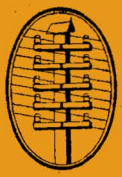
INSTRUCTION BOOKLET No. 20.

THE MORSE REPERFORATOR

MODEL No. 7W/3.



CREED & CO., LTD.
TELEGRAPH HOUSE
CROYDON

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No. 20

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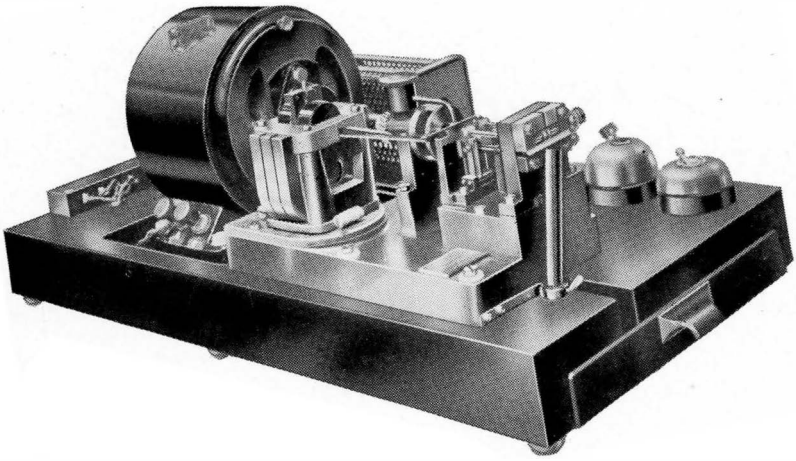


FIG. 1.

THE MORSE REPERFORATOR

The Morse Reperforator produces, at the receiving end of a circuit, a perforated tape which is a replica of the tape passed through the transmitter at the sending end. This may be used (1) in conjunction with a Creed Morse Printer, which translates the message and types it in Roman characters on a paper tape or sheet, or (2) to retransmit the message, by passing it through transmitters on other circuits.

The machine consists of an operating magnet, a motor driven perforating head (which is controlled by the armature of the operating magnet) and mechanism for feeding and controlling the movement of the paper tape.

The operating magnet is actuated, via. a line relay, by sub-audio signals from the output unit of a diversity radio receiver or by similar signals received over a land line. The line relay is employed because the operating magnet requires a current of 150 mA., when connected to a 110V. supply, or 75 mA. when connected to a 220V. supply, to obtain satisfactory operation.

To enable the Reperforator tape speed to be adjusted, so that it shall accord with that of the tape in the distant transmitter, a rheostat is connected in the field circuit of the shunt wound driving motor. Intermittent variations of speed, or irregularities of received signals can, however, be accommodated by the Reperforator mechanism.

The driving motor, which is of $\frac{1}{8}$ H.P. is wound either for 110V. or 220V. D.C., as specified. A.C. motors are not used, except for special applications, on account of the variation in speed required to suit various speeds of operation.

SPEED OF OPERATION.

With a standard 1450 r.p.m. motor, a 3 speed gear and a tape feed spindle worm and worm wheel ratio of 3-20, a speed range of 35-150 w.p.m. is obtainable. In practice the upper limit specified is normally exceeded, the actual maximum speed varying with different motors.

If higher speeds, up to 200 w.p.m. are required, a high speed motor can be fitted.

The speed ranges obtained with the standard motor and 3 speed gear are as follows :—

Speed.	Gear Ratio.	Speed Range.
High :	1 : 1	150 — 90 W.P.M.
Intermediate :	8 : 13	92 — 55 W.P.M.
Low :	3 : 8	56 — 35 W.P.M.

SPEED INDICATOR.

A speed indicator is fitted to facilitate accurate speed adjustment, by providing a continuous visual indication of any speed differences between the reperforator and the distant transmitter.

SINGLE AND DOUBLE SETS.

On lightly loaded circuits one reperforator is usually sufficient to carry the traffic, but on busy circuits, in order to ensure that signals are not lost when a coil of tape is exhausted, it is the usual practice for two machines to be installed, side by side, so that the second machine can be switched on, in parallel with the first, just before the tape is quite exhausted. It can than continue to carry the traffic while the emptied tape wheel drawer is recharged.

ACCESSORIES.

Unless instructions are received to the contrary each Reperforator is shipped complete with a set of accessories as listed at the end of this booklet.

When ordering, however, it is necessary to state the supply voltage to be employed and whether Bayonet or Screwed type holders and lamps are required.

When Morse Printers are used adjacent to the Reperforators it is customary to connect the driving motors of these machines to the same supply, as shown in Fig. 3.

In order to conserve the number of meters employed, milliammeter jacks can be inserted as shown. If these are fitted with suitable shunts the same meter can be employed for both the line and local circuits.

DIMENSIONS.

The space occupied by the Reperforator is 12″ × 24″ × 9¼″ high.

WEIGHT.

The weight of the Reperforator is 70 lbs.

OPERATING SUPPLIES.

(a) For Signalling.

A 3 wire D.C. supply is required to operate the Reperforator Operating Magnet in the local circuit of the receiving relay. Storage batteries or commercial sources of D.C. supply may be employed. A motor generator set or a rectifier may be used where only an A.C. supply is available and where it is not convenient to use batteries.

When batteries are used the third supply wire can be obtained by tapping the centre point of the battery.

With other sources of supply, having only a 2 wire output a potential divider must be provided.

This can conveniently take the form of a 4 holder lampboard connected as shown in Fig. 2.

When using a lampboard potential divider for this purpose the following are the conditions for standard 110 volt and 220 volt equipments :—

Supply Voltage	Current in Operating Magnet Windings	Operating Magnet Windings Resistance	Winding Designating Letter	Capacitor connected across the Windings	Rating of Lamps, Metal Filament
110V.	150 mA.	6¼ + 6¼ ohms.	"A"	5 μF.	110V. 40W.
220V	75 mA.	25+25 ohms.	"C"	1 μF.	220V. 40W.

(b) For Motors.

If only an A.C. supply is available, suitable means must be provided to obtain a D.C. supply either by means of a motor generator set or a rectifier. It is essential that this supply be stable as variations in voltages cause speed variations which reduce the amount of signal distortion that can be tolerated and may even cause errors. For small installations a separate rectifier for each reperporator should be used.

The same source may be used for the current supply for the operating magnet circuit, with resultant economies in station plant.

The power consumption of the 110V. motor is approximately 150 watts., and the 220V. motor approximately 135 watts.

LUBRICATION.

The Reperforator mechanism requires a good quality lubricating oil of medium consistency such as Creed Lubricant No. 2, "Castrol XL" or "Shell C.Y.2." The lubrication instructions given in Fig. 15 should be followed.

PAPER TAPE.

Centre-holed, standard parchment tape, is supplied in rolls of approximately 950 ft. in length. (Code word ABARF.) Each coil weighs 13 ozs. and is sufficient for 5,000 average words.

SETTING UP THE EQUIPMENT

CONNECTIONS.

The internal wiring of the Reperforator and the external connections for a single set are shown in Fig. 2, and those for a double set are shown in Fig. 3.

To simplify the diagram the single set has been shown schematically in Fig. 2, whilst in Fig. 3 a point to point diagram has been employed.

TO FEED THE TAPE.

Pull out the drawer and place the roll of tape on the wheel so that it will unwind in a clockwise direction. Lead the tape through the guide, around the vertical roller and under the horizontal roller. Close the drawer, turn the cuttings chute away from the punches and switch on the motor. Feed the tape up behind the lower guide and the dies until the tape feed wheel sprocket engages it. Replace the cuttings chute in position.

SWITCHING ON.

