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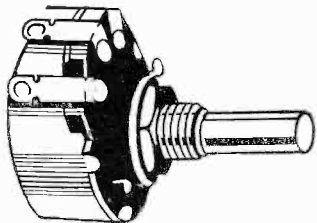
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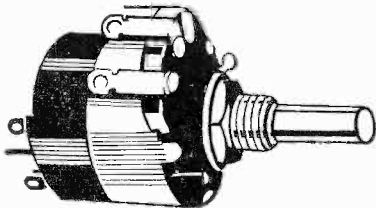
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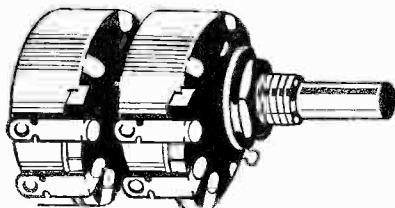
# Volume Controls for Radio & TV



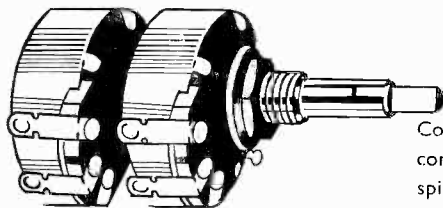
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# SERVICE ENGINEER

Vol 3. No. 10 Feb., 1961

Edited by W. Norman Stevens

Issued as a special supplement with "Radio Retailing"

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### SERVICE DATA SHEETS

RI49: Sobell ST301 and McMichael MT102 portable radio receivers.

TV172: Peter Scott 732 series television receivers.

TV173: Ferguson 516 series television receivers.

## Decca Move

Decca have now moved their spares and service departments to Ingate Place, Queenstown Road, Battersea, London, S.W.8. (Telephone: MACaulay 6677).

## Texas Instruments Move

Texas Instruments have now moved from their Dallas Road address to Manton Lane, Bedford. (Telephone: Bedford 67466).

## NEW MAGNAVOX DEPT.

### Service and Spares

Magnavox have opened a new dealer service department in London and complete service and spares are available to all Magnavox dealers in the new premises at 20-22 Corsica Street, Highbury, London, N.5. Telephone number is CANonbury 5041.

The new department also offers a technical advisory service with fully qualified staff available to give all information on the whole range of Magnavox products. The department is in the charge of Mr. F. W. Stanhope, who has been in the radio industry since 1934 and was previously with Bush Radio.

FEBRUARY, 1961

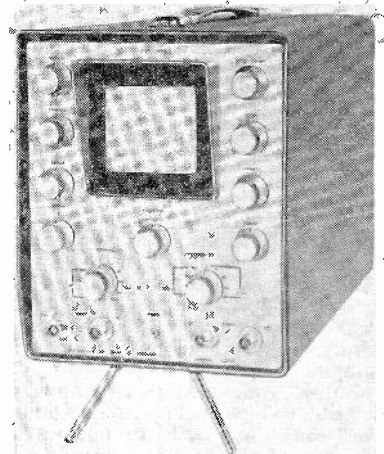
## Transistorised 'Scope by Microcell

With the aid of the latest semiconductor circuit techniques, Microcell Electronics Ltd., Blackwater, Camberley, Surrey, have produced a fully portable and completely self-contained transistorised oscilloscope.

Power is derived from an internal pack of rechargeable high capacity silver/zinc cells, and a charging circuit is incorporated which may be connected to the mains supply. The battery pack will provide 8 hours of continuous use, in the absence of a suitable mains supply. The Model 400 weighs 10 lb. and measures 9×7×13 in.

Although this instrument is small and light the performance is equal to, if not better than, that of many conventional oscilloscopes. The Y amplifier has a bandwidth of d.c.—10 Mc/s (−3dB) and to use this to the full the timebase has a range of 10μS-3S and in addition an "expand" facility (to 5 times) is provided. Y sensitivity is 100mV/cm-100V/cm.

The timebase is designed for triggered or synchronised operation and care



has been taken to prevent unstable modes of operation. Sensitivity is 0.5 cm (internal sync) or 0.5V (external sync). The X amplifier has a bandwidth of d.c.—5Mc/s and a sensitivity of 300mV-1.5V/cm. The price of the instrument is £190.

## MAZDA SERVICE

Servicing facilities for Ediswan Mazda cathode ray tubes, formerly available at A.E.I. Radio and Electronic Components Division's service department at Brimsdown, Middlesex, have now been moved to the Division's factory at Ponders End, Middlesex.

All customers who formerly returned tubes for inspection to Brimsdown should now return them to A.E.I., Ltd., Cathode Ray Tube Service Department, Ducklees Lane, Ponders End, Enfield, Middlesex. Bulbs for salvage under the A.E.I. reclamation scheme should be returned to the same address.

This reorganisation involves no change for customers whose tubes were formerly returned to provincial service departments at Birmingham, Bristol, Gateshead, Glasgow, Manchester and Sheffield whose functions and addresses continue unchanged.

Defective valves for examination or replacement are still to be returned to the service department at Millmarsh Lane, Birmingham.

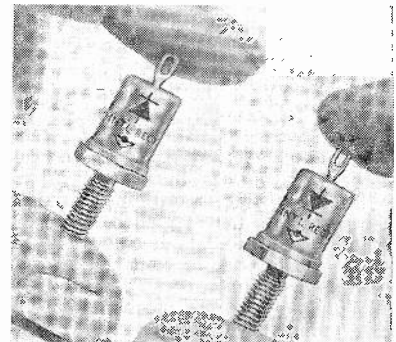
## PHILIPS MANUALS

A departure in normal practice is being made by Philips, who will now issue service manuals covering the company's range of radio and television receivers to all the main technical colleges throughout Britain. Until now, while manuals and other technical information have normally been supplied to technical colleges, on request, by most manufacturers this is the first time there has been a "matter of course" issue.

## INTERNATIONAL RECTIFIER

### New Silicon Units

1500 PIV, 300mA rated silicon rectifiers that exhibit more stable characteristics at high temperature than before have been introduced by the International Rectifier Co., Ltd., Hurst Green, Oxted, Surrey. These units, shown in the photograph above, offer reverse leakages as low as 100μA at 75°C at rated PIV of —1500V d.c. Maximum forward voltage drop at a test temperature of 25°C, at 150mA is 4.5V.



Designed primarily for high temperature operation, the units are stud-mounted for optimum heat dissipation and may be operated at temperatures up to 150°C. Their high inverse voltage combined with the ability to withstand severe shock and vibration makes them especially suitable for missile and airborne equipment applications.

## Service Viewpoint

**MASOCHISM** is a characteristic as British as Bank Holidays or fish and chips. Perhaps it is the natural awareness of our own faults that causes us to wear the stiff upper lip at which foreigners look askance. Surveying the technological world, we realise it could hardly be an ingrained inferiority complex.

British equipment is in universal demand. Its high quality is unquestioned. This sometimes leads to our waving goodbye to products so much better than we use at home that, despite the customs lists, they seem of a different genre. This is what authority means by "fun and games", we presume, and is another masochistic trait.

For a further example, take Colour TV. Closed-circuit colour channels are already in general use for industrial and medical purposes.

On the domestic front, the BBC's late night colour demonstrations leave little to be desired—so the experts assure us.

Yet, in answer to the statement that the BBC were ready to provide a limited 405-line colour service by late 1961, Postmaster-General Reginald Bevins said flatly, "No."

Cause of the refusal was the wearisome dithering over line standards. We are stalemated until the Pilkington Committee reports, favouring 405 or 625. Or, with that British genius for compromise that is another of our national characteristics, dreaming up some impossible alternative.

Most people to whom we have spoken predict that colour will eventually be transmitted on 625 lines, NTSC standard. But that would certainly not have

it was the Americans who were able to launch the first public service—because their shoestrings were longer, to be sure.

The Russians have a limited colour service on the go, backed by the State, inevitably. And last September Japan took the plunge. By the end of the year there were eight stations transmitting colour in the Tokyo and Osaka areas. Ten manufacturers are producing colour receivers, the most ambitious promising an output of 1,000 sets a month in 1961. A figure of 12,000 colour sets is quoted for this year to serve the 90-million population.

Admittedly, the pattern of viewing in Japan is different from ours, most of the sets being installed in coffee shops, hotels and such places, for communal viewing, and only a few for private residences. This makes the high price—about £500 for a 21-inch receiver—less formidable to the owner.

But the price argument is less of a deterrent than most people suppose—as witness the large number of expensive cars in Britain today, choking our inadequate roads. If people wanted Colour-TV, they'd have it and durn the price, provided it was sufficiently spread.

It seems that the thing preventing the true hues is yet another British characteristic, our innate caution.

### Not for us

deterred British set-makers, who have the ability to produce equipment to meet any market. The way things are going, they will soon have hardly any market to cater for, even on monochrome. Is that what Mr. Bevins wants?

It is worth remembering that the BBC celebrates its 25th anniversary this year. We have led the world for so long that it is hard to realise we can not possibly be more than fourth in the Colour TV stakes.

Although we have been experimenting with colour television since 1946,

## TRADE TOPICS Letters to the Editor

The Editor welcomes letters on subjects of technical or trade interest, but does not necessarily endorse the views or opinions expressed by correspondents.

### ITA and Colour

IS it of any significance that there was not a single mention of technical development, particularly with regard to colour TV, in the whole of the ITA Annual Report for 1959-60?

Considering the BBC's recent statements that they were ready to send out colour as soon as the manufacturers pulled their fingers out and supplied the sets, does the ITA silence indicate that they disagree about colour? What about sending one of your newshounds to interview Sir Robert Fraser?

With the immense income that ITV can command, research into colour should be greatly implemented. It seems curious that they do not plug the subject more.—**B. Willis, Watford.**

*(An ITA spokesman said that the Authority had subscribed to the conclusion of the Television Advisory Committee that colour broadcasts should not take place until a decision had been taken on line standards. Furthermore, it felt that little purpose would be served by such a service unless relatively simple and economic receivers were available.)*

*(When the official decision to go ahead with a colour television service was made, Independent Television would play its full part.)*

### More on Tape

NOW that the sales of tape recorders have reached such high proportions, could not a little more prominence be given them in your technical pages?

