

S.T.500—THE SEASON'S GREATEST TRIUMPH

SEARCHLIGHT RADIO

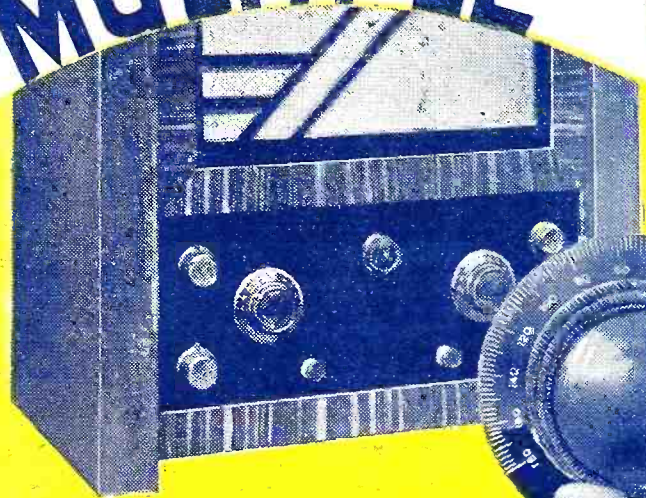
Popular Wireless

No. 598.
Vol. XXIV.
November 18th.
1933.

THE £ s. d.
OF
LOUDSPEAKER
RESULTS

EVERY WEDNESDAY PRICE 3^d

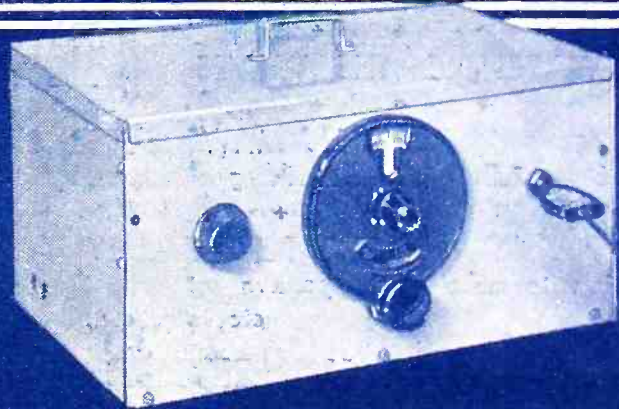
MULTIPLE CONTROLS



THE REASON
FOR
S.T. 500
SUCCESS

ALSO

AN ALL-BAND SHORT-WAVE RECEIVER



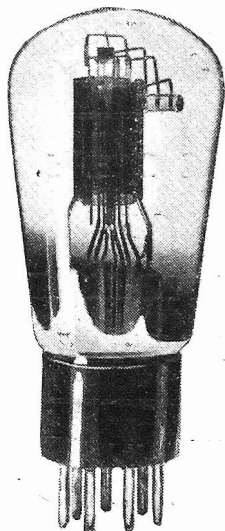
THE WORLD'S HANDIEST AERIAL

SELF ADHESIVE
BEST PICK-UP
NEATEST

A revolutionary idea in Aerials. Just unroll the tape and press it up in position around the room or up to the attic—and it sticks. One pull and it's down and leaves no mark. No danger from lightning, reduces static interference and increases selectivity. Ideal for artistic homes. Excellent pick-up for flats. Obtainable everywhere. British Pix Co. Ltd., London, S.E.1.

PIX INVISIBLE AERIAL

2/-
DOUBLE LENGTH 3/6



VALVES FOR 1934

is the title of a comprehensive survey of the latest valve developments.

THE NEW TYPES—THEIR PURPOSES—AND HOW THEY WORK are explained in a manner which everyone can follow.

