

SUCCESS ON THE SHORT WAVES!

Amateur Wireless

and
Radiovision

MAKING A
HANDY TESTER

Every
Wednesday

3^d

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Saturday, July 15, 1933

The NEW BRITAIN'S FAVOURITE THREE



WITH
CLASS-B
AND AN
IRON-CORE
COIL

Use these
lighter evenings
to build with
your
OWN HANDS!

The **NEW ALL-ELECTRIC
"SKYSCRAPER"**

THE FIRST COMPLETELY
SAFE — COMPLETELY
PRACTICAL ALL-ELECTRIC
RECEIVER FOR THE
HOME CONSTRUCTOR.

**MOST POWERFUL 3-VALVE
SET YOU CAN BUILD —
SUCCESS A CERTAINTY!**



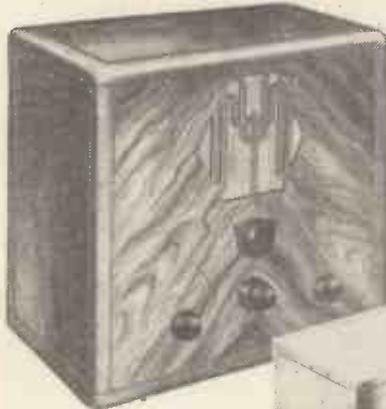
Now the lighter evenings are testing your old radio sets. In these summer evenings signal strength is reduced and foreign stations fade when you are using an ordinary set. Now is the time you need the power of "Skyscraper" radio—and now you have the longer, lighter evenings in which to build it.

If you want to build yourself all-mains radio, go to your radio dealer and ask to see the new All-electric Safety "Skyscraper." Get the FREE CHART from which you will see that Lissen have made it easy for you to build this All-electric Receiver and have also made it SAFE.

This is the most powerful, most sensitive, most modern All-electric Set ever put into the hands of the home-constructor. To make SUCCESS and SAFETY CERTAIN, unique features and right-up-to-the-minute developments are incorporated in the All-electric "Skyscraper" which you could not get even in very expensive factory-built mains sets.

Self-contained Safety Power Unit—Special Universal Safety Fuse Plug—Four matched Valves with Variable-Mu Screen-grid H.F. Stage and brilliant Power Pentode Output—One Dial Tuning with Single Knob Volume and Reaction Control—Triple Aerial Selectivity Tapping and alternative Mains Aerial—All-metal Chassis and Under-baseplate wiring—beautiful Walnut Cabinet which you put together yourself, and complete full-power Moving-coil Loud-speaker.

Chassis Kit, complete with four valves £7 19s. 6d.
Kit, complete with Table Model Cabinet, £8 15s. 0d.
With Console Cabinet and Moving-coil Loud-speaker, as illustrated above, £10 12s. 6d.



COMPLETE WITH
4 VALVES

£7 19s 6d

The LISSEN
**AC
SAFE
SKYSCRAPER**

To LISSEN LTD.,
Publicity Dept.,
Ipsworth.

Please send me
FREE CHART of the
"SKYSCRAPER"
(All-Mains) (Battery).
Strike out whichever not
required.

NAME _____
ADDRESS _____

A.W.53

**LISSEN
SKYSCRAPER**
BATTERY DRIVEN
OR ALL-ELECTRIC

**THE BATTERY
"SKYSCRAPER"**



COMPLETE
WITH VALVES
89s 6d

The Battery-driven "Skyscraper" is the most powerful battery set ever put into the hands of the home-constructor. It is the ONLY battery set kit employing Metallised S.C. High-Mu Detector and Economy Power Pentode Valves, and is sold complete to the last nut and screw, including these three valves. Yet the current consumption of these three powerful valves is less than that of an ordinary three-valve set—less than 9 m/A.—and makes the "Skyscraper" economical to work off ordinary Hi.I. batteries.

Lissen have published a Constructional Chart which enables everybody, without any technical knowledge or skill, to build this most powerful battery receiver with COMPLETE CERTAINTY OF SUCCESS. Why be satisfied with whispering, fading foreign stations when you can build with your own hands this "Skyscraper" that will bring in loudly and clearly distant stations that will add largely to your enjoyment of radio?

Chassis Kit, complete with three valves. £4 9s. 6d.
Kit complete with Table Model Cabinet £5 5s. 0d.
Kit complete with Console Cabinet and Pentode Matched Balanced Armature Loud-speaker £6 5s. 0d.

You will Help Yourself and Help Us by Mentioning "A.W." to Advertisers.



**BRITAIN'S LEADING RADIO WEEKLY
FOR CONSTRUCTOR, LISTENER & EXPERIMENTER**

EDITOR:
BERNARD E. JONES.

TECHNICAL EDITOR:
J. H. REYNER, B.Sc. A.M.I.E.E.

RESEARCH CONSULTANT:
W. JAMES.

ASSISTANT EDITOR:
H. CORBISHLEY.

NEWS & GOSSIP OF THE WEEK

A REAL "FAVOURITE"

"**BRITAIN'S FAVOURITE THREE**"—one of the most popular sets ever described for home construction by a radio journal. "A.W." introduced it as the result of a readers' ballot to decide the most popular technical features of a set. And now this week we introduce an up-to-date version of the "Favourite" complete with an iron-core coil and class-B output.

AN ANNOUNCER'S ROMANCE

THAT young Empire announcer, J. N. Lampson, has not wasted much time in finding romance at Broadcasting House. Although he has been on the Empire service only two or three months, he is now engaged to Miss Joan Riddick, of the B.B.C. Music Department.

HENRY HALL AT OLYMPIA

EVERY night from the opening of the Radio Exhibition at Olympia on August 15 to the close on August 24, Henry Hall and the B.B.C. Dance Orchestra will appear in John Sharman's variety programme. Visitors to this year's show will have plenty of opportunity to see radio stars "in the flesh." John Sharman plans to change his bill twice a week, and he will include "dumb" acts which will of course,

be cut out whenever the show is broadcast. There will also be a revue once nightly produced by John Watt and Harry Pepper.

GIVING NEW BANDS A CHANCE

WHILE Henry Hall is on holiday from September 4 to 16 the B.B.C. will try out in the studio dance bands that have never broadcast before. If the talent that the B.B.C. discovers warrants this experiment you will be able to judge what you think of the bands in the 5.15 to 6 p.m. period—if you are home from work in time!

MORE DANCE-BAND NEWS

DURING the next few months dance fans will have an opportunity of hearing three bands that are not regularly on the air; these are Marius B. Winter, Jack Padbury and Jack Jackson. By the way, Ambrose is leaving the Mayfair, so we shall miss his Saturday-night broadcasts, which have now been an uninterrupted source of enjoyment for the past three or four years. We understand that Harry Roy is booked for the Mayfair. This band is sometimes heard on Monday nights and has already achieved a big popularity among wireless listeners.

ALSO IN THIS ISSUE

- The New "Britain's Favourite Three."
- Details of a New Television System.
- How to Make a Useful Tester.
- Adjusting Your Mirror-drum Television Receiver.
- Getting the Short Waves on a Mains Set.

MORE STUDIOS FOR BELFAST

THE three studios at present attached to the Belfast low-power station will shortly be modernised and augmented to five studios, in preparation for the increased programme requirements of the new North Ireland Regional.

MALCOLM FROST'S SUCCESS

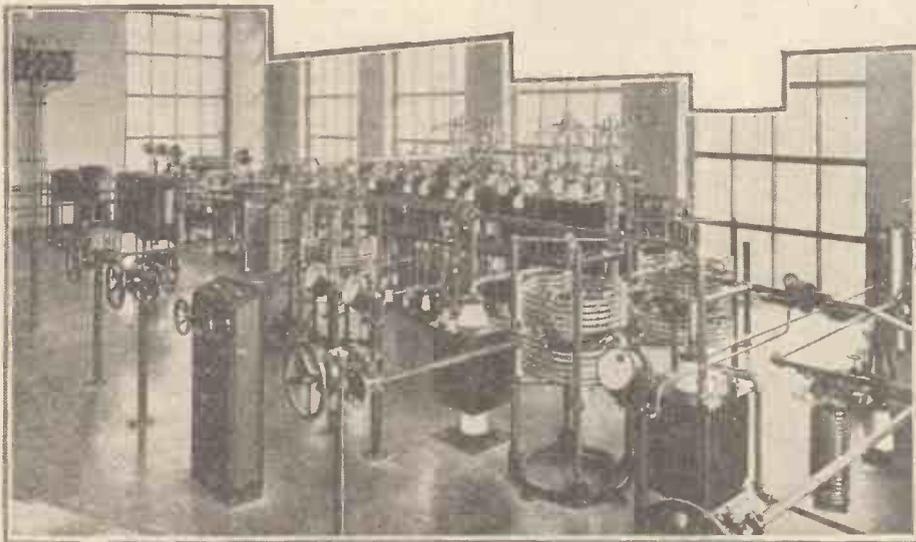
WHEN in New Zealand recently, young Malcolm Frost sold out all his records of "bottled" B.B.C. programmes! He is now on his way to Australia and from there he will journey to Colombo, thence into the hot and sticky part of his itinerary through India, Malay and the Far East. Apart from selling records, Frost has, of course, an ambassadorial mission, for he is testing the sentiment of the Empire towards the programmes sent out by the B.B.C. from Daventry.

VALVE PRICES DOWN AGAIN!

AS from July 1, the prices of various types of B.V.A. valves are reduced. The 2-volt battery-operated screen-grid valves are now 15s. 6d. The battery-operated pentodes are down to 16s. 6d. The mains screen-grid valves are now 17s. 6d., mains small power valves 14s., mains super power valves 16s. 6d., and mains pentodes are 18s. 6d. The D.C. type screen-grids are now 17s. 6d. D.C. small-power valves 14s., and D.C. pentodes 18s. 6d. Good news!

ALTERING YOUR STATION CALIBRATIONS

BY now you will have realised that the Lucerne Plan is likely to upset tuning scales calibrated in stations—many familiar landmarks being completely altered under the new line-up. Designers are already asking



Vienna on high power. Part of the transmitting gear of the new Vienna (Bisamberg) broadcaster, which uses some of the biggest water-cooled valves in Europe

NEXT WEEK: A SPECIAL PORTABLE SET FEATURE

NEWS & GOSSIP OF THE WEEK —Continued

whether the present tentative Lucerne list of stations' wavelengths can be relied upon. We do not think so, because between now and next January it is provided in the new protocol that international adjustments may be made. Quite a lot of changes will no doubt be effected before the great general post of the ether next January. Meanwhile, we think sets are better calibrated in wavelengths, which do not themselves change, whatever plan is evolved.

WEST NATIONAL TESTS

THE sliding-in period for West National is due to start about the middle of July and at the beginning dance music will be broadcast from 5.15 to 6 p.m., with West National sending out the same programme as London National on the common wavelength of 261 metres. It is hoped that tests will be completed by the middle of August, when full alternative programmes will be introduced into the West Regional area. This will mean a much bigger share of promenade concerts for the West and Wales than in previous years.

FROM TIDWORTH

ANOTHER important military tattoo will be heard by listeners to the National programme on August 5, when a relay from Tidworth takes place. These tattoos are, of course, only suitable for broadcasting in sections, as listeners are at present unable to share with the audience on the spot in the visual glories of such displays. The sound portions of the Tidworth Tattoo therefore will be relayed between 9.25 and midnight, and the B.B.C. Chorus, led by Joseph Lewis, with Ernest Butcher as soloist, will provide community singing from a studio during an interval.

MORE STARS!

A COMPANY of stars who graduated from famous concert parties will broadcast in a programme of "Memories" on July 15. In this seaside entertainment the following artistes will assist: Charles Forwood, Sydney Jerome, Stanley Kirkby, Harry Hudson, Doris Lee, Thea Philips, Philip Ritte and Fred Wildon. The programme will be presented by Harry Hudson. Since their "undergraduate" days, some of these names have become familiar in directions other than those which indicate an

earlier association with seaside concert parties. Thea Philips, for instance. She appeared with a concert party in Margate in years gone by; but then she toured in Canada and subsequently sang in *Fledermaus* with Sir Thomas Beecham, thus making her entry into opera.

"THE MODERN COLUMBUS"

FOR his transatlantic commentary on America, Mr. S. P. B. Mais has planned a wonderful tour. His talks start when he lands at Jamestown, and every Friday night after that he will tell of his experiences in such places as Kentucky, Florida, Mexico, Arizona, Hollywood, San Francisco, New England, and, of course, New York. The talks will last for about three months and should prove one of the most interesting series ever arranged for the microphone.

DR. BOULT'S MARRIAGE

EVEN to his closest friends at Broadcasting House, Dr. Boulton's recent marriage came as a great surprise. He has married Mrs. Ann Wilson, of Ditchling, a village on the Sussex Downs some way behind Brighton. Sir Walford Davies went down to Ditchling to play the organ at the wedding in the little village church where Dr. Boulton was married and afterwards they had the wedding breakfast on the South Downs.

THE NEW SCOTTISH REGIONAL DIRECTOR

AS we ventured to predict some time ago, the B.B.C. has gone outside its organisation for the new Director for Scottish Regional. The new Director is the Rev. Melville Dinwiddie. He is something of a "fighter," having won the D.S.O. and M.C. during the War in the Gordon Highlanders. Latterly, the new Director was attached to Saint Machar's Cathedral, Aberdeen. It is a most unusual appointment, of course, and time alone will show whether the redoubtable "sky pilot" will make a success of the distinctly secular job of directing a broadcasting station. To be sure, we wish him the very best of luck!

A FITTING MEMORIAL

TO the memory of J. C. Stobart, the late compiler of the Grand Good-night, a cot has been endowed in Charing Cross Hospital.



A famous television inventor, Manfred von Ardenne, with his latest cathode-ray tube outfit. He has designed a new type of cathode-ray tube specially suitable for television

A GOOD SERVICE SCHEME

DID you happen to hear the Wireless League bulletin broadcast at the end of last month? Professor Low gave first details of a new scheme which the Wireless League is starting to ensure that all set users can get really reliable service from dealers and repairers. For many years garages throughout the country have exhibited recommendation signs of approval by the two leading motoring organisations and the Wireless League is contemplating giving official approval to service men in the same way. So if you see a radio "doctor" showing the sign illustrated here, you will know that he is a safe man to



This is the sign which you will see exhibited by all service men officially approved by the Wireless League

whom to go for radio assistance. The scheme will cut out the "dabbler" and give properly qualified service men the chance of giving the radio public a square deal.

HOW TO DO IT

REPAIRERS and service men will welcome the new Wireless League scheme and it is anticipated that no time will be lost in getting out a lengthy list of officially approved service agents. Traders and repairers who wish to be appointed under the new scheme should apply for full particulars from the Wireless League, 12 Grosvenor Crescent, S.W. 1. Investigations are made regarding the service facilities available, testing apparatus employed and personal qualifications and experience. Personal inspection will be made by the Wireless League's certified engineer. Very soon we may see a large number of dealers and service men's establishments fitted with the sign shown, and you can take it as a reliable guide.

HERO OF THE MICROPHONE

WHEN Cyril Nash was dashing up from Horley to broadcast at the B.B.C.'s London headquarters, he came into collision with another car and he was knocked unconscious. After having his cut face dressed at the hospital, he jumped into a taxi and arrived at the B.B.C. just in time to fulfil his engagement. The extraordinary thing is that his wife, who was listening at the other end, was entirely unaware that anything was wrong and it was only when Mr. Nash arrived home in a friend's car that she knew anything about his serious smash.

ANOTHER VALIANT EFFORT

TALKING of microphone heroes reminds us of Herbert Heyner, the well-known singer. He had to disappoint listeners in April because it was necessary for him to undergo his twenty-seventh operation for war wounds. He is now in Roehampton Hospital recovering from the twenty-eighth operation, but, determined to "do his stuff," he came to Broadcasting House recently by ambulance, which waited outside while he sat in a studio and sang his songs to listeners.

FOR THE WIVES

ON July 19 the wives of those attending the World's Advertising Convention are going to be shown round Broadcasting House. No doubt some of them will gain a few revolutionary ideas for home furnishing from the bizarre designs of the broadcasting studios!

A NEW TELEVISION SYSTEM

First exclusive details of a new television system which is claimed to give surprising results

AT the moment no further details of Scophony beyond those given in the eyewitness account below are available, but from a careful analysis of the various patent specifications taken out by Mr. G. W. Walton we are able to present certain basic principles of the new system, though naturally in only a superficial way.

