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Colin Hinson

In the village of Blunham, Bedfordshire.

# TELEPRINTER KEYBOARD PERFORATOR—TRANSMITTER

Models  
67P/N and 7P/N

MAINTENANCE  
INSTRUCTIONS

***Creed & Company Limited***



# COMBINED TELEPRINTER KEYBOARD PERFORATOR AND AUTOMATIC TRANSMITTER

Models  
67BP/N3, 67BP/N4,  
67CP/N3 and 67CP/N4

# TELEPRINTER KEYBOARD PERFORATOR

Models  
7P/N3 and 7P/N4

## MAINTENANCE INSTRUCTIONS

(Issued April 1957)

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## INTRODUCTION

This Booklet provides maintenance instructions for Keyboard Perforators and Keyboard Perforator/Transmitters fitted with the 'N' series keyboards, i.e. with non-storage keyboards with or without shift lock facility. It is applicable to the following Models:-

Model 7P/N3: A Teleprinter Keyboard Perforator with 3-row 'N' type keyboard.

Model 7P/N4: A Teleprinter Keyboard Perforator with 4-row 'N' type keyboard.

Model 67BP/N3: A Combined Teleprinter Keyboard Perforator and Automatic Transmitter arranged for 7½-unit transmission, fitted with a 3-row 'N' type keyboard.

Model 67CP/N3: A Combined Teleprinter Keyboard Perforator and Automatic Transmitter arranged for 7-unit transmission, fitted with 3-row 'N' type keyboard.

Model 67BP/N4: A Combined Teleprinter Keyboard Perforator and Automatic Transmitter arranged for 7½-unit transmission, fitted with a 4-row 'N' type keyboard.

Model 67CP/N4: A Combined Teleprinter Keyboard Perforator and Automatic Transmitter arranged for 7-unit transmission, fitted with a 4-row 'N' type keyboard.

This booklet is also applicable to all units on Models 67P/CTK and 7P/CTK, except for the transfer and keyboard units. Complete instructions for these units are given in Instruction Booklet CTK/78 (5th Edition).

In the following pages the term "7P/N" is used in reference to a Keyboard Perforator. The term "67P/N" indicates a Keyboard Perforator/Transmitter, and covers the four varieties listed above.



## DISMANTLING AND ASSEMBLING INSTRUCTIONS

**Note:-** All sections dealing with the keyboard unit apply only to machines fitted with the standard N-type keyboard unit. If a C.T. Keyboard unit is fitted, it should be dismantled and assembled in accordance with instructions given in Booklet CTK/78 (5th Edition).

All screws, or nuts, which are painted red should be left undisturbed, unless a specific instruction to the contrary is given. Such screws, or nuts, are set in the Factory with the aid of special gauges, and if disturbed it may be necessary to return the unit to the Factory for readjustment.

When the machine has been dismantled in accordance with the instructions which follow, it may be reassembled by following the instructions in reverse. Attention should then be given to the notes relating to reassembly procedure which are placed in brackets immediately after the dismantling instructions to which they refer.

### A. TO REMOVE INDIVIDUAL UNITS

#### 1. Covers

- 1.1 Disconnect the machine from the mains supply, and from the signals line in the case of Model 67P/N, and remove the four fixing screws from the front cover. **N.B.:** Before removing the cover, it is advisable briefly to short-circuit the red and black pins of the power plug, in order to discharge the motor circuit capacitors and prevent shock.
- 1.2 Lift off the rear silencing cover, if fitted, then lift off the front cover.
- 1.3 Slacken the capstan-headed screws securing the tape control unit cover (Model 67P/N only) and remove the cover.
- 1.4 Unclamp the knurled head latch of the motor governor cover (if fitted), and turn back the cover. If it be desired to remove the cover from the machine, the method is self-evident.

#### 2. Message Desk and Gear Guard

- 2.1 Open the door of the tape roll holder and message desk, and remove the roll of tape, followed by the tape wheel.
- 2.2 Unscrew the three fixing screws of the tape roll holder, which secure it to its support pillar, and remove the holder, complete with the attached gear guard.
- 2.3 Remove the two screws securing the gear-shaft guard, and remove the guard.
- 2.4 Remove the three screws securing the message desk support pillar to the main base, and remove the pillar.

#### 3. Transmitter Head (Model 67P/N only)

- 3.1 Slacken the large knurled screw at the top of the transmitter head support stand, and withdraw the head.

(When reassembling the head, note that both head and tape control unit should be in the rest position before the coupling dog is engaged, i.e. the control unit pawls should be engaged by their detent, and the transmitter head coupling dog should be vertical, with its clamp screw in the upper left-hand section of the dog body.)

4. **Tape Control Unit** (Model 67P /N only)

4.1 Disconnect the three electrical leads of the Send/Receive switch from the contact block assembly, taking note of the order of colours.

4.2 Remove the two screws which secure the unit to the main base, and lift off the unit, withdrawing the wire leads through the insulating bush in the base of the casting.

5. **Keyboard**

5.1 Remove the plug of the End-of-Line Indicator lamp circuit (if fitted).

5.2 Remove the two large screws which secure the keyboard to the main base, and withdraw the keyboard.

6. **Perforator Operating Unit** (Figs. 1 and 12)

6.1 If a Counter Unit is fitted, slacken the clamp screw of collar H, Fig. 1, and withdraw the collar. Remove the counter unit resetting link from the spindle of the collar, and replace the collar.

6.2 Lift the locking frame L, Fig. 12, up as far as it will go, and remove the three operating unit fixing screws which secure the unit to the keyboard back plate.

**Note:** When removing the left-hand screw, care should be taken to insert the screwdriver through the hole in the keybar guide rack in such a manner that the keybar springs are not damaged.

6.3 Lift the unit off the keyboard, carefully disengaging the linkages between it and the combination unit.

(When reassembling, ensure that the selecting levers AO, and the trip lever AM, are correctly engaged with their appropriate linkages to the combination unit and the perforator link unit.)

7. **Counter Unit** (if fitted) (Figs. 1 and 12)

7.1 Disengage the wire resetting link from the pivot of collar H, Fig. 1, after removing H. Remove the three fixing nuts and washers securing the counter unit to the perforator operating unit back plate, and lift off the counter unit.

**N.B.:** Do not disturb the counter unit locating plate B, Fig. 12, whether or not the fixing screw is painted red.

8. **Perforator Unit** (Figs. 3, 4 and 32)

8.1 Remove the cuttings box and its bracket, together with the punch head guard plate which covers the damping springs B and F, Fig. 3.

8.2 Take up the tension of the inner damping spring F by means of a spring hook

engaged with the top of the spring, and remove the anchor screw A. Relax the tension and remove the hook.

- 8.3 Compress the outer damping spring by pulling it downwards with the spring hook, and remove it from the inner spring.
- 8.4 Remove the three punch block unit fixing screws from the rear of the keyboard back plate. Press the punch withdrawing bracket V, Fig. 5, to the left, out of engagement with the recesses in the punches, hold the feed pawl E out of engagement with the feed ratchet, and lift off the complete punch block unit.

(When reassembling:-

- (a) The left-hand fixing screw of the keyboard should be placed in its hole in the keyboard casting before the punch block unit is reassembled to the keyboard, and wedged in position, e.g. with a matchstick. If this is not done, difficulty may be experienced in inserting the screw into its hole after the punch block unit is reassembled.
- (b) Turn each punch so that the recessed portion faces the punch withdrawing bracket. Engage the bracket in the recesses before securing the punch block unit to the keyboard.)

- 8.5 Remove the two fixing screws M, Fig. 4, and take off the anvil bracket N from the keyboard.

(When reassembling, ensure that the right-hand ends of the selector bars O are engaged correctly with the punch block operating levers on the combination unit, and that the throwout link T, Fig. 32, is not wrongly placed under detent extension O.)

## 9. Perforator Link Unit

- 9.1 Remove the two sets of screws and washers securing the perforator link unit and lift it from the keyboard.

## 10. Combination Unit

- 10.1 Turn the keyboard over and remove the four fixing screws (two at each end) from the combination unit. Lift the anvil bracket end of the unit clear of the casting and carefully withdraw the unit.

**N.B.:** Note between which two keybars the wire link to the counter unit is passed.

## 11. Motor Governor Unit (Governed Motors only)

- 11.1 Slacken the screw which clamps the governor unit to the motor shaft, and withdraw the governor unit.

## 12. Motor and Gears

- 12.1 Turn the machine over, and remove the motor connection wires from their anchorage on the connection block, taking care to note the terminals used for each coloured wire.
- 12.2 Remove the clip securing the motor cable to the main base.

- 12.3 Hold the motor in place, and remove the *two large screws* which secure it to the main base. Remove the motor, and withdraw its cable.  
**N.B.:** The four (headless) screws and nuts which position the motor on the main base are usually painted red. They should *not* be disturbed, whether painted or plain.
- 12.4 Remove the four screws securing the intermediate driving shaft bearing blocks to the main base, and remove blocks, shaft and gears, taking care not to lose any shims which may be present.
- 12.5 If it be desired to dismantle the shaft and gears from the bearing blocks, the method of procedure is self-evident.

## B. TO DISMANTLE INDIVIDUAL UNITS

### 13. Transmitter Head (Figs. 6 and 7) (Model 67P/N only)

- 13.1 Remove the front and rear covers from the transmitter head.
- 13.2 Remove the nut and washer from the pivot of the tape retaining assembly AE, Fig. 6, and remove the assembly, taking care not to lose any shims which may be present between the assembly and the casting.  

(When reassembling, the tape retaining assembly should be so shimmed that the slots of the grid are centrally disposed about the peckers. Not more than four shims should be used, and if 'chadless' tape is to be employed, ensure that the hinged 'chads' are free to rise in the grid divisions.)
- 13.3 Turn the unit over, and remove the two bolts which secure the common (insulating) mounting block of:-
  - (a) transmitter tongue M,
  - (b) 'Mark' and 'Space' contacts K and L, respectively,
  - (c) Jockey roller assembly H,
  - (d) three line-connection plugs.
- 13.4 Turn the unit over again, and lift off the common mounting block, together with the parts listed in paragraph 13.3 above.

**Note:** It should not, normally, be necessary to dismantle the transmitter parts from the mounting block, but if it is required to do so, the procedure is obvious.

In the striker pattern transmitter, the 'Mark' and 'Space' connections at the rear have been reversed by comparison with the connections on the earlier model 6S/4. The sense of the connections on the main base has been restored by interchanging the relevant leads. Note that a Model 6S/5 Transmitter is *not* interchangeable with a Model 6S/4 unit, unless this modification is made to the base connections.

- 13.5 Remove the retaining collar from the pivot of the cam follower N, remove the follower assembly return spring, and lift off the assembly, taking care not

to lose any spacing washers which may be present between assembly and casting.

- 13.6 Slacken the clamping screw of the (wide) collar which retains the common lever B and striker dart assembly on its pivot. Detach the assembly spring and remove the collar and assembly, taking care not to lose the felt lubrication washer, and noting the position of this washer for subsequent reassembly.

(When reassembling, the common lever should be so positioned on its pivot, by means of the collar, that there is a clearance between the bottom of the slot in the striker dart E and the lower surface of the dart operating lever D when this is replaced (paragraph 13.5) of approximately .005 - .010 in. (.13 - .25 mm.), as judged by eye.)

**N.B.:** The two bolts which secure the carrier of the striker dart to the common lever are usually painted red and should not be disturbed. If, for any reason, they have to be slackened, care should be taken to line up the long axis of the dart with the pivot of the common lever before the two screws are tightened. If this is not done, the transmitter tongue cannot be correctly adjusted or operated (see Adjustments Nos. 30, 31, 32 and 33).

- 13.7 Remove the two screws which secure the front bearing bracket of the camshaft, and remove the bracket, taking care not to lose any shims which may be fitted.
- 13.8 Remove the two screws of the cover plate which carries the latching pin R, and remove the plate.
- 13.9 Remove the collar from the pivot of the cam sleeve lubrication felt holder, and withdraw holder and felt.
- 13.10 Remove the two screws which secure the pecker guide rack to the casting, and remove the rack.
- 13.11 Remove the two screws securing the pecker guide plate C, and remove the plate.

(On reassembly, it is not necessary to engage the peckers with the holes in the plate until the plate is screwed down.)

- 13.12 Remove the split ring from the common pivot of the pecker levers P.

(When reassembling, it is important to ensure that the split ring is so placed on the pivot that it does not press too tightly against the front pecker lever.)

- 13.13 Release the pecker lever springs from their adjustable (upper) anchors, and withdraw the pecker levers from the pivot.

(When reassembling, it is important to replace the peckers in their original order on the pivot.)

**N.B.:** If new peckers and pecker levers are fitted, the following conditions should apply when the transmitter is fully assembled and adjusted:-

- (a) When the pecker levers are fully depressed by the cams, the gaps between their ends and the common lever B should not have an overall variation of more than .002 in. (.05 mm.). If necessary,

stone the ends of the levers to obtain uniformity with this requirement.

- (b) With the pecker levers fully retracted, check that the clearance between the tip of each pecker and the top surface of the pecker guide plate C is not less than .004 in. (.10 mm.). This dimension cannot be measured directly, so it should be estimated by eye.

- 13.14 Lift the common pivot pin of the six pecker lever (top) spring anchors from its bearing slot in the support block of the anchors' adjustment screws Q, together with the anchors.

**N.B.:** If the anchors are removed from their pivot, they should be replaced in their original order when reassembling.

- 13.15 Slacken the clamp screw of the cam sleeve, and withdraw the sleeve from the shaft.

(When reassembling, note that the clamp screw should engage with the flat on the shaft, to ensure correct alignment of the cams with the coupling dog at the rear of the unit.)

- 13.16 Turn the transmitter over and release from their anchors:-

- (a) return spring of cam follower Z, Fig 7, and feed pawl U.
- (b) return spring of retention pawl V.
- (c) spring of cam (felt) lubricator assembly.

- 13.17 Withdraw the coupling dog, together with the camshaft.

**N.B.:** If, for any reason, the dog is removed from the shaft, it should be so replaced that its clamp screw (shown dotted in coupling dog Y) engages with the flat on the shaft, to ensure correct alignment of dog and cam sleeve.

- 13.18 Slacken the screw of the retaining collar on the common pivot of the feed and retention pawls U and V, cam follower Z and the split ring, and withdraw the assembly from the pivot.

(When reassembling, locate the assembly on its pivot by means of the retaining collar, so that the rear face of the feed pawl clears the main casting, and the flanges of the retention roller arm do not foul the sides of the tape feed ratchet.)

- 13.19 Slacken the screw of the retaining collar of the cam (felt) lubricator assembly, and withdraw the assembly from its pivot.

- 13.20 Slacken the screw W, which secures the tape feed ratchet X to the feed wheel shaft, and remove the ratchet.

- 13.21 Turn the casting over, and withdraw the tape feed wheel and shaft.

(When reassembling, note that the feed ratchet should be so replaced on the feed wheel shaft that Adjustment No. 28 is satisfied.)

#### 14. Tape Control Unit (Fig. 8)

- 14.1 Drive out the taper pin T, Fig. 8, taking care not to burr the end, and draw the driving wheel I off its shaft.

- 14.2 Withdraw the ratchet shaft assembly, together with its special washer R, from the bearing block S.
- 14.3 Dismantle the ratchet shaft assembly by removing the screw B and withdrawing the clutch sleeve with its pawls A and spring P intact. Be careful not to lose the special washer under the head of screw B, inside the clutch sleeve N.
- 14.4 To dismantle the clutch sleeve N:-
- (a) unhook and remove the pawl spring P by prising up the end which has a small pip.
  - (b) insert a small punch in the hole O in the centre of the clutch sleeve N and tap out the pawl pivot pin. Remove the pawls and distance piece.
- (When reassembling, see Item A for the correct position of the pawls. The distance piece should be assembled with the curved lobe towards the claw of the pawl, and the rear sloping face of the distance piece parallel to the rear face of the pawl.)
- 14.5 Remove the screw W, and lift the bearing block S off its locating pins.
- 14.6 Remove the locking ring L, unhook springs H and Z from their anchor pins and remove the tape control lever E.
- (When reassembling, ensure that the tape control lever E is free to fall under its own weight.)
- 14.7 Disengage spring Y from its anchor pin. Remove the locking ring U, and take off the retention lever X, together with its spring Y and special washer.
- 14.8 Remove the screw C and disconnect the flexible lead from the contact block assembly K. To prevent its loss, secure the spacing collar to the contact block assembly K by means of screw C. Release spring AB from its anchor pin and remove locking ring M. Remove the switch arm lever V, together with the spring AB and the flexible lead.
- (When reassembling, and before engaging the spring AB with its anchor pin, ensure that the switch arm lever V and lever F are perfectly free, but with a minimum amount of end play.)
- 14.9 Remove the spring washer from in front of the detent lever F, and withdraw the lever from its pivot.
- (When reassembling, ensure that the spacing washer is between the detent lever F and the switch arm lever V.)
- 14.10 Remove the screw AA, spring washer, and washer securing the detent adjustment plate G, and remove the plate.
- 14.11 Remove screw D and contact assembly K.
15. **Keyboard** (Figs. 9 and 10)
- 15.1 Withdraw the two screws J, Fig. 10, and remove the keyboard mask G and keyboard guide rack.

- 15.2 Remove the two sets of screws and washers F, Fig. 9 and lift off the stop plate B, complete with 'Figures', 'Letters' and 'Space' keybars, if fitted.
- 15.3 Remove the two screws A, Fig. 10, and lift off the keep plate H.
- 15.4 Disengage the springs C, Fig. 9, from the keybars E, and remove the keybars.

**N.B.:** If more than one or two keybars are removed, it is advisable to make a sketch plan of the keyboard layout, i.e. a list should be made of all the slot numbers in the front rack D with their corresponding keybars.

(When reassembling, check that the springs on the 'Figures', 'Letters' and 'Space' keybars have a greater number of coils than the other springs. Ensure that the tops of the springs are anchored in the correct holes, and that the keybars are in their correct slots.)

- 15.5 Further dismantling should not, normally, be necessary, but if it is desirable, the method of procedure is obvious.

## 16. Perforator Operating Unit (Figs. 11 and 12)

- 16.1 Remove the two sets of screws and washers AG, Fig. 12, which secure the driving shaft at the rear of the unit. Remove the driving shaft AH, complete with driving gear O, and two bearing blocks AF.
- 16.2 Remove the three sets of nuts and washers AB securing the front plate U, and remove spring AK from its anchor pin.

(When reassembling, position the retention lever C so that it is approximately central with the retention cam, and there is a small clearance between its shouldered bush and the front plate. Move the collar Z against the retention lever C, and clamp it in position.)

- 16.3 Remove the front plate U. Remove the lubricator fixing nut and washer S, and remove the lubricator T, together with its spring V.
- 16.4 Unhook the detent spring from its anchor pin. Remove the two sets of bolts and washers which secure the detent N and remove the detent. Remove the detent mounting block M, taking care not to lose the shims from between the block and the back plate.

(When reassembling, place the detent block M so that the end which is furthest away from a screw hole is towards the back plate.)

If there is any doubt as to the number of shims which should be placed between the detent block and the back plate, carry out the following procedure:-

- (a) Assemble the detent block M and fixing screws without any shims.
- (b) If collar X is secured by its screw, this should be slackened.
- (c) Position the shaft so that the latch F is centrally opposite to the detent reset cam.
- (d) Move the collar X against the bush in the back plate, and secure it with its screw.
- (e) Pull the detent shaft away from the back plate and measure the gap between collar X and the bush.



- (f) Remove the detent mounting block, and insert sufficient .005 in. shims (Part No. PW.5277) between the detent block and the back plate to reduce the gap just measured to .005 in. or less.
  - (g) Reassemble the detent block and detent, complete with shims.
- 16.5 Remove the locknuts A, Fig. 11, the retaining plate B and the clutch spring C.
- N.B.:** If difficulty is found in holding the camshaft assembly G steady in order to remove the lock nuts A, a spanner may be fitted to the flats of the collar (not shown) which abuts the first cam from the backplate H. On reassembly, the same method of holding the shaft may be used.
- 16.6 Remove the ratchet K.
- 16.7 Push out pin J and remove the clutch dog D, taking care not to lose the shims E, and remove the gear wheel F from the camshaft G.
- (When reassembling, care should be taken to replace the clutch dog D and ratchet F so that they are in correct relationship to the camshaft spindle before fitting the pin J. This may be achieved by turning the camshaft until the retention lever is resting in its cam fall, and turning the clutch dog and ratchet until one camming out face of the clutch is uppermost. If there is any doubt as to the number of shims which are needed between gear F and dog D, the following procedure should be carried out:-
- (a) Reassemble the clutch as described above, but without any shims between dog and gear.
  - (b) When the pin J is in position, pull the camshaft forward away from backplate H so that there is a gap between the shaft and its oil-impregnated bush in the back plate at point 'x'.
  - (c) Measure the gap at 'x', and insert sufficient .005 in. shims (Part No. PW.5277) between the gear and dog to bring the gap down to .005 in. or less.
- 16.8 Detach the spring I, Fig. 12, of locking frame L from its anchor pin. Slacken the screw R and withdraw the locking frame L, locking lever K, and collar Q from their common pivot.
- (When reassembling, care should be taken to so position the locking frame on its pivot that the toe of the locking lever is central with the keyboard locking cam J.)
- 16.9 Unhook the spring AJ from its anchor pin, and remove the retention lever C from its pivot, complete with spring. Remove collar Z.
- (When reassembling, the screw in the collar should be left loose.)
- 16.10 Remove the detent control shaft Y and associated parts, i.e. detent operating lever AN, latch carrier E, latch F and perforator release lever AL.
- (When reassembling, engage the perforator release lever AL in the claw of the release bar AM. If collar X has been disturbed, it should be positioned so that latch F is centrally opposite to the detent reset cam H.)
- 16.11 Remove the camshaft W, complete with cams.

- 16.12 Remove the clip which retains selector levers AO on their common pivot.  
(When reassembling the clip, ensure that the selector levers are free on their pivot, but have the minimum of end play.)
- 16.13 Remove the selecting levers AO, taking care not to lose the intervening spacers, which are liable to spring off the pivot.  
(When reassembling, one spacer should be placed between each pair of selecting levers, and also between the first selecting lever and the bush in the back plate.)
- 16.14 Remove the retaining pillar AC and lift off the release bar AM from the guide racks AD.
- 16.15 Procedure for further dismantling of the perforator operating unit is self-evident, but it should not, normally, be necessary to continue beyond this stage. The screw of the counter unit locating plate B is usually painted red, but it should not be disturbed, whether painted or plain.

## 17. Counter Unit (Fig. 1)

- 17.1 Remove the two screws securing the contact pileup F, Fig. 1, and lift off the pileup, complete with flex lead and plug (not shown).
- 17.2 Release spring J from its anchor pin.
- 17.3 Loosen the screw in the retaining collar H and remove the spring resetting lever D.
- 17.4 Remove two collars, one on the pivot of contact operating lever K and the other on the pivot of the retention pawl B. Remove the washer and the lever K.  
(When reassembling, replace the contact operating lever K so that the pivot of the retention pawl protrudes between the forked ends.)
- 17.5 Release the spring A from its anchor pin and remove the stop plate L.  
(When reassembling, before replacing the stop plate L, rotate the ratchet wheel G in an anticlockwise direction, sufficiently for the stud on the wheel to clear the stop plate L.)
- 17.6 Release the long spring M attached to the ratchet wheel G. Remove the collar and ratchet wheel G from their common pivot.
- 17.7 Remove the collar and feed link E from their common pivot, after releasing the feed link spring.
- 17.8 Release the spring C from its anchor pin and withdraw the retention pawl B, taking care not to lose the distance collar on top of the pawl.
- 17.9 Release the damping buffer spring from its anchor pin at the rear of the unit. Slacken the clamping nut and withdraw the damping buffer screw. Remove the components of the damping buffer, i.e. spring, clamp plate, friction plates, damping buffer and second friction plate.
- N.B.:** When the counter unit has been completely assembled, but before it has been replaced on the keyboard, Adjustment No. 7 should be carried out.