Every service department must find that these machines are great time-wasters. Often a little mechanical fault can absorb a precious hour in adjustment and observation—time which it is not always good policy to charge the customer for. If we knew a little more about the more popular decks it might help.—**Service Manager, Birmingham.**

*(Readers will be interested to know that articles on servicing modern tape recorders have been commissioned and will appear in the near future—Editor.)*

### Not Typical

MAY I, as an old hand—23 years on the service issue—reply to V. C. L. Young (*January issue*). I can only suggest that he rushed into print owing, possibly, to being a victim of the conditions he outlines.

Is it reasonable to suggest that the referred candidates in the RTEB examination had entered it before they were really confident of their ability to pass the test? Also, is it a fact that the eager apprentice is necessarily more intelligent than his predecessors?

And this "five years radio before TV trouble shooting!" In my long association with the service side I have never known this to be the case. In fact, very

much the contrary. Owing to the far greater amount of TV compared with radio servicing, most departments are only too willing to use all available skilled labour.

Having six engineers under me, I can say with all honesty that I have good reason to be apprehensive when handing over a repair to an E.A. Often, rather than trace the fault, short cuts have been tried such as altering mains tapplings to overcome low scan, bridging capacitors and resistor to overcome linearity faults. Diving into turrets and altering trimmers (even with a metal screwdriver) is not uncommon. These engineers know they can obtain assistance from me, if only to make my own work easier and to avoid clearing up other people's mess!

When I took my RTEB, an E.A. on the next bench connected an r.f. oscillator to his dead set before making any other tests. Another one presented the invigilator with a l.o.t., leads dangling, and asked for a replacement.

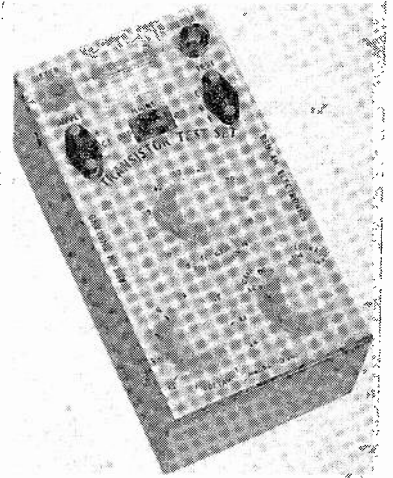
No, Mr. Young, we old timers won our laurels by sheer hard work and individual ability. I believe we were, and still are, better practical engineers than the youngsters. Don't write off us old-uns as has-beens and think we just muddled through; that isn't fair, just, or even common sense. So, Mr. Young, keep at it and if you have the ability you will get there. If not, you won't. It's as simple as that. Good luck! —**A. B. Chinn, Billericay.**



## BEULAH

### Model D900 Transistor Tester

By Gordon J. King, Assoc. Brit. I.R.E.



Appearance of the Beulah D900 portable transistor tester which sells at £10 net trade.

**T**HIS remarkably useful little instrument, known as the D900, is specifically designed to yield information relating to the goodness or otherwise of all types of p.n.p. transistors. Housed in a substantial metal case of dimensions  $5\frac{1}{2} \times 2\frac{1}{4} \times 3$  in., the unit is mains powered at 240 volts, 50 c/s, but is also available in a 120-volt version. Price is £10 net trade.

The front panel carries a control knob calibrated in terms of "A.C. Gain" (0 to 100) and "Base Input Current" (10 $\mu$ A to 1mA), a control knob calibrated in "Voltage" (0 to 25 volts, d.c.) and a four-position rotary selector switch giving "A.C. Gain", "D.C. Gain", "Ic-E Leakage" and "Ic-B Leakage" positions.

In addition, a neat indicator is installed under a protective plastic cover, two three-point sockets, a pair of sockets for connecting an external meter and a mains on/off switch.

A flying lead, terminated at one end by a three-pin plug to fit either of the three-point sockets, and at the other end by three insulated crocodile clips for connecting to the test transistor, completes the set-up.

#### A.C. Gain Measurement

From this detailed description an idea of the scope of the tests available can be realised. The basic test for a.c. gain can be accomplished in just about the time that it takes to connect the three crocodile clips to the appropriate transistor lead-out wires. The wires connected to the crocodile clips are coloured for speedy identification.

This test, as well as some of the others, is made in the common emitter configuration, which has now been adopted as a standard technique. With the flying lead plugged into the right-hand three-point socket, the "selector switch" set to the "A.C. Gain" position, the "voltage control" adjusted to suit the transistor under test and the "a.c. gain control" set to 100, the instrument is switched on and left to become voltage stable for a short while.

The "A.C. Gain" control is then rotated towards minimum until the neon lights, after which the control is slowly advanced until the neon flickers and just goes out—this is a definite adjustment which is not difficult. The a.c. gain figure may then be read from the calibrated scale.

#### Test in Situ

Exactly the same test may be performed without removing the transistor from a receiver. In this case, the flying lead can be either clipped on to the transistor terminations in the set or lightly soldered to the printed wiring.

When this quick test method is adopted, it is desirable not only to switch off the set, which is essential, but also to remove the batteries to avoid leakage currents, which may exist in the receiver circuits, from affecting the gain measurement.

#### As Audio Generator

The internally produced signal used for the measurement of a.c. gain provides an ideal signal for continuity tests within the audio sections of a transistorised receiver.

With the set switched on and connected to its normal batteries, the tester is applied to each a.f. transistor in turn, as in the *in situ* gain test, starting from the output transistor(s). Provided each stage is in working order an audible note will be heard in the loudspeaker, thus proving that signal paths exist from stage to stage.

If there is an obvious decrease in volume, or failure of signal, when the signal source is transferred to the previous stage, an immediate lead is thus given as to where the trouble lies.

#### D.C. Gain Measurement

This test can only be undertaken with the transistor removed from the circuit, and it requires the use of an external meter having a maximum f.s.d. of 25mA. With the meter connected across the two front panel terminals, observing the correct polarity, the transistor connected to the flying lead, as previously described, and the selector switch set to the "D.C. Gain" position, after switching on, the meter will read collector current.

This will, of course, vary as the base

input current is altered by means of the control knob. By such means, therefore, it is easily possible to plot characteristic curves of collector current versus base current in the common emitter mode.

A more accurate analysis is possible by metering the collector base current, in addition to the collector current, instead of relying on the voltage calibration of the control. This can be achieved by inserting a suitable meter in series with the transistor base lead-out wire.

In this way it is possible to check a transistor to the maker's specification and match two transistors to accurate limits for a push-pull output stage or switching circuits.

#### Leakage Currents

The tester also measures leakage current between the collector and emitter and between the collector and base. Again, an external instrument is required for this test, preferably a multi-range meter which is a fitment of all service departments.

With the meter connected to the appropriate sockets and switched to a minimum of 30 volts, d.c., f.s.d. (in case of a transistor short), and with the transistor connected to the crocodile clips and the "selector switch" set accordingly, the meter will read slightly when the instrument is switched on.

If the reading is in the region of 25 volts, there is almost likely to be a short in the transistor. However, if the reading does not appreciably increase when the meter is switched down the volt scale, it can be switched to low current ranges with safety to read leakage current at any voltage between 0 and 25V, as set on the "voltage" knob.

(Continued on page 148)

## New Books

Hi-Fi Amplifier Circuits, by E. Rodenhuis. Published by Philips Technical Library. (U.K. distributors: Cleaver-Hume Press Ltd., 31 Wright's Lane, Kensington, London, W.8.) Size 8×6 in. 105 pages, 64 figures. Price 15s.

DESCRIBING his book as one intended for those whose "business or pleasure" it is to make use of the "exciting techniques" of modern Hi-Fi, the author presents nine typical circuits, all proven in practice, and discourses on their design. The discourse is amply illustrated with graph and table, and practical constructional detail is included where necessary.

The circuits range from a simple 3-watt gramophone amplifier to a 20-watt ultra-linear arrangement, taking in pre-amplifiers and a 4-channel mixing amplifier.

Throughout, the style is strictly informative, even to the extent of losing a little lightness, perhaps in translation from the original Dutch.

This is most decidedly not for the casual reader. The serious student of Hi-Fi may like it at his elbow, if only to explain some empirical results. At least it can be regarded as a gathering of circuitry and performance data between one set of covers, rather than scattered among the pages of the many journals dealing with this popular subject.

If the author had added just one chapter, on various inputs and outputs, pickups, recording heads and loudspeakers, the book would have been more interesting. But as the price is already as much as prospective purchasers will want to afford, perhaps it is asking too much to add that sauce to what is metaphorically a dish of good, plain, wholesome cooking.—*M.A.Q.*

Television Engineers' Pocket Book. Edited by J. P. Hawker. Published by George Newnes Ltd., Tower House, Southampton Street, London, W.C.2. Size 6½×4½ in. 272 pages. Price 12s. 6d.

THE task of saying something new about a well-tryed favourite such as this is singularly unenviable. Most readers will be familiar with the convenient companion volume to the *Radio Servicing Pocket Book*, edited by Molloy and Hawker. Those who do not possess these "service aids" should regard themselves as improperly dressed.

The third edition of this manual and data book has been considerably enlarged and thoroughly revised. Since 1954, when the first edition appeared,

there have been many changes in design technique, and the opening up of Band III has made necessary a number of new maps and tables. There are new sections on colour TV and the transistorised receiver also. Reference data on valves and television tubes has been brought up-to-date, as have the station and intermediate frequency lists.

But this is not a mere book of tables. The chapters on various subjects, such as Basic Circuitry, Fault-Finding, Band III conversions, Installation and Alignment, contain plenty of interesting reading and many useful hints. Typical of the approach is a quote from the section dealing with Servicing Equipment: "*Hours can be spent on the niceties of alignment, which, although they may appear to have considerable influence on the measured responses, hardly alter the picture quality one iota.*"

This is essentially a practical book, and a valuable asset to the practical man. It seems a pity, then, that component values could not have been inserted in place of R and C designations in the complete receiver circuits.

