

LUBRICATION OF AUTOMATIC SWITCHING MECHANISMS (ALL TYPES)
(Includes Clocks No. 44 and Pulse Machines)

1. General principles.—Mechanisms are lubricated to obtain maximum operating efficiency and reduce wear to a minimum. The grade and type of lubricant used is carefully chosen to achieve these ends and only the lubricant specified in Tables 1 to 8 should be used. The grades of lubricant have been reduced to those referred to in par. 2. The bearings and surfaces which are being lubricated should be clean; Dusters, Selector, Cleaning or, if not available, a piece of clean material (free from dust and fluff) should be used for cleaning purposes and a little Spirit, White may be used if necessary. Attention should be given to the following points:—

(a) Mechanisms should be lubricated whenever an overhaul is performed and when a mechanism is dismantled. Normally, the frequency should be as specified in the schedules of maintenance routines in TESTS & INSPECTIONS, Routine, R 5010, etc.

(b) Lubricants should always be *applied sparingly* and any excess found after subsequent operation of the mechanism should be removed.

(c) The lubricants used must be kept clean and free from grit or other foreign matter.

(d) Reference is made in this Instruction to a 'drop' of oil when stating the amount of lubricant to be applied. A drop of oil is the amount pendant from the end of a piece of 23 S.W.G. gauge wire ($9\frac{1}{2}$ lb. per mile copper wire) after immersion in oil to a depth of $\frac{1}{8}$ in. This definition is given as a guide and with experience there is no difficulty in applying the correct quantity of oil.

★2. Lubricants.—The only lubricants which should be used on automatic switching mechanisms are Oil, Bearing, No. 16, Graphite Colloidal in Oil and Grease No. 1.

(a) *Oil, Bearing, No. 16.*—This is a mineral oil and, consequently, a non-conductor. Oil, Bearing, No. 16 is used for all bearings and on surfaces subject to light friction.

(b) *Graphite Colloidal in Oil.*—The addition of graphite to an oil gives additional protection to a bearing surface, because a film of graphite is absorbed and will remain if the oil is removed. Graphite Colloidal in Oil is specified for use on ratchets and other surfaces subjected to heavy friction. For brevity, the term 'Graphite c/oil' is used in this Instruction.

(c) *Grease No. 1.*—This is a mineral based lubricant and is specified where surfaces are subjected to heavy friction and require high electrical insulation.

★3. Supply of lubricants and containers.—In order that lubricants can be easily carried they should be kept in screwed or corked containers held in a stand. This stand, which is known as a 'holder for three oil

bottles' (see TOOLS & TRANSPORT, Hand Tools, H 1190) is marked to show the type of lubricant to be placed in each of the three holes provided. Commencing from the left, the bottles should contain:—

(a) Clean oil, for the lubrication of bearings, etc.

(b) Oil for use in conjunction with the Graphite c/oil [see par. 6 (a)].

(c) Graphite c/oil for use on ratchets, etc.

4. Oil, Bearing, No. 16 is supplied in small bottles, Graphite c/oil and Grease No. 1 in small containers.

5. Tools for the application of lubricants.—

(a) *Brushes.*—Three types of lubricating brush are supplied as follows:—

(i) *Brush, Lubricating, No. 1.*—A hard-bristle brush for cleaning and re-distributing the lubricant on ratchets.

(ii) *Brush, Lubricating, No. 2.*—A medium sable-hair brush for applying Graphite c/oil to ratchets and surfaces.

(iii) *Brush, Lubricating, No. 3.*—A fine sable-hair brush for applying oil to spindles and surfaces.

All brushes should be kept clean and should be renewed when worn.

★(b) Screwdriver No. 1 should be used to apply grease sparingly as required.

6. General notes on lubrication.—The class of lubricant to be used and the points of application are shown in Tables 1 to 8. The lubricant should be applied as described in the following notes:—

(a) *Ratchets.*—When Graphite c/oil is applied to a ratchet or hub, any dust and old lubricant should first be removed from the bearing parts with a Brush, Lubricating, No. 1 and a little Oil, Bearing, No. 16 taken from the centre bottle of the holder. The brush should be worked well down into the notches and should be cleaned after each operation, by wiping it on a piece of clean material. When the notches have been cleaned, Graphite c/oil should be applied sparingly to all the teeth with a Brush, Lubricating, No. 2.