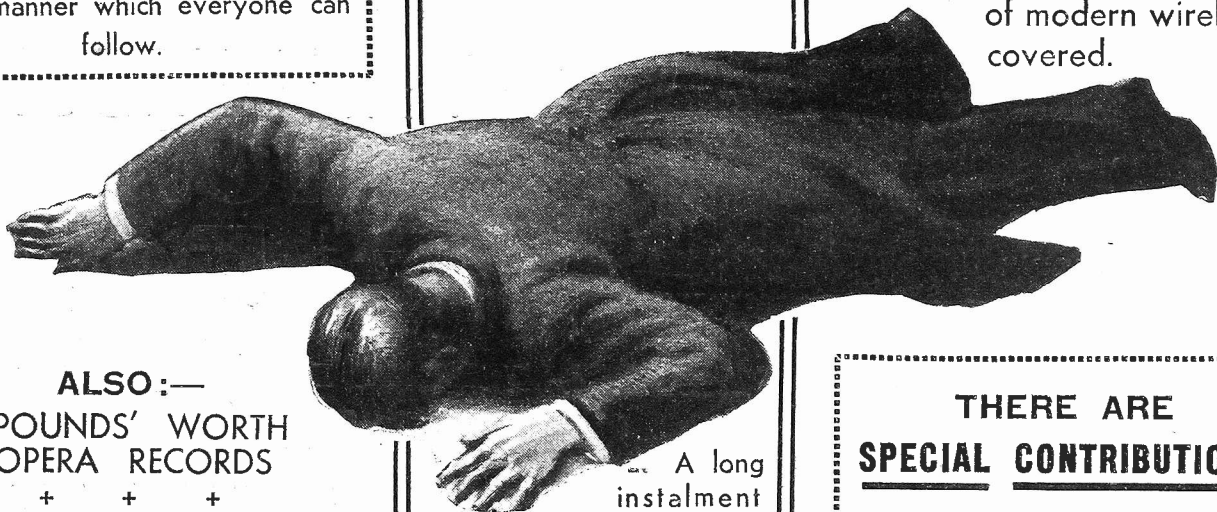
MODERN WIRELESS

FOR NOVEMBER

CONTAINS ARTICLES OF INTEREST TO YOU

DEATH AT BROADCASTING HOUSE

Britain's Leading Radio Magazine is packed with contributions on an amazing variety of radio subjects. Every aspect of modern wireless is covered.



- ALSO:—
- FIVE POUNDS' WORTH OF OPERA RECORDS
- + + +
- WHY NOT RATIONALISE RADIO?
- + + +
- RADIO LIGHT BROADCASTING
- + + +
- WATCHING THE WAVES
- + + +

A long instalment is included of our thrilling radio serial By VAL GIELGUD and HOLT MARVELL

THERE ARE SPECIAL CONTRIBUTIONS

By that distinguished designer G. P. KENDALL, B.Sc., including HOW TO GET THE LAST OUNCE FROM

- THE "M.W." SUPER FIVE
- Full details for building a powerful superhet receiver
- + + +
- THE PERMEABILITY TWO
- How to make an inexpensive set using the new permeability tuning etc., etc., etc.,

IN THE NOVEMBER NUMBER OF MODERN WIRELESS ON SALE EVERYWHERE—ONE SHILLING



DO YOU KNOW?



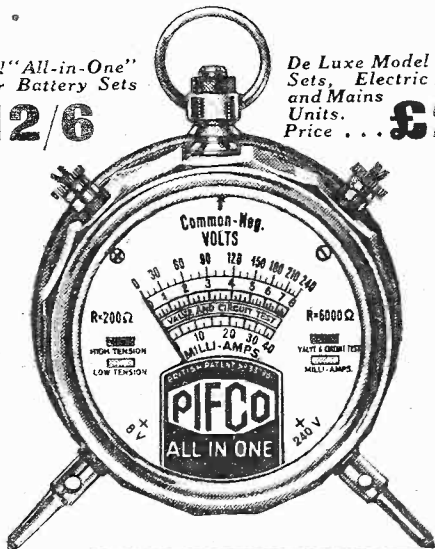
The Sherlock Holmes of Radio

- THAT** you are getting 100% service from your set? Be certain. . . .
- THAT** the loads on the valves are exactly right? Be certain. . . .
- THAT** every connection is both mechanically and electrically sound? Be certain. . . .
- THAT** both H.T. and L.T. batteries are giving full output. Be certain. . . .
- THAT** transformer windings, condensers, coils, and other components are O.K.? Be certain. . . .
- THAT** you can test every single thing and trace any fault? You can — with a PIFCO "All-in-One" Radiometer!