Into this book there has been packed a very great deal of useful information. Readers who own the previous edition will not find it wasteful to bring themselves up-to-date: to those who do not already possess this pocket book, I can only say, as I implied above—*get properly dressed.*—*H.W.H.*

Installing Hi-Fi Systems, by Jeff Markell and Jay Stanton. Published by Gernsback Library, Inc. (U.K. Agents: Modern Book Company, 19 Praed Street, London, W.2.) Size 8½×5½ in., 224 pages. Price 25s. 6d.

THE field of Hi-Fi has been a fruitful one for the technical writer for a long time. But just as the weary reader thinks the possibilities of discussion are exhausted, along comes another book from a slightly different angle to wake his interest.

The angle here is a useful one, for too often the Hi-Fi writer skips lightly past what is to most readers a formidable problem—installation of the equipment.

The various types of systems, stereo and mono, are considered. The Hi-Fi chain is broken down into its component parts and descriptions of operation and function are brief, to the point, and never too esoteric for the handy amateur. Both acoustic and aesthetic considerations are discussed—the electronics of the system being largely taken for granted.

The authors are well qualified to write in this vein, for Jeff Markell is a Hi-Fi furniture designer and Jay Stanton an audio engineer. The combination is a happy one, which could be recommended to some manufacturers of so-called Hi-Fi systems on our own doorstep.

The illustrations are frequent and

explicit, and some of the photographs of the furniture are extremely interesting. Chapters 10, 11 and 12, on "Esthetic Appeal", "Achieving Esthetic Effect" and "Construction of cabinets and built-in Furniture" are alone worth the price of the book.

There are even chapters on Structural Factors (of the building in which the equipment is to be installed) and Legal and Insurance considerations to suit the professional types, as well as a chapter on Client's Needs and Preferences.

Written in an easily readable style, prepared in the usual Gernsback manner, to the customary high standard, this small volume should surely fill many of the gaps in our Hi-Fi library, and be invaluable to the amateur.—*B.R.G.*

## BEULAH D900

—continued

Reverse current and forward current in crystal diodes can be checked on the instrument in a like manner.

### Power Supply

The instrument also represents a very useful voltage supply for operating transistor sets in the event of a suitable battery not being at hand, and to avoid a new one having to be taken from stock.

The three-point socket on the left of the front panel terminates this supply, which is variable from 0 to 25 volts, d.c., or centre-tapped, giving from 0 to 12.5 volts either side of the tap, at 25mA in both cases. The base test current is variable between 10μA and 1mA.

### On Test

The sample instrument was subjected to all the tests which have been described, and performed them all admirably. It was also given into a service department for a couple of days, solved a couple of frustrating transistor receiver faults, and was reclaimed from the engineers with some reluctance, in spite of this being the wrong season for transistorised portables.

As transistor sets are definitely gaining ground and will undoubtedly eventually represent the main receiver of the household, it would seem to me that this instrument is an essential item for all service departments, of both the present and the future.

It is simple to operate, and even though an external meter has to be connected for some tests, this is not a problem and, in any case may only be necessary in certain instances, and is not called for in the main test of a.c. gain. It is easy to store and transport, and has all the importance of a test meter to the technician of this transistor era. It is highly recommended.

# TECHNICAL GEN for SERVICING MEN

## RADIO, TELEVISION and AUDIO FAULT FINDING

PRESENTING DETAILS OF FAULTS ENCOUNTERED, DIAGNOSED AND CURED BY SERVICE ENGINEERS ON RADIO, TELEVISION AND AUDIO EQUIPMENT, TOGETHER WITH HINTS AND TIPS OF USE TO OTHER SERVICEMEN IN DEALING WITH DAY-TO-DAY SERVICE WORK.

### Unusual Tuner Fault

#### Pye 17/21F

Complaint was that sometimes, when interference was experienced during reception, both sound and vision would disappear and after about a minute both would gradually reappear. Our first investigation was centred around the common i.f. amplifier and sure enough movement of the EF80 valve appeared to stimulate the fault. A new valve did not improve matters but on checking and resoldering the valveholder, and with the new valve fitted, the trouble appeared to be cured.

About a year later the fault reappeared. This time, testing eliminated the common i.f. amplifier and it then belatedly occurred to me that the "interference" which the customer mentioned could be car ignition interference. For he lived on a main road which had a tremendous amount of traffic in the summer but hardly any during the winter.

The manufacturers were consulted and admitted that this was the first time such a fault had been reported to them. They could only suggest decoupling capacitors in the vision i.f. stages, but these were quite satisfactory.

It was then noticed that during the fault condition there was no output from the tuner unit. And here we found the cause. It was found that the 150kΩ grid resistor of the PCF80 (mixer section) was completely disconnected at the chassis end. We presume that the supposed heavy car ignition interference was blocking of the oscillator valve.—F.E.R., St. Ives (851).

#### Murphy V240/250

**Some Common Faults** Before replacing line output transformers on these chassis, shunt the 0.25μF capacitor C93, situated near the base of the U329 (V19). Conditions of this capacitor can lead to an assumption that the transformer is faulty and it may well be that after replacing a transformer the fault remains, due to faulty C93.

Instability and "screaming" when switching on from cold can usually be cured by replacing the 0.001μF 1st vision decoupler C49 or the 0.001μF 2nd vision i.f. decoupler C52.

It is important to check that every earth tag screw is as firm and tight as possible, a turn on each can often be obtained with a good Phillips screwdriver.

Check the shorting bar contact on the voltage selector drum is clear; some odd and elusive faults have been traced to this being high resistance.—T.B., Bradford (900).

### Dog Bites Man

#### Alba T655

This was a real "dog". The complaint was that the picture occasionally cut out, leaving only a raster. This happened mainly on Band III. As usual, the fault would not show up for us so we brought the set to the workshop and soaked it.

Eventually the picture went off long enough to show that it was simply lack of video. Having had trouble with the video detector, GEX34, we tested and found that its resistance was considerably lower than expected. Replacement apparently cured the fault.

Apparently, for a couple of days later the set came back, with the new GEX34 damaged. This time we looked a little deeper and found that the root cause of the trouble was instability in the common i.f. stage. The resultant abnormal detector voltage was more than the crystal could stand.

## Items for publication

in this feature are welcome, particularly in regard to the more unusual type of faults. All contributions used will be paid for at our usual rates.

*When sending in items for Technical Gen, please write (or type) on one side of paper only, adding rough sketches (where considered necessary) on a separate sheet of paper. Correspondence should be addressed to — RR Service Engineer, 46 Chancery Lane, London, W.C.2.*

The EF85 valve checked O.K., and we turned our attention to decouplers, eventually finding that C9, the 47pF Ceramicon decoupling the anode feed resistor was going intermittently open-circuit. This is awkwardly situated between the cans of T2 and T3, and the most convenient way of replacing is to connect the new capacitor between the anode end of R8 and the earthy end of cathode resistor R10.

Finally, the reason for the fault being more apparent on Band III was that Band I was low, due to a cracked slug in the r.f. coil, and there was not sufficient signal to cause a breakdown.—H.W.H., Bargoed. (906).

#### Philips HD464A

**Dead on A.M.** This portable a.m.-f.m. radiogram worked perfectly on f.m. and gram, but was absolutely dead on long-, medium- and short-wave bands. After much time had been spent on checking through the a.m. circuitry, I was very surprised to finally locate the fault in the output stage.

In this model, an extra contact on the wavechange switch shunts a 0.015μF capacitor across the primary of the speaker output transformer (to reduce h.f. response) on long-, medium- and short-wave bands only.

This capacitor had gone s/c, and a replacement cured the trouble.—D.R.L., Pontypridd (903).

#### Ferguson 344B

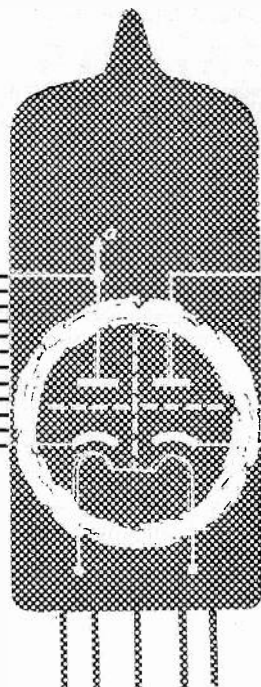
**The Missing Resistor** The fault on this set, brought in by a holidaying Londoner, was simply "no signals". On switching on, valve noise could be heard. The suspected frequency changer valve proved to be good, voltages were normal and the oscillator padding/tracking coil, i.f. decoupling and resistors all seemed to be normal.

At this point in the proceedings, I happened to note that the frequency changer grid resistor was taken to a tag on the i.f. transformer, this being the a.g.c. line, and although the decoupling capacitor was connected, there were no other leads—the grid returns of these stages being up in the air.

(Continued on page 151)

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# TECHNICAL GEN

continued

Reference to the actual chassis and to the circuit diagram revealed that the 2.2M $\Omega$  resistor which feeds the a.g.c. line from the detector load (volume control) was missing. A resistor was wired in and both bands performed normally. For confirmation, one end of the resistor was disconnected and the original symptoms reappeared.

The customer had told me that the set had been working when he left London but was inoperative when he arrived here. He claimed to have done nothing to the set except switch it on and off. Yet there was no sign of the missing resistor inside the case, speaker or chassis!—F.E.R., St. Ives (832).

## Invicta 138W/Pye CTL58F

**Four in One** Symptoms were no raster, low e.h.t., line oscillator whistle too high and distortion on sound. Replacement of PCF80 line oscillator, PL36 line output, PY81 efficiency diode and EY86 e.h.t. rectifier failed to improve matters.

Checking with the 'scope it was found that the grid drive to the PL36 was only 20V (normally 100V p-p) and at the wrong frequency. These conditions also prevailed at the anode of the oscillator. Rotation of the preset line hold control, even at maximum, did not bring the frequency within range.

Making voltage tests on the PCF80, it was found that the screen and triode anode volts were low. The feed resistors

R126 and R122 measured normal. The h.t. at the "hot" end of the resistors was just a little low.

A voltage check on the triode grid revealed a larger positive voltage than normal, there being normally a slight positive voltage via R119 from the sync transformer T10 via discriminator diode in the flywheel circuit. Disconnecting R119 and T10 still left a positive voltage.