(b) *Pawl stops and other surfaces exposed to wear.*—Graphite c/oil should be applied to these surfaces with a Brush, Lubricating, No. 2, surplus lubricant being removed with a piece of clean material.

(c) *Bearings.*—Oil, Bearing, No. 16 from No. 1 bottle should be applied, using a Brush, Lubricating, No. 3, which should be specially reserved for this purpose. Surplus oil should be removed with a piece of clean material.

★(d) *Wiper-carriage shaft (2000-4000-type selectors).*—Before lubrication, the wiper carriage shaft should be thoroughly cleaned with a piece of clean Cord, Cleaning, No. 2.

The shaft should be lubricated as described in Tables 2 [3 (a)] and 3 [3 (e)] and, after lubrication, the wiper carriage should be raised to level '0' a few times and any surplus oil removed.

(e) *Selector shafts (Pre-2000-type selectors).*—Oil should not be applied directly to the felt washers or the *shaft bearing*. The shaft should first be thoroughly cleaned at its bearing surfaces, using a piece of clean cord. It should then be lubricated with a piece of cord which has been slightly oiled with Oil, Bearing, No. 16. The cord used for lubrication should be kept clean.

After lubrication, the shaft should be raised once or twice by a light pressure applied beneath the cup-spring to ascertain that the shaft is free in its bearing. If the shaft does not feel free, the bearings and felt washers should be examined. If it is found that the felt washers have become clogged, they should be changed.

(f) *Selector shaft-restoring springs (Pre-2000-type selectors).*—Shaft-restoring springs are lubricated by the contractor before assembly. Subsequent lubrication is not necessary unless the complete shaft-restoring spring assembly has to be changed. Before fitting a new cup-spring assembly the assembly should be lubricated sparingly with Oil, Bearing, No. 16.

(g) *Wiper bearings (All types of uniselectors—ratchet and motor-driven).*—Wiper bearing-pins and spindles on all types of uniselector should be lubricated before the wiper assembly is fitted to the mechanism. The bearings should first be cleaned with a piece of clean material and a little white spirit, and then wiped dry. Oil, Bearing, No. 16 should then be sparingly applied to the whole bearing surface of the pin or spindle. On Type 2 uniselectors, the outer surface of the ratchet-wheel hub should also be lubricated.

★(h) *Wiper-feed brushes.*—

(i) *All types of uniselector other than motor-driven.*—The brush feeds of all uniselectors should be lubricated *only* when a new wiper assembly, a new brush-feed assembly or a complete uniselector mechanism is first brought into service. Oil, Bearing, No. 16 should be applied sparingly, using a Brush, Lubricating, No. 3. The purpose is to assist running-in and subsequent lubrication is not necessary.

(ii) *Uniselectors, Motor-driven.*—Oil, Bearing, No. 16 should be applied as stated in Table 8 when the mechanism is lubricated.

(j) *Wiper tips. (All types of uniselectors—ratchet and motor-driven).*—Wiper tips should be lubricated once only, i.e. when a uniselector or new wiper assembly is first brought into service. The wiper should be rotated to a convenient position, and Oil, Bearing, No. 16 should be applied *sparingly* to the wiper tips with a Brush, Lubricating, No. 3. The oil should be evenly distributed over the bank contacts by rotating the wipers electrically. The purpose of this lubrication is to assist running-in and subsequent lubrication is not necessary.

(k) *Uniselectors. Type 2.*—On heavily-worked Type 2 uniselectors, the action of the armature striking the core tends to cause the formation of an oxide deposit on the magnet core and on the armature residual plate. This deposit should be wiped off with a piece of clean material which has been moistened with Oil, Bearing, No. 16.

(l) *Wiper tips (minor switches).*—Wiper tips should be lubricated *once only*, i.e. when a switch or new wiper assembly is first brought into service. The switches should be rotated to a vertical position, beyond the tenth contact, and Oil, Bearing, No. 16 should be applied *sparingly* to the wiper tips with a Brush, Lubricating, No. 3. After lubrication, the wipers should be stepped to the tenth contact a few times and released, by hand.