## 18. Combination Unit (Fig. 2)

18.1 Remove the collar (or Anderton clip) which secures pivot G, Fig. 2, in bracket F. Withdraw the pivot from the rear, removing from it successively:-

- (a) trip lever C;
- (b) spacing washer;
- (c) split ring (or collar);
- (d) five connecting levers B, with four intervening split rings;
- (e) shims E.

(When reassembling, replace the pivot from the rear, thread on the above parts in reverse order, taking care that the shoulders of levers B face the front of the unit. When reassembled, all levers should move freely, but with a minimum of end play.)

18.2 Slacken screw Q and withdraw pivot O slowly, removing from it successively:-

- (a) collar P;
- (b) five connecting levers A, with four intervening split rings.

(When reassembling, insert pivot O through the hole in its support from the rear, threading on the parts listed above in reverse order, ensuring that the shoulders of the levers are towards the front of the unit. Check, after assembly, that the parts are free to move on their pivot, but have the minimum of end play.)

18.3 Slacken screw N, and remove collar S. Withdraw the pin U.

18.4 Withdraw the five combination bars V, W, X, Y and Z. Lift the left-hand end of the locking bar M, and withdraw it. Release spring J from its anchor pin on the trip bar L and withdraw the bar.

(When reassembling, note that the five combination bars, and the locking bar, are numbered on their right-hand ends. They should be replaced in the following order:-

No. 1	Combination bar	V (occupying rear slot)
2	"	W
3	"	X
4	"	Y
5	"	Z

Shift lock bar M, occupying sixth slot from rear,  
Trip bar L, occupying the front slot.

Check that the combination bars move freely in their racks without any sticking, and that when the trip bar L is moved to the left and released, it returns snappily under the action of spring J.)

18.5 Remove the trip bar spring J. Remove the two sets of screws and washers AA which secure the brackets for the End-of-Line Indicator trip rod K, if fitted. Remove the brackets, together with the rod.

- 18.6 Slacken the two sets of nuts and washers H which secure the locking bar jockey bracket and spring. Remove the bracket and spring.
- 18.7 The dismantling of the remainder of the unit is self-evident, but is not normally necessary.

(When reassembling, if the combination bar racks have been removed, care should be taken to locate them correctly against the back of the combination bar support plate.)

## 19. Punch Block Unit (Figs. 13 and 16)

- 19.1 Slacken the two screws D, Fig. 16, which secure the cuttings Chute A, and withdraw the chute. Remove the screws C and E, and remove the punch block head.

**Note:** Instructions for dismantling the punch block head are given on page 18 in Section 20.

- 19.2 Remove the four sets of nuts and washers which secure the front support plate, shown dotted in Fig. 13, at points N, V, W and AA. Remove the plate, taking care not to lose any shims which may lie between the cam sleeve end face S and its bearing in the plate.

- 19.3 Remove the collars from pivots V and W. Turn the cam until roller K is clear of the left-hand detent X, and lift off both detents X and T from their pivots, together with their common spring. Remove the spring.

**N.B.:** It should not be necessary to remove the two collars behind the detent (not shown) which position the detents on their respective pivots, but if they are removed they should be replaced so that the detents lie centrally disposed with respect to the cam pawl L.

- 19.4 Disengage the front spring O from its anchor pin, and remove the nut and washers from pivot P. Remove the following parts from the pivot:-

- (a) front eccentric collar.
- (b) front retention pawl R.
- (c) Washer
- (d) rear retention pawl and its spring.
- (e) rear eccentric collar.

- 19.5 Lift the cam sleeve and camshaft, together, from their rear bearing, taking care not to lose any shims which may be present. Press the cam pawl L backwards against its circular flat spring, and withdraw the sleeve S from the shaft.

- 19.6 Push out the pivot pin M from the side of the cam remote from the pawl, and remove the pawl and pawl spring.

(When reassembling, replace the pawl in such a way that the tail of the pawl spring engages in the nick on the upper surface of the pawl.)

- 19.7 Remove the metal guard plates (not shown) which cover the gear wheels of the intermediate shaft Q. Remove the screws and spring washers which secure the

shaft bearing blocks to the unit back plate, and lift off the complete assembly of shaft, bearing blocks and gear wheels.

- 19.8 Remove the collar Z and lift off the complete punch block casting from pivot AA.
- 19.9 Remove the spring from the tail of the tape feed retention pawl AB, and remove the pawl.
- 19.10 Remove the clamping screw and washer H of the retention pawl adjustment plate I, and the capstan head eccentric screw, and lift the plate from its pivot.
- 19.11 Knock out the pivot of the adjustment plate I, taking care not to damage its end face, from the side furthest away from the plate, and remove the flanged tape guide roller G, taking care not to lose the shims which lie between the flanges of the roller and the punch head casting.  
  
(When reassembling, position the roller by means of the shims so that the tape is centrally disposed about the punches.)
- 19.12 Remove the screw which secures the tape guide J to the punch head casting, and remove the guide.

## 20. **Punch Block Head** (Figs. 13, 14, 15, 16 and 17)

- 20.1 Remove the spring M, Fig. 16, from the tape guide frame L, and the spring N from the guide frame latch K.
- 20.2 Remove the two screws G and J, Fig. 14, which secure the support bracket N to the underside of the punch block head, and remove the bracket, complete with the eccentric assembly M and the latch A.
- 20.3 Remove the two screws which secure the tape guide frame L, Fig. 16, to the punch block casting. Remove the frame, taking care not to lose the two spacing washers which lie between the frame and the casting.
- 20.4 Remove the two screws J and remove the tape guide H. Remove the two screws which secure the stripper spring AL, Fig. 13, to the punch block unit, and remove the spring.
- 20.5 Remove the two screws B, Fig. 15, which secure the cover plate C of the punch block head assembly, and remove:-
  - (a) cover plate C.
  - (b) two die plates D.
  - (c) tape guide plate A.
  - (d) four die plates Q.
  - (e) five message punches O and the feed hole punch.
- 20.6 Turn the punch block over and remove the two screws M. Then remove the four bottom guide plates N.

(When reassembling, replace the guide plates N, and die plates D and Q, so that their cut-away corners are towards the feed wheel knob. Ensure that the

punches are free, after tightening screws B and M. It is advisable to tighten these screws alternately, each a little at a time.)

- 20.7 Remove the four screws O and R, Fig. 17, which secure the feed wheel shaft bearing blocks A and D to the punch head casting, and lift off the complete feed wheel shaft assembly.
- 20.8 Remove the left-hand bearing block A from the shaft, taking care not to lose the shims, if fitted.
- 20.9 Remove nut K, spring washer J, and washer L, knock out the rivet and remove the feed wheel knob H, the back space ratchet G, the feed ratchet M and the retention sprocket F.

(When reassembling, place the two ratchets G and M shoulder to shoulder, with ratchet G feeding clockwise, and ratchet M anti-clockwise, as viewed from the feed wheel knob side.)

- 20.10 Knock out pin N, which secures the ratchet bush E to the feed wheel shaft. Remove the bush, followed by the right-hand bearing block D and shims C.

(When reassembling, replace the bearing blocks A and D so that, when they are viewed from the feed wheel knob end of the shaft, their locating pins point in an anticlockwise direction, and ensure that the feed wheel shaft rotates freely when the bearing blocks are screwed down.)

## 21. Anvil Bracket (Fig. 5)

- 21.1 Remove the fixing screw of the bracket which carries the feed pawl adjusting screw C, Fig. 5, and remove the bracket. Remove the screws X, and remove the feed pawl E, together with its supporting bracket, disengaging the pawl return spring from the tail of the back space key D. Remove the pivot screw of the pawl, and separate pawl and bracket.
- 21.2 Remove the screw Y which secures the pivot bracket of the back space key D, and remove bracket, pivot and key. Remove the back space key assembly from its pivot, and dismantle the eccentric H, thus separating the key sections F and G.  
**N.B.:** Careful note should be taken of the arrangement of the springs K of the compliant members, and they should be similarly arranged when reassembling.
- 21.3 Remove the two shouldered screws which secure the punch withdrawing bracket V to the casting. Detach the two bracket springs (one shown at T), and remove the bracket.
- 21.4 Remove the threaded pins S and W, which retain the selector bars. Remove the three 'bent' selectors R, and the two straight bars Q.
- 21.5 Remove the two screws which secure anvil Z, and remove the anvil. Remove the two screws securing the selector bars' guide rack to the anvil bracket casting, and remove the rack, taking care not to lose the shims from between rack and casting.
- 21.6 Remove the two nuts A, and the threaded spring adjuster, complete with tension spring B.

22. **Motor Unit** (Motors Type KBB and KBE only) - (Fig. 18)

- 22.1 Slacken the screw securing the drip proof cover and remove the cover.
- 22.2 Remove the brush box covers, followed by the brushes, noting the position of each brush in its box. Slacken the two screws securing each brush box and remove the boxes, leaving them suspended on their connection wires.
- 22.3 Remove the two screws which secure the end plate U, Fig. 18, to the motor body.
- 22.4 Remove the three screws which secure the trefoil shaped clamp ring M to the inner clamp ring P. Remove ring M and gasket N.
- 22.5 Using a hide or wooden mallet, gently tap out the armature shaft from the commutator end, and remove the complete armature and end plate assembly.
- 22.6 Remove the three screws which secure the trefoil shaped clamp ring Y and remove the clamp ring, followed by gasket AA, special spring washer W and motor end plate U.
- 22.7 Release the screw of locking collar V and remove the collar. Using bearing extractors, remove each ball race, and the clamp rings P and S with their gaskets AE and AB.

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

- (a) Place new fibre gaskets on their respective rings, taking care to register the screw holes in each gasket ring pair.
- (b) Replace the clamp rings P and S, and their gaskets AE and AB, on the armature shaft. Replace the two ball races and the locking collar V, ensuring that the latter is pushed hard up against the race, and tighten the fixing screw.
- (c) Obtain a piece of 6BA screwed rod, about three inches in length, and engage it for a few turns into one of the screw holes of clamp ring S.
- (d) Smear a little CREED Lubricant No. 4 in the housing of ball race T, and hold the armature shaft upright, commutator end downwards.
- (e) Lower the motor end plate into position on the shaft, passing the 6BA rod through one of the clamping screw holes in the end plate U.
- (f) Replace the special spring washer W on the ballrace, and lower the trefoil shaped clamp ring, and gasket, into position, passing the rod through a screw hole.
- (g) By means of the rod, raise the inner clamp ring S into contact with the end plate U, and insert two screws to hold it in place. Remove the rod and insert the third screw. Tighten the three screws, each a little at a time, in turn.
- (h) Engage the 6BA rod for a few turns into one of the screw holes of clamp ring P. Replace the armature into the body of the motor, passing the rod through one of the clamping screw holes in the commutator end plate C.

- (i) Rotate the tongue on end plate U into register with the slot in the motor body and tap the shaft home. Press the end plate U firmly into contact with the motor body and secure with its two clamping screws, tightening each in turn.
  - (j) Replace the trefoil shaped clamp ring M, and gasket N, passing one screw hole over the 6BA rod. Secure M to ring P by the method given in (g) in the previous page. Ensure that the shaft rotates freely. If this is not so, tap the shaft with the mallet, at one end or the other, as may be found necessary.
  - (k) Reassemble the brush boxes to the rocker arm, adjusting their fixing screws E and K in their slots to give a clearance from the commutator of .010 - .015 in. (.25 - .38 mm.) at 'a'. Clamp the fixing screws before removing the feeler.
  - (l) Replace the brushes in the channels from which they were removed.
- N.B.:** If new brushes are fitted, carry out the instructions in Maintenance Section B.4.4.
- (m) Replace the drip cover, reassemble the motor on the Teleprinter and replace the governor.

**Note:** If the brush rocker arm is removed, care should be taken to replace it so that the mark on the rocker lines up with the mark on the commutator end plate.).

### 23. Governor Unit (Governed Motors only) (Fig. 20)

**N.B.:** Do not dismantle the governor unit unless absolutely necessary.

- 23.1 When removing the governor spring, first withdraw the two screws which secure the spring anchor B, Fig. 20, and remove the anchor from its seating to release the tension of spring A.
- 23.2 If the governor contacts only are to be removed, apply the adjusting clamp (provided in the Tool Kit) to anchor the contact arm which holds the spring, before removing the contacts.
- 23.3 Provided that the above precautions are taken, dismantling procedure is self-evident.

## C. TO INSERT A NEW ROLL OF TAPE

### 24. Instructions for Model 7P/N (Fig. 21)

- 24.1 Open the door of the tape roll holder A, Fig. 21, and place a new roll of tape on the tape wheel so that it unwinds in an anticlockwise direction, as viewed from the front of the machine.
- 24.2 Feed the end of the tape B down between the two guide pins C, under the snatch roller D of the tape wheel brake and over the tape guide bracket E on the left-hand end of the main casting. Close the door of the tape roll holder.



- 24.3 Raise the tape guide frame J on the punch block head, thread the tape under the roller F on the punch block casting, between the die plates and punch guide plates at G, over the tape feed wheel H, and through the tape tear-off slot at K.
  - 24.4 Lower the tape guide frame on to the tape, and feed through a small length by turning the feed wheel knob.
25. **Instructions for Model 67P/N** (Fig. 21)
- 25.1 Carry out instructions 24.1 to 24.4 above.
  - 25.2 Perforate a length of tape and feed it over and under the rollers of the tape runway L, over the tape guide bracket M on the transmitter stand O, and under the tape control lever guide N.
  - 25.3 Raise the tape retaining assembly of the Model 6S/5 Auto-Transmitter and feed the tape along the surface of the pecker guide plate, engaging the feed holes in the tape with the feed wheel of the transmitter.
  - 25.4 Lower the tape retaining assembly, and ensure that it is properly latched.

### ADJUSTMENT INSTRUCTIONS

- N.B.:**
- (1) Screws or nuts which are painted red should not be disturbed unless a specific instruction to do so is given. The majority of such screws and nuts are located in the Factory by means of a special gauge, and if disturbed it may be necessary to return the unit to the Factory for readjustment
  - (2) It is inadvisable, at a routine maintenance visit, to disturb any adjustment unless it is found to be incorrect. To simplify the checking of adjustments, without disturbing them, each of the following adjustments is divided into distinct sections headed 'Check' and 'Action'.
  - (3) If an individual adjustment is carried out, i.e. not as part of a given sequence, all related adjustments should be checked to ensure that they remain unchanged.
  - (4) Before commencing adjustments, turn back the safety cover of the motor hand wheel (Model 7P/N, ungoverned motor) or of the motor governor (Model 67P/N, governed type motor) in order that the motor may be easily turned by hand to perform those 'Checks' which require this to be done.
  - (5) In the following adjustments the term 'rest position' is intended to denote the position of the machine parts when the cams are located properly by their retention pawls or levers.

## A. PERFORATOR OPERATING UNIT

### 1. Retention Lever (Fig. 22)

#### *Check*

- 1.1 With the keyboard off the main base, turn the camshaft by hand until retention lever B, Fig. 22, drops into a recess of cam C. Turn the clutch ratchet J anti-clockwise (as viewed from the rear of the keyboard) as far as it will go, i.e. until the pin of the detent G is located against the straight part of the camming out face of the ratchet, and hold it there.
- 1.2 With the clutch ratchet held in this position, check that there is a gap of .070 - .080 in. (1.78 - 2.03 mm.), i.e. dimension 'a' (inset) between the end of the retention lever B and the vertical face of the recess in cam C.

#### *Action*

- 1.3 If this is not so, holding the clutch ratchet firmly against the detent pin, slacken screw A and adjust retention lever B, by means of the screwdriver slot, until dimension 'a' is obtained. Tighten screw A.

#### *Check*

- 1.4 Repeat Checks 1.1 and 1.2 for the other recess of cam C.

#### *Action*

- 1.5 If Check 1.4 is not satisfactory, readjust the position of the retention lever until Checks 1.2 and 1.4 are both simultaneously satisfied.

### 2. Trip Detent (Fig. 22)

#### *Check*

- 2.1 With the keyboard in the rest position, check that there is a clearance of .010 - .012 in. (.25 - .30 mm.) between the teeth of the clutch ratchets. (N.B.: On some keyboards it may not be possible to measure this dimension directly, with accuracy, because the teeth of the gear ratchet are recessed below the gear. If this is the case, the following indirect method of measuring the dimension may be used:-
  - (a) Pull forward spring H, Fig. 22, to expose gap 'b'. Measure and note the size of this gap.
  - (b) Lift detent G, and rotate the clutch ratchet through a quarter of a revolution.
  - (c) Pull forward spring H again and insert various thicknesses of feeler gauge into gap 'b' until, with the clutch ratchet pressed back to grip the gauge, the tips of the ratchet teeth are just touching. This can be tested by touch, by rotating the gear wheel K. Note the value of gap 'b'.
  - (d) The difference between the two values for gap 'b' should be .010 - .012 in. (.25 - .30 mm.).

#### *Action*

- 2.2 If the clearance between the clutch ratchet teeth was measured by the *direct* method as given in Check 2.1, but was found to be incorrect, then slacken the detent fixing screws F and adjust detent G on its pivot to obtain the required dimension. Tighten screws F.

- 2.3 If the clearance between the clutch ratchet teeth was measured by the *indirect* method, as given in Check 2.1, and was found to be incorrect, then turn the shaft to the rest position and slacken screws F.
  - 2.4 Set the feeler gauge to the value of gap 'b' as found in paragraph 2.1(c), minus .011 in. (.28 mm.), and insert it in gap 'b'.
  - 2.5 Pull the ratchet back to grip the gauge, move the detent G outwards until it is arrested by the camming out face of the ratchet, and tighten screws F.
3. **Locking Frame** (Fig. 22)

*Check*

- 3.1 With the unit in the rest position, i.e. with retention lever B, Fig. 22, located in a recess of cam C, check that cam lever N is centrally aligned with the cam R, looking from the right-hand end of the keyboard unit.

*Action*

- 3.2 If this is not so, slacken screw M and adjust collar L until the correct condition is obtained. Tighten screw M.

*Check*

- 3.3 Check that, with the unit still in the rest position, there is a clearance of .005 - .015 in. (.13 - .38 mm.), i.e. dimension 'c', as judged by eye, between the knife edges of the selectors Q and the locking frame P when they are in line.

*Action*

- 3.4 If this is not so, slacken locking screw O and set the correct gap by positioning cam lever N. Tighten the locking nut of screw O.

## B. COMBINATION UNIT

4. **Locking Bar Jockey Spring** (Fig. 24)

*Check*

- 4.1 With the unit off the keyboard, check that the locking bar A, Fig. 24, moves snappily from one shift to the other when a force of 5½ to 7 ozs. (156 - 196 gms.) is applied to it. The forces required to move the bar in either direction should be equal to within ½ oz. (14 gms.).

*Action*

- 4.2 If adjustment is necessary, slacken screw B and position spring C to give the correct conditions.

5. **Trip Bar Stop and Trip Lever** (Fig. 23)

*Check*

- 5.1 With the unit on the keyboard, depress each key in turn and note which one gives the least lift to the trip detent L (inset), Fig. 23.

- 5.2 With this key depressed, there should be a clearance of approximately  $\frac{1}{32}$  in. (.8 mm.) between the pin of detent L and the rim of the clutch ratchet K, i.e. dimension 'g'.
- 5.3 With the machine in the rest position, check that there is a clearance of  $\frac{1}{32}$  in. (.8 mm.) between the detent release latch F and the detent operating lever E, i.e. dimension 'f'.

*Action*

- 5.4 If either of the above conditions is not obtained, adjust as follows:-
- 5.5 Slacken the locknut of stop screw J and adjust the screw until dimension 'f' is approximately  $\frac{1}{16}$  in. (1.6 mm.). Clamp screw J lightly with its locknut.
- 5.6 Holding down the key which gives the least lift to the trip detent (as described above in Check 5.1), slacken screw G and, by means of the screwdriver slot H, set up a clearance of  $\frac{1}{32}$  in. (.8 mm.) between the clutch ratchet K and the pin of the detent L, i.e. dimension 'g' (inset). Tighten screw G.
- 5.7 With the machine in the rest position, slacken the locknut of stop screw J and adjust the screw until the clearance between the detent release latch F and the detent operating lever E is  $\frac{1}{32}$  in. (.8 mm.), i.e. dimension 'f'. Clamp screw J with its locknut.

### C. COUNTER UNIT

#### 6. Damping Buffer (Fig. 27)

*Check*

- 6.1 Check that a force of 11 - 13 ozs. (.31 - .37 Kg.) applied against pin O, Fig. 27, in the direction of the arrow, will just move the damping buffer.

*Action*

- 6.2 If it does not do so, slacken nut M and hold it with a 6BA spanner. Adjust screw N until check 6.1 is satisfied, and tighten nut M.

#### 7. Feed Pawl (Figs. 25, 26 and 28)

**N.B.:** Check 7.1 should be carried out only at major overhauls, when the unit is off the keyboard.

*Check*

- 7.1 With the retention pawl L, Fig. 26, engaging one of the teeth of ratchet wheel J, check that there is a clearance of .008 - .012 in. (.20 - .31 mm.), i.e. dimension 'n', between the top edge of the feed pawl F and the engagement face of the fourth tooth past the one in engagement with the retention pawl L.

*Action*

- 7.2 If this is not so, slacken screw H, Fig. 25, and position the feed pawl F, by means of the screwdriver adjustment G, to satisfy Check 7.1. Tighten screw H.

*Check*

- 7.3 Turn the ratchet wheel J, Fig. 28, until the retention pawl L is resting on top of a tooth. In this position, the grub screw P should clear the retention pawl extension (tail) by .003 - .005 in. (.08 - .13 mm.), i.e. dimension 'o'.

*Action*

- 7.4 If this is not so, slacken the locknut of grub screw P and adjust the screw until Check 7.3 is satisfied. Tighten the locknut of screw P.

**8. Contact Blades (Fig. 1)**

*Check*

- 8.1 Feed the counter on until the contacts F, Fig. 1, close, and check that there is a gap of .005 in. (.13 mm.) between the ear of the left-hand contact blade and its stop.

*Action*

- 8.2 If this is not so, 'set' the contact stop to satisfy the required condition.

*Check*

- 8.3 Trip the counter and check the gap between the contacts. This should be .015 in. (.38 mm.).

*Action*

- 8.4 If this is not so, 'set' the right-hand contact blade to obtain the required dimension.

**9. Retention Pawl Extension (Fig. 25)**

*Check*

- 9.1 Check that, with the counter unit in the rest position, the latching face of the retention pawl extension A, Fig. 25, is flush to .005 in. (.13 mm.) underflush with the right-hand face of the stop plate extension K, and ensure that the stop plate extension does not drop when the counter unit is stepped round by hand.

*Action*

- 9.2 If Check 9.1 is not satisfied, slacken screw B and move the retention pawl extension A until the correct condition is set up. Tighten screw B.

**10. Trip Lever (Fig. 25)**

*Check*

- 10.1 Feed on the counter unit a few teeth by hand. Slowly depress the carriage return key, and check that the unit trips at the same moment as the clutch of the perforator operating unit.

*Action*

- 10.2 If this is not so, slacken screw E, Fig. 25, and, by means of the screwdriver adjustment, position the trip lever until the required condition is obtained. Tighten screw E.

## D. KEYBAR STOP PLATE

### 11. Keybar Travel (Fig. 24)

#### *Check*

- 11.1 Depress the 'figures' key. Depress any key in the 'letters' case on the left-hand side of the keyboard, and check that the clearance between the upper stop plate R, Fig. 24, and the depressed keybar S is between .030 - .040 in. (.75 - 1.0 mm.).
- 11.2 Depress the 'letters' key, and repeat the above Check with a key in the 'figures' case on the right-hand side of the keyboard.

#### *Action*

- 11.3 If either of the above conditions is incorrect, slacken screws Q, and position the stop plate R until the correct clearance is obtained at both ends of the keyboard.

**N.B.:** If adjustment is carried out, ensure that the combination bars move freely, without touching the keybars at any point.

## E. PERFORATOR UNIT

### 12. Punch Block Vertical Play and Clutch Detents (Figs. 13, 29 and 30)

#### *Check*

- 12.1 Depress any key, and turn the motor by hand. Press down on the left-hand end of the punch block unit, and check the clearance between cam follower roller K, Fig. 13, and cam L throughout its half revolution. Depress the key again, and repeat the check for the second half revolution. Roller K should not bind against the cam L at any point, and its clearance from the cam should not be greater than .006 in. (.15 mm.) at any point.

