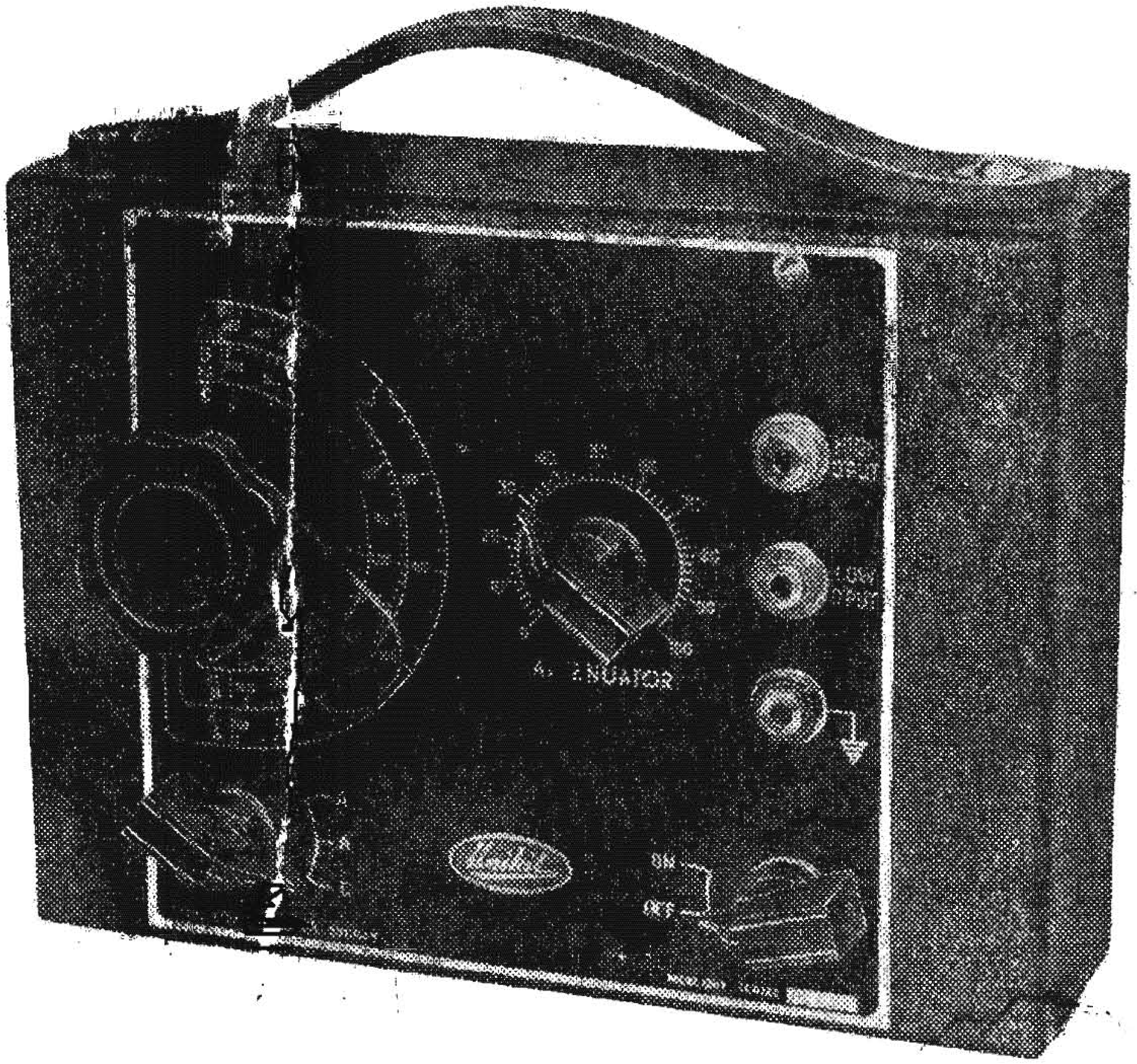
HOW TO BUILD

THE MODEL OK1

UNIVERSITY OSCILLATOR



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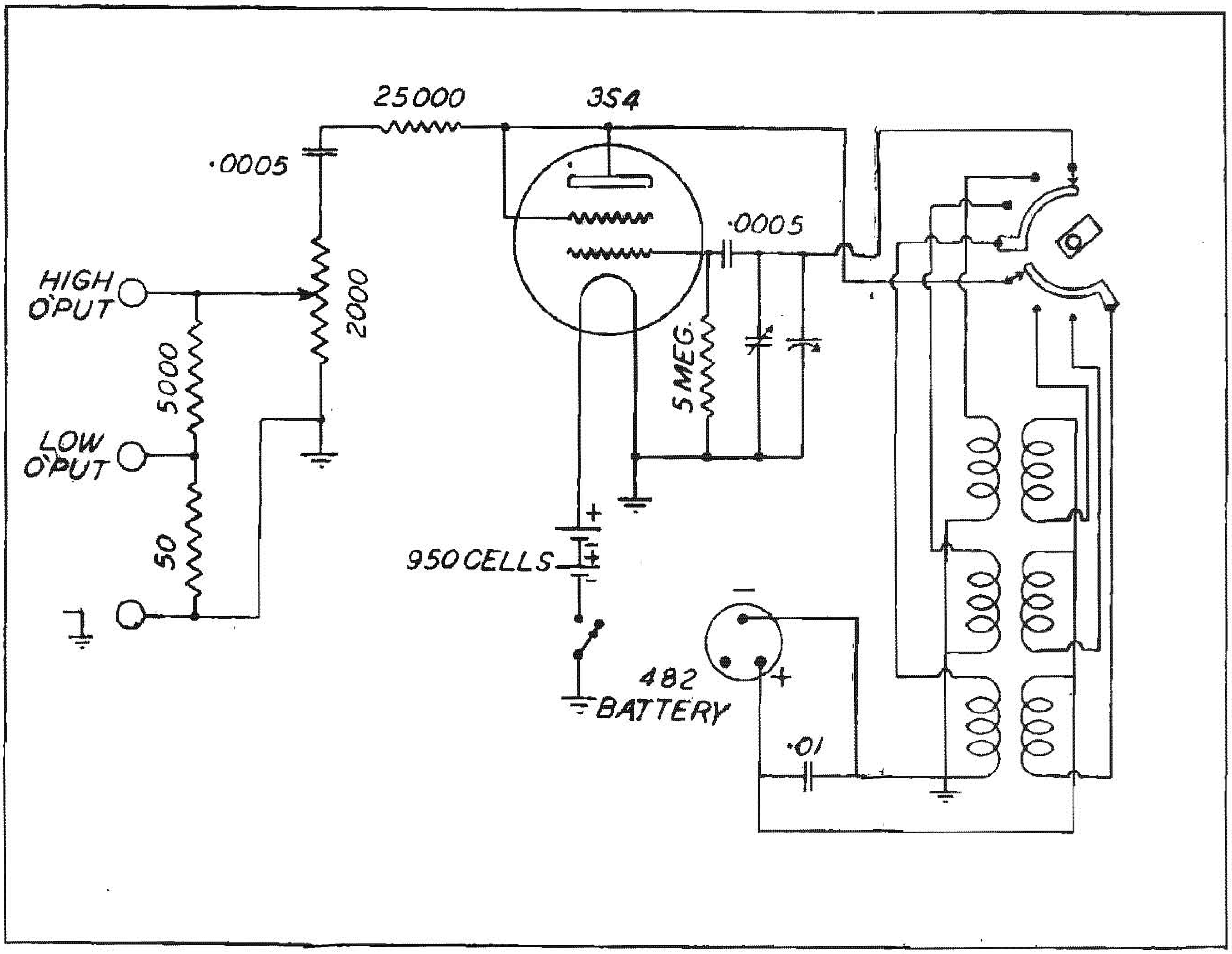
CONSTRUCTIONAL DETAILS—

The following pages, give you full details for the construction of a battery operated oscillator, of a type invaluable for the alignment of dual wave radio receivers and many of the other operations performed in radio service work. A minimum number of simple tools are required for the building of this oscillator and if care is taken in assembly and wiring, an accurate instrument will result.

The frequency ranges covered by the oscillator are set out below:

"A" band — 160 to 490 K.C.
"B" band — 550 to 1600 K.C.
"C" band — 16 to 45 metres



CIRCUIT DIAGRAM FOR OKI OSCILLATOR

The list given here is a complete one of every item in the kit. Most of these components are already mounted and soldered in place. So when you are checking your kit take this into account and you will find it complete in every detail.