(m) *Banks of two-motion selectors.*—Reference should be made to TESTS & INSPECTIONS, Routine, R 5117, for details of the special procedure concerning the lubrication of two-motion selector banks.

(n) *Notes on lubrication of mechanical pulse regenerator.*—

(i) *Main bearing.*—The main bearing should be fully lubricated. An oil-hole is provided for the purpose.

(ii) *Main spring.*—When the spring is replaced in the cup, four drops of oil should be distributed evenly over the spring.

(iii) *Ball race.*—Four drops of oil should be applied and distributed in turn by rotating the inner race before fitting to the main driving wheel.

(iv) *Governor assembly.*—Apply one drop of oil to each bearing of the governor wheel, the governor worm and the pulsing cam and the bearing of the governor spindle which is remote from the governor cup. The governor spindle bearing within the cup is of copper graphite and *must not* be lubricated.

[Table 1 follows]

TABLE 1.—TWO-MOTION SELECTORS (PRE-2000-TYPE). CLASS OF LUBRICANT AND POINTS OF APPLICATION

Selector part or bearing surface	Class of lubricant	Where lubricant should be applied
1. <i>Normal stop</i>	Graphite c/oil	Point of impact
2. <i>Normal post and bracket</i>	Graphite c/oil	Rubbing surface
3. <i>Vertical magnet</i>		
(a) Armature bearings	Oil, Bearing, No. 16 ..	Bearing surface
(b) Pawl bearings	Oil, Bearing, No. 16 ..	Bearing surface
(c) Pawl forward stop	Graphite c/oil	Point of impact
(d) Pawl guide	Graphite c/oil	Working surface
(e) Adjusting screw for armature-restoring spring	Graphite c/oil	Point of contact
4. <i>Rotary magnet</i>		
(a) Armature bearings	Oil, Bearing, No. 16 ..	Bearing surface
(b) Pawl bearings	Oil, Bearing, No. 16 ..	Bearing surface
(c) Pawl forward stop	Graphite c/oil	Point of impact
(d) Pawl guide	Graphite c/oil	Working surface
(e) Armature back stop	Graphite c/oil	Point of impact
(f) Adjusting screw for armature-restoring spring	Graphite c/oil	Point of contact
5. <i>Release magnet</i>		
(a) Armature finger or adjusting screw ..	Graphite c/oil	Point of impact
(b) Release-armature back stop ..	Graphite c/oil	Point of impact
6. <i>Detents</i>		
(a) Detent bearings	Oil, Bearing, No. 16 ..	Bearing surface
(b) Detent springs	Graphite c/oil	Point of contact with detents
7. <i>Shaft assembly</i>		
(a) Shaft bearings	Oil, Bearing, No. 16 ..	See par. 6 (e)
(b) Vertical hub	Graphite c/oil	All teeth of hub, both at point where vertical pawl strikes and where vertical detent rides during vertical motion. See par. 6 (a)
(c) Rotary hub	Graphite c/oil	All teeth of rotary hub
(d) Shaft-restoring spring	Oil, Bearing, No. 16 ..	See par. 6 (f)
8. <i>Spring-sets</i>		
(a) Vertical off-normal springs: Operating lever or roller	Graphite c/oil	Point of impact or working surface
(b) Rotary off-normal springs: Operating lever or cam	Graphite c/oil	Point of impact or working surface
(c) Vertical interrupter springs: Operating lever	Graphite c/oil	Point of impact
Operating-lever bearing	Oil, Bearing, No. 16 ..	Bearing surface
Back stop	Graphite c/oil	Point of impact
(d) Normal post springs: Operating roller, spring or stud ..	Graphite c/oil	Working surface
(e) Spring-set—operating lever and roller bearings	Oil, Bearing, No. 16 ..	Bearing surface
9. <i>Side switch (where fitted)</i>		
(a) Spider arm	Oil, Bearing, No. 16 ..	Spider-arm bearings
(b) Spider-arm-link bearing	Oil, Bearing, No. 16 ..	Between link and spider-arm extension
(c) Escapement	Graphite c/oil	All teeth of escapement
10. <i>Vertical-marking wiper</i>		
Bearing	Oil, Bearing, No. 16 ..	Between shaft collar and wiper bracket

