine is completely reassembled, *all* abutment screws must touch their fellows and the cam unit casting must abut against the rear bearing block of the combination head. Further, *no* fixing screws should be tightened unless the unit they are securing is seated firmly and squarely on the base. If any unit casting is felt to give, it indicates that the unit is not seated properly.
6. When the teleprinter is completely reassembled, check all the relevant adjustments.

SPRING TENSIONS

N.B. References to Part List No. 1078 apply to the 9th Edition—with corrections.

Spring No.	*Reference*	*Method of Measurement*	*Tension*
	PL.1078	**OPERATING ELECTROMAGNET UNIT**	
PG.7164	Fig. 22, AL K	Force to give an extension of $\frac{3}{16}$" (4.8 mm.)	3 lbs. 1 oz. 3 lbs. 7 ozs. (1.4–1.6 kgs.)
PG.7351	„ X	Force to give an extension of $\frac{1}{4}$"	8 lbs. 6 ozs. 10 lbs. 4 ozs. (3.8–4.6 kgs.)
	PL.1078	**ORIENTATION CAM UNIT**	
PG.2009A PG.2010A	Fig. 17, H_{15} „ H_{16}	Force applied at the finger setting pin to : (a) move the pin slightly	3–5 ozs. (85–142 grams)
		(b) move the pin to its fullest extent	8–9 ozs. (227–255 grams)
PG.2029	„ BM_3	Force applied at the centre of the finger springs to depress each spring flat	8–9 ozs. (227–255 grams)
PG.3027B	„ AF	Force applied at the pawl abutment faces to depress each pawl	$2\frac{1}{2}$–$3\frac{1}{2}$ ozs. (71–99 grams)
PG.3126	Fig. 18, AT	Force applied at the detent lug of the pilot cam, with the machine running, to arrest the cam (torque 325–400 gm. cms.)	9–11 ozs. (255–312 grams)
PG.7328	Not shown	Force applied at the loop of the orientation link spring to move the loop to the right	5–7 ozs. (142–198 grams)
PG.5067	Fig. 17, D	Force applied at the end of the detent shock-absorber to lift it slightly	8–10 lbs. (3.6–4.5 kgs.)
PG.7034	„ BE_{10}	Force to give an extension of $\frac{15}{32}$" (11.9 mm.) ..	$1\frac{1}{2}$–$2\frac{1}{2}$ ozs. (43–71 grams)
PG.7100	„ H_6	Force to give an extension of $\frac{7}{32}$" (5.6 mm.) ..	3–$3\frac{1}{2}$ ozs. (85–99 grams)
PG.7139	„ BQ	Force to give an extension of $\frac{3}{16}$" (4.8 mm.)	2¾ – 3½ ozs. (78 – 99 grams)
PG.7299	Fig. 18, AB	Force to give an extension of $\frac{5}{32}$" (4.0 mm.) ..	$3\frac{1}{2}$–$4\frac{1}{2}$ ozs. (99–128 grams)
PG.7346	Fig. 17, AQ	Force applied at the screwhead above the retention roller to lift the roller from the cam sleeve	1–$1\frac{1}{2}$ lbs. (454–680 grams)
	PL.1078	**COMBINATION HEAD UNIT**	
PG.3003	Fig. 13, AA	To give snappy action to receiving combs	—
PG.3009	„ ADB	Force applied at the end of the shift comb jockey lever to move the lever in either direction	2–3 ozs. (57–85 grams)
PG.7036	Fig. 12, T	Force applied at the typehead end of each shift bellcrank to move the bellcrank outwards	$4\frac{1}{2}$–$7\frac{1}{2}$ ozs. (128–213 grams)
PG.7166	„ S	Force applied at the typehead end of every bellcrank (except the two shift bellcranks) to move the bell-cranks outwards	1–$1\frac{3}{4}$ ozs. (28–50 grams)
	T.I.L. 67	**TYPEHEAD UNIT**	
2852/10A	Fig. 25, U	Force applied at the latch face just to move the latch	$1\frac{1}{2}$–$3\frac{1}{2}$ ozs. (43–99 grams)
2852/17	Fig. 25, T	Typehead friction damping torque	7.95–8.85 lb./in. (9.2–10.2 kg./cm)
2852/18	„ W	Load when compressed to $\frac{15}{32}$" (11.9 mm.)	$4\frac{1}{2}$–$5\frac{1}{4}$ lbs. (2–2.4 kgs.)
PG.7341	Fig. 26, G	Force to give an extension of $\frac{7}{32}$" (5.6 mm.) ..	$8\frac{1}{2}$–$9\frac{1}{2}$ ozs. (241–269 grams)

Spring No.	*Reference*	*Method of Measurement*	*Tension*
	PL.1078	**RIBBON FEED MECHANISM**	
1828/19	Fig. 20, G	Force applied at the base of the crown wheel to raise the spindle assembly by approximately $\frac{3}{32}$" (2.4 mm.)	10–12 ozs. (284–340 grams)
PG.2015A	Fig. 8, AE	Force applied at the end of the ratchet spring to lift the spring from the ratchet wheel	$3\frac{1}{2}$–$4\frac{1}{2}$ ozs. (99–128 grams)
PG.5056	Fig. 21, P	Force to give a compression of approximately $\frac{5}{64}$" (2.0 mm.)	3 – 4½ ozs. (85 – 128 grams)
	PL.1078	**Without Period of Operation Counter**	
PG.2081	Fig. 21, E	Force applied at each end of the driving shaft to reverse its position	12–16 ozs. (340–454 grams)
PG.2082	„ D		
	T.I.S. 13	**With Period of Operation Counter.**	
PG.2118	Fig. 18(b) O	Force applied at each end of the driving shaft to reverse its position	12–16 ozs. (340–454 grams)
PG.2119	„ P		
	PL.1078	**TYPEHAMMER UNIT**	
PG.2034	Fig. 20, AJ	Force applied approximately $\frac{1}{2}$" (12.7 mm.) from the head end of the spring to bring the spring end level with the edge of the hammer frame	$\frac{3}{4}$–$1\frac{1}{4}$ lbs. (340–567 grams)
PG.5014	Fig. 20, AB	Minimum length of spring to be $\frac{9}{32}$" (7.0 mm.) ..	—
	PL.1078	**CONTROL UNIT**	
PG.7034	Fig. 15, AH	Force to give an extension of $\frac{15}{32}$" (11.9 mm.) ..	$1\frac{1}{2}$–$2\frac{1}{2}$ ozs. (43–71 grams)
	„ X		
PG.7105	Fig. 14, T	Force to give an extension of $\frac{11}{16}$" (17.5 mm.) ..	$7\frac{1}{2}$–$9\frac{1}{2}$ ozs. (213–269 grams)
PG.7120	„ T	Force to give an extension of $\frac{1}{2}$" (12.7 mm.) ..	$16\frac{1}{2}$–$17\frac{1}{2}$ ozs. (468–496 grams)
PG.7229	„ AD	Force to give an extension of $\frac{15}{32}$" (11.9 mm.) ..	15–17 ozs. (425–482 grams)
	PL.1078	**PAGE ATTACHMENT UNIT**	
PG.2011A	Fig. 29, CV_1	Force applied at the points of contact with the control levers to depress the carriage return and line feed dogs flush with the link	30–35 grams
PG.2012A	„ BQ_5	Force applied at the point of contact with the control lever to depress the letter feed dog clear of engagement with the crosshead	30–35 grams
1839/11A	Fig. 33, AB	See adjustment 37 (Friction Feed Carriage only) ..	—
PG.1503	Fig. 29, AZ	See adjustment 35	—
Attached to 1831/18	„ DA	Force applied at the tooth of the line feed pawl to push the pawl away from the ratchet	$2\frac{1}{2}$ ozs. (71 grams)
PG.5055	„ FQ_4	Force to give a compression of $\frac{1}{16}$" (1.6 mm.) ..	12 lbs. (5.4 kgs.)
PG.7034	„ CZ	Force applied vertically under the left-hand end of the trip bellcrank just to lift it	$\frac{3}{4}$–1 oz. (21–28 grams)
PG.7037	Figs. 32, AL 33	Force to give an extension of $\frac{1}{2}$" (12.7 mm.) (Friction Feed Carriage only)	18–22 ozs. (510–624 grams)
PG.7043	Fig. 29, BP	Force applied at the mouth of the crosshead to move it to the right with the feed dog depressed	15–17 ozs. (425–482 grams)
PG.7044	Figs. 27, FX 29	Force applied at the top end of the latch arm to swing the latch clear of the pin	7 ozs. (198 grams)
PG.7101	Fig. 29, DN_6	Force to give an extension of $\frac{5}{8}$" (15.9 mm.) ..	$16\frac{1}{2}$–$17\frac{1}{2}$ ozs. (468–496 grams)
PG.7046	„ AK	Force applied at the jockey roller to lift it away from the ratchet	$1\frac{1}{2}$ lbs. (680 grams)
PG.7047	Fig. 29, CR	Tension to be sufficient to restore the carriage return bellcrank to its normal position without the aid of the carriage return link.	—

Spring No.	*Reference*	*Method of Measurement*	*Tension*
		PAGE ATTACHMENT UNIT—*continued*	
PG.7093	„ BU	Force applied at the crosshead end of the letter feed link, with the pawl throwout lever operated by hand, to just move the link towards the crosshead	Approx. 7 ozs. (198 grams)
PG.7093	„ CT	Force applied at the crosshead end of the release link, with the pawl throw-out lever operated by hand, to just move the link towards the crosshead	Approx. 1 lb. (454 grams)
PG.7093	„ DK	Force applied to the line feed link, at the end nearest to the dashpot, to just move the link	Approx. 1 lb. (454 grams)
PG.7167	„ CE	Force applied at the tooth of each pawl (letter-feed and retention) to disengage the pawl from the ratchet wheel	4–5 ozs. (113–142 grams)
	PL.1078	**PAGE ATTACHMENT UNIT** (Sprocket Feed Carriage only)	23½–26½ ozs.
PG.7053	Fig. 34, K	Force to give an extension of $\frac{25}{32}$" (19.9 mm.) ..	(666–751 grams)
PG.7137	„ N	Force to give an extension of $\frac{11}{64}$" (4.4 mm.)	31–39 ozs. (822–878 grams)
	PL.1078	**TAPE ATTACHMENT UNIT**	
PG.2060	Fig. 35, G	Pressure to be exerted by the leaf spring on the platen spindle	3–5 ozs. (85–142 grams)
PG.7039	„ Y	Force to give an extension of $\frac{17}{32}$"	3–3½ ozs. (85–99 grams)
PG.7044	„ AP	Force applied at the latching point to lift the latch	15–20 ozs. (425–567 grams)
PG.7055	„ O	Tension to be exerted on the feed spindle	1–2 ozs. (28–57 grams)
PG.7102	„ AG	Force to give an extension of $\frac{5}{8}$" (15.9 mm.) ..	13–15 ozs. (369–425 grams)
PG.7104	„ Z	Force to give an extension of $\frac{5}{16}$" (7.9 mm.) ..	54–58 ozs. (1.5–1.6 kgs.)
PG.7115	„ AC	Force applied at the spring engagement to press the feed link down	2–3 ozs. (57–85 grams)
PG.7099	„ R	Tension to be exerted on the retention lever ..	1–1¼ lbs. (454–567 grams)
	PL.1078	**With End-of-Line Indicator**	
1816/19	Fig. 36, BB	Force applied at the control lever end of the counter resetting lever to lift the counter wheel out of engagement with the rack	2–3 ozs. (57–85 grams)
PG.7114	„ BK	Force to give an extension of $\frac{3}{4}$" (19.1 mm.)	1½–2½ ozs. (43–71 grams)
	PL.1078	**GOVERNOR AND MOTOR UNITS**	
PG.2021A	Fig. 8, Z	Pressure to be exerted by the brushes on the governor slip rings	4½–5½ ozs. (128–156 grams)
PG.7301	„ J	Force applied $\frac{21}{32}$" (16.7 mm.) from the fitting screw to flatten each motor spring	1½ lbs. (680 grams)
	PL.1078	**STARTER SWITCH AND CONTROL UNIT**	
PG.3004	Fig. 10, D	Force applied at the end of the trip spindle to release the starter weight	2–3 ozs. (57–85 grams)
PG.5009	Fig. 7, AP	Force applied at the end of the switch arm to operate the switch in both directions	3½–4½ ozs. (99–128 grams)
PG.7083	Fig. 10, M	Force to give an extension of $\frac{13}{64}$" (5.2 mm.) ..	2–2¼ ozs. (57–64 grams)

LUBRICATION INSTRUCTIONS

N.B. All machines are properly lubricated before they leave the factory, but it should be remembered that some oil is likely to be lost in transit and in storage. It is, therefore, important to lubricate all machines before they are put into service.

