RADAR FITTING AND MAINTENANCE NOTES

TYPE 271Q

IMPROVISED ANTI WAVE CLUTTER UNIT -
EXTRACT FROM REPORT

"In view of the anticipated delay in supply of this unit to H.M.S. WILD GOOSE it was decided to construct a unit on board in accordance with the circuit details given in C.B.4231 (B).

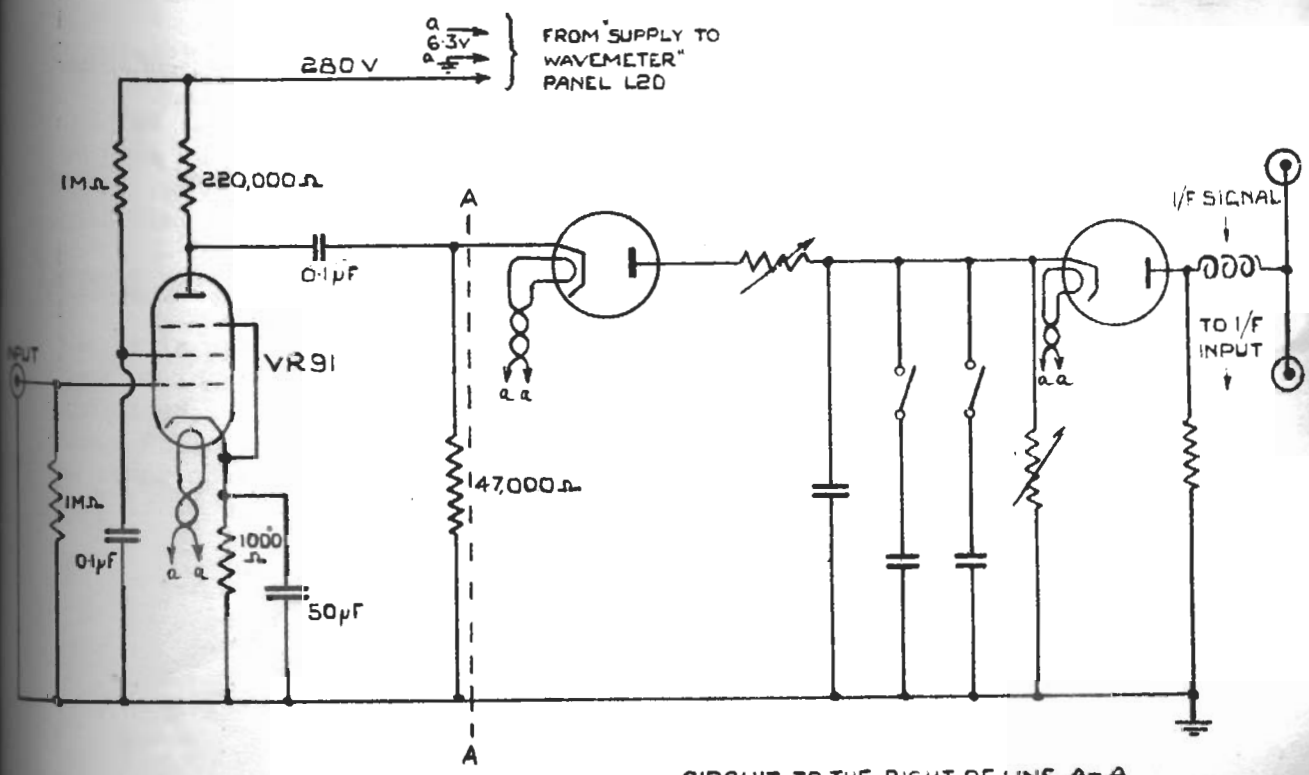
Using the negative portion of the waveform at Monitor point "A" of the modulator unit as the trigger pulse gave an output which, even at maximum, had a hardly perceptible effect on the receiver.

The construction of a pulse transformer was considered impracticable, so a single pentode stage was used to amplify and invert the positive portion of waveform "A". This has been incorporated in the clutter unit (which was constructed to the correct size) with the valve, a VR91, mounted on top. The requisite H.T. voltage was obtained from the 5-pin wavemeter supply on panel L20 from which the heater supply was also taken. Details of the circuit are attached.

The unit in this form has been found to give adequate suppression.