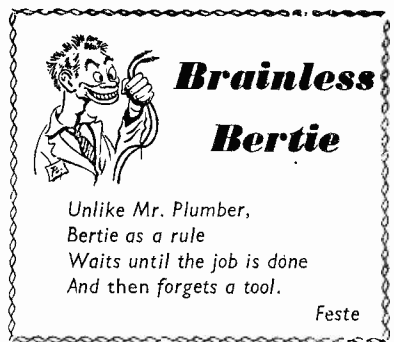
A study of the circuit showed that the only way open now for this voltage was through C100, a 360pF feedback capacitor in the multivibrator circuit. A resistance check of this, when disconnected, showed it had a leak of 5.6k $\Omega$ . Replacing C100 cleared up all the various troubles, but why the sound had been affected still remains a mystery.—S.W., Buckingham (909).

## Murphy V240

**Small Streaky Picture** The receiver was brought into the workshop with the complaint of small picture. On test the width was seen to be well down, with many vertical striations. A check on the drive and h.t. voltages revealed nothing, but the boost voltage was low.

It certainly seemed that the cause could well be due to shorted turns in the scan coils or in the line output transformer. However it was first decided to check the other components in the line output stage and this was just as well because immediately we discovered that the boost capacitor was open-circuit. This is a 0.25 $\mu$ F capacitor and reference is C93.

We feel this fault is worth reporting because since then we have experienced the same fault three times.—J.H.J., Bristol (901).

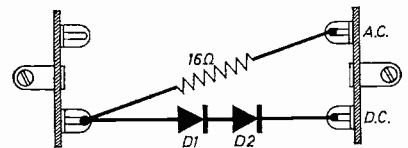


## Rectifier Replacement

**Kit of Parts** Readers may be interested in the following tip. A simple and efficient replacement kit for any type of contact cooled rectifier, which can be easily carried out, and quickly fitted to any make of set, consists of the following parts:

- Two Westinghouse silicon diodes, Type 1WP6;
- Two 3-way tag strips;
- Two sets of 4BA  $\times \frac{1}{4}$  in. C/H nuts, bolts and washers;
- One 16 $\Omega$  3W surge resistor.

The diodes are connected in series with the resistor and strung between the tag strips as shown in the accompanying diagram. This kit has three



advantages—it is cheaper, there is no overheating and there is greater freedom from breakdown due to the larger current-carrying capacity (250V at 500mA).

It is important to use a heat shunt, and the surge resistor, in order to protect the diodes.—A.L.L., Edgware (881).

## McMichael M17T

**Not Very Bright** The trouble with this set was very little brightness, giving the impression that the ion trap was incorrectly adjusted. However, it was soon found that adjustment made no difference. The e.h.t. voltage was checked and found to be normal.

Voltages on the tube base were then tried and all these appeared to be within a reasonable tolerance of the specified values, with grid volts varying when the brightness control was rotated.

Bias voltage, between grid and cathode, was then checked and found to be between 50–60V, much too high, and this gave us the clue we wanted.

(Continued on page 153)

## RECEIVER

### SPOT

### CHECKS

#### No. 65: BUSH TUG34A/TUG36

**No Sound or Vision:** Check R3, R5 or R9 for o/c and C3, C7 or C9 for s/c. Check for faulty C8.

**No Vision:** Check R10 for o/c and C15 for s/c. Check R28, R29, L23 or L24 for o/c.

**No Sound:** Check R15 or R20 for o/c and C14, C22 or C26 for s/c.

**Poor Frame Sync:** Check C14 for o/c, C16 for leakage, R13 for o/c and C15 for s/c.

**Poor Line Sync:** Check C19 for o/c.

**Frame Timebase Inoperative:** Check T2 for o/c primary. Check for faulty C5, C6 or C7.

**Line Timebase Inoperative:** Check R4 for o/c primary. Check for faulty C22 or C23. Check hori-

zontal form trimmer TCl for leakage or s/c. Check R19 for s/c and C25 for o/c or s/c.—E.L., Long Eaton (767B).

#### No. 66: INVICTA 5370

**No Frame Sync:** Check C61, 200pF, for leakage.

**Fuse Blows:** Check C81, 0.1 $\mu$ F from PY81 anode to chassis, for leakage.

**Very Low E.H.T.:** Check R96, 2.2k $\Omega$ , PL81 screen feed resistor for o/c.

**No Vision:** Common cause is for the PCL84 video amplifier V6 to develop G1 to G2 shorts, damaging the OA70 vision detector V5 and the 330 $\Omega$  grid stopper resistor R15.

**Picture Stretched at Top:** Check the 0.05 $\mu$ F capacitor C67 in the frame feedback circuit for leakage.

**Loss of Height:** If accompanied by non-linear scan, check the 0.05 $\mu$ F capacitor C79, between h.t. and the boost line, for leakage.—K.P., Stockport (874).

# SERVICE DATA SHEETS

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Acc "Astra" Mk. II Model 553 (TV52, May, 54).  
Alba T655 TV (TV130, Dec., 58).  
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Bush TV53 series TV receivers (TV101, Feb., 57).  
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Cossor 930 series TV receivers (TV62, Feb., 55).  
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Cossor 943 TV (TV127, Oct., 58).  
Cossor 945 (TV112, Nov., 57).  
Cossor 946 TV (TV104, May, 57).  
Cossor 947 TV receiver (TV114, Jan., 58).  
Cossor 948, 949 series (TV133, Jan., 59).  
Decca DM35/45/55 (TV155, May, 60).  
Ekco T330/331 series (TV154, April, 60).  
Ekco T342/344/348 (TV157, June, 60).  
Ekco T345 series (TV165, Oct., 60).  
Ferranti 1472 and 1225 (TV45, Nov., 53).  
Ferranti T1002 series (TV154), April, 60).  
Ferranti T1021, 1023, 1027 (TV157, June, 60).  
Ferranti T1024 series (TV165, Oct., 60).  
Ferguson 2047 series TV receivers (TV87, June, 56).  
Ferguson 3067/308T TV receivers (TV97, Nov., 56).  
Ferguson 506T, 508T, 546T (TV171, Jan., 61).  
G.E.C. BT1252 series TV receivers (TV96, Oct., 56).  
G.E.C. BT1746 series TV (TV81, Mar., 56).  
G.E.C. BT7092 and BT7094 (TV44, Oct., 53).  
Grundig 500L and 700L/C (53, Dec., 53).  
H.M.V. 1840 series TV receivers (TV109, Sept., 57).  
H.M.V. 1890 and 1893 (TV171, Jan., 61).  
Invicta 538 series (TV168, Dec., 60).  
Kolster-Brandes FV30, FV40, FV50 (TV23, Feb., 52).  
Kolster-Brandes HF40 series TV (TV70, Aug., 55).  
Kolster-Brandes MV30 and MV50 (TV91, Aug., 56).  
Kolster-Brandes NV40 series (TV115, Feb., 58).  
Kolster-Brandes OV30 series (TV148, Jan., 60).  
Marconiphone VC/VTS9DA (TV109, Jan., 55).  
Marconiphone VC60DA (TV61, Jan., 55).  
Marconiphone VT68DA/VT69DA (TV84, May, 56).  
Marconiphone VT164 (TV171, Jan., 61).  
McMichael 55 series TV receivers (TV79, Feb., 56).  
Murphy V214/V216 TV receivers (TV78, Jan., 56).  
Murphy V230 portable TV (TV103, April, 57).  
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Murphy V280/V300C TV (TV124, Aug., 58).  
Murphy V280A series (TV134, March, 59).  
Murphy V310 TV receiver (TV145, Dec., 59).  
Murphy V320 series (TV159, July, 60).  
Murphy V330 series (TV157, Nov., 60).  
Pam 500 TV receiver (TV108, Aug., 57).  
Pam 600S, 606S, 690 (TV144, Nov., 59).  
Pam 800 series (TV168, Dec., 60).  
Peto Scott TV 1411 series (TV65, Apr., 55).  
Peto Scott 1412 and 1712 (TV54, July, 54).  
Peto Scott 1418T receiver (TV106, July, 57).  
Philco BT1412 and BT1551 (TV71, Sept., 55).  
Philco 1000 *Sleander Seveneener* (TV139, June, 59).  
Philco A1960/1, A2060/1 (TV137, May, 59).  
Philco A1962MA/A1967M (TV142, Oct., 59).  
Philips 1458U series (TV129, Nov., 58).  
Philips 17650 series TV (TV111, Oct., 57).  
Philips 1768U/2168U (TV117, March, 58).  
Philips 17961/21961 (TV152, Mar., 60).  
Pilot PT450 series (TV161, Aug., 60).  
Pilot TV84/87 television series (TV59, Nov., 54).  
Pye PTV portable TV (TV113, Dec., 57).  
Pye CW17 series TV (TV122, June, 58).  
Pye CTL58VS series (TV150, Feb., 60).  
Pye CTM175 series (TV131, Feb., 59).  
Pye V200/V400 series (TV163, Sept., 60).  
Pye V210 series (TV168, Dec., 60).  
Regentone "Big 15/5", T and C (TV48, Feb., 54).  
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Ultra VA72, YA72/73 series (TV38, March, 58).  
Ultra Y84 and Y84 TV receivers (TV47, Jan., 54).  
Ultra 81 series TV receivers (TV74, Nov., 55).  
Ultra 915 and 917 TV receivers (TV93, Sept., 56).  
Ultra 50 series TV (TV123, July, 58).  
Ultra 52 series TV (TV133, April, 59).  
Ultra 60 series TV (TV126, Sept., 58).  
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Ambassador TV4 and TV5 (TV32, Sept., 52).  
Argosy 1412L/1412B (TV19, Aug., 51).  
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Decca RG200 radiogram (R125, Jan., 59).  
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G.E.C. BC501/BC502 portables (R146, Oct., 60).  
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Marconiphone T17B portable (R49, Jan., 54).  
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Marconiphone T24DAB (R77, Aug., 55).  
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McMichael 493 portable radio (R47, Nov., 53).  
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McMichael 855 table radio (R91, Nov., 56).  
Masteradio D155 series (R108, Nov., 57).  
Murphy V310 modifications (TV146, Jan., 60).  
Pam 111 transistor portable (R140, April, 60).  
Pam 700 *Pixie* portable (R97, March, 57).  
Pam 710 portable (R90, Oct., 56).  
Pam 955 series radios (R103, July, 57).  
Pam TB59 (R138, Feb., 60).  
Portogram "Junior S" reproducer (S5, July, 54).  
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Vidor CN421 portable radio (R79, Sept., 55).