AFTER EACH 300 HOURS OF OPERATION

No. 1 Lubricant.

1. Clean the platen spindle and running bar with a cloth dipped in paraffin oil. Apply a few drops of lubricant to the platen spindle and the running bar.

2. Apply a small quantity to the following parts :
   (a) Starter Trip Spindle.
   (b) Starter Trip Lever Pivot.
   (c) Ribbon Feed Change Rods (excessive lubrication may cause sticking).

No 2. Lubricant.

1. Fill all oil cups and oil holes, paying special attention to the following :
   (a) Finger setting block (oil sump).
   (b) Cam sleeve oil hole (Cam Unit).

2. Saturate all lubricating felts, paying special attention to the following :
   (a) Oil cover over the cam levers.
   (b) Typehead lubricator felt.
   (c) Typehammer pivot felt.

3. Lubricate all pivots, friction faces and couplings, paying special attention to the following :
   (a) Cam ratchet and pawls (Cam Unit).
   (b) Cam tracks (Cam Unit).
   (c) Finger setting pin (Cam Unit).
   (d) Pilot cam clutch (Cam Unit).
   (e) Orientation link spring (Cam Unit).
   (f) Bellcrank lifting collar engagement face (Combination Head).
   (g) Typehead clutch lining. (*N.B.* Avoid surplus oil (Typehead Unit).)
   (h) Clutch band engagement with typehead driving spring (Typehead Unit).
   (i) Latch Pivot (Typehead Unit).
   (j) Steel worm gears (Starter Switch Control Unit).
   (k) Overthrow stop engagement face.
   (l) Ribbon driving shaft, ratchet and crown wheel.
   (m) Ribbon jumper grooves in typehead support bracket.
   (n) Link guide block (Page Attachment Unit).
   (o) Spring drum ratchet wheel (Page Attachment Unit).
   (p) Platen spindle ratchet (Page Attachment Unit).
   (q) Platen end bearings (Page Attachment Unit).
   (r) Felt washers on the lock bar and air valve connector (Page Attachment Unit).
   (s) Pivots of the rollers at the top and bottom of the dashpot lever (Page Attachment Unit).
   (t) Control lever bearing bushes and the pivots of the feed throw-out lever (Control Unit).

   N.B. An excess of oil is liable to cause some sluggishness in the operation of the carriage.

No. 4 Lubricant.

1. Apply a little grease to the following parts :
   (a) Trip shaft cone pivots (Cam Unit).
   (b) Hammer head spring engagement and shock-absorber spring (Typehammer Unit).
   (c) Working faces of the ears on the stop plates (Typehead Unit).
   (d) Working faces between spring anchors and retaining plate (Typehead Unit).
   (e) Working edges of the control levers and the feed throwout lever (Control Unit).
   (f) Carriage rack and spring drum gear wheel (Page Attachment Unit).

No. 5 Lubricant.

1. Apply a little grease to the following parts :
   (a) Striker blade guides on the cam unit.
   (b) Mainshaft, cam unit and typehead gears, and the fibre starter worm.
   (c) Jockey bush on the ribbon driving shaft.
   (d) Outsides of the rollers on the dashpot lever.

AFTER EACH 3,600 HOURS OF OPERATION.

Dismantle and clean the machine. Lubricate all points as above, with the following additions :

No. 2 Lubricant.

1. Soak the following parts for 2—3 hours in the lubricant :
   (a) Typehead clutch friction washers (Typehead Unit).
   (b) Latch arm (Typehead Unit).
   (c) Stop arm (Typehead Unit).
   (d) Clutch body (Typehead Unit).
   (e) Typehead support bracket (Control Unit).
   (f) Cam release lever bracket (Cam Unit).
   (g) Pilot cam friction washers (Cam Unit).
2. Lubricate the following parts :
   (a) Receiving comb bearings and spring pivots (Combination Head).
   (b) Shift comb lever pivot and jockey spring (Combination Head).
   (c) Counter gear bearing pin (if a Period of Operation Counter is fitted).
3. Apply a trace of oil to the ribbon guide pins on the ribbon feed brackets, taking care that none reaches the outside of the rollers.
4. Soak the bellcrank bearing oiling wick in the lubricant for a few minutes.
5. Apply a few drops of the lubricant to the following parts :
   (a) All oilite bearings (Page Attachment Unit).
   (b) Leather piston washer (Page Attachment Unit).
   (c) Oiling pads in the pressure roller release lever bearing blocks (Page Attachment Unit).

No. 4 Lubricant.

1. Repack the following ball bearings :
   (a) Combination Head (2).
   (b) Main Shaft (2).
   (c) Motor (2).
2. Apply a light smear of grease to the ground faces of the armature extension and of the gap in the armature stop plate.

No. 5 Lubricant.

1. Smear a little of the lubricant on the following parts :
   (a) Periphery of bellcrank bearing (Combination Head).
   (b) Both ends of the bellcranks (Combination Head).
   (c) Magnet armature pivots after cleaning.
   (d) Adjusting block friction spring (Cam Unit).
   (e) Counter driving gear and counter driving worm (if a Period of Operation Counter is fitted).
   (f) Counter driving pin on the counter driving gear (if a Period of Operation Counter is fitted).

LUBRICANTS.

The following lubricants are recommended and may be obtained from Creed & Co. Ltd. :

No. 1 Lubricant—Thin oil, such as :
   (a) Clavus Oil 17 (Shell Oil J.Y.1.).
   (b) Wakefield Magna R.S. Oil.
   (c) G.P.O. Oil No. 12.

No. 2 Lubricant—Medium Oil, such as :
   (a) Talpa Oil 30 (Shell Oil C.Y.2.).
   (b) Wakefield Castrol XL.
   (c) G.P.O. Oil No. 14.

No. 4 Lubricant—Grease, such as :
   (a) Shell Nerita Grease 3 (Shell VW.).

No. 5 Lubricant—Grease, such as :
   (a) Mobilgrease No. 2.