As long ago as 1929 Mr. Walton patented the basic idea behind Scophony, or at least one of the basic ideas, and this we attempt to show by the diagram Fig. 1. The fundamental idea

tically speaking a straight line of light.

What we want you to understand, because it is absolutely fundamental to Scophony, is that the echelon device at any given instant converts the whole of the available picture area into a single line of light.

The great advantage of this re-arrangement is that the line of light can be very easily scanned. Quite a simple oscillating mechanism can effect this single-line scanning; certainly a much less cumbersome mechanism than a rotating disc or mirror drum, for example.

The next problem, after we have obtained the picture in a one-dimensional form, is to convert the constituent points of light and shade into a corresponding continuous but varying electric current, so that it can be transmitted from a wireless station just like a microphone current.

THE SCANNING MIRROR

Our scanning can be done by focusing this staggered strip, or uni-dimensional beam, point by point on to a light-sensitive device, such as a photo-electric cell. The focusing can be done with a simple oscillating mirror. Provided that this mirror moves across the picture line not less than fifteen times a second the phenomenon of "persistence of vision" will make the images "live," just as in cinematography.

Mr. Walton has patented an extremely ingenious form of mirror for this scanning action, very compact and presumably quite cheap to produce. We should not be at all surprised to find that in the Ferranti television apparatus to be marketed in the autumn this mirror device actually plays a more important part than the echelon—may, in fact, displace it.

This is sheer conjecture, at the moment, because the exact details of the Ferranti apparatus are not available.

From the specification of the Walton oscillating mirror, though, it certainly seems that if the motion of the mirror in its oscillation could be given a saw-toothed action it could easily be used for television reception of, say, Baird-system transmissions from the B.B.C., without the need for the echelon device.

The mirror, we mean, would then be moving in two planes—and so would build up a two-dimensional picture, just as a rotating-disc or mirror-drum does—and without the need for the special optical staggering device.

The echelon device seems more applicable to transmission, where there is an unlimited light brilliancy available, than at the receiving end, where the relatively meagre amount of light at source might easily be dissipated to an impracticable extent through the echelon mirror device.

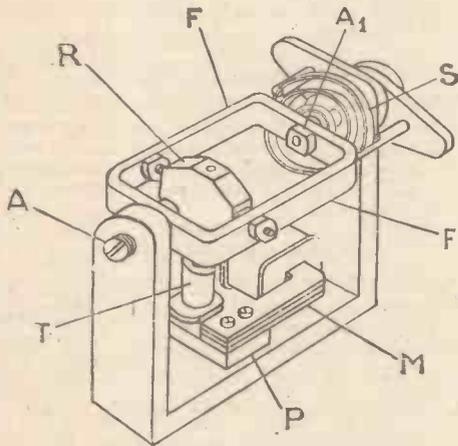


Fig. 2. The oscillating-mirror device patented by Scophony for scanning the line of light produced by the echelon device. The mirror is omitted to show the mechanism more clearly but it is carried in the frame F, its steady swing about the axis of the jewelled bearings A and A1 being controlled by the chronometer spring S. A cross-pivoted rocker R limits the swing, and is coupled by shaft T to the armature of a synchronous motor M. P is a platform carrying the stator of the motor

is a series of staggered prisms, arranged in what is described as echelon formation.

By this system the original picture area is cut up into as many horizontal strips as there are echelon prisms. As these prisms are staggered the resulting image emerging from the device is a more or less straight line. Thus a two dimensional area—the picture—is optically converted into what is prac-

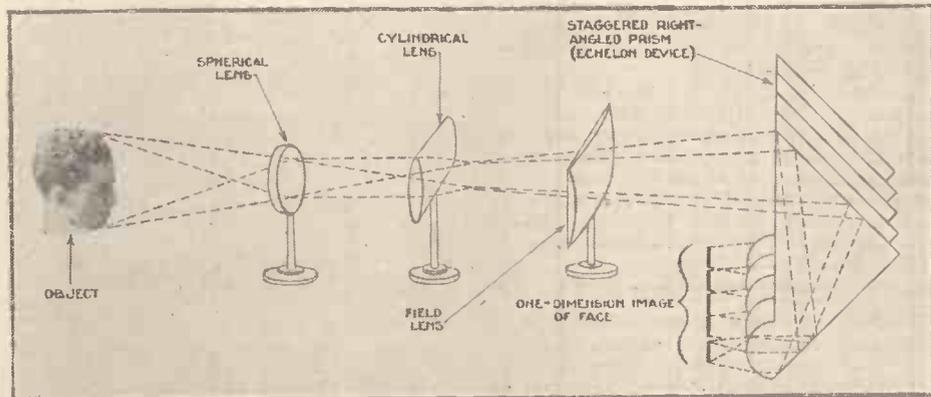


Fig. 1. This pictorial diagram gives some idea of how the two-dimensional picture area is turned into a line of light through a staggered series of prisms, arranged in echelon formation

"LOOKING-IN" WITH A SCOPHONY RECEIVER

ONE of the sensations of the Radio Show at Olympia will be a new television receiver, reasonably cheap, usable with any good broadcast set capable of delivering 1½ to 2 watts undistorted output, very economical in its power requirements and giving larger pictures than have yet been available.

It is to be put on the market by Messrs. Ferranti, Ltd., in association with Scophony, Ltd., a company formed just over two years ago to develop the inventions of Mr. G. W. Walton, a young English inventor who has devoted over ten years to the study of television.

Actually there will be two vision receivers available. The junior model will give pictures 8¼ by 3 1/5 in., and the senior 16½ by 6 1/5 in. The somewhat awkward shape of the pictures is dictated solely by the present B.B.C. transmissions. The apparatus can be adapted to give pictures of any convenient shape.

Mr. Walton has done away with Nipkow discs, mirror drums and similar unwieldy or

heavy moving parts. In his junior model the moving part weighs only an ounce or two and is so small that it will go into the waistcoat pocket. As a matter of fact, I put the whole of the essential portion of this receiver into the pocket of my coat, to the consternation of the inventor, who thought I was going to "bolt" with what was then the only available instrument of its type! In the senior model the moving parts are somewhat larger and heavier but still far less in dimensions than those of any other vision receiver.

One of Mr. Walton's fundamental inventions is the "stixograph." This is somewhat difficult to explain, but is essentially a ribbon-like development of the picture. It is of importance not only in television, but in cinematography. I have seen some very remarkable films made by the stixograph method. In the new vision receivers the very light moving part causes this stixograph to move over the scanning aperture. The moving optical system is in echelon formation.

In any vision receiver the light source, which must be capable of modulation in sympathy with the changing light and shade of the picture, is of the utmost importance. In the Scophony apparatus any convenient gas discharge device can be used—neon, sodium or mercury vapour tubes. In the demonstration I was privileged to witness a mercury tube, giving a bluish-white picture, was used for the junior model, and a sodium tube, giving a yellowish-white picture, for the senior model.

Two things struck me particularly in this demonstration. One was the excellence of the detail considering the limitations entailed by the B.B.C.'s thirty-line transmission. The other was the ease with which the pictures could be tuned in and held steady. A touch or two on the control knobs and there the picture was. And there it stayed.

Mr. Walton insists that nothing less than top-line transmissions will give really satisfactory pictures and he hopes that before long we will have them. His present apparatus is an attempt to popularise the new art by making the B.B.C. transmissions available to that large section of the public which must have something cheap and easy to use. E. H. R.

The Facts about Iron-core Tuning

Everybody is asking what the new permeability tuning is likely to mean and here J. H. REYNER, B.Sc., A.M.I.E.E., gives salient facts about the new tuning system

PERMEABILITY tuning is a development of the iron-cored coil.

If we wind a certain number of turns on a former we obtain a certain inductance. If we now insert an iron core in the centre of this coil we find that the inductance has increased. Since nothing has been altered we assume that the properties of the space inside the coil have been changed in some way by the presence of the iron, which is said to have a greater permeability than the air which was originally present.

At low frequencies the iron may have a permeability of several hundred, but at radio frequencies the figure is much less than this, being only a little over ten, due to the fact that the iron has to be made in a very finely divided state, and each particle has to be insulated from the next.

EDDY CURRENTS

Also the effect of the iron is offset by the eddy currents which are set up in the core. We are all familiar with "spade tuning," an arrangement in which the inductance of the coil is reduced by bringing a metal plate or cylinder near the coil. The iron core which we use also acts to some extent as a spade tuner so that the increase in inductance is not as great as one would expect at first. However, the fact remains that the insertion of an iron core does increase the inductance of the coil without any other alteration being made, and this has given rise to the idea of permeability tuning.

If we have a coil with an iron core and some mechanism for moving the core in and out of the coil, we can vary the inductance. We can use this variation to tune our circuit just as we ordinarily use a fixed inductance with a variable capacity. In this instance we should connect a fixed capacity across the coil and alter our tune by varying the inductance.

VARIOMETERS

Methods of this sort were adopted in quite early days, using variometers which were really an arrangement of two coils, one fixed and the other rotating, to obtain the variation of inductance required. Variometer tuning suffers from the grave disadvantage that the high-frequency resistance increases considerably as the inductance is reduced so that although the arrangement may be quite sharply tuned at the top of the scale it is very broad on the lower wavelengths.

The present method of tuning by a coil and condenser is much better in this respect, but it is not perfect because the tuning capacity is not constant. The selectivity and the signal strength of the circuit depend upon the value of the tuning capacity, and if this could be kept small the whole time there would be a marked improvement in both selectivity and sensitivity.

Permeability tuning is an attempt to provide this desirable state of affairs. If we have an inductance which can be tuned with a small condenser such as a .001, and we can vary the value of the inductance so that it tunes over the ordinary wavelength scale without altering the capacity, then we should maintain a high ratio of inductance to capacity, which is what we want. If at the same time we

can arrange that the resistance of the coil does not increase very rapidly at the higher frequencies, we shall overcome the great difficulty of the old variometer system and inductance tuning becomes a practicable proposition.

In theory, the system is particularly fascinating. The ratio of inductance to capacity at the bottom of the scale would be about the same as it is now while at the top of the scale it would be six or seven times as great, giving us a six-fold increase in the strength and selectivity!

MECHANICAL SNAGS

Unfortunately the mechanical difficulties are great. Merely pushing a core inside the coil does not give a six-fold increase in inductance. It is necessary to make some attempt to complete the magnetic circuit by using a partially-closed core, and this immediately means a large increase in the amount of iron used and a corresponding increase in the cost, for this high-frequency iron is expensive.

This difficulty is not too serious. It can be overcome, and smoothly-working mechanisms can be made which are very satisfactory for single circuits. When one comes to consider two or three such circuits ganged together, however, the problem becomes most unpleasant. The first difficulty is that of getting the iron exactly uniform. The next difficulty is that of getting the turns exactly right, and although matching to one turn or even a half

turn would make one or two per cent. change in the total inductance.

Finally, apart from the maximum and minimum inductances, we have to see that the coils do not fall out of step at various intermediate points of the scale.

The difficulties will be overcome. One has only to look back on the record of radio achievement to realise that equally insurmountable difficulties have faced the designer at every stage of development. Until actual production models are available, however, at a commercial price, it is desirable to restrain one's enthusiasm.

SIR HENRY WOOD

THE popular conductor of the promenade concerts is now happily recovered from his attack of pneumonia and is sufficiently well to rehearse the orchestra for the forthcoming "Proms" season, which will, of course, be broadcast extensively.

CRYSTAL PALACE FESTIVAL

A CHOIR of four thousand voices, drawn from two hundred and twenty choirs of cathedral, town and village churches affiliated to the School of English Church Music, will be heard by London Regional listeners on July 21, when they take part in the Festival of English Church Music at the Crystal Palace. Organ accompaniments will be played by Dr. Ernest Bullock and organ solos by Dr. Stanley Marchant. The conductor is Dr. Sydney H. Nicholson. The Crystal Palace holds no terrors for the B.B.C. engineers from the acoustical point of view, although admittedly only two previous relays have been given from this vast glass house on Sydenham heights. For the relay on July 21 draperies will be fixed behind the organ and the whole of the centre transept will be enclosed by movable draperies from roof to floor. In addition to the singing of the magnificent choir, an address by the Archbishop of Canterbury will be broadcast.

Morgan Nicholas and the Rhondda Ladies' Choir, conducted by James Davies, will be the artists in a Welsh programme from the West Regional studio on July 25.

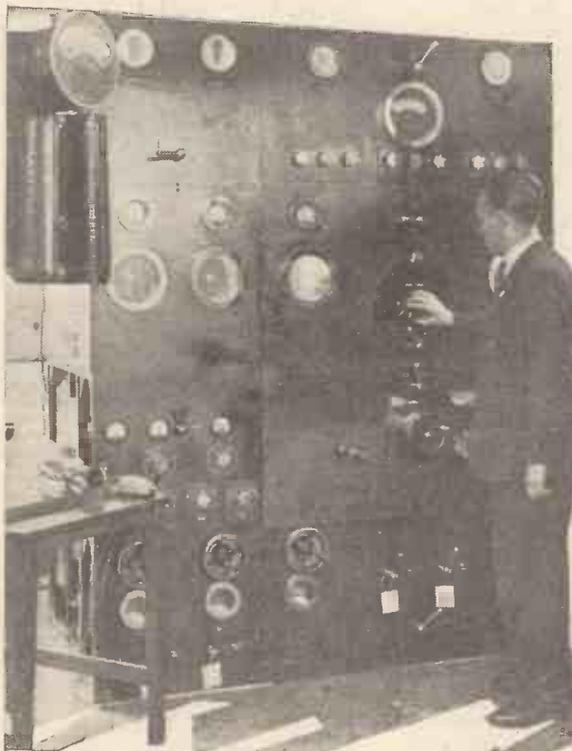
The Holman Quartet and Walter Piper will give a concert for the West Region from the Plymouth studio on July 27.

The fourth of the series of West of England programmes "Gaffer and Gavotte," will be given on July 28. The programme will include four West Country Dialect Sketches.

A West Regional relay will be taken from the Annual Luncheon of the Royal Welsh Agricultural Show at Aberystwyth on July 26. Listeners will hear speeches by Prince George, the President, the Earl of Lisburne, and Lord Davies of Llandinam.

There is to be a further relay from the Manchester Hippodrome on July 19.

An interesting recital of songs and sonatas is arranged in the North Regional programme for July 20. The modern composers of the works to be played and sung were Palmieri and Esposito.



One of the latest experimental transmitter panels at the National Physical Laboratory at Teddington. This is used for the study of the properties of the upper atmosphere

turn is sufficient for an air-cored coil, it is nothing like accurate enough for an iron-cored arrangement where a very small fraction of a

THE UP-TO-DATE EXPERIMENTER

SUCCESS ON THE SHORT WAVES

GETTING THE SHORT WAVES ON A MAINS SET

This week "The Experimenters" tackle the problem of working an existing A.C.-mains set on



Two Catkin valves are used in this S.W. unit

short waves, giving practical data of a two-stage short-wave super-het converter unit

IF we can go by the number of requests we have received from readers wanting dcpe on short-wave working with A.C. sets, this article is going to meet a crying need. As a matter of fact, this idea originated from our own desire to work one or two broadcast mains sets on the short waves. When we looked round we found a real scarcity of short-wave converters and adaptors for use with mains sets. Those we tried were very expensive.

For some reason, there seems to be a feeling that all-mains short-wave working is full of snags. We thought it would be a good idea to find out for ourselves just what was holding up this important branch of short-wave reception. To our surprise, we have found nothing really difficult about the job, although there were admittedly certain inherent difficulties needing a different line of attack from usual.

WHY WE SCRAPPED REINARTZ

Our first effort was a simple Reinartz plug-in adaptor, with which the detector of the existing mains set was used—simply inserting a plug in the detector socket and using the detector valve in the unit. Provided we kept the leads short, we were able to get moderately good results with this unit; but, in view of our later experiments, we do not think this idea has a universal application, because the low-frequency side of some of the sets in use to-day is not always good enough for short-wave work.

We therefore turned to a simple autodyne super-het converter, a combined oscillator-detector circuit that is quite well known to

We wanted a set or unit that would be practically self-contained—one that could be hooked on to the existing set with no more than one wire. From which you will gather that we were quite prepared to go to the expense of a separate power pack for the unit. In fact, we realised that such a procedure was the only really satisfactory way of obtaining the desired results.

A single-valve super-het converter is, for the average amateur, quite out of the question. Why? Because it is hard enough, in any case, to calibrate a short-waver, but with this type of super-het unit you get harmonics turning up all over the dial; so that you never know exactly where you are.