The tube cathode connection is taken from a potentiometer in the video circuit and one of the resistors (R50, 220k $\Omega$ ) was found to be o/c. A replacement restored normal operation.—J.L., Fraserburgh (904).

## Murphy V410

**Sound Goes Off** When switched on, the sound would come through as usual, but after a few seconds would fade off in distortion, and when the raster eventually appeared there was neither sound or picture.

Attention was first directed to the front end, but nothing wrong could be found. After a little thought on the problem, attention was turned to the i.f. stages and we soon found that the 0.001 $\mu$ F capacitor decoupling the junction of the 1k $\Omega$  feed resistor and input of primary of the 3rd vision i.f. transformer had gone o/c.

Replacement restored sound and vision, but the sound was accompanied

by a disturbing hum and a piercing whistle. This was tracked down to a similar decoupling capacitor o/c in the sound i.f.—F.E.R., St. Ives (905).

## Pye CW17 Series

### No Sound, Vision

The complaint was no vision or sound, and on test, although sound output and tube circuits were normal, the set appeared to be dead. Front end tests only proved that there was nothing wrong there. As the receiver uses separate i.f. strips for sound and vision it was rather baffling to know where to look next.

Having to make a start somewhere we picked the vision i.f. strip, where voltages and components all appeared to be normal. We then had a look at the a.p.c. circuit where, as a quick test, the output was shorted down to chassis. This restored the picture but not the sound.

A meter test revealed a heavy negative bias across the a.p.c. output, even when the aerial was removed. Reference to the circuit diagram showed that both vision and sound a.g.c. circuits are joined together via a decoupling network. Disconnecting the two circuits restored normal vision, proving that a

fault in the sound channel was causing the vision a.g.c. circuit to be biased completely off.

Routine checks of the sound i.f. stages revealed nothing, and all voltages were normal, but when taking a reading on the last sound i.f. stage, sound suddenly burst through. Removal of the meter brought back the fault condition.

It was then realised that this stage was unstable and although the high frequency of the oscillation made it undetectable from the speaker nevertheless it was feeding r.f. to the detector. The diode in turn was supplying a heavy negative bias to the sound a.g.c. line, cutting it and the vision line completely off.

It only then remained to find the culprit which was the 0.001 $\mu$ F screen decoupling capacitor (o/c). Replacement of this component restored stability and the vision fault.—C.S., Cambridge (898).

## Philips 1768U

### Very Weak Signals

The symptoms in this case were very weak signals on both Bands I and III.

The aerial and i.f. connecting leads appeared to be in order and after eliminating the tuner valves, tuner unit voltages were checked and found O.K.

The fault was eventually located by random probing of the tuner unit

## SERVICE BRIEFS

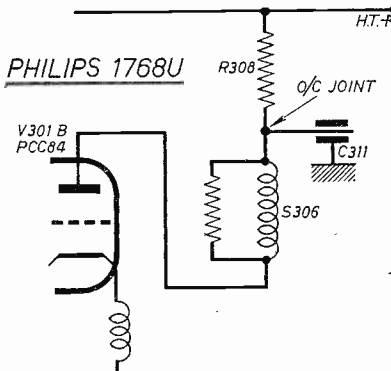
**Ekco T345:** Complaint was picture flutter at certain contrast levels. Valves were checked and replaced to no avail. Voltage tests showed a variation at the video amplifier anode, cathode and grid, and also the a.p.c. voltage was varying. The problem was—which was causing which? Further voltage checks showed a greater voltage drop than expected across the video coupling choke L21. This was found to be open-circuit due to the wire ends not being properly tinned and soldered.—V.S., London (788).

**R.G.D. 300FM:** Fault was motor boating at high volume level, with a bad hum, apparent on a.m. bands, but not on f.m. or gram. The fault was obviously in a pre-a.f. circuit and one not used on f.m. and it was found that the trouble was due to a short circuit between primary and secondary of the first i.f. transformer, the short being between the capacitor across one winding and the other winding.—G.R., Barnsley (759).

**Emerson 888:** Fault on this transistor portable was lack of sensitivity, reception being confined to Light and North Regional programmes and even these were not strong. After routine checks on transistors, capacitors, etc., the fault was traced to the printed circuit. On the board is a circular joint connecting the neutralising components R6 and C10 together. Around the joint is a ring of solder connected to earth. The two parts were not separated but completely soldered together so that R6 and C10 were effectively earthed at their junction, upsetting the working conditions of TR2 and TR3.—G.R., Barnsley (765).

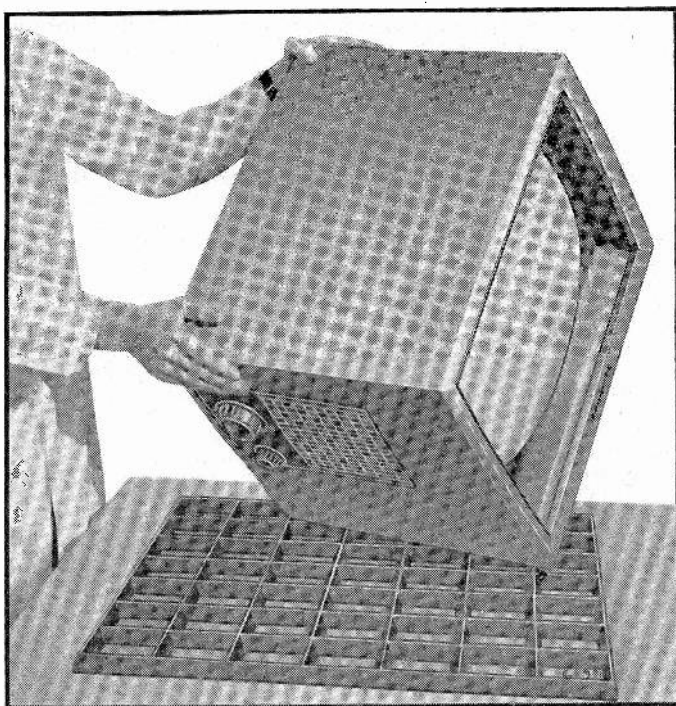
**Ekco T283/4:** Complaint was no raster. Line whistle was very faint, there being only 160V on the h.t. rail and 200V on the boost line. Mains rectifier and smoothing checked and found O.K. Line oscillator, output and efficiency valves tested to no avail and associated components were tested and found to be normal. But on checking the line output transformer we discovered a very unusual fault, namely a dead short between the anode and heater winding of the U25. On examination it was found that the heater was o/c and a free end was resting on the anode, this short circuit damping the line timebase oscillations.—E.L., Long Eaton (779).

**B.S.R. UA12:** Although the autochanger appeared to switch off, the pickup arm continued to operate and came to rest on the last record in the 7 in. position. After checking the mechanism it was found that there was flash on the angled brackets of the quadrant and the control lever, causing them to jam and move together. Filing away the flash effected a complete cure.—A.A.S., Mansfield (825).



components. The fault was momentarily cleared on prodding the spring contact supplying h.t. to the PCC84 anode coil. The contact to the coil biscuit was perfectly satisfactory but the connection to the spring of the 820pF lead-through decoupling capacitor C311 was found to be o/c, although the soldered joint looked good.

On removing the solder, however the lead from C311 was about 1/8 in. short and the connection due to the solder only had evidently failed. By open-circuiting C311, R308 became a damping resistor on the tuned anode coil S306 thus producing the fault symptoms. Extending the C311 lead to make a proper connection cured the trouble.—E.L., Blackburn (894).



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*(Inclusive of packing and carriage)*

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# TOOLS and the MAN

by M. A. QUALES

**T**OOLS are the principal difference between men and the beasts. From their humble beginnings of chipped flint to the highly elaborated machinery that sometimes seems to rule us, they have evolved by constant craftsmanship—an extension to the workmans' hands.

But, for all their common factors, tools are highly individual. Each man has his favourites, his cherished "old-timers" or home-made gimmicks that make a particular operation easier. And each service engineer probably nurses his own idea of what constitutes the ideal tool-kit.

There are certain basic needs. No radio or television mechanic worth his name would be caught without grub-screw-driver, long-nosed pliers, side-cutters, and his pet soldering iron.

## Ideal Toolkit

Certain manufacturers of tools have spent much time and trouble in research to discover what those basic needs are. They would greatly like to market an ideal toolkit.

For example, in the February, 1960, issue of *Radio Retailing* there first appeared a telling advertisement by *Philips Electrical Ltd.* This depicted

toolkits designed with the radio serviceman in mind. We are informed by a Company spokesman that these kits have met with well-merited success.

*But personal observations of Radio Retailing staff would indicate that there is a natural reluctance on the part of established service personnel to fork out their hard-earned dollars on tools, except as replacements for worn or broken items.*

With this in mind, we sounded out the opinions of a few colleagues, and took the trouble to test some of the better-known kits for efficiency and usefulness.

## Scorn or Praise

Opinions varied between downright scorn of the veteran who has bumbled along for years with a pair of worn pliers and a neon tester and unqualified approval of the service manager type who would like to standardise everything anyway. Between these extremes

lay a number of opinions varying in warmth.

The *Philips* "luxury kit" was much admired. Admired, that is, in the way the average chap admires a Rolls-Bentley, while coaxing an extra mile-per-gallon from the battered family runabout. Of the three main versions, this toolkit is something of a serviceman's dream.

With valve storage space, full range of excellent tools and a buffered compartment for an Avo Model 8 Multimeter, retailing at 35½ gns., (16 gns. less meter) net trade, it is the sort of present any engineer would like for his birthday.