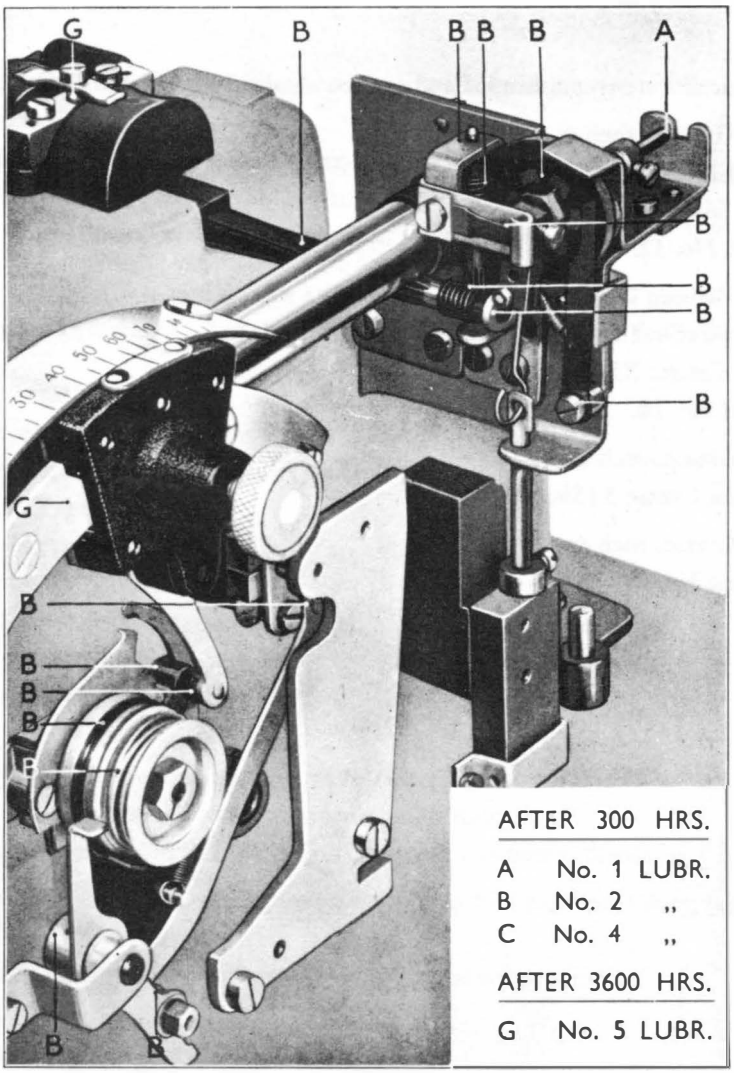


FIGURE 9. LUBRICATION CHART No. 1

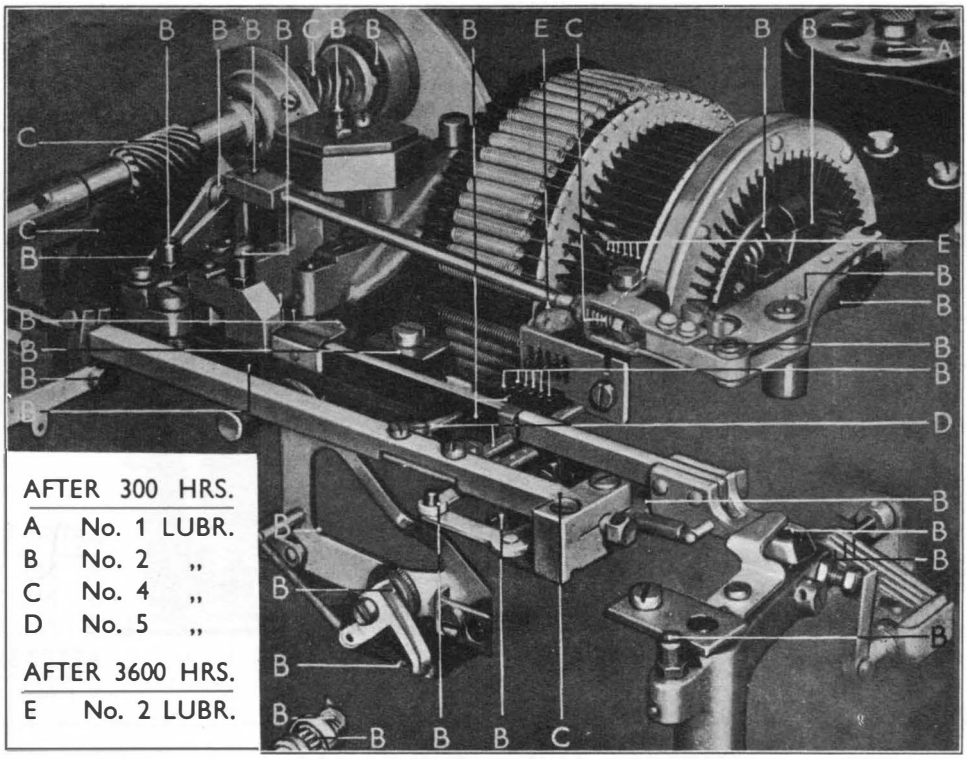


FIGURE 10. LUBRICATION CHART No. 2

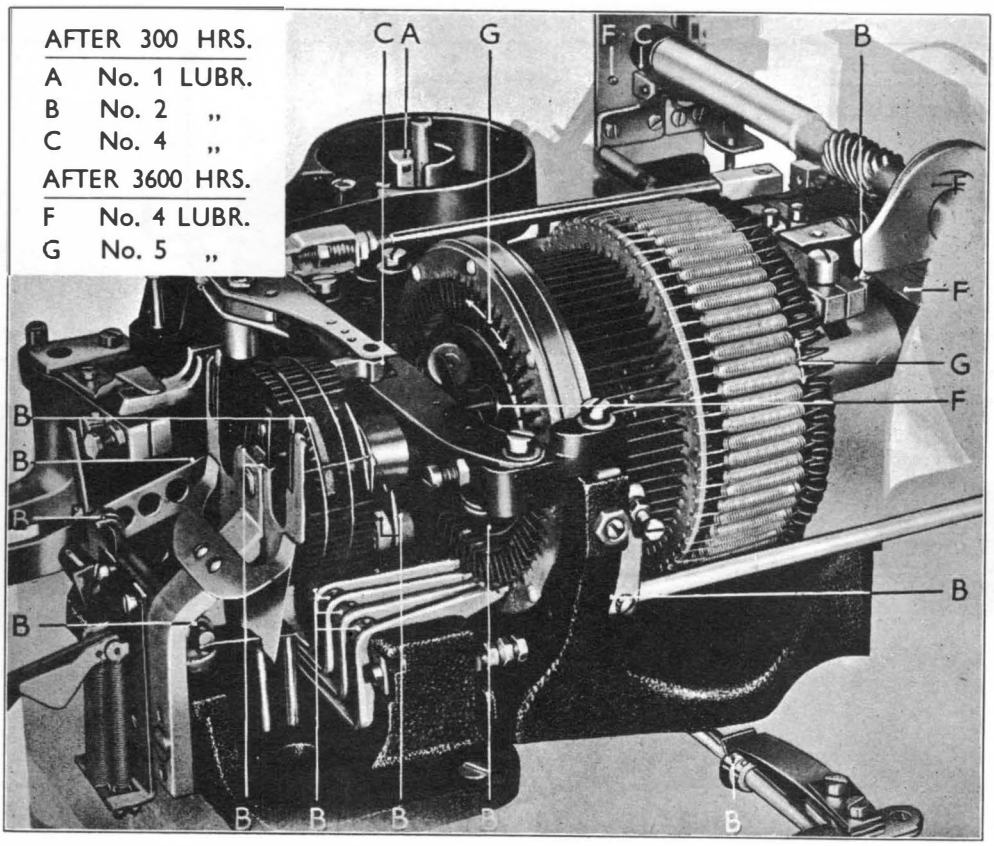


FIGURE 11. LUBRICATION CHART No. 3

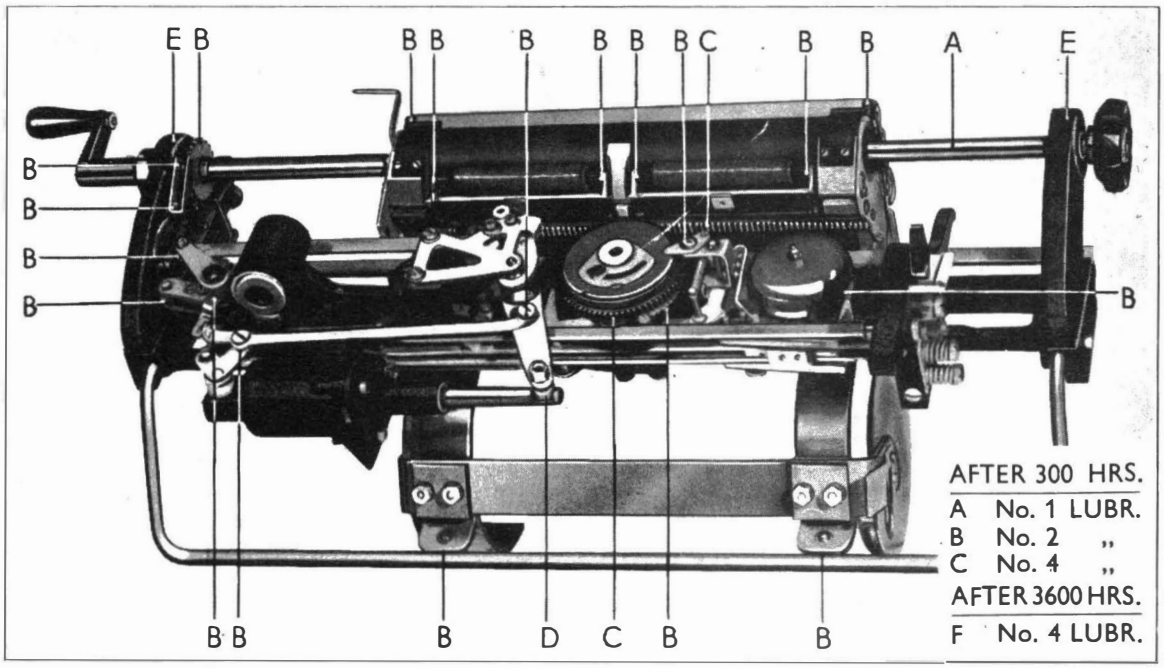


FIGURE 12. LUBRICATION CHART No. 4

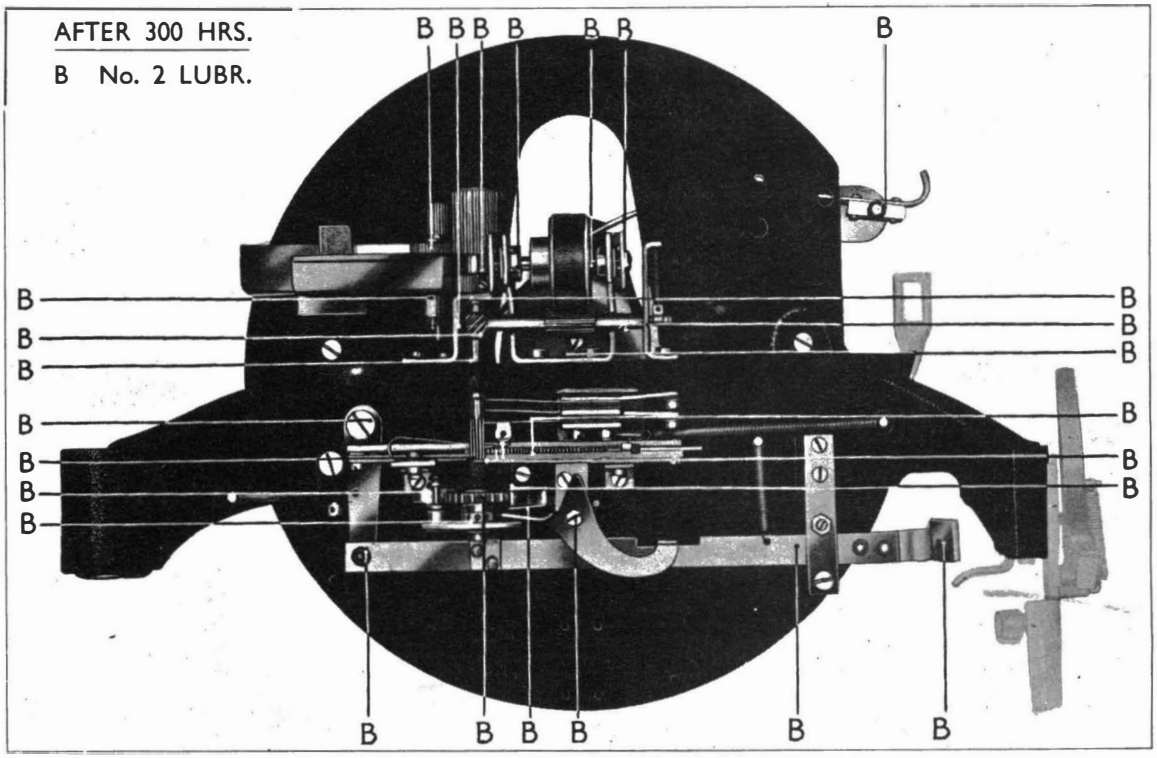


FIGURE 13. LUBRICATION CHART No. 5

PULL-OUT DIAGRAMS

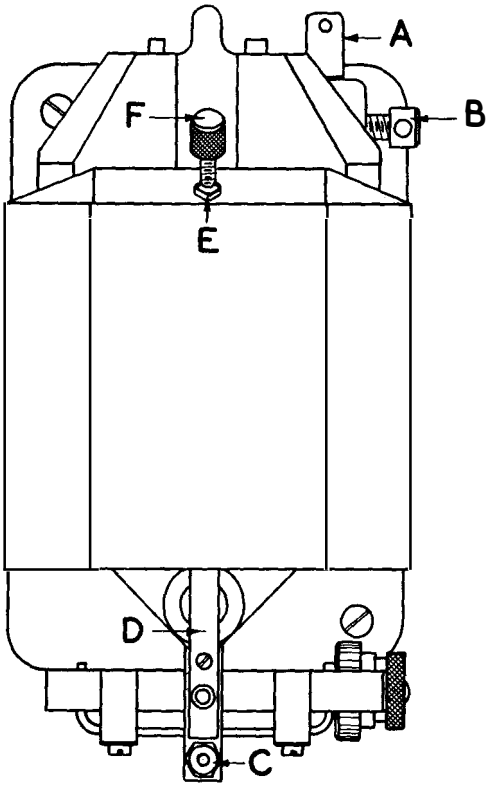


FIGURE 14

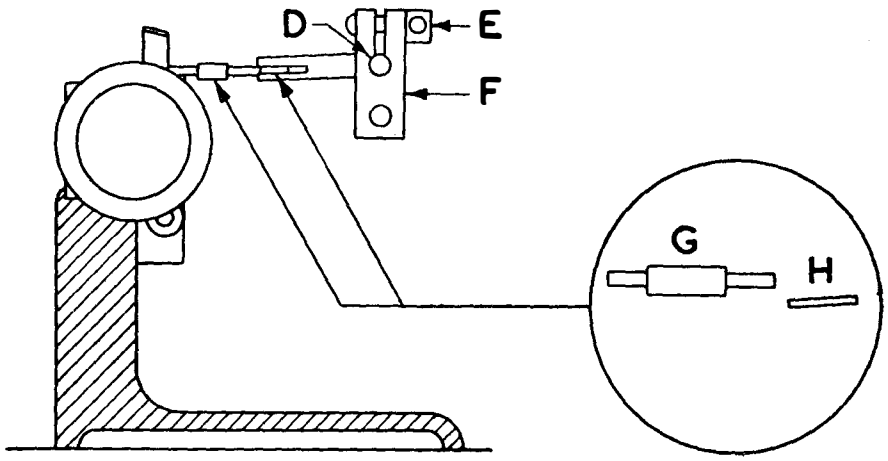


FIGURE 15

FIGURES 14 & 15

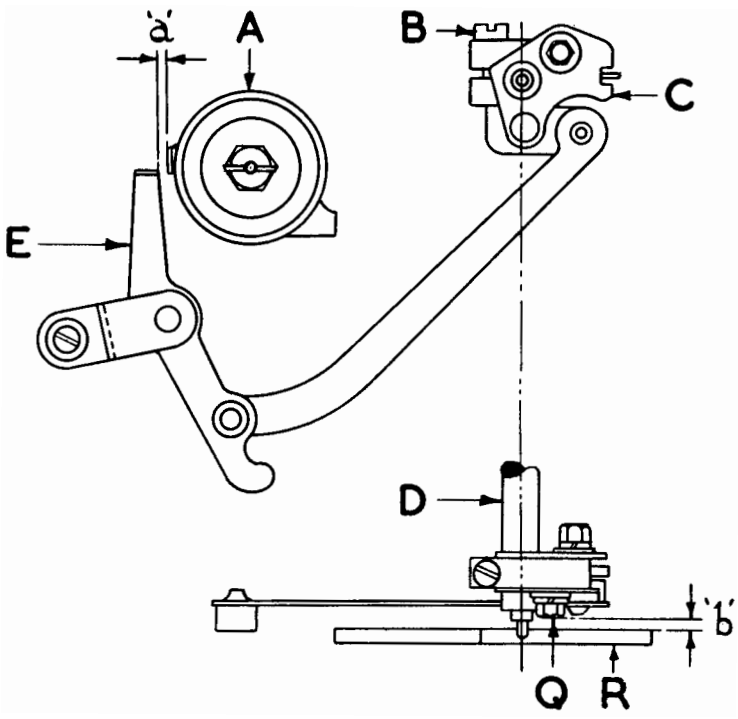


FIGURE 16

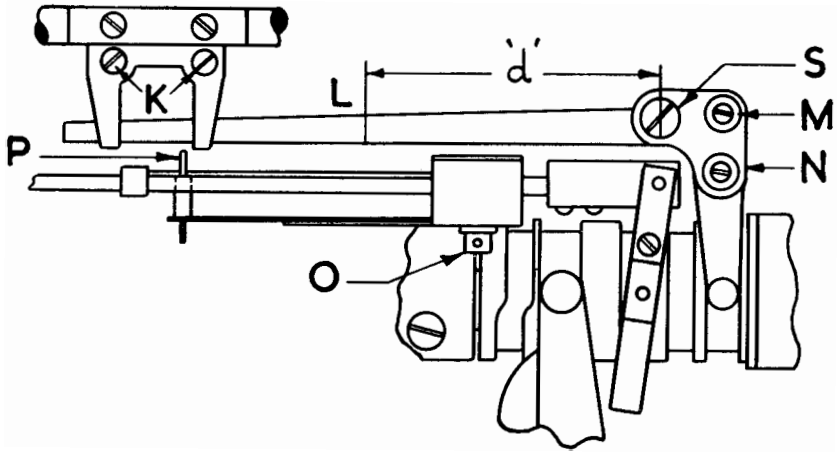


FIGURE 17

DIMENSIONS

'a' = { .013–.017 in. / .33–.43 mm. } 'b' = { .010–.020 in. / .25–.51 mm. } 'd' = { 2.0 in. / 51.0 mm. }

FIGURES 16 & 17

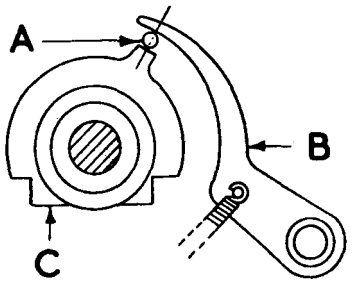