TUNING SNAGS

Another snag about this short-wave business is the tuning. Obviously, one-dial tuning is essential for really happy working—two knobs on short waves being too fiddling for words.

So we had also to consider ways and means of achieving one-knob tuning with all our other requirements. Of course, a very easy way out would have been a high-frequency stage with an untuned aerial circuit, but this is not what we call good design.

We tested out several makes of short-wave tuning coils, to see if it would be possible to gang them without much trouble. After a while, we discovered that the Colvern KSW coils were quite well enough matched to enable them to be ganged with success.

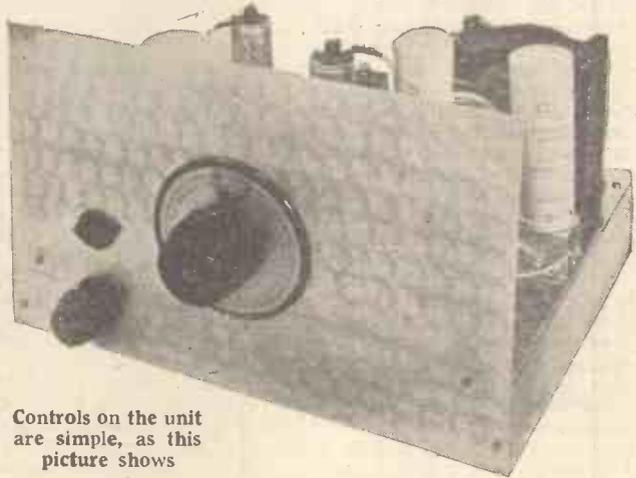
Our next problem was to find a tuning condenser to work with these coils—

a two-ganger, of course. Some ganged well, but were noisy; others were quiet, but badly matched—in fact, we finally asked Messrs. Wilkins & Wright to make us up a .00025-microfarad two-ganged specially for this type of work. When used with one of their Utility slow-motion dials, this condenser, which is

a modification of a standard model, worked really well.

Well, we had reached one objective—single-knob tuning on short waves. We had, in fact, two tuned circuits accurately ganged up and covering a wavelength band of 17 to 85 metres without any coil-changing. The next job was to hook up a group of components in chassis form, in order to materialise a two-valve short-wave unit, the circuit comprising a tuned high-frequency stage, coupled to a combined oscillator-detector, in turn fed into any A.C. set using one or more high-frequency stages—one at least being essential.

In passing, you might like to know why we are so keen on a high-frequency stage before



Controls on the unit are simple, as this picture shows

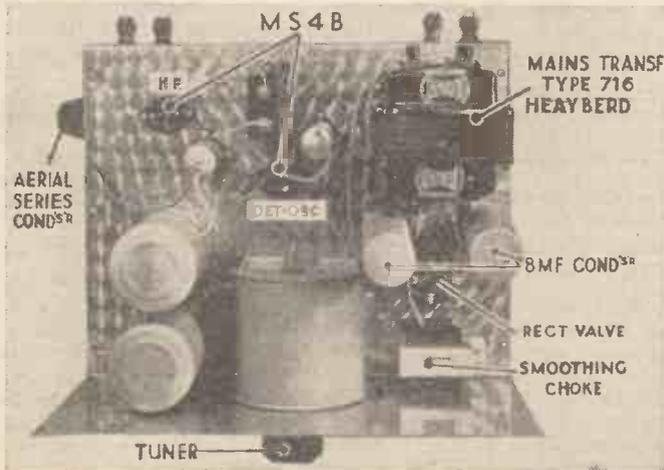
the detector oscillator. Well, firstly, you do get a decided increase in amplification, even down to 17 metres; secondly, the extra valve levels the load on the detector-oscillator, so that blind spots are wiped out; and, thirdly, it eliminates most of the bugbear of second-channel interference—that is to say, it reduces "images" of the fundamental signal frequency that tend to appear round the dial with simpler circuits.

SELF-POWERED!

Let's have a look at this circuit, now. We have a two-stage super-het converter, with tuned aerial circuit, parallel-fed tuned-grid circuit for the detector-oscillator, which is parallel-fed to the tuning circuit of the existing receiver. It embodies its own A.C. power pack, so that it can be quite simply plugged into the nearest mains, the aerial and earth removed from the existing set and hooked on to the converter unit, and one wire joined from the output of the unit to the aerial terminal of the set.

The unit's power pack consists of a transformer, two 8-microfarad electrolytic condensers, a smoothing choke, and a resistance to limit the voltage to 200. There is no hum in the unit, even on the shortest wavelengths.

You will notice that we are again using
(Continued on page 65)



This lettered plan view of the receiver gives the chief features of the two-stage super-het short-wave converter

most readers. It would be possible to use the existing power supply with some sets, but where the D.C. output of the set's power pack is very high, dropping resistances to reduce the voltage to 200 have to be inserted. It is rather a fiddling job for the average amateur to get the right value of resistance.

Music from the Air

Our impressions of electronic music, as produced by the hand-capacity control of a valve oscillator and loud-speaker

IT hardly seems six years ago that the writer listened in the Albert Hall to Professor Theremin, inventor of the musical oscillator, whereby the familiar heterodyne whistle, as produced by almost any valve receiver under suitable conditions, was made to give forth beautiful melodies under the mesmeric hand-waving of the "player."

Now, after all this time, during which many experiments have been carried out in various countries, notably in Germany and America, we find a more or less perfected apparatus for playing electronic music about to be marketed in this country.

We were given a chance to hear this new device for ourselves the other morning, when Mr. Martin Taubmann showed us by his playing some of the remarkable musical possibilities of this ultra-modern instrument. Mr. Taubmann has made a special study of the electronic musical instrument, and has given concerts in various parts of Europe. He will be heard in London concerts in the near future.

SIMPLE AND CHEAP!

The makers, Messrs. Electronic Music Development Co., Ltd., of 16A Whyteleafe Road, Purley, Surrey, stress that fact that they are working on well-known principles, and that their object is to market the *cheapest* and *simplest* electronic musical instrument. We understand the price will be in the region of five guineas, which should certainly attract large numbers of interested wireless fans and musical enthusiasts.

The unit consists briefly of two valves with associated high-frequency tuning circuits. One circuit is of fixed frequency but the other is varied by the player. The two circuits produce a heterodyne beat frequency, which after rectification and low-frequency amplification by the valves in the existing receiver operate the loud-speaker in the usual way, producing oscillations that cover the whole of the musical scale.

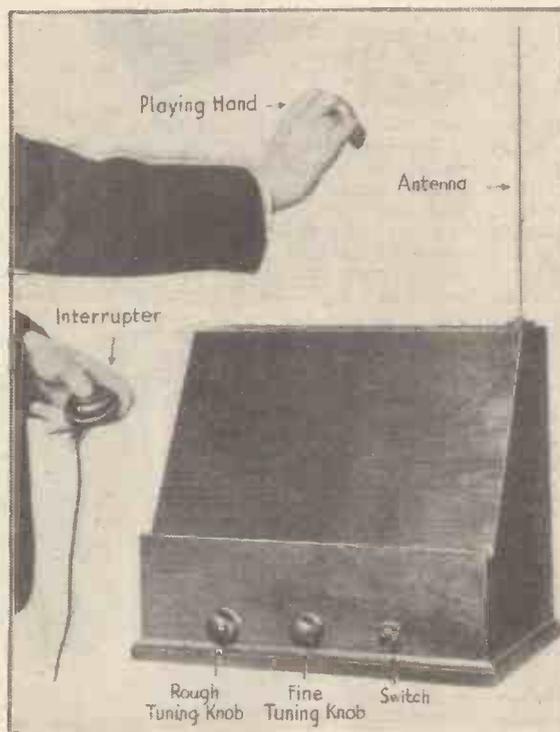
The electronic player is, of course, an add-on unit for an existing set; and its requirements are rather reminiscent of a short-wave super-het adaptor, in that the set should preferably have one high-frequency stage of amplification; and the aerial lead is removed from the set and the unit connected in its place; also the set has to be tuned to about 1,100 metres, which is the wavelength giving optimum results

THE MILLER EFFECT

MILLER first pointed out that the value of the capacity coupling between the electrodes of a valve is not the same when the valve is cold as when the filament is lit and current is passing. He also discovered that the effective capacity coupling depends upon the impedance of the output circuit, i.e. with a choke or inductive output the back-coupling alters with the signal frequency, because the effective impedance of the plate circuit does likewise. For this reason a three-electrode valve shows a greater tendency to oscillate on short waves—when the plate impedance is highest—than on long. The Miller effect exists even in the case of a screen-grid valve though its action is not so pronounced. M. B.

with the tuning circuits as at present arranged.

Now how, you may ask, can such an extraordinary combination really produce music? Well, there is a short brass rod projecting from the top of the cabinet of the unit—a small antenna, if you like—and as you bring your hand near to this rod an oscillation is set up, heard in the loud-speaker as a low-pitched



This lettered photograph of the electronic apparatus shows the controls. By waving the hand near the aerial rod you get music from the loud-speaker!

sound. As you bring your hand closer to the rod the pitch of the sound is raised, and, according to the distance of your hand from the rod, any musical frequency can be produced at will.

Practical work has been done on the elementary idea to make it workable in ordinary

hands. Thus you can alter the "playing space" to suit individual needs and different pieces, so that the operation is limited to a short or a long distance from the rod as desired. More important is the improvement whereby the notes of each octave are well spaced.

There are other features that make all the difference: for example, there is a small hand-operated on-and-off switch, so that the sound can easily be interrupted; and a foot pedal controls the volume of sound. These two devices together enable the player to create some unexpectedly varied effects.

He can play a sustained note continuously; slide from one note to another to produce a true glissando—sounding all the intermediate pitches; play detached notes by using the interrupter; control the volume of any sound produced; and finally he can very fairly imitate plucked stringed instruments, such as the guitar, by using a combination of the interrupter and volume controls.

On looking more closely at the unit we were surprised to find that only a $4\frac{1}{2}$ -volt battery is needed to drive the valves, so that it can be used equally well with battery as with mains sets.

We are assured that the radiation from the unit in action—don't forget it is an oscillator!—is so small that it will not cause interference with even near-by neighbours' sets. The Post Office seemed to be satisfied on this point, so there is nothing to worry about.

USING HEADPHONES

Of course, it will occur to you that this instrument might be worked just as well with headphones as with a loud-speaker. What a relief when the young hopeful of the family is going over his scales!

Our visit was decidedly impressive. Mr. Taubmann is entirely master of this oscillating musical device. He plays with all the feeling of an orthodox musician, and certainly, to our relatively ingenuous ears, what he got out of the loud-speaker was very beautiful music. Sad, slow and rather wistful music seems to lend itself admirably to electronic interpretation, but Mr. Taubmann showed that lively extracts from *Rigoletto* could be equally well extracted as "music from the air."

The immediate intention of the makers is to arrange a series of concerts to give the public a chance to hear what an expert can do on the device. A. H.

DO YOU KNOW—

THAT the input volume control to a radiogram amplifier should have a value of about 100,000 ohms? This potentiometer winding shunted across the pick-up will not affect the tone.

THAT in a class-B stage it is often necessary to fit .01-microfarad condensers in the output circuit between the high-tension positive tapping and each speaker terminal?

THAT when arranging the cabinet for your mains set you should fit the plug so that the set cannot be withdrawn from its cabinet unless the mains plug is removed? This is a safety measure, for it means that you cannot touch the set's wiring while the mains are still connected.

A COMPACT RADIOGRAM

BY taking certain precautions it is possible to operate a pick-up from a turntable mounted to rotate in the vertical instead of the horizontal plane. This idea has recently been utilised in Germany to produce an unusually compact self-contained radio-gram set. The driving motor and turntable for the pick-up are both mounted at the back of the loud-speaker, flush with vertical wall forming the back of the casing containing the valves and other components of the receiving set. The pick-up arm extends outwards and engages with the vertically mounted record. In this way the whole radio-gram combination is housed in a compact table cabinet of standard size. B.

THE NEW MULLARD *Screened* PENTODE



I REMEMBER WHAT A PENTODE DID FOR MY SPEAKER STAGE!

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Type V.P.4 for H.F. Stages Type S.P.4 for the Detector Stage

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Set of 3 coils ganged on base . . . 33/-

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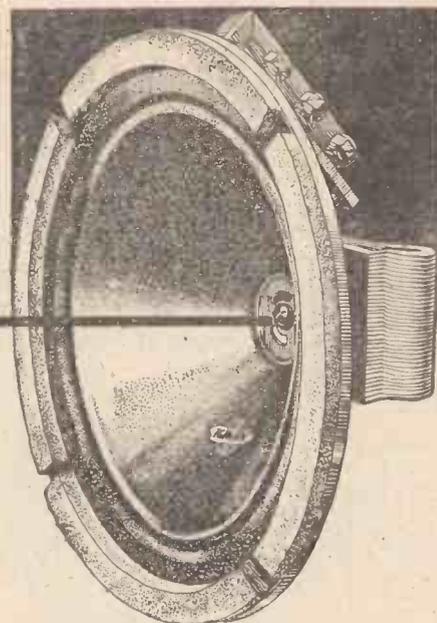
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The famous Igranitic D.9 Moving-Coil Speaker is now produced in four different models, each giving efficient reproduction on a small output receiver, as well as heavy volume without distortion.

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Mention of "Amateur Wireless" to Advertisers will Ensure Prompt Attention

On Your Wavelength!

ACTIONS AND REACTIONS

PATENT actions are notoriously one of the most expensive forms of litigation, and the recent dispute between the Marconi Co. and Messrs. Philips over the use of reaction in a thermionic valve circuit is not likely to prove any exception to the general rule. In fact, it is estimated that the combined bill of costs already exceeds £40,000. The curious thing about the whole affair is that the patent concerned has already expired, the claim for damages being in respect of past infringements.

In the early days of broadcasting one spoke of the reaction patent with bated breath—paying it the kind of respect due to one of the keystones of the radio industry—so that it comes rather strange to see it being attacked when it is no longer a force in the land. I see that evidence was given in court to the effect that low-frequency reaction was known and actually used by telephony engineers some time before the date of the Marconi patent. Considerable play was also made of the fact that there are different kinds of reaction, quite apart from magnetic back-coupling. For instance, the mere fact of tuning the output circuit of a high-frequency amplifier (before the days of the S.G. valve) is quite enough to make the valve oscillate by capacity coupling across the electrodes.

REFLEXING

HOWEVER that may be, there are indications that one of the "off-shoots" of reaction is likely to come back into modern practice. I refer to the well-known idea of "reflexing" a valve so as to make it amplify both high and low frequencies simultaneously. Most old-stagers will recall moments—often painful, but sometimes thrilling—of earnest endeavour with reflex circuits of the early type. This, of course, was at a time when it was well worth while to save an extra valve, if only for the sake of the resulting economy in H.T. and L.T. Nowadays the electric mains will give us all the "juice" we require. But, by the same token a mains-driven valve is now able to shoulder a much bigger burden without overloading, and the experts are out to find ways and means of utilizing this fact. For instance, "reflexing" can be used to save an extra valve in A.V.C. Similarly, in a super-het set the valve preceding the second detector can be used to amplify both the intermediate frequency and the rectified L.F. currents.

THE HEXODE

FOR instance, they are already using the pentode for this kind of thing in America, where one grid carries the I.F. frequency and another the rectified L.F. Of course, suitable filter circuits have to be inserted to prevent the

two different frequencies from "mixing" and modulating each other. A further development along similar lines is indicated by the introduction of the Hexode—or six-electrode valve—and the new Pentagrid converter.

When used as an amplifier, the Hexode makes it possible for the same valve to handle three different frequencies at the same time—namely, the signal frequency, the I.F. frequency, and the rectified speech currents. On the other hand, the Pentagrid type is being used as a combined H.F. amplifier, local oscillator, and "mixer" or first detector. At this rate the complete two-valve super-het seems already to be in sight.

"DOPE"

THIS question of dope is a very misleading one. I remember doing some tests some time ago to find the effect of various varnishes, and I found that shellac was the safest; yet even this statement must be accepted with caution.

The other day I wound up a little coil with Litz wire and obtained a certain resistance. I wound up another identical

FULL-SIZE BLUEPRINTS FOR EVERY TYPE OF SET CAN BE OBTAINED POST FREE FROM THE "A.W." OFFICES

coil, but this time, in order to make it a posh job, I gave it a coating of shellac. The H.F. resistance was over twice that of the other coil.