#### *Action*

- 12.2 If either of the above conditions is not satisfied, turn the cam L to the tightest point, i.e. to where the cam follower roller K is either binding against or is closest to cam L. Slacken the clamp screw which secures the eccentric pivot of the roller, and adjust the pivot until the estimated clearance between the roller and the cam is .001 in. (.03 mm.). Tighten the clamp screw.

#### *Check*

- 12.3 With the pawl E, Fig. 29, resting, as shown, against the vertical face of right-hand detent F, check that there is a clearance 'a' between screw H and the tail of detent F. This should be .022 - .028 in. (.56 - .71 mm.).

#### *Action*

- 12.4 If this is not so, slacken nut J, and adjust screw H to obtain the required clearance. Tighten nut J.

*Check*

- 12.5 Repeat Check 12.3, using the left-hand detent B, Fig. 30, and screw R.

*Action*

- 12.6 If Check 12.5 is unsatisfactory, slacken clamp nut Q, and adjust screw R to obtain the required clearance at 'a'.

13. **Retention Pawls** (Figs. 32 and 33)

*Check*

- 13.1 Turn the camshaft by hand until the pawl E, Fig. 32, engages with the left-hand detent B, and the tail of the pawl is pressed firmly against the cam. Check that the clearance 'b', Fig. 33, between the tail of the *rear* retention pawl M and the cam face is .002 - .004 in. (.05 - .10 mm.).

- 13.2 Turn the cam pawl E, Fig. 32, into engagement with the right-hand detent F, and repeat Check 13.1 for the *front* retention pawl M, Fig. 33.

*Action*

- 13.3 If either of the above Checks is not satisfied, slacken nut L, which clamps the two eccentrics, and adjust the eccentrics to satisfy the required conditions, dealing with the *rear* eccentric first. Clamp nut L.

14. **Trip Adjusting Arm** (Fig. 31)

*Check*

- 14.1 With the cam pawl E, Fig. 31, clear of both detents B and F, hold the right-hand extension of detent F against screw H, and the right-hand extension of detent B against the bent foot on the adjustable plate on detent F. Check that the clearance 'c' between screw R and the left-hand extension of detent B is .002 - .007 in. (.05 - .18 mm.).

*Action*

- 14.2 If this is not so, release screw K and adjust eccentric G to obtain the required condition. Tighten screw K.

15. **Location of Punch Block Unit** (Figs. 34 and 35)

*Check*

- 15.1 With the keyboard off the machine, depress the 'letters' key and rotate the camshaft by hand until the punch block head is fully down. Check that the punches H, Fig. 35, are fully seated down on the selector anvils, with the sides of the punches flush with the vertical ends of the anvils.

**N.B.:** The punch/anvil engagement may be easily viewed from the rear of the unit.

*Action*

- 15.2 If this is not so, remove the cuttings box, slacken screw K and rotate eccentric J away from the punch block unit back plate. Release the unit fixing screws.

- 15.3 Move the punch block unit until Check 15.1 is satisfied, and clamp into position with its fixing screws.

15.4 Rotate eccentric J into contact with the unit back plate and clamp it there with screw K. Replace the cuttings box.

## 16. Anvil Bracket Height – Preliminary Adjustment (Figs. 4 and 35)

### *Check*

16.1 With the selector anvils in the 'Mark' position (i.e. fully to the left, under the punches) and the punch block fully raised, check that there is a clearance of .026 – .036 in. (.66 – .91 mm.) between the lower ends of the punches and the tops of the anvils, i.e. dimension 'e', Fig. 35.

**N.B.:** If the punches have been re-ground, this dimension should be *reduced* by the amount by which the punches have been shortened.

### *Action*

16.2 If Check 16.1 is not satisfactory, slacken screws M, Fig. 4, remove the two screws K, and plate L, and add the correct number of shims (Part No. 1947/277) at J to give the required dimension. Replace plate L, and clamp it with screws K.

16.3 With the anvil bracket seated down on plate L, tighten screws M.

## 17. Trip Bar (Fig. 32)

### *Check*

17.1 Depress any key, and rotate the perforator operating unit camshaft by hand. Check that detents B and F, Fig. 32, are moved just clear of pawl E in both its positions.

### *Action*

17.2 If this is not so, slacken clamp screw P and adjust trip arm O, by means of eccentric A, until Check 17.1 is satisfied. Tighten screw P.

## 18. Punch Withdrawing Bracket (Fig. 35)

### *Check*

18.1 With the cam pawl arrested by one of the detents, and with the punch block head held up, by hand, as high as it will go (to take up any vertical play), check that the punches can be moved upwards by an estimated .002 – .008 in. (.05 – .20 mm.) before they are arrested by the punch withdrawing bracket.

**N.B.:** This check may best be made by means of a pair of tweezers, inserted through the 'window' of the withdrawing bracket from the left-hand end of the unit.

### *Action*

18.2 If Check 18.1 is not satisfied, release clamp screw M, Fig. 35, hold the punch head up as high as it will go, and turn eccentric L slowly *clockwise* until the punches are pulled down against the bottom guide plate by the withdrawing bracket N.

**N.B.:** Care should be taken not to force the punches down against the guide plate when the eccentric is turned.

18.3 Hold the punch head fully up, and measure the clearance at 'e'. Note this amount.



18.4 Turn the eccentric L *anti-clockwise* until an extra .002 – .008 in. (.05 – .20 mm.) can be inserted at 'e'. Clamp eccentric L with screw M.

18.5 Repeat Check 18.1.

19. **Tape Feed** (Fig. 34)

*Check*

19.1 With the cam pawl arrested by one of the detents, and with the punch block head in the rest position, check that the feeding face of feed pawl T, Fig. 34, nearly touches the bottom of a tooth of feed ratchet A. It should be just possible to move the pawl away from the ratchet without fouling the last tooth fed.

*Action*

19.2 If this is not so, release clamp screws O and position the feed pawl assembly to satisfy Check 19.1. Tighten screws O.

*Check*

19.3 Release the cam detent and turn the perforator camshaft by hand until the punch block head is fully down. Check that feed pawl T falls into the next tooth to be fed sufficiently to feed the ratchet on one tooth as the punch block head is raised up again.

*Action*

19.4 If this is not so, slacken nut P and adjust screw Q to obtain the required condition. Tighten nut P.

20. **Back Space Key** (Fig. 34)

*Check*

20.1 Depress the back space key and check that the compliant pawl of the assembly engages with the first tooth to the right of the vertical centre line of ratchet A, Fig. 34, and feeds the ratchet back one tooth.

*Action*

20.2 If this is not so, slacken the nut clamping eccentric E, and turn the eccentric to adjust the height of the back space pawl so that when the key is depressed the pawl engages with the correct tooth of the ratchet. Tighten the clamp nut of eccentric E.

20.3 Slacken screw G and adjust the eccentric so that the backward feed is correct. Tighten screw G.

21. **Tape Feed Latch** (Figs. 34 and 36)

**N.B.:** Checks 21.1 and 21.2 are preliminary Checks. A final Check, with the motor running, is detailed later, in Adjustment No. 40.

*Check*

21.1 Check that the slot between the tines F, Fig. 36, of the tape guide is centrally disposed about the teeth of the feed wheel M.

21.2 Insert a length of tape punched with feed holes, and check that the tips of the tines just touch the tape. (**N.B.:** This Check may be performed as follows:

Raise the retention lever B, Fig. 34, out of engagement with the sprocket wheel. Raise the tines F, Fig. 36, and turn the knob J forward, noting the force required to do this. Lower the tines on to the tape, and turn the knob J again. There should be no discernible difference in the force required to turn the knob. Now check that there is no gap between the tips of the tines and the tape.)

*Action*

- 21.3 If either of these Checks is not satisfied (or if the Check detailed in Adjustment No. 40 is unsatisfactory), remove spring B, slacken nut A and turn eccentric R until latch S is disengaged from frame N, as shown in the left-hand sectional diagram of Fig. 36, at point T.
- 21.4 Slacken screws O and, pressing the tape lightly on to the rollers with guide F, slide the guide backwards and forwards until its curved underside is positioned concentrically with the rollers, ensuring that the slot in the guide is positioned centrally about the feed wheel teeth. Tighten screws O.
- 21.5 Replace spring B. Insert *two* thicknesses of tape punched with feed holes, and adjust eccentric R until, with the guide resting on the tape, the vertical face of latch S is *just* clear of frame N, at point T, as shown in the right-hand sectional diagram of Fig. 36. Clamp the eccentric with nut A.
- 21.6 Remove one thickness of tape. Slacken screws O again and move the guide towards frame N until the tips of the tines F just touch the tape, ensuring that the slot is still centrally disposed about the feed wheel teeth. Tighten screws O.
- 21.7 Reassemble the keyboard to the main base.

## F. MOTOR GOVERNOR

**Note:** The following instructions apply only to governed type motors.

### 22. Governor Brush Springs

*Check*

- 22.1 With the motor governor in its normal operating position, apply a lever type spring tension gauge to each brush in turn, and check that the force required to pull the brush clear of its slip ring is  $4\frac{1}{2}$  to  $5\frac{1}{2}$  ozs. (128 - 156 gms.).

*Action*

- 22.2 If this is not so, adjust the brush pressure by giving a slight 'set' to the brush spring, and also to its backing spring.

**N.B.:** When the governor is removed from the motor shaft, the brush backing spring should lie flat against the brush spring.

### 23. Governor Contacts (Fig. 20)

#### *Check*

- 23.1 Extend the governor spring until the contact arm saddle E, Fig. 20, is just touching the stop face of the contact arm stop spring D. Check that dimension 'I' is .015 - .020 in. (.38 - .51 mm.).

#### *Action*

- 23.2 If this is not so, extend spring A, as described above, using the governor adjusting clamp TA.1110 (supplied in the Tool Kit). Slacken screw C just enough to free contact screw F, and adjust F to obtain the required dimension. Tighten screw C. Relax the governor spring A, and remove the clamp.

## G. TRANSMITTER HEAD

**Note:** The following instructions apply to Model 67P/N only.

### 24. Pecker Response (Figs. 6 and 7)

**N.B.:** This adjustment should not require attention at routine maintenance visits, but should be checked when the transmitter is overhauled.

#### *Check*

- 24.1 With the transmitter head off the machine and its front cover removed, swing back the tape retaining assembly and turn the camshaft by hand until the first pecker is fully raised. Apply a pre-set type spring gauge, set at 180 gms., to the top of the pecker and depress it. Check that the gauge extension does not leave its stop when the pecker is down flush with the surface of the tape guide C, Fig. 6.
- 24.2 Repeat the above Check for each of the remaining four peckers, noting any one which fails to satisfy the required condition.
- 24.3 Set the gauge to 165 gms. Raise the peckers in turn, apply the gauge to the top of each pecker, and press it down flush with the surface of guide plate C. Slowly decrease the pressure, and check that the pecker begins to rise before the gauge extension touches its stop. Note any pecker which fails to satisfy this requirement.

#### *Action*

- 24.4 Adjust any pecker which fails to satisfy the above Checks by means of the appropriate screw Q.

**N.B.:** The ends of screws Q are chisel-edged, and engage with notches in the spring anchor levers, with the chisel-edges lying parallel to the camshaft axis. This arrangement is, therefore, self-locating. Each screw should be adjusted by a half turn at a time, *inwards* to *increase*, and *outwards* to *decrease* the tension. The correct engagement of the chisel-edges in the notches in the anchor levers is judged by touch.

*Check*

- 24.5 Rotate the camshaft by hand until the start/stop lever (i.e. the dummy pecker lever) is fully depressed by the cam. Set the gauge to 165 gms., apply it to the free end of the lever and depress the lever away from the cam. Check that the gauge extension does not leave its stop before the lever parts from the cam.
- 24.6 With the start/stop lever positioned as in Check 24.5, reset the gauge to 150 gms. and apply it to the free end of the lever once more. Depress the lever away from the cam, then slowly relax the pressure. Check that the gauge extension does not touch its stop before the lever touches the cam.

*Action*

- 24.7 If either Check 24.5 or Check 24.6 is unsatisfactory, adjust the lever spring tension by means of the appropriate screw Q, in the manner described in Action 24.4.

**N.B.:** If, after adjustment, the response of any pecker or of the start/stop lever, cannot be brought within the specified limits, check that this is not caused by undue friction between the pecker levers on their common pivot, or by fouling between the pecker springs. Friction between the pecker levers may be caused by the split ring which retains the levers on their pivot pressing too tightly against the front lever. Fouling between pecker springs may be caused by faulty reassembly. If no friction or fouling can be found, but the foregoing Checks cannot be satisfied, fit new pecker springs, as required.

The tensions given in the above adjustment for the pecker springs are intended to apply only when the standard fully perforated or 'chadless' tapes, as supplied by CREED & CO. LTD., are used. If special hardwearing 'chadless' tape is to be used, the tensions will need to be modified.

**25. Tape Retaining Assembly (Fig. 6)**

*Check*

- 25.1 With the tape retaining assembly latch AC, Fig. 6, held clear of the latching pin R, check that there is a clearance between the underside of the tape retaining assembly AE and the upper surface of the tape guide C, i.e. dimension 'a', of .010 - .012 in. (.25 - .30 mm.).

*Action*

- 25.2 If this is not so, slacken the lock nut of screw A and adjust A to obtain the required clearance. Clamp the locknut.

**26. Latch Lever (Fig. 6)**

*Check*

- 26.1 Check that the latch lever AC, Fig. 6, engages pin R so that the tape retaining assembly is held in place with a minimum amount of vertical play.

*Action*

- 26.2 If this is not so, slacken the clamp nut of the eccentric pivot T and adjust the pivot to obtain the required condition.

*Check*

- 26.3 Raise the tape retaining assembly and allow it to drop. Check that the assembly latches on pin R under its own impetus.

*Action*

- 26.4 If it does not, slacken screw AD, and adjust the stop plate AE until the centre of the sloping edge of the latch lever foot just comes into contact with the pin R. Tighten screw AD.

**27. Tape Guide (Fig. 6)**

*Check*

- 27.1 With the latch lever AC engaged with pin R, Fig. 6, check that there is a clearance between the foot of the tape guide A and the top of guide plate C, i.e. dimension 'b', of .015 in. (.38 mm.).

*Action*

- 27.2 If this is not so, slacken the two screws securing the guide S, and adjust the guide to give the required dimension. Tighten the guide clamping screws.

**28. Tape Feed Wheel (Fig. 7)**

*Check*

- 28.1 Turn the camshaft until all the peckers are fully down. Insert a piece of tape perforated with the 'letters' combination, and check by eye that the perforations are centrally disposed about the peckers.

*Action*

- 28.2 If this is not so, remove the rear cover plate, slacken clamp screw W, Fig. 7, and ensure that the retention roller V is fully engaged with ratchet X. Position the tape to satisfy Check 28.1 and tighten screw W.

**Note:** When screw W is slackened, the tape may be drawn freely backwards and forwards along its guide, thus rotating the tape feed wheel into the correct position for holding the perforations centrally disposed about the peckers.

**29. Tape Feed Pawl (Fig. 7)**

*Check*

- 29.1 With the cam in the position illustrated in Fig. 7, i.e. with the feed cam follower Z on the curved part of the cam periphery, insert a .021 in. (.53 mm.) feeler gauge between the follower and the cam. Press the follower against the gauge. Check that the tip of the feed pawl U is just touching the tooth last fed on the feed ratchet. Withdraw the feeler gauge slowly, and check that the ratchet does not move under the action of the retention roller V.

**Note:** The object of this Check is to ensure that when the .021 in. feeler is removed there shall be a clearance of .032 - .047 in. (.81 - 1.2 mm.) between the tip of the pawl U and the ratchet tooth last fed. This clearance cannot be measured directly.

*Action*

- 29.2 If Check 29.1 is not satisfactory, slacken screw AB and push pawl U as far as

it will go to the right.

- 29.3 Insert the .021 in. (.53 mm.) gauge as directed in Check 29.1, press the cam follower Z against the gauge, and move pawl U to the left until it is just fully engaged with a ratchet tooth. Tighten screw AB, and remove the gauge.
- 29.4 Rotate the camshaft slowly, and check that the pawl does not touch a tooth at the end of its feed movement and that the ratchet is fed forward one tooth before the shaft is brought back to the rest position.

*Check*

- 29.5 With the unit in the rest position, check that a force of 120 - 160 gms., applied at the spring anchor hole of the cam follower Z, is sufficient to just move the follower from the cam.
- 29.6 Check that the force required to just move the feed pawl down away from the feed ratchet is 45 - 70 gms., when measured at the pawl spring anchor hole.
- 29.7 Check that a force of 100 - 160 gms., applied at the retention roller spindle, is sufficient to just move the roller from the ratchet teeth.

*Action*

- 29.8 If the above checks are not satisfied, replace the relevant spring(s).

30. **Striker Dart** (Fig. 6)

**Note:** Before carrying out the following Checks, ensure that the striker dart is correctly aligned in its carrier, as described in Dismantling and Assembling Instructions, No. 13.6.

*Check*

- 30.1 Remove the spring J, Fig. 6, and swing the jockey roller assembly to the right, clear of the transmitter tongue M and the striker dart E. Turn the camshaft by hand until two adjacent pecker levers are at their crossover position, and check that the common lever frame B is *not* touching stop F.

*Action*

- 30.2 If this Check is not satisfactory, slacken screw G, move stop F out of contact with the common lever frame B, and tighten screw G.

*Check*

- 30.3 Insert a sufficient thickness of feeler gauge between the transmitter tongue M and contact K to bring the knife edge of the tongue directly opposite to the knife edge of the striker dart E.
- 30.4 Hold the tongue in this position and check that there is a clearance of .007 - .010 in. (.18 - .25 mm.) between the two knife edges when the dart is pressed lightly towards the tongue.

*Action*

- 30.5 If this is not so, slacken screw O and adjust the striker dart operating lever D to obtain the required clearance. Tighten screw O.

### 31. **Contact Gap** (Fig. 6)

#### *Check*

- 31.1 With two adjacent pecker levers at the cross-over position, as in Check 30.1, insert a .003 in. (.08 mm.) feeler gauge between the transmitter tongue M and contact K. Hold the tongue against the gauge, and check that the knife edge of the tongue is directly opposite to the knife edge of the striker dart E.

#### *Action*

- 31.2 If this is not so, slacken the clamp screw of contact screw K, and adjust K so that, with the tongue still held against the gauge, Check 31.1 is satisfied. Tighten the clamp screw.

#### *Check*

- 31.3 Repeat Check 31.1 for the other contact L.

#### *Action*

- 31.4 If Check 31.3 is unsatisfactory, carry out Action 31.2 on contact screw L.

### 32. **Common Lever Travel** (Fig. 6)

#### *Check*

- 32.1 Insert a length of tape punched with the 'Y' combination (1-3-5). Turn the camshaft by hand slowly, and check that the striker dart strikes with equal engagement on each side of the tongue.

#### *Action*

- 32.2 If this is not so, turn the cam until the front two pecker levers are at the cross-over position. Insert a .015 in. (.38 mm.) feeler gauge between the pecker levers and the common lever extension B. Slacken screw G, and adjust stop F so that it touches the side of the slot furthest from the dart E. Tighten screw G and repeat Check 32.1. If necessary, refine the adjustment to satisfy Check 32.1

### 33. **Jockey Roller** (Fig. 6)

#### *Check*

- 33.1 With the jockey roller frame in its operating position and spring J, Fig. 6, replaced, turn the camshaft by hand until two adjacent pecker levers are at their cross-over position. Check that the forces required to move the tongue from side to side do not differ by more than 5 gms. when measured at the tip of the tongue.

**Note:** The tongue should be moved from side to side several times before the measurement is taken.

#### *Action*

- 33.2 If Check 33.1 is not satisfactory, slacken the capstan-headed clamp screw of eccentric H, and adjust H until the required condition is obtained. Tighten the clamp screw, and repeat Check 33.1, paying attention to the note at the end of the Check.

*Check*

- 33.3 Check that the force required to move the tongue in either direction is within the range 100-120 gms.

*Action*

- 33.4 If this is not so, unclamp the contacts K and L and adjust them *equally*:-

- a) Screwing *in* to decrease the force.
- b) Screwing *out* to increase the force.

Ensure that the 5 gms. difference between the two forces is not exceeded. Clamp eccentric H.

*Check*

- 33.5 Check that the final contact gap, between either contact and the transmitting tongue M, is within the range .005 - .007 in. (.13 - .18 mm.).

*Action*

- 33.6 If Check 33.5 cannot be satisfied, fit a new jockey roller spring J, and repeat the whole Adjustment to this point.

*Check*

- 33.7 With the transmitting tongue M held by the striker dart E against the 'Mark' contact K, and the cam follower N just past its drop-off point, check that the force required to move the striker dart away from the tongue is 90 - 120 gms., as measured at the tip of the striker dart operating lever D.

- 33.8 With the peckers depressed by their cams, and the striker dart E withdrawn from tongue M, check that the force required to lift the common lever B against its spring is 60 - 70 gms., as measured at the pecker lever contact edge (tip of lever extension B).

*Action*

- 33.9 If either of these spring tension checks is not satisfactory, fit a new spring.

## H. TAPE CONTROL UNIT

### 34. Detent Lever (Fig. 19)

*Check*

- 34.1 With the tape control lever C, Fig. 19, lowered, turn the motor by hand until pawls A are immediately above detent E. Check that the pawls clear the detent by .004 - .006 in. (.10 - .15 mm.), i.e. dimension 'q'.

*Action*

- 34.2 If this is not so, slacken screw D, and adjust plate B until the required clearance is obtained. Tighten screw D.



*Check*

- 34.3 Raise the tape control lever C, turn the motor by hand, and ensure that the pawls are engaged by the detent.

35. **Retention Lever** (Fig. 37)

*Check*

- 35.1 With the tape control lever raised and the pawls A, Fig. 37, arrested by detent E, check that the retention roller (head of lever C) is fully seated in the fall of cam sleeve J.
- 35.2 With the retention lever roller fully seated in the cam fall, check that the pawls can be pressed away from the detent by an estimated .002 - .004 in. (.05 - .10 mm.).

*Action*

- 35.3 If the above Checks are not satisfied, slacken screw F, which secures eccentric D, and, keeping the retention roller seated fully in the cam fall, adjust pivot D until the required conditions are attained. Tighten screw F.

*Check*

- 35.4 Raise the tape control lever and engage pawls A with detent E. Turn the motor by hand, and check by touch that there is no fouling between the pawl tails and the teeth on the clutch ratchet shaft, i.e. that there is no 'pawl chatter'.

*Action*

- 35.5 If there is 'chattering', modify Action 35.3 until the 'chattering' ceases.

**N.B.:** It is advisable to check for 'pawl chatter' with the motor running, after all other adjustments are completed. Adjustment No. 37 is provided for this purpose.

36. **Send/Receive Switch** (Fig. 38)

*Check*

- 36.1 With the Transmitter Head off the machine, trip the Tape Control Unit detent, and turn the motor *slowly*, by hand, until the switch blades E, Fig. 38, are touching neither of the fixed contacts D and F. Check that the gap between the backs of the blades' contacts is not greater than .006 in. (.15 mm.). Check also that the blades are approximately central between the two fixed contacts' support blocks A and B.
- 36.2 Continue to turn the motor, slowly, until the two contact blades are fully flexed against the right-hand fixed contact D. Measure the dimension 's' between the blade contact and the left-hand fixed contact F. This should be .010 - .012 in. (.25 - .30 mm.).
- 36.3 Continue to turn the motor slowly, and operate the S/R switch blades alternately from one contact to the other. Check by eye that the blades flex equally on each contact.

*Action*

- 36.4 If any of these Checks is not satisfied, slacken the clamp screws A and B, and withdraw contacts D and F clear of the S/R switch blades. If the gap

between the backs of the blade contacts is greater than .006 in. (.15 mm.) (see Check 36.1), 'set' the blades, equally, to obtain the required condition.