FIGURE 18

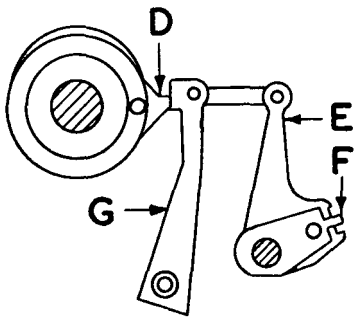


FIGURE 19

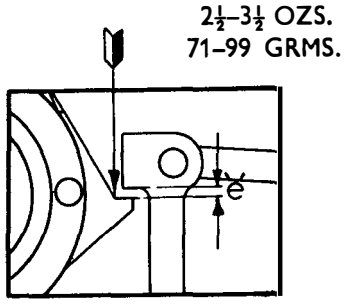


FIGURE 20

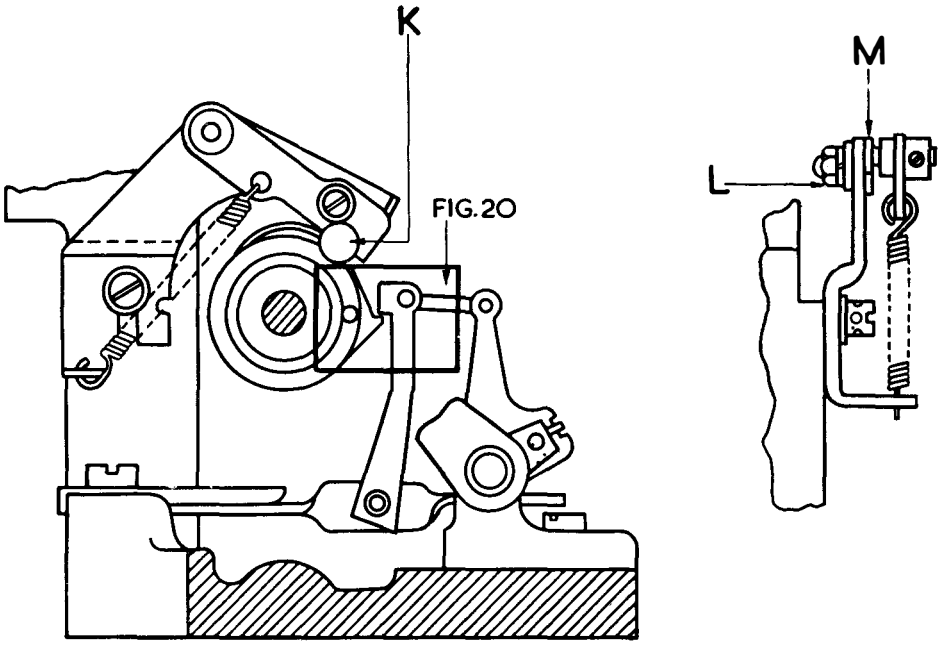


FIG. 21

DIMENSIONS

'e' = .002–.004 in. / .05–.10 mm.

FIGURES 18, 19, 20 & 21

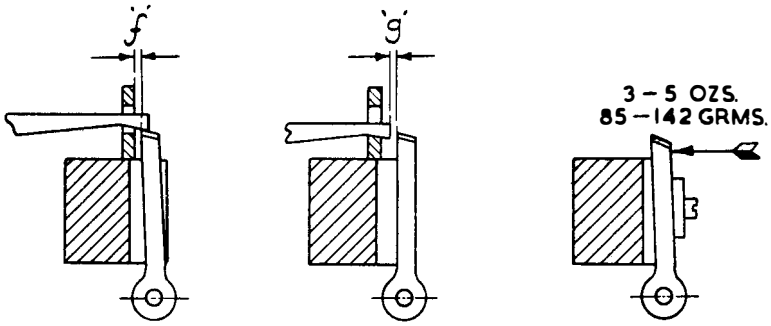


FIGURE 22

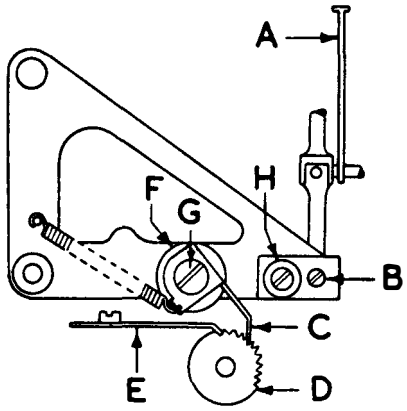


FIGURE 23

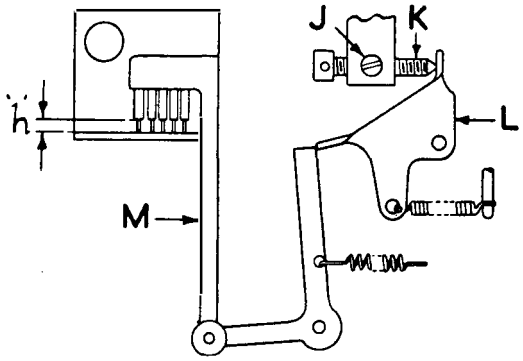


FIGURE 24

DIMENSIONS

'f' = .003–.020 in. / .08–.51 mm.

'g' ≮ .015 in. / .38 mm.

'h' ≮ .005 in. / .13 mm.

FIGURES 22, 23 & 24

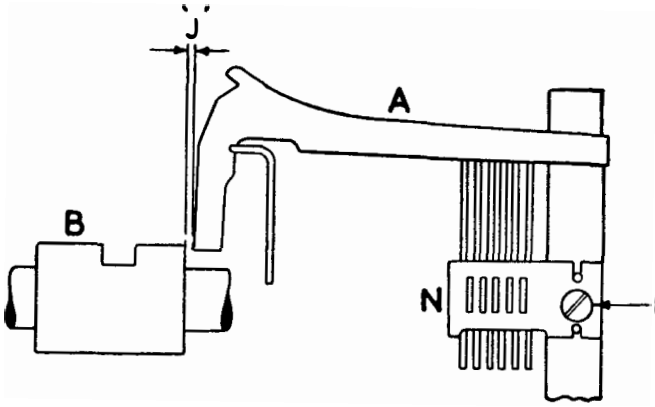


FIGURE 25

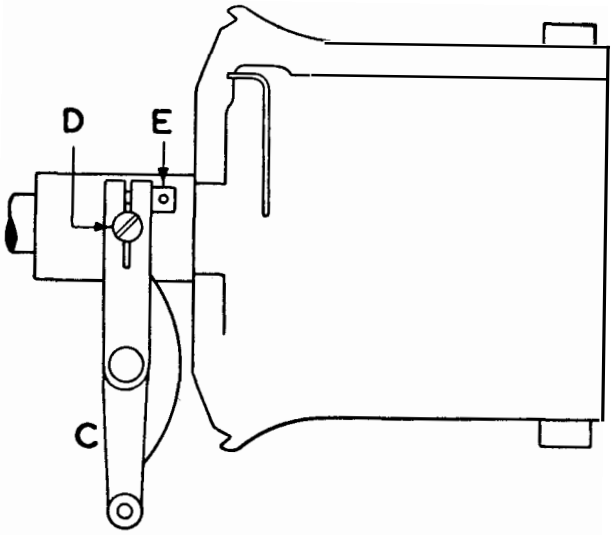


FIGURE 26

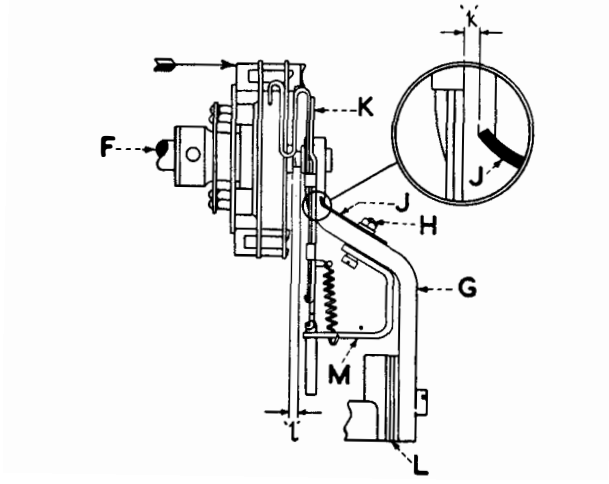


FIGURE 27

DIMENSIONS

'j' = .006–.008 in. / .15–.20 mm. 'k' = .002 in. / .05 mm. 'l' = .001–.005 in. / .03–.13 mm.

