No. 54
PAGE TELEPRINTER

MAINTENANCE INSTRUCTIONS

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Creed & Company Limited

TELEGRAPH HOUSE
CROYDON, ENGLAND

Telegraphic Address:
CREDO, TELEX, CROYDON

Telephone:
MUNICIPAL 2424

Telex: 28836

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INSTRUCTION BOOKLET No. 54

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PAGE TELEPRINTER

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Creed & Company Limited

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

MARK ELEMENT ●

SPACE ELEMENT ○

START—STOP CODE

FIG. 1

NO. 54 TELEPRINTER

MAINTENANCE INSTRUCTIONS

Introduction

This instruction manual applies to the No.54 Teleprinter receiver only. Supplementary instructions for the keyboard and reperforating attachment are published separately as follows:-

(1) N-Series Keyboard ... ... Instruction Booklet No. 47K.

(2) Commercial Typewriter Keyboard ... ... Instruction Booklet CTK/78.

(3) Reperforating Attachment ... ... Instruction Booklet No. R/5.

CIRCUITS AND CIRCUIT DIAGRAMS

Circuit diagrams for No. 54 Teleprinter are given in Figs. 2–4.

Fig. 2 is a component layout diagram, depicting the positions of the electrical components on the machine main base as viewed from underneath, the names and values of these components being listed at the bottom of the figure.

Fig. 3 is a combined point-to-point and schematic diagram for the signal circuit, showing the alternative connections for external 9-pin and 12-pin plugs. The letters on this figure refer to the component designations on Fig. 2.

Fig. 4 is a diagram of the motor circuit, with the End-of-Line Indicator shown connected for an A.C. motor supply. The modifications that are necessary when a D.C. supply is used are described in the motor circuit section below.

A. SIGNAL CIRCUIT

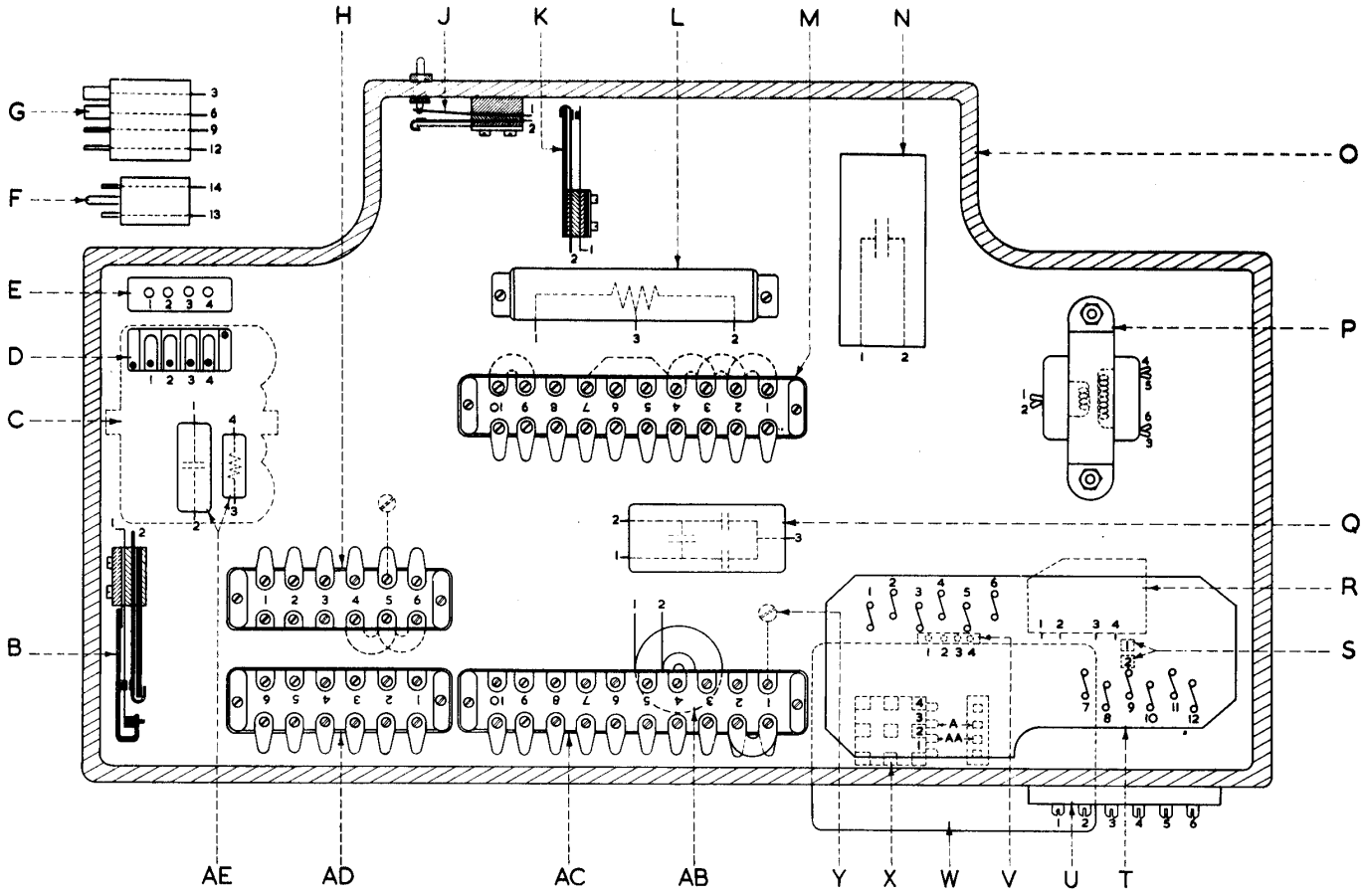
(Figs. 2 and 3)

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 AD, Fig. 3, which provides facilities for strapping them in parallel or in series, and for connecting across them a .5 μF + 330 ohm capacitor-resistor when this is required.

The main types of circuit arrangement that are obtainable are as follows:-

(a) Single Current. In this case the coils are connected in parallel by strapping AD2 to AD3 and AD4 to AD5.



A	MOTOR PLUG PIN	F	4-PIN POWER PLUG	Q	R.I.S. CAPACITOR ·1+·1+·25μF
AA	MOTOR PLUG PIN	G	12-PIN SIGNALS PLUG	R	GOVERNOR R.I.S. UNIT
AB	INDUCTOR 1000 μH	H	TERMINAL BLOCK	S	GOVERNOR BRUSH BLOCK
AC	TERMINAL BLOCK	J	END-OF-LINE INDICATOR SWITCH	T	SIGNALS R.I.S. UNIT
AD	TERMINAL BLOCK	K	BELL SIGNAL SWITCH	U	KEYBOARD CONTACTS
AE	CAPACITOR ·5μF RESISTOR 330 Ω	L	GOVERNING RESISTOR 1000 Ω	V	MOTOR FIELD STRAPPING BLOCK
B	STARTER SWITCH	M	TERMINAL BLOCK	W	A.C. SERIES MOTOR
C	RECEIVING ELECTROMAGNET	N	CAPACITOR ·5 μF	X	MOTOR CONNECTION BLOCK
D	ELECTROMAGNET CONTACTS	O	MACHINE BASE CASTING	Y	FRAME EARTH CONNECTION
E	ELECTROMAGNET CONNECTION BLOCK	P	END-OF-LINE INDICATOR TRANSFORMER		

FIG. 2 ELECTRICAL COMPONENTS

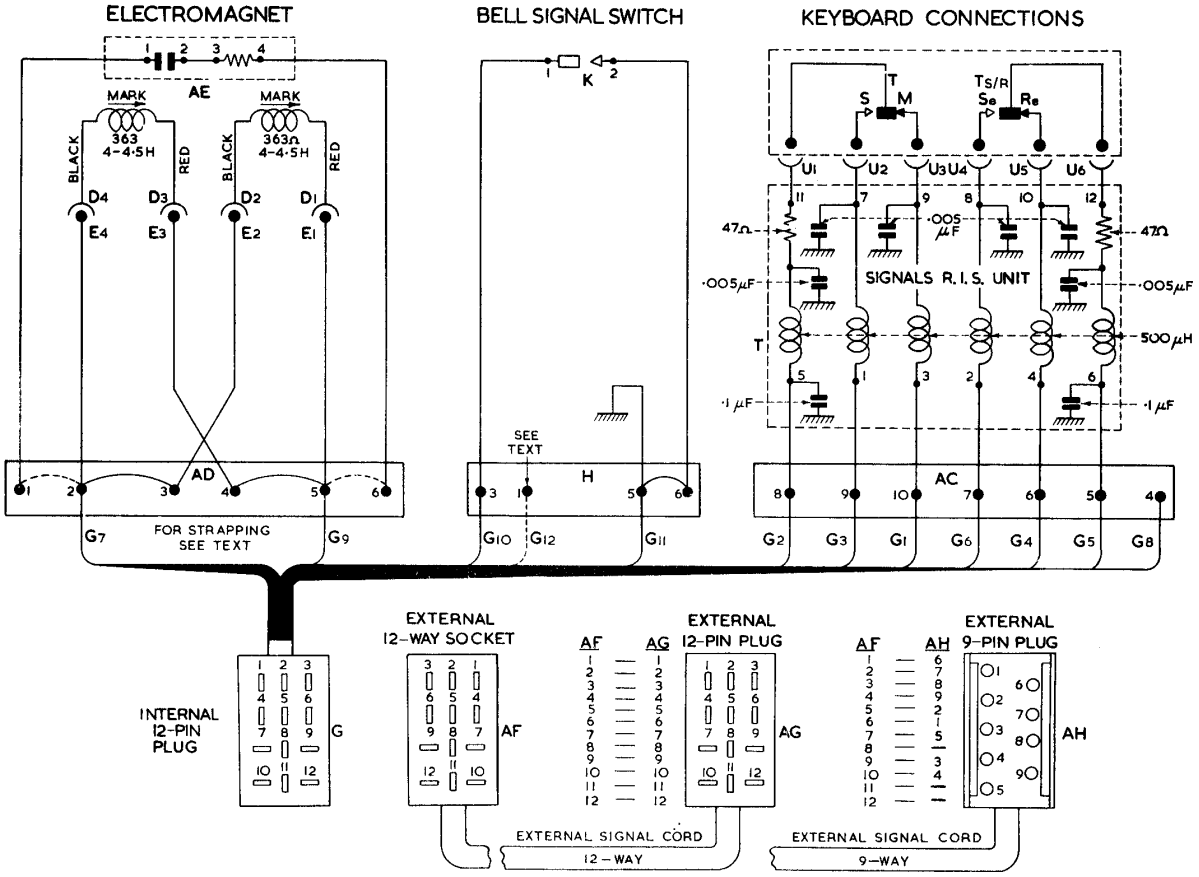


FIG. 3 SIGNAL CIRCUIT

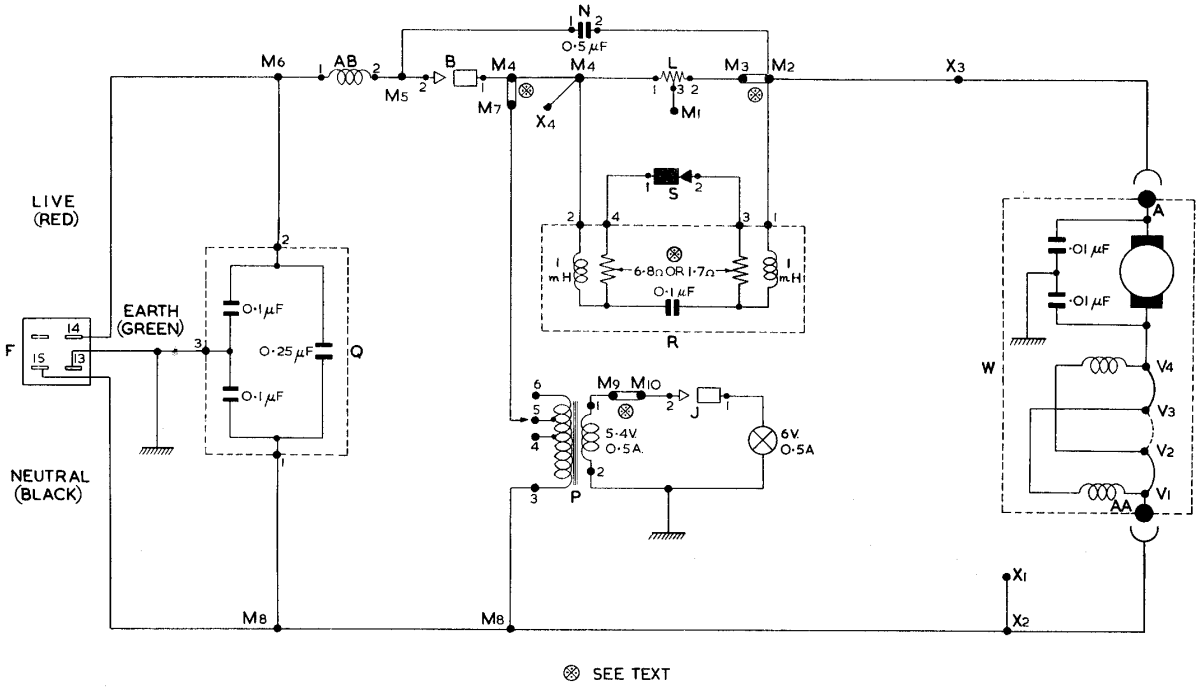


FIG. 4 MOTOR CIRCUIT

(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 AD1 to AD2 and AD5 to AD6.

(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) and 10(DC), 'P' type coils may be used provided they are connected in series by strapping AD3 to AD4 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 AD3 or AD4.

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 T, Fig. 2, located on the receiver main base. The leads from this unit are all terminated on a separate block AC (see also Fig. 3).

Bell Signal Switch

The usual bell signal switch is included for use with an external bell and power supply.

If the machine is fitted with an external 9-pin plug AH, Fig. 3, the external circuit must be completed by connecting one side of it to socket 4 of the corresponding 9-way socket and the other side to earth.

If a 12-pin external plug AG is fitted, the external circuit may be completed either through sockets 10 and 11 of the external 12-way socket, or through socket 10 only, the other side of the circuit being connected to earth. This latter method of connection has the advantage of freeing lead 11 for other purposes.

B. MOTOR CIRCUIT

(Figs. 2 and 4)

Motor

The standard motor for the No. 54 Teleprinter, the circuit for which is given in Fig. 4, is a single voltage AC/DC motor which is supplied to cover any nominal voltage in steps of 5 volts from 90 – 270V.

A motor field strapping block V, 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.

Motor Plugs and Cords

The motor circuit is terminated on an internal 4-pin plug, of which only three pins, numbered 13, 14 and 15, are used. Connection to the power supply is made via a 3-way external power cord with a 4-way socket on one end and a 3-pin plug on the other (not illustrated).

Pin 14 (live) of the internal plug is connected via a red lead to terminal 6 on the 10-way block M, pin 15 (neutral) via a black lead to terminal 8 and pin 13 via a green lead to the teleprinter frame. This latter pin should be earthed through the external power cord.

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.

Governor Resistor

The governor resistor L, Fig. 2, consists of two 500-ohm sections with a centre tap. These sections must be strapped to correspond to the voltage of the power supply, in parallel for voltages between 90 and 155 and in series for voltages between 160 and 270, identical strappings being used for A.C. and D.C. supplies.

The method of strapping (see Fig. 2 – the schematic in Fig. 4 is shown strapped for the higher range) is as follows:-

(a) Series arrangement – strap M2 to M3.

(b) Parallel arrangement – strap M1 to M2 and M3 to M4.

Governor R.I.S.

To obtain satisfactory radio interference suppression for the governor contacts over the full motor voltage range of 90–270 volts, it has been found sufficient to employ an R.I.S. resistor of 1.7 ohms to cover the range 90–155 volts and one of 6.8 ohms to cover the range 160–270 volts.

The appropriate resistor is fitted in the factory and does not require special attention in the field.

End-of-Line Indicator

Provision is made on the No. 54 Teleprinter for the option of using a carriage-operated End-of-Line Indicator.

For A.C. mains supplies of 220–240 volts, the current for the indicator lamp is derived from the motor circuit by a special transformer P, Fig. 2. The circuit connections for this case are those illustrated in Fig. 4.

For A.C. mains supplies of voltages other than 220–240, and for all D.C. mains supplies, a separate external D.C. power supply must be provided. (Alternatively, for A.C. mains supplies other than 220–240 volts, special transformers to replace P, Fig. 2, may be obtained from Creed and Co., if required).

The circuit for an external D.C. supply to the indicator lamp may be set up by making the following changes to the standard circuits in Figs. 2–4:-

(1) Remove the straps connecting terminals 4 and 7 and 9 and 10 on block M, Fig. 4.

(2) Transfer lead G12 (light blue), Fig. 3, from block H, terminal 1, to block M, Fig. 2, terminal 10.

The external voltage if supplied between socket 12 of the internal 12-way socket AF, Fig. 3, and an external earth.

ADJUSTMENT INSTRUCTIONS

N.B.: 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 effected to the factory for readjustment.

A. OPERATING MAGNET AND CAM UNIT

N.B.: To avoid damage to the machine, 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 H, Adjustments Nos. 71 and 73.

1. Preparatory

1.1 Remove the two nuts and the washer securing the electromagnet armature link to the armature and lift off the link.

1.2 Remove the two screws securing the electromagnet to the main base and lift off the electromagnet.

1.3 Remove the two screws securing the right-hand ribbon-feed bracket to the main base. Disengage the ink ribbon from the ribbon jumper and move the ribbon-feed bracket to one side.

2. Operating Magnet (Fig. 5)

N.B.: This adjustment should require attention only at major overhauls.

2.1 Slacken the four screws D, Fig. 5(a), and remove the electromagnet cover.

2.2 Check that the top of the armature is approximately level with the top of the field laminations with an estimated vertical play of .003 – .005 in. (.08 – .13 mm), and that the movement of the armature from side to side is symmetrical with respect to the pole faces. If either of these conditions is not satisfied, adjustments 2.3 – 2.8 should be carried out.

2.3 Unhook the rear bias spring and the spring attached to the rear of the adjustable magnet. Remove the screw and washer securing the retaining plate and remove the plate, with the retaining plate collar. Unhook the remaining front spring. Remove the screw securing the safety plate and remove the plate. Lift off the field unit.

2.4 Obtain the correct height for the armature by means of the top and bottom central adjustment screws L, Fig. 5(b), securing the screws with their locknuts.

2.5 Slacken the four screws K securing the upper and lower armature bearing blocks so that the armature pivots are free to move laterally.

2.6 Swing the armature clockwise and adjust the lateral position of the bearing blocks so that the armature touches diagonally opposite pole faces. Tighten screws K sufficiently to prevent free lateral movement of the armature.

2.7 Swing the armature anti-clockwise. If it again touches both diagonally opposite pole faces, the correct adjustment has been obtained and the four screws K may be tightened.

2.8 If the armature touches only one pole face, measure the gap between the armature and the other pole face. Slacken the four screws K and adjust the bearing blocks laterally until the gap is halved. Tighten screws K.

2.9 Reassemble the electromagnet by following instructions 2.1 – 2.3 in the reverse order.

3. Receiving Cam Sleeves

3.1 Check that the translator and function cam sleeves rotate freely and with negligible end-shake.

3.2 If not, slacken the locking screw in the collar of the selector cam driving gear. Hold the main camshaft stationary and rotate the selector driving gear in the appropriate direction on the threaded section of the camshaft.

3.3 Tighten the locking screw carefully. If this screw is left loose, and the machine run under power, complete dismantling may be necessary to rectify the error.

4. Rockshaft

4.1 Check that the cone-pointed rear pivot of the rockshaft is so adjusted that the rockshaft pivots freely, with a minimum of end-shake.

5. Selector Cam Detent – Preliminary (Fig. 6)

5.1 Set the orientation adjusting block to '120' on the scale.

5.2 With the unit at rest, release the selector cam detent E and rotate the selector camshaft until the detent just rests on stop arm D.