This did not line up with my previous experience, and I therefore looked into it further. In the end I came to the conclusion that the shellac varnish used had contained too great a proportion of methylated spirits; being, in fact, rather a weak solution. This methylated spirits had dissolved or softened some of the enamel insulation on the various strands of the Litz. This, of course, made the wire to all intents and purposes the same as a solid wire, and the H.F. resistance was correspondingly increased.

It all goes to show that the greatest care must be taken in these matters. Some of

the acetate dopes give a most unpleasant effect on the H.F. resistance and will send it sky high. In fact, I always steer clear of any dope of this character in coil design, but hitherto I always found that shellac was quite satisfactory if not too heavily applied. It seems that one must also make sure that it is not too thin; at any rate, if Litz wire is being used.

SOME EYE!

AS readers may remember, I have long maintained that the perfection of television would come only with the invention of something as nearly an electro-mechanical copy of the human eye as the microphone is of the ear. Now I see that something of the kind is being developed, and I am looking forward with great interest to learning more about it. Unfortunately, the only information available at present comes from lay sources, and I have given you many previous examples of what some such information can be like. In the present instance I learn that the "artificial eye" consists of three million photo-electric cells, each so small that ten thousand can be crowded into a square centimetre! Some eye, what?

NOT QUITE ACCURATE

THE photo-electric cell, as we know it, is a piece of apparatus comparable in size with the wireless valve. Its price also is round about £5; so that an "eye" containing three million of them would cost most of us our cigarette money for quite a bit! Whatever the three million elements are, I am quite sure that they cannot be photo-electric cells—or, at any rate, cells of this kind as we know them to-day. Possibly they are small light-sensitive cells, which are very different things. The idea seems to be that the image is focused on to the "eye" by means of a camera lens and is then transformed into electrical impulses with the help of a cathode-ray tube. At the receiving end these impulses operate a multitude of relays, each of which illuminates a minute area of a viewing screen. There seems to be a great deal in this system, but it will doubtless be some time before it is fully developed.

ARTISTES IN THE WEEK'S PROGRAMMES



On Your Wavelength! (continued)

REMEMBER YOUR NEIGHBOUR

THE wireless set and the gramophone are very jolly things to have beside you when you sit in your garden during the hot weather. But do, I beg of you, remember your neighbours, if you have them. It is a peculiarity of acoustics that any small wireless set or gramophone operated in the open air and heard at some little distance is most likely to produce highly unpleasant distortion effects. Don't forget, too, that the range at which reproduction is audible is a considerable one and that the farther you are away from the instrument, the worse it sounds. The other Sunday I was driven out of my garden and into a frenzy by thoughtless neighbours who turned on the world's worst wireless and kept it going at the top of its voice for three aching hours. Don't imagine that because you don't receive complaints that you are not annoying near-by dwellers. People hate making complaints even more than they hate the annoyance caused by thoughtless neighbours. Nuff said.

BROADCAST "HUMOUR"

REALLY, I must make my protest against the terrible stuff so frequently broadcast nowadays under the heading of humour or comedy or something of the kind. I can laugh with the best of them when there is anything to laugh at. But I want to burst into tears and smash things when, on turning on the wireless set, I find that a comedian (?) is giving us a sample of the old, old seaside boarding-house jokes. One had thought that, like kippers and mothers-in-law, seaside landladies had had their day. Apparently it is not so. The other night a fellow got off his chest as I switched on, something like this: "Oh, yes, Ours is a lovely hotel. Splendid menus. Toad-in-the-hole, flies in the jam. Seed cake, plum cake, and stomach-ache." Matters were made even worse by the bursts of pumped-up laughter by the studio claque. I don't want to seem hyper-critical, but really. . . .

CUTTING IT FINE

IF and when the Lucerne Plan comes into operation things are not going to be too easy on the long waves owing to the surprisingly small separations between the channels allotted stations. In a good many instances the separation is only 7 kilocycles; in the majority it is 8, and only here and there is it as much as 9 kilocycles. Since the band is so closely packed, a high order of selectivity will be necessary for the long-wave circuits of receiving sets, and this in its turn will necessitate some kind of tone-control—genuine tone-control—if quality is not to suffer. It is generally accepted now that high selectivity does not lead to the absolute cutting of sidebands: what does happen is that there is much more amplification of the low frequencies (bass notes) than of the high in circuits whose tuning is of the knife-edge variety. In

other words, the high frequencies come through, but so feebly that they may be drowned by the low. Balance of tone can be restored by means of proper tone control.

THE "B" MINORS

THE class-B valves with .4 ampere filaments and an output of the order of 2 watts I call the "B" majors, the "B" minors being the more modest little fellows drawing .2 ampere of filament current and with a rating output of a bit over 1 watt. I have been trying out a number of patterns recently—the new Cossor B220, the Mullard PM2B, and the Mazda PD220—and I must say that I like them very much. Of course, if you can manage the extra .2 ampere of filament current, the "B" majors are wonderful, for they are always working with such an ample factor of safety. The minors, though, give an excellent account of themselves and furnish ample volume for the average room. I have heard some criticism of class-B quality, but my experience is that if you use a driver transformer and carefully match the output to your loud-speaker, whilst at the same time taking proper precautions against parasitic oscillation, the quality is extraordinarily good, whether you are playing records with the pick-up or reproducing wireless programmes. It isn't, of course, up to the standard of push-pull, in which you use super-power valves each working on the straight portion of its characteristic. With this combination harmonic distortion is, to all intents and purposes, non-existent, but class-B push-push can be made so good that it takes a very sensitive ear to find fault with it.

A MISCONCEPTION

FIND, by the way, that there is one misunderstanding about class B which prevails rather widely. People say: "If the valve is delivering 2 watts it must be drawing the power from

the high-tension battery and no ordinary battery will stand up for any reasonable length of time to such a load." It is perfectly true that it wouldn't; it is also true that the valve only works up to 2 watts at infrequent intervals. The whole essence of class B (and of Q.P.P. as well) is that the drain on the H.T.B. is proportional to the volume. Thus, during quiet passages only a minute fraction of a watt is drawn from the battery, and the full output is reached just every now and then when a loud sound occurs. The average drain on the battery measured over a whole week of reception at three or four hours a night is quite small. In fact, the driver valve and the output valve between them consume far less high-tension current than is required by a single power valve used in the ordinary way and giving a much smaller output.

DEFINITELY ECONOMICAL

EITHER class B or Q.P.P. are definitely economical forms of amplification, but it must be remembered that if you are using a set containing five or six valves the drain on the H.T.B. is, in any event, a fairly heavy one. You can average screen-grids at about 2½ milliamperes apiece and triodes of the medium impedance type at about 1½ milliamperes. Variable-mu screen-grids require 3 or 4 milliamperes apiece. Quite apart from its output stage, of whatever kind it may be, a set with two high-frequency valves and detector is eating quite as much current as a standard-capacity high-tension battery should be called upon to deliver. If you want real economy in working a bigish set you must adopt the larger capacity high-tension battery. It is not always realised that one big trouble with the standard-capacity battery is not so much that the voltage falls off as that the internal resistance rises. And rise it does to a remarkable extent when the battery has seen a certain amount of use. Now, if the resistance goes up to a big figure the battery simply cannot deliver the spurts of current required by a class-B or Q.P.P. amplifier every now and then. One result is that you introduce distortion; another is that you discard the battery at a fairly early date and then complain of the cost of running the set. With a bigger battery of first-rate make you don't get anything like this increase in the internal resistance. To give you a concrete example, a big battery that has been under test now for more than 400 hours at an intermittent discharge rate of 20 milliamperes shows a resistance of one-third of an ohm per cell. In a standard-capacity battery after half this amount of service the resistance may easily reach a figure of from 10 to 50 ohms per cell. When you remember that there are forty cells in a 60-volt battery, or eighty in the battery which supplies the 120 volts needed for class B, you will see what this means. The little battery that has seen some service may have a total internal resistance of 1,200 ohms or more; that of the big fellow will be under 30 ohms. THERMION.

Before you screw down your valve holders it is worth while making sure that there are no loose connections underneath. The short wires or metal strips which



connect the valve-holder terminals to the sockets sometimes work loose. It pays to tighten the underneath terminals before screwing all the holders in place

HOW TO MAKE A USEFUL TESTER



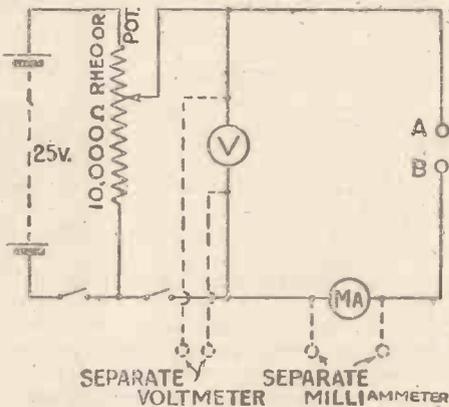
This useful instrument can be made up from odd materials and a voltmeter

THE average radio fan frequently finds himself wishing that he had some quick and handy method of either ascertaining the correct value of a certain resistance, or more

necessary, be omitted. The same circuit is used for measuring or correcting the value of a resistance, and is really only an adaptation of Ohms Law. From the circuit it is seen that a certain voltage or potential difference exists between two terminals marked A and B. This voltage can be varied by means of the potentiometer or by moving the plug into a different socket in the battery. The potentiometer is to be recommended as it gives a very smooth control, and in addition without it the exact voltage required cannot be obtained, especially if the voltages marked against the sockets are not particularly true, as they often are not to a volt or so.

This method of ascertaining the correct value of a resistance is applicable to any type of resistance whatsoever, whether wire-wound, carbon, metallized, or any type whatsoever. Care should be taken, however, when making these tests to see that a current is not passed through the resistance which exceeds the safe maximum current carrying capacity of the resistor. Not so, universal however, is the method of altering or correcting the value of a resistance.

The value of a resistance alters inversely with the increase or decrease of the cross-sectional area—also with an alteration in length, but we are not concerned with this at the moment—which means that if the cross-sectional area is increased, the value of the



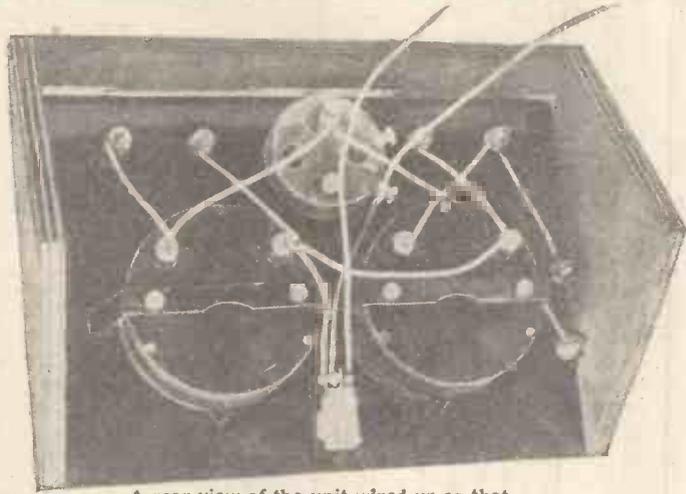
This is a suggested wiring scheme for the tester. The dotted lines show connections which can be made in order to use the meters independently of the resistance testing arrangements

often still, a means of securing a definite resistance value.

The method described below, while not intended to be a universal method of providing any resistance value, has been found of use on many occasions.

TESTING

A voltmeter is inserted in the circuit so that the exact voltage across the terminals A and B is known. The resistor under test should be connected across these two terminals. Ohms Law says that the value of the resistance can be ascertained by dividing the voltage placed across the resistor by the current passing through it, so that all that is necessary is to vary the potentiometer setting until convenient values are showing on both



A rear view of the unit wired up so that both meters can be used for testing

resistance is decreased, and vice versa. In the carbon type of resistance, this can be put to very good use.

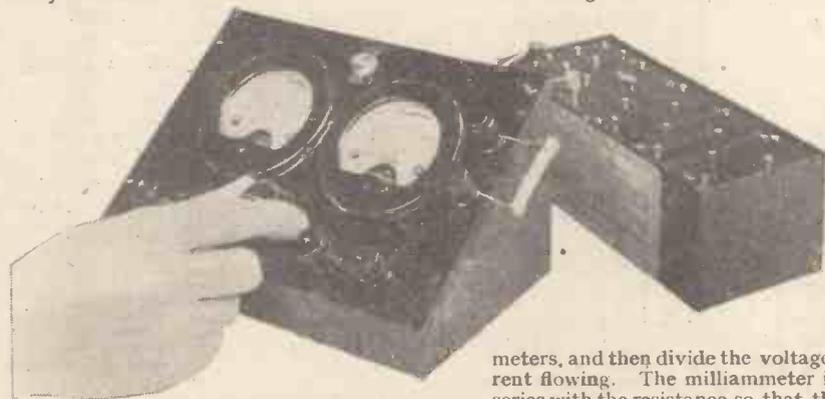
SCRAPING FOR OHMS!

Obtain a resistance of a value slightly lower than that which is required, and with the aid of a penknife, or better still a razor-blade—taking care that when the latter is used, the fingers are protected—scrape through the coloured enamel with which the resistance is covered, until the actual element itself is laid bare on one portion of the resistance. In most cases this will be found to be a hard black substance. Scraping is now continued on the actual composition, and if the resistance value is measured from time to time, by the method described previously, it will be seen that the more element that is removed the higher the resistance value becomes.

To obtain a certain value, all that is required then is to connect the resistance to the two terminals of the test-meter, work out by means of the formula mentioned, the values of voltage and current that would show on the two meters for the actual value required, and then continue removing the composition until these figures do actually show on the meters.

As an example, suppose that a value of

(Continued on page 66)



Here is the meter used with a battery to check the actual value of a resistance: the resistance can be seen connected to the two side terminals

The apparatus required is a high-class voltmeter of range 0-25 or 0-50 volts, and preferable of the moving-coil type having a resistance of about 1,000 ohms per volt; a good-quality milliammeter of range about 0-25 milliamperes, a rheostat of say 10,000 ohms resistance. A potentiometer would do just as well, but whichever is chosen should be wire-wound for preference; the remaining articles are a few pieces of wire, some terminals and three grid-bias batteries or a small high-tension battery. The potentiometer could, if

meters, and then divide the voltage by the current flowing. The milliammeter is inserted in series with the resistance so that the exact current flowing through the latter is shown on the meter. One point should be noted here, however. When ascertaining the values of fairly high resistances such as are being discussed here, it will be found that only milliampères are flowing. It is therefore necessary to multiply the result by one thousand for a correct result. Take an example: A resistance has 10 volts across it and 5 milliampères is flowing through it, then the resistance in ohms is $10 \div 5$ (giving a result of 2) multiplied by 1,000 which is 2,000-ohms.



The latest "Britain's Favourite Three" all ready to work. It has a fine specification including iron-core tuning and class-B output

"BRITAIN'S FAVOURITE THREE."

A fine name for a fine set!
It is bound to be a favourite for it has every up-to-date feature.

It is an economical three-valver and yet it will surprise all home constructors by the amazing volume it can deliver.

As you can see from the photographs, it is one of the neatest and most straightforward conventional sets and its fine performance is due not only to a high-quality circuit, but to the practical way in which this circuit is incorporated in the set.

FROM A BALLOT

New readers will be interested to know that the original "Britain's Favourite Three" was a set pioneered by "Amateur Wireless" at the beginning of 1928.

Further very successful efforts were brought out in 1931 and 1932, each time alterations and additions being made so that the "Favourite" would justify its title and be an up-to-the-minute set in every sense of the word.

"Choose your circuit" was the theme of a competition organised by AMATEUR WIRELESS in 1928. Readers were invited to ballot for their favourite technical features.

And as a result of this competition—a valuable census of opinion—the first "Favourite Three" was designed—a straightforward "three."

Basically it was a fine circuit and many readers still write to us and give the results they obtain with various modifications of the "Favourite." The "Favourite Three" of 1931 had improvements on the original and in order to cope with the other conditions of 1932 last year's

"Favourite Three" had an ingenious band-pass tuning arrangement.

UP TO DATE

And now here is the "Favourite Three" for 1933—as up-to-the-minute a set as you could desire.

Last year the best method of getting selectivity was bandpass tuning, which meant matched coils and a two-gang condenser. The new "Favourite" has iron-core tuning, the very latest idea in selec-

AN UP-TO-DATE VERSION OF THE NEW IRON-CORED SET

The original "Britain's Favourite" was designed to determine the most practical

tivity. It simplifies the set, too. There is only one coil in the new "Favourite" and so no trimming has to be done nor do we have to make use of a two-gang condenser.