FIGURES 25, 26 & 27

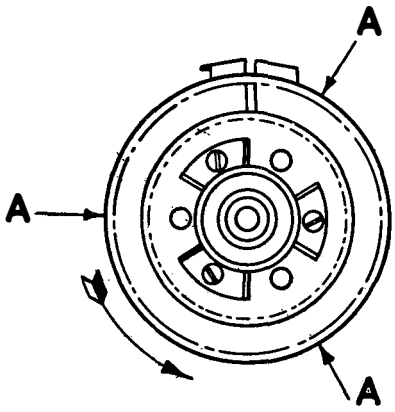


FIGURE 28

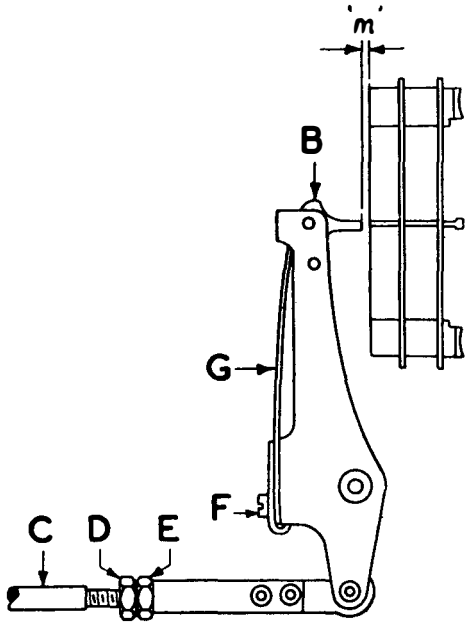


FIGURE 29

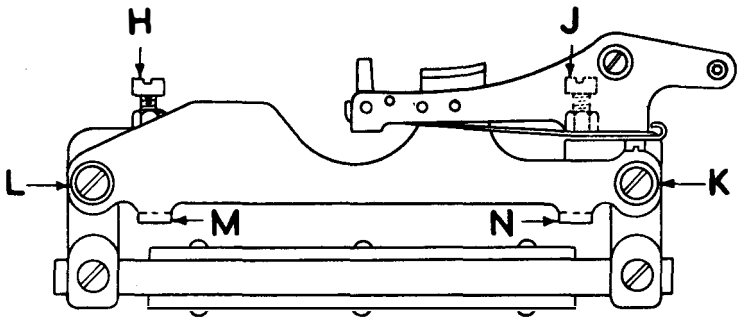


FIGURE 30

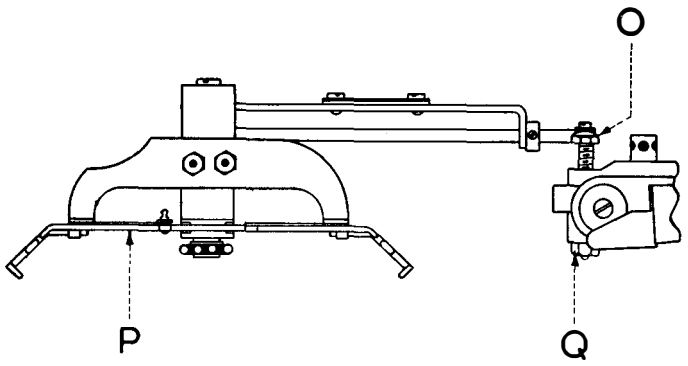


FIGURE 31

DIMENSIONS

'm' = { $\frac{1}{32}$ in. (.8 mm.). FOR PAGE TELEPRINTERS
{ $\frac{1}{16}$ in. (1.6 mm.). FOR TAPE TELEPRINTERS

FIGURES 28, 29, 30 & 31

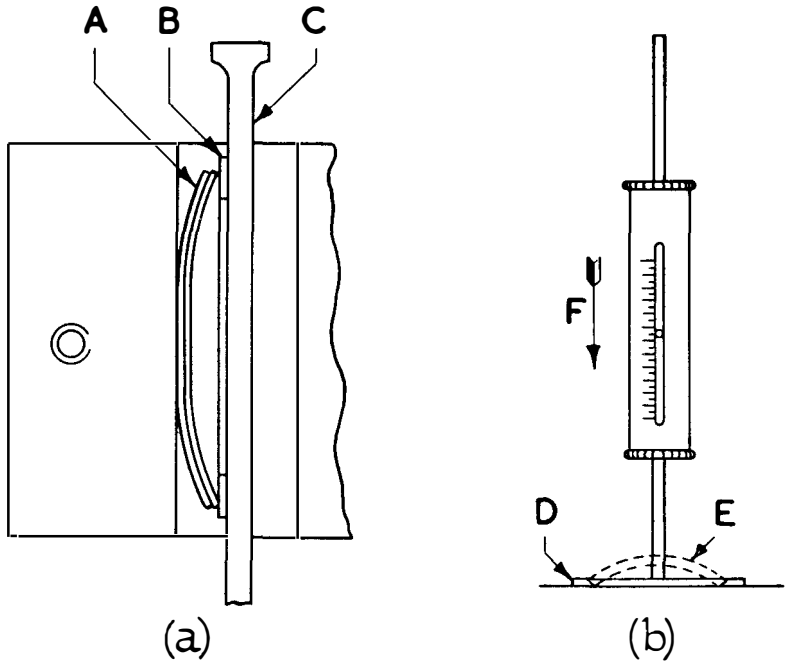


FIGURE 32
DIMENSION
F = 6–7 ozs. (170–198 grms.)

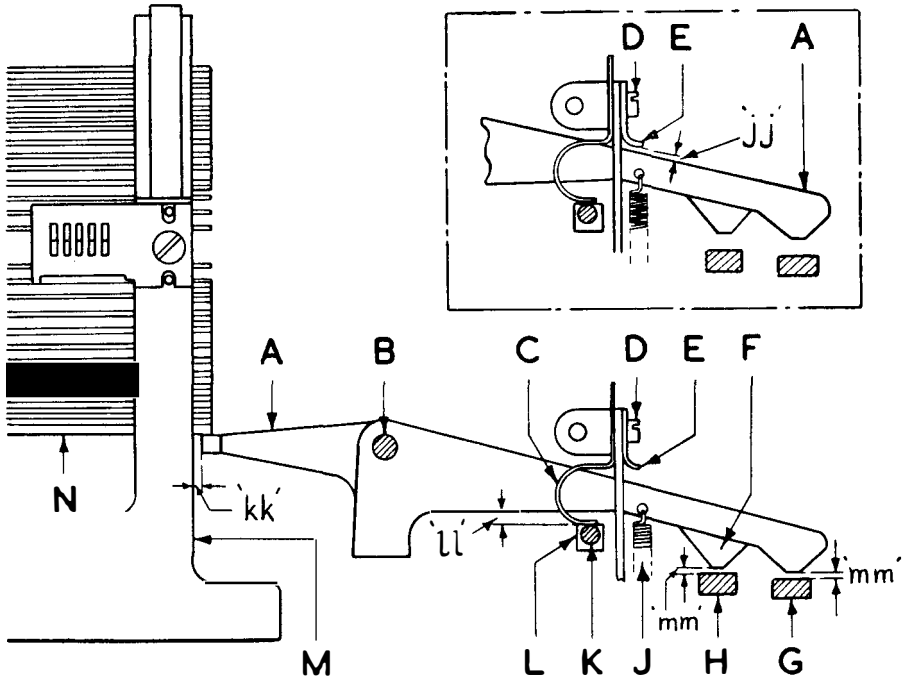


FIGURE 33
DIMENSIONS

'jj' = .010–.015 in. / .25 –.38 mm.

'll' = .005–.015 in. / .25–.38 mm.

'kk' ≮ .010 in. / .25 mm.

'mm' ≮ .010 in. / .25 mm.

FIGURES 32 & 33

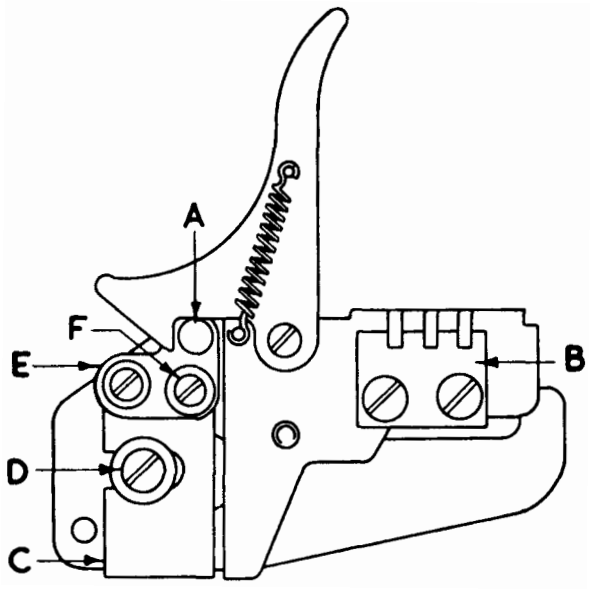


FIGURE 34

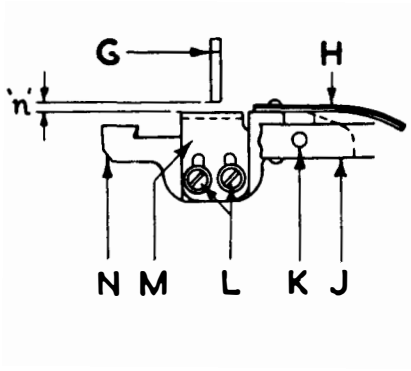


FIGURE 35

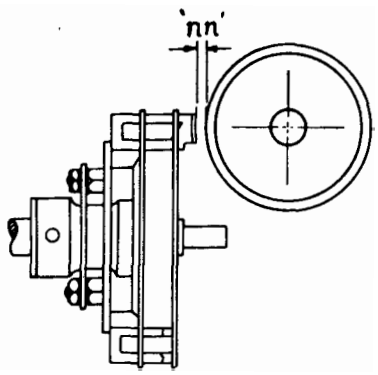


FIGURE 36

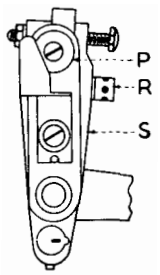


FIGURE 37

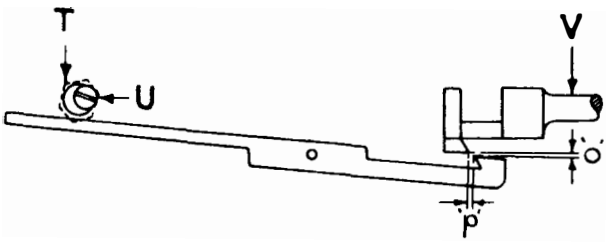


FIGURE 38

DIMENSIONS

'n' = .006–.010 in. / .15–.25 mm

'nn' = $\frac{1}{8}$ in. / 3.2 mm.

'o' = .010–.015 in. / .25–.38 mm.

'p' = .015–.025 in. / .38–.64 mm.