Subsequently, it was found that the positive pulse from the strobe generator unit in panel L20 was satisfactory for triggering the unit, and this is at present being used, with the strobe potentiometer locked in the zero position."

IMPROVISED ANTI-WAVE-CLUTTER UNIT



CIRCUIT TO THE RIGHT OF LINE A-A IDENTICAL WITH THAT IN C.B.4231 (B)
FIGURE 21.

EMERGENCY REPAIR OF TYPE 271Q

Lieutenant J. E. Somner, R.N.V.R. sends us the following :-

"THIS MIGHT HAPPEN TO YOU

"Bang, bang" went the depth charges and the Type 271Q.

When the breakers on the power supplies had been remade, the Type 271Q was obviously damaged - destroyers to a maximum of 5,000 yards only and very little "grass". Unfortunately, the A/S team were still in contact, the Senior Officer had his eyes on the remote P.P.I. and "bang, bang" went another pattern! In great discomfort between reports which were still going down to the plot and the "extra careful search astern in case he surfaces", the meters, connections and cables were checked.

Soon the fault was found. The second I/F valve in the mixer unit was not warming. Changing the valve did no good and as we moved round behind the reflectors, the operator still chanting "Target 1 025 - 2500", etc., the problem resolved itself into either:

(a) Put the set out of action and clear the fault in the mixer.

or (b) Short the grid of the second VR136 to its anode with fuse wire and do without that stage of amplification.

This was all that had to be done. Land echoes came up to the maximum range and the set was working efficiently before the escorts had opened to three miles.

Inspection of the mixer the following morning showed that there would have been a minimum delay of an hour to find and replace CH6 in the VR 136's filament circuit."

RADAR OPERATING PROCEDURE IN ESCORT VESSELS USING P.P.I.

The following are extracts from a report from C-in-C, WESTERN APPROACHES:-

"ADJUSTMENT OF SETS.

All operators must be, and all officers should be, capable of setting up a P.P.I. in its most sensitive state and understand how to use it for searching efficiently under all conditions.

When sea returns obscure echoes at short ranges the gain control must be varied up and down continuously in order to search areas both close into and far out from the ship.

It must be emphasised that a P.P.I. set for maximum sensitivity gives a blurred and smudgy picture.

Most operators tend to use a P.P.I. with insufficient gain in order to obtain a clear picture (one free from side echoes and sea returns). This setting of a P.P.I. greatly reduces the range of detection of a surfaced U-boat and eliminates all chances of detecting a Schnorkel. This tendency must be checked by frequent personal inspection of P.P.I's by Commanding Officers and Officers of the watch.

In ships with Anti-Wave Clutter Units, great care must be taken to ensure that the unit is set up correctly and is adjusted as necessary to suit varying sea conditions. Even with the unit so adjusted, it is often necessary to vary the P.P.I. 'input' in order to get optimum results.

A personal demonstration from an experienced radar officer will usually be necessary before an operator can be expected to know how to make all these adjustments correctly.

ILLUMINATION.

The lighting and ventilation in the radar office and the lighting in the plot (in the case of a remote P.P.I.) must receive careful attention. It will often be necessary to shield remote P.P.Is from direct light, both artificial light and daylight.

ADVERSE EFFECT OF HOLDING AN ECHO.

It is not always fully appreciated that it is impossible to keep track of identified friendly echoes unless a continuous sweep is maintained. If the relative positions of escort vessels in company change while the sweep is interrupted, it will usually be impossible for the radar operators to identify some or even any of the echoes when the sweep is resumed".

TYPE SC2/SK

Extracts from a G.E.C. news-letter to field engineers.

"Many of our A.J. receivers have been very erratic as to gain just at the point where operation is the best. Just a touch on the gain control will make the level jump sharply up or down. Different 6AC7's in the first two I-F stages affected this some, but not enough to cure the trouble. Adding resistance between R4021 and ground so that the potentiometer would operate at a different point gave approximately the same conditions, although the jump in gain occurred at a different spot on the potentiometer. The trouble was found to be due to uneven windings on the potentiometer resistance element. The moveable contact bridges several windings. The contact also rocks. Both conditions add up to jumpy operation."

"Low sensitivity on the A.J. receivers was found to be due to low voltage on the plate of the second r.f. tube. This was traced to the high side of ceramic capacitor C4015 shorting to the shield. Pushing it away cured the trouble.