5.3 Check, with Adjustment Tool TA.1174, that the larger end of the pin, of diameter .078 in. (1.98 mm), just fails to pass between the release lever C and the lug on the retaining plate A, i.e. at point B.

5.4 Repeat the test, using the smaller end of the pin, of diameter .072 in. (1.83 mm). The pin should pass between the release lever and the lug.

5.5 If either of these conditions is not satisfied, slacken nut F clamping the release lever to the trip shaft. Hold the selector detent against its stop arm by pressing, in an anti-clockwise direction, the screw securing the collar on the selector trip shaft just behind its front bearing block G. Adjust the position of the release lever C in accordance with instructions 5.3 and 5.4 and tighten clamping nut F.

5.6 Restore the orientation adjusting block to its original position on the scale.

6. Translator Cam Retention Lever (Figs. 7 and 8)

N.B.: If during a routine check of adjustments, it is found necessary to alter adjustments 6.2 or 6.4, then adjustment 9.3 must be done again.

6.1 Disengage the translator cam detent F, Fig. 8, from the pawls and rotate the cam slightly so that a spring balance can be applied to each pawl engagement face. A force of 3–4 ozs. (85–113 grams) should be required to press the pawls back against their seating on the cam sleeve, as indicated by the arrow.

6.2 Slacken the clamping nut and adjust the retention lever eccentric C, Fig. 7, so that the pivot is in its lowest position.

6.3 With the unit at rest, check that the retention lever roller D is properly seated in the bottom of its hollow in the cam sleeve.

6.4 Adjust the eccentric pivot C until the pawls can be pressed away from the detent by an estimated clearance of .002–.004 in. (.05–.10 mm), i.e. dimension 'a'. This can be checked by inserting a thin blade in front of the nose of the detent and depressing the pawls.

6.5 Reclamp the locknut on the eccentric pivot.

Translator Cam Detent (Figs. 8 and 9)

7.1 Rotate the selector cam until the trip lever A, Fig. 9, rests on the peak of its cam. Slacken locknut B and adjust abutment screw C to give a clearance of .018–.022 in. (.46–.56 mm) between the screw and its abutment face on the trip lever, i.e. dimension 'c'. Clamp locknut B.

7.2 With the unit at rest, release detent F, Fig. 8, from the pawls E and hold it against the pawl tails. Slacken detent clamping screw D and place a gauge of .011–.015 in. (.28–.38 mm) between the abutment face on the trip lever and the abutment screw C, i.e. dimension 'b'. Press the abutment up against the gauge and tighten detent clamping screw D.

8. Function Cam Retention Lever (Figs. 10 and 11)

8.1 Remove the typehammer pivot fixing screw and washer and the collar securing the typehammer link to the typehammer lever. Remove the typehammer. Remove the gear cover and support plate and lift off the typehammer lever, carefully retaining the roller on its pin.

8.2 Disengage the function cam detent B, Fig. 10, from the pawls and rotate the cam slightly so that a spring balance can be applied to each pawl engagement face. A force of 3–4 ozs. (85–113 grams) should be required to press the pawls back against their cam setting, as indicated by the arrow.

8.3 With the unit at rest, check that the retention lever roller A, Fig. 11(a), is properly seated in the bottom of its hollow in the cam sleeve.

8.4 Slacken locknut C, Fig. 11(b), and adjust the eccentric pivot D until the pawls can be pressed away from the detent by an estimated clearance of .002–.004 in. (.05–.10 mm), i.e. dimension 'e', Fig. 11(a). This can be checked by inserting a thin blade in front of the nose of the detent and depressing the pawls in the direction of the arrow in Fig. 10.

8.5 Clamp the eccentric pivot by means of locknut C, Fig. 11(b).

9. Function Cam Detent (Figs. 10 and 12)

9.1 With the machine at rest, release detent B, Fig. 10, from the pawls E and hold it against the pawl tails.

9.2 Slacken the two screws securing the stop plate C and adjust the plate by means of the screwdriver adjustment to give a clearance of .020–.023 in. (.51–.58 mm), i.e. dimension 'd', between the underside of its top lug and the top of the detent bellcrank D. Tighten the screws.

9.3 With the unit again at rest, slacken the locknut and adjust the rocker lever pivot C, Fig. 12, vertically in its slot to give a clearance of .031–.035 in. (.79–.89 mm), i.e. dimension 'f', between the rocker lever and the top of the translator cam retention lever. Tighten the locknut.

9.4 Replace the typehammer lever, the gear cover and the support plate.

10. Finger Resetting (Figs. 13, 14 and 15)

10.1 Slacken screws C, Fig. 15, securing the finger push rod keep plate D, and move the plate as far as it will go towards the right.

10.2 With the unit at rest, slacken the locknut and adjust the resetting link pivot F, Fig. 13, in its slot until, with the resetting link G pressed forward against stop pin A, there is a clearance of .010–.015 in. (.25–.38 mm), i.e. dimension 'g', between the resetting link lever E and the abutment face on the resetting bellcrank B. This can be done as follows: turn the machine by hand to the rest position. Slacken the resetting link pivot F and insert a .012 in. (.30 mm) gauge between the resetting link lever E and the abutment face on the resetting bellcrank B. Press the resetting link forward against stop pin A and the link lever against the gauge and tighten the pivot locknut.

10.3 Adjust screw B, Fig. 14, after slackening its clamping screw, so that, when the fingers are reset, there is a clearance of .012–.018 in. (.30–.46 mm), i.e. dimension 'h', between the fingers G and the ends of the comb extensions A. Tighten the clamping screw.

10.4 Maintain this clearance and adjust the position of the push rod keep plate until it clears the ends of the push rods by .003–.008 in. (.08–.20 mm). Tighten the two securing screws.

10.5 Replace the typehammer and link.

11. Finger Springs (Fig. 16)

N.B.: This adjustment should require attention only at major overhaul periods. If a fault condition arises, making it necessary to perform adjustment 11.2 at any other time, the cam unit will have to be taken off the machine.

11.1 Rotate the camshaft by hand until the fingers are lowered. A force of 1–2 ozs. (28–57 grams) should be required to set each finger inwards, when applied at the top of the finger, horizontally along its line of travel.

11.2 If this condition is not satisfied, the finger springs should be checked. Place each spring on a flat surface so that its ends are touching the surface. A force of 8–9 ozs. (227–255 grams) should be required to depress the centre flat. Replace the finger springs C and dampers B as illustrated in Fig. 16.

12. Bellcrank Lift (Figs. 17 and 18)

12.1 Set up the 'N' combination (––34–). Turn the machine by hand until the top bellcrank has fallen. Slacken the clamping screw A, Fig. 18.

12.2 With the cam roller on the straight part of its cam track, and with the backlash taken up by pressing the bellcrank lifting collar in the direction of withdrawal, adjust the bellcrank lifting lever eccentric B to give a clearance of .006–.008 in. (.15–.20 mm) between the tail of the fallen bellcrank A, Fig. 17, and the lifting collar D, i.e. dimension 'j'.

12.3 Reclamp screw A, Fig. 18.

12.4 Turn the machine by hand until the bellcranks are fully lifted. Lift each comb extension to see that the combs are free and return snappily under the action of their springs.

13. Finger Lift (Figs. 17 and 19)

13.1 Turn the machine by hand and set up the 'N' combination (––34–). Continue turning until the fingers are fully raised and the selected bellcrank has dropped into the slot in the comb discs.

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

13.3 If not, turn the cam until the fingers are lowered. Slacken the capstan-headed screw G, Fig. 19, and by means of the screwdriver adjustment, adjust the relationship between the two halves of the finger lift lever. Fully tighten screw G and repeat 13.2.

13.4 Repeat instructions 13.2 and 13.3 until the dimensions in 13.2 are satisfied.

13.5 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 B, Fig. 17, and allow the comb stop plate C to drop. Raise the plate until it touches the lowest of the comb extensions and tighten screw B.

14. Ribbon Feed (Fig. 19)

14.1 Turn the machine by hand and check that the ribbon feed pawl feeds its ratchet regularly.

14.2 If not, turn the machine by hand until the fingers are fully raised. Slacken the feed pawl eccentric clamp screw D. Adjust the knurled eccentric until the pawl is in its uppermost position. Tighten the clamp screw.

14.3 Turn the machine by hand and check the ribbon feed. If the feed is unsatisfactory, slacken clamp screw D and move the eccentric bush clockwise through approxi-

mately 90 degrees. Tighten the screw and recheck the feed.

15. Magnet Bias and Field Strength (Fig. 5)

15.1 Replace the electromagnet on the main base and secure with the two screws. Do not, at this stage, replace the armature link.

15.2 Slacken clamping screw B, Fig. 5(a), thereby releasing adjusting screw C.

15.3 Remove the centralising springs G. With no current in the operating magnet windings, adjust the field unit by means of screw C until the force required to move the armature from side to side, measured on the pin in front of the armature stop plate, is the same for both directions.

15.4 Adjust the field force by means of knurled screw A until this force is:-

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

and

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

15.5 Tighten clamping screw B.

15.6 For Double-Current Operation. Re-connect the centralising springs G. Check that the armature change-over forces are still equal. If not, slacken the knurled locking screw F and adjust the spring slide by means of nut E until the forces are equal. They should now both be reduced to 3½–5 ozs. (99–142 grams).

15.7 For Single-Current Operation. Re-connect the centralising springs. The method of adjusting these springs is given in Section I, since this must be done after the machine is in correct adjustment.

16. Electromagnet Armature Link (Fig. 20)

16.1 Slacken the nut securing the armature link eccentric pivot C, and adjust the pivot to the top of its throw. Tighten the nut.

16.2 Connect the armature link to the armature, ensuring that it seats down without strain, and replace the washer, nut and locknut.

17. Rocker Blade – Vertical Adjustment (Figs. 15 and 20)

17.1 With the fingers reset and the armature in the 'Marking' position, slacken nut B, Fig. 20, clamping the armature link lever to the rockshaft.

17.2 Rotate the rockshaft until the top face of the rocker blade E, Fig. 15, is level, by eye, with the horizontal clearance faces of the sequential levers L. Clamp nut B, Fig. 20.

18. Rocker Blade – Horizontal Adjustment (Fig. 15)

18.1 With the fingers reset and the armature in the 'Marking' position, slacken screw F securing the rocker blade to the rockshaft and slide the blade away from the sequential levers as far as it will go.

18.2 Release the selector cam detent and rotate the selector camshaft until the first

code lever J is on the peak of its cam K, giving maximum movement to the sequential lever L.

18.3 Insert a .012 in. (.30 mm) gauge between the push rod B and the finger M. Now push the rocker blade E forward until the finger touches the comb stop plate A or the resetting link N, whichever is the nearer. Tighten the rocker blade clamp screw F.

18.4 Remove the gauge. Turn the camshaft, setting the remaining fingers forward. Check that, in each case, there is a clearance of .003–.020 in. (.08–.51 mm) between the rear edge of the finger and the comb stop plate or the resetting link, whichever is the nearer.

18.5 If not, slacken screw F, straighten rocker blade E, and repeat adjustments 18.1–18.4.

18.6 Secure the right-hand ribbon feed bracket to the main base.

19. Pilot Cam Detent (Fig. 20)

19.1 With the armature in the 'Spacing' position, slacken nut E clamping the pilot detent link lever to the rockshaft D. Slide the lever along the rockshaft until it just touches the felt lubricating washer at its front end. The washer should not be compressed against the rockshaft end plate F. Check that, at its other end, the link does not foul the machined face of the casting and that it is free on both its pivots.

19.2 With the machine at rest, adjust the detent link lever radially on the rockshaft sc that, with the armature on its 'Spacing' stop, there is a clearance of .013–.017 in. (.33–.43 mm) between the inner face of the detent G and the outer face of the lug on the pilot cam A, i.e. dimension 'k'.

B. PRINTING MECHANISMS

N.B.: The adjustment for the typehead clutch torque is given in Section H, Adjustment 72.

20. Type Retaining Springs (Figs. 21 and 23)

20.1 Check that a force of 7–8 ozs. (198–227 grams), applied to a type in the direction of the arrow in Fig. 21, at the three positions marked 'A' in Fig. 23, will move the type $\frac{1}{8}$" (3.2 mm) from its rest position.

20.2 If, at any point, the force required to move the type is too low, measure the tension of each spring. The correct tension is given in the section on Spring Tensions on page 31 under PG.7341.

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

21. Typehead Latch (Fig. 22)

21.1 Check that the typehead latch A moves snappily under the action of its spring.

22. Clutch Body (Figs. 65 and 66)

N.B.: This adjustment need not be checked unless the clutch body has, for any reason, been removed from the machine.

22.1 Press the typehead towards the combination head and check whether the latch engagement, dimension 'c', Fig. 66, is .055–.066 in. (1.40–1.68 mm). (If any difficulty is experienced in measuring this dimension, the following method of obtaining it may be employed:-

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

(b) 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.

(c) In this position, measure the distance between the point B, Fig. 65, 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. 65.

(d) If the reading on the rule is between 4 and 4.75 mm, the latch engagement, i.e. dimension 'c', Fig. 66, will be correct.

22.2 If the foregoing check is not satisfied, it will be necessary to remove the typehead and clutch body (using special spanner TA.1127) and to change the number of shims between the clutch body and the ball race. In this case, care should be taken, when reassembling, to engage the driving spring of the typehead clutch inside the eye of the clutch band.

23. Typehead Support Bracket (Fig. 21)

23.1 Check the amount of play between the face of the bearing bush in the bracket C and the shoulder on the typehead spindle A, i.e. dimension 'l'.

23.2 If this does not lie between .001–.005 in. (.03–.13 mm), add or remove shims at B until the correct end-play is obtained. Not more than seven shims should be required.

24. Typehammer Unit (Fig. 24)

24.1 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.

24.2 Check the clearance 'm'. This should be 1/32 in. (.8 mm). To correct the adjustment, alter the positions of the two nuts D and E and lock them again.

24.3 Turn the machine until the typehammer is fully forward. Release screw F and move the leaf spring G until the centre of the typehammer head B is aligned with the centre of the type bar. Reclamp screw F.

24.4 Remove the typehammer from the machine and screw up the typehammer rod C until the spring enclosed in the shackle is closed right up. Then release for approximately one turn and replace on the machine. Secure with screw, washer and collar.

25. Typehammer Overthrow Stop (Fig. 25)

25.1 Slacken the locknuts for screws H and J and fully withdraw the screws. Loosen fixing screws L and K.

25.2 With the end-play in the typehead taken up towards the combination head, adjust the position of the stop plate until the outer face of the stop lug is clear of the ends of the types by .005–.010 in. (.13–.25 mm). Tighten the fixing screws.

25.3 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.

25.4 If either of the conditions (a) or (b) is not satisfied, slacken fixing screws L and K again and change the position of the stop plate to obtain the required condition. Tighten screws L and K. Check that this does not upset adjustment 25.2.

25.5 Screw in the abutment screws H and J until they touch the abutment lugs M and N and clamp them with their locknuts.

26. Ribbon Change-Over

N.B.: See also Section H, Adjustment 74.

26.1 Remove the left-hand ribbon feed bracket. Ensure that the right-hand ribbon feed change rod is lifted (the presence of ribbon on the spool will ensure this). Adjust the length of the bias spring so that it bears equally each side of the jockey bush when the ribbon driving shaft is pushed from side to side.

26.2 Adjust the ribbon driving shaft change-over force by slackening one of the jockey spring clamping screws and tightening the other to give 12–16 ozs. (340–454 grams) in either direction. Replace the left-hand ribbon feed bracket.

27. Ribbon Jumper (Fig. 27)

27.1 Slacken screws A and adjust guide bracket B so that the ribbon jumper C slides freely in its guides.

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

27.3 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.

28. Ribbon Lift (for Single-Colour Ribbons) (Fig. 26)

N.B.: For machines adapted for two-colour printing, see Section C, Adjustments 31 and 33.

28.1 Check that, when the type strikes the ribbon, the top edges of a type pad and of the ribbon are level, except when long fractional types are used (e.g. 7/), when the ribbon should be raised by an additional 1/32" (.8 mm).

28.2 If this is not so, turn the cam by hand until the traversing link is in its extreme position of movement towards the back of the machine. Slacken nut B and adjust the abutment screw A until the ribbon is at the required height. Reclamp nut B.

C. TWO-COLOUR AND A/B TRIP CONTROL MECHANISMS

N.B.: Adjustments 31–33 are applicable to machines adapted for two-colour printing; adjustments 34–35 to machines fitted with an A/B trip suppressor mechanism.

29. Bowden Cable Plungers (Fig. 29)

N.B.: This adjustment should require attention only at major overhauls.

29.1 Press in the rear plunger K until the front plunger J is fully forward and the play in the system is taken up. Check dimension 'b'. This should be approximately 1/16 in. (1.6 mm).

29.2 If this is not so, slacken screw L and push in or withdraw some of the cable outer covering under screw L until dimension 'b' is satisfied. Tighten screw L.

30. Latching Lever (Figs. 30, 34 and 35)

30.1 Depress any key, thus allowing the transmitter ratchet to engage, and turn the machine by hand until the latch lever V, Fig. 35, is latched in its uppermost position.

30.2 Slacken screw W, Fig. 34, 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.

30.3 With the 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, Fig. 35, by means of the nut AA so that the latch lever V is just pushed off the rack Y when the typehammer moves to its extreme forward position.

31. Ribbon Lift (Black) (Fig. 32)

31.1 Complete the operating cycle. Withdraw the function cam detent and turn the machine by hand again until the traversing link is fully forward. Slacken screw P.

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

32. Trip Lever (Figs. 30, 31 and 35)

32.1 Turn the machine by hand until it resumes the rest position. Raise the latching lever V, Fig. 35, with the finger until it engages in its uppermost position in the rack Y.

32.2 Slacken screw S, Fig. 30, and ensure that the raised end of the trip lever Q is opposite arm R. Adjust trip lever Q to obtain a clearance of 3/64 in. (1.2 mm), i.e. dimension 'd', between the upper edge of lever Q and arm R. Tighten screw S.

33. Ribbon Lift (Red) (Figs. 31, 33 and 34)

33.1 Slacken screw AB, Fig. 33. Withdraw the function cam detent and turn the machine by hand until the traversing link O is fully advanced.

33.2 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.

33.3 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. 31. Tighten screw AB, Fig. 33.

33.4 Check that, when the latch lever V, Fig. 34, resumes its 'down' position after being unlatched by the pin Z, arm R, Fig. 33, clears the trip lever Q by at least 1/32 in. (.8 mm) when the traversing link is fed forward.

34. Latch Trip Lever (Figs. 35 and 68)

34.1 Complete the operating cycle. Remove the control lever unit from the machine. Latch the latch lever V, Fig. 35, in its upper latching position.

34.2 Slacken nut and screw C, Fig. 68, and adjust the position of trip lever D until there is a clearance of approximately .005 in. (.13 mm), i.e. dimension 'b', Fig. 68, between the bottom of extension B and the latch E. Tighten nut and screw C.

35. Lock Lever (Figs. 67 and 68)

35.1 Replace the control lever unit on the machine. Depress any key other than the WRU key and turn the machine by hand until the corresponding bellcrank has just fallen.

35.2 Slacken screw G, Fig. 68, and move the extension F to the middle of its adjustment. Tighten screw G.

35.3 Slacken nut and screw A, and swing the lock lever about its pivot until it is arrested by the inner side of the hook on latch E. Tighten nut and screw A.

35.4 Slacken screw G again and adjust extension F horizontally until dimension 'a' is not greater than .003 in. (.08 mm). Tighten screw G until it is finger tight.

35.5 Turn the machine until it reaches the rest position. Trip extension B, allowing latch E to turn anti-clockwise. Depress the WRU key and turn the machine by hand until the WRU bellcrank drops.

35.6 Adjust the vertical position of extension F, Fig. 67, taking care not to alter its horizontal position, until it clears the left-hand raised part of the latch by approximately .005 in. (.13 mm), i.e. dimension 'c'. Tighten screw G.