TABLE 2.—TWO-MOTION SELECTORS—P.O. 2000-TYPE. CLASS OF LUBRICANT AND POINTS OF APPLICATION

Selector part or bearing surface	Class of lubricant	Where lubricant should be applied
1. Vertical mechanism		
(a) Armature	Oil, Bearing, No. 16 ..	To the exposed portion of the lubricating wick and the outer bearing
(b) Pawl	Oil, Bearing, No. 16 ..	Between the pawl and the bearing collars
(c) Pawl spring	Graphite c/oil	To the tip of the spring at point of contact with the pawl
(d) Armature restoring spring	Graphite c/oil	At the point where the spring engages its adjusting screw
(e) Pawl guide	Graphite c/oil	At point of contact with pawl
(f) Pawl front stop	Graphite c/oil	At point of contact with pawl
(g) Armature back stop	Graphite c/oil	At point of contact with armature
2. Rotary mechanism		
(a) Armature	Oil, Bearing, No. 16 ..	To the exposed portions of the lubricating wick and lower bearing
(b) Pawl	Oil, Bearing, No. 16 ..	Between the pawl and the bearing collars
(c) Pawl spring	Graphite c/oil	To the tip of the spring at point of contact with pawl
(d) Armature restoring spring	Graphite c/oil	At the point where the spring engages its adjusting screw
(e) Pawl guide	Graphite c/oil	At point of contact with pawl
(f) Pawl front stop	Graphite c/oil	At point of contact with pawl
(g) Armature back stop	Graphite c/oil	At point of contact with armature
3. Shaft and wiper-carriage assembly		
(a) Shaft and carriage restoring spring	Oil, Bearing, No. 16 ..	After the shaft has been cleaned, three or four applications of the oil should be given to the exposed portion of the shaft, using Brush, Lubricating, No. 3. Similar application of the oil should be given to the lower exposed portion of the shaft when the carriage is lifted to level '0'
(b) Vertical ratchet	Graphite c/oil	To all vertical teeth
(c) Rotary ratchet	Graphite c/oil	To all rotary teeth
(d) Rotary disk	Graphite c/oil	To the underside of the rotary disk, to cover the surface which engages with the comb-plate
4. Detents		
(a) Vertical- and rotary-detent bearings	Oil, Bearing, No. 16 ..	At point of bearing on spindle
(b) Rotary-detent upper projection ..	Graphite c/oil	At point of engagement with rotary disk
(c) Vertical- and rotary-detent springs	Graphite c/oil	At tip of springs where they engage the frame
(d) Vertical and rotary adjusting screws	Graphite c/oil	At point of engagement with selector frame
5. Mechanically-operated springs		
(a) Levers	Oil, Bearing, No. 16 ..	Upper and lower bearings
(b) Rollers	Oil, Bearing, No. 16 ..	Upper and lower bearings. Where 'fixed' rollers are used, lubricate the contact surface with Graphite c/oil
(c) Operating cam	Graphite c/oil	At periphery of cam
(d) Off-normal spring-operating arm ..	Graphite c/oil	At point of contact with cam
(e) Level-springs roller	Oil, Bearing, No. 16 ..	Roller bearing
(f) Level-spring cam plates (when fitted)	Graphite c/oil	To bearing surface of cam plate

TABLE 2.—(contd.)