A not too frequent trouble, we hope, but still one to keep in mind.

Incidentally, did you know that an 8 volt drop in line voltage will cause a 50% drop in the A.J. receiver signals? That's another point to keep in mind and one good reason for having a voltage stabilising transformer in the later equipments."

TYPE 293/M PEDESTALS 19U.

Complaints have been received that the lower bearing in 19U pedestals is being overfilled with grease at the manufacturers as the grease is working its way up the pedestal and into the waveguide.

Investigation at the manufacturers does not support this explanation and A.S.E. believes that the trouble is due to over greasing by fitting and maintenance staffs. These bearings are supplied packed with grease and should need no attention for the first three months. Thereafter one shot from a grease gun at about quarterly intervals should be sufficient to keep them adequately lubricated.

TYPE 281.

Concerning the wearing of the worm wheel in motor gearbox Pattern W4319 of Control Unit 20D, a report from H.M.S. DIDO states:-

"This Gearbox was opened up and inspected on failure of Radar Type 281 transmitter and receiver training.

2. Twenty five toothed four inch diameter wormwheel was discovered with half the teeth stripped, and remainder worn evenly to less than 1/32".

3. Item was installed in June 1943 and had given satisfactory performance for 3250 hours running. The gearbox had not previously been dismantled as the seizing of the gear was the first indication of a fault and such dismantling is not required in the maintenance schedule.

4. It is considered that the defect may have been caused by either or both of the following two reasons.

(A) Inefficient Lubrication.

During the regular maintenance in accordance with CB.4310(A) Chapter 10, paragraph 1 (B) page 72, it was observed that the gearbox rarely required topping up indicating little or no loss of oil. On dismantling after the failure, it was checked that the oil pipe was quite clear.

It is suggested that the stated oil level in the gearbox may be insufficient to provide efficient lubrication.

(B) Heavy load on worm gear at start of training due to 'brake clutch' sticking.

Great difficulty has been experienced in keeping the surface of the brake clutch, Item 16, Fig:49 C.B.4310(B), free from oil, it is often cleaned several times daily, this results in a 'sticky clutch' which does not always release the brake smoothly so producing a heavy load on the driving motor and worm gear.

It is suggested that the use of Coopers No:4 grease on nipple 1, 5 and 8 of the oiling chart, Fig.51 C.B.4310(B), instead of oil might obviate this.

5. It is believed that other ships have had similar defects, and it is suggested that quarterly inspection of the condition of the gearbox be added to the maintenance routine".

Commenting on the above, C-in-C Home Fleet states:-

"A small number of failures of this wormwheel have occurred in other ships and the experience gained has shown that breakdowns occur owing to over-loading of the motor caused by sticking clutches and the lack of oil in the motor gear box when first fitted.

The gear box is not filled with oil at the factory and labels are attached to the motor stating that it is to be filled before running. These labels often become lost during fitting and the initial wear before the gear box is "topped up" is very damaging and results in later breakdowns.

The oiling of the control table should be very sparing, a few drops of high speed machine oil at each point being required every few weeks. Under no circumstances should grease be used at oiling points (C.B.4130A, Parts I and II, Page 72). Over-oiling causes sticking of clutches and over-loading of the motor.

No fibre "quiet running" gears should be greased as this causes the fibre gears to swell and stiffness to develop in the table.

If the control table has been greased it will require stripping down and all bearings and shafting cleaning, light oiling and re-assembly; if oiling is then correctly carried out, cleaning of clutches will be required at most daily."

A.S.E. COMMENT.

"The recommendations of the Commander-in-Chief, Home Fleet are fully concurred in.

In addition there is one point of explanation. When the gear boxes leave the markers' works the vent hole is plugged with a small screw to prevent ingress of dirt during transport. This screw must be removed when the gear box is fitted to the control unit. Although the filling pipe which also acts as an oil level indicator could be filled to the top it would in these circumstances give a misleading indication of the quantity of oil actually in the box. With the vent unplugged the box can be properly filled and the level is adequate for proper lubrication. This is the probable explanation of para.4(a) of report from "DIDO".

The oil used in the worm gear box should be heavier than that used for the other gears and shafts of the units. General service mineral oil should be satisfactory".

BLANK SPACE

SOMEONE DIDN'T SEND IN

A FITTING OR MAINTENANCE

NOTE.

