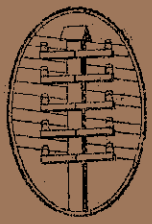
THE MORSE REPERFORATOR

MODEL No. 7-W.

MODEL No. 7-W.3



CREED

CREED & CO., LTD.,
TELEGRAPH HOUSE
CROYDON

THE MORSE RECEIVING REPERFORATOR

MODEL No. 7-W.

INSTRUCTION BOOKLET

No. 20

(ISSUED : DECEMBER, 1934)

CREED & CO. LTD.
TELEGRAPH HOUSE
CROYDON

Telegrams :
" CREDO, TELEX, CROYDON."

Cables :
" CREDO, CROYDON."

Telephone : CROYDON 2121 (4 lines).
Telex No.: CROYDON TELEX 1082.

CONTENTS

THE MORSE RECEIVING REPERFORATOR

The Morse Receiving Reperforator is the standard apparatus for translating Morse signals into their equivalent perforations in a paper tape.

It consists of an operating magnet which is actuated by signals received from the line relay, 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 motor is provided with a sliding speed-control resistance to bring the Reperforator speed to that of the distant Transmitter. This need not be exact as the mechanism of the Reperforator provides for a wide tolerance between speeds and intermittent variations of speed, or irregularities of received signals due to line disturbances, etc.

PAPER TAPE

Centre-holed standard parchment tape should be used. The tape is supplied in rolls of approximately 800 ft. in length and is fed into the perforator as follows :—

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 wire guide round the pin and under the front bobbin. Close the drawer, turn the cuttings chute away from the punches and switch on the motor. The tape should now be pushed up behind the lower guide and the tape feed wheel until the sprocket engages with it. Replace the cuttings chute in position.

THE MOTOR

A $\frac{1}{8}$ h.p. motor drives the Reperforator and is provided with a sliding resistance to adjust the speed.

The standard motors (approximately 80 watts) are D.C. 110 volts or 220 volts. A.C. motors cannot be used on account of the variation in speed required to meet various speeds of working.

RELAYED OPERATION

A receiving line relay should always be used to relay the line signals to the operating magnet, as this magnet is not intended for operation on small currents such as are received from the line.

SPEED OF OPERATION

The Reperforator can operate satisfactorily up to a speed of 200 words per minute, the minimum speed depending on traffic requirements. With a standard 1,450 r.p.m. motor and a tape feed spindle worm ratio of 3-20, a speed range of 90-150 w.p.m. can be obtained. If higher speeds are required a higher speed motor should be fitted. If very low speeds are required a three-speed gear can be provided giving the following ratios :—

Three-speed gear for Reperforator.

Speed No.	*Ratio*
1	1 : 1
2	8 : 13
3	3 : 8

For operating at very low speeds a special worm gear is fitted. This is arranged to reduce the speed of the tape feed spindle while maintaining a relatively high clutch speed for operating the punching and correction mechanism.

CURRENT SUPPLY.

A current supply is required to operate the local circuit of the receiving line relay in which the Reperforator operating magnet is connected. Only direct current may by used for this purpose. Storage batteries or commercial sources of D.C. supply may be used, or where an A.C. supply only is available, motor generator sets or signalling rectifiers can be utilised.

When using lampboard potentiometers to supply current for the local circuit in which the operating magnet is controlled, the following are the values for standard 110 volt and 220 volt equipments.

Voltage	*Current in Operating Magnet circuit*	*Resistance of Operating Magnet windings*	*Capacity of Condenser across windings*
110 v.	150 m.a.	$6\frac{1}{4} + 6\frac{1}{4}$ ohms.	5 mfd.
220 v.	75 m.a.	25 + 25 ohms.	1 mfd.

SWITCHES

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 resistance 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.

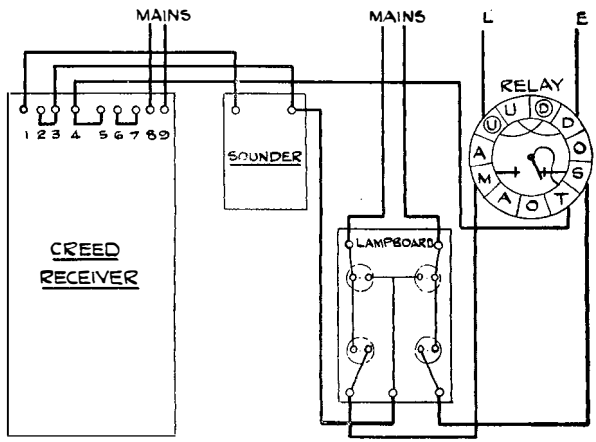
SPACE

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

CONNECTIONS

The external connections for a single set are as shown in Fig. 1, and for a double set as shown in Fig. 2.

The internal wiring of the Reperforator is given in Fig. 3.



LOCAL CONNECTIONS OF SINGLE RECEIVING SET

Fig. 1.

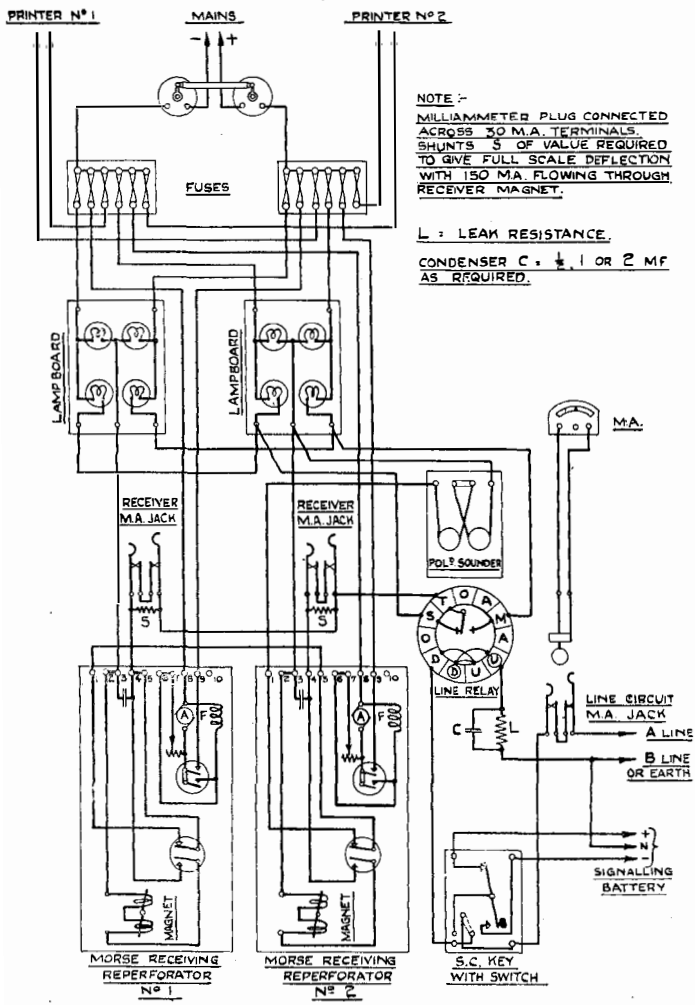


Fig. 2.

LOCAL CONNECTIONS OR DOUBLE RECEIVING SET.

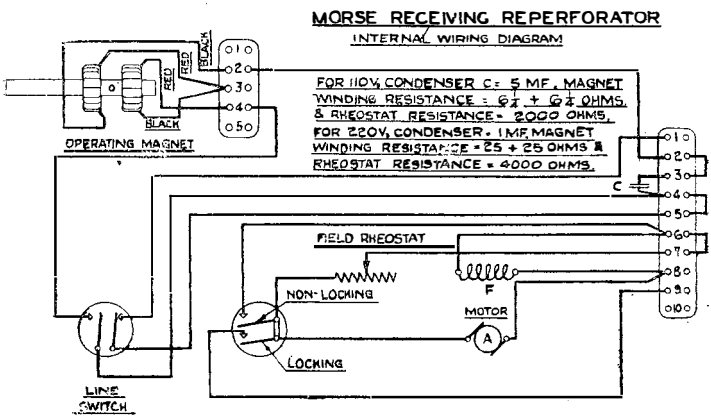


Fig. 3.
INTERNAL WIRING DIAGRAM.

OPERATION

The Receiving 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 devices.
(f) The tape feeding mechanism.