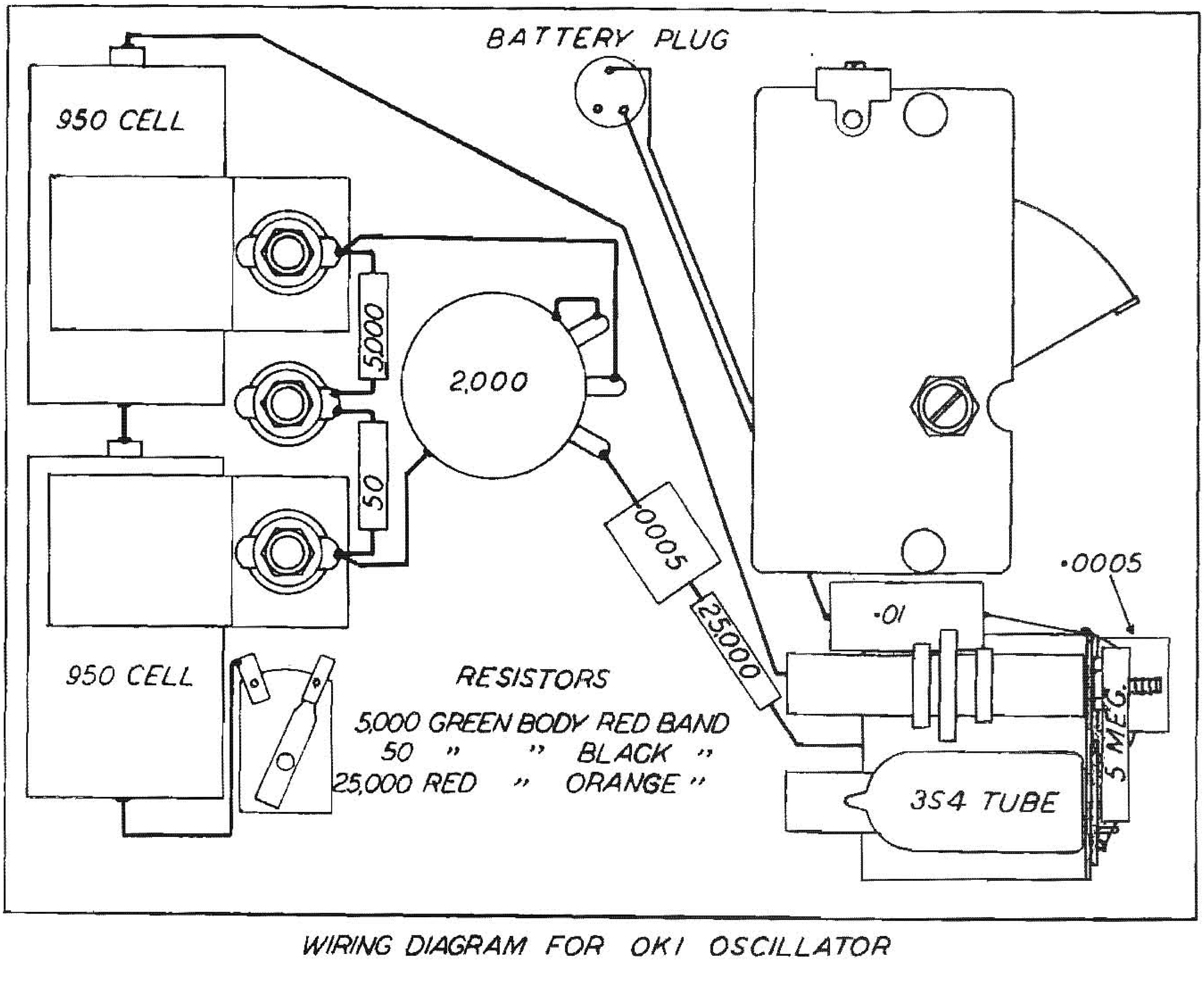
The dial has been set and the coil iron cores and trimmer adjusted in the factory so on no account should the wax seals be broken and any readjustments made to these components. Each coil unit is adjusted with highly accurate equipment after the tuning condenser and dial are assembled, this is a very important point as it saves you the trouble of a complicated calibration procedure when you have completed wiring your oscillator.