Get one to-day to ensure full enjoyment of your radio. Obtainable through good-class radio shops. Issued by PIFCO LTD., High Street, MANCHESTER, or 150, Charing Cross Road, London, W.C.2.

Standard Model "All-in-One" Radiometer for Battery Sets only, as shown here. Price **12/6**

De Luxe Model for Battery Sets, Electric Receivers and Mains Units. Price **£2.2.**



PIFCO ALL IN ONE RADIOMETER

© R4

If You Want a Quality S.T.500

1 Use no Output Choke
(You also Save 8/6)
See P.397 Popular Wireless, Nov. 4 1933

2 Use **ROLA**
FR6-PM-23 Class B
(As Specified) **39/6**

NOTE.

Rola make special type Class B Input Transformers because of the special requirements of Class B as to Super-High Inductance, etc. This is why nearly every British manufacturer making Class B receivers uses Rola.

USED WITH ITS OWN INPUT TRANSFORMER as above, this Speaker will give vastly superior results to any other.

EXTENSION SPEAKERS

Write for list

ROLA

The World's Finest Reproducers

THE BRITISH ROLA CO., LTD.,
Minerva Road, Park Royal, N.W.10.
Phone: Willesden 4322-3-4-5.

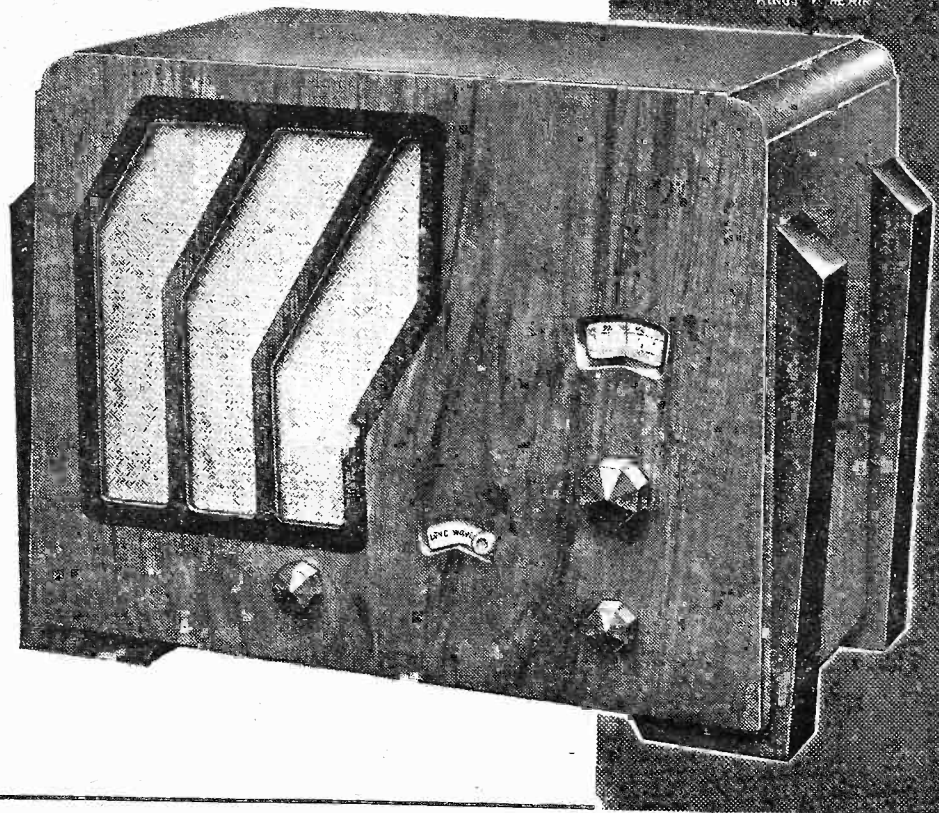
There is a correct Rola Extension Speaker for practically all British Radio Receivers. Rola speakers are used by nearly all British Radio Manufacturers. As it is highly desirable to have the speech coil impedance of the Extension Speaker similar to that of the speaker in the receiver, the necessity for using Rola Extension Speakers is manifest.