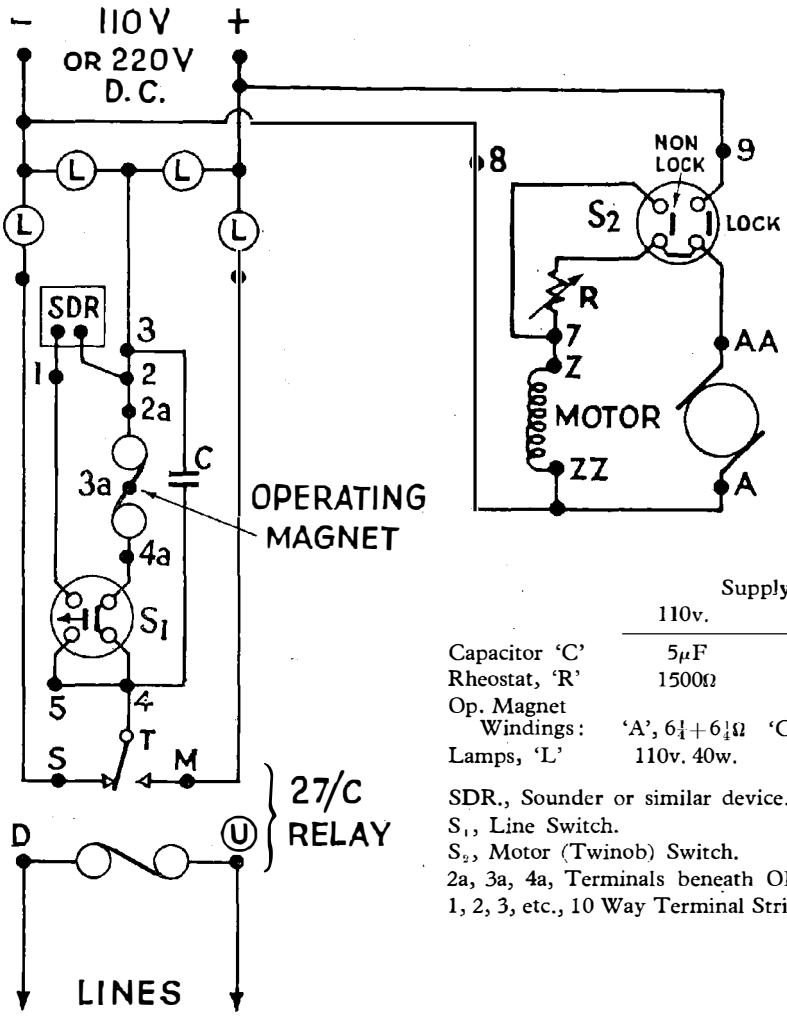
The Reperforator is fitted with two tumbler switches, the front one for switching the line current through the windings of the operating magnet, and the rear one for controlling the motor. The latter switch is arranged to short circuit the field rheostat at the moment of starting.

It should be noted that the motor switch must be switched on first and off last, in order that the punching of the tape shall only take place while the motor is revolving at its correct speed.

TO SET THE SPEED.

In order that the paper tape shall be held stationary while each hole is being perforated, the tape feed spindle is arrested momentarily for each punching operation. Therefore, to enable the mean speed of the tape to accord with that of the tape in the distant transmitter, its speed, between the operation of punching each hole, must be higher than the mean speed.

The Speed Indicator indicates whether the speed is correctly adjusted or whether it is too fast or too slow. But, when first putting a reperforator into service it is usual to adjust its speed approximately to that of the distant transmitter by means of a speed test tape as described below.



	Supply. 110v.	220v.
Capacitor 'C'	5μF	1μF
Rheostat, 'R'	1500Ω	4000Ω
Op. Magnet Windings:	'A', $6\frac{1}{4}+6\frac{1}{4}\Omega$	'C', $25+25\Omega$
Lamps, 'L'	110v. 40w.	220v. 40w.

SDR., Sounder or similar device.
S_1, Line Switch.
S_2, Motor (Twinob) Switch.
2a, 3a, 4a, Terminals beneath OP. Magnet.
1, 2, 3, etc., 10 Way Terminal Strip on Base.

FIG. 2.
Simplified diagram for Single Set.

Subsequent speed adjustments, necessitated by an alteration to the speed of the transmitter and dictated by improved or worsened reception conditions, are made according to the indications of the Speed Indicator.

SPEED TEST.

Request the Transmitting Station to insert in their transmitting head, a continuous band, consisting of 12 inch lengths of blank tape separated by 3 inch lengths of reversals.

Adjust the speed of the Reperforator, both by means of the 3 speed gear and by means of the rheostat, until 13 inches of blank tape is fed out between the groups of reversals.

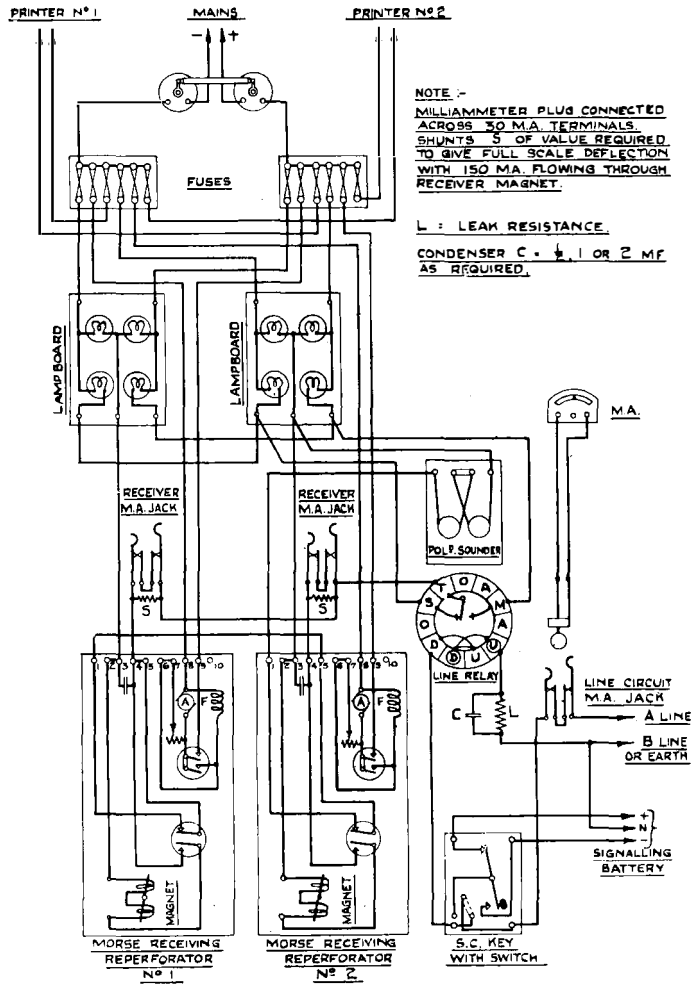


FIG. 3.
Wiring diagram for Double Set.

To enable the machine to accept the greatest amount of distortion it is advisable that the *highest motor speed* and the *lowest gear ratio, consistent with the signal speed being received*, should be employed.

Having so adjusted the speed, the distant station should be requested to send traffic and the speed indicator on the reperforator should be observed. The white spots on the Indicator disc should be approximately stationary.

If the reperforator motor is running too fast the spots will move continuously in a FAST direction, and if too slow in a SLOW direction. The operator should endeavour to keep the spots stationary by correctly adjusting the motor rheostat.

Owing to fluctuations in the speeds of the transmitter and reperforator motors, the spot which is being observed may not be perfectly still but tend to drift in

one or other direction. The rheostat should be adjusted to keep the spots as nearly stationary as possible, but for speeds above 100 w.p.m. any drift should only be in a FAST dirction. For speeds below 100 w.p.m., any drift should only be in a SLOW direction.

At the end of the message, or at any time when no signals are being received, the spots will move quickly in a SLOW direction. The speed of the motor should not, however, be altered. Immediately the signals start again, the spots will become nearly stationary.