D. CONTROL LEVER UNIT

36. Control Lever Shoes (Fig. 36)

36.1 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 minimum of .010 in. (.25 mm), i.e. dimension 'kk'. Each shoe should engage its bellcrank by an amount not less than 3/64 in. (1.2 mm).

36.2 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.

37. Buffer Plate and Spring (Fig. 36)

37.1 Turn the motor by hand until the bellcranks are fully raised. Adjust the buffer plate E (see inset), after releasing the two fixing screws D, to give 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. Secure the plate with the fixing screws.

37.2 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. Slacken the buffer spring fixing screws D and adjust spring C so that there is a clearance of .005–.015 in. (.13–.38 mm), i.e. dimension 'll', estimated by eye, between the feed throw-out lever trunnion and the control levers.

37.3 Again select the combination –234– and continue to turn the motor until the bellcranks fall. In falling, the control levers should not move the feed throw-out lever. If they do, increase the clearance slightly. (**N.B.**: In the case of the 'Bell' control lever, a slight movement of the feed throw-out lever is unavoidable but this should be kept to a minimum.).

E. PAGE ATTACHMENT UNIT

38. Latch (Figs. 37 and 39)

38.1 Release screw D, Fig. 37. With the page attachment unit abutting against casting C, adjust the latter until a clearance of 1/8 in. (3.2 mm), i.e. dimension 'nn', Fig. 39, is obtained. Reclamp screw D, Fig. 37

38.2 Release screws F and position pin A by means of the abutment plate E until the latch functions correctly, i.e. until the latch is fully engaged over the pin A, but without any free play. Reclamp screws F.

39. Clutch Crosshead (Figs. 37, 40 and 41)

39.1 Turn the machine by hand until the traversing link is in its extreme position of movement away from the carriage. Unlatch the page attachment unit and remove the screw, spring washer and washer covering the eccentric pivot A, Fig. 40, between the feed lever and the traversing link. Slacken clamping screw B.

39.2 Latch the page attachment unit and adjust eccentric A by means of its screwdriver slot until dimension 'p', Fig. 41, i.e. .015–.025 in. (.38–.64 mm), is obtained. Only the 180 degrees away from the feed lever pivot may be used to obtain this adjustment. (**N.B.**: This dimension is most easily seen from the rear of the machine).

39.3 Unlatch the page attachment unit. Lock the eccentric by means of clamping screw B, Fig. 40, and replace the screw, washer and spring washer. Latch the page attachment unit.

39.4 If the eccentric A provides insufficient adjustment, change the number of .015 in. (.38 mm) buffer plates behind the buffer plate B, Fig. 37 (Part No. 1831/108A).

40. Line Feed and Carriage Return Dogs (Fig. 41)

40.1 Remove the unit from the machine. Release nut T at the back of the casting and, by means of the eccentric pin U, adjust the dogs to give a clearance of .010–.015 in. (.25–.38 mm), i.e. dimension 'o', between the dogs and the clutch crosshead. Lock with nut T.

40.2 Check that the movement of the dogs under the action of their springs is lively. Stiffness of movement may be due to an accumulation of dirt and grease round the pivot.

40.3 Replace the unit on the machine. Check also that pin U is not fouled by the carriage return control lever when the latter is operated.

41. Control Levers (Fig. 36)

41.1 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', when in their normal, or unoperated, position.

41.2 If this is not so, the control levers must be set.

42. Letter Feed Dog (Fig. 38)

42.1 Position the adjustable plate M on the letter feed dog N so that there is a clearance of .006–.010 in. (.15–.25 mm), i.e. dimension 'n', between the feed throwout lever G and the plate, when the feed throwout lever is not selected.

43. Carriage Retaining Pawl (Fig. 42)

43.1 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.

43.2 Slacken clamping screw A (on the back of the frame behind the letter feed levers) and adjust eccentric B until the clearance between the platen end plate E and stop D is .015–.020 in. (.38 – .51 mm), i.e. dimension 'q'. Tighten screw A.

44. Adjustable Platen Stop (Fig. 43)

44.1 Depress the carriage return key on the page attachment unit and ensure that the carriage is in its extreme right-hand position.

44.2 Examine the engagement between the retention pawl F and the first tooth on the

spring drum ratchet G. The pawl must engage at the intersection of the tooth slope and the flat portion of the wheel, as shown in the inset.

44.3 If necessary, correct the engagement by slackening clamping screws H and adjusting the position of the stop K. Tighten screws H.

45. Carriage Feed Pawl (Fig. 44)

45.1 Feed the carriage a few spaces to the left.

45.2 Slacken clamping screw P. Adjust eccentric pivot N until there is a clearance of .005–.008 in. (.13–.20 mm), i.e. dimension 'r', between the feed pawl and the next tooth of the ratchet wheel. Clamp screw P.

46. Adjustable Pawl Throwout Lever (Fig. 45)

N.B.: The pawl throwout lever is adjusted correctly in the factory and should not normally require attention. If, however, new parts are fitted, or wear develops in the carriage return linkage, the lever should be readjusted as follows:-

46.1 Move the carriage to approximately its mid-position. Hold the crosshead to the right (so that the feed pawl L 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'.

46.2 The clearance under these conditions should be .001–.005 in. (.03–.13 mm). If necessary, slacken clamping screws R and adjust the tail of the pawl throwout lever Q.

47. Air Valve (Fig. 46)

47.1 Loosen screw W and adjust the position of the air valve lever X relative to the air valve V so that the apertures in the air valve that appear at the extremes of the carriage travel are equal. Tighten screw W.

48. Line Feed (Figs. 47, 48 and 49)

48.1 Check that the line feed positioning disc B, Fig. 49, is clamped between the knurled knob A and the hexagonal nut so that the maximum eccentricity of the eccentric Q, Fig. 47, is at right angles to the gaps in the disc. The adjustment is set before the machine leaves the factory and should not normally require attention.

48.2 For sprocket feed carriages, adjust the retention lever eccentric K, Fig. 47, so that the typing lines up with the printed matter on the forms.

48.3 Turn the knurled knob A, Fig. 49, to the double-line feed position. Slacken screws E, F and G. 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. 48. Adjust plate P, Fig. 47, until a clearance of .005–.010 in. (.13–.25 mm), i.e. dimension 't', Fig. 48, is obtained between the eccentric Q and the feed pawl G. Tighten screws E, F and G, Fig. 49.

48.4 Continue to turn the machine by hand until the feed pawl is fully down. In this position, slacken screw D, Fig. 49, and turn eccentric C until the retention pawl M, Fig. 47, bottoms fully in a tooth. Tighten screw D, Fig. 49, and the retaining nut on the end of screw D. Continue to turn the machine by hand and confirm that, as

the feed pawl rises, there is no further rotation of the platen in either direction.

48.5 Turn the machine by hand until the feed pawl is again fully down. Slacken the screws clamping stop plate O, Fig. 47, and push the stop plate against the feed pawl. Tighten the clamping screw. Slacken locknut H and adjust screw J until it touches the back of the stop plate. Reclamp nut H.

49. Chariot Rail and Chariot

49.1 Adjust the carriage support bar so that, after slackening its fixing screws, the chariot is free in all positions, without undue shake.

49.2 Check that, 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.

49.3 Adjust the position of the paper chariot with respect to the paper carriage so that the centre of the chariot is within ± 1/32. (.8 mm) from the centre of the casting. The adjustment may be obtained in the following way:-

(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 carriage 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) Adjust the position of the chariot by means of the pivot screws until the two clearances, measured in (b) and (c), differ by less than 1/16 in. (1.6 mm).

50. Carriage Spring Tension (Fig. 45)

50.1 Place the carriage in its extreme left-hand position. Using a 0–4 lb. spring balance, measure the force necessary to prevent the carriage from moving when the carriage return key is depressed. This should be between 2½–3¼ lbs. (1.1–1.5 kgs.).

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

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

50.4 Check the operation of the carriage by means of the 'Short Line' and 'Long Line' tests given in Section H, Adjustment No. 75.

51. Switch Contacts (Fig. 52)

51.1 Check that the spring blade M rests against arm L with a pressure of 10–20 grams. If not, 'set' blade M to satisfy this condition.

51.2 Check that there is a clearance of .012–.015 in. (.30–.38 mm) between the contacts on blades M and N. If not, 'set' blade N as necessary.

52. Switch Trigger Bracket (Fig. 50)

52.1 Slacken screws A and slide bracket C until trigger B engages the full thickness of the lug on the trigger plate D.

52.2 Lock bracket C in this position by tightening screws A.

53. Switch Operating Lever (Figs. 51 and 52)

53.1 Trip latch E, Fig. 51, so as to release the resetting lever F, which will thus strike the switch operating lever J, Fig. 52, and move this until it stops against plate K.

53.2 With the mechanism in this position, slacken nut H, Fig. 51, and turn eccentric pivot pin G until the contact blade M, Fig. 52, is deflected sufficiently to give a clearance of .010–.020 in. (.25–.51 mm), i.e. dimension 'a', between blade M and arm L.

54. 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.

54.1 Check that the pressure rollers are pressing firmly against the platen. The pressure should be such that a force of 3–4½ lbs. (1.36–2.04 kgs.), applied at the ends of the pressure roller bearings, will just cause the rollers to lift off the platen. Readings should be taken at both ends of the rollers. Differences in pressure between the ends of each roller and each pair of rollers should not exceed ½-lb.(227 grams).

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

F. STARTER SWITCH AND SWITCH CONTROL UNIT

55. Switch Arm (Fig. 54)

55.1 Check that, when the switch arm XD is moved up and down to 'break' and 'make' the starter switch, the contacts open and close when the arm is within approximately 1/16 in. (1.6 mm) from the top and bottom respectively of the hole in the weight stop plate AU.

55.2 If this is not so, 'set' arms G and H to obtain this condition.

56. Switch Blades (Figs. 53 and 54)

56.1 Check that, with the tail 'j' of blade J, Fig. 53, pressing against blade H, the clearance between the riveted head of the contact and blade is .010 in. (.25 mm), i.e. dimension 'b'.

56.2 If this is not so, bend tail 'j' upwards or downwards to obtain the required clearance.

56.3 With the switch in the 'Off' position, check the clearance 'c', Fig. 54, between the two contacts. This should be not less than .045 in. (1.14 mm).

56.4 If this clearance is too small, say by x ins., then 'set' arm G until the clearance is increased by not less than x/2 ins., and 'set' blade H until it is increased by a further equal amount.

57. Switch Operating Force (Fig. 54)

57.1 Check that the forces required to 'make' and 'break' the switch, applied in the direction of arrows K and L, are equal and between 2½–3½ ozs. (71–99 grams).

57.2 If this is not so, slacken screws CS and adjust the operating shaft bridge SB in the direction of arrows A and B until the correct forces are obtained.

58. Switch Control Unit – Preliminary (Figs. 54, 55, 56, 58 and 61)

58.1 Check the freedom of spindle N, Fig. 55. If necessary, slacken screws CT and adjust the position of the bearing bracket to give complete freedom.

58.2 Check that, when the weight is in the 'down' position, it is resting on the weight stop plate AU, Fig. 54, and is not on the switch arm XD.

58.3 Check that, when the weight-lifting arm X, Fig. 55, is in full engagement with the ratchet gear W, the other end of spindle N is vertically above the centre of trip shaft P. If this is not so, slacken the screw in the weight-lifting arm and adjust the position of the arm along the spindle, taking care to clamp the arm afterwards on the flat provided on the spindle.

58.4 Check that, when the weight-lifting arm X is in the same position as for the preceding adjustment, there is a clearance of 1/32 in. (.8 mm) between cam T and the bearing bracket, i.e. dimension 'c'. If this is not so, slacken the screw in cam T, slide the cam along the spindle to the correct position, and clamp it again, ensuring that the screw engages on the flat provided.

58.5 Remove all load from the weight-lifting arm X. With the roller H, Fig. 56, at the bottom of the hollow in cam T, depress spring-setting arm G, Fig. 58, so that only the roller lever spring is operating on the cam. Measure the force required in direction 'm', Fig. 55, to disengage the weight-lifting arm X from the ratchet gear W. This force should not exceed 4½ ozs. (128 grams).

58.6 Check that the weight-lifting arm X, when disengaged from ratchet gear W and then released, snaps back easily into engagement.

59. Throwout Lever (Figs. 55, 56 and 57)

59.1 Position the weight-lifting arm X, Fig. 55, so that roller H, Fig. 56, is at the bottom of its hollow in cam T.

59.2 Check that set collar AQ is at the end of trip shaft P. If this is not so, slacken the screw securing the set collar and move the collar to the correct position. Tighten the clamping screw.

59.3 Slacken the screw securing the throwout lever O to the trip shaft P. Push the trip shaft towards the rear until the set collar is in contact with the front support plate. Bring the throwout lever into contact with the other side of the plate and clamp it in position so that end-play does not exceed .005 in. (.13 mm).

59.4 Slacken the screw securing the latch lever M, Fig. 57, to the trip shaft P and adjust the position of the latch lever along the shaft until it just touches the side of the vertical shoulder on latch L, as shown in Fig. 56. Clamp latch lever M in this position.

59.5 Depress latch lever M to rest on top of latch L, as shown in Fig.56, and check that the weight-lifting arm X, Fig. 55, is fully engaged in the first available tooth of ratchet gear W. If this is not so, raise the weight-lifting arm slightly.

59.6 Slacken the screw securing the throw-out lever O, Fig. 57, and swing the lever to give a clearance of .015–.025 in. (.38–.64 mm) between lever O and the end of spindle N, i.e. dimension 'd'. Clamp throwout lever O in this position, making sure, at the same time, that the condition specified in adjustment 59.3 is unaltered.

60. Latch Lever Block (Figs. 56, 57, 58 and 59)

60.1 Return roller H, Fig. 56, to the bottom of its hollow in cam T, if this was moved in the previous adjustment. This can be done by disengaging the weight-lifting arm from the ratchet gear.

60.2 Slacken the screw securing latch lever block J, Fig. 58, to the trip shaft P and position the block laterally so that the vertical latch lever AN, Fig. 59, moves freely in its slot in bearing bracket AR. Clamp latch lever block J, Fig. 58, lightly in this position.

60.3 Slacken nut AS, Fig. 59, to ensure that the latch operating lever A does not interfere with the following adjustment.

60.4 Rotate and hold trip shaft P, Fig. 57, so that latch lever M rests on top of latch L. Rotate the latch lever block J, Fig. 58, on trip shaft P until there is a clearance of .002–.005 in. (.05–.13 mm), i.e. dimension 'e', between the spring setting arm G and the roller arm K. Clamp latch lever block J tightly in this position, ensuring that the condition specified in 60.2 is unaltered.

61. Latch Lever (Figs. 57 and 59)

61.1 Advance the weight-lifting arm slightly, thus rotating trip shaft P, Fig. 57, until the latch lever M rests on latch L.

61.2 Position the latch operating arm A, Fig.59, until there is a clearance of 1/16–3/32 in. (1.6–2.4 mm) between the lower face of the vertical latch lever AN and the latch seating on bracket AR, i.e. dimension 'f'. Clamp lever A in this position with nut AS.

62. Trip Spring Blade (Figs. 59 and 60)

62.1 With the machine in the same position as for adjustment 61, adjust the height of the trip spring blade AL, Fig.59, on the armature link AM, by 'setting' the spring guide, until there is a clearance of 1/64–3/64 in. (.4–1.2 mm) between the blade and the latch face, i.e. dimension 'g'.

62.2 Advance the weight-lifting arm until latch lever AN, Fig. 60, is allowed to seat on its stop on bearing bracket AR. With the electromagnet on its 'Marking' stop, loosen screw CH on the armature link AM. Adjust the position of spring blade AL until there is a clearance of .002–.006 in. (.05–.15 mm) between the tip of the blade and the face of lever AN, i.e. dimension 'h'.

63. Control Unit Timing (Figs. 57 and 61)

63.1 With the motor control switch on, lower the weight-lifting arm manually until the roller lies at the bottom of its hollow in the cam. Release set collar AT, Fig. 61, and screw QS clamping weight AB to the rod AS.

63.2 With the weight AB resting on its bottom stop plate, push rod AS down into the weight to the full extent permitted by the wire link. Position collar AT so that it rests on top of the weight and clamp in that position.

63.3 Raise rod AS in the weight until there is a clearance of .005–.015 in. (.13–.38 mm) between collar AT and weight AB. Clamp screw QS. Release collar AT. Allow it to rest on top of the weight and clamp in that position. The wire link will now hang completely free.

63.4 Check the minimum time delay as follows: raise the weight-lifting arm from the fully 'down' position and count the number of ratchet teeth passed from the moment when latch L, Fig. 57, is withdrawn from under latch lever M to the moment of switch-off. The number of teeth passed must be at least eleven (46 seconds). If not, check the adjustment of the starter switch (Adjustments 55–57).

64. Knock-out Cam (Fig. 62)

64.1 Raise the weight-lifting arm to its highest position. Disengage the tooth from the ratchet gear, insert a .005 in. (.13 mm) feeler gauge between the tooth and the gear.

64.2 Slacken the two screws securing the knock-out cam B. Position the cam until it just touches the chamfered screw head in the weight-lifting arm. Clamp the cam in this position.

65. Spring Check (Figs. 58 and 61)

65.1 With the vertical latch lever AN, Fig.61, *just* engaged with its slot on bearing bracket AR, check that a force of 5 ozs. (142 grams) is required to part the anchor pin F, Fig. 58, from the bottom of its slot in the spring stop D, when applied vertically above the anchor pin.

65.2 If less force is required, move the lower end of spring E to the lower anchor hole in the spring setting arm G and repeat the adjustment.

66. Front and Rear Trip Levers (Figs. 61 and 62)

66.1 With the latch lever AN, Fig. 61, engaged on its seat on bearing bracket AR, and with the front trip lever AFL held up against its stop pin AV, slacken the screw securing the rear trip lever AFR, Fig. 62, to spindle AH. Adjust the position of the trip lever AFR until there is a clearance of 1/32–3/64 in. (.8–1.2 mm), i.e. dimension 'j', between the trip lever AFR and the vertical latch lever AN, Fig. 61.

66.2 With the vertical latch lever still engaged in its stop on bearing bracket AR, slacken the screw in collar BA, Fig. 62. Check the force on the end of trip lever AFL, in the direction of arrow 'n', that is required to trip the mechanism. This force should not exceed ¾ oz. (21 grams).

66.3 Position and clamp collar BA on spindle AH so that the tension of spring AG is such that a force of ½–1½ ozs. (14–43 grams), applied at the tip of lever AFL in the direction of arrow 'n', is just sufficient to depress the lever from its stop pin.

67. 'Letters' Key Trip Connection (Figs. 62 and 63)

67.1 Slacken screw A, Fig. 63, and with the keybar connecting link B held taut, adjust the position of pin C until it clears trip lever AFL, Fig. 62, by 1/32–3/64 in. (.8–1.2 mm). Clamp screw A, Fig. 63.

G. MOTOR AND GOVERNOR

68. Motor Governor Brushes

68.1 If the governor brushes are new, check that they are set so that the tip of the back of the governor brush spring, when the governor is removed, is ¾ in. (19.1 mm) from the motor support plate. Check also that the governor brush backing spring lies flat against the governor brush spring.

68.2 If the governor brushes are worn, check the force that they exert on the governor slip rings. This should be 4½–5½ ozs. (128–156 grams). The pressure of the brushes will fall as they wear and the springs must be set slightly to compensate for this. 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.

68.3 Replace the governor, ensuring that it is pushed on to the motor shaft as far as it will go.

69. Governor Contacts (Fig. 64)

69.1 Using the governor contact adjusting clamp TA.1110, extend the governor spring A until the contact arm saddle E is just touching the stop face of the contact arm stop spring D.

69.2 Slacken screw C just enough to free contact screw F, and adjust contact screw F to give dimension 'l', .015–.020 in. (.38–.51 mm). Tighten screw C.

69.3 Relax the governor spring A and remove the adjusting clamp.

70. Motor Brush Boxes

70.1 Adjust the brush boxes to obtain a clearance of .010–.015 in. (.25–.38 mm) between the brass brush slide and the periphery of the commutator.