Write for List.

ROLA SPEAKERS
for better
Rola Reception



Radio de Luxe at economy price



**A.C. SUPER-HETERODYNE
SIX VALVES (Including Rectifier)
ENERGISED M.C. SPEAKER**

HERE is de luxe radio at a truly modest price—the Model 635. Most modern in conception, every refinement incorporated to ensure first class performance, in selectivity, range, tone and ease of operation it is a set for the connoisseur.

Its special super-heterodyne circuit, matched output, and latest type energised M.C. Speaker combine to give performance and reliability only associated with much more costly sets.

Enjoy every worth-while European station free of the local transmitter . . . but hear it first in your own home—your dealer will arrange it—gladly.

EVERY MODERN REFINEMENT

Receiver as illustrated, complete with six Cossor Valves, viz.: MVS/PEN (Met.) Detector, MVS/PEN (Met.) I.F. Amplifier, 41 MP. Oscillator, MSG/HA (Met.) Second Detector (Anode Bend), MP/PEN Pentode Output and 442 BU Rectifier Valves. The latest type Mains Energised Moving Coil Loudspeaker. Illuminated single dial tuning, calibrated in wavelengths (200/570 and 1,000/2,000 metres), combined volume control and on-off switch. Tone control. Handsome walnut finished cabinet 13" high, 18" wide, 11½" deep, complete with pick-up plug and socket. Mains aerial. For A.C. Mains only, 200/250 volts (adjustable), 40-100 cycles.

£14.14.0

Hire Purchase Terms: 32/6 deposit and 11 monthly payments of 26/6.

Prices do not apply in I.F.S.

COSSOR
SUPER-HETERODYNE
RECEIVER

**ALL
ELECTRIC
MODEL
635**

To A. C. COSSOR LTD., Melody Dept., Highbury Grove, London, N.5.

Please send me a copy of your photogravure catalogue of Cossor Receivers (B.2C).

Name.....

Address.....

P.W. 18/11/33.

POPULAR WIRELESS

THE FIRST AND FOREMOST RADIO WEEKLY FOR THE CONSTRUCTOR & AMATEUR EXPERIMENTER

Scientific Adviser: SIR OLIVER LODGE, F.R.S.
 Technical Editor: C. V. DOWDING, Associate I.E.E.
 Assistant Editor: P. ROBERT BIRD.

Managing Editor:
 N. F. EDWARDS.

Chief Radio Consultant: P. P. ECKERSLEY.
 Assistant Editor: A. JOHNSON-RANDALL.
 Chief of Research Dept.: K. D. ROGERS.

FIFTY YEARS AGO
 MARCONI IN AMERICA
 A GOOD BOOK
 WIRELESS IN INDIA

RADIO NOTES & NEWS

A USEFUL GIFT!
 THE PARIS RADIO SHOW
 RADIO IN THE HIMALAYAS
 A TALL STORY

Looking Ahead.

MARCONI is reported to have said in America that, in his opinion, the "sound" part of the future radio programme will be more important than the "sight" part.

Whilst I do not presume to discuss the point with the great man I really do believe that the two ought rather to be considered as complementary, their combination providing a more complete and satisfying reproduction of the show than "radio sound" alone or "silent movie" alone.