Parts List

1 metal case with lid
1 coil unit
1 output lead
1 482 battery
2 950 cells
1 single gang condenser
1 trimmer condenser
3 pointer knobs
1 2000 ohm potentiometer
1 battery switch
1 5000 ohm ½ watt resistor
1 50 ohm ½ watt resistor
1 25,000 ohm ½ watt resistor
4 self tapping screws
2 "A" battery clamping strips
1 "B" battery clamping strip
3 tip jack sockets with nuts, lugs and lockwashers
1 tuning knob and pointer
2 .0005 mfd. mica condensers
1 5 megohm resistor
1 3S4 tube
1 leather handle with screws, washers and lockwashers
1 brass label
1 "B" battery plug
Hookup wire
Solder

Assembly and Wiring

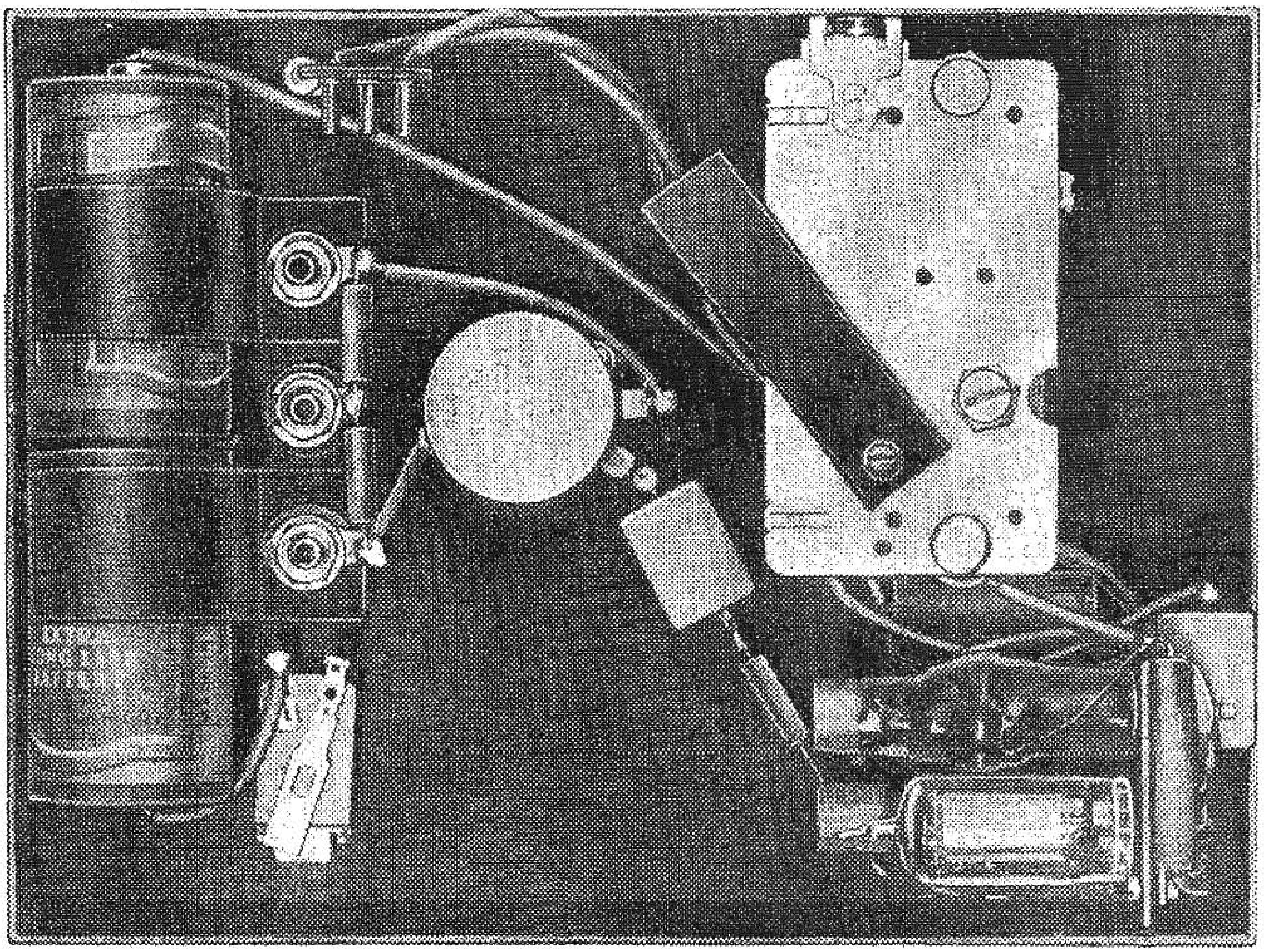
The first step in wiring the oscillator is to connect the two 950 torch cells in series with a small length of the hookup wire provided in the kit—about two inches will be ample. Next slip the two cells under the clips provided with the positive ends towards the top of the panel (the positive end is that which has a brass cap in the centre). Then mount the switch near the batteries at the bottom of the case with the lugs pointing to the top of the case. The potentiometer is next mounted with the lugs pointing towards the gang condenser.