N.B.: Two brushes should be used at a time in vertically opposite positions, i.e. in contact with the same track. On renewal, the new brushes should be placed in the adjacent slides. The purpose of this is to distribute the wear equally between the two tracks.

H. ADJUSTMENTS WITH THE MOTOR RUNNING

71. Rocker Blade – Final Adjustment (Figs. 5 and 20)

71.1 Adjust the armature link eccentric pivot B, Fig. 20, to obtain the following conditions: with the motor running, and with a .013 in. (.33 mm) gauge gripped between armature J, Fig. 5, and its 'Spacing' stop, an 'all-space' combination should be set up when the selector detent is released by hand.

71.2 When a .017 in. (.43 mm) gauge is similarly placed, an 'all-mark' combination should be set up.

71.3 With the motor stopped, check that adjustment 19.2 is unaltered. If not, readjust to obtain dimension 'k', Fig. 20. It will also be necessary to check adjustment 62.1.

72. Typehead Clutch Torque

72.1 Select the letter 'J' on the combination head so that the typehead clutch latches on the 'J' bellcrank with the large gap in the types uppermost.

72.2 Apply a spring balance to the typehead by placing the hook of the balance over the 'J' type and tension the balance to 9 ozs. (255 grams). Hold the balance firmly in this position.

72.3 Depress the space bar, or operate the magnet armature to 'Space'. The spring balance should now give a reading between 10 and 12 ozs. (284–340 grams).

72.4 When a new clutch lining is fitted, the spring balance will give a reading which is too high. Before the machine is restored to service, it should be run continuously until the clutch pressure is reduced to within the limits specified in 72.3.

73. Selector Cam Detent – Final Adjustment (Fig. 6)

73.1 With the motor running, insert the smaller end of adjustment tool TA.1174 (of diameter .072 in. (1.83 mm)) between the release lever C and the lug on the retaining plate A, i.e. at point B. Check that detent E is *not* withdrawn clear of its stop arm D.

73.2 Repeat the test, using the larger end of the adjustment tool (of diameter .078 in. (1.98 mm)). Detent E should now be withdrawn clear of stop arm D.

73.3 If either of these conditions is not satisfied, refine adjustment 5.

74. Ribbon Change-over Mechanism

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

74.2 Hold the electromagnet armature on its 'Spacing' stop. 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. If it does not do so, 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.

74.3 Check also whether the bias spring bears equally each side of the jockey bush as the ribbon driving shaft automatically alternates. If not, remove the left-hand ribbon feed bracket. Readjust the length of the bias spring slightly to obtain this condition. Reset the change-over force to the value given in adjustment 26.2. Replace the ribbon feed bracket and re-check the jockey spring engagement.

75. Carriage Operation Tests

75.1 **Short Line Test.** With the motor running and signal power connected to the machine, 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 underneath each other.

75.2 **Long Line Test.** Move the carriage to the extreme left of its travel. Depress the C.R., L.F., LETTERS, letter 'A' and SPACE keys 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.

75.3 If the results of the tests in adjustments 75.1 and 75.2 are unsatisfactory, this may be due to excessive friction or to a damaged part.

I. SINGLE-CURRENT ADJUSTMENTS

N.B.: (a) The adjustment for the magnet field strength given in instruction 15.4, and the following adjustments, are based on the use of 11-lb./in. centralising springs, and give optimum results only on circuits using a signalling supply of 90–120 volts and a receive current of 40 mA. For circuits employing lower signalling voltages, these adjustments may be tried, but if unsatisfactory results are obtained, application should be made to Creed and Company for alternative spring arrangements and adjustments.

(b) 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 78, which is provided to cover this case, should be followed.

(c) 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 should be initially set at 60.

(d) 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 followed, irrespective of the length of the line.

76. Short Lines (Fig. 5)

76.1 Check that the electrical connections are for single-current working.

76.2 Set the orientation lever to 20.

76.3 Slacken clamping nut F, Fig. 5 (a), and determine the approximate setting for the bias spring adjustment E by transmitting a succession of Rs from the *local* transmitter and increasing the bias from zero towards 'Space' until correct selection just occurs.

76.4 Refine adjustment 76.3 as follows: Determine the lowest setting of the orientation lever for which the receiver correctly selects both one line of Rs and one line of Ys. Let this setting be x_1.

76.5 Move the orientation lever towards 120. Determine the highest setting of the lever for which the receiver correctly selects one line of Rs and one line of Ys. Let this setting be y_1.

76.6 Increase the bias spring tension in steps of two or three divisions and repeat the tests in 76.4 and 76.5 until $y_1 - x_1$ is a maximum. Lock the adjustment with clamp nut F, Fig. 5(a).

76.7 Repeat adjustments 76.4 and 76.5 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.

76.8 Set the orientation device lever in the centre of the range found in 76.7, i.e. on $\frac{1}{2}(x_d + y_d)$.

77. Long Lines (Fig. 5)

77.1 Carry out adjustments 76.1 and 76.2.

77.2 Slacken clamping nut F, Fig. 5(a), and determine the approximate setting for the bias spring adjustment E by transmitting a succession of Rs from the *distant* transmitter and increasing the bias from zero towards 'Space' until correct selection just occurs.

77.3 Refine adjustment 77.2 as follows: Determine the lowest setting of the orientation lever for which the receiver correctly selects both one line of Rs and one line of Ys. Let this setting be x_d.

77.4 Move the orientation lever towards 120. Determine the highest setting of the lever for which the receiver correctly selects both one line of Rs and one line of Ys. Let this setting be y_d.

77.5 Increase the bias spring tension in steps of two or three divisions and repeat the tests in 77.3 and 77.4 until $y_d - x_d$ is a maximum. Lock the adjustment with the clamp nut F, Fig. 5(a).

77.6 Set the orientation lever in the centre of the range found in 77.5, i.e. on $\frac{1}{2}(x_d+y_d)$.

78. Lines of Unknown Characteristics (Fig. 5)

78.1 Slacken clamping nut F, Fig. 5(a), and adjust the bias spring tension nut E to give maximum tolerance to *distant* signals, as in adjustments 77.1 – 77.5.

78.2 Check the margin to *local* signals, as in adjustments 76.2 – 76.5.

78.3 If the local margin is adequate, centralise the orientation lever to the settings for the *distant* signals found in 78.1.

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

(a) If the local margin is thereby increased, the receiver should be adjusted as for 'short' lines, i.e. in accordance with adjustment 76.

(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.

78.5 Lock the adjustment with the clamping nut F.

79. Short Lines (Alternative Method) (Fig. 5)

N.B.: The 'Short Lines' procedure given in adjustment 76 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.

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

79.2 Transmitting signals from a T.D.M.T. or a correctly adjusted keyboard transmitter, slacken clamping nut F, Fig. 5(a), and adjust the bias spring tension nut E until the optimum margin is obtained for one line of Rs and one line of Ys. Clamp the bias adjustment locknut F.

79.3 Place the machine in the line circuit in which it is required to operate.

79.4 Measure the margin from the *distant* end and centralise this by means of the orientation device.

J. DOUBLE-CURRENT ADJUSTMENTS

N.B.: It is assumed in the following adjustments that the receiver tolerance is measured with the orientation device.

80. Margin Measurement and Centralisation (without T.D.M.T.)

80.1 Check that the electrical connections are for double-current operation.

80.2 Check the adjustment of the keyboard transmitter which is to be used as a source of signals.

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

80.4 Transmit a succession of Rs and move the orientation lever towards zero to determine the lowest position for which the receiver correctly selects one line of characters.

80.5 Leaving the orientation lever in the position found in the last adjustment, transmit one line of Ys. If the machine fails to select correctly, move the lever towards 120 until the receiver just selects correctly. Note the reading, i.e. the orientation

setting for which the receiver just correctly selects one line of Rs and one line of Ys. Let this setting be x.

80.6 Move the orientation lever past 60 towards 120 and determine, as in 80.4 – 80.5, the highest orientation setting for which the receiver correctly selects one line of Rs and one line of Ys. Let this setting be y.

80.7 The difference between x and y provides an approximate measure of the receiver tolerance. If this is less than the required amount, the adjustment of the machine should be checked.

80.8 Set the orientation lever in the centre of the range determined in 80.7, i.e. on ½(x + y).

81. Margin Measurement and Centralisation (with T.D.M.T.)

81.1 Check that the electrical connections are for double-current working.

81.2 Connect the receiver to the T.D.M.T. and set the orientation lever on 60.

81.3 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 one line of transmitted characters.

81.4 Leaving the margin control knob in this position, transmit a line of 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 a line of Rs and a line of Ys. Let it be x per cent.

81.5 Slowly turn the margin control knob in the opposite direction and determine, as in 81.3 and 81.4, the longest start signal for which the receiver correctly registers one line of Rs and one line of Ys. Let this be y per cent.

81.6 If x and y are unequal, the setting of the orientation lever should be changed and tests 81.3 and 81.5 repeated until they are equal.

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

(1) If the bias is towards shortened start, move the orientation lever towards zero by ½(x – y) divisions.

(2) If the bias is towards lengthened start, move the orientation lever towards 120 by ½(y – x) divisions.

It may be necessary to repeat these corrections.)

81.7 When a balance is obtained, check that the margin of the machine is satisfactory.

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 MAGNET UNIT**	
PG.7164	Fig. 22, K and AL	Force to give an extension of 3/16" (4.8 mm)	3-lb. 1-oz. – 3-lb. 7-oz. (1.4 – 1.6 kgs.)
PG.7368	Centralising Springs (not shown)	Force to give an extension of ¼" (6.4 mm)	2-lb. 3-oz. – 3-lb. 3-oz. (1–1.4 kgs.)
	PL.3750	**OVERLAP CAM UNIT**	
PG.7363	Fig. 7, EV	Force to raise the function retention lever out of engagement with the hollow in the cam sleeve, measured under the screw-head above the follower	14–18 ozs. (397–510 grams)
PG.7372	Fig. 6, JM	Force to give an extension of 1/8" (3.2 mm)	15–17 ozs. (425–482 grams)
PG.3027B	Fig. 7, GS3 GZ3	Force, applied at the pawl abutment face, to depress each pawl . . .	3–4 ozs. (85–113 grams)
PG.7100	Fig. 6, LE	Force applied at the screw abutment face of the translator trip lever just to part the lever from the screw . .	4–6 ozs. (113–170 grams)
PG.7227	Figs. 4, 5, CZ	Force applied at the spring anchor pin of the selector release lever to disengage the selector detent from its stop arm	2–3 ozs. (57–85 grams)
PG.5095	Figs. 4, 5, DN	Force to arrest the pilot cam, with the motor running	125–157 grams
PG.7367	Fig. 2, AJ	Force applied to the tail of a code lever to depress it from the stop pin . .	1¼–2 ozs. (35–57 grams)

Spring No.	*Reference*	*Method of Measurement*	*Tension*
PG.7364A	Fig. 2, AG	Force applied to the knife edge of the upper arm of the chopper lever to part the lower arm from the cam	90–135 grams
PG.2120	Fig. 3, BG	Force applied at the centre of a finger spring to depress it flat . .	8–9 ozs. (227–255 grams)
PG.7322	Fig. 8, HZ	Force to give an extension of 23/64" (9.1 mm)	12–13 ozs. (340–369 grams)
PG.7209	Fig. 3, AX	Force to give an extension of 19/32" (15.1 mm)	12½–13½ ozs. (354–383 grams)
PG.5097B	Fig. 8, KZ	Force to compress the spring to 9/32" (7.1 mm)	4¼–5¼ ozs. (120–149 grams)
PG.7100	Fig. 6, FL	Force to give an extension of 7/32" (5.6 mm)	3–3½ ozs. (85–99 grams)
PG.5093B	Fig. 3, BA4	Force to compress a selector clutch spring to 5/16" (7.9 mm) . .	12½–14½ ozs. (354–411 grams)
PG.7134	Fig. 8, JU	Force to give an extension of 11/32" (8.7 mm)	2½–3 ozs (71–85 grams)
		Two-Colour Printing Only	
PG.7066	Fig. 7, GB	Force to give an extension of 15/16" (23.8 mm)	2 ozs. (57 grams)
	PL.1078	**COMBINATION HEAD UNIT**	
PG.3003	Fig. 13, AA	To give snappy action to the receiving combs	
PG.3009	Fig. 13, 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 bell-crank outwards	4½–7½ ozs. (128–213 grams)
PG.7166	Fig. 12, S	Force applied at the typehead end of every bellcrank (except the two shift bellcranks) to move the bellcrank outwards	1–1¾ ozs. (28–50 grams)

Spring No.	*Reference*	*Method of Measurement*	*Tension*
	T.I.L.67	**TYPEHEAD UNIT**	
2852/10A	Attached to Fig. 25, U	Force applied at the latch face just to move the latch	1½–3½ ozs. (43–99 grams)
2852/17) 2852/18)	Fig. 25, T Fig. 25, W	Typehead friction damping torque	7.95–8.85 lb.ins. (9.2–10.2 kg.cms.)
2852/18	Fig. 25, W	Load when compressed to 15/32" (11.9 mm)	4½–5¼ lbs. (2.0–2.4 kgs.)
PG.7341	Fig. 26, G	Force to give an extension of 7/32" (5.6 mm)	8½–9½ ozs. (241–269 grams)
	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 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	3½–4½ ozs. (99–128 grams)
PG.5056	Fig. 21, P	Force to give a compression of approximately 5/64" (2 mm)	3 ozs. (85 grams)
PG.2081) PG.2082)	Fig. 21, E Fig. 21, D	**Without Period of Operation Counter.** Force applied at each end of the driving shaft to reverse its position . .	12–16 ozs. (340–454 grams)
	T.I.S.13	**With Period of Operation Counter.**	
PG.2118) PG.2119)	Fig. 18(b), O Fig. 18(b), P	Force applied at each end of the driving shaft to reverse its position . .	12–16 ozs (340–454 grams)
	PL.1078	**CONTROL LEVER UNIT**	
PG.7034	Fig. 14, AH X	Force to give an extension of 15/32" (11.9 mm)	1½–2½ ozs. (43–71 grams)
PG.7105	Fig. 14, T	Force to give an extension of 11/16" (17.5 mm)	8½–9½ ozs. (241–269 grams)

Spring No.	*Reference*	*Method of Measurement*	*Tension*
PG.7229	Figs. 14, AD 15	Force to give an extension of 15/32" (11.9 mm)	15–17 ozs. (425–482 grams)
PG.7139	Figs. 67, H 68 (this booklet)	Force to give an extension of 3/16" (4.8 mm)	3–3½ ozs. (85–99 grams)
PG.7120	Fig. 14, T	Force to give an extension of ½" (12.7 mm)	16½–17½ ozs. (468–496 grams)
	T.I.S. 32	**Two-Colour Printing Only**	
PG.7396	Fig. 1, K_1	Force to give an extension of 13/64" (5.2 mm)	7–8 ozs. (198–227 grams)
PG.7176	Fig. 1, K_1	Force to give an extension of 5/16" (7.9 mm)	10½–11½ ozs. (298–326 grams)
	PL.1078	**PAGE ATTACHMENT UNIT**	
PG.2011A	Fig. 29, CV1	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	Fig. 29, BQ5	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 No. 54.	–
PG.1503	Fig. 29, AZ	See Adjustment No. 50.	–
Attached to 1831/18	Fig. 29, DA	Force applied at the tooth of the line-feed pawl to push the pawl away from the ratchet..	2½ ozs. (71 grams)
PG.5055	Figs. 27, 29, FQ4	Force to compress the spring to 7/16" (11.1 mm)	12-lbs. (5.4 kgs.)
PG.7034	Fig. 29, CZ	Force applied vertically under the left-hand end of the trip bellcrank just to lift it	¾–1 oz. (21–28 grams)

Spring No.	*Reference*	*Method of Measurement*	*Tension*
PG.7037	Figs. 32, 33, AL	Force to give an extension of ½" (12.7 mm)	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, 29, FX	Force applied at the top end of the latch arm to swing the latch clear of the pin	7 ozs. (198 grams)
PG.7046	Fig. 29, AK	Force applied at the jockey roller to lift it away from the ratchet	1½-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	
PG.7093	Fig. 29, BU CT DK	Force to give an extension of ½" (12.7 mm)	7½–8½ ozs. (213–241 grams)
PG.7029	E.O.L.I. Trip (not shown)	Force to give an extension of 19/64" (7.5 mm)	1-lb. 14-oz- 2-lb. 2-oz. (851–964 grams)
PG.7167	Fig. 29, 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)	
PG.7053	Fig. 34, K	Force to give an extension of 25/32" (19.9 mm)	23½–26½ ozs. (666–751 grams)
PG.7137	Fig. 34, N	Force to give an extension of 11/64" (4.4 mm)	29–31 ozs. (822–879 grams)
PG.7101	Fig. 29, DN_6	Force to give an extension of 5/8" (15.9 mm)	16½–17½ ozs. (468–496 grams)

Spring No.	*Reference*	*Method of Measurement*	*Tension*
	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	Fig. 8, J	Force applied 21/32" (16.7 mm) from the fitting screw to flatten each motor spring	1½-lbs. (680 grams)
	This Booklet	**STARTER SWITCH AND SWITCH CONTROL UNIT**	
PG.5009	Attached to XD, Fig. 54	See Adjustment 57	–
PG.5102	AY, Fig. 55	See Adjustment 58.4	–
PG.7387	AX, Fig. 56	Force to give an extension of ¼" (6.4 mm)	8–12 ozs. (227–340 grams)
PG.3147	Links A\and AN Fig. 59	See Adjustment 66.2	–
PG.7386	Attached to front end of G, Fig. 58	Force to give an extension of 17/64" (6.8 mm)	21–28 ozs. (595–794 grams)
PG.7385A	E, Fig. 58	See Adjustment 65	–
PG.3149	AG, Fig. 62	See Adjustment 66.3	–
PG.7389	AW, Fig. 56	Force to give an extension of 9/64" (3.6 mm)	2–2½ ozs. (57–71 grams)
	–	**ANSWER-BACK ROCKSHAFT**	
PG.7395	–	Force to give an extension of 47/64" (18.7 mm)	2¼–2½ lbs. (1–1.1 kg.)
PG.7379	–	Force to give an extension of 5/32" (4.0 mm)	1-lb. 2 ozs. – 1-lb. 9 ozs. (511–709 grams)

LUBRICATION INSTRUCTIONS

Note: 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 new machines before they are put into service.

AFTER EACH 300 HOURS OF OPERATION

No. 1 Lubricant

A. 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.

B. Apply a small quantity to the ribbon feed change rods (excessive lubrication may cause sticking).

C. Lubricate the following parts:-

(1) Cam spindle bearings
(2) Periphery of operating cam
(3) Cam roller bearing

} Starter Switch Control Unit.