The clutch shaft gear wheel 1 (Fig. 4) is driven from the main shaft gear wheel 2. Fixed to the clutch shaft 4 is an adjustable friction clutch B, one plate of which rotates the cam shaft 6. Revolving with the cam shaft 6, and situated between the cam 7 and the clutch, is a detent 8 whose movements are controlled by the operating magnet (not shown) by means of the armature extention 11, yoke 10 and two detent plates 9, 9a. These detent plates permit the cam 7 to revolve in one direction for one half-

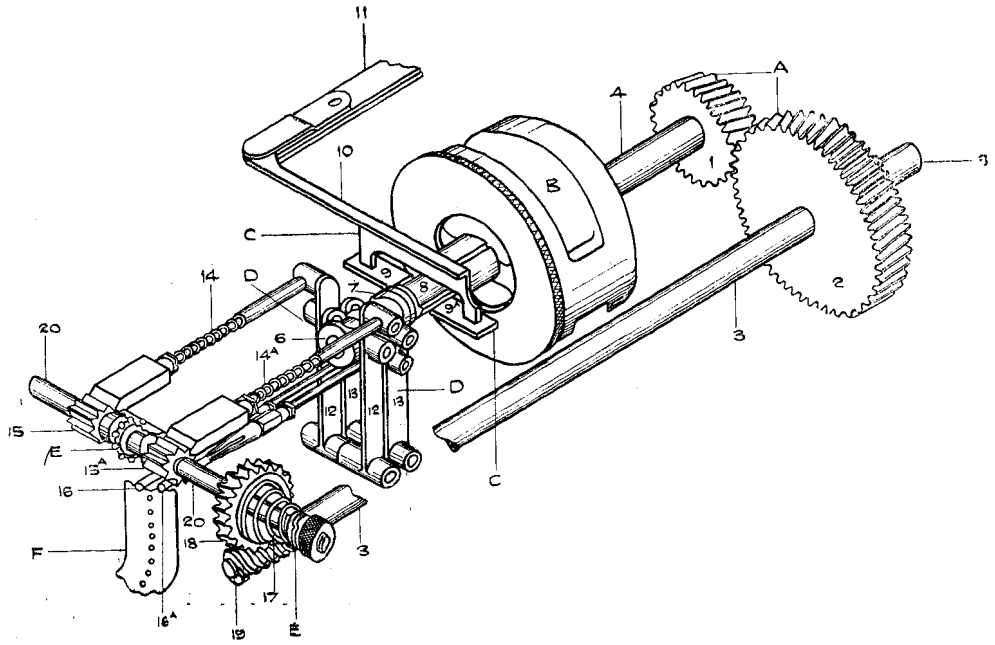


Fig. 4. DIAGRAM OF MORSE RECEIVING REPERFORATOR.

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 operating magnet and the armature is attracted to the opposite pole carrying the yoke piece 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 piece and detent plates which will control the movements of the cam.

The cam 7 which turns with the detent 8 has two tracks, the front track controlling the movements of the corrector rods 14 and 14a, and the rear track controlling the movements of the punches 16 and 16a.

Before the paper tape F can be perforated, it is necessary that its forward feeding motion should be momentarily arrested to avoid tearing.

To effect this, the cam tracks are so designed as 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 cleared.

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 for one half-revolution and recording the marking perforation on 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 records the spacing perforation on the tape.

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 feeding forward ; consequently, the spacing perforation recorded on the return of the armature will be perforated opposite the next centrehole to that facing the marking perforation.

The tape-feed spindle 20 is made to revolve in correct ratio to the clutch shaft 4 by means of gears 1 and 2, driving shaft 3 and worm gear 18 and 19.

A small adjustable friction clutch 17 situated in the worm-wheel 18 is caused to slip when a corrector rod engages a corrector wheel and stops the feed.

Exact isochronism between the transmitting and receiving tape feed spindles is not absolutely necessary, as the Receiving Reperforator will operate satisfactorily when its tape feed spindle speed varies from that of the Transmitter to the extent of from 5% slower to 30% faster.

FITTING NEW CORRECTORS, PUNCHES AND DIES

When new dies only are to be fitted, the old ones may be removed by slackening their clamping screws. When each of the new dies is clamped in position, the corresponding punch should be used to locate it. The punches may be moved forward one at a time, by moving the magnet armature and turning the cam by hand.

When the correctors, punches and dies all have to be replaced the following procedure should be adopted :—

First remove the punching head by taking out its two fixing screws, and sliding it from the locating key.

The cam should next be removed by detaching its bearing block and pivot. This will permit the removal of the punch and corrector rods from their pivots.

The old correctors may be removed from their rods and the new ones screwed in their place. The lock nuts should subsequently be re-tightened.

To remove the old punches from their connectors, turn them sharply backwards at right-angles, in the same plane as the slots in the connectors. When in this position, pull forward. The new punches should be tapped into the connectors with the handle of a screwdriver.

Now replace the punch and corrector rods on their pivots, and after removing the old dies by slackening their clamping

screws, slide the punching head back into position, with the punches and correctors passing through their respective guide holes in the casting.

If the four cam levers are now moved backwards and forwards, any lack of freedom of movement may be located and eliminated.

The new dies may now be fitted. The punches should be pushed forward to ensure that the dies are correctly located when they are clamped in position.

After the dies have been fitted, the freedom of the punches should again be tested, and any fault rectified.

Finally, the cam should be replaced. This operation should be carried out in the following manner :—

First move the detent so that its projecting edge is on the left, then take up the cam pivot and bearing, and place the front thrust washer, cam and back thrust washer on the spindle. Then with the cam bearing 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.

Next, while holding the cam and thrust washers in position with the thumb, withdraw the pivot and bearing.

Re-insert the pivot in its correct position by passing it under the right-hand corrector rod and securing the bearing on its support block.

DISMANTLING

The following instructions refer to the dismantling of he complete machine for purposes of cleaning and overhaul.

THE OPERATING MAGNET

The operating magnet (Fig. 5) may be removed from the machine by taking out the two screws which secure it to the base and swinging aside the spring clip which holds the end of the armature in engagement with the detent yoke.

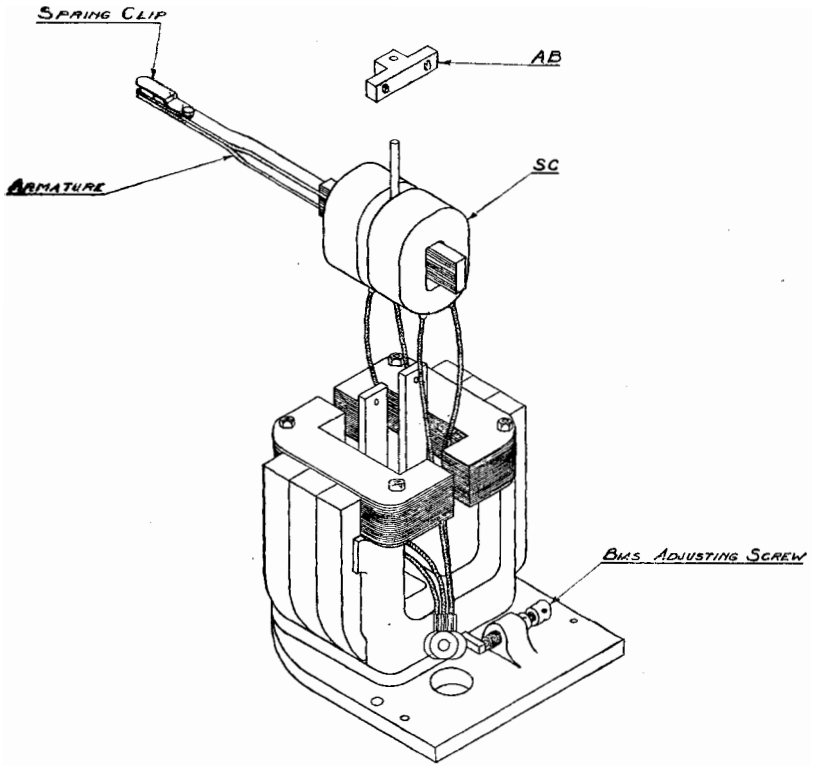


Fig. 5. OPERATING MAGNET.

The operating magnet should at first only be moved far enough to render accessible the terminal strip to which the connections are made ; then when the leads have been disconnected the operating magnet will be entirely free.

To dismantle the operating magnet, remove the top pivot bearing AB by taking out the two fixing screws and lifting it vertically off the pivot. Next lift the armature and windings together from the unit, and it will then be possible to remove the windings from the armature. Do not remove the magnets unless absolutely necessary. If they are removed they should have a piece of iron (keeper) placed across their poles.

THE PUNCH BLOCK

The punch block which accommodates the punching head, punch lever bracket and detent mechanism may be removed by first turning the cuttings chute outwards and lifting it clear of its pivot hole, then removing the two punch block fixing screws. Assuming that the operating magnet has first been removed, it will now be possible to slide the whole punch block forward and remove it from the base. Should the operating magnet still be in position, it will first be necessary to swing aside the spring clip on the end of the armature, and then to depress the end of the armature sufficiently to disengage it from the detent yoke.

THE DIES

The dies may be removed by slackening their clamping screws.

THE TAPE FEED SPINDLE

To dismantle the tape feed spindle remove the two bearing bracket fixing screws and lift the brackets from the keyway and steady pins. Then unscrew the tape feed friction adjusting nuts and remove the lock washer, spring and worm wheel.

To remove the spindle from the bearing block it will be necessary to remove the tape feed spindle collar, which is pinned in position. This should only be done if it is required to replace one of the parts which cannot otherwise be detached.

To remove the tape feed spindle driving worm, unscrew the nut on the rear end of the worm spindle and remove the worm.

THE CAM

To remove the cam pivot bearing, unscrew the bearing fixing screw and draw the bearing block and pivot clear of the cam.

To remove the cam, press all the punching and corrector levers forward with the cam until the cam is clear of the detent. The cam and its thrust washers can then be lifted from between the cam levers. The cam rollers can now be removed from the spindles.