WIRING DIAGRAM FOR OKI OSCILLATOR

Now solder a lead from the bottom or negative end of the lower cell to the lug closest to the batteries on the small switch. If any difficulty is experienced in soldering to the bottom of the cell it should be scraped lightly first when it will be found to solder readily. Next solder the long single wire from the coil unit onto the positive cap of the top 950 cell making the wire long enough to lay flat across the back of the panel all the way. This completes the filament wiring of the oscillator.

The remaining wiring is all ossociated with the attenuator and if the position of the leads is carefully studied when they are put in and kept as short as possible the attenuator will work smoothly with a minimum of leakage. First bend the top lug on the potentiometer flat and solder it onto the metal cover. Next solder a lead from the earth socket to the closest point on the potentiometer cover. Both of these soldered joints should be on the side wall of the cover so as not to interfere with the mounting of the type 482 battery when it goes in. The other wire to put in is one from the HIGH OUTPUT socket to the centre of the potentiometer. Next solder the 5,000 ohm resistor between the HIGH OUTPUT socket and the LOW OUTPUT socket and the 50 ohm resistor from the LOW OUTPUT socket to the earth socket. Then connect one end of the .0005 mfd. condenser to the remaining lug on the potentiometer. The other end is soldered to the 20,000 ohm resistor which is mounted on the switch. If the wiring has been checked carefully the 482 battery can now be put in position. Screw



the metal strip firmly on the gang condenser so that it lies across the battery holding it in place. After that the three pin plug is inserted into the socket in the top end of the battery. If the 3S4 tube is placed in the socket and the oscillator turned on it will now function. All that is left to do before screwing the instrument in the box is to fasten the handle to the box with the nuts and bolts provided and slip the sheet of prespahn along the top of the box to come between the negative end of the 950 cell and the case. Finally, put on the knobs and tighten them in position.

When the oscillator is built check your wiring very carefully also check to see that no solder has run down under the lugs on either the tip jack sockets or the potentiometer, as a short circuit at any of these points will prevent the instrument functioning.

Replacing Batteries

With normal use quite a long life may be expected from the batteries in this oscillator. However, it will be found that the 950 cells require much more frequent replacement than the 482 "B" battery.

Recalibration

If for any reason it should ever be necessary to recalibrate the oscillator, the coil iron core positions are as follows. Looking at the end of the coil bracket with the panel upright the "A" band iron core adjustment is above the 3S4 socket, the "B" band iron core is beside the "A", closest to the panel and the "C" band iron core is beneath the "B" iron core beside the 3S4 socket. The iron cores affect principally the low frequency end of each band, so that any readjustment should be made with the tuning condenser plates almost fully in. The trimmer should be set at the higher frequency end of "A" band, preferably on 455 K.C. These adjustments will not be necessary under normal circumstances.

Using the Oscillator

Apart from alignment, an oscillator of this nature can be used for several other purposes almost as important in radio service work. Its uses are set out below:

(1) Alignment of I.F. and R.F. circuits.
(2) Adjustment of dial tracking.
(3) Checking automatic volume control characteristics.
(4) Testing valve and circuit components under working conditions.
(5) Signal tracing.

1. Alignment

Alignment of modern superheterodyne receivers has been fully dealt with from time to time in various technical articles and, consequently, only a brief description is given here.

The first point in aligning superheterodyne receivers is the adjustment of the intermediate frequency transformers. To do this, the hot (red) oscillator lead is connected to the grid of the intermediate tube, while the earth lead connects to the chassis earth. If the receiver possesses two intermediate stages, the lead is connected to the second intermediate tube before the first one. The oscillator is now switched on and the dial turned until the needle points to the intermediate frequency required by the receiver under test. The intermediate transformer following the tube to which the oscillator is connected, is now adjusted to give maximum reading on an output meter or the maximum signal is judged by the ear. When this action is completed the hot lead is transferred to the first intermediate tube or the first detector, as the case may be, and the action already described is carried out on the remaining I.F. transformer. The one which has been previously aligned should now be re-adjusted to give maximum output. It is a wise precaution, when aligning sets with automatic volume control, to keep the signal input as low as it can conveniently be kept. This prevents the automatic volume control from interfering with the correct alignment.