RE-FORMING POLARIZED ELECTROLYTIC CONDENSERS.

An electrolytic condenser, if out of use for any period, undergoes chemical changes in the dielectric. As a result, on first applying the working voltage it will take a large current which may cause internal heating and failure; this occurs if it has been standing for about three months or more.

Before placing any equipment containing electrolytic condensers into service, the condensers should, therefore, be re-formed to avoid overheating and damage due to excess leakage current.

In the case of an equipment having been temporarily removed from service, the condensers should be re-formed if the idle period has exceeded three months. To facilitate this requirement it is advantageous to attach to an equipment, on withdrawal from service, a tag bearing the date on which power was removed.

The following instructions do not refer to reversible (non-polarized) electrolytic condensers.

METHOD OF RE-FORMING.

Apply a steady D.C. voltage equal to the rated maximum peak voltage of the condenser through a resistance of approximately 1•5k ohms (a suitable carbon filament lamp may be used) to each condenser, in the correct direction in accordance with the terminal marking on the condenser, for a period of 1 hour.

ALTERNATIVE METHOD.

If the method detailed above cannot be employed, the following method may be used, although the results obtained may be less satisfactory.

Connect a 1•5k ohms resistor or suitable lamp in series with each condenser. Switch on the equipment as normally, thus allowing the applied voltage to re-form the condenser.

COMPLETION OF RE-FORMING.

After about 1 hour measure the leakage current with a moving coil meter, with the series resistor shorted out. If the leakage current is steady and does not exceed the values given in Table I, reforming is complete. If, after an hour, the leakage current is still falling and has not reached the value given in Table I, the re-forming process should be continued.

If the leakage current increases during the application of a steady voltage at a constant ambient air temperature, the condenser should be replaced.

TABLE I - MAXIMUM PERMITTED LEAKAGE CURRENTS (/uA)

Air temperature	Dry electrolytic	Wet electrolytic	Or
Up to 25°C	0•15 C x V	0•35 C x V	100
• + For each 2°C above 25°C to 55°C.	0•01 C x V	0•02 C x V	5

Notes. 1. Where C is the capacity in μF, V is the voltage across the condenser as measured by a moving-coil voltmeter when the series resistor is shorted out.

2. Leakage current must not exceed the greater of the two figures given in Table I.

SAFEGUARDS FOR ELECTROLYTIC CONDENSERS

Electrolytic condensers when not in use should be stored in a dry, cool place and re-formed every 6 months as specified above.

Electrolytic condensers should be disconnected on the live side before the unit is meggered or tried out. Care must also be taken when testing with a D.C. voltage to see that the polarity of the supply corresponds with the polarity of the condenser.

EXAMPLE OF CIRCUIT

A suitable unit for forming condensers may be made up as shown in Fig. I. The meter should be an Avometer or similar instrument, and switched initially to the highest range.

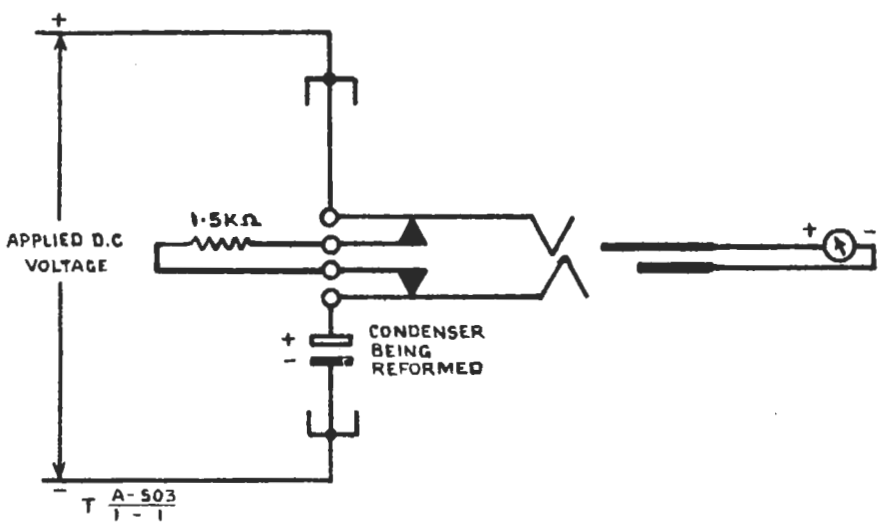


FIG.1 — TYPICAL CIRCUIT.