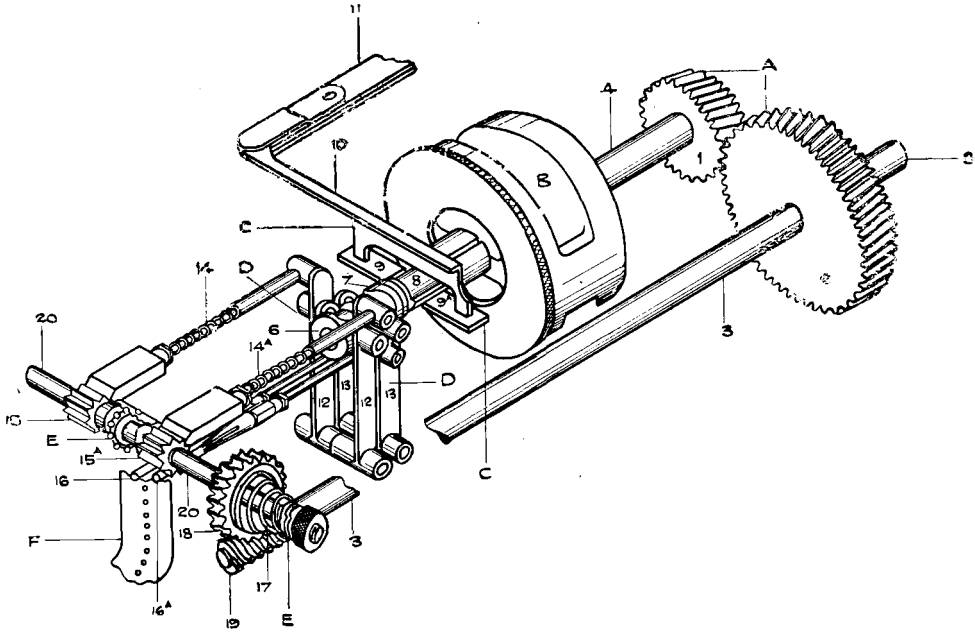


FIG. 4.
Diagram of Reperforator.

OPERATION

The Reperforator consists of the following units :—

(a) The driving motor.
(b) The operating magnet.
(c) The friction clutch.
(d) The detent mechanism.
(e) The punching and correcting mechanism.
(f) The tape feeding mechanism.

The clutch shaft gear wheel 1 (Fig. 3) is driven from the main shaft gear wheel 2. Fixed to the clutch shaft 4 is a friction clutch B, one plate of which rotates the cam 6. Revolving with the cam, and situated between it and the clutch, is a detent 8 whose movements are controlled by the operating magnet armature extension 11, yoke 10 and two detent plates 9, 9a. These detent plates permit the cam to revolve in an anti-clockwise direction for one half-revolution at a time, the inner edge of either detent plate 9 or 9a being advanced to engage the detent 8 and hold it, thus causing the driven plate of the friction clutch to slip. This continues until the current reverses in the windings of the operating magnet. The armature is thus attracted to the opposite pole carrying the yoke 10 with it and permitting the detent and cam to make another half-revolution. Thus it will be seen that the movements of the operating magnet armature will be communicated in turn to the yoke and detent plates and so control the movements of the cam.

The cam has two tracks, the front track controlling the corrector rods 14 and 14a, and the rear track controlling the punches 16 and 16a.

Before the paper tape F can be perforated, it is necessary that it should be arrested and correctly positioned.

To effect this, the cam tracks are designed to allow the corrector rod 14 or 14a to be advanced into engagement with the corrector wheel 15 or 15a before the punch 16 or 16a touches the paper, and to remain in engagement until the punch is withdrawn.

In the case of a "dot" signal, the armature of the operating magnet is attracted to the marking side for one signal period carrying with it the yoke and detent plates, thus releasing the detent and cam which makes one half-revolution in an anti-clockwise direction, thus recording the marking perforation in the tape. When the marking impulse ceases the armature and detent plates are returned by the succeeding spacing impulse and the second half-revolution takes place and the spacing perforation is recorded in the tape.

In order to allow for the resultant movement of the tape between the withdrawal of the Marking corrector and the advancement of the Spacing corrector, the Spacing corrector wheel is staggered by one half a tooth pitch with respect to the Marking corrector wheel, and the Spacing punch is placed 1/20th of an inch higher than the Marking punch.

In the case of a "dash" signal the armature is attracted and held for three signal periods during which time the centre-holed tape is fed forward 3/20ths of an inch. Consequently, the spacing perforation will be recorded, on the return of the armature, opposite the next centre-hole to that facing the marking perforation.

The tape feed spindle 20 is driven via the driving shaft 3, and the worm wheel and worm 18 and 19.

A small friction clutch E allows the tape feed spindle 20 to be arrested by the correctors 14 and 14a.

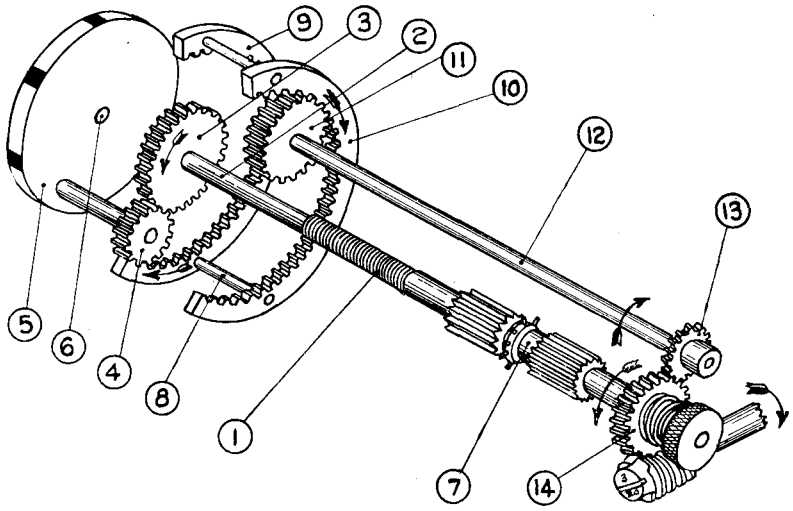


FIG. 5.

SPEED INDICATOR. (Fig. 5.)

The worm wheel 14 is driven continuously in an anti-clockwise direction and drives the pinions 13 and 11, so causing the outer sun wheels 9 and 10 to rotate continuously in a clockwise direction.

The inner sun wheel 3 is coupled to the Tape Feed Spindle 7 by a spring coupling 1 and therefore rotates in an anti-clockwise direction.

The planet wheel 4 will rotate owing to the combined action of the inner sun wheel 3 and outer sun wheel 9, and the disc 5, carrying the planet wheel 4, will rotate in a clockwise or anti-clockwise direction, depending upon the relative speeds of the inner and outer sun wheels.

This may be readily appreciated by assuming that the inner sun wheel is held stationary and the outer sun wheel is moved in a clockwise direction, in which case it will be seen that the disc 5 must also rotate in a clockwise direction.

If now the outer sun wheel 9 is held stationary and the inner sun wheel 3 is rotated in an anti-clockwise direction, the disc 5 will now rotate in an anti-clockwise direction.

Consequently, if both inner and outer sun wheels rotate in opposite directions but at the proper relative speeds, the disc 5 will remain stationary.

The gear ratios are so designed that this occurs when there is a speed difference of 8 per cent. between the speed of the worm wheel 14 and the mean speed at which the corrector spindle 7 rotates, whilst being corrected under the control of the received signals.

When no signals are being received, the corrector spindle 7 and the worm wheel 14 will rotate at the same speed, and consequently the disc 5 will rotate slowly in an anti-clockwise direction.

At 100 words per minute, if the worm wheel speed differs by 1 per cent. from its correct speed relative to the signals, the disc 5 will rotate at a speed of approximately 1 r.p.m.

An increase in motor speed will cause the disc to rotate in a clockwise direction, and a decrease in speed will cause the disc to rotate in an anti-clockwise direction.

DISMANTLING INSTRUCTIONS

NOTE.—The same reference is used throughout for the same part. Figure references are not, therefore, always given in the text.

Do not unnecessarily remove the 4 fixing screws securing the Perforating Unit (Fig. 6) to the Main Base. These screws should be adjusted so that the packing felt holds the unit clear of the Main Base by approximately 1/16".