- 36.5 With the S/R switch lever roller resting on the periphery of the clutch sleeve, slacken screws H, and adjust bracket E until the blades are central between the fixed contacts' mounting blocks, as judged by eye. Tighten screws H.
- 36.6 Screw in contact D to give a gap of .020 - .022 in. (.51 - .56 mm.) between it and the switch blade contact. Tighten clamp screw B.
- 36.7 Rotate the motor until the retention lever roller drops into its recess in the clutch sleeve. Screw in contact F until it clears the blade contact by .010 - .012 in. (.25 - .30 mm.), i.e. dimension 's'. Tighten clamp screw A.

**N.B.:** This adjustment of the S/R switch contacts may result in the S/R switch lever roller not getting fully home in the clutch sleeve recess. This may be disregarded, provided that the S/R switch lever is perfectly free on its pivot.

#### I. ADJUSTMENTS WITH MOTOR RUNNING

#### 37. **Tape Control Unit Clutch Pawls** (Fig. 37) - Model 67P/N only.

##### *Check*

- 37.1 With the motor running, the tape control lever raised and the pawls of the tape control unit arrested by detent E, Fig. 37, check by ear that there is no evidence of 'pawl chatter', i.e. that the pawl tails do not foul the clutch shaft ratchet teeth (see Adjustment No. 35).

##### *Action*

- 37.2 If 'chatter' is present, modify Adjustment No. 35, as required.

#### 38. **Anvil Bracket Height** - Final Check

##### *Check*

- 38.1 Perforate a length of tape, and check the depth of punching. This should be such that the tape is fully perforated, but without signs of 'dragging' (shown by elongated holes). The perforations should be cleanly cut, without any chads attached.

##### *Action*

- 38.2 If this is not so, add or remove shims by the method given in Adjustment No. 16.2.

##### *Check*

- 38.3 If Action 38.2 has been performed, check Adjustments Nos. 18, 19 and 20.
- 38.4 Perforate another length of tape as directed above in Check 38.1.

### 39. **Damping Springs** (Fig. 3)

#### *Check*

- 39.1 A simple check for the correct adjustment of the damping springs B and F, Fig. 3, is not available. It is, therefore, advisable to carry out Adjustments Nos. 39.2 and 39.3 at intervals of 900 hours of operation.

#### *Action*

- 39.2 With the machine in operation, depress keys E, T, K, L, Z and 'Letters' shift, and determine by ear which key produces the noisiest operation of the perforator unit. Adjust the tension of the damping spring F, by means of nuts C and D, until the noise of the perforator unit, when perforating the noisiest combination, is at a minimum.
- 39.3 Clamp the spring adjuster E securely in position with locknuts C and D when the adjustment of the spring is judged to be satisfactory.

### 40. **Feed Hole Pitch** (Fig. 34)

#### *Check*

- 40.1 Perforate a length of tape and check the pitch of the feed holes over a length of not less than 10 inches of tape. It should either be constant, or increase or decrease *regularly*, so that the total change of pitch is not greater than half a feed hole pitch in the 10 inches of tape.

#### *Action*

- 40.2 If the feed hole pitch is irregular, carry out Adjustments Nos. 21.3 to 21.6,
- 40.3 If the feed hole pitch varies regularly, but the cumulative variation over 10 inches is greater than half a feed hole pitch, slacken screw C, Fig. 34, and move the retention lever B forward or backward, as required.
- 40.4 If this action has been performed, it is advisable to repeat Adjustment No. 19 before perforating another length of tape for testing as described in Check 40.1.

### 41. **Motor Speed** (Fig. 20)

**Note:** This section applies to governed type motors only. These units are intended to run at 1,500 r.p.m., and should be tested for speed by means of the white stripes painted on the governor casing and the special fork stroboscope supplied in the Tool Kit.

#### *Check*

- 41.1 With the motor running as for normal operation, observe the white stripes through the stroboscope, and check that they appear to remain stationary, thus indicating that the motor is running at correct speed.

#### *Action*

- 41.2 If this is not so, i.e. the stripes appear to move *clockwise*, indicating that the motor is *too fast*, or *anticlockwise*, indicating that the motor is *too slow*, check Adjustments 22 and 23, and, if either of these is incorrect and action has been taken, then repeat Check 41.1 above.

*Action*

- 41.3 If the speed is still incorrect, the cause may lie in the voltage of the supply, a break or short-circuit in the governor circuit, or incorrect adjustment of the governor spring tension. As the tension of this spring is accurately set before it leaves the factory, its adjustment should not be altered unless it is definitely decided that the fault does not lie elsewhere. Hence, check:-
- (a) the voltage of the supply.
  - (b) the governor circuit. This may be done by short-circuiting the governor brush connections. The motor speed should increase rapidly to considerably above its normal value, and the motor may have to be switched off before the speed will decrease. (N.B.: The motor should *not* be run longer than is necessary, with the governor contacts shorted, to decide the result of this test). Conversely, if the motor governor is removed, and the motor turned on, its speed should remain steadily below normal.
- 41.4 If the governor circuit is found to be at fault, inspect the wiring, test the components and proceed as may be necessary to rectify the fault. (See Fig. 40 for guide to the governor circuit and components.)
- 41.5 If all else is found to be correct, the tension of the governor spring should be altered, as follows:-
- 41.6 Insert a small screwdriver through the hole in the governor casing and turn the governor spring adjusting screw B, Fig. 20, in a *clockwise* direction to *increase* the motor speed, or in an *anticlockwise* direction to *decrease* the speed. It will be found that one complete turn of this screw will alter the speed by approximately 30 r.p.m.

### SPRING TENSIONS

1. Transmitter Head )  
 ) - Model 67P/N only.  
 Tape Control Unit )

Note: References are to Part List  
 No. 1067 (3rd Edition)

<i>Spring No.</i>	<i>Part List Reference</i>	<i>Extension</i>	<i>Tension</i>
PG.7374	N, R, Fig. 46	5/8 - 7/8 in. (15.9 - 22.2 mm.)	8½ - 9 ozs. (241 - 269 gms.)
PG.7376	X, Fig. 46	3/4 - 27/32 in. (19.1 - 21.4 mm.)	472 - 708 gms.
PG.7196	AR, Fig. 47	23/32 - 1-1/32 ins. (18.3 - 26.2 mm.)	7¾ - 8½ ozs. (220 - 248 gms.)
PG.7054	AS, Fig. 47	19/32 - 1-17/32 ins. (15.1 - 38.9 mm.)	4 - 4½ ozs. (113 - 128 gms.)
PG.7226	AY, Fig. 47	11/16 - 1 in. (17.5 - 25.4 mm.)	1¾ lbs. (749 gms.)
PG.7377	AB, Fig. 48	11/32 - 9/16 in. (8.7 - 14.3 mm.)	3 lbs., 9 ozs. (1.6 Kgs.)
PG.7019	H, Fig. 50	5/8 - 13/16 in. (15.9 - 20.6 mm.)	15½ - 16½ ozs. (439 - 468 gms.)
PG.7357	AB, Fig. 50	61/64 - 1-5/32 ins. (24.2 - 29.4 mm.)	3½ - 4½ ozs. (99 - 128 gms.)
PG.7066	AT, Fig. 50	21/32 - 1-19/32 ins. (16.7 - 40.5 mm.)	2 ozs. (57 gms.)
PG.7075	AU, Fig. 50	43/64 - 1-1/8 ins. (17.1 - 28.6 mm.)	2 ozs. (57 gms.)
PG.3022B	N, Fig. 51	<b>Cam Pawl Spring.</b> Force required to press each pawl back against the cam seating with a gauge held horizontally should be 3-4 ozs. (85-113 gms.).	
<b>2. Perforator Unit - Models 67P/N and 7P/N</b>			
PG.5036	AR, Fig. 39	<i>Compress from:-</i> 1-7/8 - 1-3/8 ins. (47.6 - 34.9 mm.)	4 - 4½ lbs. (1.81 - 2 Kgs.)

2. Perforator Unit - Models 67P/N and 7P/N (continued)

Spring No.	Part List Reference	Extension	Tension
PG.7152	B, Fig. 45	<i>Extend from:-</i> 1-13/32 - 1-25/32 ins. (35.7 - 45.3 mm.)	3 lbs., 11 ozs. to 4 lbs., 1 oz. (1.68 - 1.85 Kgs.)
PG.7345	Q, Fig. 40	1-1/32 - 1-3/16 ins. (26.2 - 30.2 mm.)	6½ - 8½ ozs. (187 - 241 gms.)
PG.7213	S, Fig. 38	45/64 - 51/64 in. (17.9 - 20.3 mm.)	1 - 1½ ozs. (28 - 43 gms.)
PG.7322	AD, Fig. 45	37/64 - 15/16 in. (14.7 - 23.8 mm.)	12 - 13 ozs. (340 - 369 gms.)
PG.7186	U, Fig. 45	7/16 - 35/64 in. (11.1 - 13.9 mm.)	6 - 7 ozs. (170 - 198 gms.)
PG.7074	BQ, Fig. 43	19/32 - 27/32 in. (15.1 - 21.4 mm.)	15½ - 16 ozs. (439 - 454 gms.)
PG.7100	AH, Fig. 39	3/8 - 27/32 in. (15.9 - 21.4 mm.)	3 - 3½ ozs. (85 - 99 gms.)
PG.3057	K, Fig. 40	<b>Cam Pawl Spring.</b> Force required to press the pawl back against the cam seating, with gauge pressing down vertically on pawl engagement face should be 3½-4 ozs. (99-113 gms.).	
	<i>Reference: This Booklet -</i>		
PG.7388A	B, Fig. 36	7/8 - 13/32 in. (22.2 - 27.8 mm.)	4 lbs., 2 ozs. to 4 lbs., 14 ozs. (1.87 - 2.21 Kgs.)
PG.7078	C, Fig. 36	25/32 - 1-1/6 ins. (19.9 - 27 mm.)	9 - 11 ozs. (255 - 312 gms.)
<b>3. Keyboard</b>			
	<i>Reference to: Part List 1064</i>		
PG.7060	BO, Fig. 14	Force to give an extension of 29/32 in. (29 mm.)	1¾ - 2¾ ozs. (50 - 64 gms.)
PG.7077	BP, Fig. 14	Force to give an extension of 5/8 in. (15.9 mm.)	4½ - 5½ ozs. (128 - 156 gms.)

**4. Combination Unit**

<i>Spring No.</i>	<i>Part List Reference</i>	<i>Extension</i>	<i>Tension</i>
PG.7362	AJ, Fig. 16	Force to give an extension of 3/8 in. (9.5 mm.)	1 oz. (28 gms.)
2091/26	F, Fig. 17	Force to move the locking bar in either direction	Maximum of 7 ozs. (198 gms.), and equal within 1/2 oz. (14 gms.)

**5. Perforator Operating Unit**

PG.7212	CF, Fig. 24	Force to give an extension of 17/32 in. (13.5 mm.)	14 1/2 - 16 1/2 ozs. (411 - 468 gms.)
PG.7003	BW, Fig. 24	Force to give an extension of 7/32 in. (5.6 mm.)	1 lb., 14 ozs. to 2 lbs., 4 ozs. (.85 - 1.02 Kgs.)
PG.7039	AW, Fig. 26	Force to give an extension of 17/32 in. (13.5 mm.)	3 - 3 1/2 ozs. (85 - 99 gms.)
PG.5085	AL, Fig. 25	Force to give a <i>compression</i> of 1/4 in. (6.4 mm.)	4 - 6 ozs. (113 - 170 gms.)
PG.7219	Spring of Item AD, Fig. 23	Force to give an extension of 3/16 in. (4.8 mm.)	2 - 2 1/2 ozs. (57 - 71 gms.)
PG.7066	AZ, Fig. 26	Force to give an extension of 29/32 in. (29 mm.)	1 3/4 - 2 1/4 ozs. (50 - 64 gms.)
PG.7034	Spring of Item AQ, Fig. 26	Force to give an extension of 15/32 in. (11.9 mm.)	1 1/2 - 2 1/2 ozs. (43 - 71 gms.)

**6. Counter Unit**

PG.7219	C, Fig. 34	Force to give an extension of 3/16 in. (4.8 mm.)	2 - 2 1/2 ozs. (57 - 71 gms.)
PG.7198	E, Fig. 33	Force to give an extension of 1-23/32 ins. (43.7 mm.)	6 - 7 ozs. (170 - 198 gms.)
PG.7070	Spring of Item F, Fig. 33	Force to give an extension of 7/16 in. (11.1 mm.)	3 - 3 1/2 ozs. (85 - 99 gms.)

6. Counter Unit (continued)

<i>Spring No.</i>	<i>Part List Reference</i>	<i>Extension</i>	<i>Tension</i>
PG.7208	M, Fig. 34	Force to give an extension of 5/64 in. (2.0 mm.)	2 - 2½ ozs. (57 - 71 gms.)
PG.7197	T, Fig. 33	Force to give an extension of 1/32 in. (.8 mm.)	17 gms.
PG.3074	V, Fig. 33	<b>Spring of Damping Buffer.</b> No test is available, but correct tension, in operation, is indicated in Adjustment C.6.	
PG.7176	Z, Fig. 34	Force to give an extension of 5/16 in. (7.9 mm.)	10 - 11½ ozs. (284 - 326 gms.)
PG.7173	AH, Fig. 33	Force to give an extension of 9/16 in. (14.3 mm.)	3 - 3½ ozs. (85 - 89 gms.)



## MAINTENANCE INSTRUCTIONS

### A. INSTRUCTIONS APPLICABLE TO MODEL 67P/N ONLY

#### AFTER EACH 60 HOURS OF OPERATION

##### 1. **Contacts and Jockey Roller**

- 1.1 Remove the transmitter head from the machine, and remove its front and rear covers.
- 1.2 Remove all dust from the mechanism.
- 1.3 Burnish the transmitter contacts and the Send/Receive switch contacts.  
  
N.B.: Contacts should not be cleaned with abrasive material. They should be inspected and, if pitted, removed and refaced in a lathe or with a superfine file. The contacts (including those of the tongues) should then be burnished with a highly polished steel burnisher.
- 1.4 Check the jockey roller pressure - *Adjustment G.33.*

#### AFTER EACH 300 HOURS OF OPERATION

##### 2. **Lubrication and Adjustment**

- 2.1 Carry out the appropriate Lubrication Instructions.
- 2.2 Check Adjustments G.24 to G.33 inclusive.
- 2.3 Check Adjustments H.34 to H.36 inclusive.
- 2.4 Check that the tape control lever, detent lever and Send/Receive switch lever move freely on their respective pivots.

#### AFTER EACH 3,600 HOURS OF OPERATION

##### 3. **Dismantling and Inspection**

- 3.1 Dismantle the Transmitter Head and Tape Control Unit in accordance with Dismantling and Assembling Instructions, Sections B.13 and B.14.
- 3.2 Thoroughly clean all the parts, removing all dirt and congealed oil.
- 3.3 Inspect all parts for undue wear, and replace where necessary.
- 3.4 Carry out the appropriate Lubrication Instructions.
- 3.5 Reassemble the units, and carry out the whole of Adjustment Sections G and H.

B. INSTRUCTIONS APPLICABLE TO MODELS 7P/N AND 67P/N

AFTER EACH 300 HOURS OF OPERATION

1. **Cleaning, Lubrication and Adjustment**

- 1.1 Remove all covers, and remove dust, loose paper chads etc.
- 1.2 Remove all carbon dust from the Motor Governor brush support block, and from the slip-ring face of the Governor.  
**NOTE:** A soft brush (or rag) should be used, and care taken not to damage the anti-tracking varnish.
- 1.3 Lubricate the machine in accordance with the Lubrication Instructions, and remove all surplus oil.
- 1.4 Check the adjustments in Sections A – E.

2. **Punches and Die Plates**

- 2.1 Perforate a length of tape and examine the condition of the perforations. If they are ragged, remove the punches from the punch block unit in the following manner:-
  - (a) Release the spring of the tape feed retention lever AB, Fig. 13, and remove the retention lever and its spring.
  - (b) Slacken the two screws E and remove the cuttings chute.
  - (c) Remove screws B, Fig. 15, followed by:-
    - i) Cover Plate C,
    - ii) two die plates D,
    - iii) tape guide plate A,
    - iv) four guide plates Q.
- 2.2 Hold the punch withdrawing bracket out of engagement with the recesses of the punches and draw out the five punches and the feed hole punch.
- 2.3 Insert the punches individually into the Lapping Block (T.A.1056) provided in the Tool Kit, and sharpen on a fine stone until a keen edge is restored. Examine the condition of the die plates and replace if badly worn.
- 2.4 Reassemble the punch block by following instructions 2.1 and 2.2 in reverse order, replacing each punch in the guide channel from which it was removed. Ensure that the recesses of the punches are correctly engaged with the punch withdrawing bracket.
- 2.5 After the punch block has been reassembled, check Adjustments E.16 and I.38.

3. **Feed Hole Pitch**

- 3.1 Perforate a length of tape (not less than 12 inches), and check the pitch of the feed holes in accordance with Adjustment 40.1. Adjust the pitch, if necessary.

#### 4. Motor and Governor (Governed Motors only)

- 4.1 Examine the governor brushes and replace them if they are badly worn.
- 4.2 Check the force exerted by the governor brush springs, as directed in Adjustment F.22.
- 4.3 Examine the governor make/break contacts and replace them if they are badly pitted. Replacement should be done as follows:-
  - (a) Apply the governor spring clamp (T.A.1110) with its fork over the spring anchor loop E, Fig. 20, and with its screw bearing against the outside face of the contact arm resilient back stop D.
  - (b) Tighten the clamp screw, and the governor spring will extend, thus opening the contacts, at F.
  - (c) Remove the old contacts and replace them by new ones.
  - (d) Adjust the positions of the contacts so that they are directly opposite to one another, and obtain dimension 'I' as directed in Adjustment F.23.
  - (e) Relax the governor spring, and remove the clamp.
- 4.4 Examine the condition of the motor brushes, and if they have a life of less than 400 hours remaining, i.e. if they are less than 3/8 in. (9.5 mm.) long, change them as follows:-

- (a) Remove the old brushes and springs, noting on which track they were working, and discard brushes and springs.

**N. B.:** It is important that old springs should not be used with new brushes.

- (b) Slacken the fixing screws of the brush box, and slide it slightly away from the commutator. Feed one end of a strip of fine glass paper, 12 to 18 inches (30 - 43 cms.) long, between the commutator and the brush slide, with its abrasive surface facing the slide. Move in the brush box until the slide is just clear of the glass paper, and tighten the fixing screws.
- (c) Insert a new brush of the correct grade in the box, and replace the brush box cover. (For motors using a supply of less than 50 volts D.C., the correct brush is AA.2/3. For D.C. motors of a higher voltage than this, and for all A.C. motors, the correct brush is AA.1/2. These parts include brush springs).
- (d) Slowly draw the strip of glass paper in the normal direction of armature rotation, taking care to keep it taut. Repeat this process several times, in the same direction, until the surface of the brush takes the shape of the commutator.

**Note:** The brush spring tension should be released by withdrawing the brush box cover, before the glass paper is re-inserted between slide and commutator.

- (e) Remove the glass paper, brush box cover and brush. Slacken the brush box fixing screws again, and position the box so that there is a gap of .010 - .015 in. (.25 - .35 mm.) between the brass brush box slide and the periphery of the commutator. Tighten the fixing screws before withdrawing the feeler.

- (f) Replace the new brush so that it is working on the other track to the one noted in paragraph (a). Replace the brush box cover.
- (g) Repeat instructions (b) to (f), inclusive, for the other brush.

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

- 4.5 Remove all carbon dust with a clean dry rag, using a brush to remove the dust from between the segments of the commutator. No attempt should be made to remove the black glazed surface.
- 4.6 Check the motor speed as directed in Adjustment 1.41.

#### AFTER EACH 3,600 HOURS OF OPERATION

#### 5. Cleaning and Checking

- 5.1 Remove all apparatus units from the keyboard and main casting. Thoroughly clean each unit, and wash out the Combination Unit in petrol, or white spirit, removing all congealed oil and dirt with the aid of a brush.
- 5.2 Carefully check each part for wear, paying special attention to the condition of the punches and the die plates of the Perforator Unit. Sharpen the punches, if necessary, and replace the die plates if they are badly worn.

#### 6. Motor - Types KBB and KBE only

- 6.1 Dismantle the motor in accordance with Section B.22 of the Dismantling and Assembling Instructions.
- 6.2 Discard the fibre gaskets which seal the ballrace housings, and replace by new ones before reassembling.
- 6.3 Wash out the ballraces in petrol, or white spirit, and when thoroughly dry re-pack them with CREED Lubricant No. 4 (grease).

**N.B.:** Oil should not be used for the ballraces.

- 6.4 Check the condition of the commutator surface. If this is badly pitted, or worn, the following procedure should be adopted:-
  - (a) Mount the armature between centres in a lathe, and 'skim up' the commutator surface by means of a sharp, pointed tool.
  - (b) Check that the mica insulation between the segments is .015 - .025 in. (.38 - .64 mm.) below the surface of the commutator.

**NOTE:** This may be checked by brushing all dust from the slots and laying therein a piece of wire of the appropriate dimension (S.W.G. (approx.) No. 28 to No. 23).

- (c) If the depth of the mica is less than that required, it should be undercut whilst the armature is still in the lathe, by means of a thin, square-edged tool. With the lathe at rest, the tool can be run along the commutator slot to cut down the mica.
- (d) Take a light finishing cut, and then remove any burrs which have arisen on the commutator.
- (e) Polish the commutator with *fine* glass paper to obtain as high a degree of polish as possible, in order to minimise brush wear.

**N.B.:** Emery paper should on no account be used for this purpose, and commutator grinding stones are not recommended.

6.5 Reassemble the motor unit, as directed in Section B.22 of the Dismantling and Assembling Instructions, and reassemble the motor to the main base.

## 7. Lubrication and Adjustments

- 7.1 Reassemble the machine, paying attention to the appropriate Sections of the Lubrication Instructions, and taking care, whilst the units are still off the main casting and keyboard casting, to lubricate those points which are inaccessible when the whole machine is assembled.
- 7.2 Check all adjustments on the machine, in accordance with the Adjustment Instructions.

## LUBRICATION INSTRUCTIONS

**Note:** Figure references are to this Booklet and to Part List 1067 (3rd Edition).

Instructions regarding the Transmitter Head and Tape Control Unit apply only to Model 67P/N.

Care should be taken to see that electrical components, and contacts, are kept free from lubricants.

Lubricants should be used sparingly.