The radio play at present calls for enormous efforts of the imagination.

Early "Broadcasting."

I SEE in the "Electrician" that fifty years ago, in October, 1883, a broadcast took place. During the Leeds Musical Festival ten telephone transmitters were connected to receivers in Bradford, Dewsbury and Huddersfield, where the music was distinctly heard.

Not exactly a Regional scheme, but certainly the ancestor of the radio-relay system now in vogue. I wonder if any "P.W." reader was one of the listeners on that occasion.

Let Smethwick Flourish!

SMETHWICK has a wireless society, and its Hon. Sec. is Mr. E. Fisher, M.A., of 33, Freeth Street, Oldbury, near Birmingham. For the coming winter—if we are to have a winter—this society has arranged an attractive programme, including a special elementary class in wireless theory and practice for new members.

The weekly meetings are held at the New Talbot Inn, High Street, Smethwick, at 8 p.m. on Fridays. So many of these jolly wireless clubs meet at jolly old inns that I think that jolly old G. K. Chesterton ought to be made an Hon. V.-P. of all of 'em.

Marconi "Mixes In."

THE illustrious Marchese Marconi had a great old time during his visit to America. When David Sarnoff, of the Radio Corporation of America, was over here a few months ago he induced the Marchese to go to the U.S.A. and planned a great reception for him, ranging from a dinner in New York during "Radio Progress

Week" to a "Marconi Day" at the Chicago World's Fair.

In spite of his fame, Marconi is a man's man and—if I may be permitted to say so—a "regular fellow." He will have given those genial Americans as good a quip as he receives—and a bit over. Not for nothing is he half Irish, half Italian by blood.

THIS WEEK

Link Your Home With FIVE CONTINENTS

by Short-Wave Radio—the most fascinating branch of wireless reception!

☐ **THE ALL-BAND SHORT WAVE RECEIVER** fully described on page 513 covers all the wavelengths between 16 and 200 metres.

☐ **RADIO, STEP BY STEP** appears on page 499, and deals absorbingly with Ohms Law, Radio Terms and Power.

☐ **MULTIPLE CONTROLS—The Reason for ST 500 Success**, by John Scott-Taggart, is on page 492.

War on "Interference."

THE committee appointed by the Institution of Electrical Engineers to study electrical interference with broadcasting has accepted the report of its four sub-committees, which report shows that devices for the suppression of interference from many items of electrical plant, especially domestic appliances, could be introduced in future designs at a reasonable cost.

Further investigation on larger items of plant are necessary, and tests are being carried out by the British Electrical and Allied Industries Research Association. More power to their meters!

"Yorkshire Pudding."

I HAVE received from Mr. Leslie W. A. Baily, its compiler, "The Yorkshire Radio Book," which is packed with good stuff as surely as a Yorkshire pudding, and costs sixpence.

Mainly about broadcasting in Yorkshire, this book also contains a number of articles of use and interest to any radio amateur or "listener," and data concerning call signs, time signals, short-wave stations, European stations and the B.B.C.

Mr. Baily is the author of that recent radio play success, "The Fantastic Battle." I wish his little book fantastic sales. It is a rich mine of facts attractively and effectively set out.

Towards the Stratosphere.

BEFORE I leave book reviewing this week I must mention another volume which has given me much pleasure. "Adventure above the Clouds," by F. V. Monk and H. T. Winter, is a graphic account of man's attempts to reach great heights above the earth and study the conditions there.

From the adventures of Charles and Robert in 1783 the book goes on through a series of thrilling tales till it reaches the exploits of Professor Piccard and Flight-Lieut. Cyril F. Unwins (who holds the record for high flying in an aeroplane) and the inter-planetary with their mighty rockets.

A book to please a boy, a physicist and a radio man, or, for that matter, anyone with imagination. Be thoroughly thrilled for three and sixpence!

India Reforms.