(Editor's Note.

The above is taken from the publication "Telecommunications" A.503 (Electrical and Mechanical Engineering Regulations) of 30th May, 1945).

RADAR MODIFICATIONS

In the past six years the Back Room Boys at A.S.E. have conceived and brought forth some weird and wonderful equipment. But even a B.R.B. may be human at times and err by using an unsuitable component. Or a bigger and brighter B.R.B. in the midst of his periodic Archimedean immersion may envisage some possible improvement. Perhaps a time base although perfectly stable within A.S.E's sheltered walls may be loth to flip (or flop) near Manila's Coral strands.

Not all bright ideas, however, grow to the status of an official modification. Many requirements must be satisfied,

Elimination of a prevalent fault.
Improvement of scope or performance of equipment.
Increase operational efficiency.
Simplify operation and/or maintenance.

Finally the stores must be readily available and the modification must be easily carried out and justified by the improvement.

Thus all published modifications are worth doing, and should be given high priority, The responsibility for obtaining the necessary stores (either locally or from S.N.S.O.(H)), and carrying out the work rests with the ship's Radar Officer in ships in commission, and with the Port Radar Officer in ships under construction.

So get cracking and bring your sets up to date. Below is a list of recent Radar modifications.

TYPE 242/M

A.F.O.	6060/44	Fit performance meters.
-	2750/45	Fit bolt connection to ASD Y-transformer.
C.A.F.O.	223/45	Modifications when fitting JH(1) and (2).
-	1363/45	Reduction of repetition rate

TYPE 251M/MS

C.A.F.O.	118/45	Modifications to improve performance.
A.F.O.	4320/45	Modification to ATU Aerial.

TYPE 253P

C.A.F.O.	2305/44	Fitting suppression lead to Type 242.
-	2361/44	Replace Type 253 by Type 253P
-	3312/44 }	
	581/45 }	Replace resistance.
A.F.O.	2750/45	Fit bolt connection to ASH Y-transformer.

TYPE 267

A.F.O.	2318/45	Modification to panel 3BD.
A.F.O.	2319/45	Fit water trap in Air Conditioning Unit exhaust.
-	2748/45	Modify Patt. 58413 stand for display Unit.
-	2751/45	Replacement of Condenser in C.R. Unit Des. 21.

TYPE 271/3/P/Q.

A.F.O.	6439/44	Remove cotton covering from transformers W3973/4.
-	6586/44	Replace electrolytic condensers in Receiver power pack.
-	165/45	Addition of Anti-Wave Clutter Unit.
-	1075/45	G82A modification.
-	1464/45	Modification of local oscillator circuit 271/2/3/P.
-	4609/45	Replacement of transformers W3976/7.

TYPE 274

C.A.F.O.	2805/44	Modifications to several panels.
-	742/45	A-J modification to L32.
-	1286/45	Modification to spotting panel blanking wave generator.
-	1364/45	Replacement of Control Unit in L32.
A.F.O.	2319/45	Fit water trap in Air Conditioning Unit exhaust.
-	4609/45	Replace transformers W3976/7

TYPE 275

A.F.O.	6300/44	Modification to Trigger Unit for 242 sync.
-	3914/45	Modification to Time Base Unit, Design 'P'.
-	4609/45	Replace transformers W3976/7.

TYPES 276/277/293

A.F.O.	583/45	Replace follow-up switches in AUK Control Table.
-	1075/45	G82A Modification.
-	2026/45	Fit Mica Waveguide seal.
-	2027/45	Modify 2AM power board to protect Air Conditioning Unit heaters.
-	2319/45	Fit water trap in Air Conditioning Unit exhaust.
-	2320/45) 2753/45)	Colour coding of power distribution board switches.
-	2752/45	Replacement of follow-up switches in Control Tables.
-	3773/45	Fit Aerial Matching Unit in upper waveguide.
-	4159/45	Replacement of W4815 pulse transformer.
-	4160/45	Replace choke L6 in modulator panel.
-	4609/45	Replace transformers W3976/7.

TYPE 281/B.

A.F.O.	5669/44	Replace resistance in diode switch supply unit.
-	6581/44	Replace changeover switch in Board 2AJ.
-	706/45	Modification to thyratron delay unit.
-	4161/45	Fit indicator lamp in Amplifier M81.
C.A.F.O.	808/45	Summary of modifications.