CLASS-B OUTPUT

The order of selectivity obtainable in the "New Favourite Three" is a surprise even to keen set users who have already had experience of tuning systems with an iron core.

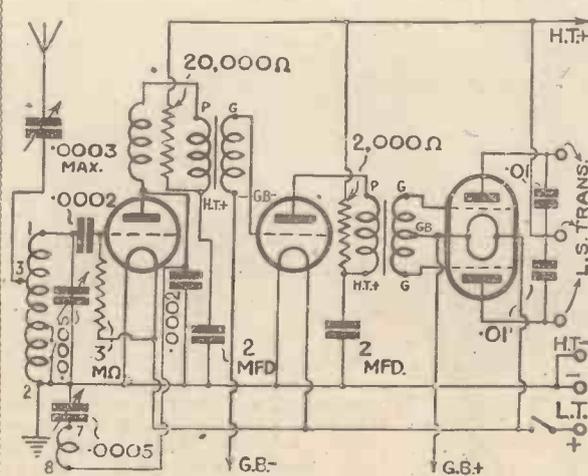
Our new set has no high-frequency stage and so it is essential to get the very best selectivity in the detector circuit.

The new "Favourite" has iron-core tuning followed by an efficient detector stage. Then there is a driver valve followed by class-B output.

Do not imagine that because there is only one tuning coil and no high-frequency stage the selectivity and sensitivity of the "Favourite" are below par.

The reverse is true. We get the selectivity by the low losses and efficient H.F. working of only one circuit. The knife-edge tuning is obtained without any

COMPONENTS NEEDED FOR THE "NEW BRITAIN'S FAVOURITE"



- CABINET**
With baseboard 12 in. by 10 in. and panel 12 in. by 7 in. (Osborn, type 237).
- CHOKES—HIGH-FREQUENCY**
1—Peto-Scott (Wearite, Lissen, Igranic, Bulgin, Varley, Telsen, Sovereign, Goltone).
- COIL, IRON-CORED**
1—Varley aerial, with reaction, type BP30 (Colvern, Igranic, Wearite).
- CONDENSERS, FIXED**
2—Dubilier .002-mfd., type 670 (Lissen, T.C.C., Telsen).
2—Dubilier .01-mfd., type 670 (Lissen T.C.C., Telsen).
2—Lissen .2-mfd. (Dubilier, T.C.C., Telsen).
- CONDENSERS, VARIABLE**
1—Utility .0005-mfd. complete with disc drive, type W318.
2—Utility bakelite; one .0003-mfd. and one .0005-mfd. (Polar, Telsen, Lissen, Magnum).
- HOLDERS, VALVE**
2—W.B. 4-pin (Lissen, Graham-Farish, Benjamin, Wearite, Bulgin, Telsen, Ready Radio).
1—W.B. 7-pin (Wearite, Benjamin).
- RESISTANCES, FIXED**
3—Dubilier 1-watt; one 2,000-ohm, one 20,000-ohm and one 3-megohm (Erle, Claude Lyons, Graham-Farish).
- SUNDRIES**
Three yards thin flex (Lewcoflex).
Connecting wire and sleeving (Lewcos).

Here's the theoretical circuit diagram of the latest edition of the "Favourite." It has iron-core tuning in place of the previous band-pass arrangement, and class-B output. The values of the chief components are indicated

AN UP-TO-DATE VERSION OF ONE

FAVOURITE THREE

VERSION OF AN EVER-POPULAR SET: IT HAS THE
-CORE TUNING AND CLASS-B OUTPUT

"Favourite Three" was produced as the result of a readers' ballot
popular type of set. This latest version has all the most up-to-
date improvements



bandpass loss. This, you see, is a further advantage of using an iron-core coil. You will be genuinely surprised at the punch obtainable from a straightforward detector system with iron-core tuning.

COIL SELECTIVITY

In addition to the inherent selectivity provided by the iron-core coil the knife-edge effect is increased by taking the aerial tapping part of the way down the winding.

FINE "FAVOURITE" FEATURES

There is nothing difficult about the construction of the latest "Favourite" as this rear view of the set proves



The reason why the up-to-date version of the "Britain's Favourite Three" tunes so sharply—an iron-core tuning system is used

"FAVOURITE THREE"

TERMINALS, PLUGS, ETC.

- 5—Small Belling-Lee terminals, marked: A, E, L.S. (2), H.T. + (Clix, Bulgin, Eelex).
- 5—Single terminal blocks (Goltone).
- 4—Belling-Lee wander plugs, marked: H.T.—, H.T.+, G.B.—, G.B.+ (Clix, Eelex).
- 2—Belling-Lee spade terminals, marked: L.T.—, L.T.— (Clix, Eelex).

SWITCH

- 1—Bulgin rotary toggle (Benjamin, Lissen, Telgen, Tunewell, Igranic).

TRANSFORMERS.

LOW-FREQUENCY

- 1—Lissen Hypernik (Igranic, Ferranti, Varley, Bulgin, R.L., Lewcos).
- 1—Lissen class-B (Multitone, Varley, Radiophone, Wearite, Benjamin, R.L.).

ACCESSORIES

- 120-volt H.T. battery (Lissen, Ediswan, Drydex, Ever-Ready, Pertrix).
- 9-volt G.B. battery (Lissen, Ediswan, Drydex, Ever-Ready, Pertrix).
- 2-volt accumulator (Exide, Lissen, Ever-Ready, C.A.V., Pertrix).
- Permanent-magnet moving-coil class-B loud-speaker (Rola F5 class-B, Earh (Graham-Farish "Filt").
- Aerial (Electron).
- Down-lead (British Radiophone "Receptru").
- Lighting switch (Bulgin).

OF THE MOST POPULAR "A.W." SETS

"BRITAIN'S FAVOURITE THREE" (Continued from preceding page)

valve will take approximately 1 milli-ampere of high-tension current and the driver valve of the class-B stage consumes only about 1½ milliamperes.

The quiescent current of the class-B valve depends on the type used, but the total quiescent current of the set can be kept down to only about 4 or 5 milliamperes.

An advantage of class-B output is that you only pay for what you use. When no

arrangements, you can rest assured that the conversion is well worth while and you will not regret buying the new parts to make your "Favourite."

The accompanying components list shows the parts actually used in the new "Favourite" made up by the AMATEUR WIRELESS Technical Staff, while in addition there are a number of alternatives. Recommended accessories are given too, so that if you are starting off with no equipment at all you will be well advised to follow the recommendations given regarding batteries, aerial-earth equipment and so forth.

PANEL LAYOUT

You will see that the panel of the new set is not exactly rectangular but a very pleasing appearance is given to the set by its new cabinet and the panel is shaped at the sides to fit the box. The layout is kept as close as possible to that of the foregoing "Favourites" but, of course, the different tuning and output arrangements have necessitated a considerable difference in the general scheme.

In order to simplify construction you should get a copy of the full-size blueprint which has been specially prepared for this set. Copies can be obtained, price one shilling, post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4. Ask for print No. A.W.394.

A reproduction of this blueprint is given to scale on this page and this gives you a rough idea of the set's layout. But, of course, you will find it much easier to work from the full-size sheet.

From the wiring diagram, photographs and components list given this week you will be able to make a good start with the constructional work and in next week's issue practical constructional hints will be given.

Arrangements have been made for the latest edition of the "Britain's Favourite

Three" to be on view in the Radio Department windows of Messrs. Selfridge & Co., Ltd., Oxford Street, London, W.1.

THE ORGAN AGAIN

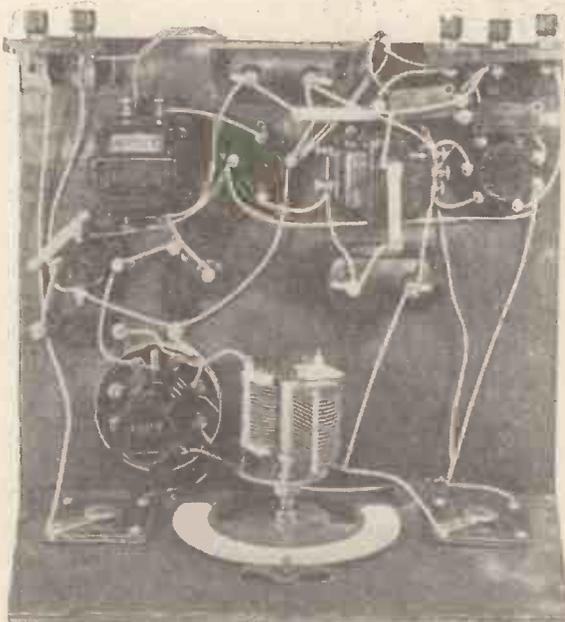
A NOTE for those of you who are interested in the new "B. H." organ. Sir W. G. Alcock will give a recital on the Broadcasting House organ on July 31 and it will be relayed on the Regional wavelength. The programme consists of Overture in D Minor (Handel-Ellingford), Larghetto in F Sharp Minor (Bach), Caprice (Guilmant) and Postlude in C (Alcock). On Fridays during August organ recitals will be given from the Concert Hall at noon by C. H. Trevor.

A NEW RADIO ACT

LEILA AND RUBIA, with "Ted" at the piano, make their radio debut in a Sharman show on July 14. The girls in this new radio act are trained by the well-known coloured comedians, Scott and Whaley.

"INARTISTIC" TIME SIGNALS

IN future the six pips will not be superimposed on the Daventry National programme when their radiation would spoil the artistic appreciation of music running over its time.



A plan view of the latest "Britain's Favourite Three" which proves that there is nothing difficult about the constructional work

speech or music is being handled by the set the quiescent or steady high-tension current is at a minimum. Loud notes cause more high-tension current to flow and so the class-B consumption is directly in proportion to the volume handled.

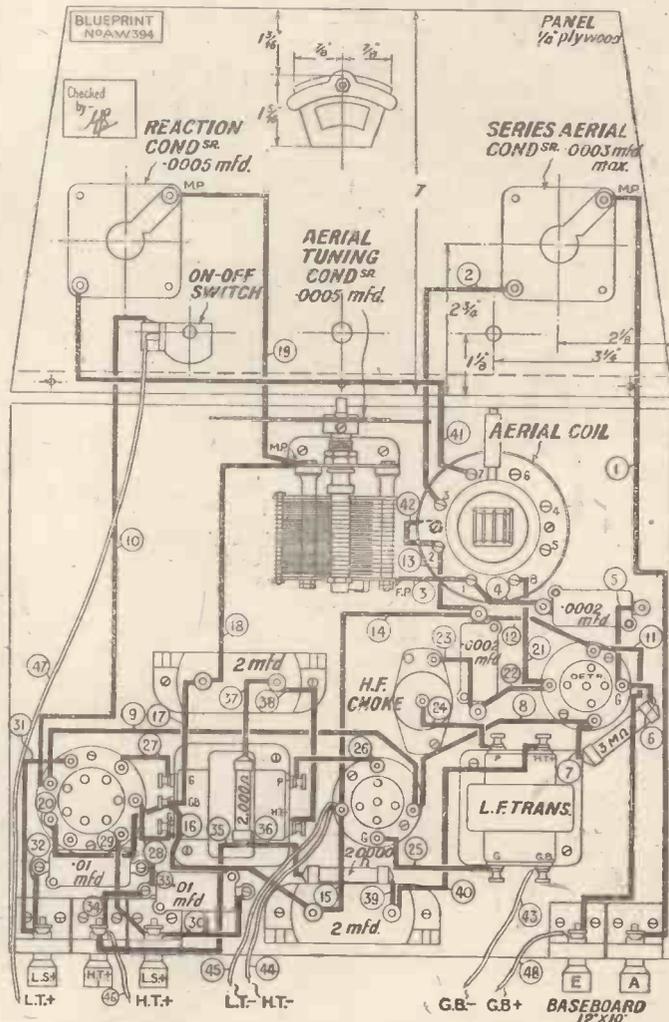
The theoretical circuit of the "New Favourite Three" shown here is, as you can see, devoid of any complications. The latest "Favourite" is just as simple a set to build as any of the foregoing "Favourites."

SIMPLE WIRING

The introduction of the iron-core coil has cut out all constructional difficulties in the detector stage. The driver valve of the class-B arrangement is no more difficult to wire up than any ordinary transformer-coupled L.F. valve and the class-B output valve, although using one of the new seven-pin bases is no more difficult to set up or work than a pentode. In fact, the arrangement is very similar for tone correction is provided in the anode circuit.

This week we give a full list of the components needed to build the new "Favourite" and from this you will, if you are the owner of one of the previous "Favourite Threes," be able to see what additional parts are needed to bring your set up to date.

Even though certain radical alterations have been made in the tuning and output



The wiring diagram shown here is a reproduction of the blueprint which has been specially prepared for the "Britain's Favourite Three." Copies of the full-size blueprint can be obtained, price one shilling, post free. Ask for print No. 394

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Don't Forget to Say That You Saw it in "A.W."

OUR BROADCAST CRITIC

A CLEVER PRODUCTION

IT was quite an original idea on the part of Lance Sieveking and Robert Chignell to produce a dramatic version of part of Jonathan Swift's immortal *Gulliver's Travels*. I have heard various accounts of it, but I hold to my own opinion that it was highly successful. The Lilliputians squeaked so high, though, that I could hardly follow their arguments, and Gulliver bellowed so loudly that I was forced to sit with my hand on the volume-control to turn him down and them up. Otherwise I think it would be unjust to complain, for it was a clever little production.

The satire of Dean Swift hardly signifies now, and perhaps much of it went for nothing, but the general atmosphere of the production was so unusual that if a few points were missed here and there it was not a serious matter. I have always had a healthy respect for Dean Swift. He was an amusing old fellow. Did you ever read what he wrote about Handel and Bononcini, just at the height of their quarrel, when London was divided in opinion regarding them? It is worth quoting.

"Some say that Signor Bononcini
Compared to Handel is a ninny;
Others say that to him, Handel
Is not fit to hold a candle;
Strange such difference should be
'Twi' Tweedledum and Tweedledee."

The next time Handel passed Swift in the Strand after that he cut him dead!

I listened carefully to Billy Cotton and His Band because I have been censured for not kneeling at the sacred shrine of these dance-band leaders. I liked him immensely, but failed to find anything sufficiently outstanding to justify my saying so here. For example, he played "Somebody's Stole My Gal." Other dance-band leaders have had their gals stole, but with no better effect—or worse.

The same thing regarding Percival Mackey and His Band. Very nice, jolly, rhythmical—anything you please; but no better (or worse) than Duke Ellington, Roy Fox, Henry Hall, and others whose names escape me. These people are doing a splendid work in providing us with an hour of varied entertainment, but it is ridiculous to pretend that they should be singled out for special notices every time they broadcast—or even the first time. It is putting the emphasis in the wrong place.

I liked the New London Trio playing Mozart. That is what I call *smart* Mozart.

May Busby's singing of Strauss gave me considerable pleasure. Not every soprano



LESLIE WOODGATE

can sing Strauss, who requires more thought than most song-writers.

Tommy Handley not so funny, as usual, was he? Now, Tommy, pull yourself together. I don't envy you a little bit, but you must be funny.

Phyllis Scott and John Rorke sang well together. A hint for next time, though. *A trifle slower*. Some of their words got mixed up in the gearing tackle.

New to me: Edwin Styles. Patter in the best style. More of him, please.

A word of praise for Victor Hely-Hutchinson's playing of Beethoven in the Foundations this week. I heard that *A flat Major Sonata*. I thought the speed every bit quick enough, but it certainly suited some of the variations.

Not being able to get to Lord's for the West Indies Test Match, I thought I would try Mr. Howard Marshall's account instead. I thought it very well done, and entirely free from the silly and extravagant expressions generally appearing in newspaper accounts. I can hardly ever read about a cricket match without a feeling of irritation. Mr. Marshall was direct and simple in expression. I enjoyed him for that reason.

PROGRAMME POINTERS

Thought-association plays a great part in our appreciation of wireless programmes. When we hear a cinema-organ we do not expect to hear anything in the nature of resonance or echo. When we hear a church or concert organ we do. I believe I am right in suggesting that one of the disappointing things about the new organ at Broadcasting House is that it sounds a little "dead." Would it not be a good plan to experiment with the echo-room when the organ is being broadcast? Too much echo would prove confusing to the listener, but, judiciously treated, a "spot" of echo might add dignity to the transmission of what is a dignified instrument. The more sonorous an organ sounds the more real it sounds. Purely by thought-association with large and echoing buildings, of course; even so, I suggest it is worth trying.