EMPIRE broadcasting may have something to do with the improvement in the radio-licence situation in India! but I like to think that the beneficent influence of radio upon character has also played its part and reduced what Mister Ghandi called "civil disobedience."

Now, in 1932 the number of licensees was 8,557 for the whole of India, but during the first six months of 1933 there were issued 6,276 licences as compared with 4,105 for the corresponding period of last year. That's the stuff! Pay your licence fees and throw away your guns and bombs, and India will be a nation yet.

Radio and Fishing.

AFTER three months of fishing, with an Echometer aboard, the captain of the Violet and Rose wrote a very interesting article in which he recorded

(Continued on page 522.)

MULTIPLE CONTROLS

"I consider that the wireless set for the constructor is, first and foremost and every time, a musical instrument and source of real enjoyment and happiness," says John Scott-Taggart. And in the S.T.500 our distinguished contributor has unquestionably put these words into practice by placing at the disposal of the constructor a non-compromise receiver which for range, selectivity, power and quality stands unequalled by any other combination of four valves. The efficiency of Scott-Taggart designs is proved by the phenomenal success of the S.T.500 which is being built by thousands of constructors all over the country.—Have you built yours ?

NO inventor worthy of the name is ever satisfied with what he has done; he is always searching for better methods or cheaper methods or easier methods of achieving a given object. If, however, he makes the public discontented he has failed.

The "S.T.500," as presented in this journal, is a result of my being discontented with the average set design of to-day; it also represents all the improvements in technique which I consider are requisite to a set which is not merely up to date, but which will make the constructor happy in the future.

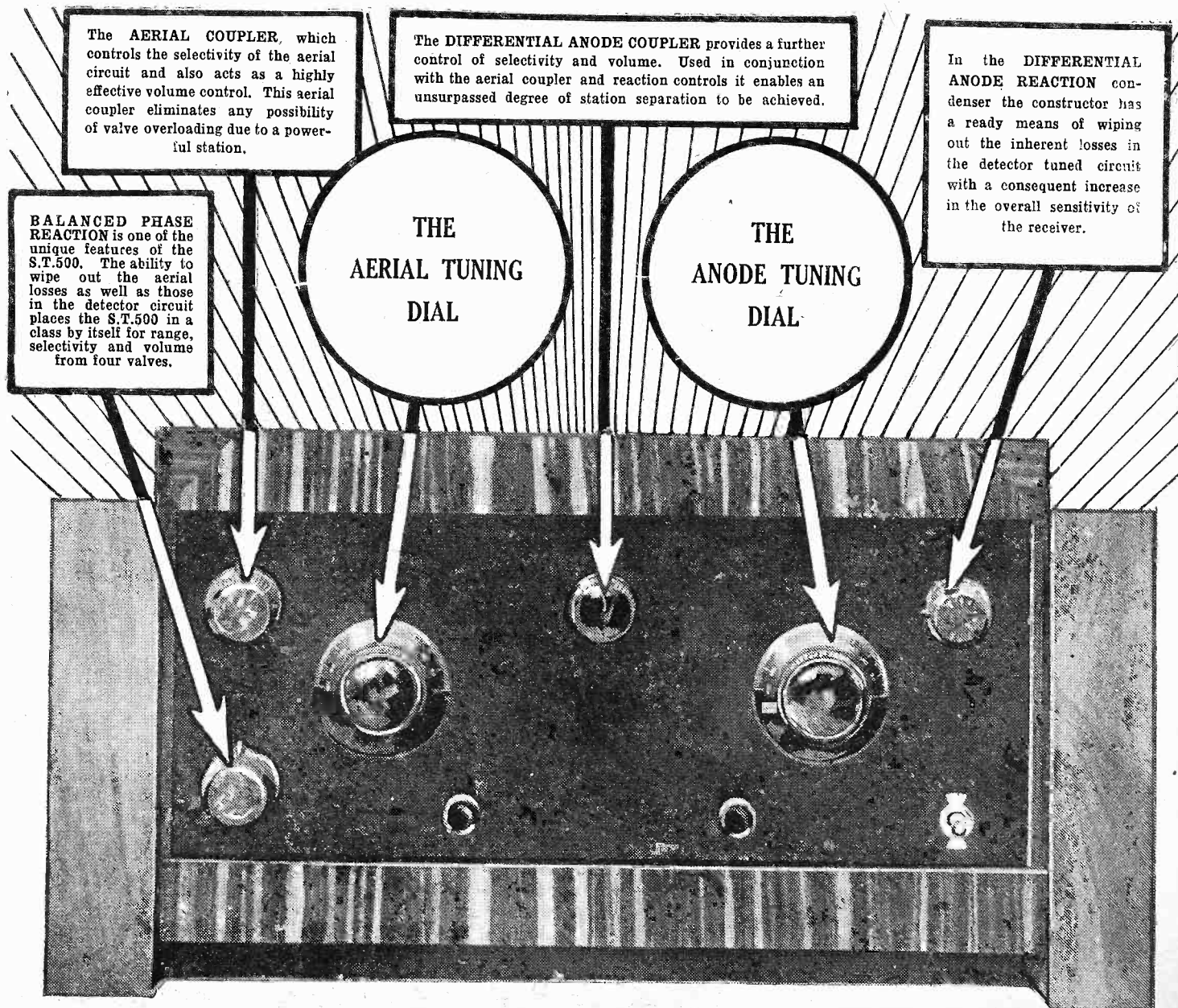
I have been criticised on the score of designing so few sets that the public is given no choice in the matter; it is said that they have to "take it or leave it." There is some truth in this. No attempt is made by me to cater for their special individual needs.