TYPES 282/3/4/5

C.A.F.O.	2362/44	Modify remote C.R. and R.U's to prevent vibration damage.
-	2663/44	Fit lens magnifier to L12.
A.F.O.	313/45	Replace filament control knob.
-	431/45	Replace L12 condensers.
-	4322/45	Check lining up of R.T.U's.
C.A.F.O.	831/45	M68 Modification.
-	928/45	Circuit modifications for A - J.
-	1119/45	Fit lens magnifier to L24/34.
-	1326/45	Training tube modifications.

TYPE 291

C.A.F.O.	2532/44	Increase indicator range scales.
-	785/45	3AN modification, earthing of sync. lead.
-	881/45	3AN modification to provide sufficient sync. pulse.
A.F.O.	2751/45	Replacement of condenser in C.R. Unit, Des. 21.

TYPE 941

A.F.O.	3915/45	Fit performance meter.
A.F.O.	6441/45	Mixer Unit Design 9 - modification.

P.P.I.

A.F.O.	6850/44	Regrouping of electrolytic condensers.
-	1739/45	Ventilation.
C.A.F.O.	668/45)	
-	1164/45)	Modifications.

SKIATRON

A.F.O.	5668/44	Replace resistances in Calibrator and Monitor Unit.
C.A.F.O.	2481/44	Modification to lamp box.
-	25/45	Modification to brightening circuits.

SOLDERING WITHOUT TEARS

(By the Editor)

Some people are born to soldering and some have soldering thrust upon them ! It is to the latter unfortunates that the following remarks are addressed.

Few who have to deal with that tangle of wires so aptly misnamed wireless, can escape, and sooner or later the question of soldering must be faced.

Of course, one way of dealing with your soldering problems is for you to make frequent visits, with the defective panel to A.S.E. Sooner or later the opportunity will come for you (1) to persuade someone to do the job for you, or (2) to remove a good panel from the Lab. bench and neatly insert the defective one in its place.

If course (2) is successful, you will have achieved two things (a) you can proceed with your bit of the battle and (b) you will have impeded the presiding scientist in his efforts to produce more and improved instruments for your future torture. On the other hand if visiting A.S.E. is impracticable - like your being a couple of thousand miles away at the time - you must tackle your soldering the hard way.

Three things are required (1) an "iron" - so called because it is invariably made of copper (2) a supply of resin-cored solder and (3) a thorough digestion of the axiom "clean enough and hot enough".

THE IRON

It is proposed to adopt the unusual course of dealing with first things first. So let us regard the "iron". Its name notwithstanding, the iron should look like a piece of copper. That is to say, it should look like copper except at its pointed or "business" end where it should look like tin. The whole is supported in a handle which looks like wood, by a shank which - never let it be said - looks like iron.

If you still don't know what a soldering iron looks like, a Pattern 4383/4 Electric Soldering Iron will - after being subjected to the treatment detailed hereunder - adequately illustrate the above description and will afterwards come in very useful for soldering.

THE FLUX

Next we must give our attention to the solder and to the flux. Experts will talk glibly of 40/60 solders and tetra something or other fluxes, but the scientist who built the first L24 when things were scarce, swears he used lead-pipe and Union Jack corn-paste. The writer, who subsequently inherited the maintenance of this L24, has no reason to contest the affidavit and thinks that on the whole, resin-cored solder is better.

Then the "clean enough hot enough" technique ! This means exactly what it says and applies equally to the iron and to "that which has to be soldered". Not clean enough not hot enough, on the contrary means no joint or "dry" joint. Too hot means oxydisation and the same result plus a ruined iron, or at any rate an iron you have to start all over again on. (Read on).

THE "MODUS OPERANDI"

Now for the "modus operandi". The first step is to "condition" the iron. The Pattern 4383 is an electric iron for 220v. - Pattern 4384 is the 110v. version. It comes coated with a protective covering and will respond to treatment. The "copper bit" should be lightly

filed until all of the pointed end shows bright copper. It should then be switched on and allowed to heat up until the resin-cored solder (Henley's Solon, Ersin Multi-core, or G.P.O. Code 7) just melts when applied to the cleaned surface. The iron should then be switched off and the solder spread evenly all over the surface - a piece of clean rag will assist in spreading and removal of the excess mixture of resin and solder. When the whole of the business end is evenly and cleanly coated with bright tin, the iron is ready for use.