No. 2 Lubricant

A. Fill the following oil cups and oil holes:-

(1) Pilot cam detent pivot
(2) Left- and right-hand pivots of pilot cam detent link
(3) Function retention lever pivot
(4) Selector trip shaft front bearing block
(5) Function detent bellcrank pivot
(6) Function detent rocker lever pivot
(7) Typehammer lever pivot
(8) Traversing lever roller
(9) Typehammer lever roller
(10) Bellcrank lifting lever roller
(11) Oil hole in cam sleeve
(12) Translator retention lever pivot
(13) Oil pot on finger lift lever
(14) Barrel camshaft front and rear bearing blocks
(15) Detent trip shaft rear bearing
(16) Selector trip shaft rear bearing
(17) Front and rear selector camshaft bearings
(18) Oil pot on feed lever

} Overlap Cam Unit

B. Saturate the following lubricating felts, washers and wicks:-

(1) Function retention lever lubricating pad
(2) Traversing lever lubricating washers
(3) Bellcrank lifting lever lubricating wick
(4) Translator retention lever lubricating pad
(5) Selector cam lubricator frame

} Overlap Cam Unit

(6) Chopper and rocker blade knife-edge lubricating wick } Overlap
(7) Oiling washers at front and rear ends of rockshaft } Cam Unit
(8) Typehead lubricator felt – Typehead Unit
(9) Felt washers on lock bar and air valve connector – Page Attachment Unit

C. Lubricate the following pivots, friction faces and couplings:-

(1) Abutment face of pilot cam detent
(2) Orientation roller
(3) Pivot between orientation link and adjusting block
(4) Armature link eccentric pivot
(5) Fork of function detent bellcrank
(6) Function detent pivot
(7) Function detent link pivots
(8) Pivot between traversing lever and traversing link
(9) Point of engagement between translator retention lever and function detent rocker lever
(10) Translator and function cam sleeve ratchets and pawls
(11) Gap between translator and function cam sleeves
(12) All cam tracks
(13) Bellcrank lifting block
(14) Translator detent pivot
(15) Translator detent link pivots
(16) Cone-pointed link pivot on finger plunger
(17) Finger plunger
(18) Slots in push rod rack
(19) Knuckle joints between push rods and sequential levers
(20) Resetting link pivot
(21) Chopper and code lever pivot
(22) Knuckle joints between code and sequential levers
(23) Finger pivot
(24) Finger lifting link pivot
(25) Feed lever trunnion pivot
(26) Pivot between feed lever and rear end of traversing link
(27) Face of finger resetting bellcrank
(28) Finger resetting bellcrank pivot

} Overlap Cam Unit

(29) Clutch-band engagement with typehead driving spring
(30) Clutch lining (N.B.: avoid surplus oil)
(31) Typehead latch pivot

} Typehead Unit

(32) Link guide block
(33) Spring drum ratchet wheel
(34) Platen spindle ratchet
(35) Platen end bearings
(36) Pivots of the rollers at top and bottom of the dashpot lever

} Page Attachment Unit

(37) Control lever bearing bushes and pivots of feed throw-out lever } Control Lever Unit
(38) Ribbon jumper grooves in typehead support bracket
(39) Ribbon feed pawl pivot } Ribbon feed mechanism
(40) Ribbon driving shaft, ratchet and crown wheel
(41) Ratchet gear teeth } Starter Switch Control Unit
(42) Knock-out cam face
(43) Bellcrank lifting collar engagement face – Combination Head Unit

No. 4 Lubricant

A. Apply a little grease to the following parts:-

(1) Working faces between spring anchors and retaining plate } Overlap
(2) Camshaft gear, selector driving gear and selector camshaft gear } Cam Unit
(3) Working faces of the ears on the stop plate – Typehead Unit
(4) Carriage rack and spring drum gear wheel – Page Attachment Unit
(5) Working edges of the control levers and the feed throw-out lever } Control Lever Unit
(6) Hammer head spring engagement and shock-absorber spring – Typehammer Unit

No. 5 Lubricant

A. Apply a little grease to the following parts:-

(1) Outsides of the rollers on the dashpot lever – Page Attachment Unit
(2) Jockey bush on the ribbon driving shaft – Ribbon Feed Mechanism
(3) Operating face of the trip spring blade – Starter Switch Control Unit

AFTER EACH 3,600 HOURS OF OPERATION

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

No. 2 Lubricant

A. Soak the following parts in the lubricant for 2–3 hours:-

(1) Translator and function cam sleeves
(2) Pilot cam friction discs
(3) Rocker blade lubricating washer } Overlap Cam Unit
(4) Selector camshaft front and rear friction discs
(5) Typehead latch arm
(6) Typehead stop arm } Typehead Unit
(7) Clutch body
(8) Clutch friction washers
(9) Typehead support bracket – Control Lever Unit

B. Soak the following part in the lubricant for a few minutes:-

(1) Bellcrank bearing oiling wick – Combination Head Unit

C. Lubricate the following parts:-

(1) Anchor holes and pins of all cam unit tension springs
(2) Operating face of rocker blade
(3) Finger lift lever pivot
(4) Comb setting fingers } Overlap Cam Unit
(5) Guideway in push rod rack for resetting link
(6) Resetting link lever pivot
(7) All oilite bearings
(8) A few drops to the leatherpiston washer } Page Attachment Unit
(9) A few drops to the oiling pads in the release lever bearing blocks

(10) 'Letters' key transfer lever pin
(11) Keybar connecting link loops
(12) Transfer lever spindle bearings
(13) Switch operating shaft pivot
(14) Switch weight guides
(15) Loops of switch weight wire link
(16) Trip lever spindle bearings
(17) Pivots of the roller lever, spring setting arm and latches
(18) Slot in the spring stop
(19) Trip shaft bearings
(20) Operating face of the latch lever
(21) Pivot between the latch operating lever and the spring setting arm
(22) Pivot between the latch operating lever and the vertical latch lever
(23) Latch and guide faces of the vertical latch lever and the bearing bracket

} Starter Switch Control Unit

(24) Pivot of operating bellcrank
(25) A smear of lubricant on the Bowden cable inner wire behind the front plunger
(26) Rear plunger oiler tube on control unit casting
(27) Operating face of delay lever
(28) Bearing of trip lever spindle
(29) Operating face of trip lever
(30) Roller pivot
(31) Ribbon lift roller and its bearings
(32) Drop lever pivot

} Two-Colour Printing

(33) Counter gear bearing pin – Period of Operation Counter

D. 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.

No. 4 Lubricant

A. Clean and repack the following ball bearings:-

(1) Combination head (2).
(2) Main shaft (2).
(3) Motor (2).
(4) Page attachment unit (2).

B. Apply a light smear of grease to the following:-

(1) Gear train – Starter Switch Control Unit
(2) Ground faces of the armature extension and of the gap in the armature stop plate

} Electromagnet Unit

No. 5 Lubricant

A. Smear a little of the lubricant on the following parts:-

(1) Periphery of the bellcrank bearing
(2) Both ends of the bellcranks

} Combination Head Unit

(3) Driving worm and gear
(4) Driving pin on the driving gear

} Period of Operation Counter

(5) Armature pivots after cleaning – Electromagnet Unit

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.

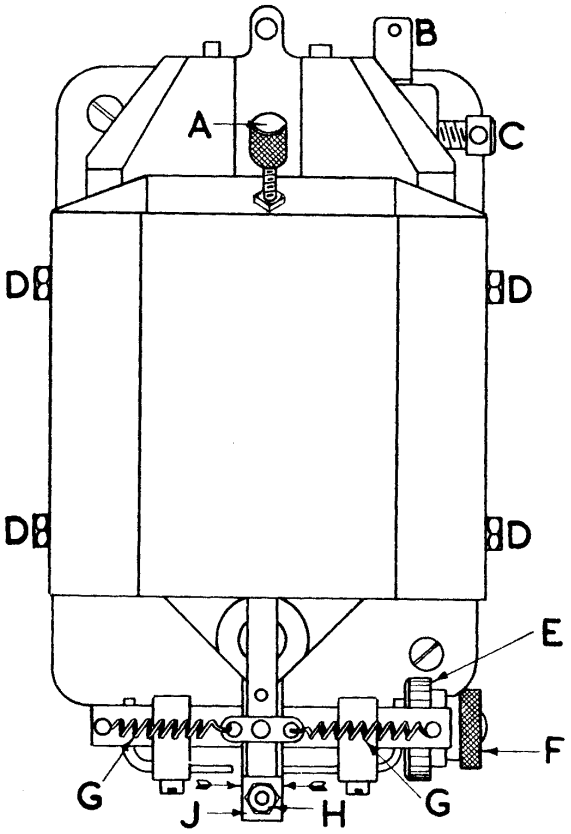


FIG. 5 (a)

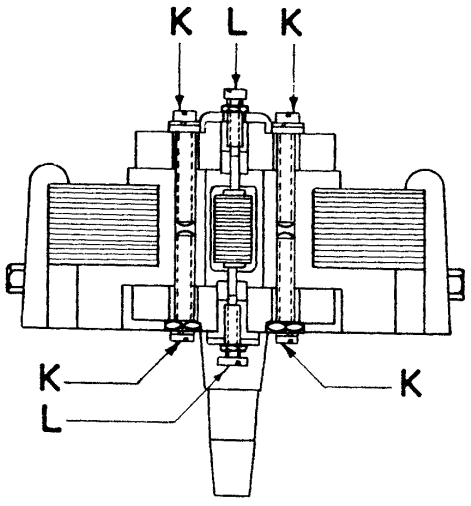


FIG. 5 (b)

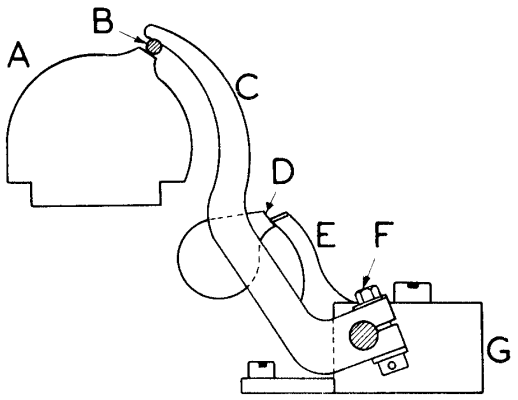


FIG. 6

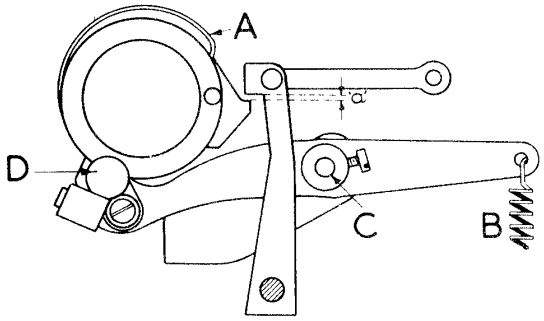


FIG. 7

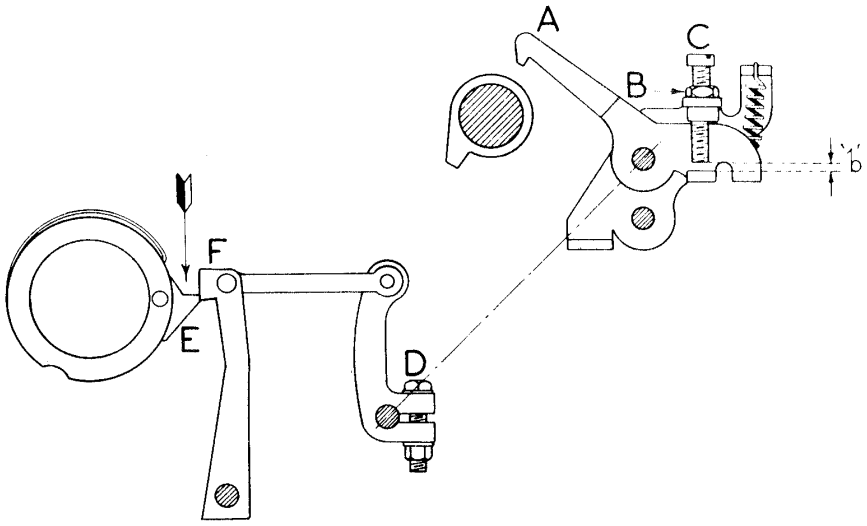


FIG. 8

DIMENSIONS

'a' = { ·002—·004 ins. / ·05— ·10 mm. } 'b' = { ·011—·015 ins. / ·28—·38 mm. }

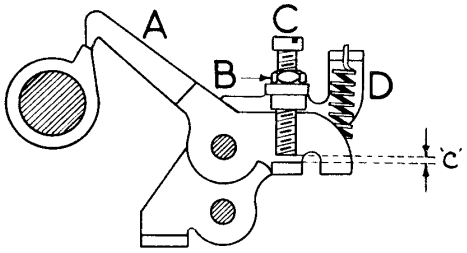


FIG. 9

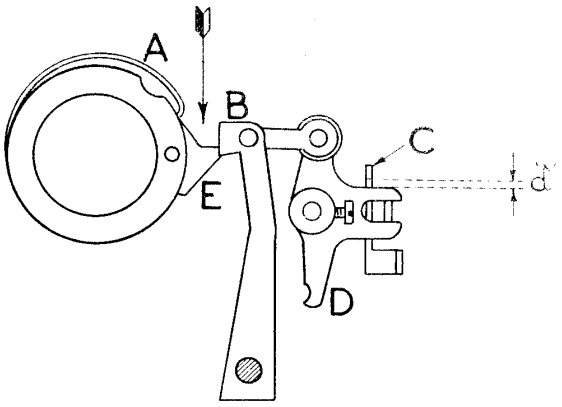


FIG. 10

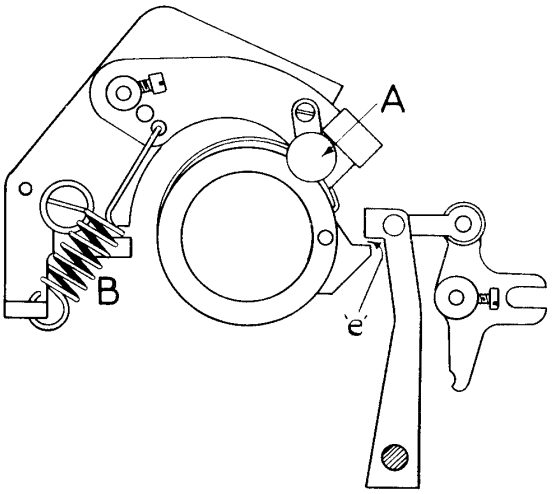


FIG. 11 (a)

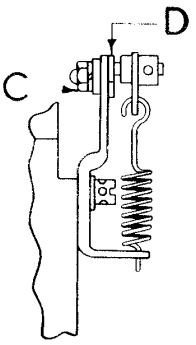


FIG. 11 (b)

DIMENSIONS

'c' = { ·018—·022 ins. / ·46— ·56 mm. }

'd' = { ·020—·023 ins. / ·51— ·58mm. }

'e' = { ·002—·004 ins. / ·05— ·10mm. }

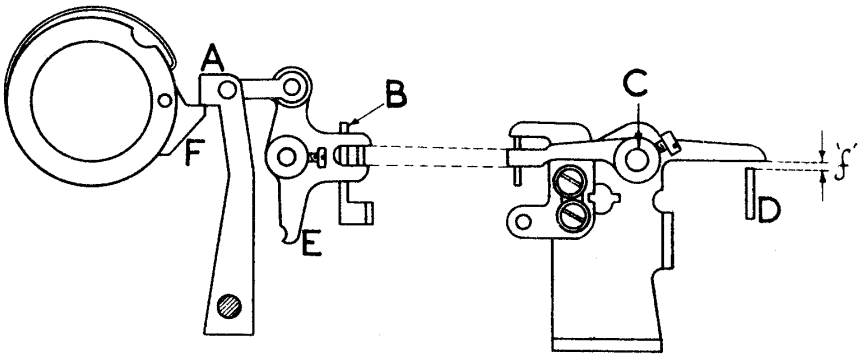


FIG. 12

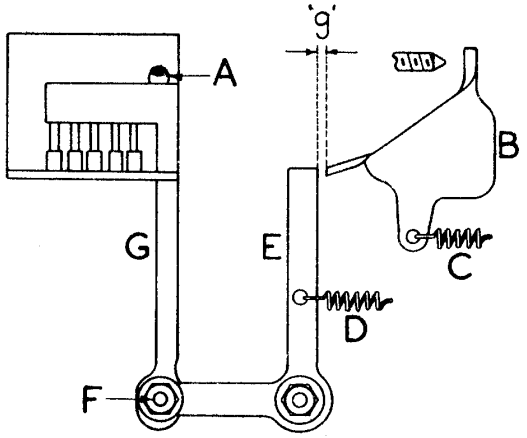


FIG. 13

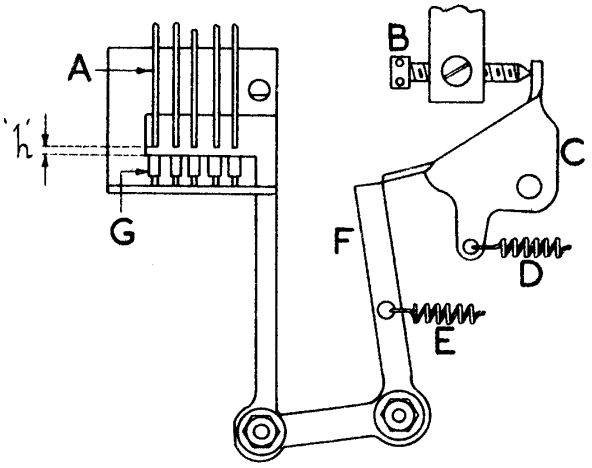


FIG. 14

DIMENSIONS

'f' = { ·031—·035 ins. / ·79— ·89 mm.

'g' = { ·010—·015 ins. / ·25— ·38mm.

'h' = { ·012—·018 ins. / ·30— ·46mm.

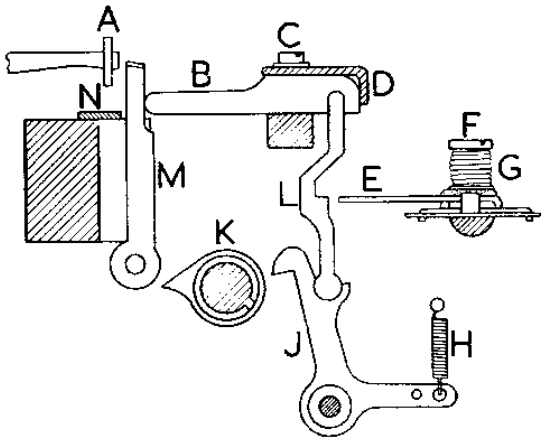


FIG. 15

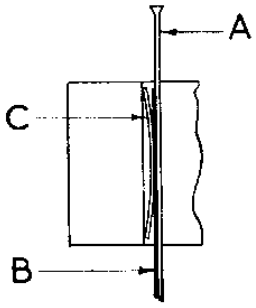


FIG. 16

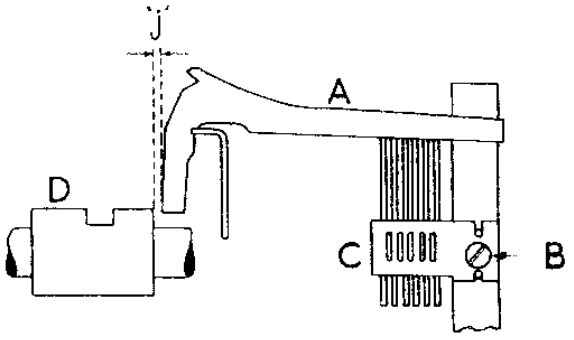


FIG. 17

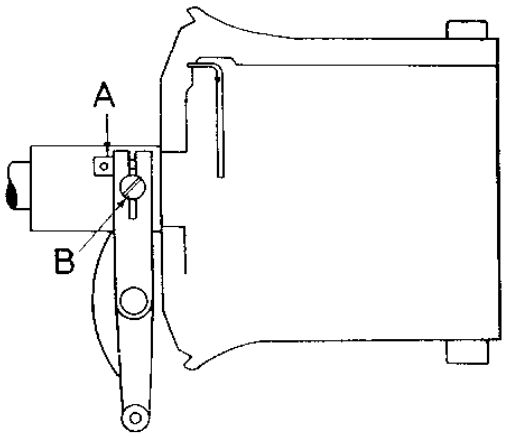


FIG. 18

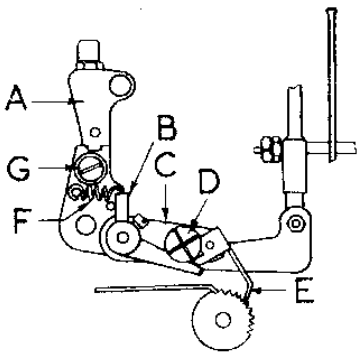


FIG. 19

DIMENSION

'j' = { ·006—·008 ins.
·15— ·20mm.