THE CAM LEVERS

Remove the punch and corrector lever bracket fixing screws and lift the bracket clear of the steady pins. After removing the split rings from the pins, the punch and corrector lever bracket pins can be tapped out with a punch from either side, thus releasing the levers.

THE CORRECTORS

To dismantle the correctors and corrector rods loosen the corrector locking nuts and unscrew the correctors from their rods. Then remove the corrector locking nuts, springs and sleeves. This will permit the corrector rods to be drawn back through the levers.

THE PUNCHES

To dismantle the punches remove the connecting rods from their pivots, loosen the punch connection locking nuts and remove the connections. The punches can be extracted from their connections by turning them sharply backwards at right angles and in the same plane as the slot. When in this position, pull forward.

THE DETENT

To dismantle the detent and detent plates remove the right-hand detent plate cover screw and take out the yoke by sliding it to the right, together with the detent plate cover and lifting them clear. Then remove the left-hand detent plate cover and the detent plates can be easily removed from their seats.

The detent bearing screw should then be removed and the back and front bearings lifted from their steady pins, releasing the detent.

THE CLUTCH

To dismantle the clutch, slide the buffer spring and buffer slips from the clutch plate, unscrewing the milled clutch cap so that the friction plate, clutch plate and clutch spring can be taken out. The clutch body is screwed to a taper on the clutch spindle and should not be removed unless damaged.

To remove the clutch spindle from the bearing, tap out the pin in the cam shaft spur wheel, remove the spur wheel and thrust washer and the clutch spindle can then be drawn through the bearing.

THE MAIN SHAFT

To remove the main shaft tap out the taper pin in the thrust collar, slide off the thrust collar and washer, and the main shaft can then be withdrawn from the bearing.

THE MAIN BEARING

The main bearing can be removed by unscrewing its holding-down screws and lifting it from its keyway.

ASSEMBLING

When re-assembling see that all parts are perfectly clean and free from dirt. *This is very important.*

THE OPERATING MAGNET

When re-assembling the operating magnet, care should be taken to see that each of the windings is replaced in correct relation to the armature.

The coloured leads from the windings serve as a guide when the windings are replaced, the correct arrangement being as indicated in the wiring diagram (Fig. 3).

THE CLUTCH

Replace the clutch spindle in its bearing with the thrust washer inserted between the clutch body and the face of the bearing. Place the second thrust washer and spur wheel in position and insert the taper pin, tapping it gently home.

Screw on the adjusting and lock nuts, and replace the friction spring. Then take up the clutch cap, and place in it first the friction plate with its tang downwards, then the clutch plate with its projecting pin inserted in the slot in the clutch cap, and its bevelled inner edge downwards.

When screwing up the clutch cap, make certain that all three legs of the spring are resting on the friction plate. Replace the buffer spring and slips on the tang of the clutch.

THE DETENT

Place the front detent bearing in position ; insert the detent with the long tang to the rear. Over this place the rear detent bearing, gently press it home on its steady pins and screw up tightly.

The detent should be perfectly free with a minimum of end play.

THE PUNCHES AND CORRECTORS

Replace the punch lever bracket on its steady pins, and screw it down, making sure that the levers are not fouling the pillar carrying the cam pivot bearing.

To replace the punches in the punch connections, place the thick ends of the connections on a firm surface, hold the tapered end of the punch in position over the split end of the connection and tap it smartly with the handle of a screwdriver. There should be no end play on the punches in the connections. Now screw the lock nuts and the punch connections on to the punch levers.

Replace the punch connecting rods on their fulcrums. It will be noticed that the guide holes for the punches in the punch block casting are staggered (the spacing guide hole is set a little in advance of the marking guide hole), so when replacing the punch connecting rods on their fulcrums, make certain that the punches are in correct alignment—the higher, or spacing punch, being on the right.

Pass the corrector rods through the sleeves in the top ends of the corrector levers. Replace the corrector sleeves, springs, lock nuts and correctors.

THE PUNCHING HEAD.

Lift all the punch and corrector connections into a horizontal position, place the punching head so that its keyway just engages with the key on the punch block base and thread in the punches and correctors until they are right home ; then screw down the punching head.

THE DIES

To replace the dies, push the punches forward through the casting, place the thin packing pieces in position and locate the dies by slipping them over the punches and locating pins. Now fix the dies firmly in position by means of the clamps and clamping screws. By moving the levers backwards and forwards any undue stiffness may be located. When these operations have been completed the cam rollers may be replaced.

THE DETENT PLATES AND YOKE

All parts connected with the assembly of the detent plates should be very carefully wiped clean before being placed in position.

The parts should be replaced in the following order :—

First the detent plate stop should be placed in position on its key, then the left-hand detent plate and detent plate cover. These parts may now be secured in position by inserting the hexagon headed bolt. Next place the right-hand detent plate in position and engage the yoke with the slot in each plate, then slide the right-hand detent plate cover into position and screw it down with the hexagon headed bolt. After tightening make sure that the yoke and detent plates are quite free to move.

The normal travel of the yoke should not exceed $\frac{1}{32}''$. If this amount increases owing to wear, to an extent sufficient to affect the operation of the instrument (dropped dots are a symptom), the worn parts should be renewed.

THE TAPE FEED SPINDLE

Replace the right-hand bearing worm wheel, spring, lock washer and adjusting nut. Fit the worm in its bearing on the punch block and screw up the nut at the rear. Place the left-hand tape feed spindle bracket on the spindle and press both brackets home on their steady pins and keyway. Hold the tape take-off in position and screw it down.

THE PUNCH BLOCK

Replace the punch block base on the main base, depressing the operating magnet armature slightly so that the yoke does not foul it as the base is slid backwards.

When sliding the base into position, turn the clutch until the buffer spring and slips engage with the detent.

Engage the yoke with the armature extension and swing the spring clip into position.

ADJUSTMENTS

SPEED

When working at low speeds, the Reperforator should run about five per cent. faster than the Transmitter.

Working at higher speeds, good results are obtained by running five to ten per cent. faster than the Transmitter.

The sliding rheostat fitted to the base is connected in the field or shunt circuit of the motor, so that if the knob of the slider is moved towards the front of the machine the resistance of the field will be increased and the speed raised.

To correct the speed of the Reperforator in relation to the speed of the Transmitter, ask the distant station to run its Transmitter and put through at intervals 12 inches of blank tape (the bases upon which Creed Reperforators and Printers are mounted are 12 inches wide).

When the Transmitter is running without tape, reversals of current are sent to line, and the Reperforator will perforate a regular series of dots, but when the 12 inches of blank tape is inserted, the reversals are interrupted, and a length of blank will appear in the tape issuing from the Reperforator. This blank should measure 13 inches in length.

If less than 13 inches the Reperforator is running too slowly and the motor speed must be increased by altering the resistance until the blank tape is of the required length. If more than 13 inches, the motor speed should be reduced.

It is possible to adjust the speed while the line is being worked by altering the rheostat slider until the correct spacing appears between the letters and words on the perforated tape.

If spaces are lost between words, causing them to run together, the Reperforator is running too slowly. If spaces are gained between words, or words become split up, the Reperforator is running too quickly.

To ascertain the line speed, get the distant station to run reversals. Then measure the number of inches of perforated tape issuing from the Reperforator in ten seconds.

Multiply the number of inches per second by 25 to obtain the number of words per minute.

THE CORRECTORS AND PUNCHES

When in a forward position, the correctors should not only securely bed in the V-tooth of the corrector wheel, but the movement should continue so as slightly to compress the corrector rod spring. When set correctly, the corrector cam lever will travel forward a little further than the nut at the back end of each corrector rod, thus slightly compressing the spring and opening a small gap between the nut and the cam leyer. Lock securely. With both corrector rods in the mid-way inactive position, pressure with the fingers from the back should not stop the corrector wheel from revolving.

The punches should be adjusted until they drop just below the flush of the punch guide. When in a backward position any slackness should be taken up in the forward direction by turning the punch holders to the left. These punch holders are purposely made hexagonal, so as to accommodate a suitable spanner.

THE MAIN CLUTCH

The clutch should be sufficiently strong to compress the corrector springs to their full extent (i.e., when the correctors strike the edge of the corrector wheel teeth) at all speeds. This can be determined by starting up the Receiving Reperforator and turning the tape feed spindle backwards by hand. If the clutch spring has not sufficient tension, the cam will stick in the forward position.

The adjustment should be light for high speeds and heavier for low speeds. One adjustment of the clutch is generally suitable for a large range of speeds, and it will not be found necessary to alter it unless extremely low or high speeds are used. A little vaseline should be rubbed on the clutch plate before assembly.

THE OPERATING MAGNET

The operating magnet is adjusted for bias by means of the tommy screw situated at the back of the magnet. To obtain neutral bias, first make sure that there is no current passing through the windings, then turn the driving spindle by hand until the detent is in such a position as to allow the detent plates

to move their full distance. Move the armature from side to side, meanwhile turning the magnet body by means of the bias adjusting screw until the armature rests with equal force on either stop.