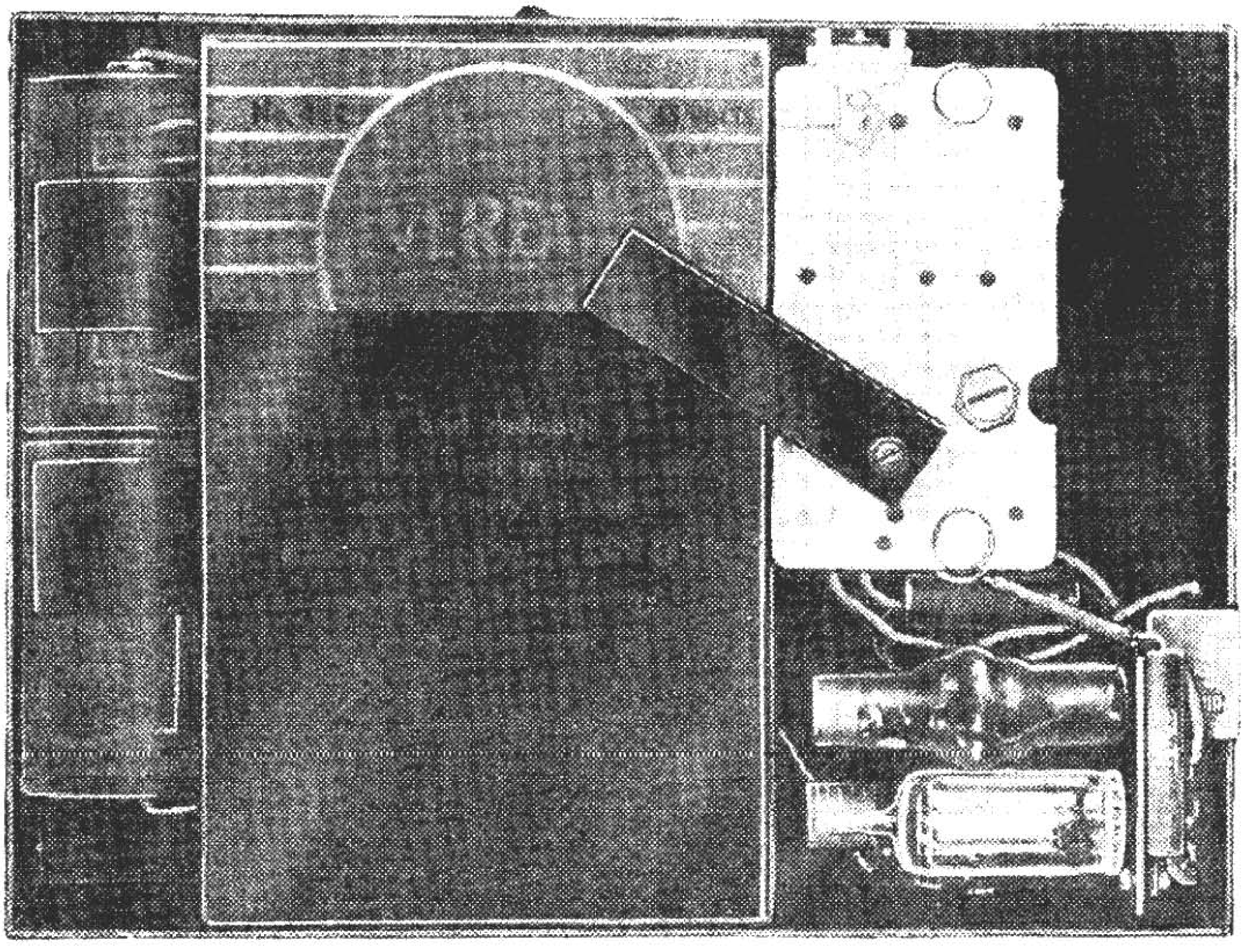
After having aligned the I.F. transformers the hot lead of the oscillator should be transferred to the aerial terminal and the range switch turned to the broadcast band. The oscillator should now be tuned to a frequency of 1400 K.C., and the receiver tuned in to the signal. From this position, the oscillator and R.F. trimmers should be adjusted. The oscillator and receiver are then tuned to a frequency of approximately 600 K.C. and the padder adjustment made. After having adjusted the padder, the action previously carried out on 1400 K.C. should be repeated.