### AFTER EACH 300 HOURS OF OPERATION

<i>Instructions</i>	<i>Fig. No.</i>	<i>Unit</i>
<b>No. 1 Lubricant</b>	<b>Bkt. 67N</b>	
Roller in head of tape feed retention lever AB.	13	Perf. Unit
Bearings of upper and lower cam rollers (one shown at K).	13	-do-
Oil holes in feed wheel bearing blocks A and D.	17	-do-
Engaging faces of clutch ratchet and dog K and J.	22	Perf. Operating Unit
<b>No. 2 Lubricant</b>		
Main pivot AA of punch block casting.	13	Perf. Unit
Oil hole plug felts of front and rear bearings of camshaft assembly S.	13	-do-
Oil holes in bearing blocks of intermediate driving shaft Q.	13	-do-
Teeth of forward feed and back space ratchets M and G.	17	-do-
Pivot of tape feed pawl T.	34	-do-
Cam pawl L and engagement faces of detents T and X.	13	-do-
<b>Note:</b> Lubricate the pawl sufficiently for the oil to reach the camshaft ratchet which engages the tail of the pawl.		
	<b>P.L. 1067</b>	
Pivot of detent operating lever AY.	26	Perf. Operating Unit
Pivot of perforator release lever AX.	26	-do-

<i>Instructions</i>	<i>Fig. No.</i>	<i>Unit</i>
<b>P.L. 1067</b>		
Pivot of retaining lever BY.	24	Perf. Operating Unit
Oil hole in clutch ratchet AF.	25	-do-
Pivot of contact operating lever P.	33	Counter Unit
Retaining pawl F, and its pivot.	33	-do-
Pivot of resetting lever AD.	33	-do-
Pivot of ratchet wheel D.	33	-do-
Pivot of feed pawl B.	34	-do-
Pivot of feed lever H.	34	-do-
Pivot of stop plate S.	33	-do-
<b>Bkt. 67N</b>		
Jockey roller, and jockey roller assembly pivot H.	6	Transmitter Head
Nose of striker cam follower N.	6	-do-
Racks of striker dart E.	6	-do-
Operating faces between striker dart E and its operating lever D.	6	-do-
Working faces of common lever stop plate and stop F.	6	-do-
Cam track of retention lever roller X.	8	Tape Control Unit
Oil hole in clutch sleeve Q.	8	-do-
Pivot of tape control lever E.	8	-do-
Pivot U of retention lever.	8	-do-
Jockey roller of S/R Switch arm.	-	-do-
<b>No. 5 Lubricant</b>		
Engaging faces of detent N and clutch dog.	12	Perf. Operating Unit
Cam tracks of camshaft W.	12	-do-
Teeth of driving ratchet and clutch ratchet F.	11	-do-
Cam tracks of camshaft assembly S.	13	Perf. Unit

<i>Instructions</i>	<i>Fig. No.</i>	<i>Unit</i>
<b>No. 5 Lubricant (continued)</b>		
Knife edges of the striker dart E and the transmitting tongue M.	6	Transmitter Head
Motor pinion and driving wheel.	-	Main Base

**WHEN DISMANTLING**

<i>Instructions</i>	<i>Fig. No.</i>	<i>Unit</i>
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**Note:** Lubricate all parts listed previously, with the following additions:-

<b>No. 1 Lubricant</b>	<b>Bkt. 67N</b>	
Brush the combination bars V, W, X, Y and Z lightly with the lubricant.	2	Combination Unit
Working faces between the release bar racks and the perforator trip release bar AM.	12	Perf. Operating Unit
Working faces between the link bar N and its racks.	32	Perf. Link Unit
Pivots of both detents T and X.	13	Perf. Unit
Pivot of retention pawls R.	13	-do-
<b>No. 2 Lubricant</b>		
Pivot AB of connecting levers.	2	Combination Unit
Pivot O of punch block operating levers.	2	-do-
Oil holes in bearing blocks of drive shaft AH.	12	Perf. Operating Unit
Working faces of pin S and tape feed throwout lever F.	34	Perf. Unit
Eccentric pivot E of the back space pawl compliant member.	34	-do-
Pivot of detent trip link throwout lever (if fitted).	-	-do-
Guide rack slots of selector bars Q and R.	5	-do-
Pivot of retention roller V.	7	Transmitter Head
Common pivot of feed lever Z and the retention lever.	7	-do-
Pivot of feed pawl U.	7	-do-
Saturate the two felt (cam) lubricators, one at front, one at back, of the Head.	-	-do-
Apply a few drops of oil to the oil holes of the drive shaft bearing block S.	8	Tape Control Unit
All spring anchor points.	-	All Units

**P.L. 1067**

Soak the two canvas friction washers of the damping buffer assembly Y.	34	Counter Unit
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<i>Instructions</i>	<i>Fig. No.</i>	<i>Unit</i>
	<b>P.L. 1067</b>	
Oil holes in bearing blocks of drive shaft AK.	5	Main Base
Friction faces between trip link R and the perforator unit detent.	38	Perf. Link Unit
Pivot of trip link R.	38	-do-
<b>No. 4 Lubricant</b>	<b>Bkt. 67N</b>	
Clean and re-pack the ballraces of the Motor Unit (KBB and KBE type motors only)	18	Motor Unit
<b>No. 5 Lubricant</b>		
Teeth of ratchet wheel G.	1	Counter Unit
Teeth of all gear wheels.	-	Whole Machine

#### CREED LUBRICANTS

The following lubricants are recommended, and may be obtained from CREED & COMPANY 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.

## CIRCUITS AND CIRCUIT DIAGRAMS

### A. MOTOR CIRCUITS

The machine may be fitted with any one of the following motor units:-

**Model 7P/N** - a) Ref. No. 125A. An uncontrolled, synchronous type induction motor. For AC operation only.

b) Ref. No. 151A. A series-wound, series-governed motor, for DC operation only.

**Model 67P/N** - c) Ref. No. 151A. As (b), above.

d) Ref. No. 152A. A series-wound, series-governed motor, for AC operation only.

**Note:** Motor Ref. No. 125A is not suitable for Model 67P/N.

The motors listed above can be supplied to suit any nominal supply voltage, in steps of five volts, between the limits 90-250V.

To meet special requirements, a few machines have been fitted with motors differing in characteristics from those listed above. These units are as follows:-

Ref. No. 150A - A series-wound, series-governed motor, for AC or DC operation.

Ref. No. 158A - A shunt-wound, armature-governed motor, for 24 volt DC operation only.

#### Circuit Diagrams (Figs. 39, 40 and 41)

Fig. 39 shows the motor circuit, in schematic form, of a Model 7P/N fitted with Motor Ref. No. 125A, together with the layout of the motor circuit components on the underside of the main base.

The value of capacitor C is chosen as follows:-

<i>Supply Voltage</i>		<i>Capacitor Value</i>
200 - 250 volts	-	2.5 $\mu$ F.
110 - 125 volts	-	10.0 $\mu$ F.

Fig. 40 shows the motor circuit of a Model 67P/N fitted with a governed type motor unit, and a Model 6S/5 Auto-Transmitter unit, together with the layout of motor and signals circuit's components on the underside of the main base. In the case of a Model 7P/N fitted with a governed motor, the layout of components will be as shown in this diagram, with the exception of those for the signals circuit which will not be fitted.

Fig. 40 is intended to be used in conjunction with Fig. 41, which shows the internal connections of the governed type motors listed above, and indicates the correct connections between the motor and the ten-point terminal strip TBA.

If the Ref. 150A motor is fitted to the machine, the strapping of the terminal strip is

arranged as follows:-

For DC operation – Strap TBA7–TBA8, TBA9–TBA10

For AC operation – Strap TBA8–TBA9

### Motor Governor

Governed type motors are fitted with the CREED rotary governor unit, type S.1910, and a radio interference suppression network, the circuitry of which is shown in Fig. 40.

The value of the governor resistor R3 is chosen as follows:-

<i>Motor Ref. No.</i>		<i>Resistor Value</i>
150A	–	2,000 ohms.
151A	–	2,000 ohms.
152A	–	1,000 ohms.
158A	–	25 ohms.

In the case of motor Ref. No.158A, note that the governor resistor is wired in series with the motor armature winding only.

### End-of-Line Indicator (Figs. 39 and 40)

In the case of a Model 7P/N fitted with motor Ref. No. 125A, current for the E.O.L.I. lamp is obtained from the supply mains *via* a step-down transformer, TX, Fig. 39, and the possible alternative connections of the transformer to terminal strip TBB, to suit various supply voltages, are indicated in the diagram.

In all models fitted with governed type motors, the current supply for the E.O.L.I. lamp is obtained from the mains by means of a voltage divider network, connected as shown in Fig. 40. The value of the resistor R1 is chosen as follows:-

<i>Supply Voltage</i>		<i>Resistor Value</i>
200–250 volts	–	3,500 + 300 ohms
110–125 volts	–	1,500 + 500 ohms

For operation at 125 volts, only, the lamp is shunted by a resistor of value 1,000 ohms.

Machines fitted with motor Ref.No.158A have resistor R1 replaced by a non-tapped resistor, of value 330 ohms, connected direct between terminals TBA1 and TBA4.

## B. SIGNAL CIRCUIT

Fig. 42 shows the signals' circuit of a Model 67P/N when fitted with the Model 6S/5 Transmitter unit. The capacitor/resistor network shown in the diagram is designed to suppress radio interference originating from the contacts of the Transmitter and the Send/Receive switch.

Output to Line is via a standard 9-pin or 12-pin plug, as specified by the customer, and connections to the contacts of each type of plug are indicated in the table on the right of the diagram.



MODEL 7P/N TELEPRINTER KEYBOARD PERFORATOR

DIAGRAMS

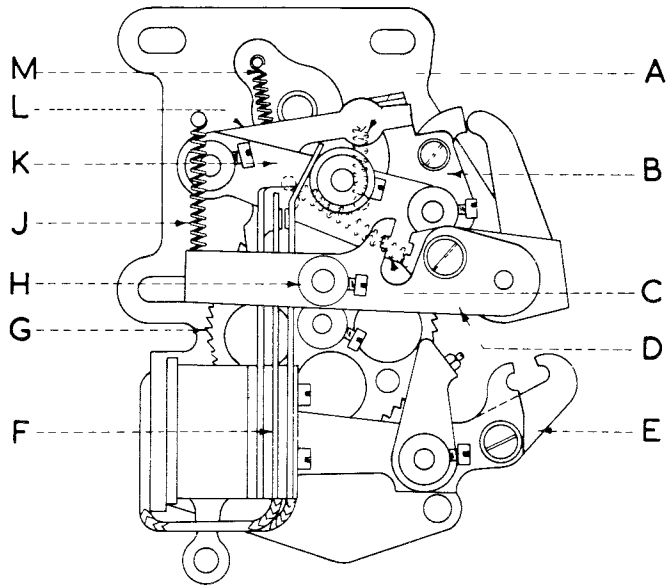


Fig. 1

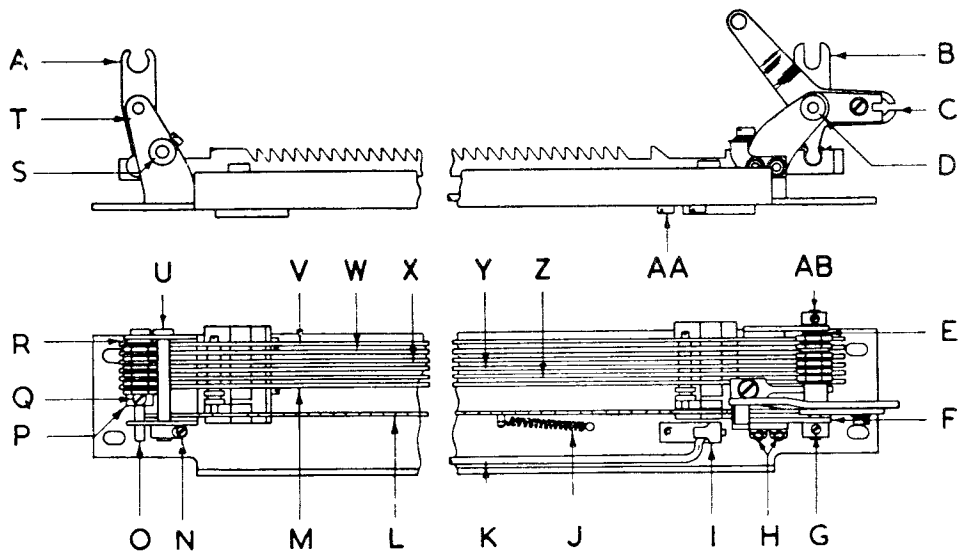
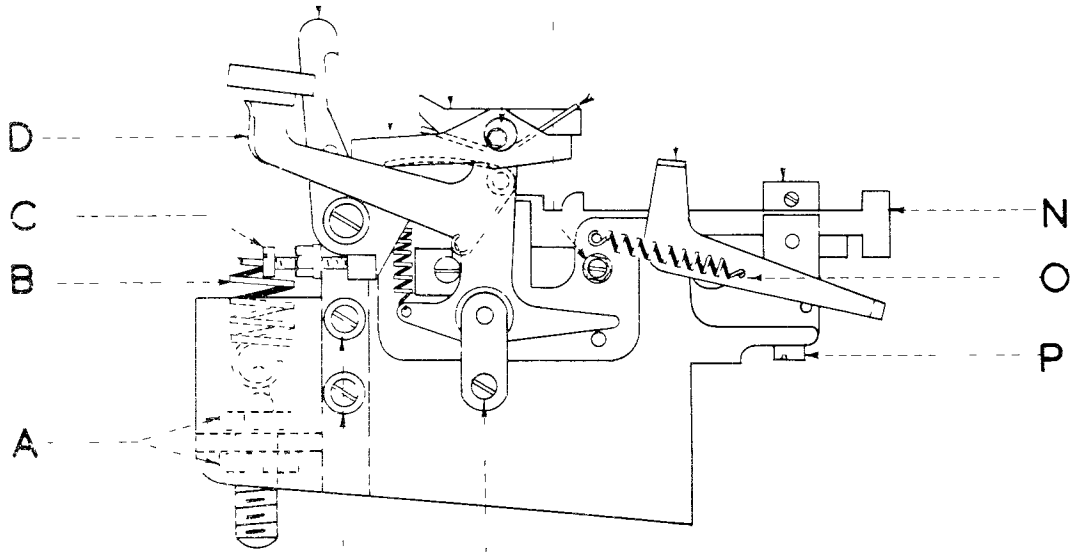
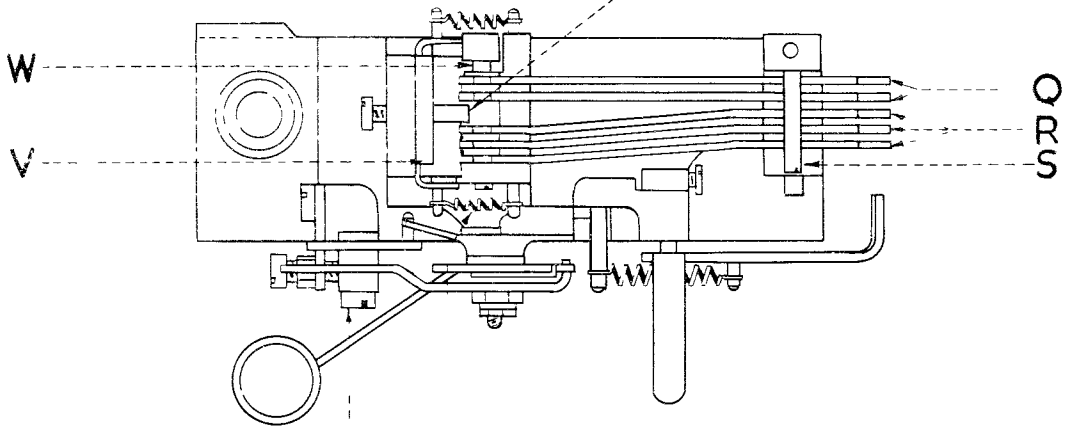


Fig. 2

E F G H J K L M



X Y Z



U T

Fig 5

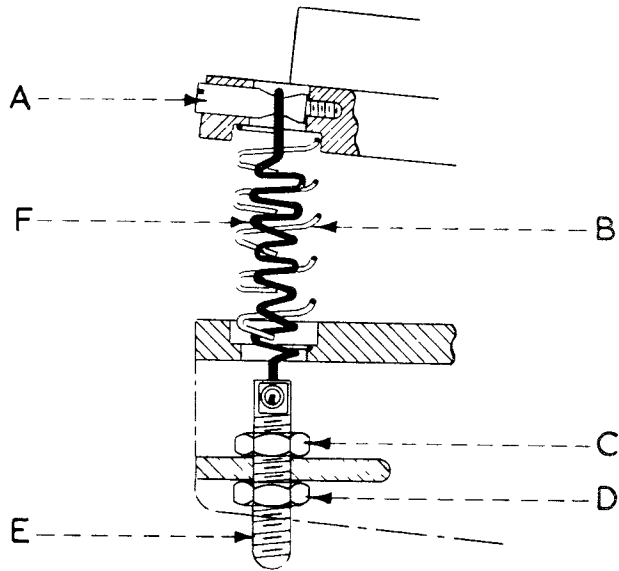


Fig. 5

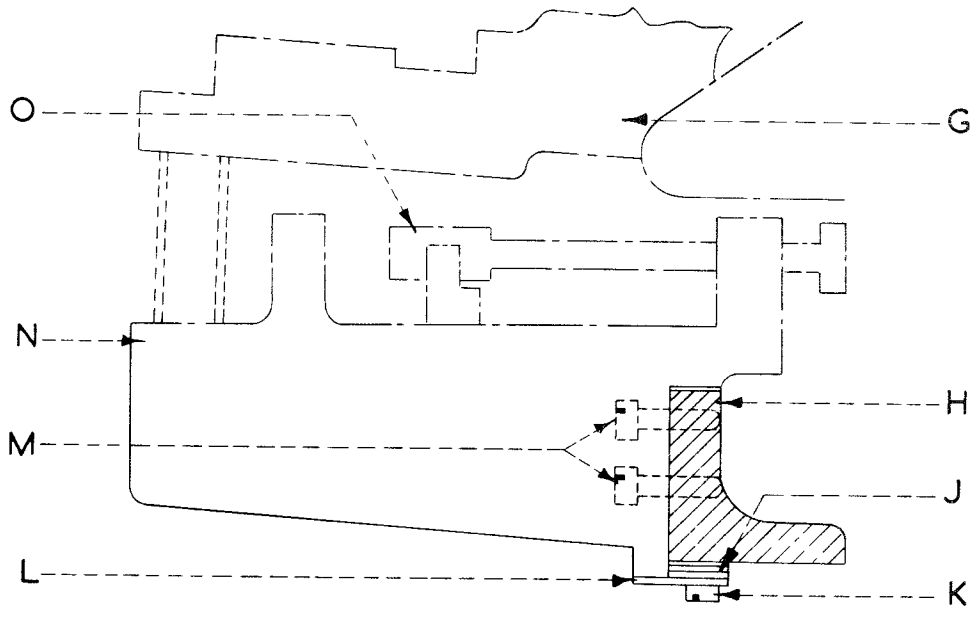


Fig. 4

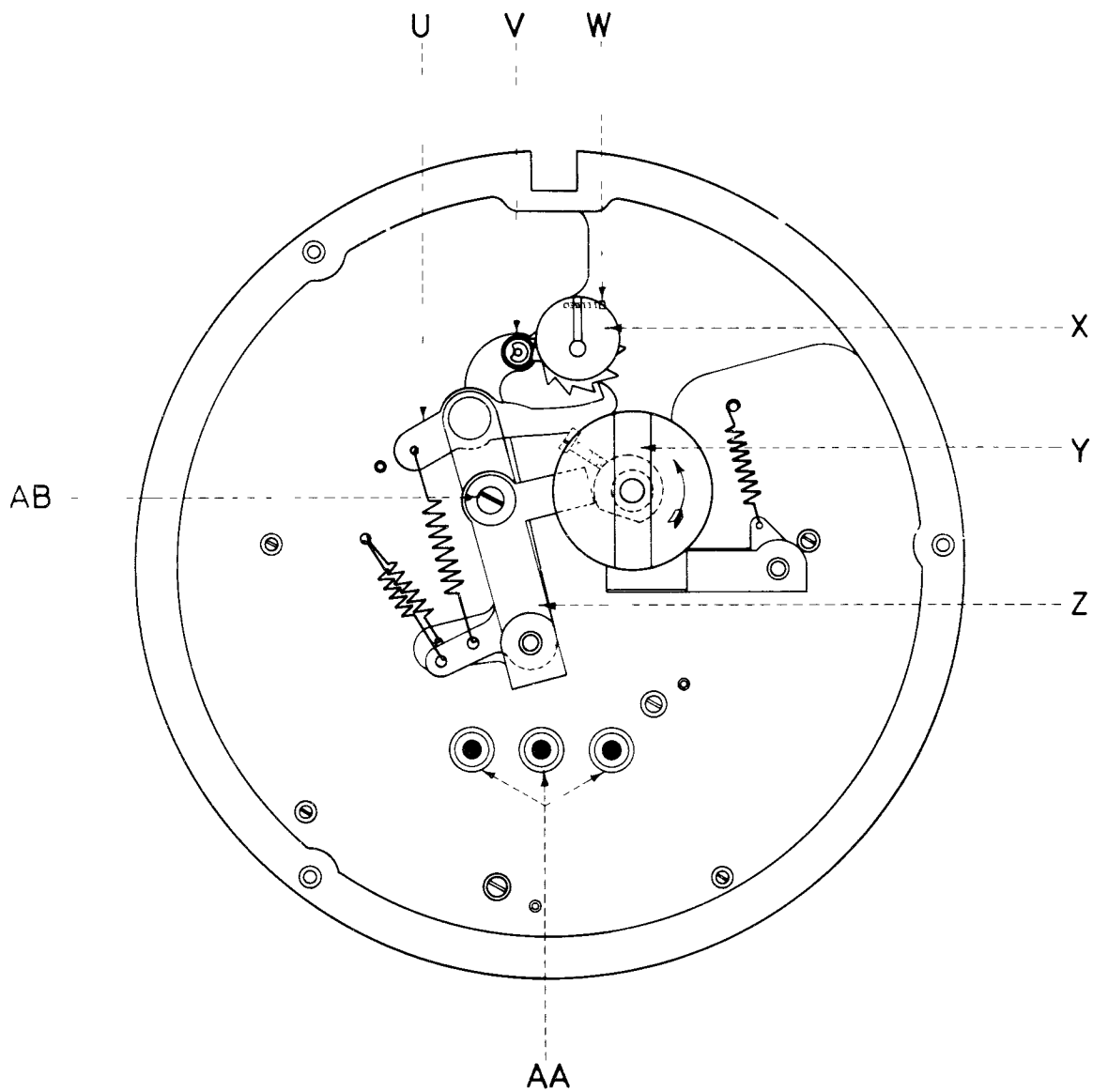


Fig. 7



AD AE A

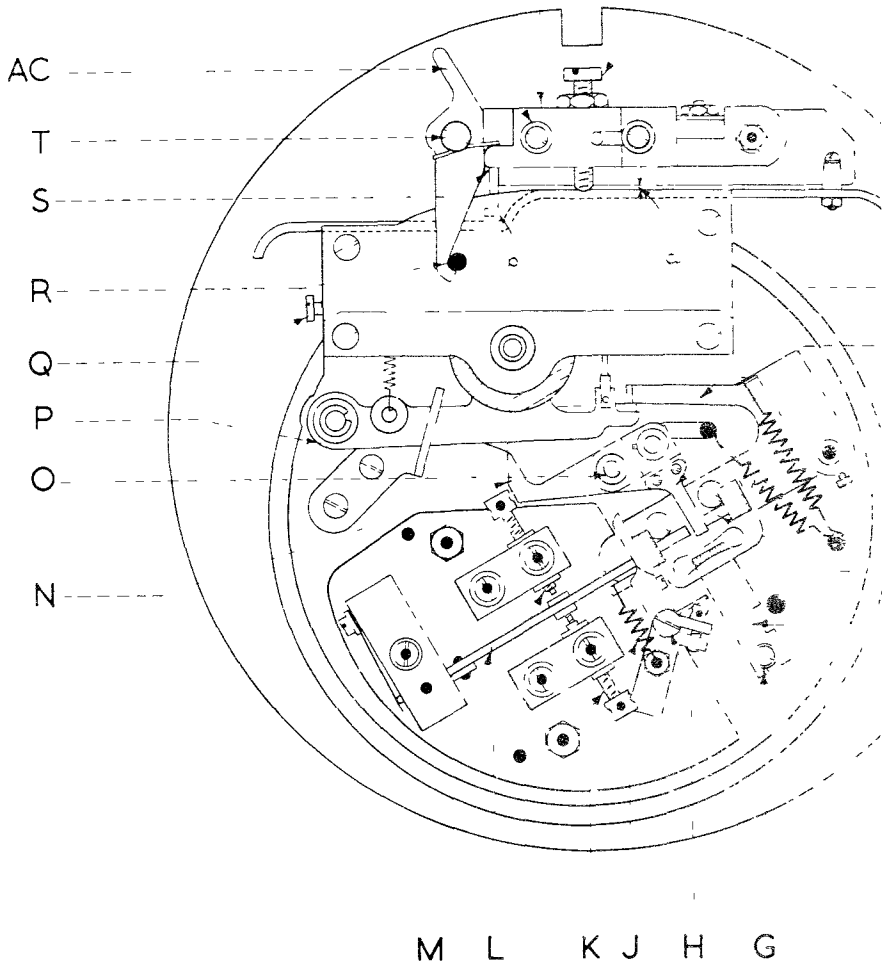


Fig. 6

DIMENSIONS

$$'a' = \begin{cases} .010-.012 \text{ ins.} \\ .25-.30 \text{ mm.} \end{cases} \quad 'b' = \begin{cases} .015 \text{ ins.} \\ .38 \text{ mm.} \end{cases}$$