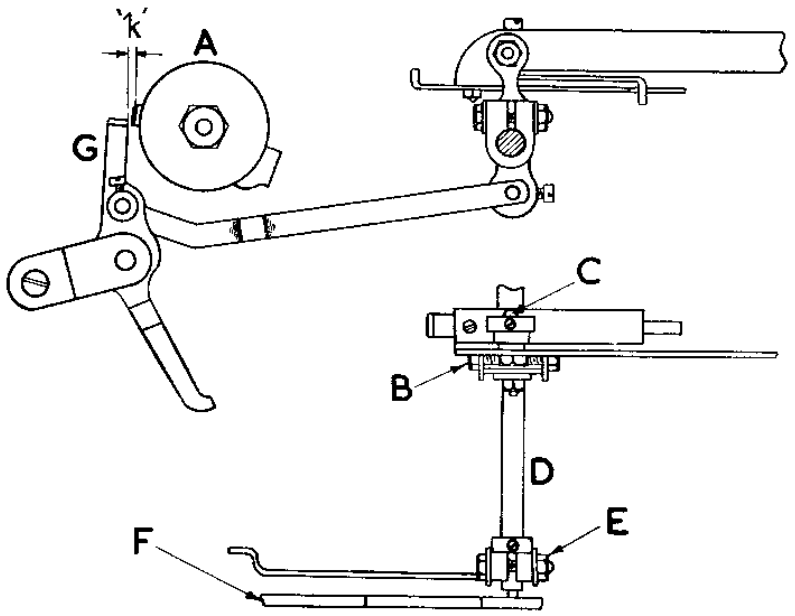


FIG. 20

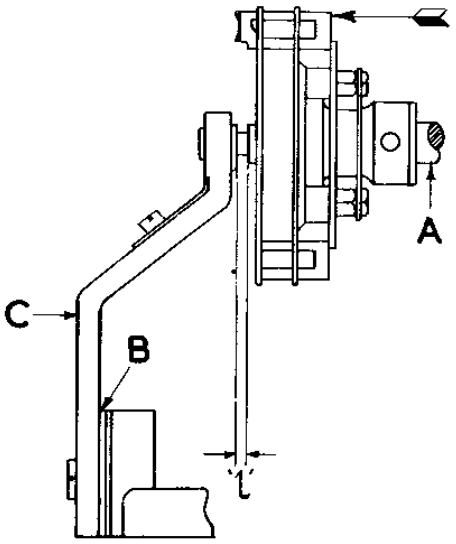


FIG. 21

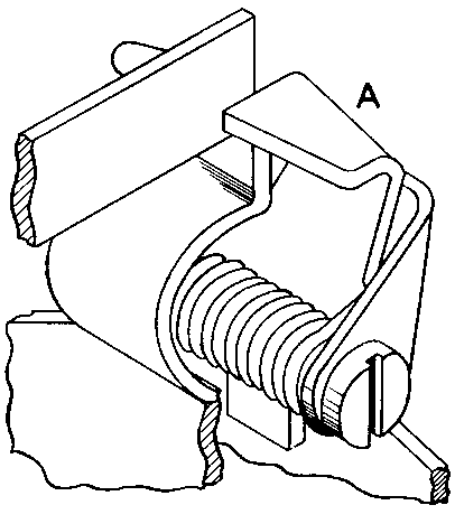


FIG. 22

DIMENSIONS

'k' = { ·013—·017 ins. / ·33— ·43 mm. } 'l' = { ·001—·005 ins. / ·03— ·13 mm. }

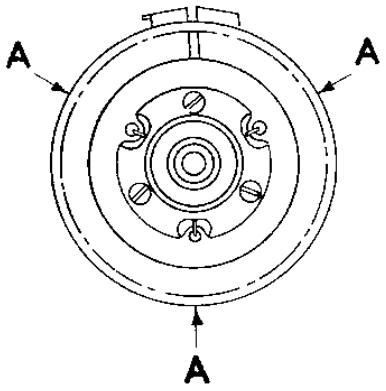


FIG. 23

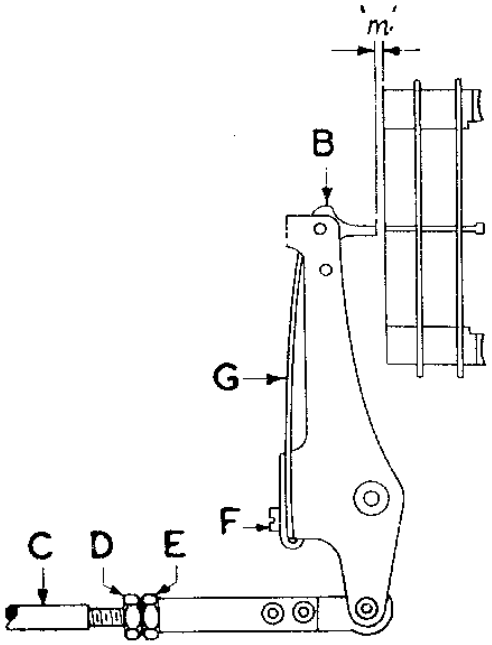


FIG. 24

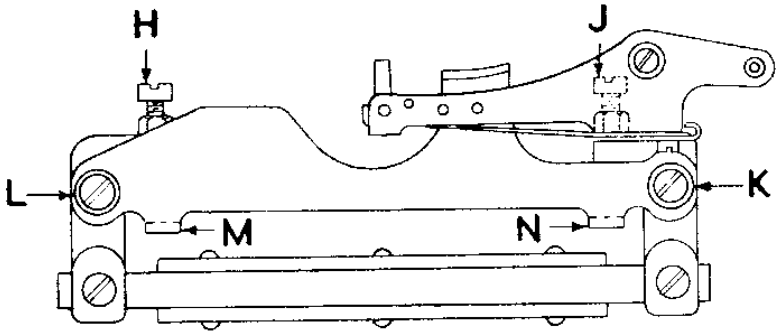


FIG. 25

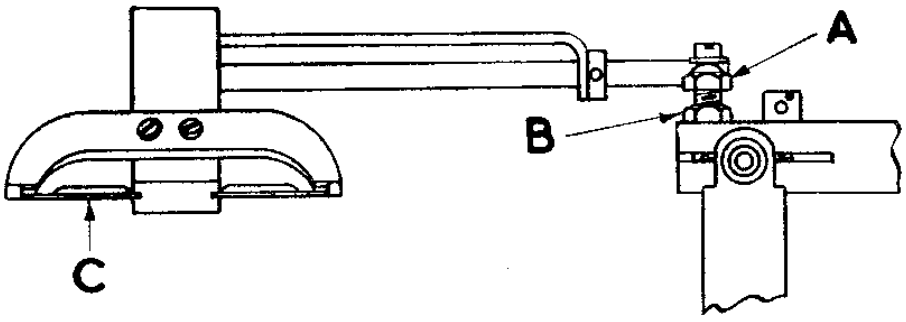


FIG. 26

DIMENSION

'm' = $\frac{1}{32}$ ins. (·8 mm.)

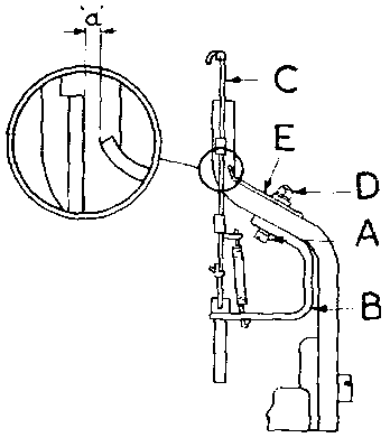


FIG. 27

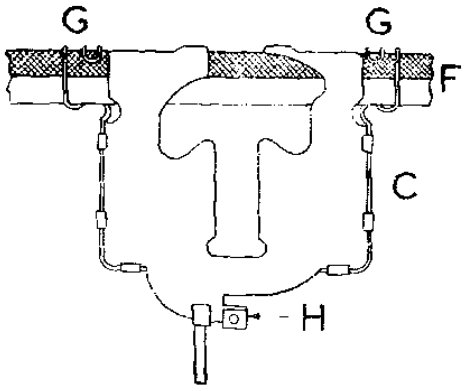


FIG. 28

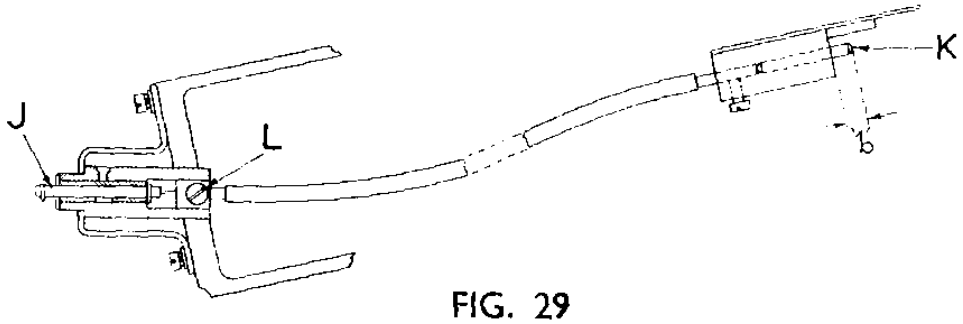


FIG. 29

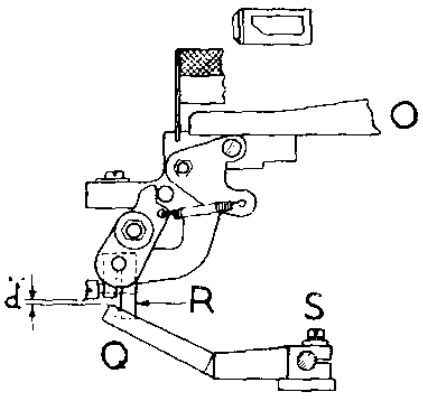


FIG. 30

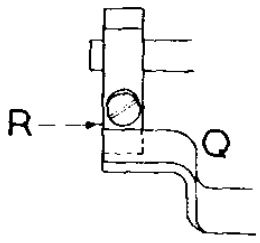


FIG. 31

DIMENSIONS

'a' = { ·002 in. / ·05 mm. }

'b' = { $\frac{1}{16}$ in. / 1·6 mm. }

'd' = { $\frac{3}{64}$ in. / 1·2 mm. }

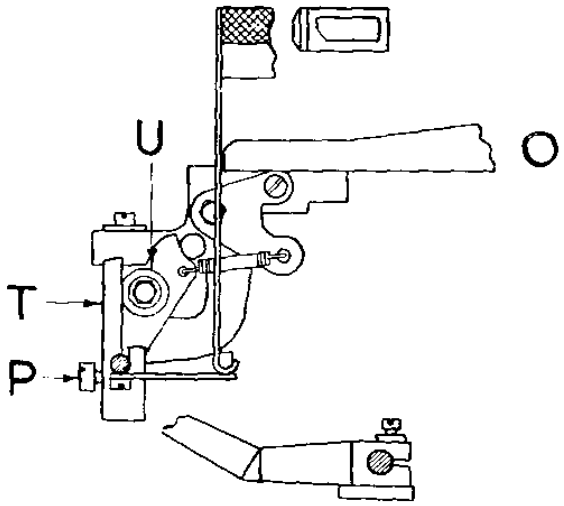


FIG. 32

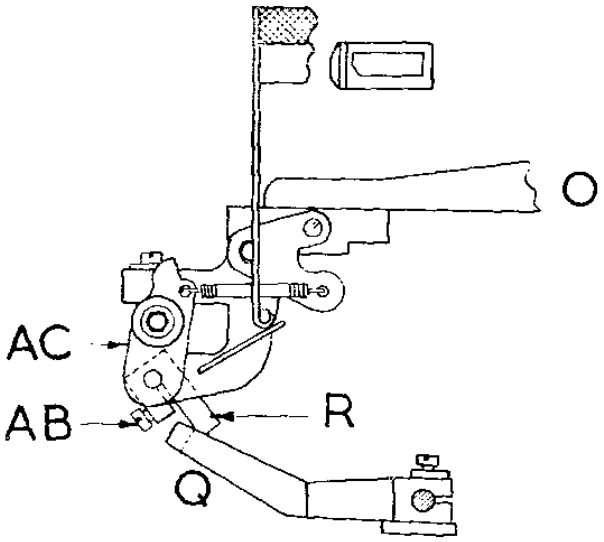


FIG. 33

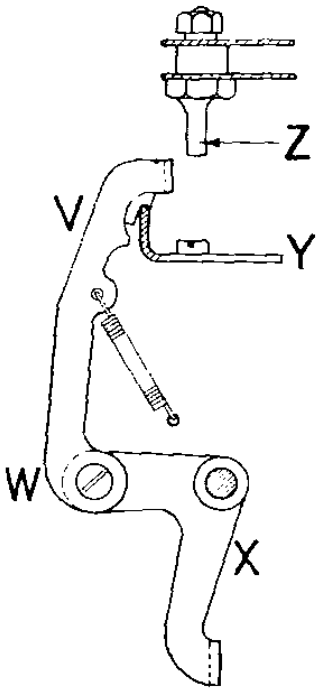


FIG. 34

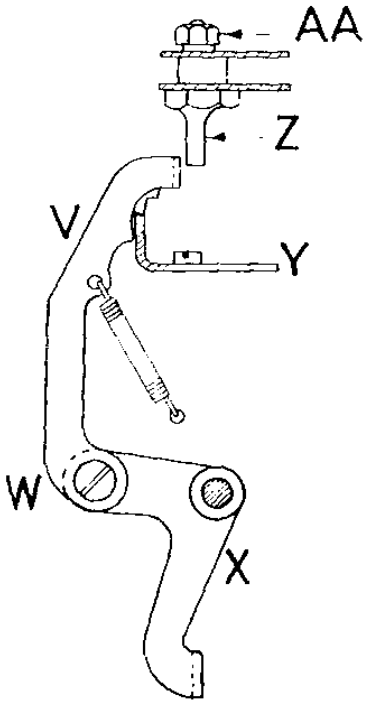


FIG. 35

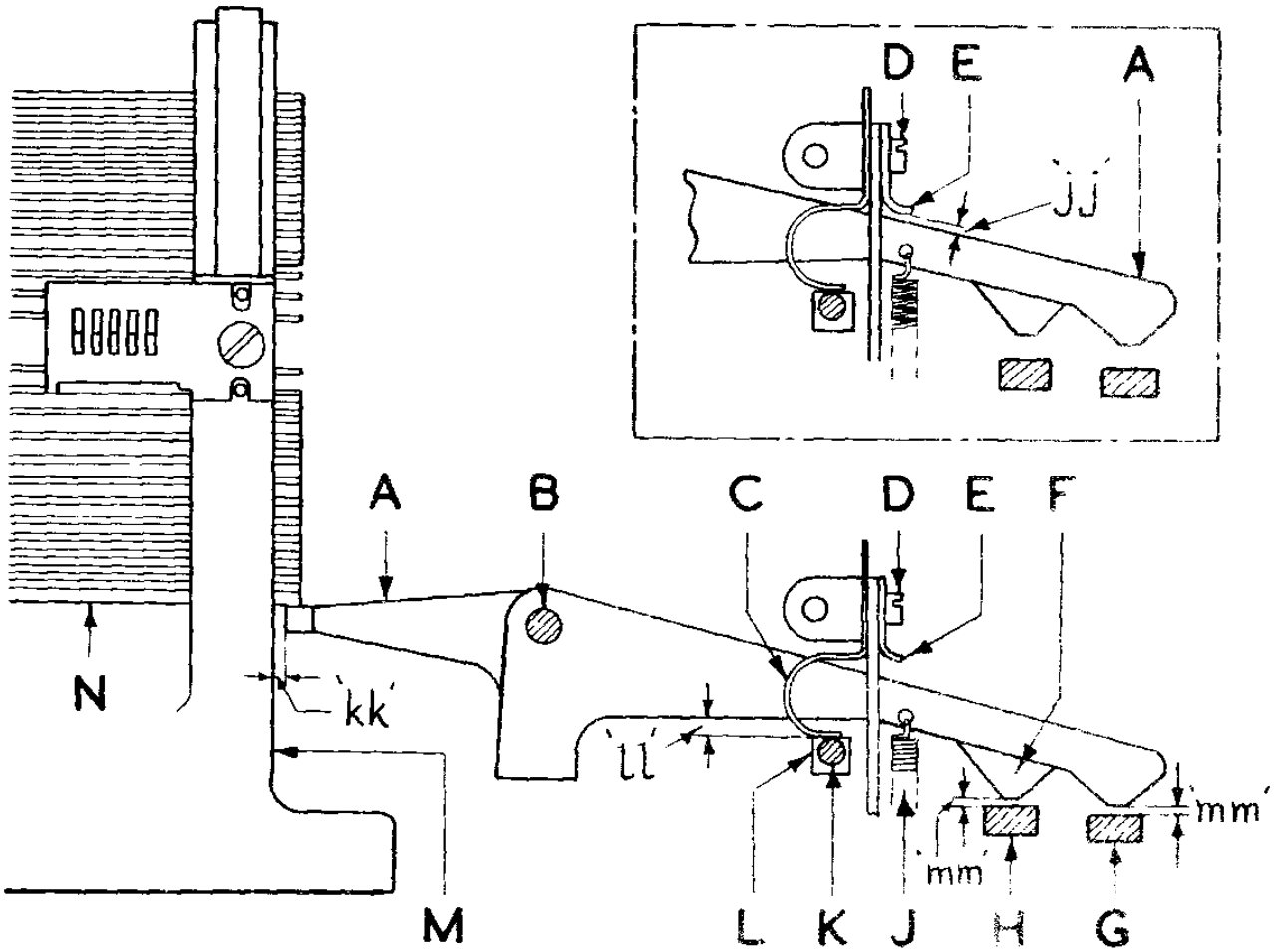


FIG. 36

DIMENSIONS

'jj' = { ·010—·015 in. / ·25—·38 mm. } 'kk' = { 010 in. / ·25 mm. } (min.)

'll' = { ·005—·015 in. / ·13—·38 mm. } 'mm' = { ·010 in. / ·25 mm. } (min.)