FIGURES 34, 35, 36, 37 & 38

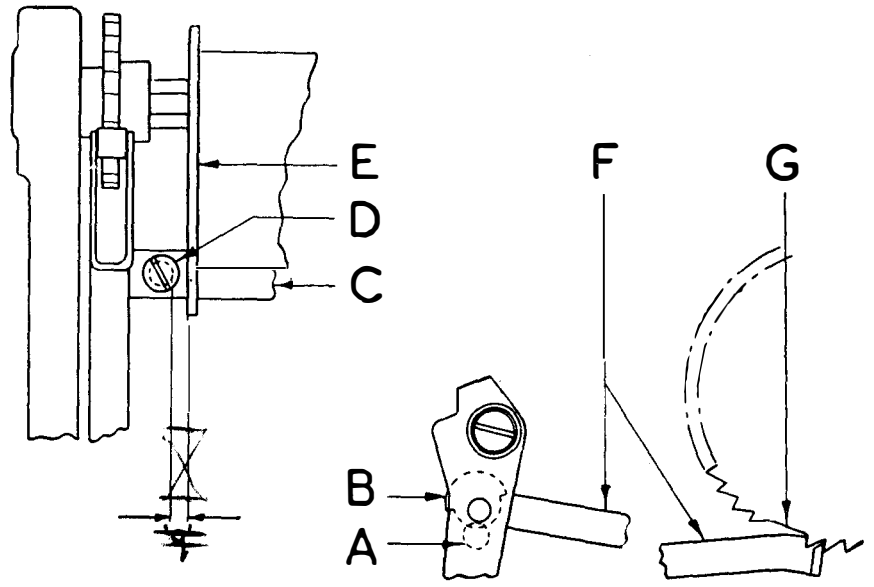


FIGURE 39

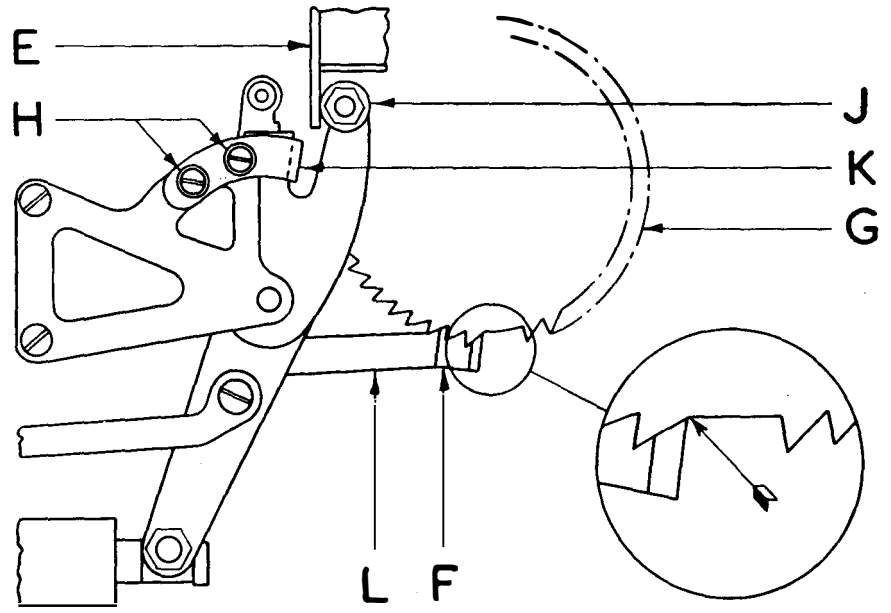


FIGURE 40

~~{q' { .010 in. .25 mm.~~

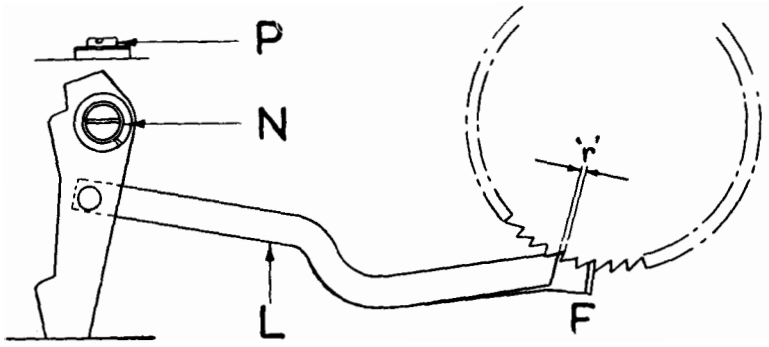


FIGURE 41

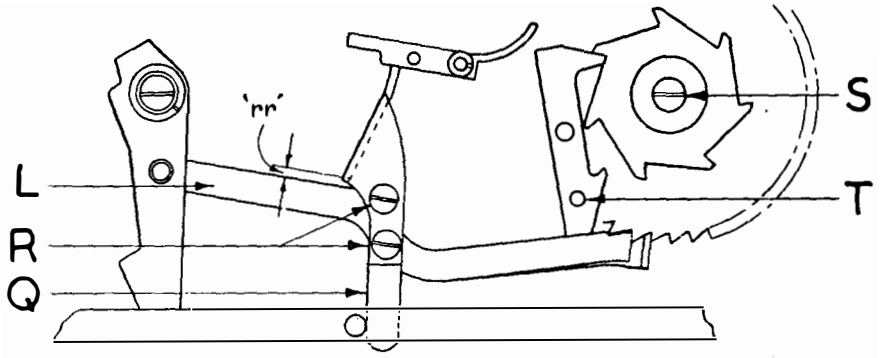


FIGURE 42

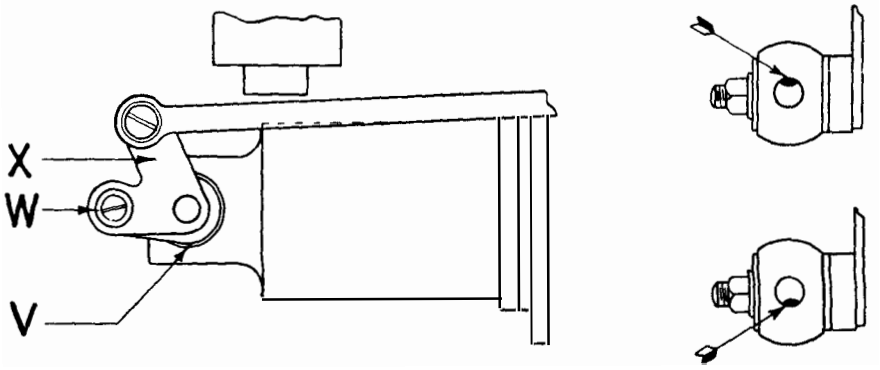


FIGURE 43

DIMENSIONS

'r' = { .005–.008 in. / .13–.20 mm. } 'rr' = { .001–.005 in. / .03–.13 mm. }

FIGURES 41, 42 & 43

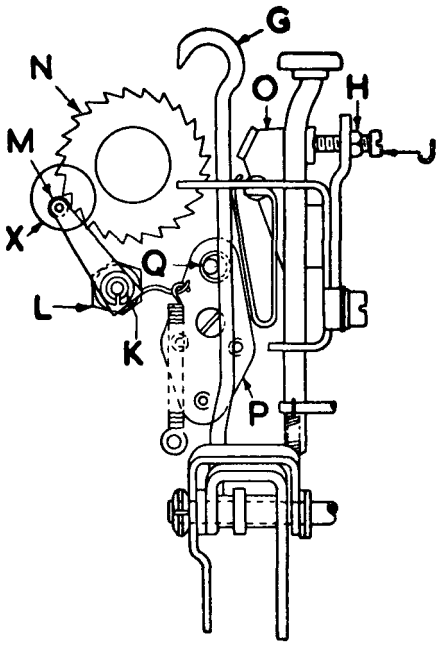


FIGURE 44

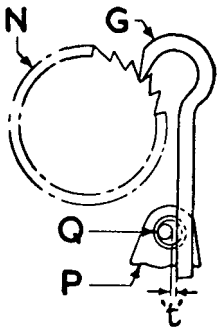


FIGURE 45

Nº	HOME		DISTANT		PROBABLE CAUSE
	RECEPTION	LOCAL RECORD	RECEPTION	LOCAL RECORD	
1			FAULTY		HOME TRANSMITTER
2		FAULTY	FAULTY		HOME TRANSMITTER
3	FAULTY				DISTANT TRANSMITTER
4	FAULTY			FAULTY	DISTANT TRANSMITTER
5	FAULTY	FAULTY			HOME RECEIVER
6			FAULTY	FAULTY	DISTANT RECEIVER
7	FAULTY		FAULTY		LINE, LINE EQUIPMENT OR TERMINAL UNIT

FIGURE 46

FAULT LOCALISATION TABLE

DIMENSIONS

't' = { .005–.010 in. / .13–.25 mm.

FIGURES 44, 45 & 46

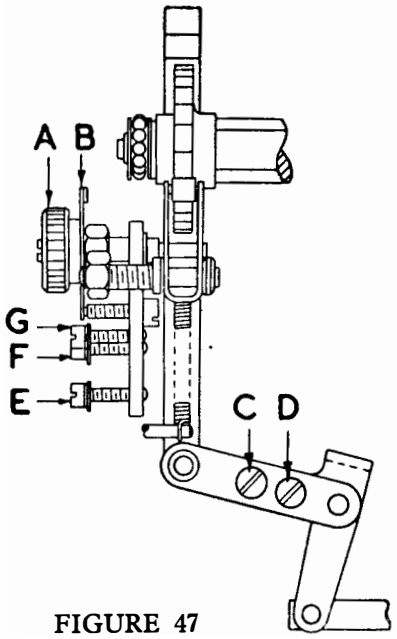


FIGURE 47

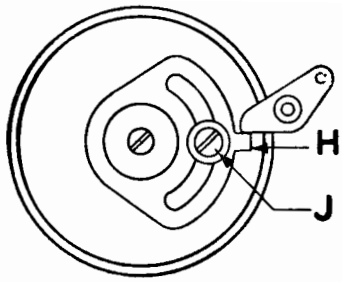


FIGURE 48

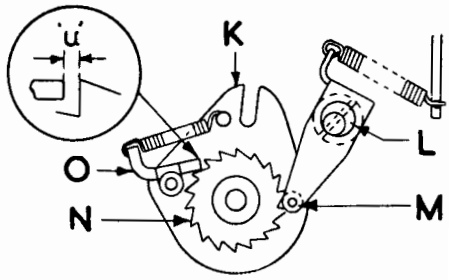


FIGURE 49

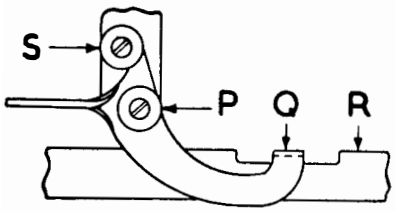


FIGURE 50

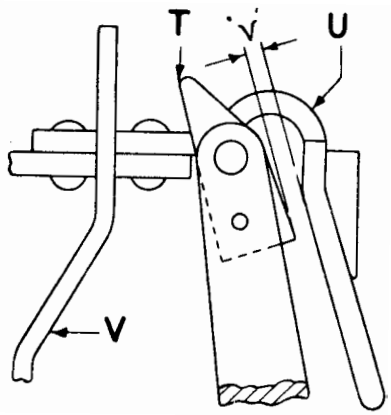


FIGURE 51

DIMENSIONS

'u' $\triangleleft$ { .005 in. / .13 mm.

'v' = { .010–.015 in. / .25–.38 mm.