THE TAPE FEED CLUTCH

This clutch should be adjusted to feed the tape at all speeds without slipping. To facilitate correction and diminish wear, the minimum tension is desirable.

LUBRICATION

Full oiling instructions are given on Lubrication Chart No. 520, a copy of which is supplied with each machine.

SPARE PART LIST

When referring to this list it should be noted that the lettering C.P. affixed to part names indicates a complete part. A complete part consists of two or more separate parts assembled to form a convenient section or unit which may be easily attached to, or detached from, the machine.

The serial number of the instrument, which will be found on the name plate, must be quoted in all cases when ordering spares, as well as the name and number of the part required.

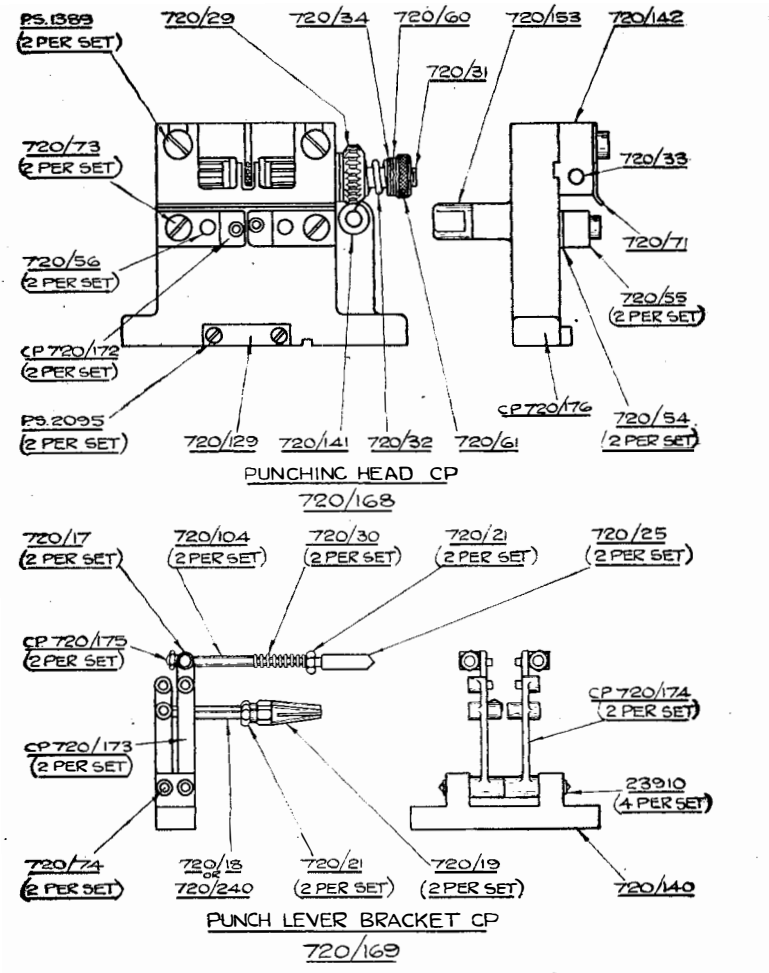


Fig. 6.

PUNCH LEVER BRACKET C.P.

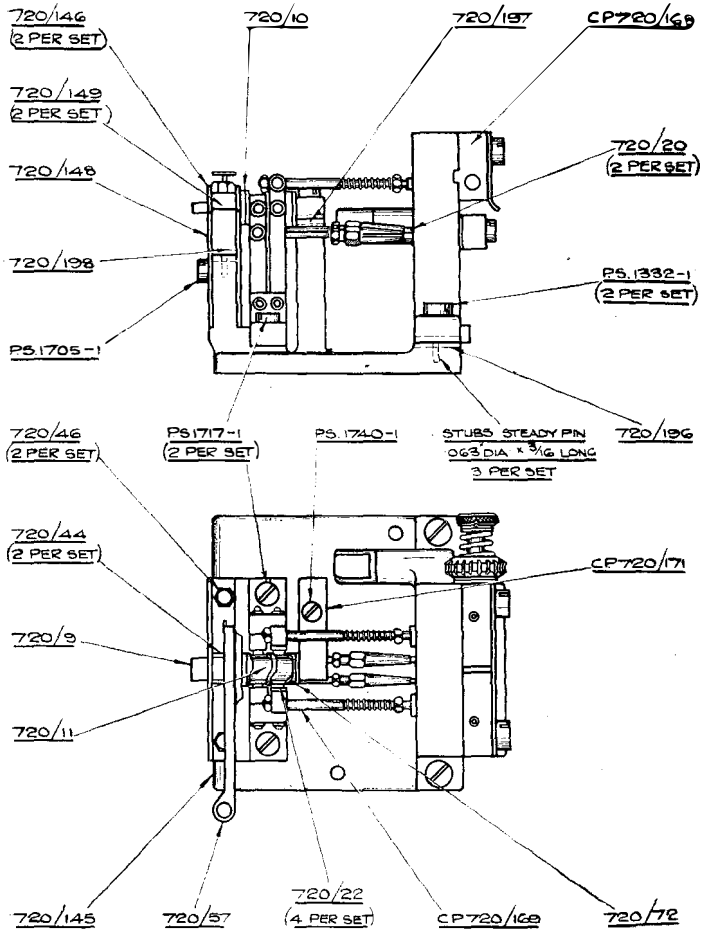


Fig. 7.

PUNCH BLOCK C.P.

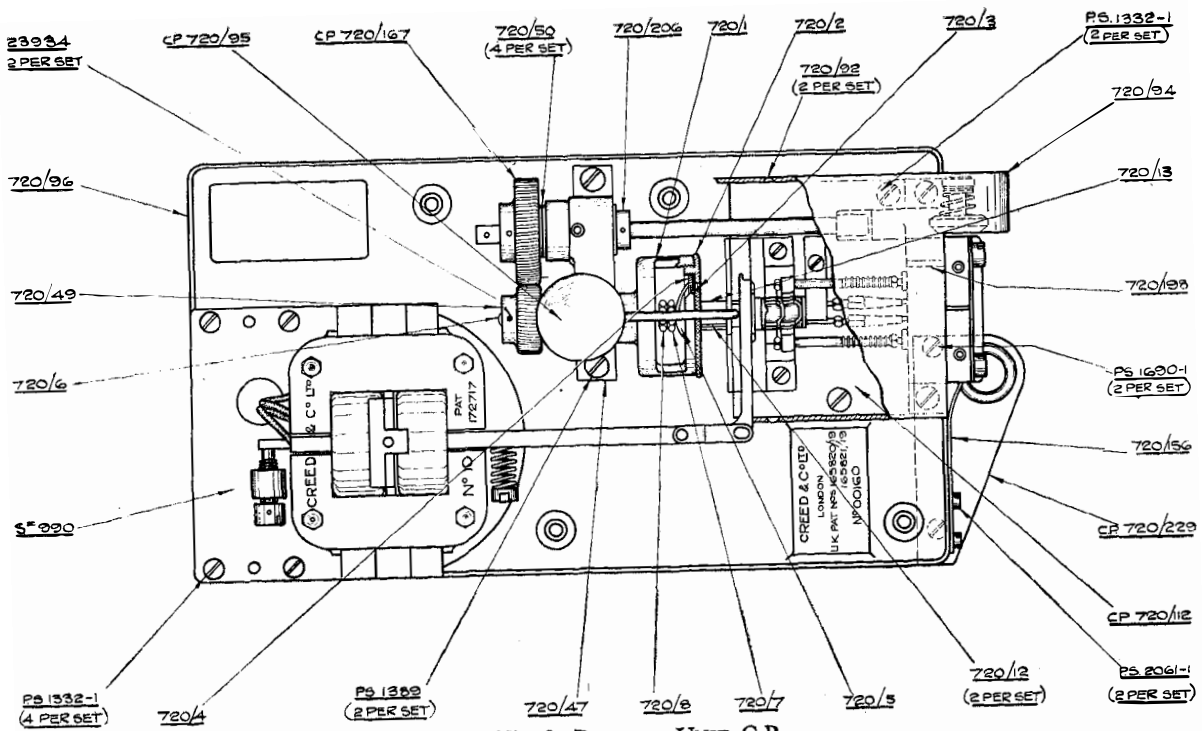


Fig. 8. RECEIVER UNIT C.P.