I heard the first few minutes of Mr. Rawnsley-Gurd's running commentary on the first official speedway test at Wembley. The subject does not interest me in the least, and I had no intention at the time of including any review of the commentary here. A friend, however, who is something of an expert, told me it was very well done. In that case, then, a word of commendation may not be out of place.

The show called "Cabaret, or the Mystery of the Blue Dragon," suffered from its music. I do not mean the music was bad in itself, but there was too much of it. Obviously padding. The production began as though it meant to be a cabaret show and nothing else. Had I not noticed the subtitle I should have switched off. When, at last, the real plot began to be revealed, I found some interest in listening, but was none too pleased when it all broke off for fifteen minutes for more cabaret. What I liked was the originality of using the string of a double-bass as a catapult for a poisoned dart. The members of the B.B.C. Orchestra might practise the device. Handy for the ultra-modernists.

Much as I admire Flotsam and Jetsam, I am going to tell them I was disappointed with their third "hour." "Theirs wasn't such a nice hour as usual, theirs wasn't," because they tried a highbrow effect in it, which did not come off. Now, look here, you two; there must be no more songs with poor lyrics, and please keep right away from the serious side. No good imitating the Miscellanies, you know!

Olive Groves made a hit at Llandudno. The orchestra, by the way, has vastly improved since I knew it twenty-five years ago. Another relay would not be amiss.

Shakespeare once wrote a lyric called "Hark, Hark, the Lark." Schubert set it to music. Liszt arranged it as a showy sort of piano solo. Elsie Horne arranged Liszt's transcription for two pianos, and Ethel Bartlett and Rae Robertson played it in that form in their Sunday afternoon recital. I enjoyed it. I think both Shakespeare and Schubert would have enjoyed it, too.

John Morel sang difficult music with an ease that pleased me. Slightly under pitch in one or two places when taking soft notes. Perhaps he would like to know this? Easily remedied.

WHITAKER-WILSON.

“GETTING THE SHORT WAVES ON A MAINS SET” (Continued from page 53)

Catkin valves. Both are of the MS4B screen-grid type. Owing to their very low inter-electrode capacity and exceptionally good screening, they proved ideal for the job in hand.

The practical layout of the unit can be seen quite clearly, we think, from the photographs. On top of the metal chassis are two screened Wearite high-frequency chokes with pigtailed. By using these chokes we save two connecting wires, because these pigtailed go straight to the top terminals of the screen-grid valves.

The whole of the power pack is on the top of the chassis, but the rest of the important unit components—except the valves, of course—are underneath. Even the valve holders are virtually underneath, their connections all being below the chassis.

All the fixed condensers are fitted by means of nuts and bolts to the chassis baseplate and sides. Where convenient, resistances, such as those for biasing, are connected across their bypass condensers.

ISOLATING THE AERIAL CONDENSER

One little point you must make sure of; the series aerial condenser, which is on the left-hand side of the chassis looking from the front, must be isolated from the metal. We strongly advise the Stratton condenser shown, as it is as free from losses as possible—rather important in the aerial circuit, we assure you.

The wiring is simple enough, but you must use good quality sleeving, and when you drill the chassis to push the wire and sleeving through, make sure there are no sharp edges,

or the sleeving may be cut and a short circuit caused.

You should wire the filament circuit with single Lewcos Lewcoflex, because it is essential to avoid filament voltage drop, which might occur with thinner wire.

To operate this unit is very simple. You should firstly tune the existing set to a little above Radio Paris, set the volume control at maximum, and, if there is a reaction control, increase it to the threshold of oscillation; then roughly gang up the unit's tuning, by tuning into any strong short-wave signal, adjusting the trimmer in conjunction with the front control knob until you obtain the maximum strength.

You ought to vary the pre-set aerial condenser until you get maximum signal strength. This gadget is also very useful in wiping out blind spots caused sometimes with long aerials.

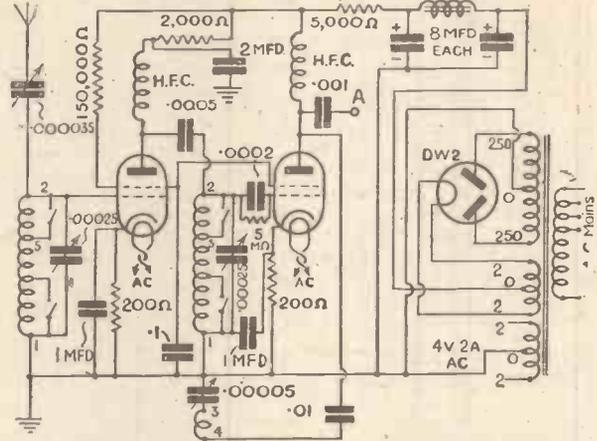
The reaction control of the unit should be advanced until you hear a “rushing” noise. Then leave this knob alone, and carry on with the main tuning control.

The wave-change switching is internal, and there are only two positions of the switch knob on the front—one position covering a waveband from 17 to 32 metres and the other from 30 to 85 metres.

You can see from the photograph that the unit can be made up very compactly, and if you wish to leave it permanently connected

near your existing set you can switch over the aerial and output wires with a double-pole change-over-switch, and thus save all trouble of going from medium and long to short waves. The unit's mains switch should be in the supply lead—it should be kept separate from the set's lead.

The Experimenters



This is the theoretical circuit of the two-stage super-het short-wave converter

British Made

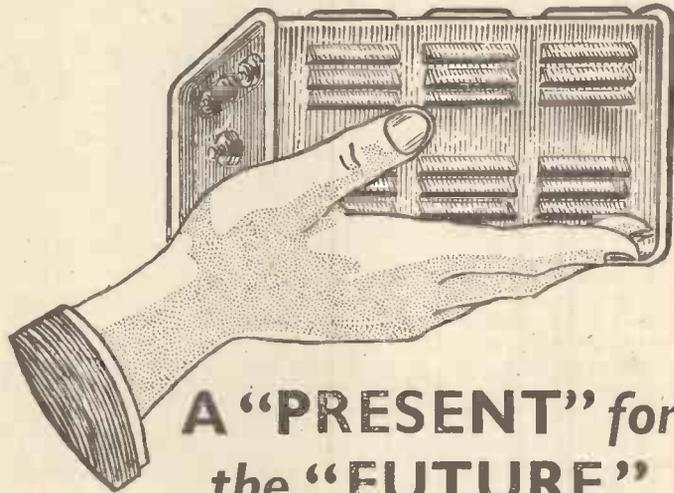


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WRITE FOR FREE CATALOGUE

Sets of the Season

Varley Four-valve Super-hot

THERE'S always something technically clever about a Varley set, as many of you must have noticed. This new super-hot four-valver lives up to that Varley tradition. It is one of the most interesting super-hets I have come across. Clever in conception, it has the indubitable merit to the set buyer of working well in practice.

I mean that it brings in a fair number of the foreigners during the daylight evenings in which most of our listening is done just now, and adds a host of alternatives when it gets dark. I was able to tune in all my favourite foreigners by 10.30 p.m., and there was still plenty of power in reserve. On the score of sensitivity this Varley set does everything you could want it to do.

Perhaps in these days we are concerned not so much with an imposing list of stations received as with a reasonable selection of programme alternatives to the fare Sir John Reith thinks we ought to like! Well, here

BRIEF SPECIFICATION

Makers: Oliver Pell Control (Varley), Ltd.

Price: 15 guineas.

Valve Combination: Super-hot four-valver, with two high-frequency pentodes, pentode output and valve rectifier for the mains.

Power Supply: A.C. mains.

Type: Table-cabinet set, with moving-coil loud-speaker.

Remarks: A super "hot" four, giving good quality.

again the Varley set under review comes up to scratch, because while some of the stations it logs are not really worth listening to for any length of time, owing to various conditions that are not the fault of the set design at all, there are innumerable foreigners that really are of programme value, such as Hilversum, Poste Parisien, Langenberg, and Fecamp, to mention three or four almost at random.

A few details will interest you. The circuit consists of a VP4 variable-mu high-frequency pentode, preceding the frequency-changer valve, which is another high-frequency pentode—an SP4—functioning as first detector and oscillator; after this comes the intermediate coil, to which is applied reaction—quite a novel idea, but one that produces amazing results in practice. Lastly we have a pentode power output valve, working into a small moving-coil loud-speaker. A Mullard DW3



rectifier feeds all the valves with high-tension juice from the A.C. mains.

These valves are framed up in the conventional metal chassis, but the layout is more compact than the average, and there seems to be plenty of room to spare when the chassis and moving-coil loud-speaker have been inserted in the walnut cabinet, which measures 13 in. wide and 11 in. deep at the base, tapering off at the top, the overall height being about 17 in., including a sunken carrying handle to make it easy to carry the complete set about the house.

Moving Escutcheon!

The front layer of the cabinet is distinctive, an outstanding feature being the tuning escutcheon, which moves bodily up and down as a wave-change switch, hiding the calibrations of whichever waveband is switched out of circuit. Very ingenious—and convenient.

The scale is well marked in stations, which will be fine and dandy until the Lucerne Plan comes into action, when I suppose new scales will be provided. Plenty of stations, in fact most of them, are marked on the medium- and long-wave sections, and these pass behind a fixed hair line, which, taken in conjunction with the very bright lighting of the scales, makes station logging a pleasure.

Three knobs do everything for you on this set. The centre one is for tuning, the left-hand one for volume, and the right is for reaction. Rather an unusual control on a super-hot, isn't it? But you must try reaction on the intermediate stage to realise what a difference it can make not only to the volume, but to the selectivity.

After Dark

For many of the stations logged after dark I did not need even a trace of reaction for signal strength, but I quickly found that by reducing the volume a little and increasing the reaction I was able to make a great difference to the station separation—a cleaner background being very patently audible.

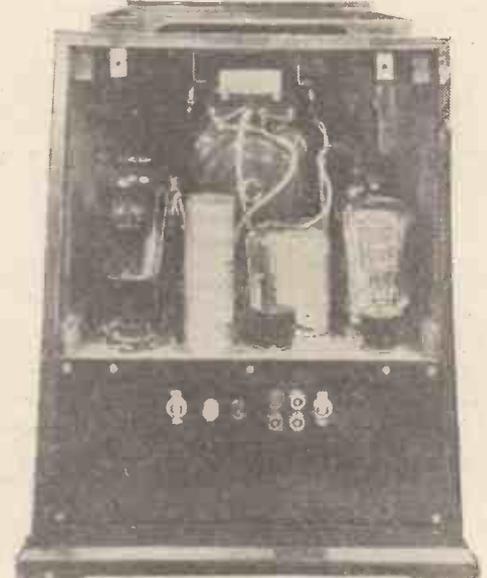
Altogether the control of this Varley super is out of the ordinary. It is rather like handling a super-sports baby car—remarkable response for what is a relatively modest power. You have a feeling that there is plenty of

power to play with all the time, which naturally is pleasant when you are touring the ether.

I must say a word about the quality. For such a small cabinet the bass-note output is really very good. Deep bass one cannot expect, but there is no artificial boom to make the musically-inclined listener unhappy. I liked the round, crisp tone of the set, which is not lost on full volume, and is still good when you cut down the London to a small output. Top notes are retained remarkably well in view of the selectivity, partly due to the tone-compensating transformer.

External Speaker Points

Sockets are provided for an external loud-speaker, and the whole design has obviously been done with a keen ear on the retention of quality, so that if you have a hefty loud-speaker you want to yoke up to a good set, here is just the set for you. By the way, there is a switch to cut out the self-contained loud-speaker if you want the external one alone.



A rear view of the Varley four-valve super-hot, which shows the very compact chassis layout and moving-coil speaker

Sockets are also fitted for a pick-up, for the aerial and earth. Talking of the aerial, I found a 60-ft. indoor wire ample to bring in all the worth-while foreigners, and the earth made practically no difference to mains hum, which on my test was not audible unless you put your head right up against the loud-speaker.

I think this is a very fine technical achievement, the selectivity and quality being above the average for a four-valver and the sensitivity quite amazing if you are not accustomed to high-frequency pentodes in action. A set of the next season, and one of its high lights, as I'll be prepared to prove in a few months' time. Meanwhile, you can buy it now!

SET TESTER.

"HOW TO MAKE A USEFUL TESTER"

(Continued from page 59)

0,000 ohms is required, adjust the potentiometer or rheostat until 12 volts is shown on the voltmeter, and by the formula it is found that when a current of 2 milliamperes shows on the milliammeter, the resistance value will be 6,000 ohms. Obtain a resistance of say 5,000 ohms, which when connected in circuit will pass a current of about 2.4 milliamperes. Scrape away with the penknife and the current passing will slowly decrease until finally the meter indicates 2 milliamperes. Then the value of the resistance is 6,000 ohms as required

This method is not applicable to the metalized type of resistance, because as mentioned previously, the outer cover of this type of resistance is composed of porcelain or some other ceramic material, and no amount of scraping would alter the resistance value!

Wire-wound resistances can be altered in a similar manner when the wire is exposed. Connect one end of the resistance to one of the terminals of the test-meter. If the wire of the resistance is soldered to two metal end caps or terminals, disconnect one end of this wire, i.e., the end not connected to the test-meter. Work out as before the values of current and voltage for the resistance value required, and then by unwinding turns from the resistance and connecting it at different points to the

other meter terminal the resistance can be lowered or decreased to any specified value.

Note however, that in this method the resistance value is decreased, and not increased as in the case of the carbon type. It will therefore be necessary to obtain a higher value than is actually required.

The test-meter can be wired as a hook-up only, or better still could be fitted into a properly made cabinet about 10 in. by 6 in., and the meters left permanently in circuit. In order not to lessen the use of the two meters separate connections can be taken from them to the panel or side of the cabinet, and they could then be used at any time entirely independently of the circuit into which they are wired.

How to Adjust Your Mirror-drum Television Receiver

Here is practical information about the setting up and adjustment of the Mirror-drum Television Receiver described in the past few issues of "A.W."

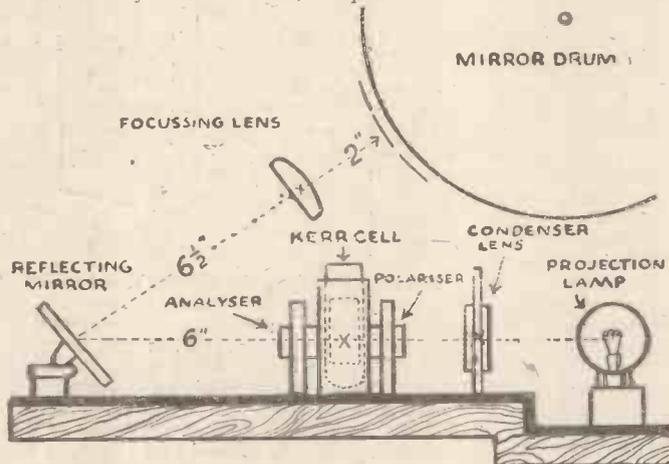


IT will be taken for granted in these instructions that the receiver has been built exactly as specified in the previous issues of "A.W."

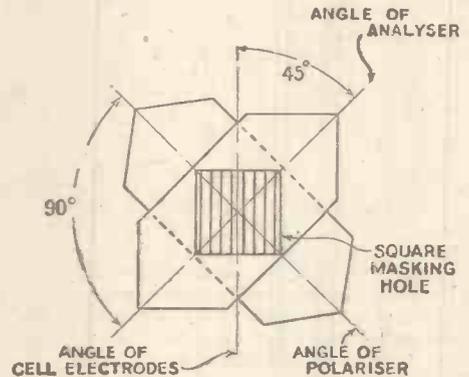
There are, of course, other methods of assembly and design and it will be up to the individual constructor to modify various pieces of apparatus to suit his own requirements or parts he has to hand. For instance, having ascertained by trial and error, the positions of

their bolts on the drum, bolt A, B, and C, likewise. Thus one side of the drum will have thirty A bolts, and the other side will have alternate B and C bolts. On each C bolt screw two nuts firmly down to the brass and on each A and B bolt screw one nut lightly down to the brass, these must be left loose as they are the adjusting nuts. Before proceeding further with the actual construction of the mirror drum a chart must be drawn for adjusting purposes. A piece of stiff white paper is obtained roughly 16 in. by 8 in. and a horizontal line A-B 6 in. long is drawn across the centre and is equally divided into thirty 1/5-in. sections numbered from 1 to 30. The line dividing sections 15 and 16 is extended to the top and bottom of the paper. This line is intersected by two lines C and D 7 in. above and below line A-B respectively. Mirror holder No. 15 is now mounted on the drum. This is the master mirror from which the others are adjusted and must be mounted parallel to the surface of the drum. To assure this, two nuts must be screwed

reflecting mirror, focusing lens and mirror No. 15 on to the chart which is placed in a vertical position at a certain distance away from the drum. This distance is determined by the following method. The chart is placed roughly 1 1/2 feet from the edge of the baseboard and the light spot is focused on to it by adjusting the reflecting mirror and focusing lens until a clearly defined spot 1/5-in. square is obtained and the chart is moved so that the



This is a schematic drawing of the optical arrangements of the mirror-drum receiver. The adjustment is described in the accompanying article



A diagram which shows the relative angle of the nicols and Kerr cell electrodes. The masking hole and the electrodes are drawn much larger in proportion to the nicols for the sake of clearness

the optical equipment and Kerr cell they could be fixed permanently in position and the wooden optical bench dispensed with. However, the optical bench and adjustable focusing lens holder allow for a fair variance in the focal length of the lenses and this is very helpful when trying out other combinations.