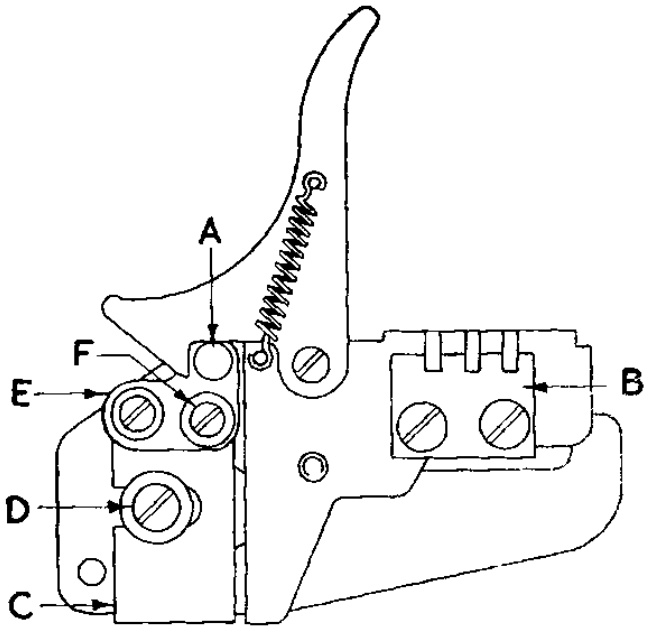


FIG. 37

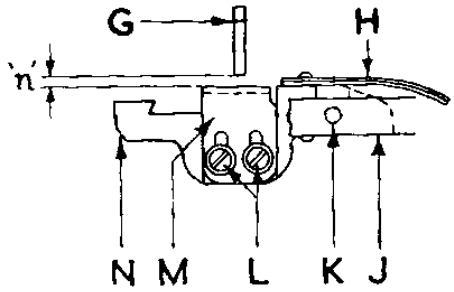


FIG. 38

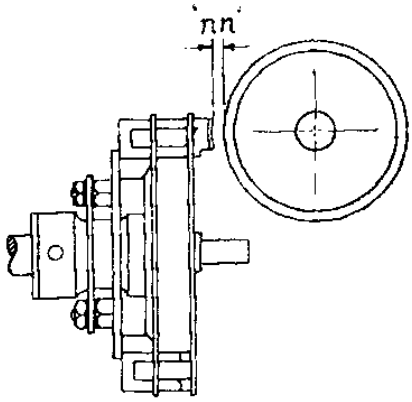


FIG. 39

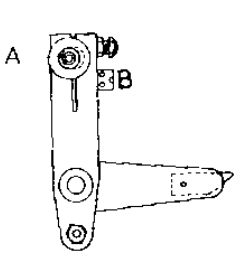


FIG. 40

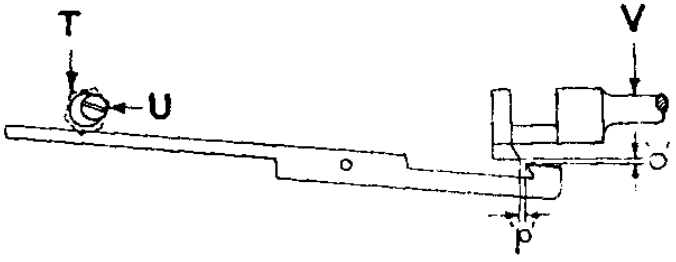


FIG. 41

DIMENSIONS

'n' = {·006—·010 in. / ·15—·25 mm.} 'nn' = $\frac{1}{8}$ in. (32mm.) 'o' = {·010—·015 in. / ·25—·38mm.} 'p' = {·015—·025 in / ·38—·64 mm}

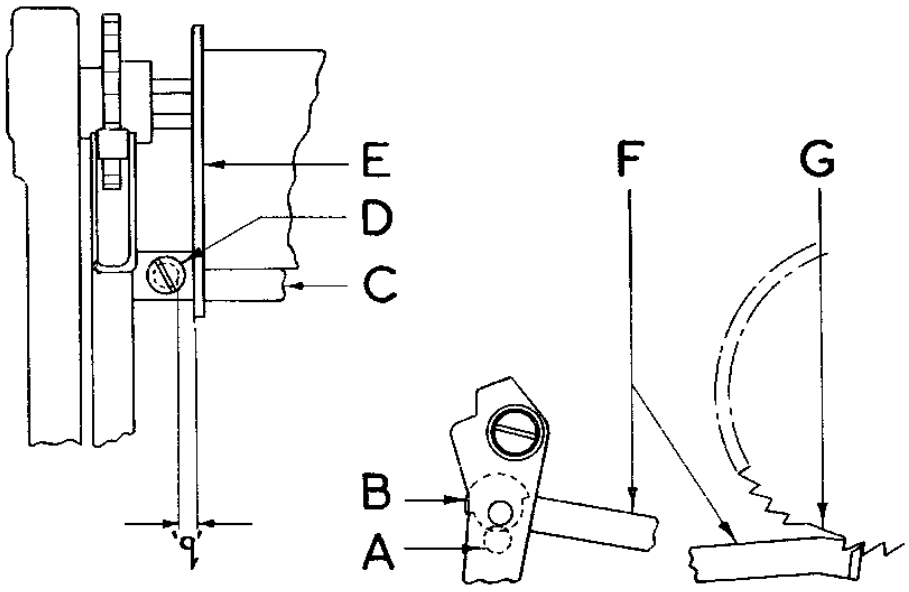


FIG. 42

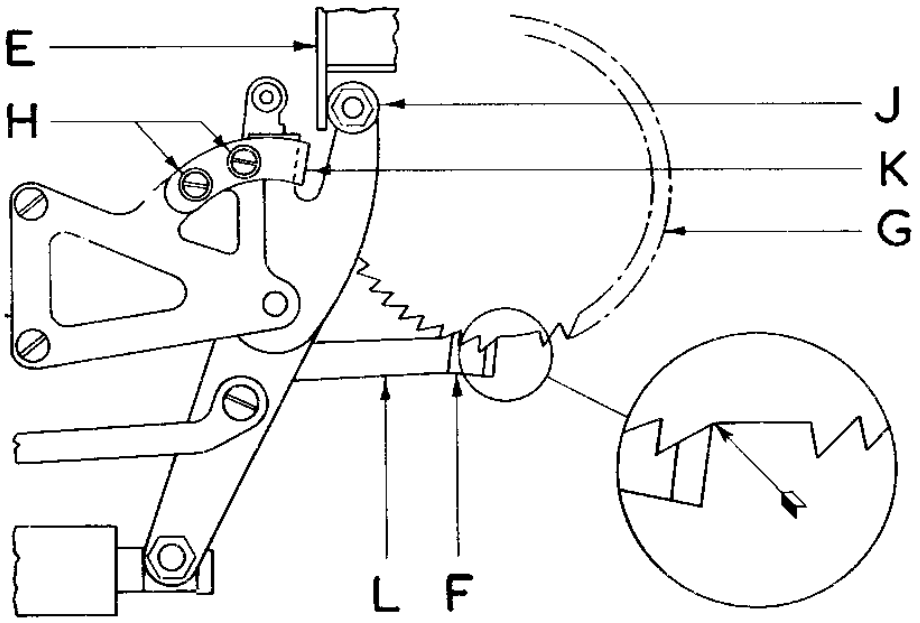


FIG. 43

DIMENSION

'q' = ·015—·020 in. (·38—·51 mm.)

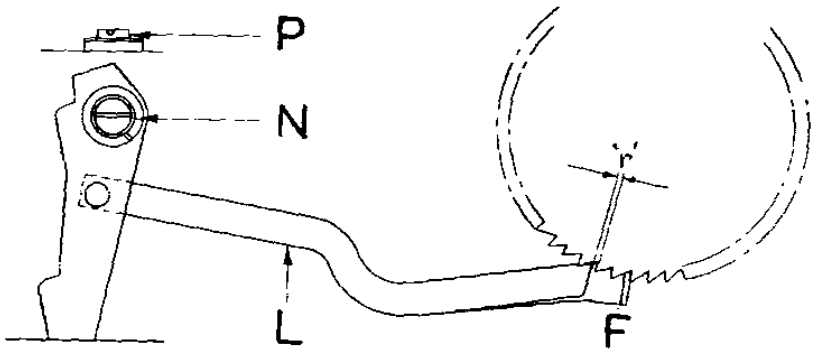


FIG. 44

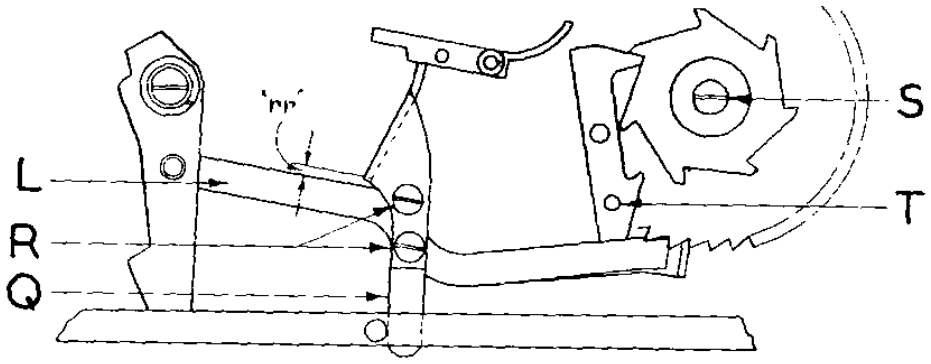


FIG. 45

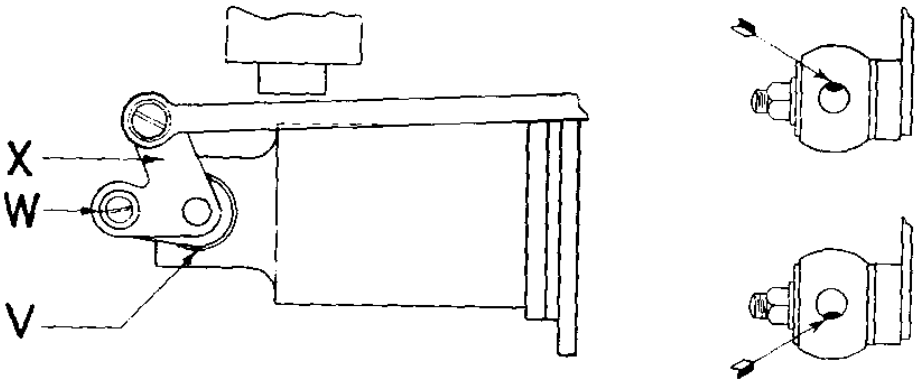


FIG. 46

DIMENSIONS

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

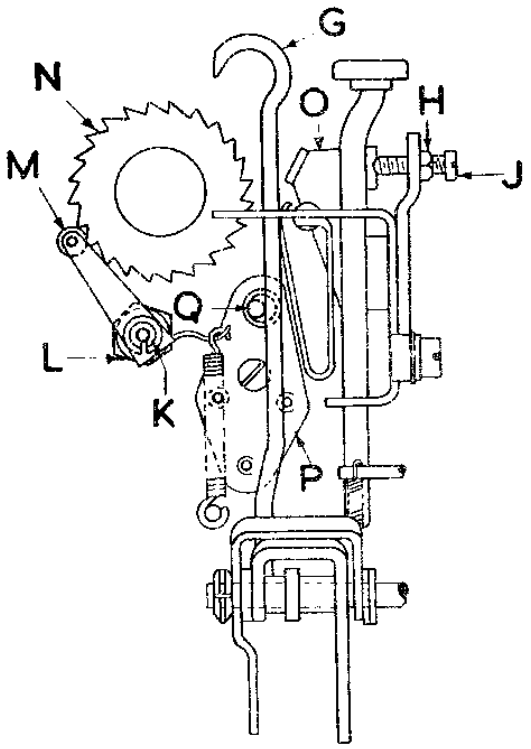


FIG. 47

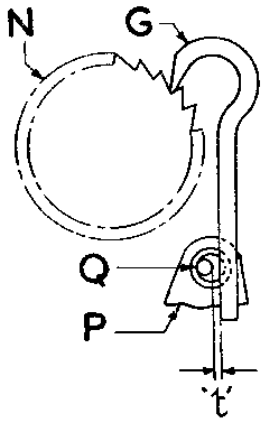


FIG. 48

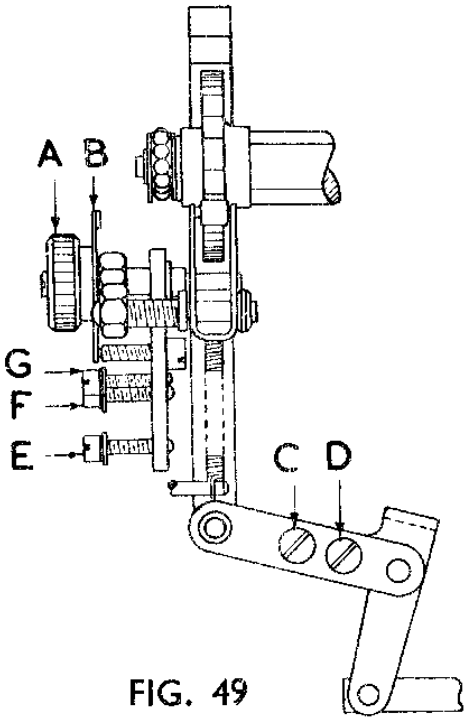


FIG. 49

DIMENSION

't' = { ·005—·010 ins. / ·13— ·25 mm. }

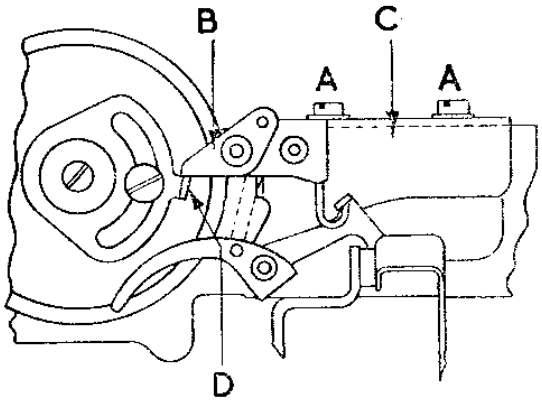


FIG. 50

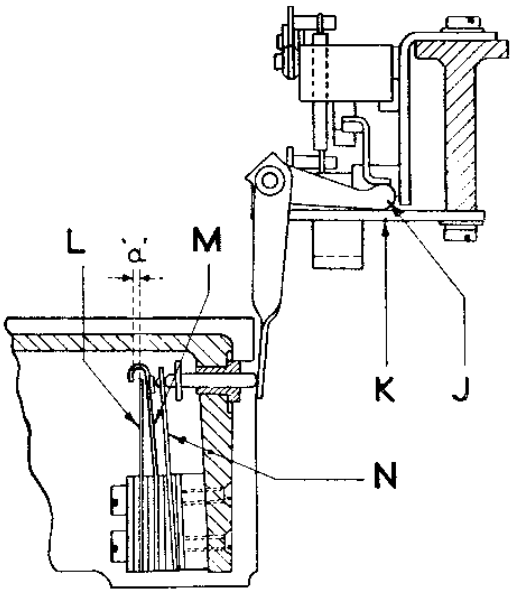


FIG. 52

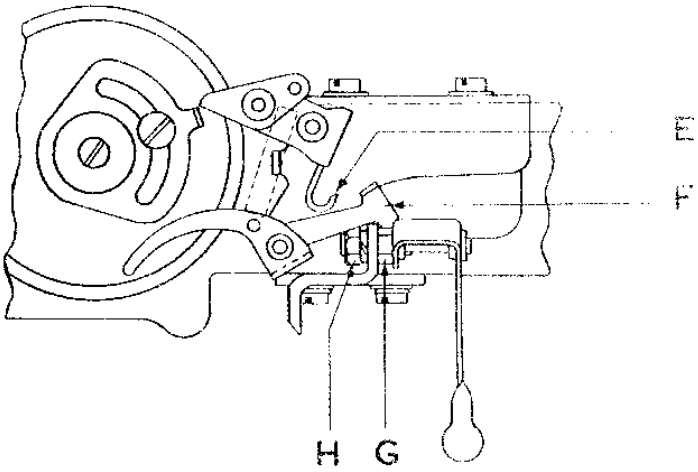


FIG. 51

DIMENSION

'a' { ·010—·020 in.
·25— ·51 mm.

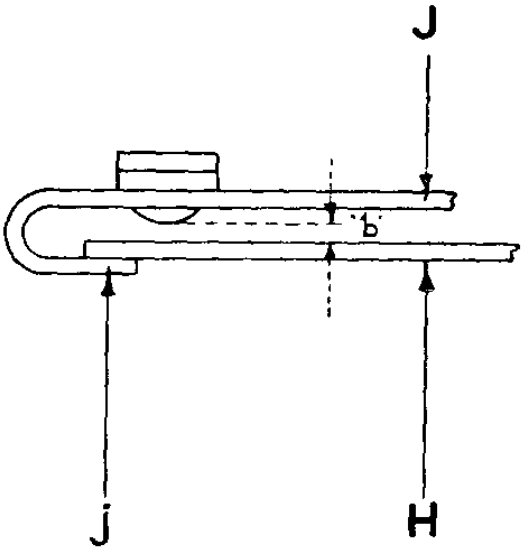


FIG. 53

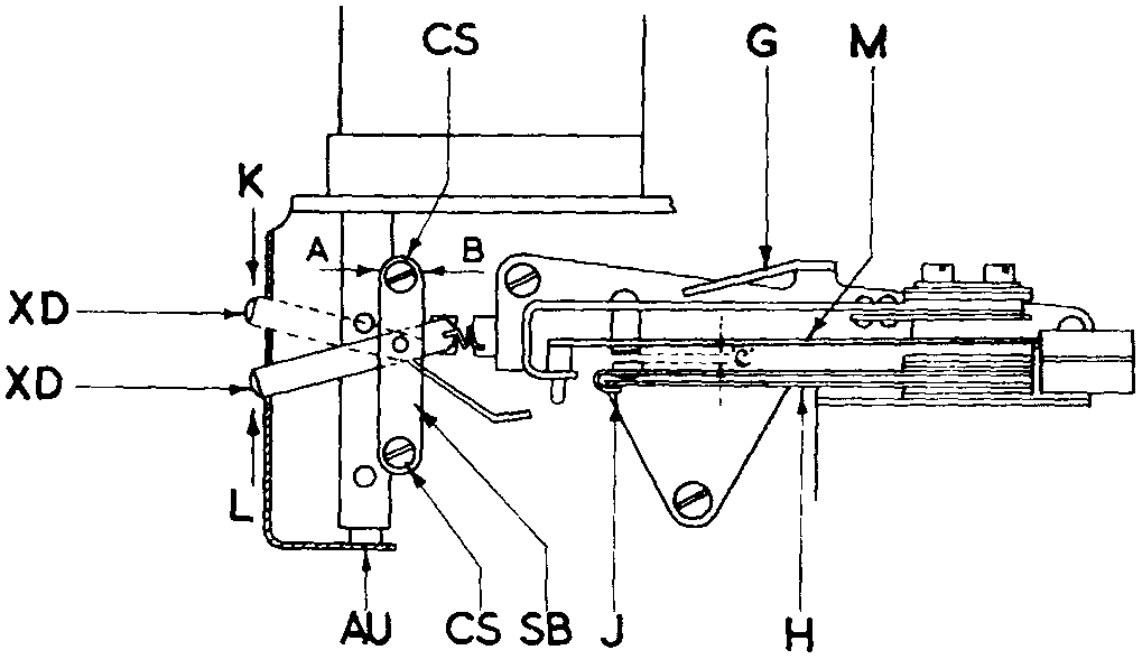


FIG. 54

DIMENSIONS

'b' { ·010— ins. / ·25— mm. }

'c' { ·045—·048 ins. / 1·14—1·22 mm. }

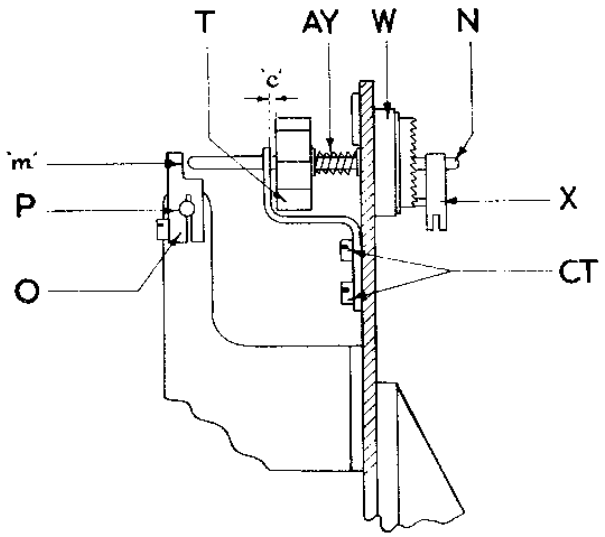


FIG. 55

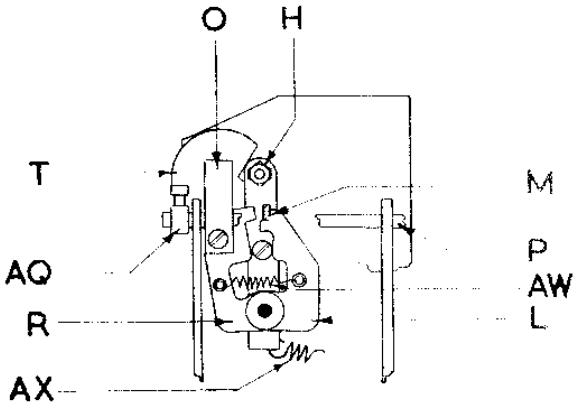


FIG. 56

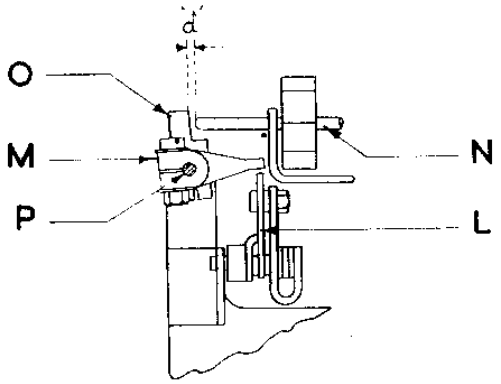


FIG. 57

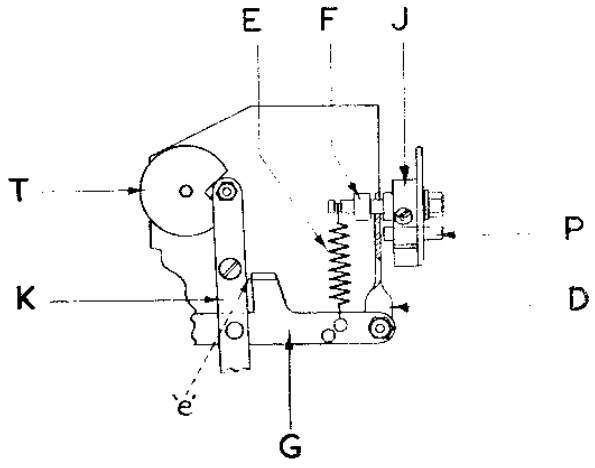


FIG. 58

DIMENSIONS

'c' { $\frac{1}{32}$ ins. / ·8 mm.