FIGURES 47, 48, 49, 50 & 51

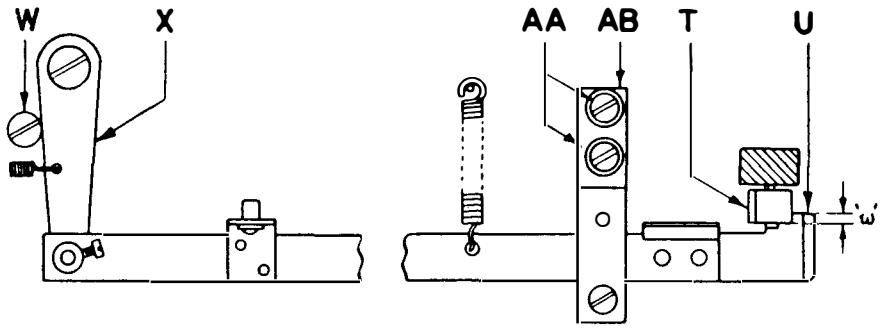


FIGURE 52

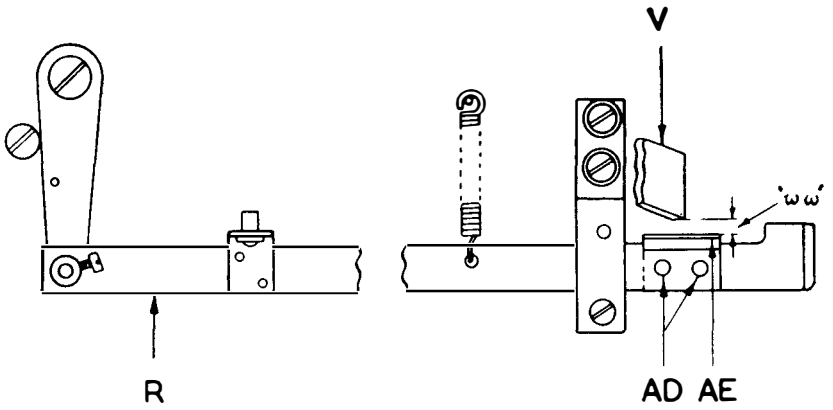


FIGURE 53

DIMENSIONS

'w' = { 1/16 in. / 1.6 mm. } 'ww' = { .005—010 in. / .13—.25 mm. }

FIGURES 52 & 53

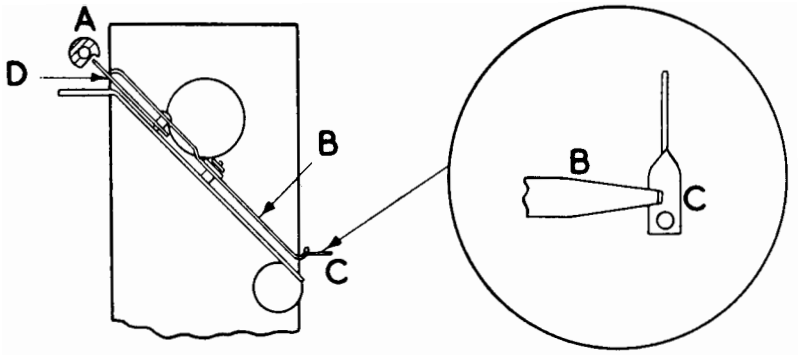


FIGURE 54

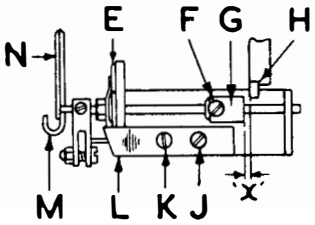


FIGURE 55

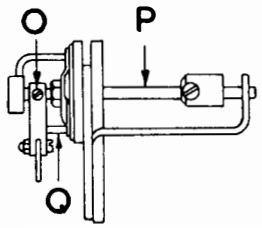


FIGURE 56

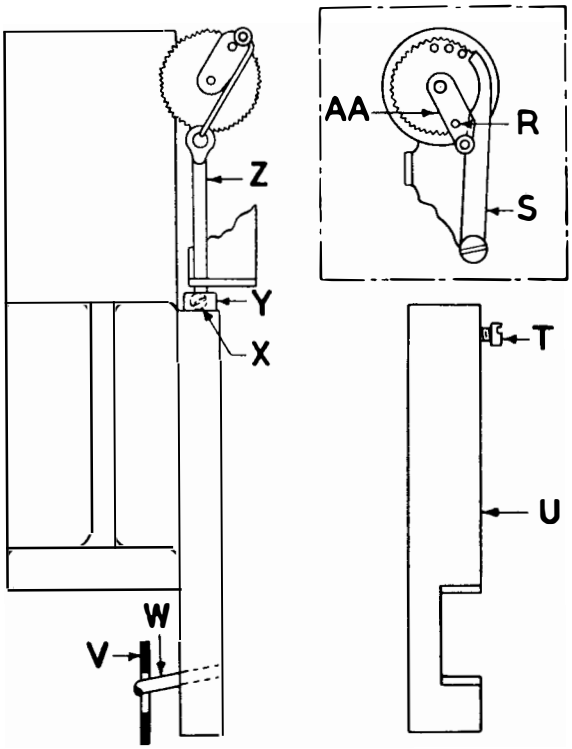


FIGURE 57

DIMENSIONS

'x' = { .005–.010 in. / .13–.25 mm.

FIGURES 54, 55, 56 & 57

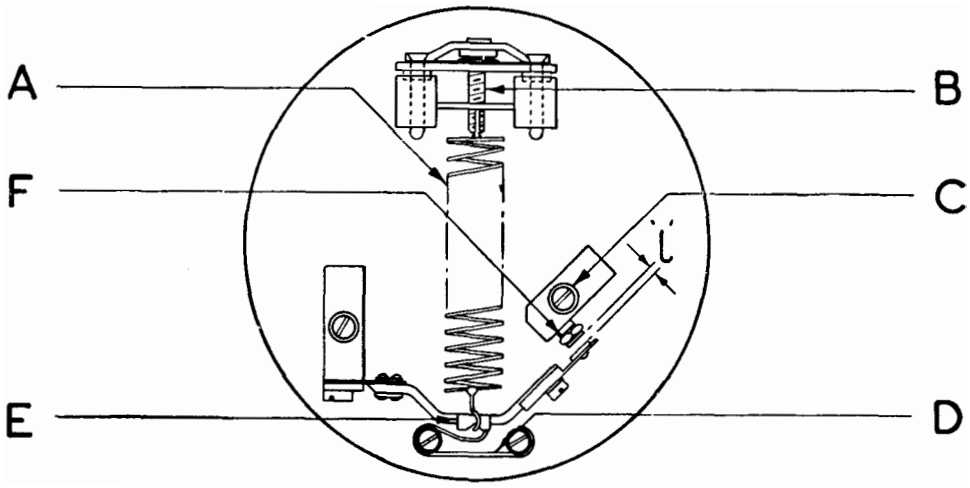


FIGURE 58

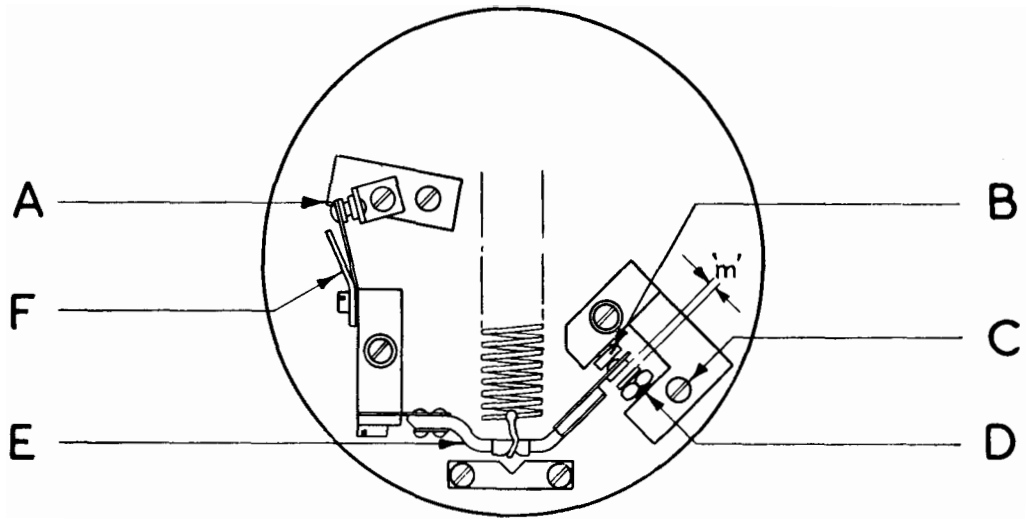


FIGURE 59

DIMENSIONS

'l' = { .015–.020 in. / .38–.51 mm. } 'm' = { .020–.025 in. / .51–.64 mm. }

KEY

A. Ribbon Jumper.
B. Control Lever Unit.
C. Ribbon.
D. Ribbon Feed Bracket (L.H.).
E. Typehead Unit.
F. Typehammer Unit.
G. Ribbon Feed Bracket (R.H.).
H. Typehammer Overthrow Stop.
J. Combination Head Clamp Strap.
K. Comb Stop Plate.
L. Cam Unit (with Orientation Device).
M. Ribbon Driving Shaft Unit.
N. Combination Head Unit.
O. Answer-Back Release Shaft.
P. Main Base Unit.
Q. Operating Electromagnet Unit.
R. Governor Unit.
S. Motor Support Plate.
T. Motor Unit.
U. Starter Switch Stop Plate.
V. Typehead Gear Cover.
W. Mainshaft.
X. Cam Unit Gear Cover.
Y. Starter Switch Control Unit.

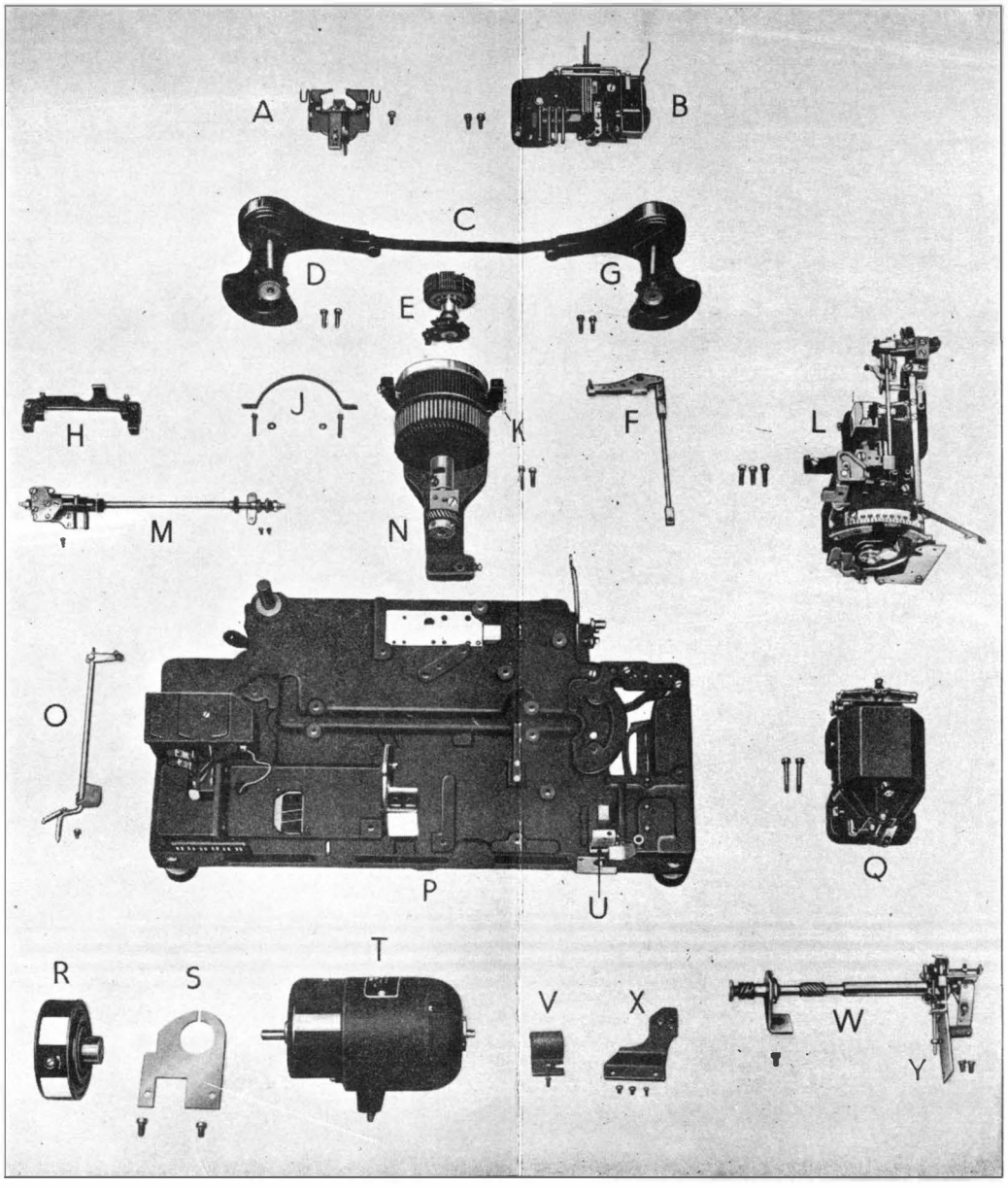


FIGURE 60. TELEPRINTER COMPONENTS

Creed & Company Limited
TELEGRAPH HOUSE
CROYDON – ENGLAND

AMENDMENTS TO BOOKLET No. 78 (12th Edition)

The following adjustments cover the two-colour printing facility as fitted to No. 7 Teleprinters with 'Overlap' pattern cam units and 'N' or 'CTK' keyboards.