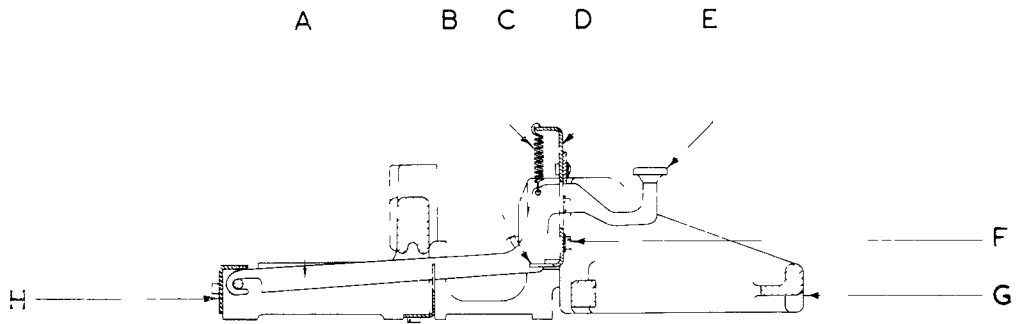


Fig. 9

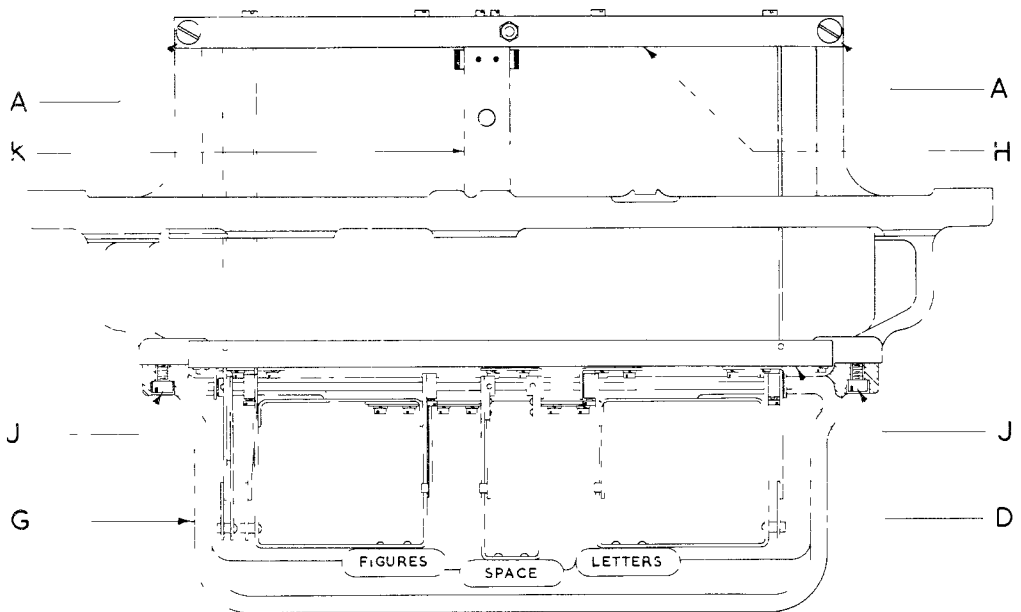


Fig. 10

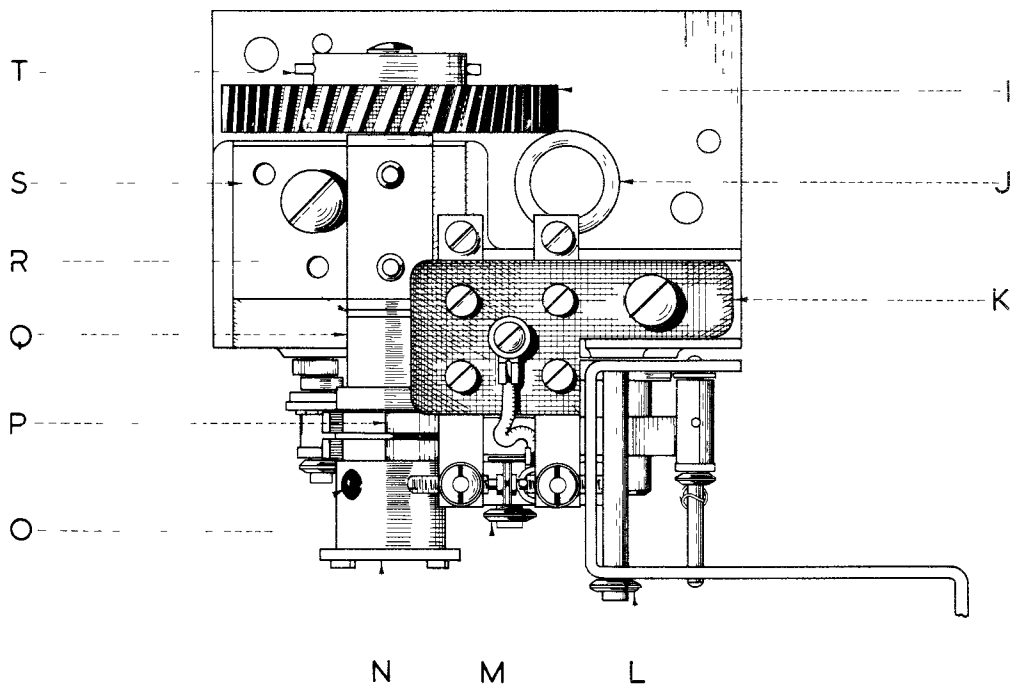
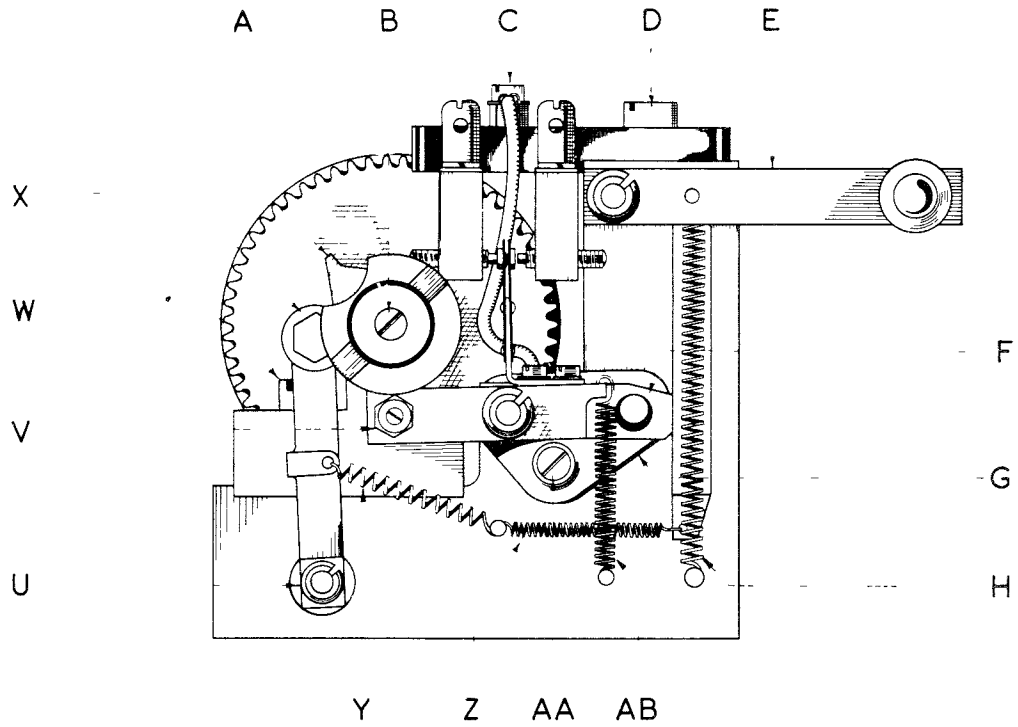


Fig 8

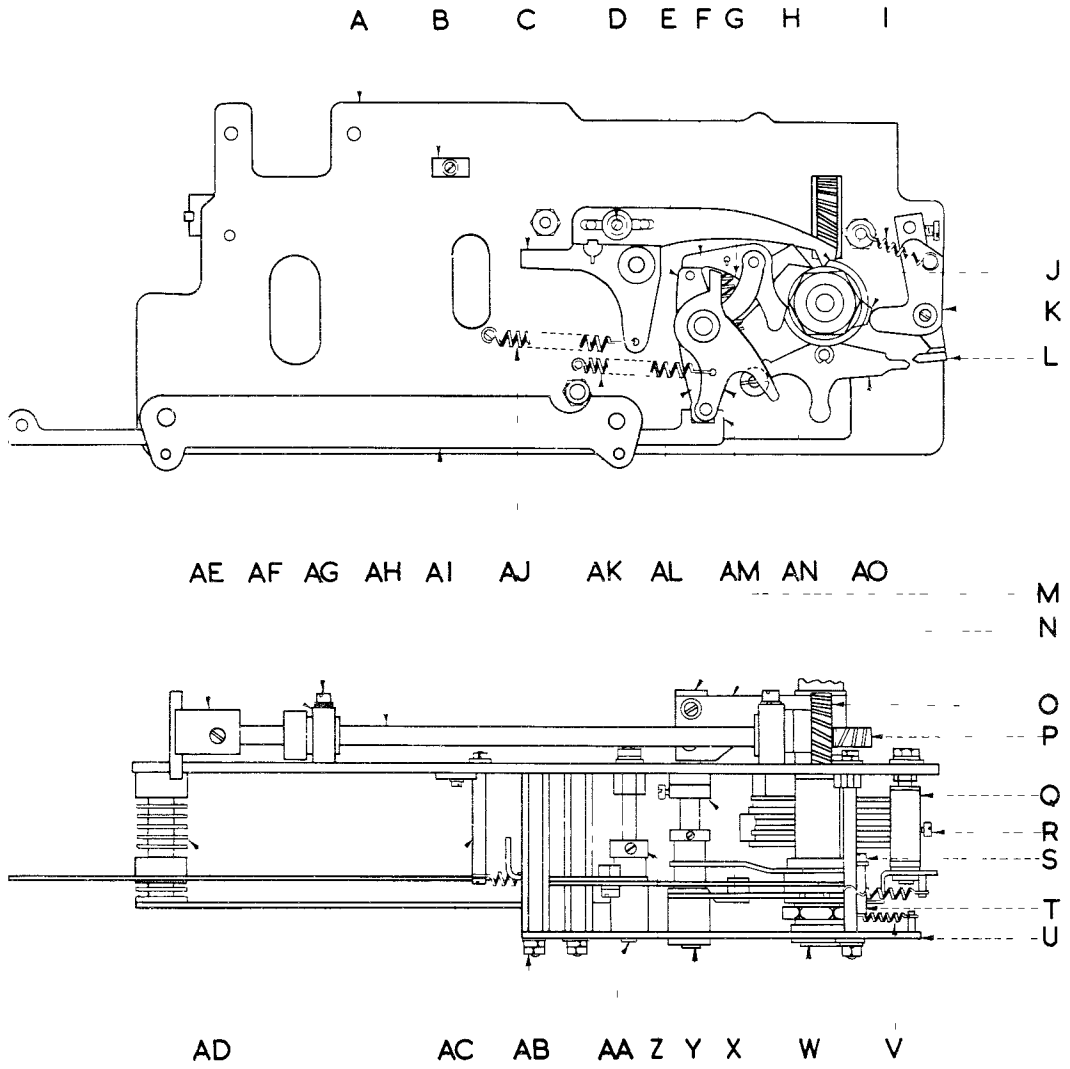


Fig. 12

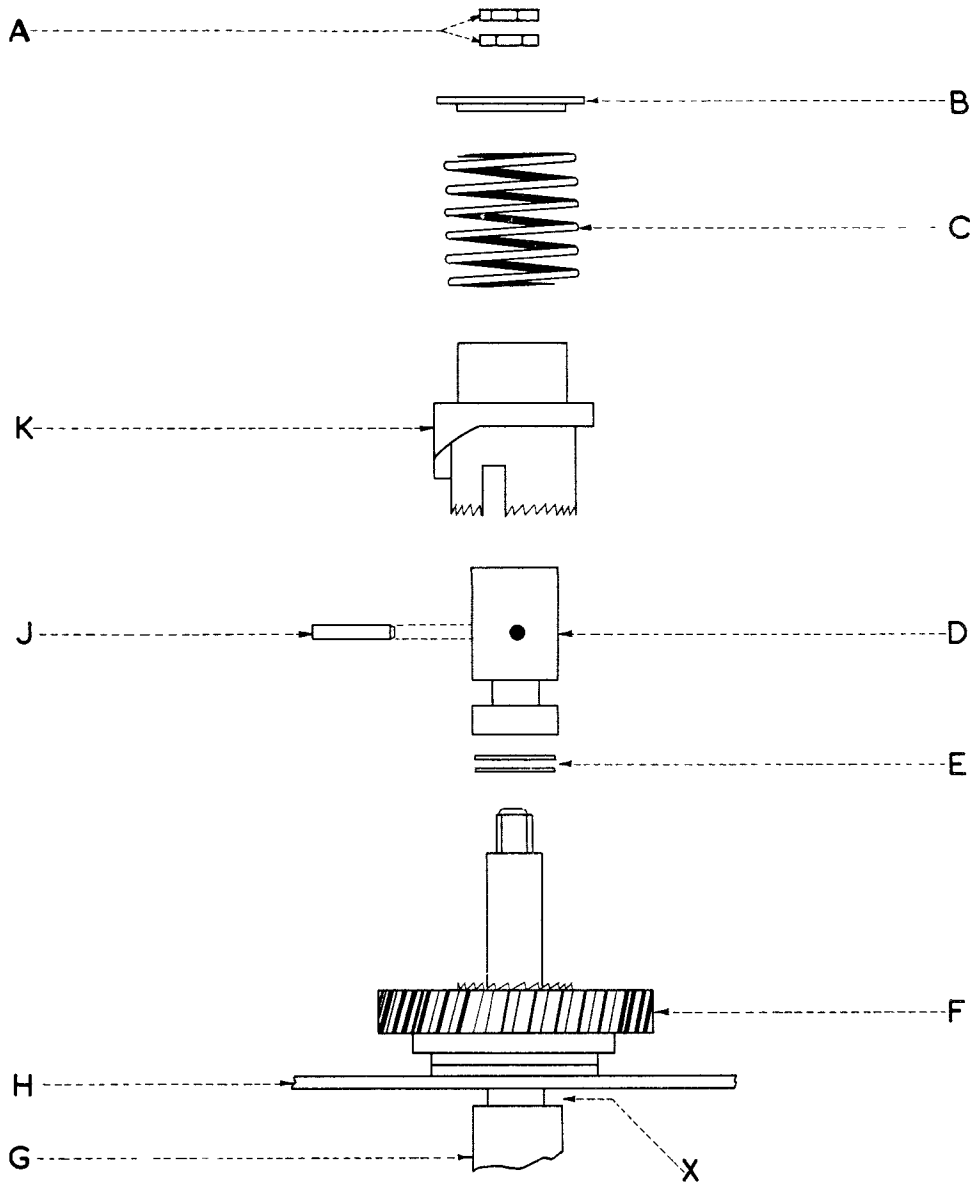


Fig. 11

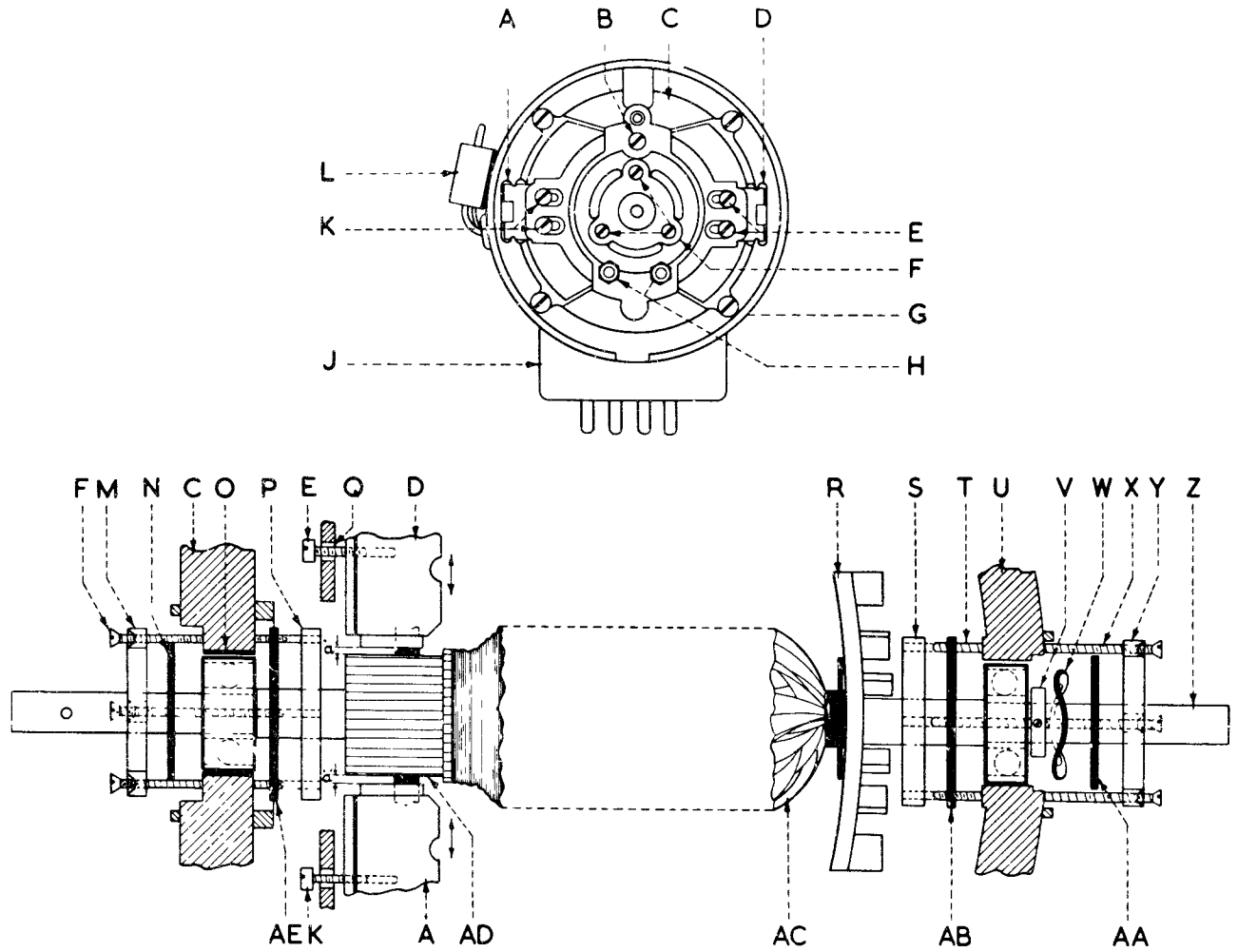


Fig. 18

DIMENSION

$$'a' = \begin{cases} .010 - .015 \text{ ins} \\ .25 - .38 \text{ mm.} \end{cases}$$

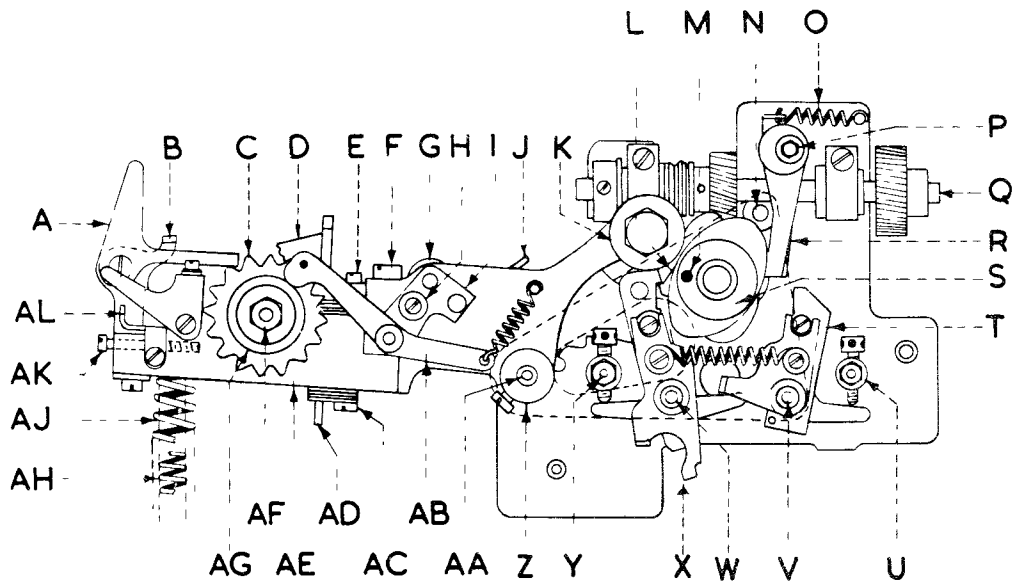


Fig. 13

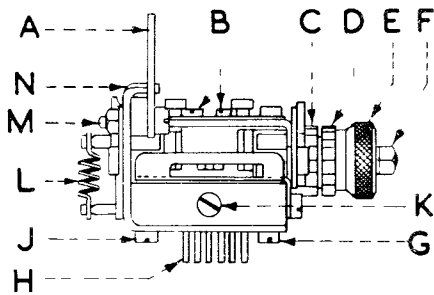


Fig. 14

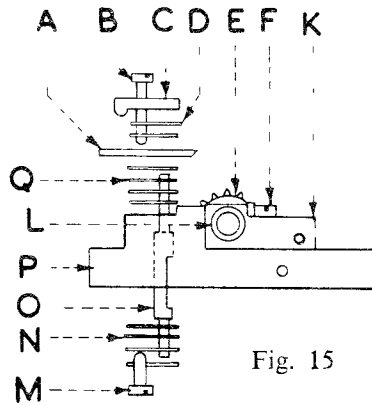


Fig. 15

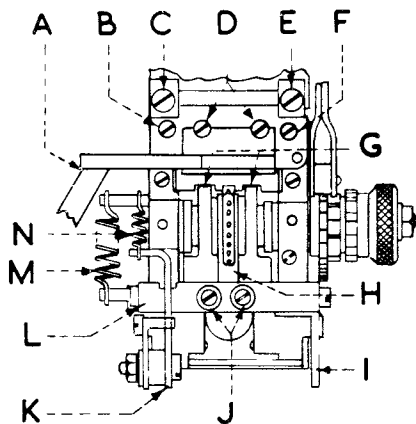


Fig. 16

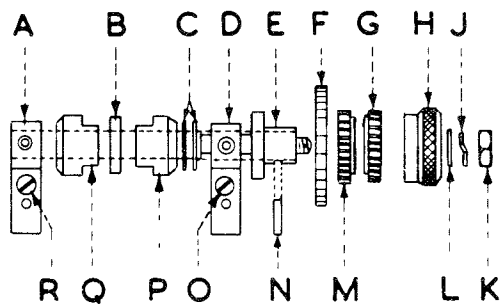


Fig. 17

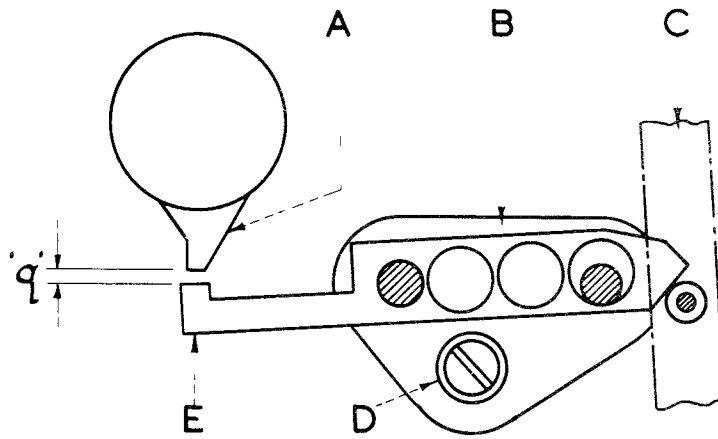


Fig. 19

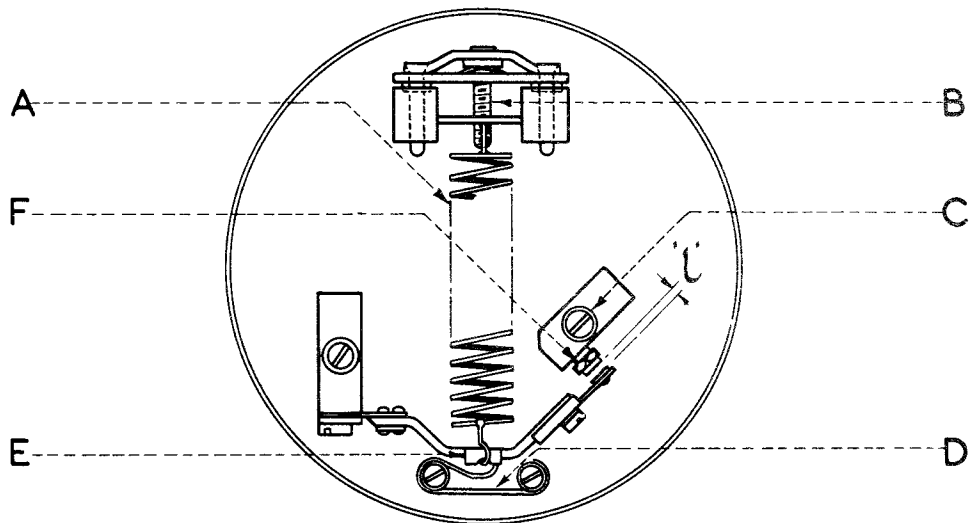


Fig. 20

DIMENSIONS

$l$	$\left\{ \right.$	.015—.020 ins.	$\left\{ \right.$	$q$	.004—.006 ins.
		.38—.51 mm.			.10—.15 mm.