Less ambitious, though almost equally comprehensive, is Type A, at 11 gns. This contains practically every small tool needed to set up a workshop or go out on a job. The quality of the tools is beyond criticism.

The style of packing, in foam plastic casing which lines a leatherette wooden case, makes for easy tool selection, and, more important, encourages methodical replacement of the tools when the job is done.

This last point certainly helps cut down those losses that occur when tools roll under the customer's sideboard and are forgotten.

Even so, many practising servicemen, eyeing it covetously, muttered that the price was beyond the average pocket.

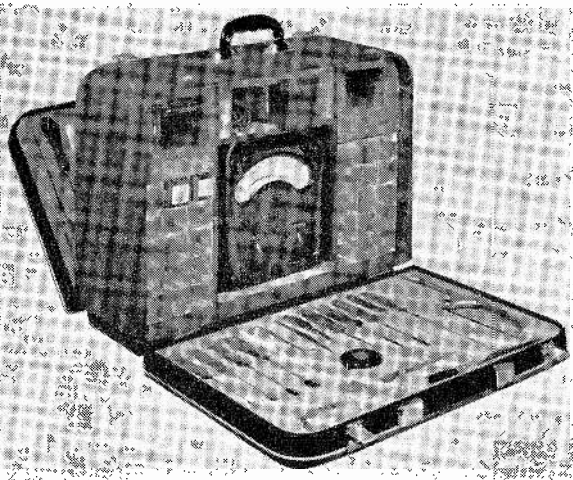
"After all," argued one, "the sort of chap who would make the best use of this will already have a quantity of tools of his own."

## Rich Uncle

Our correspondent, G. L. A. Morgan, who is interested in the training of apprentices, agrees that the kit is excellent. "It would be fine to start a lad on his working career with such a comprehensive array of tools. However, unless he has a rich uncle—or an unusually benevolent employer—he will probably have to make do with the usual workshop cast-offs."

Coming to the smaller kit, Type F,

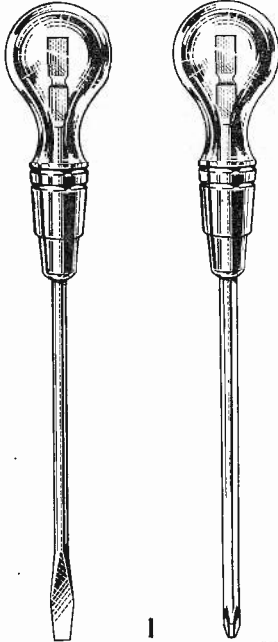
(Continued on page 157)



General view of the Philips "B" Type tool kit, showing the two hinged tool compartments opened up and the main compartment for housing testmeter, spare valves and replacement components.



# fine CRAFTSMEN use ooo



1

1 STEADFAST Cabinet Handled Screwdrivers —the finest made. Unbreakable amber plastic handles moulded on to the blade give twice the turning power of any other type. Also available Phillips type blades.

2 STEADFAST Ratchet Screwdriver with the unique pistol grip handle.

3 STEADFAST Electricians' Screwdrivers, with or without sleeve.

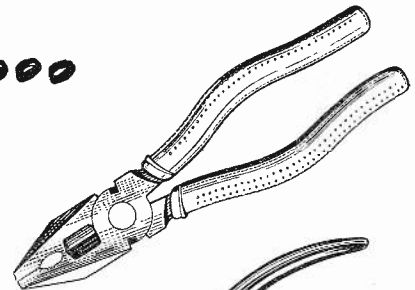
4 STEADFAST Engineers' Screwdrivers, with either round or square blades.

5 STEADFAST Combination Pliers.

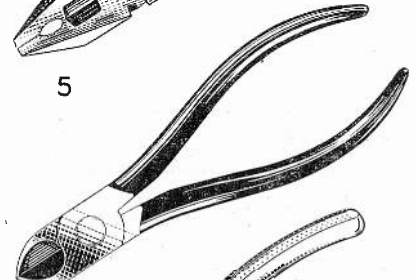
6 STEADFAST Diagonal Nippers.

7 STEADFAST Radio Pliers.

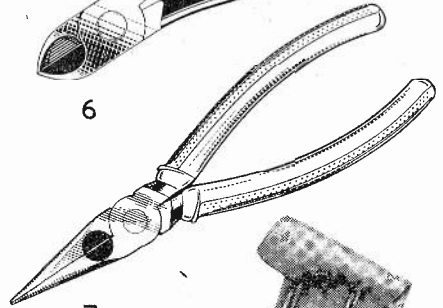
8 STEADFAST Electricians Kit. Contents: Electric Mains Tester, Diagonal Nippers, Combination Pliers (insulated), Electrician's insulated Screwdriver, Small Screwdriver.



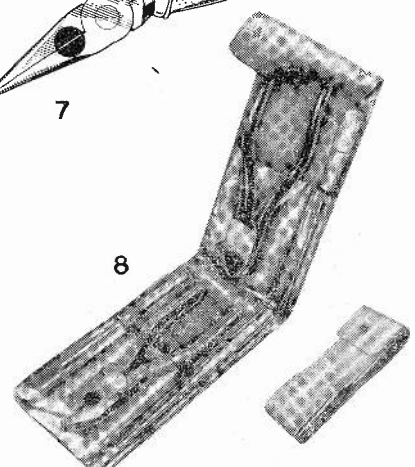
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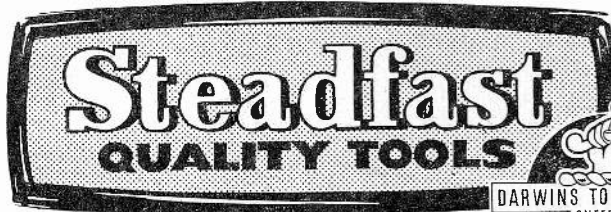
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3



4



Ask for details of the full range of STEADFAST Quality Tools and the attractive Sales Aids and Dispensers now available.

S152.E.K.

**DARWINS TOOL DIVISION**  
**J. STEAD & CO. LTD. MANOR WORKS, SHEFFIELD, 2**

# TOOLS

—continued

which is really a handy wallet suitable for the quick job, we found much more general approval. The price, £3 9s. 6d. trade, is not exorbitant, and the tools are of the same high standard.

This kit contains the basic necessities; General purpose and pointed-nosed pliers, small side cutters, all with insulated handles, the well-known amber screwdriver socket handle, with three double ended blades for various sizes of slotted and cross-head screws, a neon grub-driver, tweezers, an offset screwdriver and multi-purpose trimming tool.

There were a few minor criticisms from field engineers on whom we tried this Tool Wallet by Philips. Main objection was to its shape. Although advertised as ideal for the overall pocket, it is, in fact, rather bulky to be carried except in the hand. Some felt it could have been designed slightly slimmer and longer, with advantage. The wallet measures  $6\frac{1}{2} \times 6\frac{1}{2} \times 1\frac{1}{2}$  in.

Some users complained that the trimming tool blade was too soft for the sort of treatment it was likely to get. It is not easily reshaped by filing. "You can't beat the old knitting needle", grunted one veteran.

After seven or eight months of daily use, the only criticism one busy service department had to make of this "handy pack" was the inadequacy of the slide-spring catch. This could have been more positive; but such a small quibble alone speaks much for the excellence of a kit that certainly lives up to its maker's claims.

## Big v. Small

On the general principle of "pocket" versus "comprehensive" toolkits there were also different opinions. One experienced field serviceman told us, "Most jobs are minor repairs, adjustments, valve replacements and so on."

If you have to go out to the van for the odd valve or component, it is as easy to bring back the larger toolbox with meter, soldering iron and replacements. For the initial test, he argued, a pocket kit saves a lot of lugging about—and makes a very good impression on the customer.

Another school of thought favours the "comprehensive kit" as a means of making this impression. Where the policy of the firm is to do as much repair work as possible on site this method helps to raise prestige, they say.

On the other hand, it can have disadvantages, as our contributor, H. W. Hellyer, points out. "Nothing looks more incongruous than the mess of muddled paraphernalia of the average toolkit... spread out all over the kitchen table, mauled by the kids,

chewed by the dog, clawed by the cat... and in the middle a tiny personal portable, the object of all the fracas!"

From this it would appear that the principal attribute is tidiness. Modern toolkits, with their nests of tools in handy packs, assist us here.

The opinion of an experienced service manager, Dr. W. D. Cussins, of Cussins and Light, York, is worth quoting: "As with everything else, tidiness is the keynote. Preferably the tools should be laid in cut-outs for a quick check when preparing to move off."

## Glisten of Tools

But he adds that his policy is no longer to blind the customer with the glisten of tools and equipment.

"I think he (the outside engineer) should carry only his basic tools into the house. This gives the impression that the van is loaded with mysterious parts,

can work miracles with a pair of tweezers.

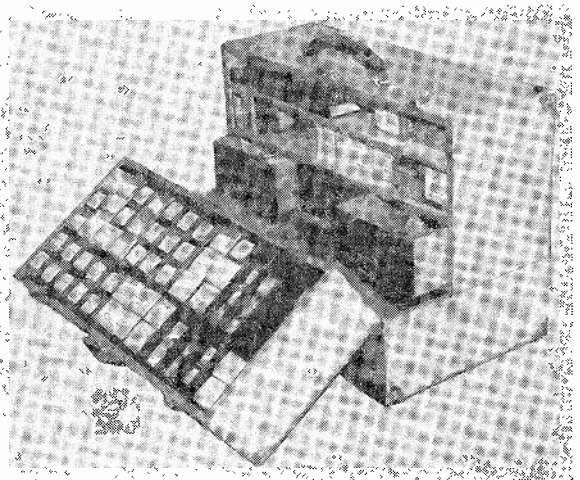
Dr. Cussins recommends a visit to a shop selling surgical instruments, or a watch repairer's tools. "The Man Mechanic"—the surgeon—has lots of implements with wide applications. Although expensive, they last indefinitely.

## The Right Driver

But although the engineers' individual tools can often be improvised, it is important that the correct tool be used for the job. Trying to loosen a small screw with a big blade, or vice versa, can only benefit the makers of screwdrivers and tranquillisers.