Selector part or bearing surface	Class of lubricant	Where lubricant should be applied
(g) Level-springs auxiliary cam ..	Oil, Bearing, No. 16 .. Graphite c/oil ..	To upper bearing (under surface of cam) To the lower bearing (on the later type of cam)
(h) Auxiliary armatures (Type 2 spring-sets)	Oil, Bearing, No. 16 .. Graphite c/oil ..	Bearings At point of contact with operating levers
6. Interrupters (Types 1 and 2)		
(a) Operating-lever bearing-pin ..	Oil, Bearing, No. 16 ..	To both ends of bearings
(b) Loop spring	Oil, Bearing, No. 16 ..	To both bearings (Lubrication should be very sparing to avoid lubricant reaching contacts)
★7. Interrupters (Types 4 and 5)		
These are lubricated during manufacture (bearings and spring are greased). Further lubrication is not necessary, unless the operating lever or the loop spring is changed. If either of these items is changed, they should be lubricated <i>during assembly</i> .		
(a) Operating bearing-pin	Grease No. 1	To the bearing-pin <i>before insertion</i>
(b) Loop spring	Grease No. 1	To the bearing surfaces of the spring
8. Vertical-marking wiper		
Bearing	Oil, Bearing, No. 16 ..	Between locating collar and wiper bracket, and to bearing surfaces of tongue on wiper bracket

★TABLE 3.—TWO-MOTION SELECTOR—P.O. 4000-TYPE. CLASS OF LUBRICANT AND POINTS OF APPLICATION

Switch part or bearing surface	Class of lubricant	Where lubricant should be applied
1. Vertical mechanism		
(a) Armature	Graphite c/oil	To the armature bearing pin on inner and outer surfaces of both points of contact with the armature bearing pin bracket
(b) Pawl	Oil, Bearing, No. 16 ..	Between the pawl and the bearing collars
(c) Pawl spring	Graphite c/oil	To the tip of the spring at point of contact with vertical armature
(d) Armature-restoring spring	Graphite c/oil	At point of contact with adjusting screw
(e) Pawl guide	Graphite c/oil	At point of contact with pawl
(f) Pawl front stop	Graphite c/oil	At point of contact with pawl
(g) Armature back stop	Graphite c/oil	At point of contact with armature
2. Rotary mechanism		
(a) Armature	Graphite c/oil	To the armature bearing pin on inner and outer surfaces of both points of contact with the armature bearing pin bracket
(b) Pawl	Oil, Bearing, No. 16 ..	Between the pawl and the bearing collars
(c) Pawl spring	Graphite c/oil	To the tip of the spring at the point of contact with the pawl

TABLE 3.—(contd.)

Switch part or bearing surface	Class of lubricant	Where lubricant should be applied
(d) Auxiliary pawl stop	Graphite c/oil	To the tip of auxiliary pawl stop at point of contact with the pawl
(e) Armature-restoring spring	Graphite c/oil	At point of contact with adjusting screw
(f) Pawl guide	Graphite c/oil	At point of contact with pawl
(g) Pawl front stop	Graphite c/oil	At point of contact with pawl
(h) Armature back stop	Graphite c/oil	At point of contact between armature and back stop
3. Shaft and ratchet assembly		
(a) Rotary ratchet	Graphite c/oil	To all ratchet teeth
(b) Rotary ratchet hub	Oil, Bearing, No. 16	To the outer surface and rotary ratchet spline. Remove surplus oil
(c) Vertical ratchet	Graphite c/oil	To all ratchet teeth
(d) Vertical detent teeth	Graphite c/oil	To all detent teeth
(e) Shaft	Oil, Bearing, No. 16	To the shaft, as follows:—lubricate above the rotary cam, raise carriage to level '0', clean and lubricate shaft, then remove surplus oil
(f) Rotary cam	Graphite c/oil	To the working surface of the cam
(g) Rotary return stop	Graphite c/oil	At point of contact with cam stop
(h) Ratchet cam	Graphite c/oil	At point of contact with off-normal spring roller and level cams (when fitted)
4. Detents		
(a) Vertical-rotary detents	Oil, Bearing, No. 16	At points of contact on bearing pin
(b) Vertical- and rotary-detent springs	Graphite c/oil	At tips of springs where they engage the frame
(c) Vertical-detent adjusting screw ..	Graphite c/oil	To tip of screw
5. Release mechanism		
(a) Armature	Graphite c/oil	(i) To bearing points (ii) At point of contact with detent release bar carrier
(b) Release lever plate	Graphite c/oil	At point of contact with detent bracket
(c) Manual release bracket	Graphite c/oil	To the guide pins
(d) Release link	Graphite c/oil	(i) Points of contact with rotary detent extension (ii) Point of contact with vertical armature extension
6. Mechanically-operated springs		
(a) Off-normal spring-set cam follower ..	Graphite c/oil	To the edge engaged by the ratchet cam
(b) Off-normal spring-set cam-operated lever	Oil, Bearing, No. 16	To the bearing
(c) Off-normal spring-set toggle arm ..	Oil, Bearing, No. 16	At pivot
	Graphite c/oil	At toggle
	Graphite c/oil	At point of contact of dome with auxiliary armature
(d) Level spring-set level cams ..	Oil, Bearing, No. 16	At pivots
	Graphite c/oil	To the surface engaged by the ratchet cam
(e) Level spring operating brackets ..	Oil, Bearing, No. 16	To all points of contact between operating brackets and bearing pins
(f) Level spring-set coupling links ..	Oil, Bearing, No. 16	To bearings
(g) Auxiliary armatures	Oil, Bearing, No. 16	To bearings
7. Interrupters		
(a) Loop springs	Grease No. 1	At bearing points