The focusing lens is a plano-convex achromatic with a focal length of 7 1/4 in. and it is not advisable to vary this figure by more than 1 in. either way. The size of the square masking hole is dependent upon the focal-length of this lens and with the lens specified, the aperture will be 1/16 in. square. For a longer focus lens the hole will be slightly larger and vice versa.

SETTING IT UP

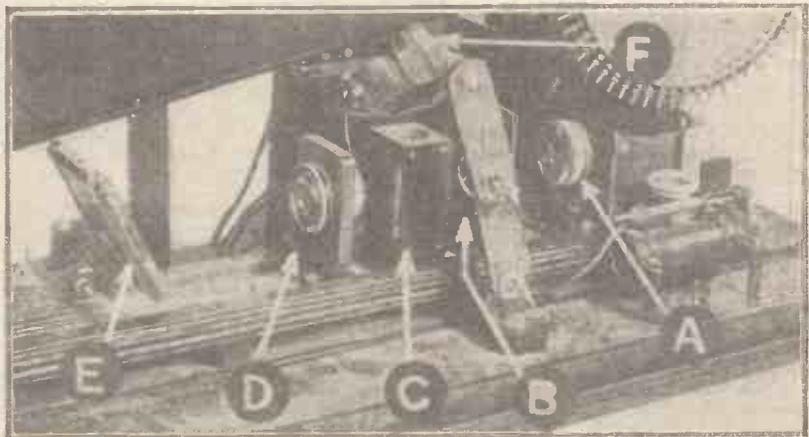
Now for details of assembly. The first step is to drill the holes in the baseboard as indicated for the mains plug, resistance lamp holders, transformer and projection lamp holder, also for the dimming resistance if used. This resistance is not essential but, as will be explained later, it is useful when making preliminary adjustments. The optical bench and motor stand are then screwed into position and the components, for which the holes have already been drilled, are affixed. The motor is then mounted on its holder and clamped into an approximate position on the stand. Next comes the mirror drum. Having attached the brass tubing and bush to the aluminium disc, the 90 6B.A. bolts must be tightly screwed into place. In order to make this description quite clear the three holes in each mirror holder will be referred to as hole A, B, and C, as in the diagram on page 68, and

down firmly on each of bolts 15A and B as well as the two already on bolt 15C. The mirror is then tightly fixed into position by three locking nuts. The other mirrors may now be placed into position and lightly screwed down.

The condenser lens, Kerr cell with its masking clip attached and reflecting mirror are slid into their approximate positions on the wooden slide as in the diagram, and the focusing lens fixed into its clip. The lamp is then switched on and the image of the filament is focused by the condenser lens through the cell and its masking hole. The mirror drum is now fixed to the motor spindle and the light passing through the mask is focused via the

spot rests by the side of the vertical line and when the drum is rotated the spot should follow the side of the vertical line from C to D.

Only two other small parts are now needed before commencing the actual adjustment of



A "close-up" of the optical system of the television receiver. A is the light condenser lens, B and D the nicol prisms, C the Kerr cell holder, E the reflecting mirror and F the focusing lens

the drum viz. a small 6 B.A. spanner and a short length, 2 or 3 in., of 1/8-in. diameter metal rod. The rod is now interposed between one of the pole pieces of the synchronising coils and one of the synchronising wheel teeth as in the diagram.

The synchronising wheel is then rotated until it is stopped by the metal rod.

Now slacken the drum on the motor spindle and with the synchronising wheel, which is fixed to the other end of the motor spindle, still held in position the drum is rotated until the spot just touches line D. The drum is then rotated one-thirtieth of a complete revolution so that the spot moves in the direction of line C. One-thirtieth of a revolution, or $12\frac{1}{2}$ degrees, is obtained by removing the stopping rod and interposing it between the next tooth on the synchronising wheel. If the chart is at the correct distance from the drum the spot should stop exactly on line C. If it stops above the line, the chart is too far away and if it stops below the line, the chart is too near to the drum.

When the correct distance has been determined, the drum must be again slackened and

the spot is below the line, the nut under the mirror holder must be undone until it pushes the holder from underneath and so adjusts the spot. Having adjusted the spot on the

Owing to pressure on our space we have been compelled to hold over the description of an amplifier for use with the mirror drum receiver. Any good quality amplifier of suitable output can be used, but a description will be given next week of the special amplifier used by the designers of the television receiver.

line it must now be adjusted to its appropriate section by nuts on bolt A. This procedure is continued throughout until all 30 spots are in their respective sections on the chart. It is necessary to revert to spot 15 at regular intervals during the adjustment to see that the drum and chart are still in position.

For those not incorporating the synchronising gear some other means of obtaining one-thirtieth of a turn will, of course, be necessary. A good method is to make thirty fine equally-spaced nicks round the edge of the drum. Unless they are very accurately spaced distortion will occur in the picture. A pointer must be fixed to the baseboard in such a position as to coincide with each nick in turn as the

drum is rotated. The drum is then adjusted as already described, but instead of stopping the drum with the teeth of the synchronising wheel, the appropriate nick must be made to coincide with the pointer.

Having adjusted the drum it should, be revolved at a fair speed so that the field of scansion on the chart may be examined. If the drum has been correctly adjusted for vertical scanning, no very bright or dark lines should be apparent. Faint lines between each spot are tolerable and are not noticeable when looking at an image. If bright or dark lines are discernible they will be due to overlapping or underlapping of the spots. This must be corrected by the adjustment of nut A on the offending mirrors.

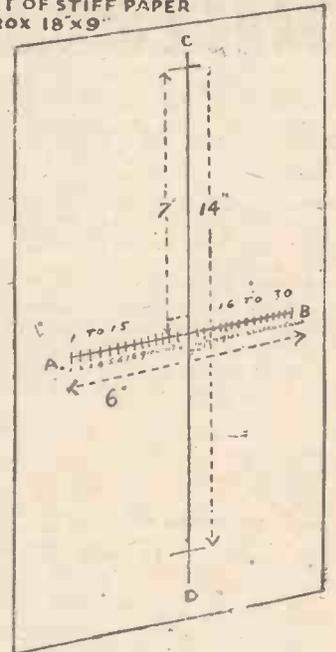
KERR CELL POSITION

The rest of the optical equipment as shown in the diagram must now be positioned. In

order to do this the Kerr cell and reflecting mirror must be removed, but before doing so mark their respective places as their original positions must be adhered to.

It should be explained here that the nicols

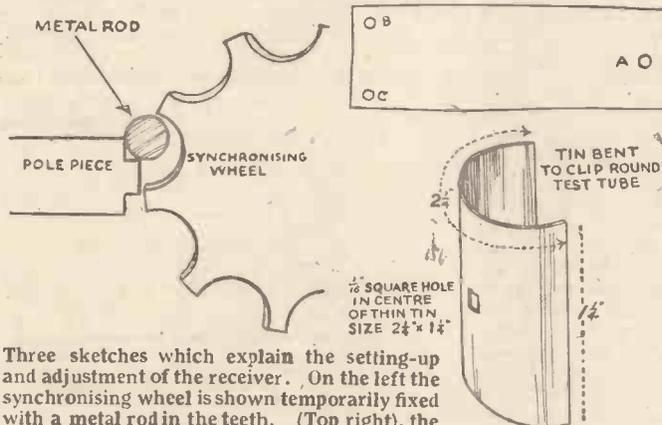
SHEET OF STIFF PAPER APPROX 18" X 9"



Here are details of the chart which enables you to adjust the mirror drum

both have identical properties and may be inter-changed. If they differ in size the larger should be used as the polariser. The plane of polarisation of the polariser should be at an angle of 45-degrees to the electrodes of the Kerr cell. Having switched on the light, the analyser should then be rotated until no light passes; its plane of polarisation will then be 45-degrees to the Kerr cell electrodes.

To ascertain that the focusing of the filament has been carried out correctly, the reflecting mirror should be removed, the lamp dimmed and the analyser rotated so the maximum amount of light passes. By looking through the analyser to the Kerr cell, the image of the filament should be found to coincide with the electrode space in the cell. The light must now be turned full on and the analyser rotated so that no light passes. On connecting the Kerr cell to the radio receiver, light will be found to pass through the analyser, if the applied potential is modulated the light will vary according to the modulation and will perceptibly brighten on loud passages.



Three sketches which explain the setting-up and adjustment of the receiver. On the left the synchronising wheel is shown temporarily fixed with a metal rod in the teeth. (Top right), the three bolt holes in the mirror holder, and (bottom right) the Kerr cell mask.

with the synchronising wheel stopped in the last position, the drum must be rotated until spot 15 rests in its appropriate section on line A-B, i.e., with the base of the spot exactly coinciding with line A-B and its sides just touching the vertical lines of the section. The spot should be therefore $1/5$ in. square.

Now tighten the drum and remove the stopping rod and interpose it between the next tooth above, then turn the drum in an anti-clockwise direction (looking at it from the motor side) until it is stopped by the rod. Number 16 mirror must now be put into position and a nut screwed on each of the three bolts, nut C being screwed down firmly and nuts A and B left loose. It will be found that the spot is somewhere on the chart, and the mirror must be so adjusted that the spot rests on line A-B exactly in the space marked 16. If the spot is above the line nut B must be tightened until the spot rests on the line. If

ALREADY many keen wireless fans who own cars have taken advantage of our data on fitting up wireless so that programmes can be heard while the car is in motion. We have been helping a friend of ours (writes "The Experimenters") who wished to have the fun of car radio with the minimum of expense. We had to make a few variations in our original layout, but we did not have to alter the set very much.

We found that the accumulator was somewhat old, and the voltage was anything but constant. This meant that, short of installing a barretter resistance, the valves would be under- and over-run alternately. We therefore put in two-volt battery valves with a two-volt non-spillable accumulator, enlarging the high-tension battery box to both.

The set we put on the running board, close to the front wing and a piece of extension cable connected the set through the body of the car to the control unit on the steering

RADIO on the CAR

column. Apart from this, the layout followed our published ideas for a two-seater—the aerial being Pix adhesive fixed behind the back of the set, and the loud-speaker being located in the dickey seat as suggested, with the sound percolating through the upholstery.

We took the car into the country—actually the Weston Hills, in Hertfordshire, where we parked in a field and did some testing. The receiver worked very well, and we got London Regional and National stations, Midland Regional and North Regional, all without touching the volume control.

We left the radio going, climbed into the car, but—oh, the crackles! And the engine not even turning over! We hastily checked over the set for bad contacts, but couldn't find

any. Finally we tracked down the noise to the springs in the seat. One spring was broken, the coils of the spring touched, and set up the dickens of a row.

The aerial was too near the springs, we found. We could not put the aerial under the running board as suggested last week because there happened to be a tool box in the way. We had to use Harbro single cable and this we tied to our front spring and then went right round the car with it, using the springs of the car's chassis for anchoring. This gave good results.

Our friend was not keen on the noise-suppressing resistances—he thought they might affect his engine's performance, although we assured him it would not. He therefore made use of Lodge shielded plugs, with some 7 mm. Harbro metal cable for the plug leads. These did the job equally well. Perhaps others might do the same—especially with high-revving engines.

WHAT OUR READERS THINK

The Editor does not necessarily agree with the views expressed by readers and does not accept responsibility for the letters published. Letters cannot be published which do not bear the sender's full name and address

CRITICISING THE CRITIC!

SIR,—I regret the necessity, but I must criticise your weekly critic. I understood that the functions of a critic were to give impartial criticisms, but I notice that almost every week Mr. Whitaker-Wilson utilises his position to sneer, in a lofty disdain, at the leading artistes and exponents of "jazz and syncopation."

This week he remarks of Duke Ellington, "Is his really a famous orchestra? I suppose it is as everybody says so," etc. In other words—our Jack's the only one in step.

Whether Mr. Whitaker-Wilson likes it or not, most people prefer jazz and Duke Ellington to Bach and he must realise that the B.B.C. has not obtained five million odd yearly ten shillings by broadcasting church organs and Bach.

Everybody has his own opinion, of course, and I do not criticise Mr. Whitaker-Wilson for not liking jazz, as he terms it, but I object to his highbrow attitude in treating it as something hardly worth mentioning. Please, Mr. Whitaker-Wilson, either leave the subject alone or definitely be antagonistic towards it; do not adopt the unsatisfactory tolerant point of view.

"Hot Fan" (London, S.E.16).

IRON-CORE COILS

SIR,—I am contemplating altering my S bandpass set to include iron-core coils. What I am anxious to know is whether or not the supposed inherent selectivity of the iron-core arrangement is enough to justify my dropping the use of bandpassing and fitting only the one tuned stage. I should like to have the opinions of other readers who have tried the new coils.

H. J. K. (London, W.C.).

The "New Britain's Favourite Three," described in this issue, uses an iron-core coil in place of the bandpass system used in the 1932 "Favourite Three." It was found that the use of an iron-core coil gives wonderful selectivity and, of course, there is no ganging needed as only the one tuning circuit is used.—Ed.

SETS WITHOUT SPEAKERS

SIR,—Why is it that set manufacturers have gone crazy on the idea of fitting speakers in console sets? I have just been to a radio dealer's with the idea of getting a good set to replace my tried and tested friend which has given me good reception for the last three years. And I can't get a set of any note without an integral speaker! I don't want the speaker, for I invested in a fine energised moving-coil only three months ago. In fact, it is because of the good response of this speaker that I am searching for a new set. So you see, I don't want a speaker thrown in with my new outfit. Let's hope that at the forthcoming Show there will be more good-quality sets for use with an external speaker.

P. B. (Brighton):

CAR RADIO IS NOT DANGEROUS

SIR,—I think J. M. (Birmingham) is unduly worried over the possible danger in having his car fitted with a radio equipment. I have recently returned from America, where radio on cars is very widespread, and the experience over there certainly does not tend to show that there is the slightest additional risk of an accident on account of the installation.

The essential point missed by those who have never had a radio on a car is that the

music, or even a talk, forms a background accompaniment to the hundred-and-one noises incident to travelling on the road. It is far less likely, when you come to think of it, for an even background noise to distract your attention than, say, a sudden blare on a nearby car's horn or someone suddenly calling out from a passenger seat in the car.

At first the police in America were rather down on car radio, but they have now been convincingly converted to the idea that a radio installation does not in any way distract the driver's attention. Indeed, on the "busses," as they call their lorries, radio helps to keep the night-time drivers awake, when in the ordinary way, without a wireless set, there is often a danger of falling asleep.

J. S. (Barnes).

TOWARDS TELEVISION PROGRESS

SIR,—I am very interested in your detailed information on building a television receiver on the mirror-drum system, but, as you will see from my address, I am miles outside the service area of the present B.B.C. television transmissions, and so, much as I would like to build up your machine and pioneer in this new development, I am reluctantly compelled to sit back and do nothing because there is nothing for me to receive.

R. D. (Sale, Cheshire).

The Radio Amateur Call-book gives the complete list of every amateur station in the world as well as all the high-frequency commercial, press and weather stations. It also gives a comprehensive list of short-wave broadcasting stations, international prefixes and abbreviations. This is the only book of its kind and at 6s. is excellent value. It can be obtained from Mr. F. T. Carter, Gleneagle Mansions, London, S.W.16.