1. TO REMOVE THE PUNCH BLOCK UNIT, BE. (Figs. 6 and 7.)

1.1 Remove the Cuttings Guide, if fitted, and the Punch Block Unit Cover.

1.2 Unclip the Armature from the Detent Yoke DM.

1.3 Remove the two Punch Block Unit fixing Screws BG and lift the Unit from the machine.

2. TO DISMANTLE THE PUNCH BLOCK UNIT. (Figs. 7 and 8.)

2.1 Slacken the 2 screws P (Fig. 8) and remove the Speed Indicator (not shown) by pulling it to the left.

2.2 Remove the Punching Head fixing screws DB and pull the Head DA clear of the punches and correctors.

2.3 Remove the Cam Pivot Block fixing screw DY and remove the Block DW, plate DX and cam DT from the unit.

2.4 Remove the fixing screws EF and lift the Punch and Corrector Lever Bracket ED clear. **The pivot pins EG should not be removed unless absolutely necessary. Care should be taken not to lose the four cam rollers EC.**

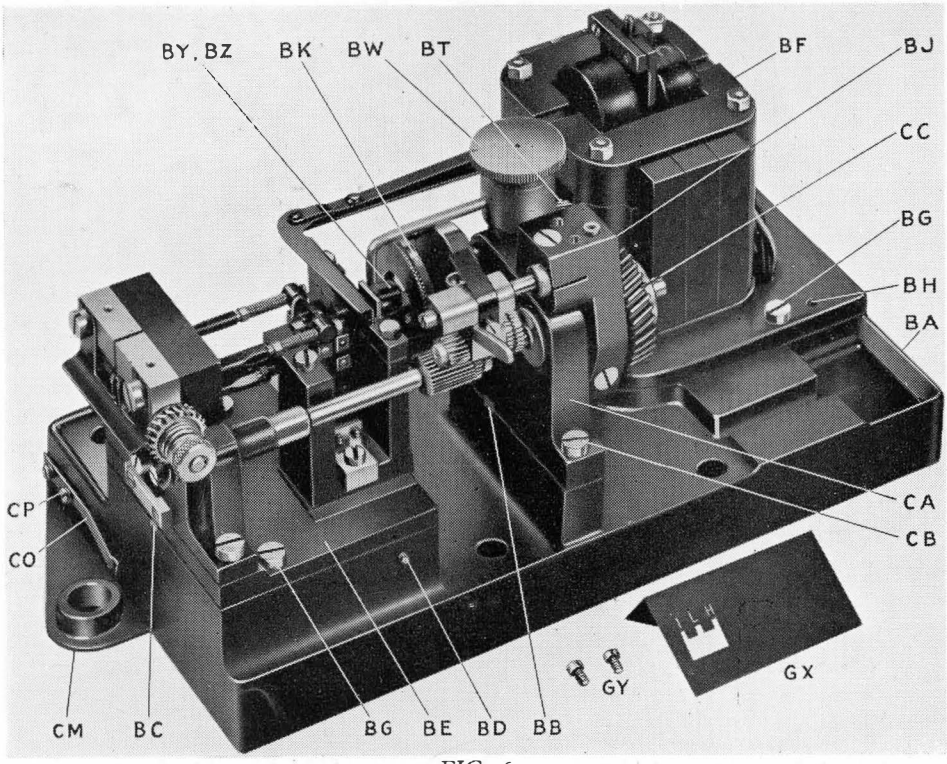


FIG. 6.

2.5 Remove the exposed Detent Plate Cover fixing screw DQ and slacken the screw beneath the Detent Yoke DM. Remove the Yoke and one Cover DN. Remove the second screw and cover.

2.6 Remove the Detent Plates DO.

2.7 After noting which way round they are assembled, and marking the plates, if necessary, so that they can be identified and reassembled in the same order, remove the Detent Bearing Plates DG (1 screw and nut).

2.8 Remove the Detent Plate Stop Block DP.

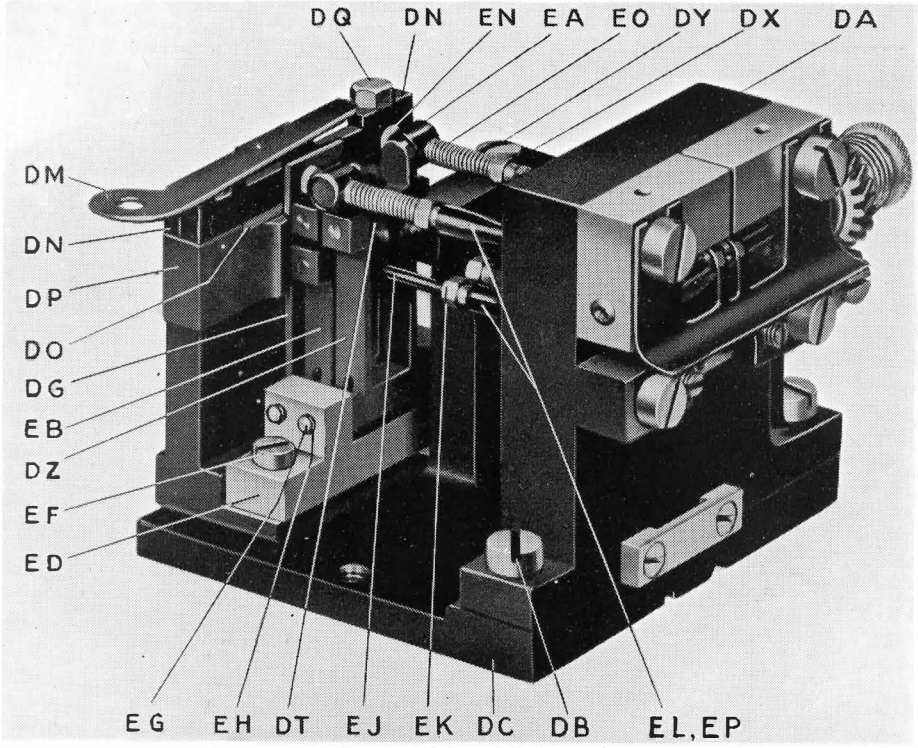


FIG. 7.

3. TO DISMANTLE THE PUNCHING HEAD UNIT after REMOVAL. (Figs. 8 and 9.)

3.1 If fitted remove the four screws securing the two bearings R (Fig. 8) and remove them and their associated spindle from the unit.

3.2 Remove the screws FO and lift off the Tape Take Off FN and Tape feed Spindle Brackets FM complete with the Tape feed spindle.

3.3 Remove the loose bearing from the spindle and unscrew the nut FE, releasing the worm wheel FQ and associated parts. DO NOT attempt to remove the Collar FK unless it is necessary to fit a new spindle or bearing. The collar is secured to the spindle by pin FL driven through both parts and filed flush both ends.

3.4 Holding the nut FR with a 2 BA spanner, unscrew, with a screwdriver, the worm FP.

3.5 Slacken the screws FW (not FV) and release the dies FS.

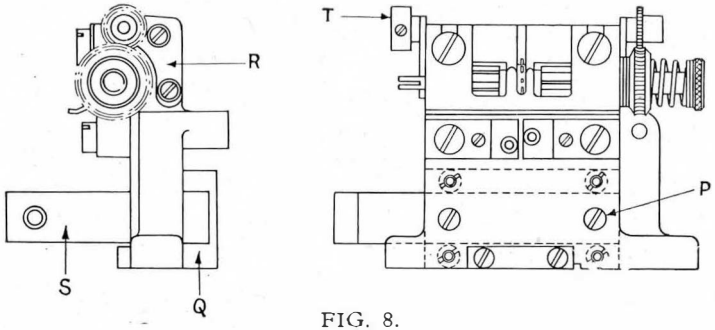


FIG. 8.

4. TO REASSEMBLE THE PUNCHING HEAD UNIT. (Fig. 9.)

4.1 Inset a punch EM from the rear, through the casting and locate a die FS, with it. Securely clamp the die by tightening screw FW (not FV). If the Die clamp FU is not parallel with the face of the casting slacken the screw FW and adjust the screw FV. Reclamp screw FW and ensure that the punch can pass cleanly into the die. Replace the second die in a similar manner.

4.2 Insert the worm FP into the casting and replace the nut FR.

4.3 Replace the loose tape feed spindle bracket on the spindle together with the worm wheel and mount the assembly on the casting without the Tape Take Off FN. After clamping the screws FO ensure that the spindle rotates freely. This is very important. Presence of foreign matter beneath the brackets will cause the spindle to run tight.