To this end, the screwdriver that grips the slot of the screw is a very definite boon. Readers may recall a description of such a useful accessory on page 50 of the August 1960 issue of *Service Engineer*. Marketed by

An example of a general tool and components box (the Geo-Pat Superb) which incorporates valve storage compartments, storage shelves and component drawers.



and if the set cannot be fixed on the spot it must be a 'snorker'—(prepare for a slight delay and a big bill!)"

He has very decided views also on the individuality of tools. The Cussins and Light engineers provide all their own hand tools; the firm supplies a soldering iron and test equipment. Although there is a fully equipped mechanical workshop most people have a personal collection of useful drills, hacksaws, small files, etc.

Apprentices are recommended to furnish themselves at the outset of their working career with only the barest necessities and to buy further tools as they find them desirable.

The reason for this, points out Dr. Cussins, is that the requirements of no two people are the same. The man with very large hands cannot reach many places accessible to others.

However, he may be strong, or ambidextrous, and able to dispense with some mechanical aids. Someone with a good eye and a steady hand

Valtock Ltd., of Warwick Street, W.1, the *Slotgrip* has a blade with a central torsion bar which twists and locks itself against the walls of the screw slot when the blade is pushed in.

This is very handy for removing and replacing screws in awkward places. The standard size, at 7s. 6d., should suit the tastes of all but the most miserly mechanic.

Another voice of experience, our contributor, Gordon J. King, added some trenchant remarks on the subject. "Tools are personal things, like a soldier's eating irons. They should be treated with the utmost of respect."

Screwdrivers could do with a weekly blade "touch-up", suggests Mr. King. Nothing looks worse than a mutilated screw slot, he says—it reflects the grade of workmanship.

On no account should Philips screws be tackled with an ordinary screwdriver. If they have been properly driven home they can be expected to break the normal blade.

(Continued on page 159)



# RADIVET

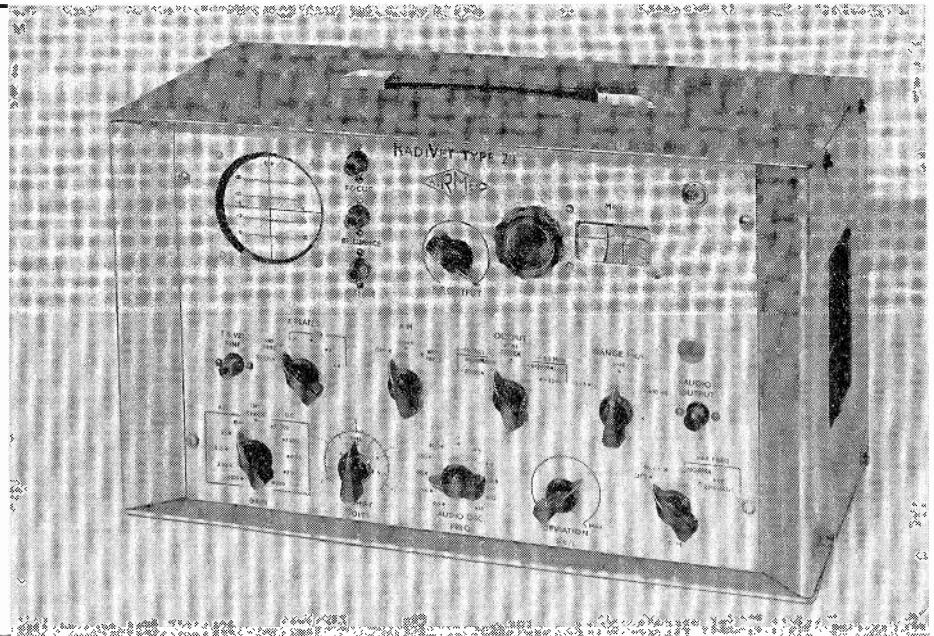
THE COMPLETE  
BROADCAST RECEIVER TESTER

**66 GNS**

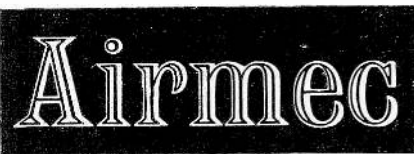
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# TOOLS

—continued

With a chuckle, Mr. King explained that screwdrivers were his pets. Among other things, they are useful for "... checking e.h.t., line pulse voltage, fuses, noisy valves, grid hum, causing transients, getting in locked cars—even acting as a magic wand in the customer's house."

## Cutters and Pliers

Other tools are useful, he concedes. It is worth mentioning the importance of good side or top cutters and long-nosed pliers. The cutters should never be used for severing bolt ends or cutting the corners of home-made chassis.

Pliers of the tapered 5-inch variety are not suitable for a "twist-grip" action, such as releasing a stubborn nut. Their points are particularly vulnerable: many a good tool has been ruined by being employed for prising or levering.

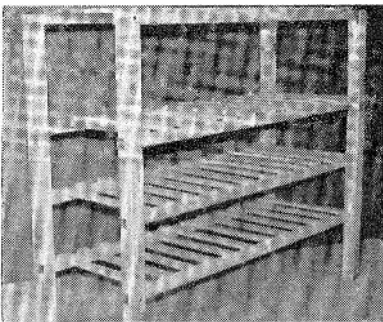
A wide range of tools, particularly the ubiquitous screwdriver, is marketed by *J. Stead & Co.*, under the trade name *Steadfast*. These can be safely recommended for electrical work, for the screwmaster drivers all have genuinely unbreakable plastic handles, insulated to withstand 5,000 volts. The blades are of chrome vanadium steel, irremovably moulded, well finished.

Other *Steadfast* tools include radio pliers, insulated and uninsulated diagonal nippers and combination pliers, "fusedrivers", mains testers, and a useful three-in-one multipurpose tool with two pad saw blades and a knife edge cutter, the blades retracting into the plastic handle when closed.

## The Toolbox

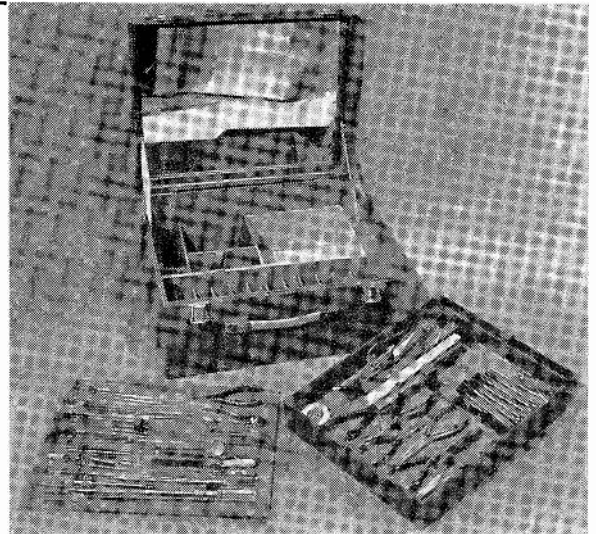
For the engineer who collects his own tools and makes his own kit, the toolbox is always a problem. One firm who are doing their best to remedy this defect is *Geo-Pat Suppliers* of Larkhall, Bath. Their "standard" toolbox, retailing at £3 10s., was designed originally for the field engineer.

A sturdy wooden box, 18×12×10



A typical rack equipment by *Geo-Pat*, who will undertake the complete fitting of a service department.

The Bernstein toolkit includes a very comprehensive array of tools, seen here in the "dismantled" condition. Assembled, the tool tray fits over the valve and meter compartments and the tool board over the tray, making a compact assembly.



in., with shelf space, a meter compartment and sensible divisions for components, it has already found wide favour with rental organisations and trade service departments.

Announcing a *Super* version, designed after collating information from dealer's reports, the managing director, G. P. O'Neill, informs us that the present increase in demand for these products indicates "More respect for engineers in the building of a business".

The *Super* has three-drawer compartments, a partitioned valve section and a service manual folder. Its price, less tools, 4 gns. The overall price, with selected tools, also chosen after much head-knocking with members of the radio trade, is 11 gns.

The latest version, the *Slimease*, has the addition of a full-width drawer, a top-side section with strong spring clip for holding service manuals, and the advantage of quickly removable side sections. It is available in a choice of four colours, blue, green, red or natural, and costs 4 gns., net trade, or 9 gns. complete with tools.

This firm goes several steps further. They make excellent bench and rack equipment and will even fit out an entire service department with the structural requirements that cause the service fraternity so many headaches.

Benches are designed for television, tape-recorder and electrical engineers. The results show that a good deal of research has gone into their production.

## Comprehensive Toolbox

It must be the dream of every field service engineer to own the sort of toolbox that he sees in transatlantic advertisements. No more of that dark, wet trudge to the van to fetch a forgotten spanner. No more lugging a 24-inch deadweight down five flights of narrow

stairs because an inspection panel is irremovable.

All the tools and valves, and most of the test components he needs could be carried in one not-too-large case... if only some genius would design it.

Well, some genius has. And it is left to Alfred Rose of *Direct TV Replacements* to put this paragon on the market.

The *Bernstein* toolkit is far and away the most comprehensive we have seen. In a strong wooden box, covered with grey washable plastic, and only 17×13×8 in., weighing approximately 17 lbs., there have been crammed 50 tools and a high-grade mirror, with space for a small meter and about sixty valves, plus the odds and ends any engineer accumulates.

The tools are of good quality, all pliers chromium-plated and insulated, screwdrivers with chrome vanadium steel blades, moulded in transparent plastic handles, insulated to 10,000 volts.

All the conventional tools are included and a number of less frequently needed accoutrements. The mirror is fitted to the detachable lid, and has an adjustable prop stand for bench use.

The cost of this kit is £26, net, which may sound a lot but is actually in the nature of a sound investment, especially for the service department that specialises in efficient field service.

There are many other products on the market which cannot be mentioned here. A notable exception is the engineer's right hand, the soldering iron, which deserves an article on its own.

But every engineer has his personal ideas, his own pet gimmicks, his home-made tools and toolboxes. It would be interesting to hear from readers about any tools or bench equipment they have found especially useful.

## Pale Misfeature

**T**HIS is the time of year when I am driven to discuss that British cathartic, that conversational stop-gap, that ever-present incubus—the weather. It is the serviceman's worst enemy.