There is always a big demand for back numbers of "A.W."; so much so that we ourselves are out of print of certain numbers! In order to complete library files we are very anxious to obtain four copies of "A.W." for July 30, 1932. If any readers have spare copies of this issue we should be glad if they would get in touch with the Publishing Department, 58-61 Fetter Lane, London, E.C.4.

INFORMATION BUREAU

Will every querist please observe the following revised rules.

Please write concisely, giving essential particulars. A fee of one shilling postal order (not stamps), a stamped, addressed envelope and the coupon on the last page must accompany all queries.

Not more than two questions should be sent at any time.

The designing of apparatus or receivers cannot be undertaken.

Slight modifications of a straightforward nature only can be made to blueprints. For more serious alterations the minimum charge is 2/6.

Blueprints supplied by us will be charged for in addition, but of course, readers may send their own blueprints for alteration.

Modifications to proprietary receivers and designs published by contemporary journals cannot be undertaken. Readers' sets and components cannot be tested by us. Queries cannot be answered by telephone or personally. Readers ordering blueprints and requiring technical information in addition should address a separate letter to the Query Department and should see that their remittance covers the price of the Blueprint and the amount of the Query fee.

We do not answer queries in cases where the fee is omitted.

Queries should be addressed to the Query Department, "Amateur Wireless," 58/61, Fetter Lane, London, E.C.4.

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BROADCASTING STATIONS

Table of Broadcasting Stations classified in order of wavelengths. Columns include Station and Call Sign, Power (Kw.), Metres, Kilo-cycles, Station and Call Sign, Power (Kw.), Kilo-cycles, Station and Call Sign, Power (Kw.).

THE final stage of the competition for the King's Prize at Bisley will be the subject of a running commentary by Captain E. H. Robinson which is to be relayed to National listeners on July 22.

Tommy Handley's tirelessness in searching around for something new which he can present to listeners is unabated. Sufficient time has elapsed, however, since the broadcasting of "Handley's Manoeuvres," "Ring-Gin-Gin," "The Disorderly Room," and other well-known Handley productions to enhance the interest in a new revue which he will contribute to the National programme on July 17 and the Regional programme of July 18.

Naima Wivstrand, the Swedish artist who broadcast from London for the first time on July 6, is staying in this country until the end of July and will appear in a television programme on July 25, when she will be seen and heard in excerpts from Leo Fall's operetta "Marie Therese."

James Coleman, of Lichfield, sings two groups of bass songs in interludes of the Birmingham Military Band concert on July 31.

The Whitby Municipal Orchestra, under the conductorship of Frank Gomez, is to provide the North Regional programme on the evening of July 22.



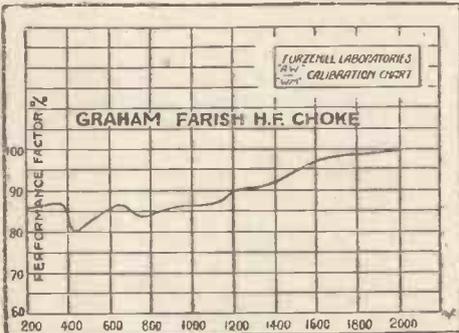
A Weekly review of New Components and Tests of Apparatus
Conducted by J. H. REYNER, B.Sc., A.M.I.E.E.

A USEFUL H.F. CHOKE

THE small screened Graham Farish H.F. Choke which we have received for test this week is a neatly made component mounted on a brown moulded bakelite base and provided with two terminals for connection. A soldering tag to facilitate earthing of the screening can is also provided.

The inductance is approximately 200,000 microhenrics, the winding being accommodated on a built-up former having three slots.

The choke was tested in accordance with our usual practice, and the performance curve is reproduced herewith. It will be seen that the performance factor varies between 85 and



This curve shows the performance factor of the Graham-Farish choke tested

90 per cent. up to 1,200 metres, after which it rises to just below 100 per cent. at 1,700 metres, remaining there up to about 2,000 metres. It is possible that the somewhat sharp dip at 450 metres may cause instability if care is not taken.

THE RADIOLAB TESTER

AN elaborate and comprehensive test set specially designed for the use of radio dealers and service engineers has just been placed on the market, the manufacturers being the Radiolab Manufacturing Co.

This test set enables receivers, valves and components of all kinds to be tested. The meter included in the tester is also available for measuring D.C. voltages and milliamperes and A.C. volts. It can also be used as a resistance tester up to 250,000 ohms.

A most useful feature of the tester is the inclusion of a small signal generator, this actually consisting of a buzzer with a tuned circuit, the wavelength being approximately 450 metres.

All types of battery or indirectly-heated valve may be tested with the exception of the new seven-pin type valve. This, however, is not a serious drawback. It is also possible to test the various valves of a receiver actually in circuit, this being accomplished by means of a valve adapter and a length of multi-way cable.

It would in fact be difficult to conceive any tests which could not be applied by means of the Radiolab tester, and the whole outfit appears to have been very carefully and thoughtfully designed. The general accuracy appears to be good and quite satisfactory for the purpose for which it is intended.

The tester is housed in a wooden case covered with leather cloth, and is about the size of a normal portable receiver. The case also has a small space at the back to enable the service man to carry such small tools as he is likely to require.

The retail price is 12 guineas complete with full instructions, and considering its universal usefulness, we consider this very reasonable.

LISSEN I.F. TRANSFORMER

A NEW I.F. transformer recently placed on the market is that made by Messrs. Lissen, Ltd. This transformer is of normal design, having tuned primary and secondary windings, the coupling between which being arranged to give band-pass characteristics, the flat portion of the curve being approximately 7 kilocycles in width. Each winding is accommodated in a built-up former, the two windings being separated by a piece of paxolin tube. The assembly is mounted on a moulded bakelite base which carries the two trimming condensers. Over the whole a metal screening can is fitted, slots being provided to allow the leads to pass through.

The transformer is tuned to 126 kilocycles, and no adjustment is provided. This being so it is necessary to keep stray capacities to a minimum, but with careful wiring this matter is not at all serious.



A new intermediate-frequency transformer by Lissen with the screen removed to show the construction

On test the transformer was satisfactory, the matching appeared to be accurate, and the transformer is well up to the standard claimed.

After an absence of six months from the Midlands and from the Midland Regional programme, Billy Merrin and his Commanders have returned to Nottingham. They will be heard in a programme of dance music, relayed from the Victoria Ballroom, on August 1. Three of the numbers to be given have not been broadcast before.

That cheery concert party, known as Tom Vernon's Royal Follies, is to be heard in the North Regional programmes on July 21.

Some famous houses of Worcestershire will be described by Arthur L. Horsburgh, F.R.I.B.A., in a talk on July 31.

The City of Bristol Police Band will give a concert, which will be relayed to West Regional listeners, on July 24.



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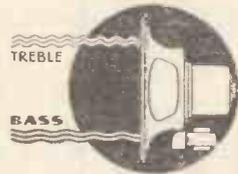
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3 H.T. FROM 2-VOLT ACCUMULATOR.—New. Sealed carton, 50/-, list, £3/15/-.—BCM/DRY2.

OUR LISTENING POST

By JAY COOTE

AS most listeners find from experience, the lower end of the long-wave band and around the channels used by Leningrad, Heston, and Croydon persistent morse signals are inclined to mar the programmes. Reference has already been made to the radio beacons sending out these transmissions, and I have no intention of labouring this subject in these columns. There is, however, a new call to be logged, namely, that of the East Goodwin Lightship. You will find it on 820 metres (365.85 kilocycles), the signal consisting of MEG (— — —) sent twice in 15½ seconds, followed after an interval by a warning dash (3 seconds), a silence lasting just over one second, and twelve dashes each of 1 second duration. This signal is emitted every six minutes in foggy weather.

The publication of the details of the new Lucerne wave plan confirms a forecast made many months ago that the Eiffel Tower programme broadcasts would be discontinued and that the station would confine its duties entirely to official transmissions. The French, I understand, fought hard to retain a second long-wave channel; and, from what I hear, Great Britain, backed by other countries, put forward very strong reasons for its refusal. In effect, I am told, the main motive underlying the protest was the possibility that Radio Luxembourg might have induced the French State to part with such a channel on the long-wave band.

France's Grouse

As it is, according to the plan, Luxembourg has been allotted 240.2 metres, but, as the Grand Duchy is among the countries who have refused to sign the agreement, it is hardly likely she will adopt it. From the criticisms culled from the radio press, France is dissatisfied with the portion of the European ether granted to her; her wireless fans, in particular, are "peevish," possibly because the Eiffel Tower was a possession of which they were inordinately proud, and even its height record, held since 1889, is being wrested from her by foreigners. Apparently as a solace, some Paris architects and engineers have put forward a scheme for the construction of a concrete tower to be twice as high as the present *Tour Eiffel*; it is, if the plan reaches maturity, to be one of the main attractions of the International Exhibition advertised to be held in the French capital in 1937. The site under consideration is the summit of the Mont Valérien, in the Meudon Hills, about six miles from Paris. An electrical beacon powerful enough to be seen in the English Channel is to be installed at the top.

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Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them FREE OF CHARGE, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radio Literature," "AMATEUR WIRELESS," 58/61 Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire. Please write your name and address in block letters.

Hivac Valves

I have just received a useful leaflet from the High Vacuum Valve Co., Ltd. Hivac valves have excellent characteristics and are really remarkable value at the price. The leaflet gives all the usual working figures.

1059

Build It Yourself!

Heyberd make a feature of mains units which you can build at home. This means quite a considerable saving in initial cost and you can get a great deal of fun out of making up your own mains unit. Write through my free catalogue service for a free copy of the latest Heyberd book on mains units and kits.

1030

Gripso Switches

I see from a newly issued folder that considerable reductions have been made in the prices of the popular Gripso patent indicating switches. Gripso also have new valve holders and self-locking tags. This will interest home constructors.

1061

New Hellesen Battery

Class B has meant a new lease of life for battery-driven receivers. It is essential, however, to use a really good battery in order to get economical working. No matter what type of set yours may be I advise you to get in touch with Hellesens, Ltd., through my free catalogue service and obtain a copy of the latest battery folder.

1062

For Seven-Pin Valves

A Clix seven-pin chassis mounting valve-holder has just been brought out to accommodate the new valves. This has the new floating socket mounting, each socket automatically aligning itself to any variation in the centres or angles of valve pins. This new holder costs only one shilling, and there is a free leaflet describing it.

1063

A Good Battery List

From Full o' Power comes a practical folder giving details of H.T. and grid-bias batteries and of sizes. The tapping points on many of these are in small steps so that they are fine for class-B or Q.P.P. working. The folder is handy to have as it gives dimensions and approximate weights as well as tapping-point details. Make your own! If you are interested in charging accumulators on a large scale then you will be interested in the Gee-Gee automatic electric distiller which provides large quantities of distilled water at practically no cost. The electric distiller plugs into the mains and is absolutely automatic.

1064
OBSERVER.

Twenty minutes Penillion singing will be given by Amy Thomas and Rhiannon James in the Welsh Interlude for Daventry National listeners on July 29.

The Western Studio Orchestra and W. R. Allen will give a programme of "Folk Music from Many Lands," on July 29.

A Charles Brewer production will be a popular Midland feature on August 2. This is a broadcasting burlesque entitled "This Radio Racket," the book and lyrics being by Godfrey M. Hayes and F. Keston Clarke, and the music by Jack Venables.

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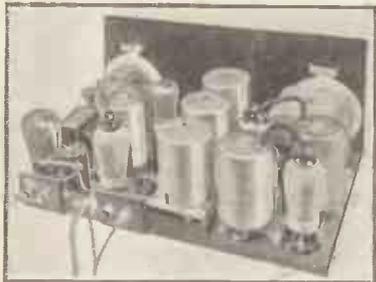
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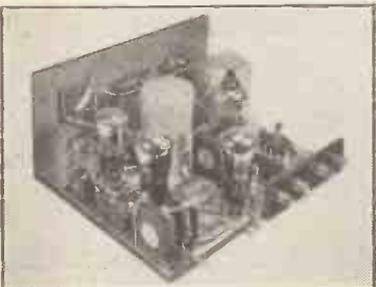
Circuit: six-valve super-het. Battery version, approximate cost, less valves, £7; A.C. version, approximate cost, less valves, £13 5s.

Port Said.

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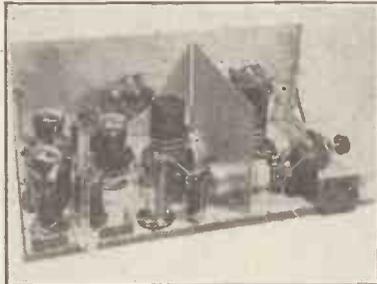
Circuit: S.G., D., R.C., Trans. (Battery). Price of set, less valves, £3 5s.; complete with valves and cabinet, £5 4s. 3d.

Paillington.

"I must write to thank you for such a good cheap four-valver as the '65s. Four.' Performance is excellent, stations rolled in, and tone, stability, and selectivity are all that one could wish for." D. G. T.

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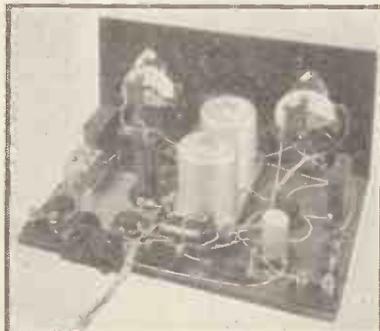
Circuit: S.G., D., R.C., Trans. (Designed by S. Rutherford Wilkins). Approximate price, less valves, £6 6s.; A.C. version, price approximately £10 10s. This is a four-valve four-wave receiver, covering wavebands from 12 to 2,000 metres without coil changing.

Edinburgh.

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THE WIZARD 3

Blueprint No. A.W. 360, price 1s.



Circuit: S.G., D., Trans. (Designed by Percy W. Harris.). A simple battery three-valver, a fine station-getter, and an ideal family set. Approximate cost, less valves, £4.

Swainsa.

"Have built up the 'Wizard' from a kit of parts, and have pleasure in giving the results I have had with this truly magical three-valver. Have already logged thirty-seven stations at good loud-speaker strength and an American station, also at loud-speaker volume. I must say that, for a three-valver, this one takes top score." D. R.

★ When ordering these full-size blueprints, send postal order, not stamps, and quote the blueprint numbers shown and not the date of the issue. Copies of "Amateur Wireless" containing descriptions of these sets can be obtained at 4d., post free. "Amateur Wireless,"
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Clarion-voice 2 (SG, D, Pen) AW371
Home Station A.C. 2 (D, Pen) AW374
B.B.C. National Two (D, Trans) AW377
Melody Ranger Two (D, Trans) AW388
Screen-grid Two (SG, Trans) WM289
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Build As You Learn SG 3 (SG, D, Trans) AW372
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Everybody's Home Radiogram (SG, D, Trans) AW381
Home-Lover's New All-electric 3 for A.C. mains (SG, D, Trans) AW383
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Class-B Three (D, Trans, class B) AW386
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Prosperity Three for Batteries (SG, D, Trans) WM296
1933 Economy S.G. Three (SG, D, Trans) WM306
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A.C. Calibrator (SG, D, Trans) WM309
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Gold Coaster (A.C. Short-waver) WM292
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Table Quad (SG, D, RC, Trans) WM303
"Words and Music" Radiogram (2SG, D, Trans) WM307
Home Short-waver (SG, D, RC, Trans) WM311
"Words and Music" Radiogram de Luxe (SG, D, RC, Q.P.P.) WM307A
Empire Short-waver (SG, D, RC, Trans) WM313
Calibrator de Luxe (SG, D, RC, Trans) WM316
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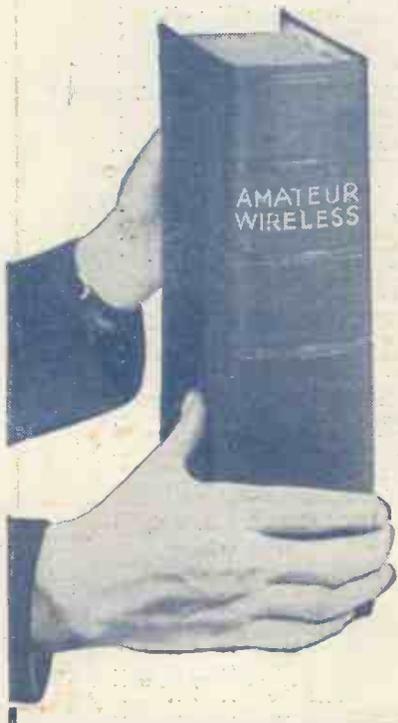
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