Amendment No. 1

Between Figs. 27 and 28, insert Figs. 28A to 28J.

Amendment No. 2

On page 28, delete adjustment 20 and substitute the following adjustments:-

"**20A. Ribbon Jumper (Fig. 28A)**

20A.1 Slacken the screws A, Fig. 28A, and adjust the guide bracket B so that the ribbon jumper C slides freely in its guides.

20A.2 Slacken the two nuts D and adjust the ribbon jumper steady plate E to obtain a clearance of .002 in. (.05mm.), i.e. dimension 'a', between the ribbon jumper and the steady plate.

20A.3 Check that there is an adequate clearance between the ribbon jumper and all parts of the platen, when the play of the jumper is taken up towards the platen. If there is not, set the jumper to obtain this condition.

20B. Bowden Cable Plungers (Fig. 28C)

N.B.: This adjustment should require attention only after a major overhaul, or when the two-colour printing facility is being fitted to existing machines.

20B.1 Slacken the screw securing the adjustment collar AD. Position the front plunger J so that the length of the plunger protruding from its front bearing is $^{15}/_{32}$" (12mm.), i.e. dimension 'b'. Move the adjusting collar along the plunger until it abuts against the rear face of the bearing. Secure the collar in this position.

20B.2 Press in the rear plunger sufficiently to take up play and check by eye the length of plunger protruding from the rear bearing. This should be $^{1}/_{16}$" (2 mm.).

20B.3 If this is not so, then slacken screw L, slide the outer covering of the Bowden cable in the collar and again secure with screw L.

20B.4 Repeat the check in adjustment 20B.2. Slacken the securing screw for collar AD and move the collar away from the front bearing so that the plunger has complete freedom.

20C. Ribbon Lift (Black) (Fig. 28F)

20C.1 Withdraw the function cam detent on the overlap cam unit and turn the machine by hand until the traversing link O is fully forward. Slacken screw P.

20C.2 By placing a finger under the lifting arm, raise the ribbon jumper until the top of the ribbon is level with the top of a type pad and adjust arm T so that it supports the jumper in this position, while resting on roller U. Tighten screw P.

20D. Latching Lever (Figs. 28D, 28H and 28J)

20D.1 Depress any key, thus allowing the transmitter ratchet clutch to engage, and turn the machine by hand until the latch lever V, Fig. 28J, is latched in its uppermost position. Ensure that the trip lever Q, Fig. 28D, does not foul arm R during this movement.

20D.2 Slacken screw W, Fig. 28H, and by means of the slotted hole in the drop lever X, adjust the height of the latch lever V so that it engages with the rack Y with a small overshoot. Tighten screw W.

20D.3 With a page attachment unit on the receiver latched in its normal working position, and with a sheet of paper in the platen, turn the machine further by hand. Adjust the eccentric pin Z on the typehammer by means of the nut AA, Fig. 28J, so that the latch lever V is just pushed off the rack Y when the typehammer moves to its extreme forward position. Turn the machine by hand until it resumes its 'rest' position.

20E. Trip Lever (Figs. 28D, 28E and 28J)

20E.1 Raise the latching lever V, Fig. 28J, with the finger until it engages in its uppermost position in the rack Y.

20E.2 Slacken screw S, Fig. 28D, and ensure that the raised end of the trip lever Q is opposite arm R. Adjust trip lever Q to obtain a clearance of $\frac{3}{64}$" (1.2 mm.), i.e. dimension 'd', between the upper edge of lever Q and arm R. Tighten screw S.

20F. Ribbon Lifting (Red) (Figs. 28E, 28G and 28H)

20F.1 Slacken screw AB, Fig. 28G. Withdraw the function cam detent and turn the machine by hand until the traversing link O is fully advanced.

20F.2 Raise the ribbon jumper by hand until the dividing line between the red and black portions of the ribbon is level with the top of a type pad.

20F.3 Adjust arm R so that it touches the trip lever Q and, at the same time, position the arm so that its side is flush with the end of lever Q as in Fig. 28E. Tighten screw AB.

20F.4 Check that, when the latch lever V, Fig. 28H, resumes its 'down' position after being unlatched by the pin Z, arm R, Fig. 28G, clears the trip lever Q by at least $\frac{1}{32}$" (8 mm.) when the traversing link is fed forward.

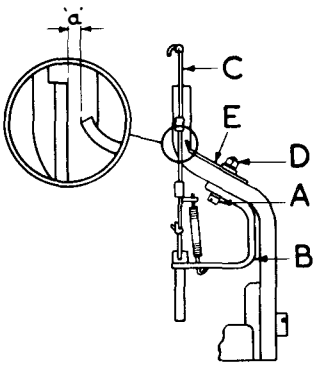


FIGURE 28A

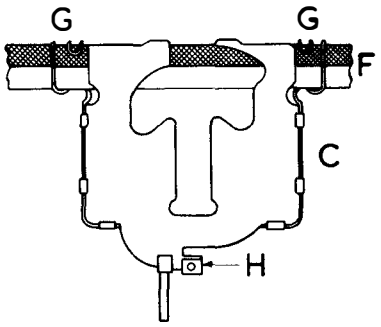


FIGURE 28B

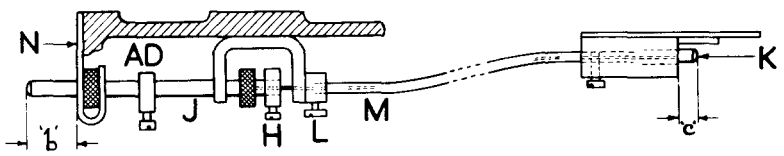


FIGURE 28C

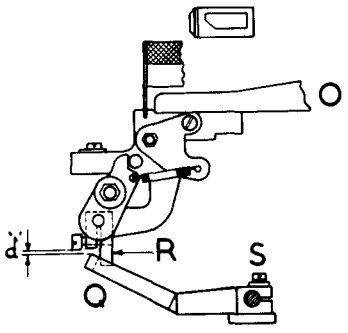


FIGURE 28D

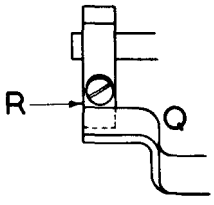


FIGURE 28E

DIMENSIONS

'a' { ·002 IN. / ·05 MM. } 'b' { 15/32 IN. / 12 MM. } 'c' { 1/16 IN. / 2 MM. } 'd' { 3/64 IN. / 1·2 MM. }

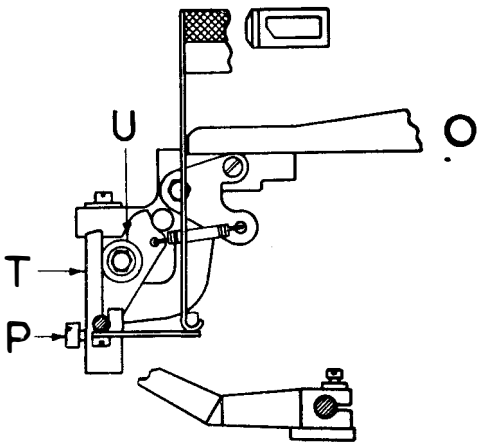


FIGURE 28F

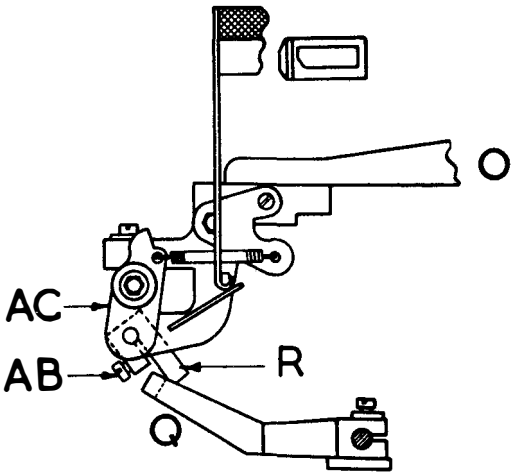


FIGURE 28G

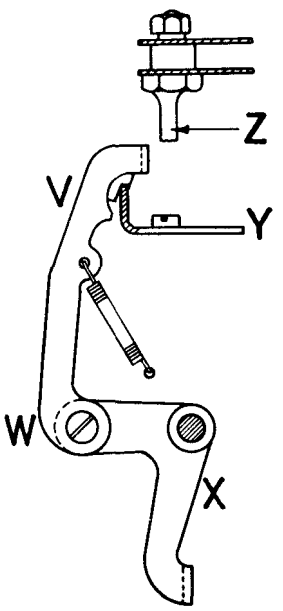


FIGURE 28H

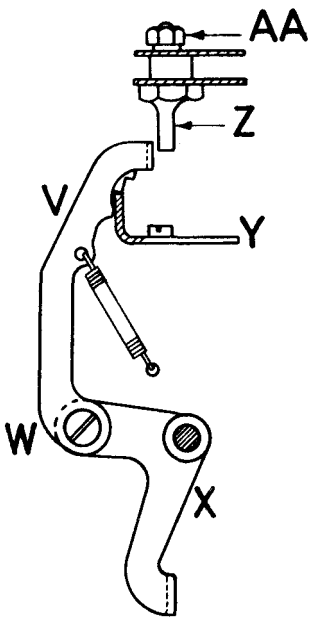


FIGURE 28J

Creed & Company Limited

TELEGRAPH HOUSE
CROYDON - ENGLAND

AMENDMENTS TO BOOKLET NO. 78 (12th Edition)

(Nos. 7 and 8 Teleprinters)

Amendment No. 1

Delete instructions 28 – 29 on pages 30 – 31 and substitute the following instructions:-

"28. **Carriage Feed and Retaining Pawls.** (Figs. 39 and 41)

Check *

28.1 Remove the page attachment unit from the machine. Feed the carriage along a few spaces to the left from the extreme right-hand position, i.e. until it is retained by the retaining pawl. Check the clearance 'r', Fig.41, between the feed pawl and the next tooth of the ratchet. This should be .005 – .008 in. (.13 – .20 mm).

Action

28.2 If clearance 'r' is incorrect, slacken clamping screw A, Fig. 39, (on the back of the frame behind the letter feed levers), and clamping screw P, Fig. 41. Set the eccentrics B, Fig. 39, and N, Fig. 41, to their neutral positions, i.e. with their slots horizontal.

28.3 With the carriage in the position specified in check 28.1, adjust the carriage feed and retaining pawl eccentrics to give the correct value for clearance 'r'. (**N.B.**: The adjustment should be shared between the two eccentrics. As the retaining pawl eccentric has twice the angular throw of the feed pawl eccentric, the slot in the retaining pawl eccentric should be turned through approximately twice the angle of the feed pawl eccentric). Lock the feed and retaining pawl eccentrics.

29. **Adjustable Platen Stop.** (Figs. 40 and 41)

Check *

29.1 Depress the carriage return key and ensure that the carriage is in its extreme right-hand position. Check the clearance between the feed pawl and the next tooth of the ratchet once more, i.e. dimension 'r', Fig. 41. This should be as in check 28.1, .005 – .008 in. (.13 – . 20 mm).

Action

29.2 If this is not so, slacken the clamping screws H, Fig. 40, and adjust the position of stop K to obtain the dimension. Tighten screws H. (This adjustment ensures that the retention pawl engages correctly at the intersection of the tooth slope and the cut-away in the spring drum, as shown in the inset to Fig. 40)."

Printed in England