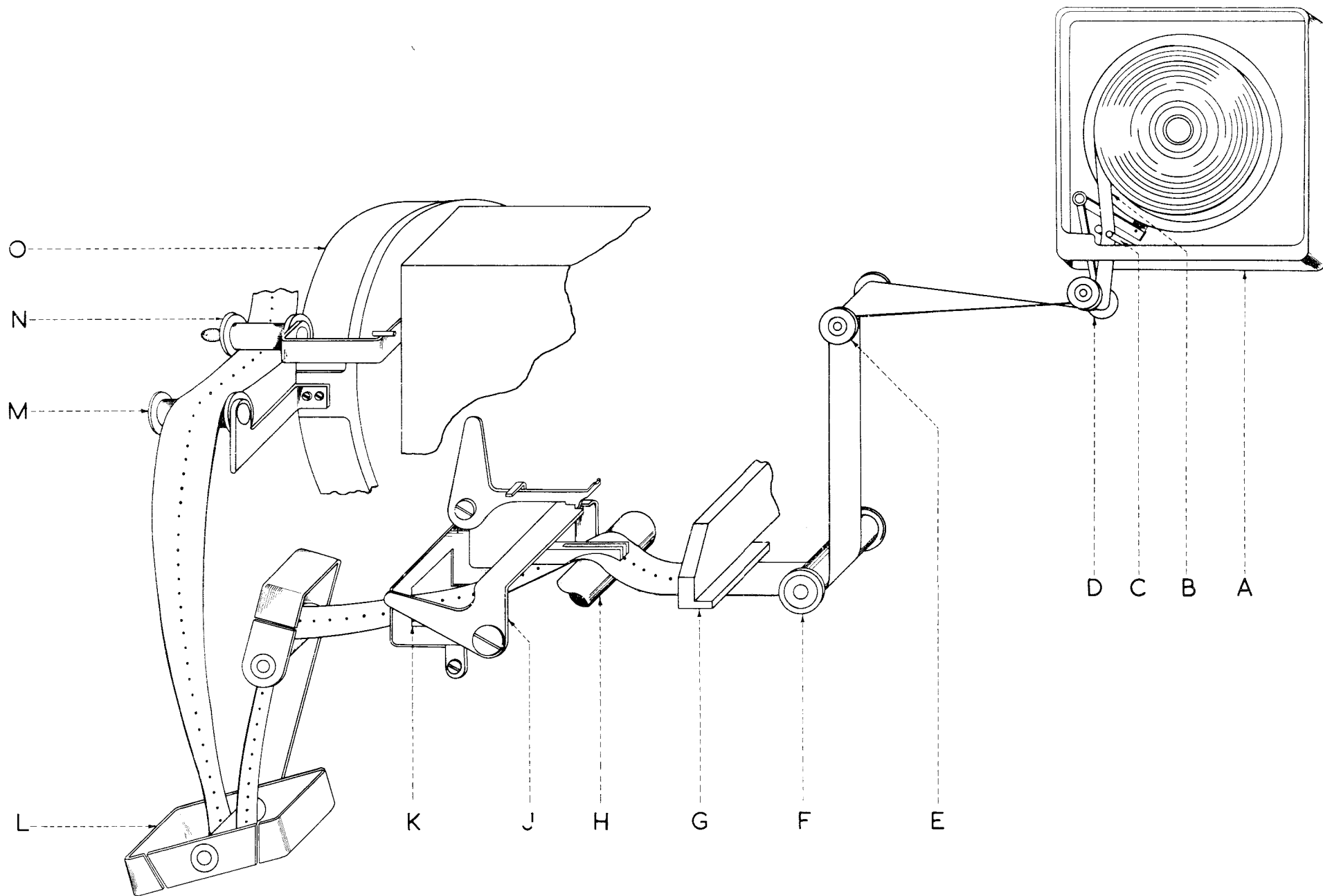


Fig. 21

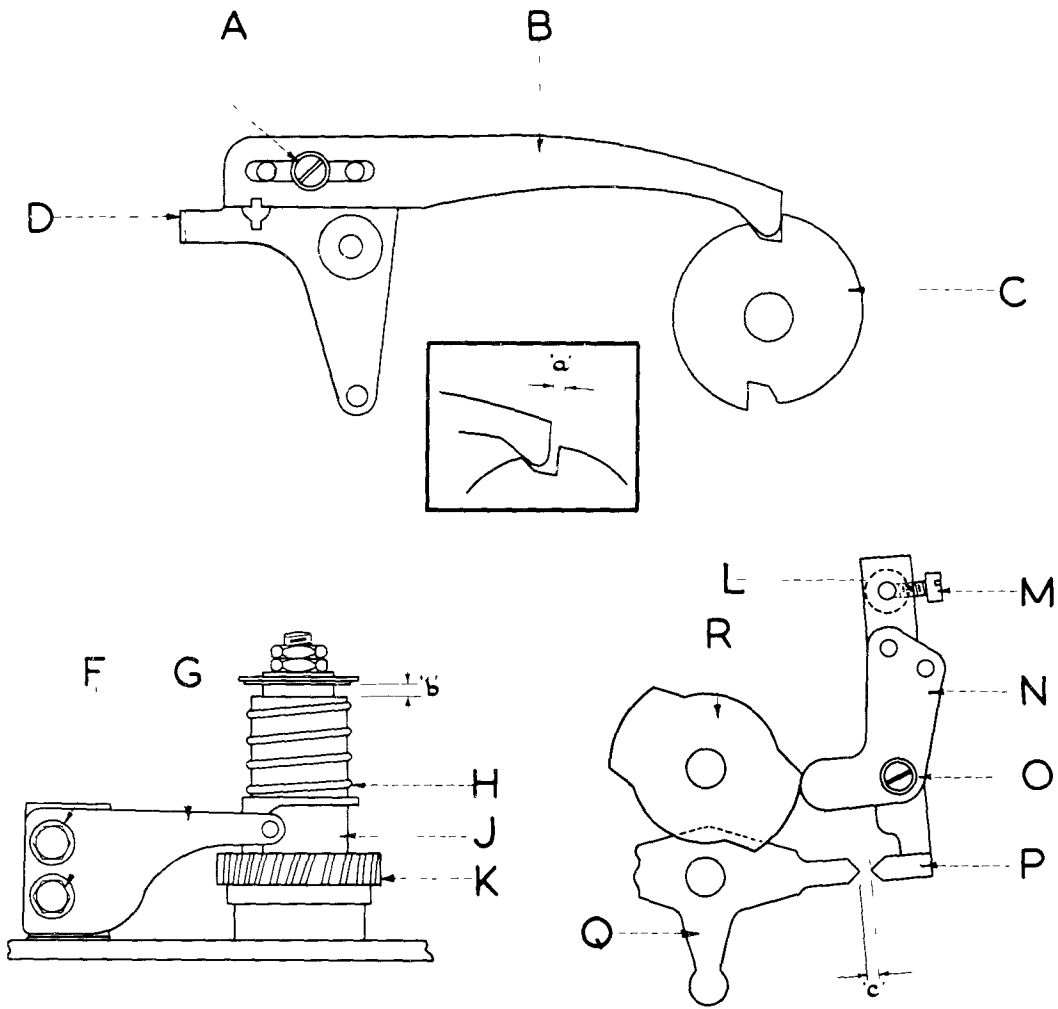


Fig. 22  
DIMENSIONS

$a'$   $\left\{ \begin{array}{l} .070 \text{-.}080 \text{ ins.} \\ 1.78 \text{-.}2.03 \text{ mm.} \end{array} \right.$

$b'$  SEE TEXT

$c'$   $\left\{ \begin{array}{l} .005 \text{-.}015 \text{ ins.} \\ .13 \text{-.}38 \text{ mm.} \end{array} \right.$

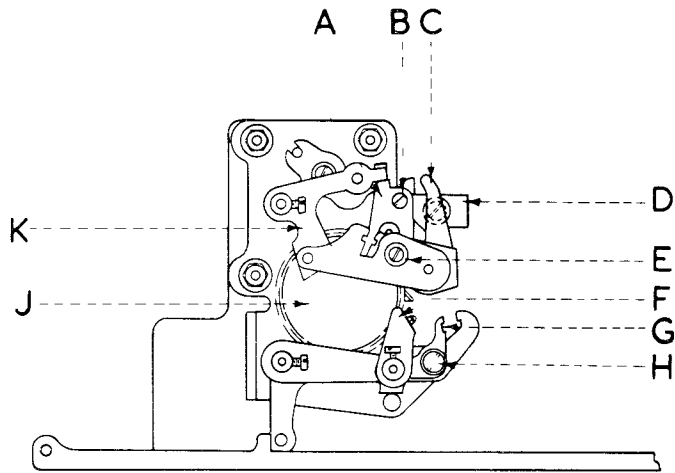


Fig. 25

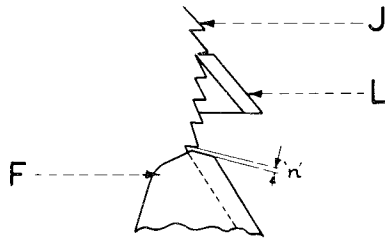


Fig. 26

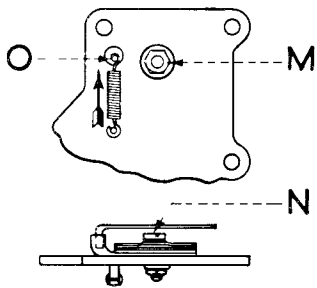


Fig. 27

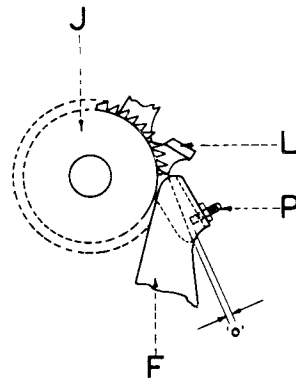


Fig. 28

DIMENSIONS

$$'n' = \begin{cases} .00 \\ .2 \end{cases} 'n' \begin{cases} .008-.012 \text{ ins} \\ .20-.31 \text{ mm.} \end{cases} \quad 'o' = \begin{cases} .003-.005 \text{ ins.} \\ .08-.13 \text{ mm.} \end{cases}$$

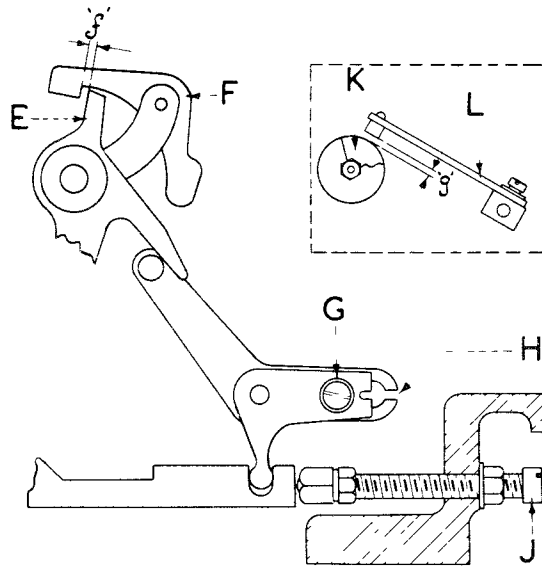


Fig. 23

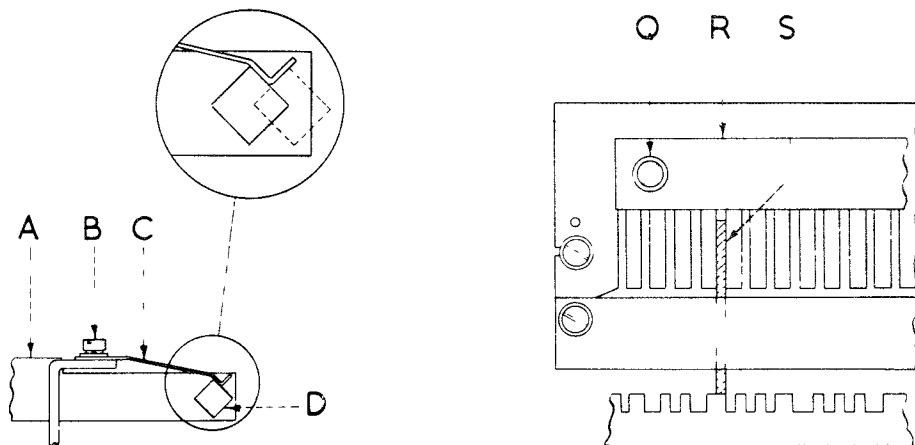


Fig. 24

DIMENSIONS

$$f' \begin{cases} \frac{1}{32} \text{ ins} \\ .8 \text{ mm.} \end{cases}$$

$$g' \begin{cases} \frac{1}{32} \text{ ins} \\ .8 \text{ mm.} \end{cases}$$

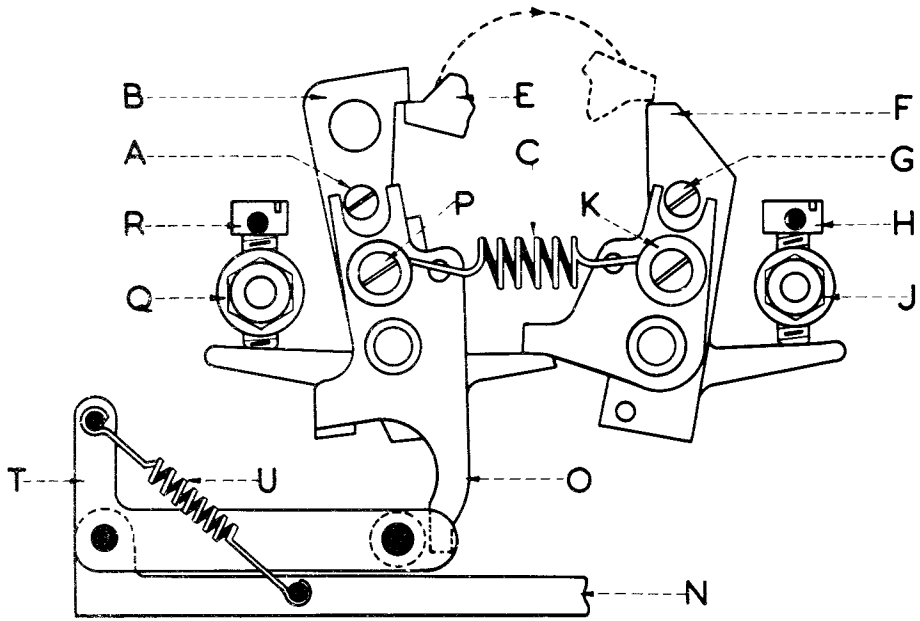


Fig. 32

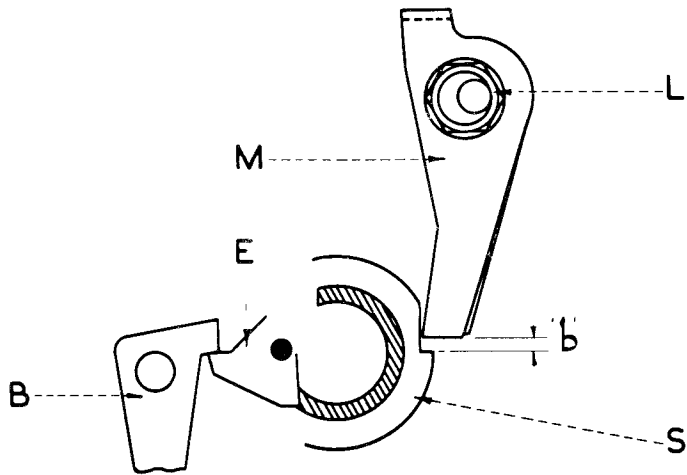


Fig 33

DIMENSION

.002 - 0.04 ins

'b' .15 - 10 mm

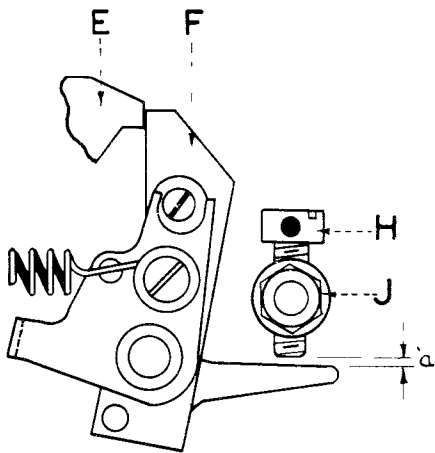


Fig. 29

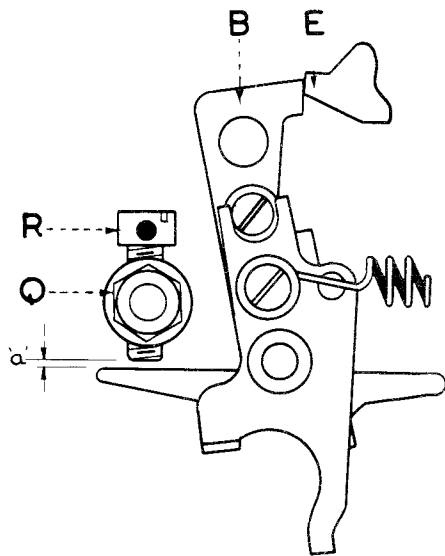


Fig. 30

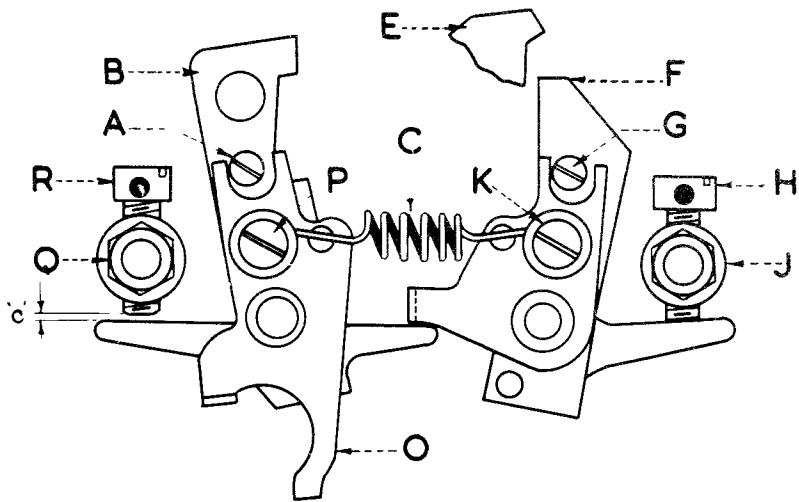
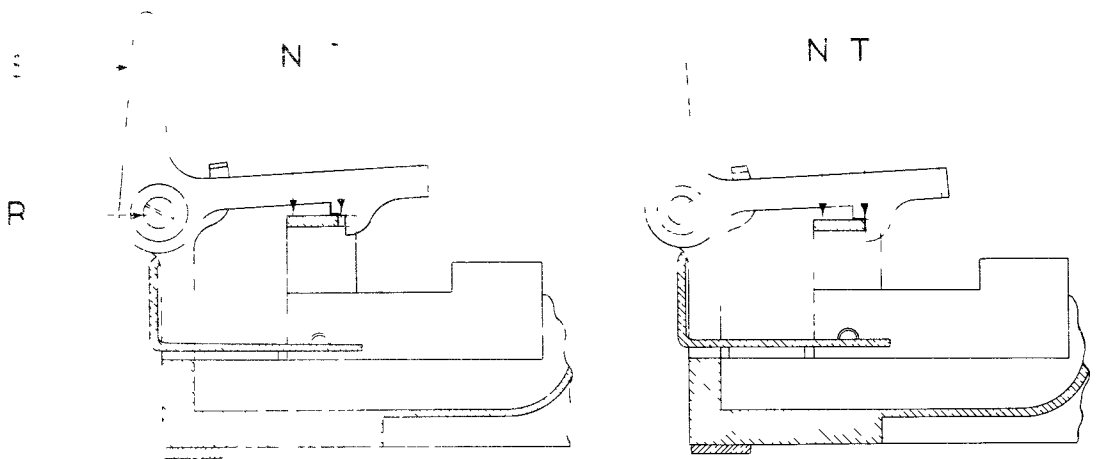
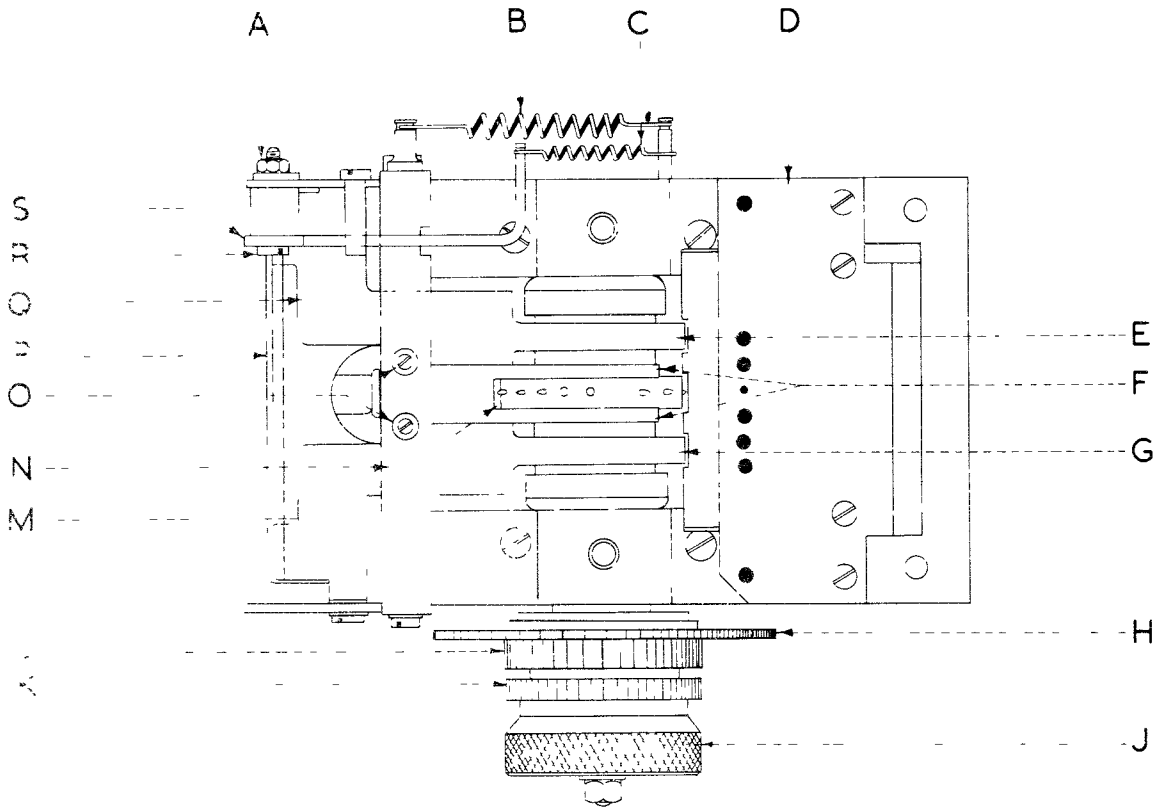