TABLE 3.—(contd.)

Switch part or bearing surface	Class of lubricant	Where lubricant should be applied
(b) Operating lever	Grease No. 1	At point of engagement with rear face of bearing bracket
8. Vertical marking wiper bearing ..	Oil, Bearing, No. 16 ..	Between locating collar and wiper bracket and to bearing surfaces of tongue on wiper bracket

TABLE 4.—MINOR SWITCHES (ALL TYPES)
CLASS OF LUBRICANT AND POINTS OF APPLICATION

Switch part or bearing surface	Class of lubricant	Where lubricant should be applied
1. Rotary or operating armature Armature bearing-pin	Oil, Bearing, No. 16 ..	Point of bearing between bracket and armature
2. Pawl		
(a) Pawl bearing-pin	Oil, Bearing, No. 16 ..	Centre of pawl spring on bearing-pin
(b) Pawl front stop	Graphite c/oil	Point where pawl strikes
3. Wiper assembly and hub		
(a) Ratchet wheel	Graphite c/oil	All teeth of ratchet-wheel [see par. 6 (a)]
(b) Wiper bearing-pin	Oil, Bearing, No. 16 ..	A.T. & E. type—through hole provided in flat on ratchet-wheel G.E.C. type—between split pin and washer on bearing-pin S.T. & C. type—between end of wiper assembly hub and fixed collar
(c) Shaft restoring spring (clock-spring type)	Oil, Bearing, No. 16 ..	See par. 6 (f)
(d) Wiper tips	Oil, Bearing, No. 16 ..	See par. 6 (l)

★TABLE 5.—UNISELECTORS (ALL TYPES). CLASS OF LUBRICANT AND POINTS OF APPLICATION

Switch part or bearing surface	Class of lubricant	Where lubricant should be applied
1. Armature		
(a) Armature knife-edge	Graphite c/oil	P.O. Type 1 and G.E.C. type—to lower side of knife-edge, where armature rides
(b) Armature knife-edge and sides of locating lug	Graphite c/oil	P.O. Types 2, 3 and Bothway C—to lower sides where armature rides
(c) Armature bearings (spindles and pins)	Oil, Bearing, No. 16 ..	A.T. & E., Ericsson's and S.T. & C. types—to between armature and washers or bearing collars
(d) Armature bearing-pin	Oil, Bearing, No. 16 ..	P.O. Type 4—to both sides of both armature bearings sparingly

TABLE 5.—(contd.)