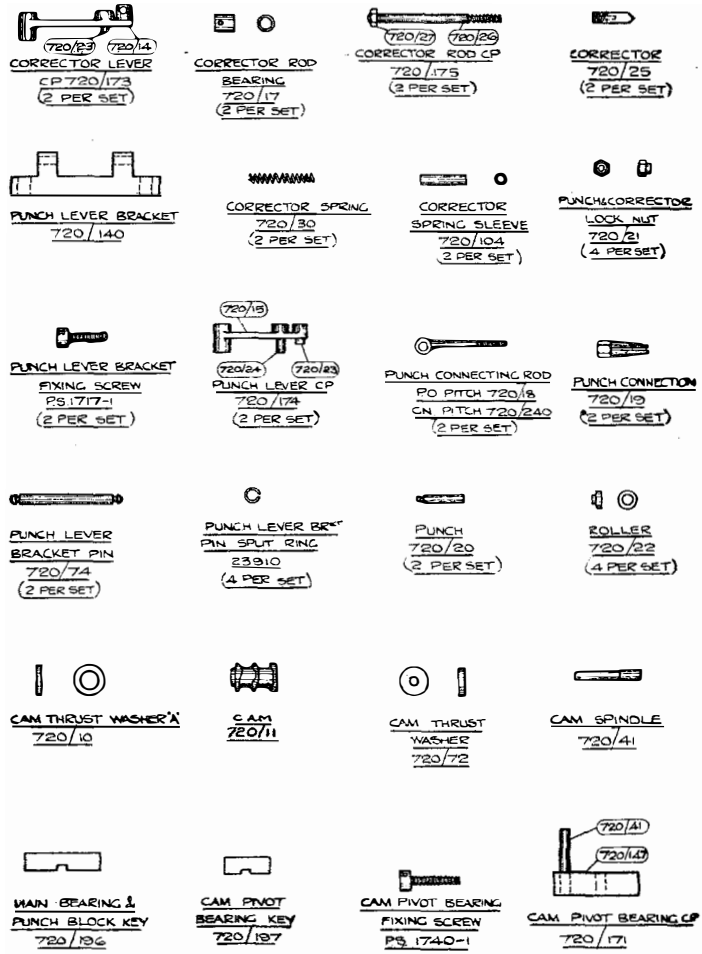


Fig. 9.
PUNCH BLOCK PARTS.

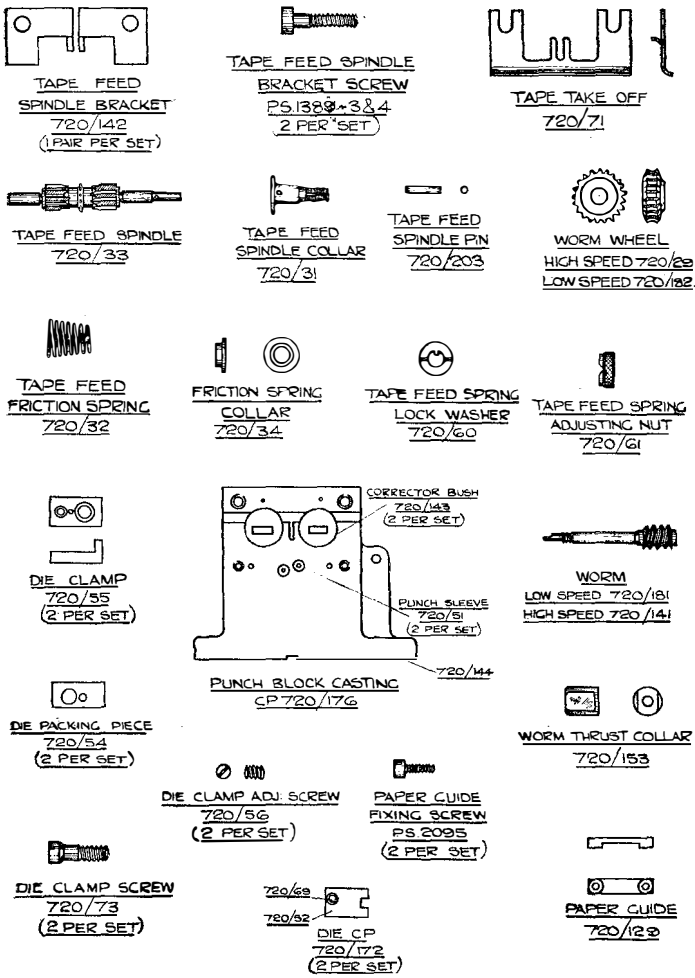


Fig. 10.
PUNCHING HEAD PARTS.

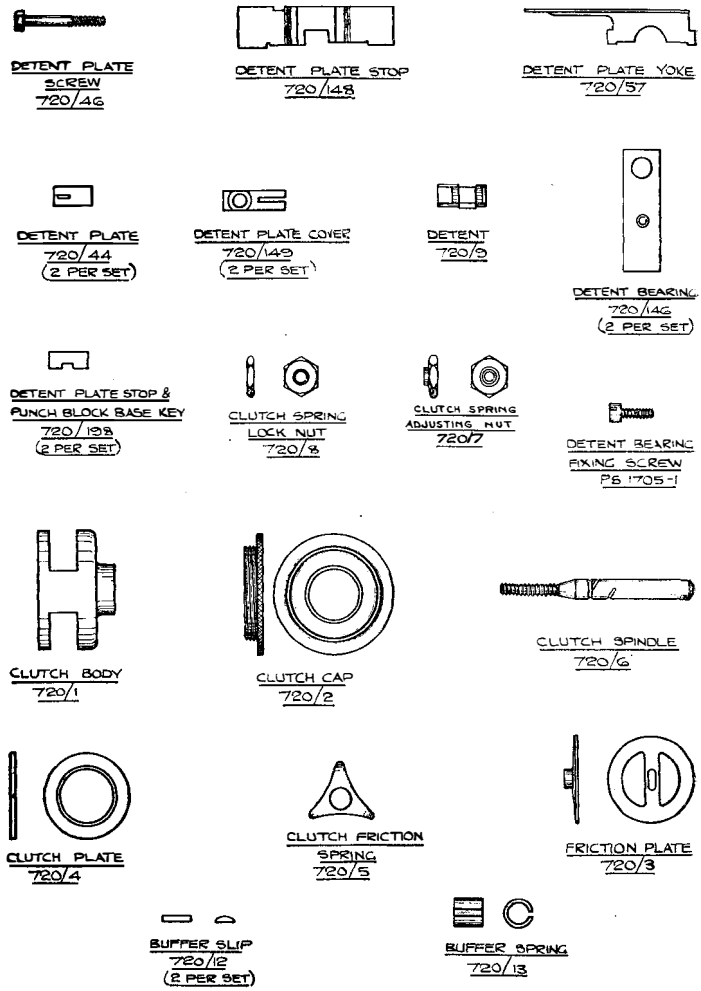


Fig. 11.

DETENT AND CLUTCH PARTS.

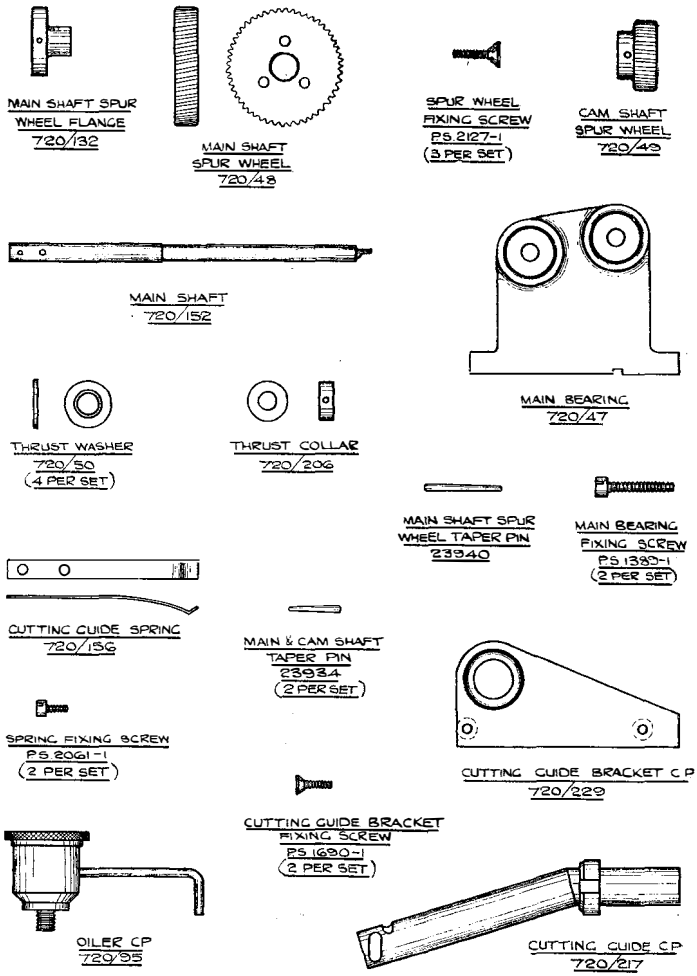


Fig. 12.

MAIN SHAFT, SPUR WHEEL AND CUTTING GUIDE PARTS.