'd' { ·015—·025 ins. / ·38— ·64 mm.

'e' { ·002—·005 ins. / ·05— ·13 mm

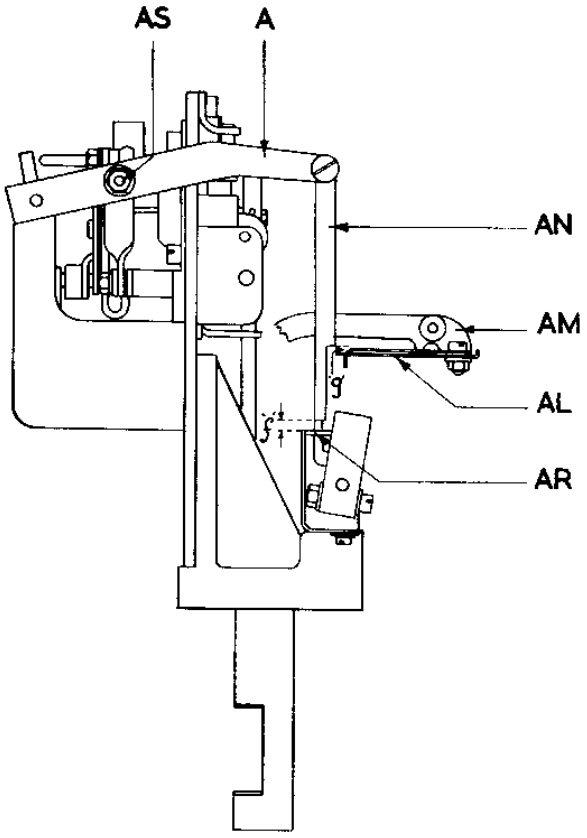


FIG. 59

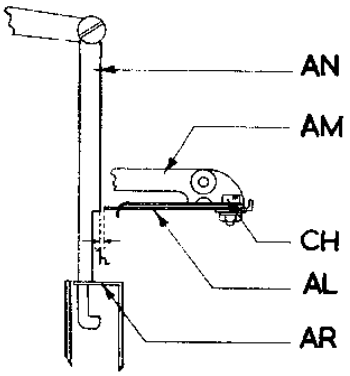


FIG. 60

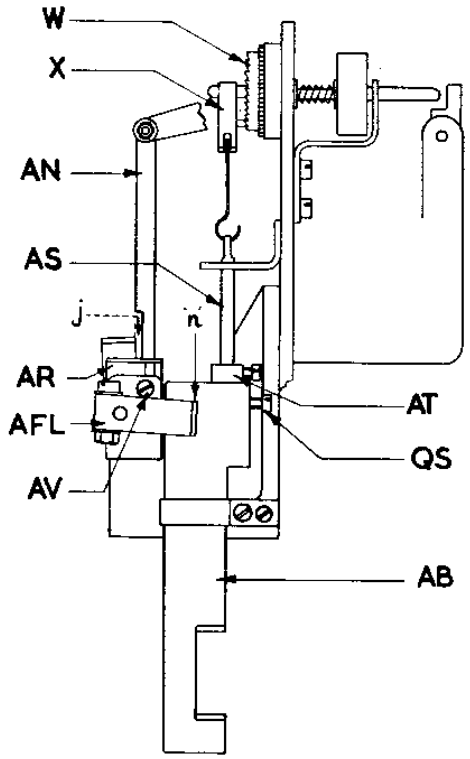


FIG. 61

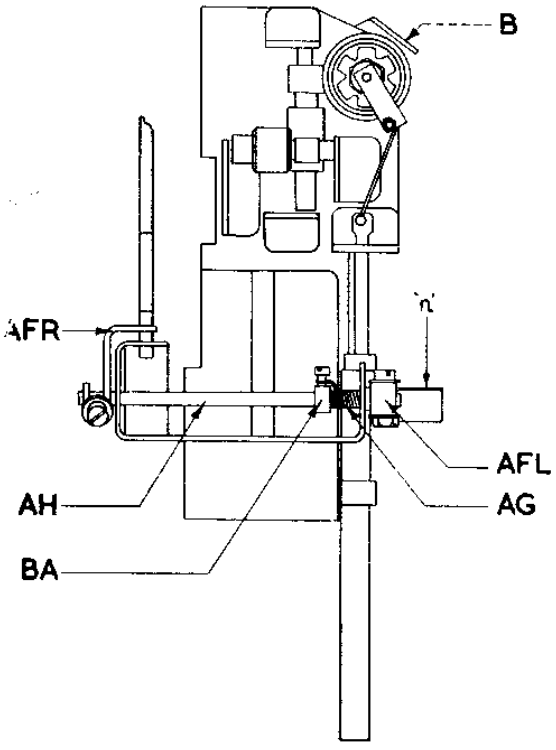


FIG. 62

DIMENSIONS

'f'	$\frac{1}{16}$—$\frac{3}{32}$ ins. 1·6—2·4 mm.	'h'	·002—·006 ins. ·05—·15 mm.
'g'	$\frac{1}{64}$—$\frac{3}{64}$ ins. ·4—1·2 mm.	'j'	$\frac{1}{32}$—$\frac{3}{64}$ ins. ·8—1.2 mm.

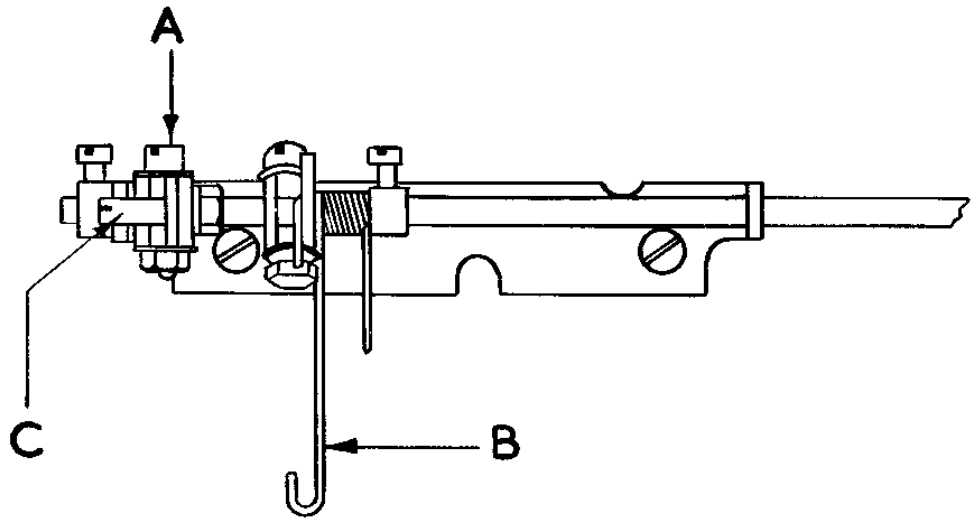


FIG. 63

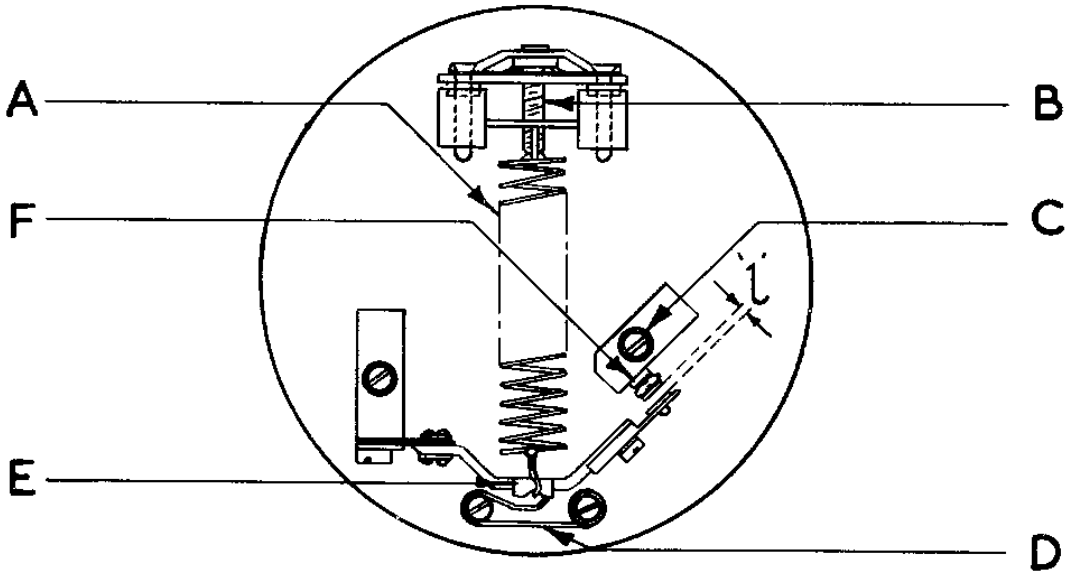


FIG. 64

DIMENSION

'l' { ·015—·020 ins.
·38— ·51 mm.

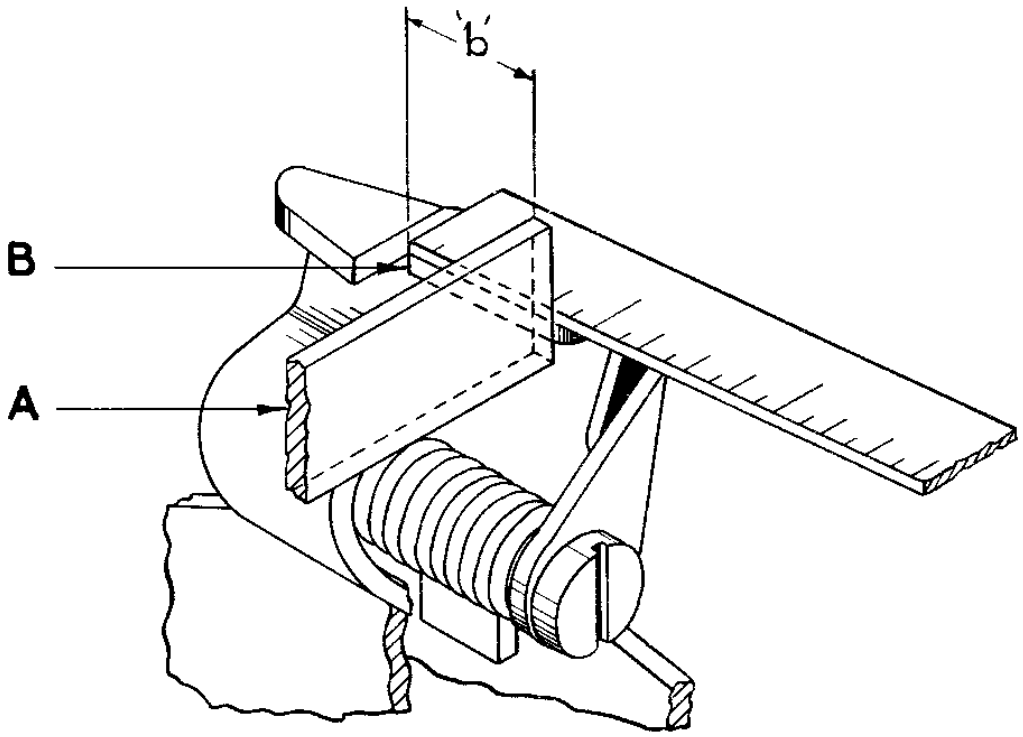


FIG. 65

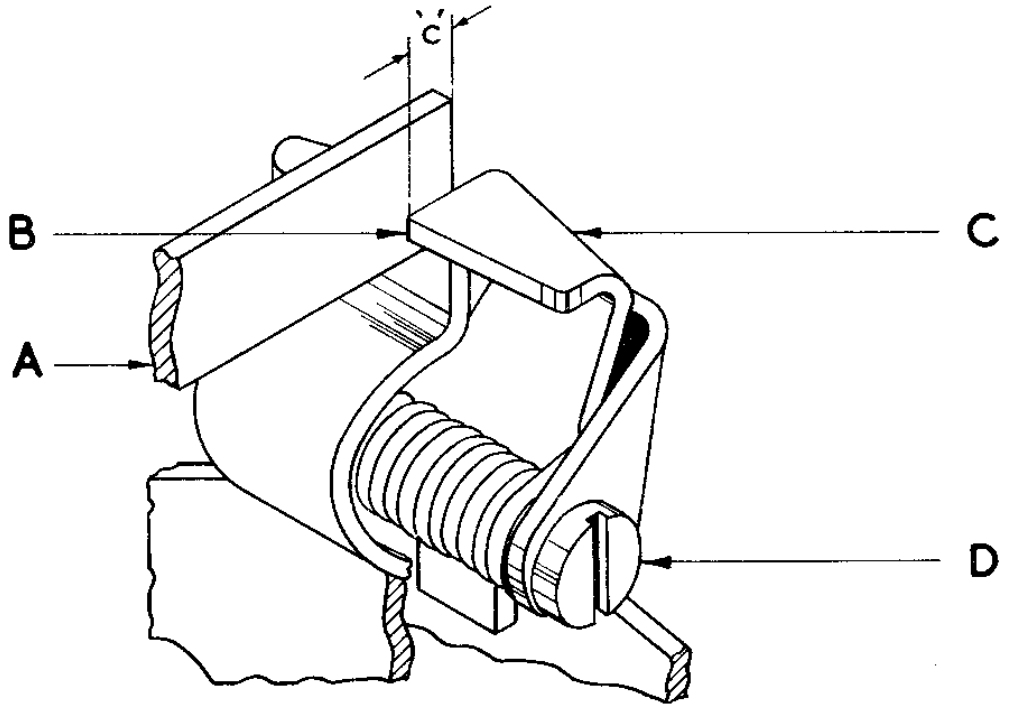


FIG. 66

DIMENSIONS

'b' = $\begin{cases} \frac{5}{32}—\frac{3}{16} \text{ in.} \\ 3{\cdot}75—4{\cdot}75 \text{ mm.} \end{cases}$ 'c' = $\begin{cases} {\cdot}055—{\cdot}066 \text{ in.} \\ 1{\cdot}40—1{\cdot}68 \text{ mm.} \end{cases}$

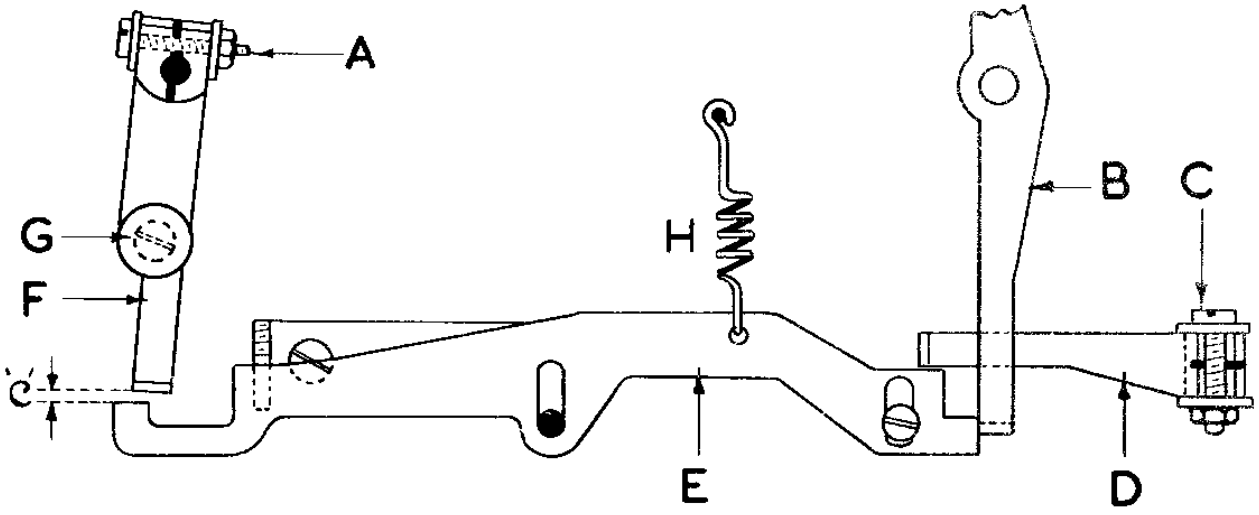


FIG. 67

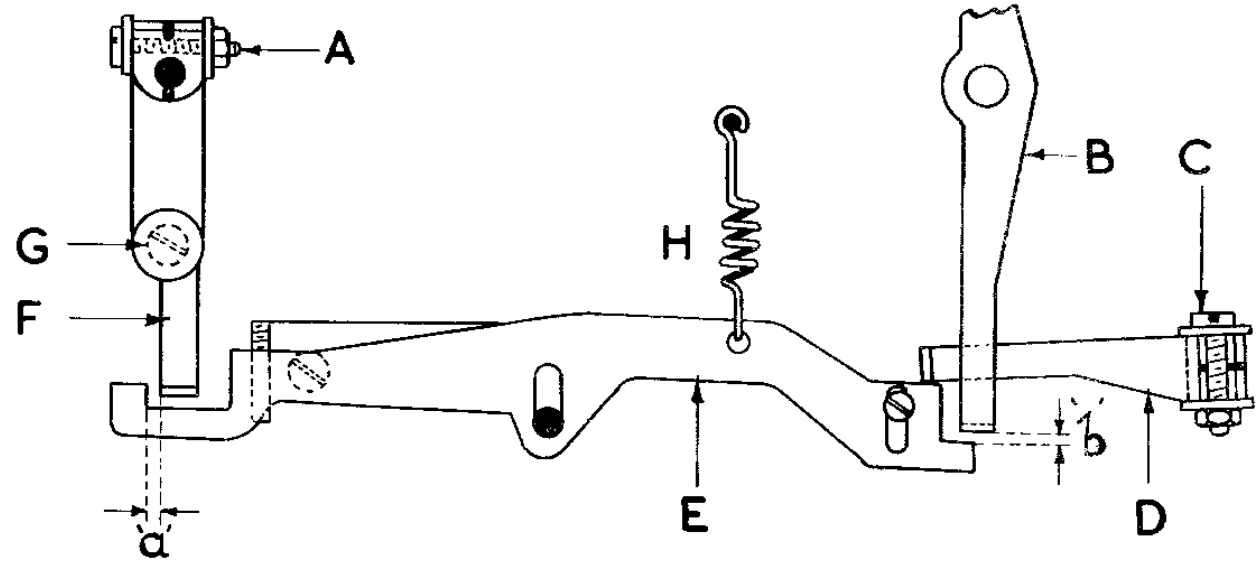


FIG. 68

DIMENSION

'a' > { ·003 ins. / ·08 mm. }

'b' ≃ { ·005 ins. / ·13 mm. }

'c' ≃ { ·005 ins. / ·13 mm. }