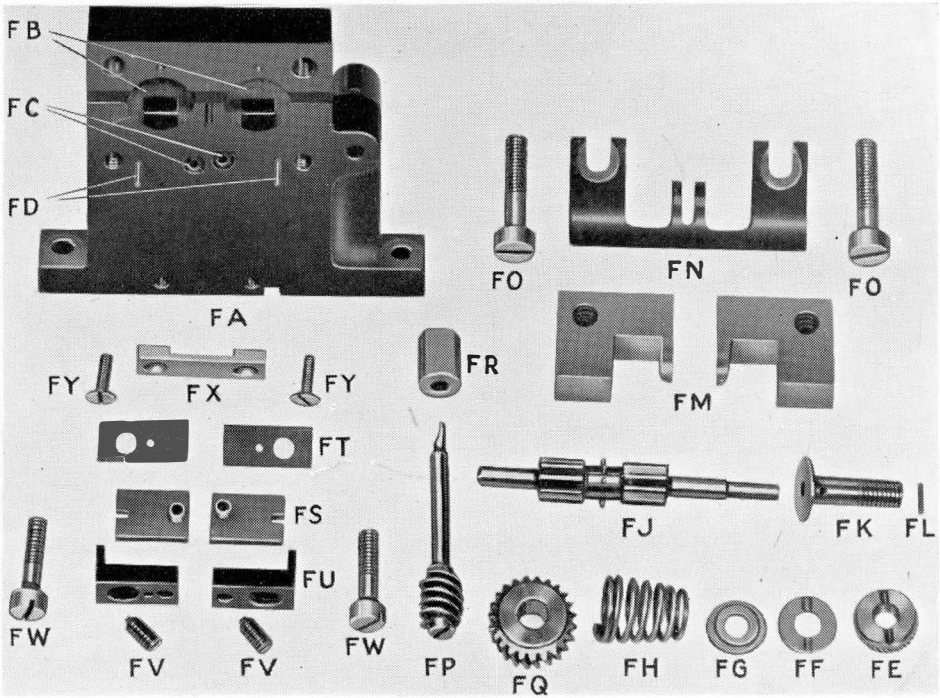


FIG. 9.

4.4 Slacken the screws FO, which should be $\frac{7}{8}$" long, replace Plate FN. Ensure that the ears of this plate do not foul the spindle and that a piece of tape will pass freely between the bearing brackets and the plate.

4.5 Replace the worm wheel spring FH and collar FG, the keyed washer FF with its projections outwards and the knurled nut FE with its groove facing inwards. Adjust the position of the nut so that the end of the spindle is just under flush.

4.6 Replace the bearings R and associated spindle (Fig. 8) and secure with the 4 screws.

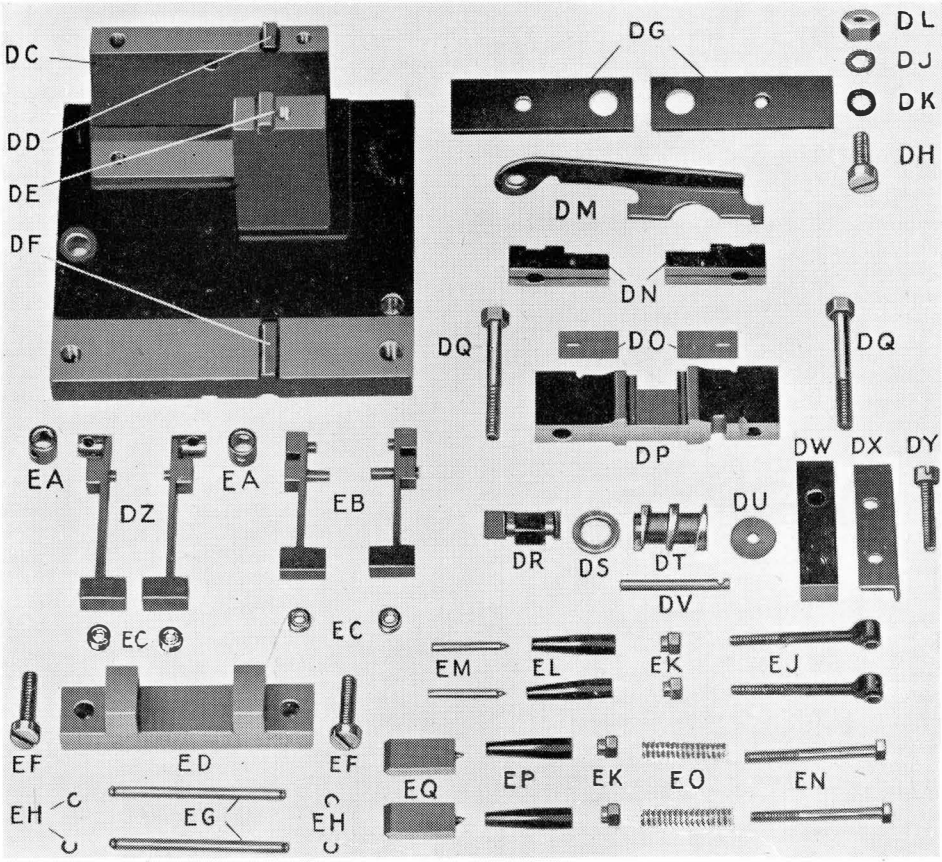


FIG. 10.

5. TO DISMANTLE THE PUNCH AND CORRECTOR LEVER BRACKET. (Fig. 10.)

5.1 Remove the 4 cam rollers EC and the Punch connecting Rods EJ. Remove the punches EM from the connectors EL by bending the punches backwards into their slots.

5.2 Holding the corrector rod EN firmly, bend the corrector EQ backwards into the slot in the corrector connector EP.

Slacken the lock nut EK and remove both the nut and the connector EP.

Slide off the spring EO and remove the rod EN and the bearing EA from the lever DZ.

6. TO REASSEMBLE THE PUNCH AND CORRECTOR LEVER BRACKET. (Fig. 10.)

6.1 **Punch Connecting Rod.** Hold the connector EL upright on a firm base with the punch resting in the connector. With the handle of a screwdriver tap the punch sharply and it should enter and remain in the punch connector.

6.1.1 Replace the nut EK and the assembled punch and connector on the connecting rod EJ.

6.2 **Corrector Rods.** Place the bearings EA on the levers DZ so that when the holes in the parts are coincident the ends of the bearings are flush with the levers.
Pass the corrector rods EN through the bearings.

6.2.1 Thread on to the corrector rod the spring EO and replace the lock nut EK. Stand the corrector connector EP on a firm base with the corrector EQ resting in the small hole at the top. With the handle of a screwdriver give the corrector a sharp tap and the pip on the end of the corrector should enter and remain in the corrector connector. Replace the assembled part on the corrector rod.

6.3 Replace the Punch connecting rods and the cam rollers on to the levers. The rollers must have their shoulders adjacent to the levers. **The Connecting rods EJ must have their shoulders adjacent to each other.**

7. TO REASSEMBLE THE PUNCH BLOCK UNIT. (Figs. 7 and 10.)

7.1 Place the Detent Plate Stop Block DP on its key DD and replace the detent bearing plates DG and detent DR ensuring that they are the same way round as when dismantled. Ensure that the plates are seating snugly against their location faces and that the detent is perfectly free in its bearings. Clamp the nut, washers and screw DH, DJ, DK, DL very tightly.

7.2 Replace the Punch and Corrector Lever Bracket Assembly (assembled under para. 6) and secure it by the 2 screws EF, after ensuring that the punch connecting rods EJ are assembled with their shoulders adjacent.

7.3 Replace the Punching Head Unit DA, engaging the punches and correctors in their respective guides. Secure with two screws DB. Ensure that the punches and correctors move perfectly freely, their full travel. Any stiffness in the movement should be located and corrected before proceeding any further with the assembly.