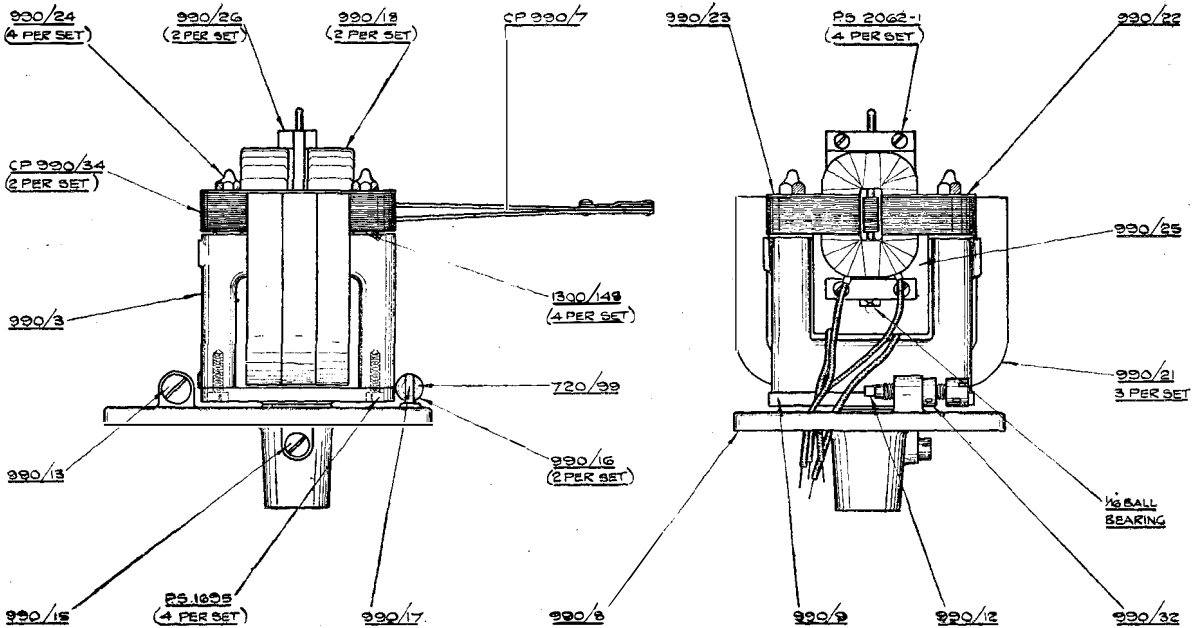


Fig. 13. Operating Magnet.

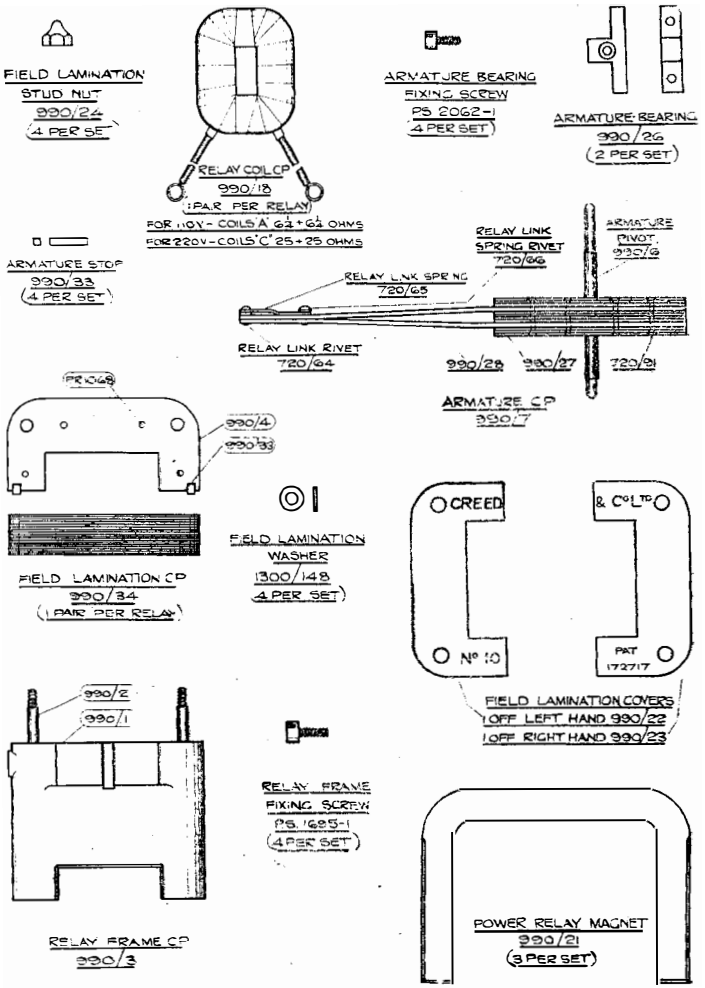


Fig. 14.

OPERATING MAGNET.

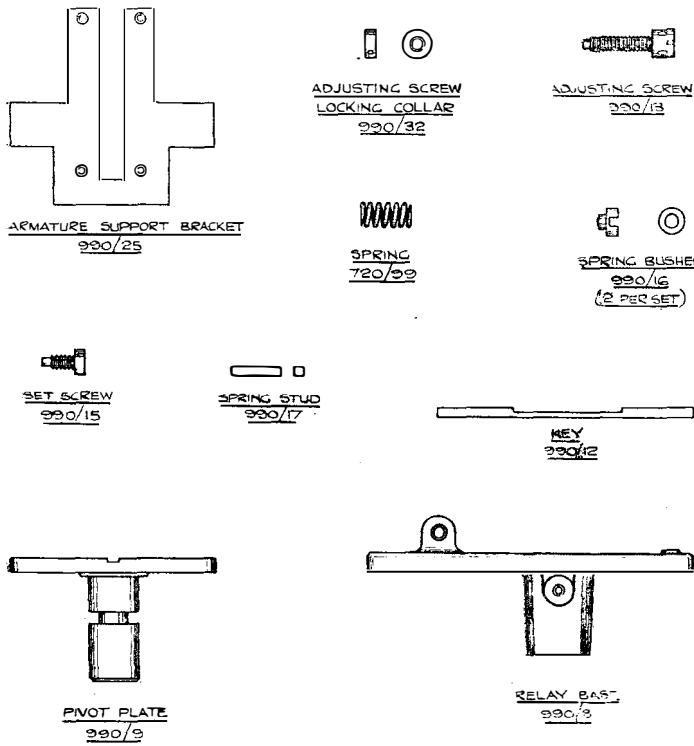
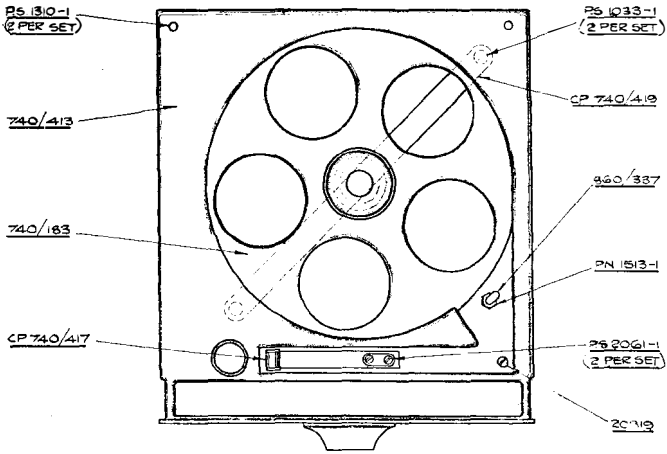
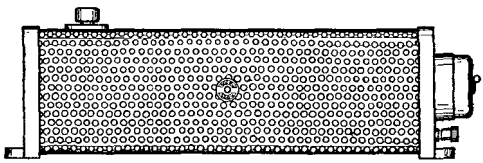


Fig. 15.
OPERATING MAGNET PARTS.





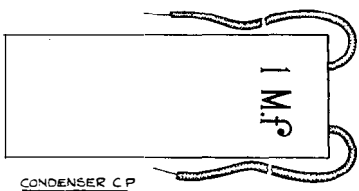


Fig. 16.
BASE PARTS.

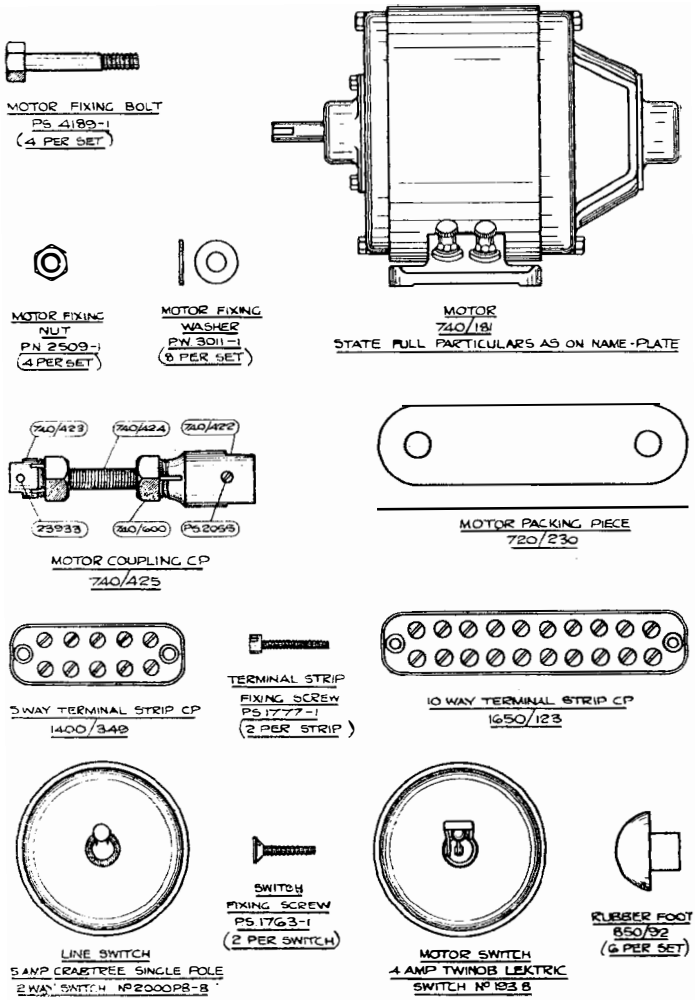


Fig. 17.
BASE PARTS.