Beset by the clamant calls of clients who would rather miss the morning 8.40 than the evening "Wagon Train", soaked, scorched, buffeted, frozen, he must sometimes wish he was cosily ensconced in a snug nine-till-five.

See him, standing on the uncanopied doorstep, cold rain dripping down his disconsolate neck, waiting for the customer to answer his knock.

He enters, leaving puddles on the linoleum, unpeels cap, coat and scarf, gratefully dries his hands at the fire as the receiver warms up. The customer eyes the pile of sodden apparel on her best Axminster with unconcealed apprehension. The serviceman turns tentatively to the ailing set.

Just how badly it is ailing hardly matters. What *does* matter is that it needs a particular valve or component, or piece of test equipment before it can be mended. And that required item is fifty yards away, down the steps, between the dripping laurels, through the stuck gate, across the muddy road, in the van.

Where, he inevitably discovers, he has left the quarterpane open on the windward side and will be favoured with a wet seat—in more senses than one.

★

Grinning apologies, he shakes the surplus drops on the hearthrug and turns again to tackle the set. Some minutes later, just long enough for the warmth of the fire to gratify his hams, he discovers that the part for which he took that drop-dodging trek was not, after all, the root cause of the fault.



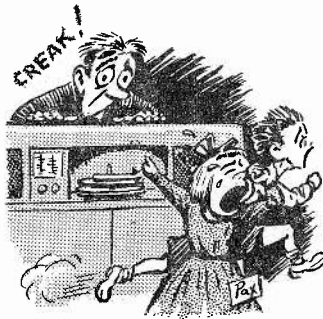
When Joe went to swing an aerial in a blizzard.

The circuit diagram is needed. And that is—yes, you've guessed it.

It is in a battered suitcase, right beneath the roof ventilator, which he foolishly opened last summer and has since never been able to close.

He shakes more surplus drops to the floor, again grins apologetically and spreads the service sheet on the fireguard to dry. In the time it takes to hook up the meter, sort the toolkit, connect the soldering iron, the service sheet has become brittle as parchment and is scorching across one corner.

And that, need I mention?, is the corner whereon the mystery of the



He scares the kiddies when he rises, creaking, from behind the radiogram.

circuit is delineated. He shrugs, and decides to work out the value of the doubtful (and always unidentifiable) component from basic principles.

★

It's a funny thing about basic principles. Resorting to the valve book, we calculate to the nearest dot, then find, when we return to the workshop and consult the manual, that the component designated by the manufacturer varies widely from our findings. And yet the replacement we fitted functions perfectly. Sometimes, indeed, it seem to effect an improvement on the original circuit!

★

Back on the job—the repair is eventually completed and our serviceman glances doubtfully at his watch. Doubtfully, for on his wages he could not afford the anti-magnetic, water-proof, dustproof, shockproof model, that our kind of work requires. He is appallingly late for his next appointment and would probably miss the signal anyway.

Strange thing about the signal, if you'll excuse another digression. Despite the increased transmission periods, there are blank spaces during the day when we are far from home or the nearest cafe. And, just to rub it in, when we most need the test card, there will be a Schools' Talk on "House-training Boll-weevils" for Scottish Sixth-Formers or one of those abominable "stills" that defy resolution except under perfect conditions.

★

It is at this precise moment of resolve, when the serviceman has whipped up the courage to do battle with the elements, that the customer melts, and rewards him with a steaming cup of tea. "Poor boy, you must be frozen", she coos.

True enough, he is. Rheumatics and persistent head colds are occupational diseases which can complicate matters still further. Imagine the reaction of Miss Spinsniff when he greets her with: "Soddy I'b a liddle lade." Think how he scares kiddies when he rises, creaking, from behind the massive radiogram, like a crone coming up from Cawdor.

I hear the keep-fit faddists muttering. "Servicemen should not go out on call with a cold." Try telling that to the service manager, who once sent Joe to swing an aerial in the teeth of a howling blizzard.

★

Not that Joe cared. He has an infallible cure for colds (and many other ills). Unfortunately, addiction has now made it necessary for him to take enough to float a loan—which in these days of our "flatulent society", as one TV comedian called it, not inaptly, is more than a minor sup.

Joe has a kind of drip-dry exterior, too, shaking water and worries from him as he goes. Which, in this month of lixiviation, is a useful virtue for the radio serviceman to acquire. Colleague Feste's namesake may have shouted "Heigh-Ho", but for my part, I would rather stay in the workshop and watch February through the windows.

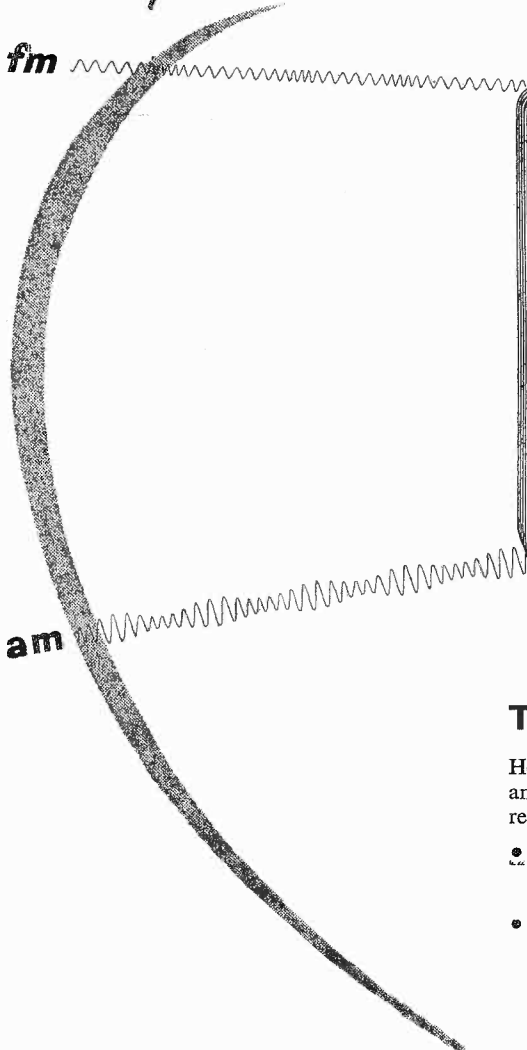
Will Spring be a little late this year, I wonder?



He enters, leaving puddles on the linoleum.



# Complete Coverage *from 7.5 Mc/s to 230 Mc/s*



## TYPE SG. 63A FM/AM SIGNAL GENERATOR

Here, within this one modestly priced instrument, are the essential facilities and the essential accuracy demanded for servicing radio and television receivers on Bands I, II and III. The SG. 63A provides

- Frequency range  
7.5 Mc/s-230 Mc/s
- F.M. at 1000 c/s fixed  
 $\pm 22.5$  kc/s and  $\pm 75$  kc/s
- Crystal Calibrator checks  
at 5 Mc/s points  
(accuracy  $\pm 0.03\%$ )
- Wide deviation at line  
frequency variable  
0 to  $\pm 200$  kc/s
- A.M. at 1000 c/s fixed 30 %

This instrument is also available with output impedance of 50 ohms

Full technical details in Leaflet D.61 available on request.

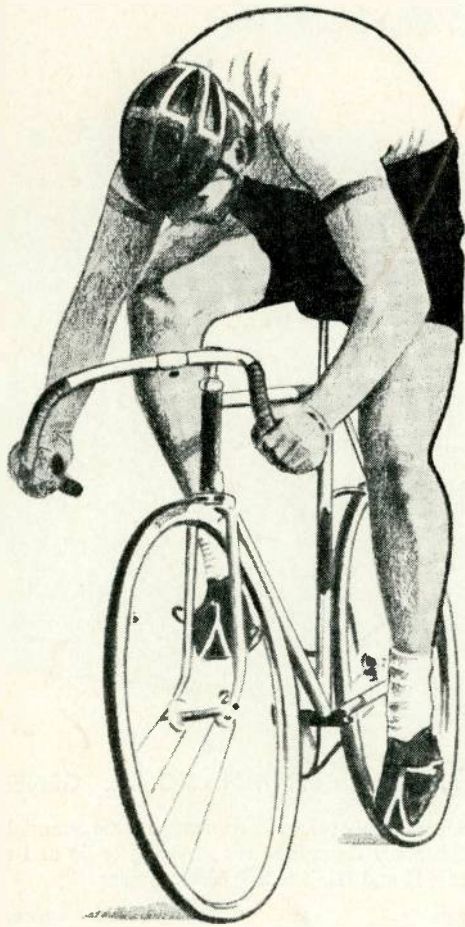
NETT PRICE IN U.K.

**£90**

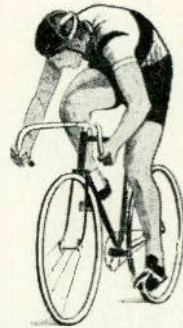
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# The LEADER-



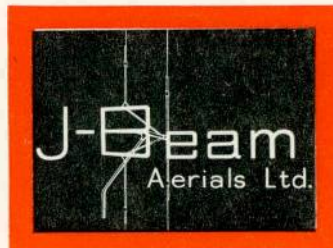
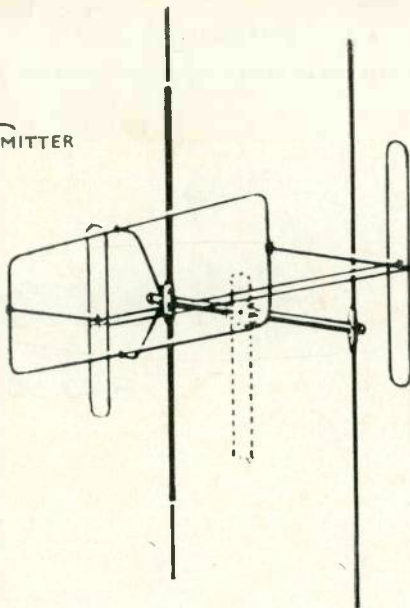
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DB 4/1 Array with U/V bracket	£3 19s 6d	retail
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1 1/4" Cranked Arm Mast	17s 6d	„
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