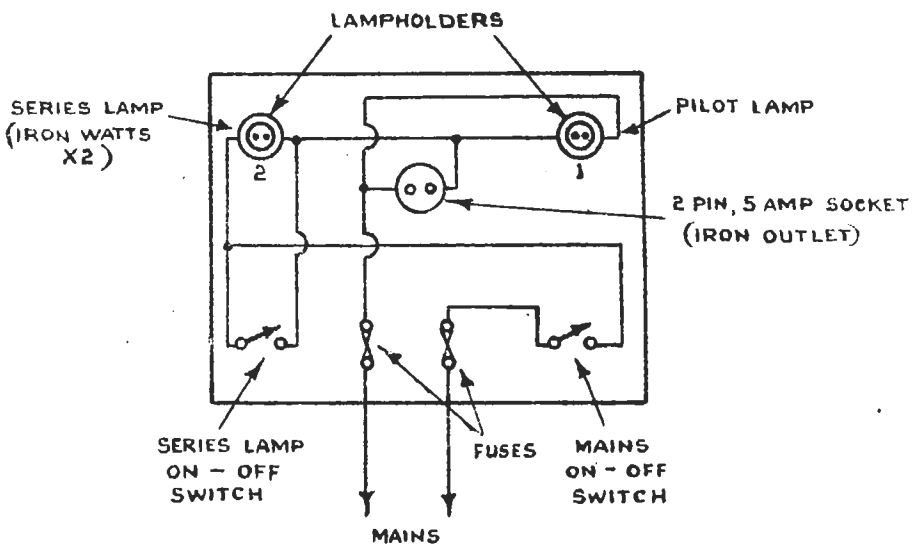
All the above remarks on conditioning the iron apply whether it is of the electric type or not. The important thing is, when preparing the copper bit, to get it only just hot enough to melt the solder. If the bit is hotter than this the copper oxydises or the flux burns and tinning is difficult. Remember that it is quite impossible to do a good job of soldering if the iron is not in the condition described and that it always saves time and temper if it is got right before any work is attempted.

It should also be remembered that an electric iron is designed to retain its heat while work is actually in progress. Therefore, if it is left switched on when no work is being done it will over-heat, the tinning will be burnt, the copper will oxydise and the above filing and tinning process will have to be done all over again.

Note that there is a limit to the number of times this procedure can be carried out as it is advisable to leave sufficient copper available for the normal functions of the tool. Nor can it be said that there is an unlimited supply of Patt. 4353/4 Iron Soldering Electric in Naval Store, since, we understand, supplies are being husbanded in the belief that a large number may be required for the Germans and Japs in order to facilitate their preparations for World War III. Attention is therefore drawn to the next paragraph.

HEAT CONTROL.

In the work-shop or where much soldering has to be done, the writer, in long experience, has found that the making up of a small switch-board well repays the trouble involved. Such a board consists of a piece of ply-wood about 8" square on which are mounted two batten lamp-holders, two tumbler switches, two 5 amp. fuses and one two-pin socket. One of the batten holders - which we shall call number 1 - is for a pilot light and is wired in parallel with the two-pin socket. Both of these are then wired in series with one of the switches, one of the fuses, the other batten holder (number 2) and the other fuse. The remaining switch is wired across (parallel) number 2 batten holder. See figure for wiring diagram.



The use of the switch-board does two things. The pilot light indicates whether or not the iron is switched on - a useful feature - and the series lamp when switched on limits the temperature of the iron. When a job

is being done, but the iron not actually being used, the series lamp is switched on (switch off to switch on). This keeps the iron hot but prevents over-heating. When the iron is going to be used the series lamp is switched off and the iron will then heat up normally. The standard bayonet plug on the iron's flexible lead should of course be replaced by a two-pin plug to fit the two-pin socket.

Now (if you haven't blown up the ship) let us turn to "that which has to be soldered" hereinafter called the work. Cleanliness is the thing here. By cleanliness is meant getting right down to bright metal everywhere. Especially where the metal is not already tinned. Every vestige of dirt, corrosion, oil, grease or foreign matter of any kind must be removed from the surfaces to be tinned. Scraper, file, wire brush, emery cloth and patience are the weapons. There is no short cut and no other way out. But don't waste any time at all on cast iron or aluminium - or aluminium alloys - they won't solder and that's that.