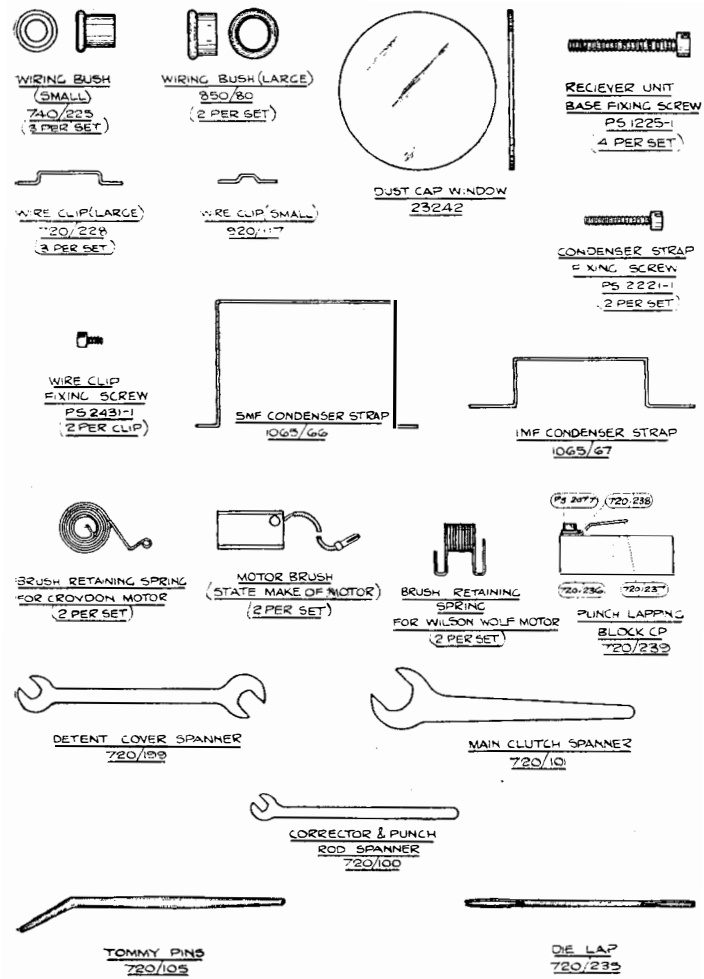


Fig. 18.

BASE AND ACCESSORY PARTS.

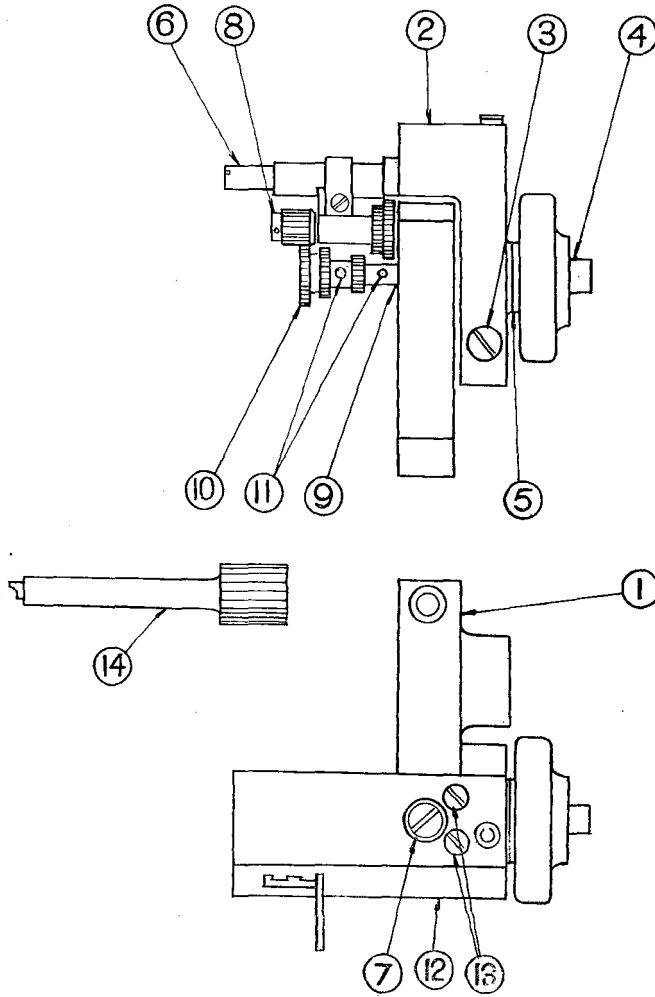


Fig. 19.
3-Speed Gear.

NUMERICAL PART LIST

(See Figs. 6 to 19)

Part No.	*Part Name*	*Renumbered*
720/1	Clutch body.	
720/2	Clutch cap.	
720/3	Friction plate.	
720/4	Clutch plate.	
720/5	Clutch friction spring.	P.G.3024
720/6	Clutch spindle.	
720/7	Clutch spring adj. nut.	P.N.5033
720/8	Clutch spring lock nut.	P.N.5034
720/9	Detent.	
720/10	Cam thrust washer " A."	P.W.5141
720/11	Cam.	
720/12	Buffer slip.	
720/13	Buffer spring.	
720/14	Corrector lever.	
720/15	Punch lever.	
720/17	Corrector rod bearing.	
720/18	Punch connecting rod (Post Office pitch).	
720/19	Punch connection.	
720/20	Punch.	
720/21	Punch and corrector rod lock nut.	P.N.5042
720/22	Roller.	R.L.1028
720/23	Roller pins.	
720/24	Punch fulcrum pin.	
720/25	Corrector.	
720/26	Corrector rod.	
720/27	Corrector rod end.	P.N.5043
720/29	Fast speed worm wheel.	G.R.3002
720/30	Corrector spring.	P.G.5023
720/31	Tape feed spindle collar.	
720/32	Tape feed friction spring.	P.G.3041
720/33	Tape feed spindle.	
720/34	Tape feed friction spring collar.	P.B.1131
720/41	Cam spindle.	
720/44	Detent plate.	
720/46	Detent plate screw.	P.S.5031

Part No.	*Part Name*	*Renumbered*
720/47	Main bearing.	
720/48	Main shaft spur wheel.	G.R.2016
720/49	Cam shaft spur wheel.	G.R.2017
720/50	Thrust washer.	P.W.5069
720/51	Punch sleeve.	P.B.1133
720/52	Die.	
720/54	Die packing piece.	
720/55	Die clamp.	
720/56	Die clamp adjusting screw.	P.S.1674
720/57	Detent plate yoke.	
720/60	Tape feed spring lock washer.	
720/61	Tape feed spring adj. nut.	P.N.6008
720/64	Relay link rivet.	P.R.5012
720/65	Relay link spring.	P.K.2001
720/66	Relay link spring rivet.	P.R.5009
720/68	Relay base.	
720/69	Die extension.	
720/71	Tape take off.	
720/72	Cam thrust washer.	
720/73	Die clamp screw.	P.S.5243
720/74	Punch lever bracket pin.	
720/88	Cuttings guide bush.	P.B.1132
720/92	Cover stud.	P.P.6501
720/94	Cover.	
720/95	Oiler C.P., consists of: 23221, 23222, 23224, 23225, 21679 and 720/98.	
720/96	Receiver base.	
720/98	Oiler tube.	
720/99	Bias adj. spring.	P.G.5022
720/104	Corrector spring sleeve.	P.B.1136
720/112	Punch block C.P., consists of: 720/9, 720/10, 720/11, 720/20, 720/22, 720/44, 720/57, 720/72, 720/46, 720/145, 720/146, 720/148, 720/149, 720/196, 720/197, 720/198, C.P. 720/171, C.P.720/169, P.S.1705, P.S.1332, P.S.1717 and P.S.1740.	
720/126	Cuttings guide cap.	
720/127	Cuttings guide pin.	