Switch part or bearing surface	Class of lubricant	Where lubricant should be applied
(e) Armature-restoring springs	Graphite c/oil	P.O. Types 1, 2, 3 and Bothway C, and G.E.C. type—to point of attachment of armature-restoring springs to armature
(f) Armature-restoring springs	Oil, Bearing, No. 16	P.O. Types 1, 2, 3 and Bothway C, and G.E.C. type—to top of springs, immediately above felt inserts
(g) Armature-restoring springs	Graphite c/oil	A.T. & E., Ericsson's and S.T. & C. types—to point of contact between armature and restoring springs
(h) Armature-restoring springs	Grease No. 1	P.O. Type 4—at point of contact with the frame and at point of contact with washer sparingly
(j) Armature back stop	Graphite c/oil	P.O. Types 2, 3 and Bothway C—to striking face of armature back-stop
2. Pawl		
(a) Pawl bearing	Oil, Bearing, No. 16	P.O. Type 1 and G.E.C. 6-level to 10-level types and all types of A.T. & E., Ericsson's, S.T. & C., and Bothway C—between pawl and armature
(b) Pawl spring	Graphite c/oil	A.T. & E., Ericsson's and S.T. & C. types—between end of pawl spring and pawl
(c) Pawl back stop	Graphite c/oil	All types except P.O. Type 4—to back of pawl and striking face of pawl stop
(d) Pawl front-stop	Graphite c/oil	Bothway C—to striking face of pawl stop
3. Wiper assembly and hub		
(a) Ratchet-wheel	Graphite c/oil	All types except P.O. Type 4—to all teeth of ratchet-wheel [see par. 6 (a)]
(b) Ratchet-wheel	Grease No. 1	P.O. Type 4—to all teeth of ratchet wheel sparingly
(c) Ratchet-wheel hub	Oil, Bearing, No. 16	P.O. Type 2—to outer diameter of hub [see par. 6 (g)]
(d) Wiper bearing-pin	Oil, Bearing, No. 16	P.O. Types 1, 2, 3, 4 and Bothway C, and G.E.C. type—see par. 6 (g): (i) A.T. & E., Ericsson's and Siemens' No. 50—to both ends of wiper bearing-pin, on the inside at index-wheel end and on outside at ratchet-wheel end (ii) S.T. & C.—to extreme ends of bearing-pin (iii) Siemens' No. 16—to bearing points where bearing-pin passes through magnet frame
(e) Wiper tips	Oil, Bearing, No. 16	All types—see par. 6 (j)
(f) Wiper-feed brushes	Oil, Bearing, No. 16	All types except P.O. Type 4—see par. 6 (h)
4. Magnet core and armature residual plate	Oil, Bearing, No. 16	P.O. Type 2. The magnet core and the armature residual plate to be wiped with a piece of clean material, lightly oiled, to remove any oxide deposit [see par. 6 (k)]

TABLE 6.—PLUNGER-TYPE LINE AND MASTER SWITCHES
CLASS OF LUBRICANT AND POINTS OF APPLICATION

Switch part or bearing surface	Class of lubricant	Where lubricant should be applied
1. <i>Plunger-type line switches</i>	Lubrication not necessary	
2. <i>Master switches</i>		
(a) Plunger-guide shaft bearings	Oil, Bearing, No. 16 ..	All shaft bearings at top between collar and bearing
(b) Locking-arm pivots	Oil, Bearing, No. 16 ..	Both pivots of locking arm
(c) Governor bearings	Oil, Bearing, No. 16 ..	Through hole provided in governor cup
(d) Governor worm	Oil, Bearing, No. 16 ..	Surface of worm
(e) Locking segment	Graphite c/oil	All teeth of locking segment
(f) Pinion driving segment	Graphite c/oil	All teeth of pinion driving segment
(g) Pinion bearing-pin	Oil, Bearing, No. 16 ..	At point where bearing-pin passes through top of pinion
(h) Solenoid plunger	Graphite c/oil	Surface of solenoid plunger
(j) Trip spring	Graphite c/oil	On latch projection of trip spring