7.4 The cam DT should then be replaced. This operation should be carried out in the following manner :—

7.4.1 First, move the detent DR so that its engaging face is uppermost. Push the cam pivot DV into the bearing DW and place the rear thrust washer DU, cam DT and front thrust washer DS on the spindle. With the cam bearing DW vertical and the active portion of the cam tracks turned to the top, push the cam down into position between the cam rollers, and re-engage the cam with the tang of the detent DR.

7.4.2 Next, while holding the cam in position with the thumb-nail, withdraw the cam bearing together with the pivot and rear washer.

7.4.3 Re-insert the pivot together with the cam bearing in its correct position by passing it under the right-hand corrector rod and secure the bearing on its support block after ensuring that the Securing Plate DX is engaging the slot in the Pivot Pin DV.

7.5 Replace the detent plates DO so that the detent DR engages the chamfered face of each plate as it is revolved, i.e., the chamfer on one plate will be facing upwards and the chamfer on the other plate, downwards. (NOTE.—On certain machines the detent plates are chamfered on both sides. They can then be mounted either way up.)

7.6 Replace the left hand Detent Plate Cover DN together with its screw DQ, leaving the latter slightly loose.

7.7 Engage the Detent Yoke DM with the Detent Plates and tighten the cover fixing screw DQ.

7.8 Replace the second Detent Plate Cover and screw and ensure that the yoke can move freely from side to side.

7.9 With the machine correctly assembled and when the armature is moved to the left or spacing position, the cam will be arrested with the active portion of the cam tracks uppermost or in view.

7.10 Replace the Speed Indicator engaging the couplings. Clamp with screws P (Fig. 8).

7.11 Adjust the Unit in accordance with the Adjustment Instructions.

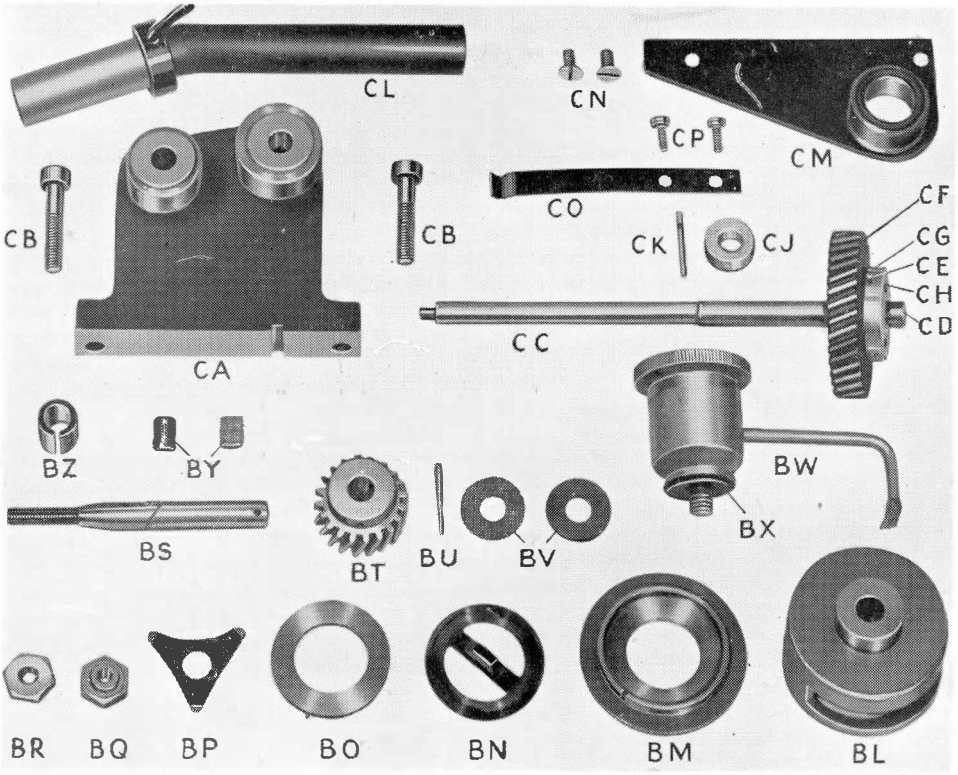


FIG. 11.

8. TO REMOVE THE MAIN BEARING UNIT CA. (Fig. 6.)

8.1 Remove the Punch Block Unit BE. (See Section 1.)

8.2 Slacken the grub screw in the motor coupling.

8.3 Remove the Main Bearing CA (2 screws CB).

9. TO DISMANTLE THE MAIN BEARING UNIT. (Figs. 11 and 12).

9.1 Remove the taper pins GG and BU from the two gear wheels GJ and BT and the taper pin from the motor coupling. Use a **brass** punch until the pins are level with the surrounding material, then withdraw them with a pair of pliers.

9.2 Slacken the clamping screw GB in the 3-speed gear unit and remove the unit.

9.3 Withdraw the Clutch Assembly BK (Fig. 6) complete with its spindle BS.

9.4 Remove the Lubricator BW.

9.5 If the Main Shaft GE cannot be removed easily, the Main Shaft Gears GM, GN will have to be removed. This should not be done unless it is absolutely necessary to remove the shaft.

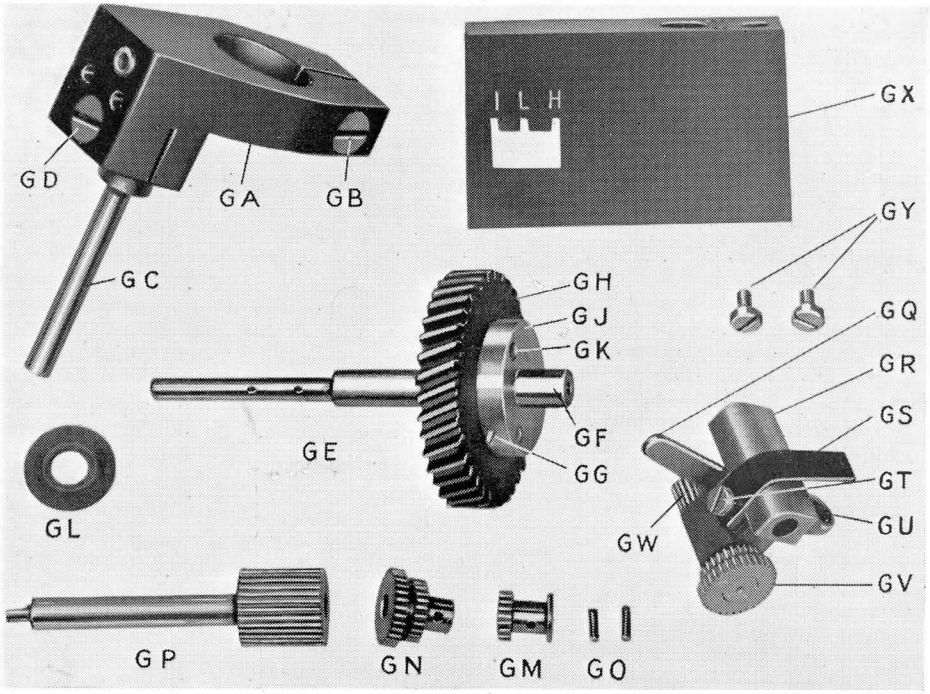


FIG. 12.

10. To DISMANTLE THE CLUTCH.

10.1 Unscrew the Knurled Cap BM.

10.2 Remove the loose parts BN, BO, BP.

11. TO REASSEMBLE THE CLUTCH.

11.1 Grease the inside of the Clutch cap BM, both sides of the Friction Plate BN and the **counter sunk** side of the Clutch Plate BO.

11.2 Place the friction plate BN into the Knurled Cap, tang side downwards.

11.3 Place the Clutch Plate BO on top of the friction plate with the countersunk side downwards and the pin in its side located in the slot in the Clutch Cap.

11.4 Place the Spring BP on the shoulder of the nut BQ and replace the cap on the body, ensuring that the spring does not come off the shoulder of the nut and that the pin in the plate BO does not come out of the slot in the Cap BM.

12. TO REASSEMBLE THE MAIN BEARING UNIT.

12.1 Replace the 3 speed gear unit, ensuring that the lubricating hole in the casting behind screw GD is vertically above the lubricating hole in the bearing casting.