Fig. 31

DIMENSIONS

$$\begin{array}{l}
 \text{'a'} \left\{ \begin{array}{l} .022-.028 \text{ ins.} \\ .56-.71 \text{ mm.} \end{array} \right. \quad \text{'c'} \left\{ \begin{array}{l} .002-.007 \text{ ins.} \\ .05-.18 \text{ mm.} \end{array} \right.
 \end{array}$$



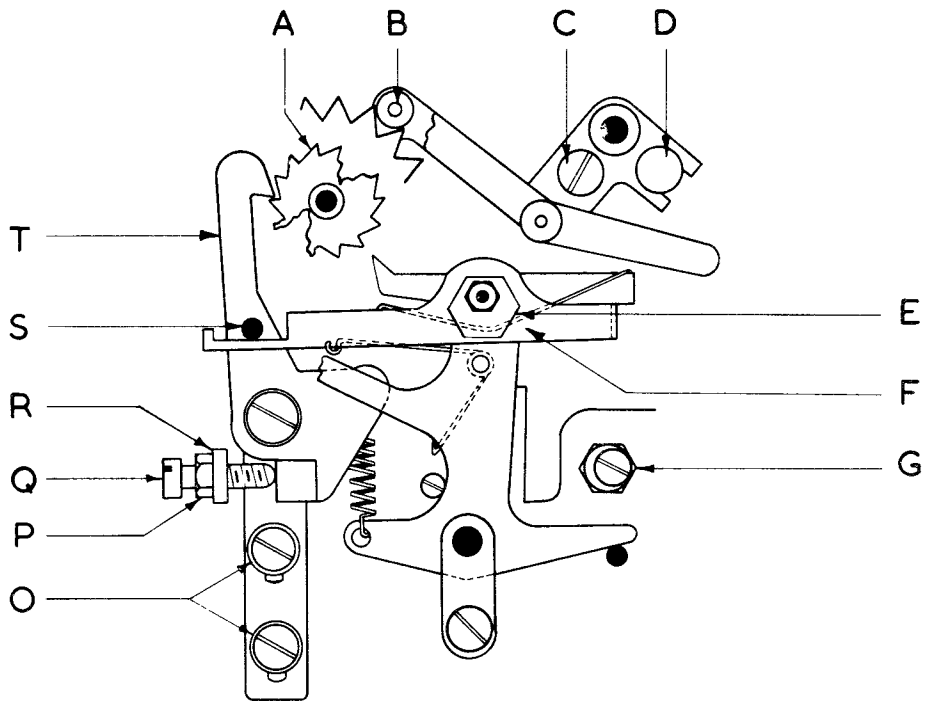


Fig. 34

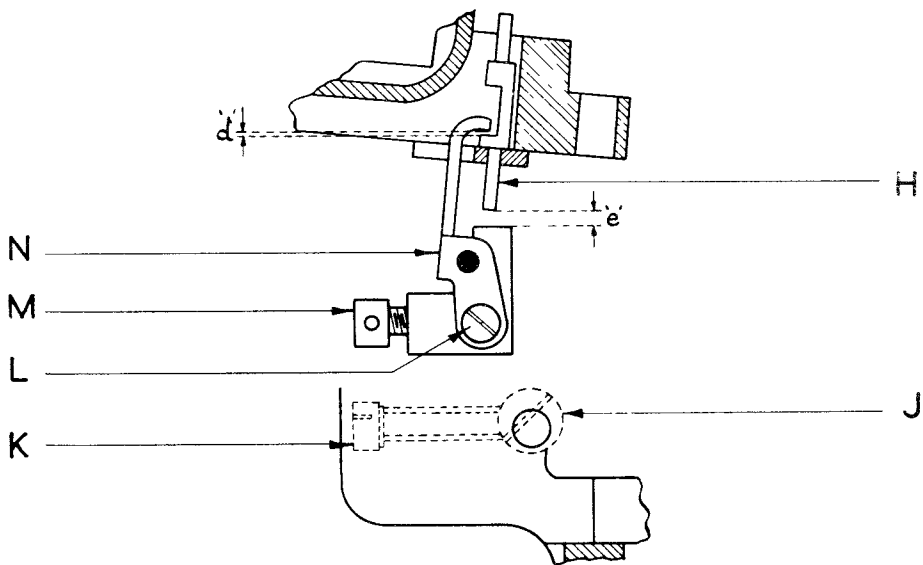
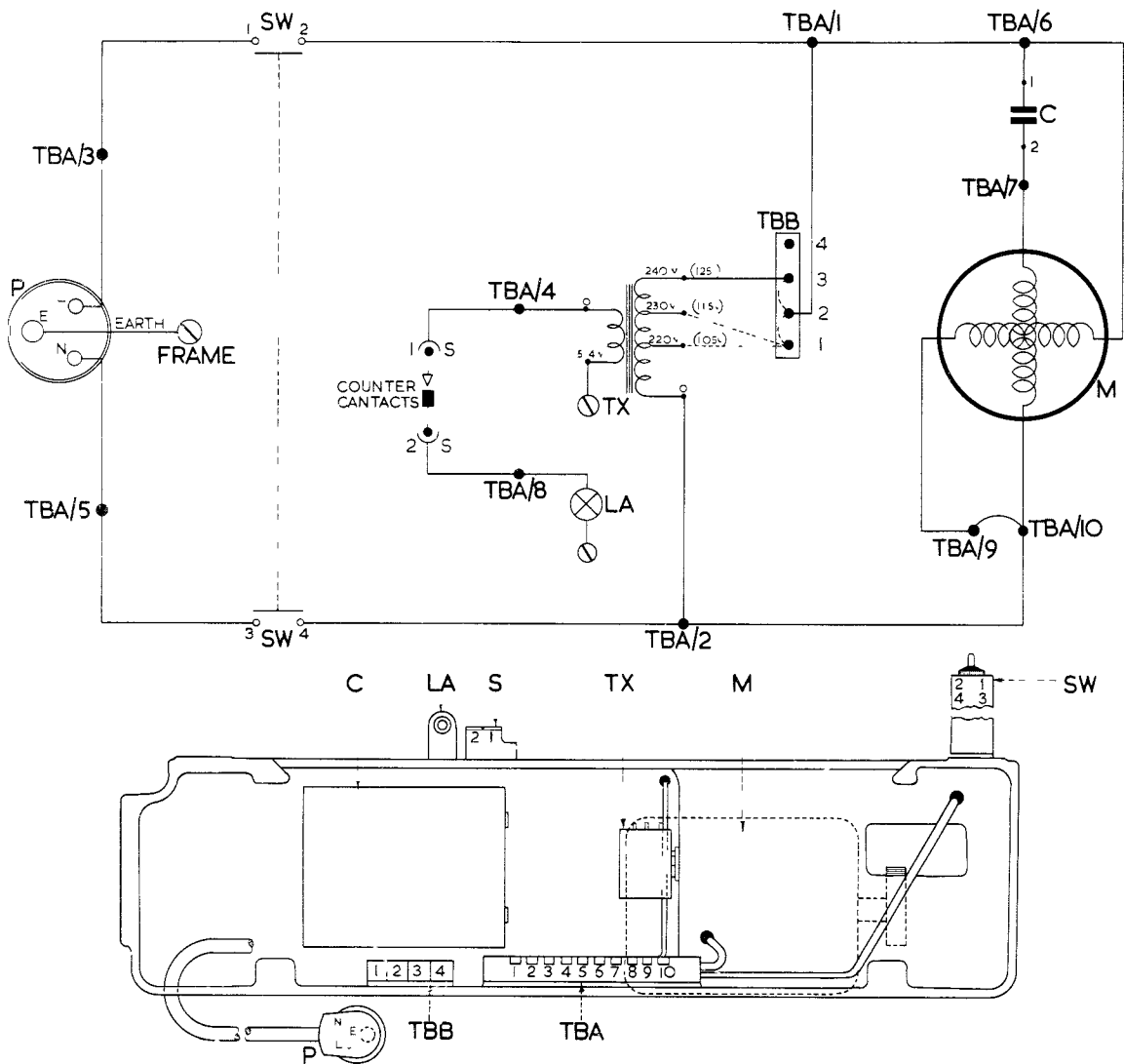


Fig. 35

DIMENSIONS

'd'	{	.002—.008 ins.	{	.026—.036 ins.
		.051—.20 mm		.66—.91 mm.





TBA	10-POINT TERMINAL STRIP	P	3-PIN 5AMP PLUG
TBB	4-WAY CONNECTION BLOCK	S	SQUARE SECTION SOCKET
C	CAPACITOR (SEE TEXT)	SW	SWITCH
LA	EoLI LAMP (6 VOLT · 5AMP)	TX	TRANSFORMER
M	AC INDUCTION MOTOR, UNGOVERNED, REF N°125.A		

Fig. 39 CIRCUIT SCHEMATIC AND COMPONENTS LAYOUT. MODEL 7P/N ONLY

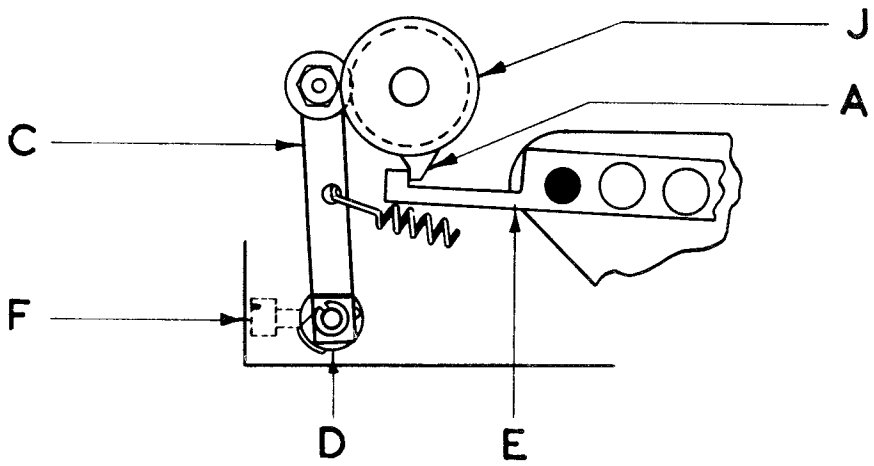


Fig. 37

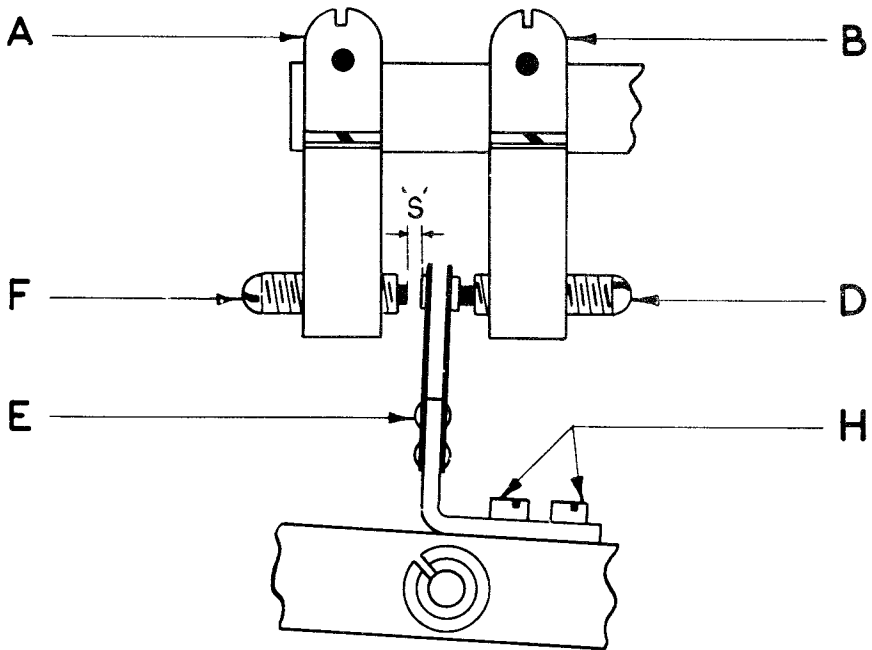
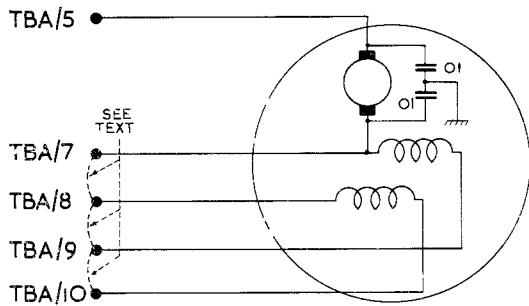


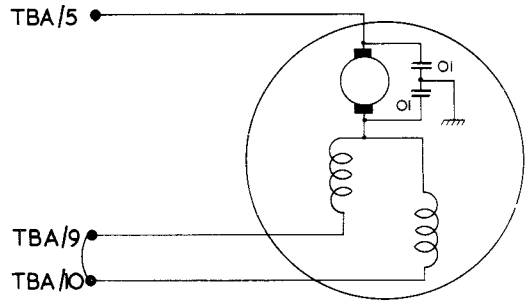
Fig. 38

DIMENSION

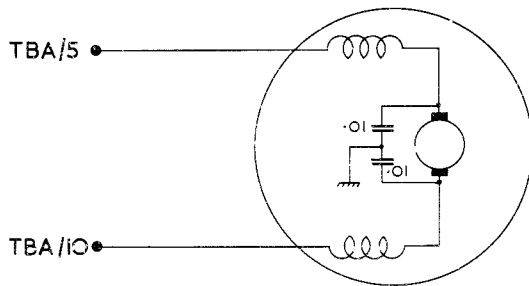
's'  $\left\{ \begin{array}{l} .010-.012 \text{ ins} \\ .25-30 \text{ mm.} \end{array} \right.$



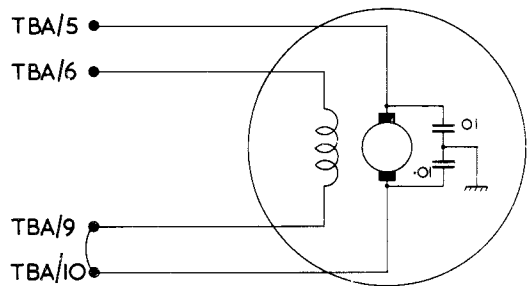
REF. 150A



REF. 152A



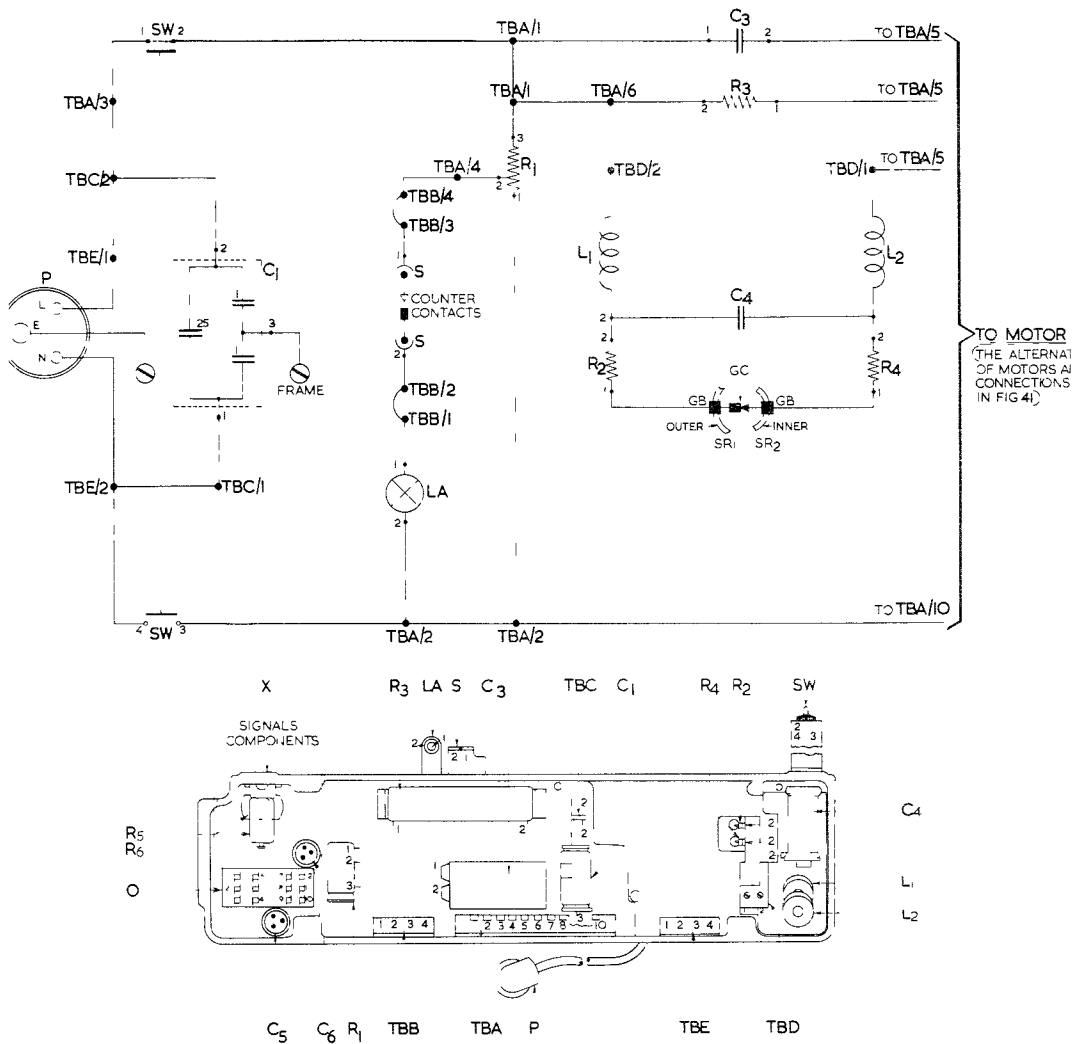
REF. 151A



REF. 158A

MOTOR	CHARACTERISTICS
REFERENCE N°150 <sup>A</sup>	FOR A/C OR D/C OPERATION, GOVERNED
- - N°151 <sup>A</sup>	FOR D/C OPERATION ONLY
- N°152 <sup>A</sup>	FOR A C OPERATION ONLY
- - N°158 <sup>A</sup>	FOR 24v D/C OPERATION ONLY

Fig. 41 ALTERNATIVE MOTOR UNITS WITH DETAILS OF CONNECTIONS TO TERMINAL BLOCK TBA. (See Fig. 40)



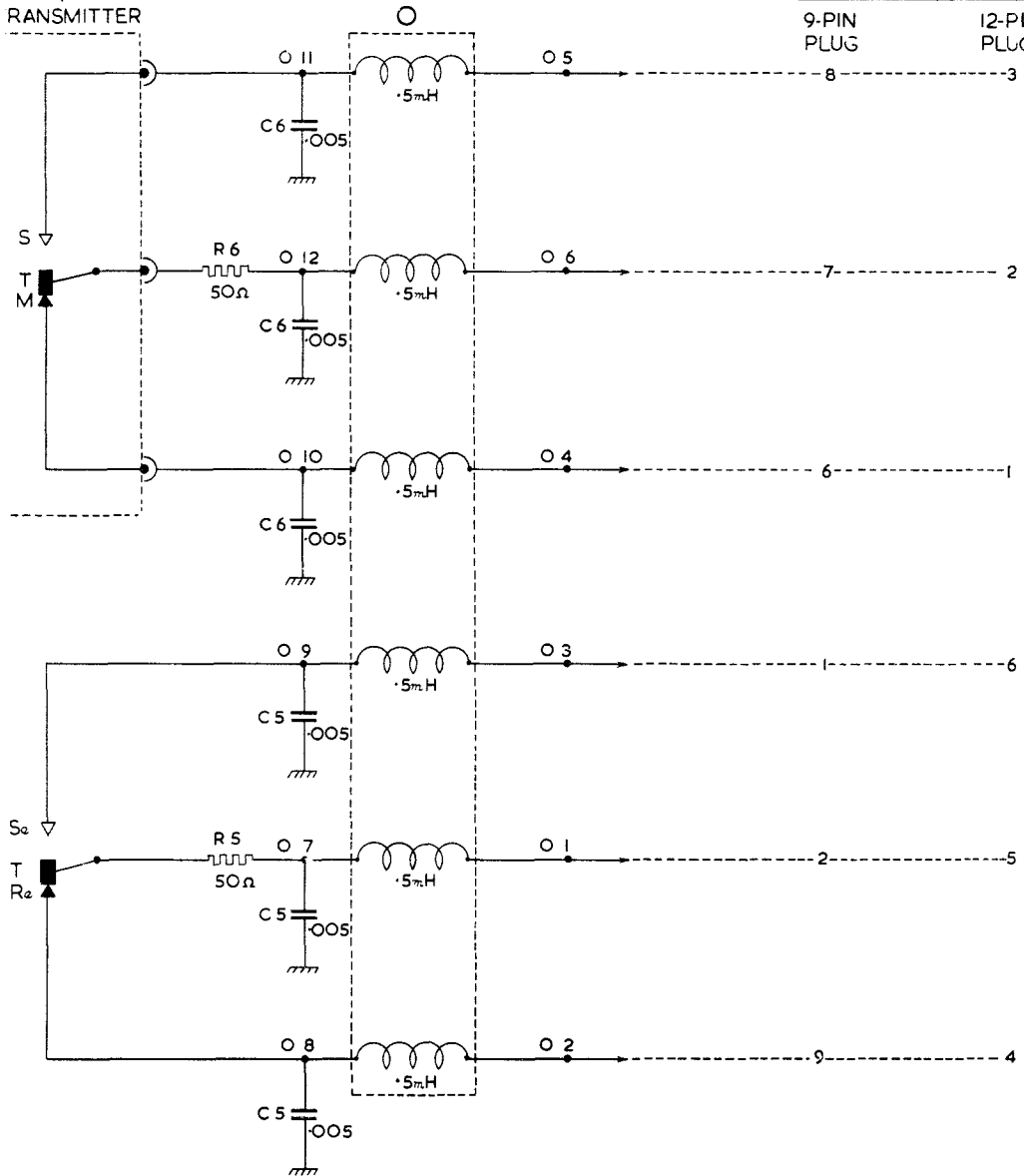
TBA	10 POINT TERMINAL STRIP	C4	CAPACITOR 1 $\mu$ F	R1	EoLI RESISTOR (SEE TEXT)
TBB	4WAY CONNECTION BLOCK	C56	SIGNALS RIS (005+ 005+ 005)	R24	RIS RESISTORS (5 $\Omega$ EACH)
TBC	MAINS SUPPRESSOR UNIT	GB	GOVERNOR BRUSH	R3	GOVERNOR RESISTOP
TBD	TERMINAL BLOCK	GC	GOVERNOR CONTACTS	R56	RIS RESISTORS (LOW REACTANCE)
TBE	4WAY CONNECTION BLOCK	LI2	RIS INDUCTORS (1mH EACH)	S	EoLI SQUARE FLANGE SOCKET
C1	RIS CAPACITOR UNIT	LA	EoLI LAMP (6v 0.6A MES)	S3	GOVERNOR SLIP RINGS
		O	SIGNALS RIS INDUCTORS	SW	MAINS SUPPLY SWITCH
C3	RIS CAPACITOR 5 $\mu$ F	P	MAINS SUPPLY PLUG	X	MODEL 67P/N ONLY (SEE FIG 42)

Fig. 40 CIRCUIT SCHEMATIC AND COMPONENTS LAYOUT FOR MODEL 67P/N, AND MODEL 7/PN WITH GOVERNED MOTOR.

MODEL  
6S/5  
TRANSMITTER

**CONTACT NUMBERS**

9-PIN PLUG	12-PIN PLUG
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NOTE: FOR COMPONENTS IDENTIFICATION  
SEE TABLE OF FIG.40

Fig. 42 SIGNAL CIRCUIT SCHEMATIC.