TABLE 7.—REGENERATOR NO. 1. CLASS OF LUBRICANT AND POINTS OF APPLICATION

Regenerator part or bearing surface	Class of lubricant	Where lubricant should be applied
Main Spring	Oil, Bearing, No. 16 ..	To spring
Ball race	Oil, Bearing, No. 16 ..	To balls and race
Governor spindle	Oil, Bearing, No. 16 ..	To worm gear and to bearing remote from cup. Bearing within cup must not be lubricated
Governor wheel	Oil, Bearing, No. 16 ..	To bearings
Pulsing cam	Oil, Bearing, No. 16 ..	To cam and collar
Magnet armatures	Oil, Bearing, No. 16 ..	To bearings
Main bearing	Oil, Bearing, No. 16 ..	Through oil-hole provided
Main shaft	Oil, Bearing, No. 16 ..	To shaft where flanged collar rides
Spindle	Oil, Bearing, No. 16 ..	To spindle
Pawl	Oil, Bearing, No. 16 ..	To pawl bearings and spring
Forked extension of marking-magnet armature and flanged collar	Oil, Bearing, No. 16 ..	Rubbing surface
Laminated spring on marking arm ..	Oil, Bearing, No. 16 ..	Between springs
Marking arm	Oil, Bearing, No. 16 ..	Between arm and laminated spring
Receiving-magnet laminated restoring-spring	Oil, Bearing, No. 16 ..	To striking surface and to bearing. Between springs and to point of engagement with the adjusting lever
Nuts on end of main spindle	Oil, Bearing, No. 16 ..	To rubbing surface
Marking arm operating pins	Oil, Bearing, No. 16 ..	To surface and ends of pins
★Code pins, friction rollers, and spring ..	Oil, Bearing, No. 16 ..	To retaining spring
Resetting-plunger assembly	Oil, Bearing, No. 16 ..	To bearings, to spiral spring, to plunger where it passes through bracket and at steps in plunger
Centre contact spring	Oil, Bearing, No. 16 ..	At point of contact with plunger-arm
Governor gear and wheel	Oil, Bearing, No. 16 ..	To teeth
Main driving wheel	Oil, Bearing, No. 16 ..	To teeth
Ratchet-wheel	Graphite c/oil	To teeth
Pawl and pawl-stop	Graphite c/oil	At the surface of impact
Receiving armature extension and back stop	Graphite c/oil	At the surface of impact

★TABLE 8.—UNISELECTORS MOTOR-DRIVE. CLASS OF LUBRICATION AND POINTS OF APPLICATION
(See Note 1)

Switch part or bearing surface	Class of lubricant	Where lubricant should be applied
Wiper-assembly bearings	Oil, Bearing, No. 16 ..	To the bearing at each end of the assembly
Rotor spindle and wick (see Note 2) ..	Oil, Bearing, No. 16 ..	Remove the rotor. Apply oil to the bearing surfaces and <i>also</i> to the wick. The lubricating wick should not protrude from the spindle and should be oiled fully but not to excess
★Cams on wiper wheel (see Note 3)	—	—
Cams on rotor shaft	Graphite c/oil	To the working faces of the cams
Rotor thrust face	Graphite c/oil	The point of engagement between the rotor and the base of the rotor spindle. Lubricate very sparingly.
Idler spindle and wick	Oil, Bearing, No. 16 ..	Apply oil to the end of the spindle, which is hollow and contains a wick. The wick should be fully oiled, but should not carry an excess of oil
Latch-armature bearings	Oil, Bearing, No. 16 ..	To each bearing
Latch detail	Graphite c/oil	Between latch detail and latch-restoring spring
Adjusting screw for latch-restoring spring	Graphite c/oil	Apply sparingly at point of contact between tip of screw and spring
Gear teeth	Graphite c/oil	The working surfaces of all gear teeth
Wiper tips	—	See par. 6 (j)
★Wiper-feed brushes	Oil, Bearing, No. 16 ..	Apply sparingly to tips

NOTES:—

- (1) For convenience, the mechanism should be removed from the bank.
- (2) To remove the rotor, first remove the interrupter assembly and mounting plate—the rotor can then be lifted from the rotor spindle. Care should be taken to replace the rotor in its correct position as described in B 5172.
- (3) The tips of the cams on the wiper wheel should not be lubricated because there is a tendency for the lubricant to foul the contacts of the spring-sets.

7. **Lubrication of Clocks No. 44.**—Lubricate all bearings and rubbing parts sparingly with Oil, Bearing, No. 16. for the lubrication of pulse machines are contained in the appropriate maintenance routine instructions and are listed in TESTS & INSPECTIONS, Routine, P 5016.

8. **Lubrication of pulse machines.**—Instructions

References:—B 5172

(TPM2/3) TESTS & INSPECTIONS, Routine, P 5016, R 5010, R 5117, R 5503
TOOLS & TRANSPORT, Hand Tools, H 1190

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