2. Dial Alignment

The adjustment of the dial is part and parcel of the alignment of the receiver. The work of the oscillator in this adjustment is to supply the correct frequency, so that by adjusting the oscillator trimmer and the needle of the dial, the correct frequency setting will be registered. For this purpose, the oscillator should be fed into the aerial and earth as previously described, and the range selector switch turned to the broadcast band when the desired frequencies can be taken from the calibrated dial.

3. Checking A.V.C.

The action of automatic volume control may be checked very easily with an oscillator. The test con-



sists of feeding the signal into the aerial and earth at various frequencies and noting the effect of the automatic volume control voltage on one of the tubes controlled by the A.V.C. In a valve using a bias resistor in the cathode circuit, it is only necessary to place a meter across the cathode resistor, having sufficient range to measure the full bias voltage, and to increase the signal from the oscillator from zero to maximum, noting the effect of this signal on the voltage developed across the bias resistor. If the automatic volume control is working properly, the voltage registered by the meter will decrease as the signal strength is increased. The amount of automatic volume control voltage can quite readily be judged by the reduction of bias voltage. This action should be tried on all tubes which are controlled by the automatic volume control system.

In tubes such as octodes or pentagrid converters, the majority of the cathode current is made up not by the ordinary plate current but by screen and oscillator plate current, the effect of automatic volume control will be hardly noticeable with a meter connected across the resistor in the cathode circuit. In this case, as in the case of valves which are biased by a back bias method, it will be necessary to insert a milliammeter in series with the plate circuit or the screen circuit and note the effect on the increased signal on the plate or screen current. As the automatic volume control increases due to increased signal strength, the plate or screen current will be reduced. The effective change is again an indication of the automatic volume control voltage. Of course, the range of the milliammeter must be correct for the type of tube being tested.

4. Valve and Circuit Testing

Frequently in radio service work, various components will test quite in order under normal testing conditions, but when operated in a receiver may cause considerable trouble. In such cases, it is obviously necessary to test these components under their actual working conditions. The oscillator may be used very conveniently for this function, as it can be made to feed an unvarying signal strength into the receiver and, consequently, any variation which takes place in the output will be due to some fault in the receiver itself. By feeding a signal of broadcast frequency into the aerial and earth terminals, and by adjusting the attenuator unit to a reasonable signal strength, various components in the receiver can be replaced to see whether they are working satisfactorily or not. It is advisable to use some form of output meter to measure the output being obtained, as the ear is very inaccurate in judging changes of signal strength. In this way, if a valve is suspected of being faulty, it may be tested under its actual conditions by replacing with one known to be good while the test is being under gone. Any increase in output represents greater gain from the new tube than from the old and, consequently, the old tube may be considered as being inefficient. Various minor components such as resistors and condensers may be tested in a similar manner.

5. Signal Tracing

An efficient means for locating a fault in a radio receiver for service consists of what is known as stage testing. Stage testing is a means of localising particular faults being experienced, to one individual stage. The various components of this stage may then be checked quite readily, resulting in a greatly reduced time of operation. The oscillator is a very fine instrument for locating faulty stages. To do this, the oscillator should be switched on and the range switch and dial turned to the correct intermediate frequency of the set under test. The hot lead should then be fed into the grid of the last intermediate tube, while the earth lead connects to the chassis. The receiver is now functioning only from the last intermediate stage and, consequently, if the function here is quite normal, it immediately eliminates the second detector, power tube, speaker and power supply unit. The hot lead should then be transferred to the first intermediate or first detector, and if the receiver still continues to function, then the fault exists before this first intermediate or first detector, and the remaining sections between the intermediate or detector and speaker have been proved to be in good order.

Switching now to a broadcast frequency and feeding the signal into the aerial and earth terminals will locate the fault in the remaining stages.

Conclusion

This is a carefully designed instrument and with careful and thoughtful use, can give you many years of service.

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NOTE:

Due to the extreme shortage of type 482 batteries, a type 467 has been substituted.

The battery should be left in its white container, the lid and side flaps being torn off the box to provide the clips. It should be fitted in the clip with terminals facing towards the top and so that the negative terminal is nearest to the tuning condenser.

When discharged, the battery may be replaced with another 467 or with the type 482.