Assuming the, perhaps rather wild, assumption that the work is now clean - and assuming that the iron has been switched on, a start can be made. A small amount of solder (and with it of course the flux) should be applied to the bit to freshen it up. The bit is then applied to the work. There must be sufficient heat available to heat up the work so that it (the work) gets hot enough to melt the solder. This is, in fact, the criterion. The work itself must be hot enough to melt the solder even when the iron is temporarily removed. When this is achieved the resin-cored solder should be applied to the work and not to the iron. This is where most amateurs go wrong. The reason should be obvious. The bit is - or should be - already tinned. Therefore you want the flux on the - as yet - untinned work.

Continuing, spread the melted solder thinly and evenly over the surface. It should present the appearance already prescribed for the bit i.e. a bright highly polished appearance.

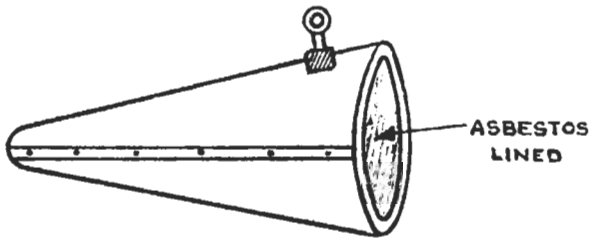
If two surfaces are to be "sweated" together (Heaven only knows why "sweated" - it must be another one of those copper-iron things) both surfaces must be cleaned, tinned, held securely together, and heated by the bit while solder and flux are run into the joint - again by applying the solder to the joint and not to the iron.

If the work is not quite hot enough the solder will appear as a sort of grey matt paste. If it is too hot the metal will oxydise and a rainbow coloured scum will form, meantime the flux will burn and gum up the whole thing with carbon. On the other hand, if the temperatures of both work and iron are right the solder will be fluid and will look something like quick-silver with globules of molten resin floating on it.

A burnt copper bit can be easily diagnosed. Even if it is not an obviously charred and fused mass, the tinning may be burnt. Try it with a file. If it is soft and tends to clog the file it is alright. If it is hard and unsympathetic it is burnt and quite useless for good work. The only answer is to get right down to the copper again by filing and then re-tinning

Avoid large masses of solder at the joint. There is no mechanical strength in them and they may, and probably will, disguise a "dry" joint. Incidentally why "dry" joint ? Mechanical strength can only come from a mechanical joint and good quality soldering. The large lumps so often seen in amateur soldering usually conceal bubbles of flux or alternate layers of solder and flux stuck together on the fish glue principle.

A good deal has been said about not letting the iron get too hot, but in exposed places the difficulty may be to get it hot enough. A great help in this direction is the "cosy". This is made in a few minutes and is merely a cone of tin plate lined with asbestos as per diagram.



It is remarkable what a boon such a simple piece of apparatus can be at the mast-head or similarly exposed places. The iron, of course, is merely inserted into the cone and allowed to heat up. A ring or hook should be attached to the cone to facilitate hanging it on a convenient projection. In such locations, or where the work is on the heavy side, it may be necessary to provide additional heat - to the work - by a blow lamp or other means.

Nothing has been said here about acid fluxes and in fact, so far as radio work is concerned the least said the better. "Killed" spirits (i.e. Zinc Chloride) or Baker's Fluid should never be used since they are corrosive and will play havoc with radio components. Fluxite, too, is messy and should be avoided except in an emergency.

However, where steel or iron (not cast) surfaces, remote from radio components, are to be tinned, Baker's Fluid will make the job much easier. It will also clean up a copper bit quickly but should not be used in this capacity often with an electric iron or you will soon want a new one. Another rapid cleaner for the iron is sal-ammoniac, but this gives off objectionable fumes and should not be used in a confined space.

Finally one more gadget. The use of a knife for stripping tough insulation is a tedious operation and sometimes results in damage to the conductor. The sketch below shows a useful device for making a clean cut.

An edged V-shaped slot should be cut in a flat copper strip. The slot should end in an $\frac{1}{8}$" hole and the strip then clamped round the shank of the soldering-iron.

The cable to be stripped is laid across the slot and rotated. The separate portion can then be pulled off the conductor.