Part No.	*Part Name*	*Renumbered*
720/129	Paper guide.	
720/130	Receiver C.P., consists of: C.P. 720/229, C.P.720/112, C.P.720/167, C.P.720/168, C.P.720/95, C.P.720/204, S.990, 720/12, 720/13, 720/50, 720/47, 720/94, 720/96, 720/49, 720/92, 720/196, 720/206, 720/198, 23934, P.S.1332, P.S.1389, P.S.2061 and P.S.1690.	
720/132	Main shaft spur wheel flange.	
720/140	Punch lever bracket.	
720/141	Fast speed worm.	G.R.4004
720/142	Tape feed spindle bracket.	
720/143	Corrector bush.	
720/144	Punch block.	
720/145	Punch block base.	
720/146	Detent bearing.	
720/147	Cam pivot bearing.	
720/148	Detent plate stop.	
720/149	Detent plate cover.	
720/152	Main shaft.	
720/153	Worm thrust collar.	
720/155	Cuttings guide collar.	
720/156	Cuttings guide spring.	P.G.2043
720/167	Main shaft C.P., consists of: C.P.720/210, 720/152 and 23940.	
720/168	Punching head C.P., consists of: 720/29, 720/141, 720/31, 720/33, 720/60, 720/71, 720/142, 720/153, 720/32, 720/34, 720/61, 720/129, 720/203, C.P.720/172, 720/54, 720/55, 720/56, 720/73, P.S.1389 and P.S.2095.	
720/169	Punch lever bracket C.P., consists of: C.P.720/175, C.P.720/173, C.P.720/174, 720/140, 720/17, 720/19, 720/25, 720/30, 720/74, 720/104 (720/18 or 720/240), 720/21 and 23910.	
720/171	Cam pivot bearing C.P., consists of: 720/41 and 720/147.	
720/172	Die C.P., consists of: 720/52 and 720/69.	

Part No.	*Part Name*	*Renumbered*
720/173	Corrector lever C.P.	
720/174	Punch lever C.P.	
720/175	Corrector rod C.P., consists of : 720/26 and 720/27.	
720/176	Punch block casting C.P., consists of : 720/143, 720/144 and 720/51.	
720/180	Main shaft spur wheel, slow speed.	
720/181	Slow speed worm.	G.R.4005
720/182	Slow speed worm wheel.	G.R.3005
720/196	Punch block key.	K.Y.1013
720/197	Cam pivot bearing key.	K.Y.1014
720/198	Detent plate stop key.	K.Y.1015
720/203	Tape feed spindle pin.	P.P.6575
720/204	Clutch C.P., consists of : 720/1, 720/2, 720/3, 720/4, 720/5, 720/6, 720/7 and 720/8.	
720/206	Main shaft thrust collar.	P.B.1010
720/210	Main shaft spur wheel C.P., consists of : 720/48, 720/132 and P.S.2127.	
720/215	Receiver combined base.	
720/216	Cuttings guide.	
720/217	Cuttings guide C.P., consists of : 720/126, 720/127, 720/155 and 720/216.	
720/218	Receiver base felt.	P.F.1029
720/221	Receiver Reperforator C.P., consists of : 720/215, C.P.1400/349, C.P.1650/123, C.P.740/425, C.P.720/130, C.P.740/414, C.P.720/217, 720/218, 850/92, 720/230, 740/181, 850/80, 740/225 (1065/66 or 67), 720/224, 920/117, 720/228, 920/95, 720/235 (1 or 5 M.F. condenser), Switch No. 2000 P.B.-B, Switch No. 193 B, P.S.4189, P.S.1777, P.S.1763, P.S.1225, P.S.2221, P.S.2431, P.S.1172, P.W.1003, P.W.3011 and P.N.2509.	
720/224	1 mf. condenser packing.	
720/225	Cuttings guide bracket.	
720/229	Cuttings guide bracket C.P., consists of : 720/88 and 720/225.	

Part No.	*Part Name*	*Renumbered*
720/230	Motor packing.	
720/235	Die lap.	T.A.1010
720/236	Punch lapping block.	T.A.1009/1
720/237	Punch lapping block spring.	P.G.2056
720/238	Punch lapping block spring plate.	T.A.1009/2
720/239	Punch lapping block C.P., consists of: 720/236, 720/237, 720/238 and P.S.2077.	T.A.1009
720/240	Punch connecting rod (G.N. pitch).	
740/181	Motor C.P.	
740/183	Tape wheel C.P., consists of: 740/184, 185 and 186.	
740/184	Tape wheel.	
740/185	Tape wheel boss.	
740/186	Tape wheel centre.	
740/225	Wiring bush.	P.E.1001
740/413	Tape reel drawer.	
740/414	Tape reel drawer C.P., consists of: C.P.740/417, C.P.740/419, C.P.740/183, 740/413, 20819, 860/337, P.S.1310, P.S.1033, P.S.2061 and P.N.1513.	
740/415	Tape reel pivot strap.	
740/417	Tape reel spring C.P., consists of: 740/421, 21758, 21759, 21760 and 23862.	
740/413	Tape reel pivot pin.	P.P.7501
740/419	Tape reel pivot strap C.P.	
740/421	Tape reel spring.	P.G.2051
740/422	Motor coupling sleeve.	
740/423	Printer coupling sleeve.	
740/424	Flexible coupling.	
740/425	Motor coupling C.P., consists of: 740/422, 423, 424, 600 and 23933.	
740/600	Holding sleeve lock nut.	
920/95	Window.	23242
920/117	Wire clip.	P.K.1014
S.990	Operating Magnet C.P., consists of: C.P.990/3, C.P.990/7, C.P.990/18, C.P.990/34, 990/8, 990/9, 990/12, 990/13, 15, 16, 17, 21, 22, 23, 24, 25, 26, 32, 720/99, 1300/149, P.S.2062 and P.S.1695.	

Part No.	*Part Name*	*Renumbered*
990/1	Relay frame.	
990/2	Field lamination stud.	
990/3	Relay frame C.P., consists of 990/1 and 2.	
990/4	Field lamination.	
990/6	Armature pivot.	
990/7	Armature C.P., consists of: 990/6, 720/64, 65, 66, 990/27 and 28.	
990/8	Relay base.	
990/9	Pivot plate.	
990/12	Key.	
990/13	Adjusting screw.	
990/15	Set screw.	
990/16	Spring bush.	
990/17	Spring stud.	
990/18	Coil C.P. ("A" winding for 110 v. "C" winding for 220 v.).	
990/21	Magnet.	
990/22	Field lamination cover, L.H.	
990/23	Field lamination cover, R.H.	
990/24	Field lamination stud nut.	
990/25	Armature support bracket.	
990/26	Armature bearing.	
990/27	Armature lamination, short.	
990/28	Armature lamination, long.	
990/32	Adj. screw locking collar.	
990/33	Armature stop.	
990/34	Field lamination C.P., consists of: 990/4 and 33.	
1065/66	5 mfd. condenser strap.	
1065/67	1 mfd. condenser strap.	P.K.1013
1300/148	Field lamination washer.	P.W.5045
1400/349	5-way terminal strip C.P.	C.B.1011
1650/123	10-way terminal strip C.P.	C.B.1008
20819	Tape feed pivot roller screw.	
21679	Oil cup tube.	
21758	Tape reel spring roller bracket.	
21759	Tape reel spring roller.	
21760	Tape reel spring roller pivot.	
23221	Oil cup.	

Part No.	*Part Name*
23222	Oil cup cover.
23224	Oil cup washer.
23225	Oil cup cover washer.
23862	Tape reel spring roller bracket rivet.
23910	Punch lever bracket pin split ring.
23933	Motor coupling taper pin.
23934	Cam shaft spur wheel taper pin.
23940	Main shaft taper pin.

SCREWS

P.S.1033	Tape wheel strap fixing screw.
P.S.1172	Resistance fixing screw.
P.S.1225	Receiver unit base fixing screw.
P.S.1310	Tape wheel drawer stop screw.
P.S.1389	Main bearing and tape feed spindle bracket fixing screw.
P.S.1690	Cutting guide bracket fixing screw.
P.S.1695	Relay frame fixing screw.
P.S.1705	Detent bearing fixing screw.
P.S.1717	Punch lever bracket fixing screw.
P.S.1740	Cam pivot bearing fixing screw.
P.S.1763	Switch fixing screw.
P.S.1777	Terminal strip fixing screw.
P.S.2061	Tape guide fixing screw and cutting guide spring fixing screw.
P.S.2062	Armature bearing fixing screw.
P.S.2077	Lapping block screw.
P.S.2095	Paper guide fixing screw.
P.S.2127	Spur wheel fixing screw.
P.S.2221	Condenser strap fixing screw.
P.S.2431	Wire clip fixing screw.
P.S.4189	Motor fixing bolt.

WASHERS

P.W.1003	Resistance fixing screw washer.
P.W.3011	Motor fixing screw washer.

NUTS

Part No.	*Part Name*
P.N.1513	Tape guide lock nut.
P.N.2509	Motor fixing nut.

3-SPEED GEAR PARTS (See Fig. 19)

Index No.	*Part No.*	*Part Name*
1.	720/47	Bearing block.
2.	1775/10	Gear box casting C.P.
3.	P.S.1374-3	2 B.A. × $\frac{3}{4}$″ Ch. Hd. M.S. screw.
4.	1775/12	Main shaft C.P.
5.	P.W.5069	Washer.
6.	1775/21	Rockshaft.
7.	P.S.1332-4	2 B.A. × $\frac{1}{2}$″ Ch. Hd. M.S. screw.
8.	1775/7	Layshaft C.P.
9.	1775/20	Drive gear R.H.
10.	1775/19	Drive gear C.P.
11.	P.P.2001	Pin.
12.	1775/13	Gear change gate.
13.	P.S.2051-3	6 B.A. × $\frac{3}{16}$″ Fil. Hd. M.S. screw.
14.	1775/22	Driven shaft.