12.2 Replace the Main Shaft Assembly GE if this has been removed.

NOTE.—A thrust washer GL is fitted between the large gear wheel GH and the bearing CA.

12.3 Replace the lubricator BX.

12.4 Replace the Motor Coupling, together with its taper pin.

12.5 Replace the Clutch Assembly BK and gear wheel BT. Note that a thrust washer BV is fitted either side of the casting CA.

13. TO REPLACE THE MAIN BEARING UNIT.

13.1 Locate the Unit on its Keyway and secure it with 2 screws CB, $\frac{7}{8}$" long.

13.2 Place the Driven Shaft GP in the Worm Thrust Collar FR on the Punching Head Unit and the Buffer Spring BZ and Buffer Slips BY on the tang on the Clutch Friction Plate BN.

13.3 Replace the Punch Block Unit BE, and after ensuring that the Detent and Main Shaft are correctly engaged and that the unit is sitting squarely on the Main Casting replace the 2 fixing screws BG.

13.4 Tighten the grub screw in the Motor Coupling, ensuring that it locates on the flat on the Motor Shaft.

13.5 Adjust the 3 speed gear unit in accordance with the Adjustment Instructions.

14. TO REMOVE THE OPERATING MAGNET UNIT, BF. (Fig. 6.)

14.1 Unclip the Armature from the Yoke.

14.2 Remove the unit fixing Screws BG (2).

14.3 Lift the unit and undo the terminal screws in the block beneath, noting the existing arrangement of the wires.

14.4 Remove the unit from the machine.

15. TO DISMANTLE THE OPERATING MAGNET UNIT. (Fig. 13.)

15.1 Remove the top bearing HO (2 screws).

15.2 Remove the Armature HV, complete with winding HW.

15.3 **Do not** remove the magnets HN unless they are to be replaced. If this is necessary, remove the four fixing screws HM beneath the unit and remove the magnet frame HH. Carefully tap the magnets off the unit.

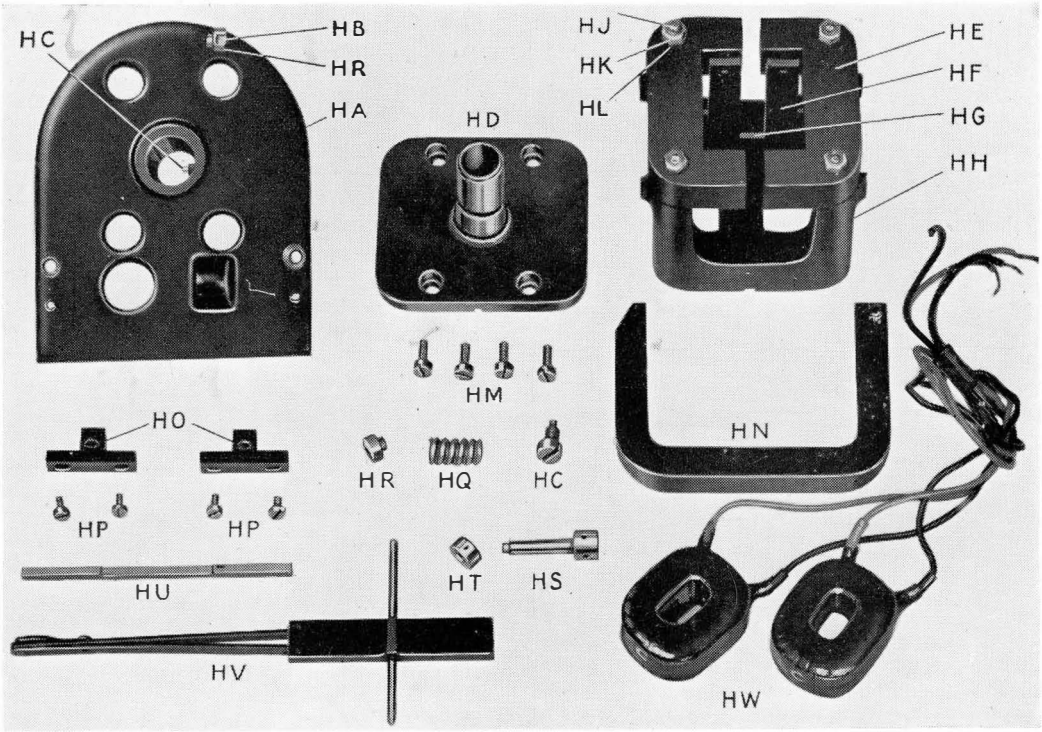


FIG. 13.

16. TO REASSEMBLE THE OPERATING MAGNET UNIT. (Fig. 13.)

16.1 If the magnet frame HH has been removed replace it on the Key HU in the Pivot Plate HD, ensuring that the vertical oil groove in the Armature Bracket HF is on the right hand side and that the bevelled sides of the magnets HN are on the left. Secure with 4 screws HM leaving them friction tight.

16.2 Replace the windings HW on the armature HV so that the designating letters on the windings face down the armature, and with the leads hanging downwards.

16.3 Replace the Armature, complete with the windings, into the Magnet Frame HH.

16.4 Replace the top bearing HO so that the counter bored holes are away from the armature extension and the **vertical and horizontal oiling grooves coincide. THIS IS MOST IMPORTANT.**

16.5 Reconnect the winding leads in accordance with Fig. 2. The armature should move to the right when a current of 150 mA. is passed through the windings from terminal No. 4 to terminal No. 2 on the 10-way terminal block, terminal No. 4 being positive.

16.6 Replace the Unit on the Main Base.

16.7 Fold a piece of paper tape to three thicknesses and insert it between the R.H. side of the Armature and the front pole piece. If necessary, adjust the bias screw HS (at the rear of the unit) so that the armature will stay against the paper.

16.8 Ensure that the Detent Yoke DM will drop easily on to the Stud in the end of the armature extension. If necessary, tap the Magnet Frame HH forwards or backwards until this condition exists.

16.9 Remove the magnet unit and tighten the 4 screws HM.

16.10 Replace the magnet unit, ensuring that the wires are not caught between the unit and the base, and secure with the two fixing screws BG. Remove the paper packing piece from the field unit.

17. COMPLETE MACHINE.

17.1 Check that the cam humps are uppermost and can be seen when the operating magnet armature is moved to the left (spacing) and the detent turned until it is arrested by the detent plate.

17.2 Ensure that there is end play for the Buffer Spring BZ and Buffer Slips BY between the rear bearing plate DG and the friction clutch plate BN.

17.3 Adjust the machine in accordance with the Adjustment Instructions

17.4 Replace the Cover CQ and the Cuttings Guide CL

ADJUSTMENTS

With the Punch Block Unit removed from the machine :—

1. CHECK THAT EVERY MOVING PART HAS PERFECT FREEDOM OF MOVEMENT, viz. :—

(a) the detent DR in its bearings DG ;

(b) the cam DT on its pivot pin DV ;

(c) the cam DT when engaged with the detent DR ;

(d) the corrector and punch levers DZ and EB with the cam DT in position and the punching head DA removed ;

(e) the correctors EQ and the punches EM in their guides in the punching head unit DA with the cam DT and the tape feed spindle brackets FM removed.

(f) the correctors and punches in their guides with the cam DT replaced ;

(g) the tape feed spindle FJ in its bearings with the fixing screws securely clamped and the clutch spring FH nut FE and tape take off FN, removed;

(h) as (g) above, but with the tape take off FN in position ;

(i) the punches EM in the dies FS.

(j) the detent yoke DM in the detent plate covers DN.

2. DETENT PLATES AND DETENT.

2.1 Ensure that the chamfered edges of the detent plates DO engage the detent DR.

2.2 Ensure that when the engaging face of the detent DR is uppermost, the cam humps are visible.

3. CORRECTORS.

Adjust the corrector rods EN so that, with the correctors EQ fully forward and engaged in a tooth of the tape feed spindle FJ there is a gap of .003" (one thickness of paper) between the head of the corrector rod EN and the corrector rod bearing EA. Securely tighten the locknuts EK.

4. PUNCHES (initial adjustment).

With the detent DR arrested, ensure that the punches are below flush and that the paper can pass freely beneath the dies FS.

NOTE :—The packing pieces FT beneath the dies should be assembled with the rounded corners downwards.

5. DETENT YOKE.

With the punch block unit reassembled to the machine, check that the detent yoke DM engages freely with the armature HV of the operating magnet. To facilitate this inspection, insert three thicknesses of tape between the pole piece and the R.H. side of the armature. To correct the engagement of the armature with the detent yoke, remove the magnet unit, slacken the four fixing screws HM underneath and replace the unit. Tap the field unit HH backwards or forwards as required until correct engagement is obtained.

Remove the magnet unit, tighten the four screws HM and replace the unit, ensuring that the flexible leads of the coils HW are not caught between the unit and the base. Replace and tighten the fixing screws and remove the paper tape.

6. MAGNET UNIT.

Adjust the magnet unit for neutrality by means of the bias screw at the rear of the unit.

7. 3 SPEED GEAR UNIT. (Fig. 12.)

Adjust the position of the Layshaft of the 3 speed gear by means of the eccentric pivot GC so that the gears GV and GW make full but easy engagement with the Gears GN and GM when the gear change lever GQ is fully engaged in the Gear change Gate GX.

8. PUNCHES (final adjustments).

With the motor running and whilst receiving reversals from the transmitter, adjust the lengths of the punches, after slackening the lock nuts EK and turning the punch connectors EL, until clean holes are just punched. Secure the adjustment by tightening the lock nuts EK.

9. MAIN CLUTCH.

The main clutch BK should be adjusted by means of the adjusting nuts BR, BQ, to give the minimum pressure on the clutch spring BP. To obtain the correct setting run the machine for 5 minutes to warm up the clutch, then retract the adjusting nuts until, with the motor running and reversals being received, the clutch is not strong enough completely to compress the corrector spring when the tape wheel FJ is held by hand and turned until the tip of a corrector tooth is struck by a corrector EQ.

Then gradually advance the adjusting nuts BR and BQ until the clutch has sufficient strength just to overcome this load. Clamp the adjusting nuts securely.

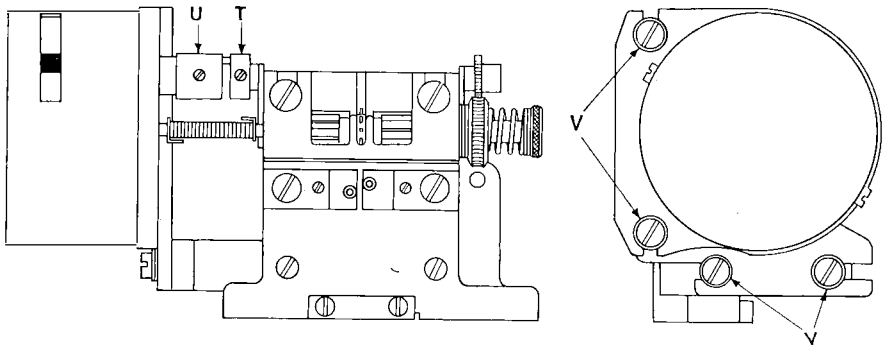


FIG. 14.

10. TAPE FEED SPINDLE.

Adjust the knurled nut FE on the tape feed spindle so that the end of the spindle is just under flush.

11. SPEED INDICATOR. (Fig. 14.)

Check that the couplings U and T are in line and also that the spring coupling is not distorted. If necessary slacken the 4 screws V and align the two units. Retighten the clamping screws.

12. SPEED.

Adjust the speed of the reperforator so that the tape feed spindle, when no signals are being received, is revolving 8 per cent. faster than the tape feed spindle of the distant transmitter.

This condition will be satisfied when the reperforator feeds out thirteen inches of blank tape whilst the transmitter is passing 12″ of unperforated tape through the head.

Finally, correct the speed until the disc in the Speed Indicator remains approximately stationary whilst signals are being received.

LUBRICATION CHART No. 520

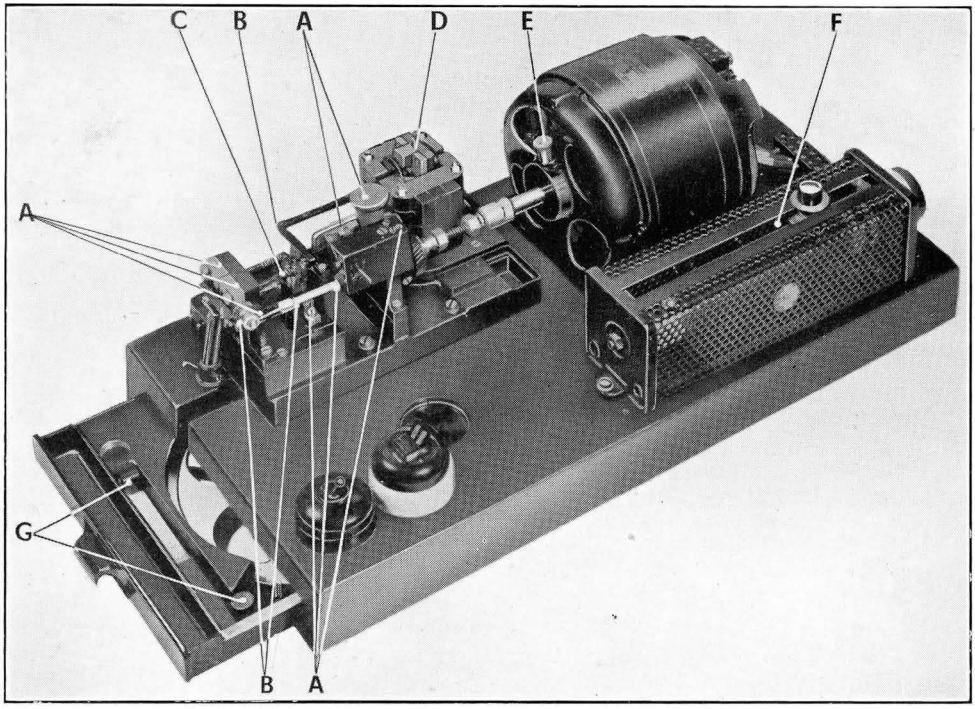


FIG. 15.

DAILY

A Fill all the lubricators and oil holes with Lubricant No. 2.

B Apply a drop of Lubricant No. 2 at the points marked B.

C Spread a few drops of Lubricant No. 2 along the cam tracks.

MONTHLY

D Place two spots of Lubricant No. 1 in the groove in the top bearing of the operating magnet.

E Screw the grease cup down one turn. (When the grease cup is empty it should be repacked with Lubricant No. 4.)

F Wipe the rheostat track rail free of dirt and apply two drops of Lubricant No. 1.

G Apply one drop of Lubricant No. 1 to each of the tape roller pivots.

Lubricant No. 1. Spindle or Clock Oil.
„ No. 2. Medium Oil. (Such as Castrol X L.)
„ No. 4. Grease. (Such as Shell VW.)

Accessories List No. 7

1 Lampboard, 4 holder, 5 terminal	with bayonet holders	8334
	or with Edison screwed holders ...	8337
4 Lamps, 40W.	110V. bayonet	8120
	or 110V. screwed	8170
	or 220V. bayonet	8147
	or 220V. screwed	8201
5 Coils, 0.475″ (12 m.m.) wide Centreholed Parchment Tape (Standard)		ABARF
1 $\frac{1}{4}$-pint can Lubricant No. 2 (medium oil)		9349

1 Instruction Booklet No. 20.
1 Part List No. 1020.

Tool Kit No. 7

1 Punch Lapping Block	TA.1009
1 Tommy Pin (medium)	TA.1011
2 Spanners, Clutch Adjusting	TA.1012
2 Spanners, Punch and Corrector Adjusting	TA.1014
1 Screwdriver, 5″ × $\frac{1}{8}$″	8549
1 Screwdriver, 5″ × $\frac{1}{4}$″	8550
1 Oil Can (watch pattern)	8620