There are some constructors who will not build anything more than a two-valve set; others who want a ten-valve superheterodyne. There are others who have never been satisfied unless they had a magnificent piece of furniture in their room. Some constructors derive almost their whole joy from fiddling with a very

short wave receiver which gives plenty of fun but questionable entertainment.

There is a certain section of the public that calls out for a vague imitation of the manufacturers' type of set. There is a whole heap of people who will sacrifice almost anything for the sake of simplicity of operation.

For none of these do I cater. Nearly all of them are worth catering for, and there are competent designers to do the work. But in a set which is to have a nation-wide appeal the only considerations I am prepared to admit are Performance and Entertainment. By performance I mean



The Reason for S.T.500 Success

that the results must be obtained with maximum efficiency and with a full regard to the future; and as regards entertainment, I consider that the wireless set for the constructor is, first and foremost and every time, a musical instrument and source of real enjoyment and happiness.

Designs of Original Character.

In the case of every set I have designed I have disregarded any prejudices that constructors may already possess, in the belief that a strong case, convincingly applicated, will be given a fair hearing. I have presented technical designs of a highly controversial and original character. Hence my intention to explain and justify every line of the "S.T.500" circuit. I have explained and justified, and more than justified, every control on the panel. Although I may not provide you with an alternative choice, there is no "take-it-or-leave-it" attitude in my presentation of a new design.

It is, however, the function of a designer, in my opinion, to disregard fashionable tendencies if they cripple his progress for better results. Public taste, whether in the matter of knobs, simplicity of control, size of set, number of valves, cabinet designs, can be a hindrance and a pit into which many an able designer has fallen. In search of public approval he might be untrue to himself in order to "give the public what it wants."

The true function of a designer, however, as I conceive it, is not to drift with the tide, but to reverse it if it becomes necessary. The Duke of Plaza Toro in the Gilbert and Sullivan opera always led his men from behind; but I think that the

average wireless constructor would prefer to follow a firm, well-built road, even if it leads him into country which is new to him.

If, in the "S.T.500," I ask you to accompany me along technical and operating paths which you have not before trodden the adventure requires more than my promise that at the end of it you will receive a full reward.

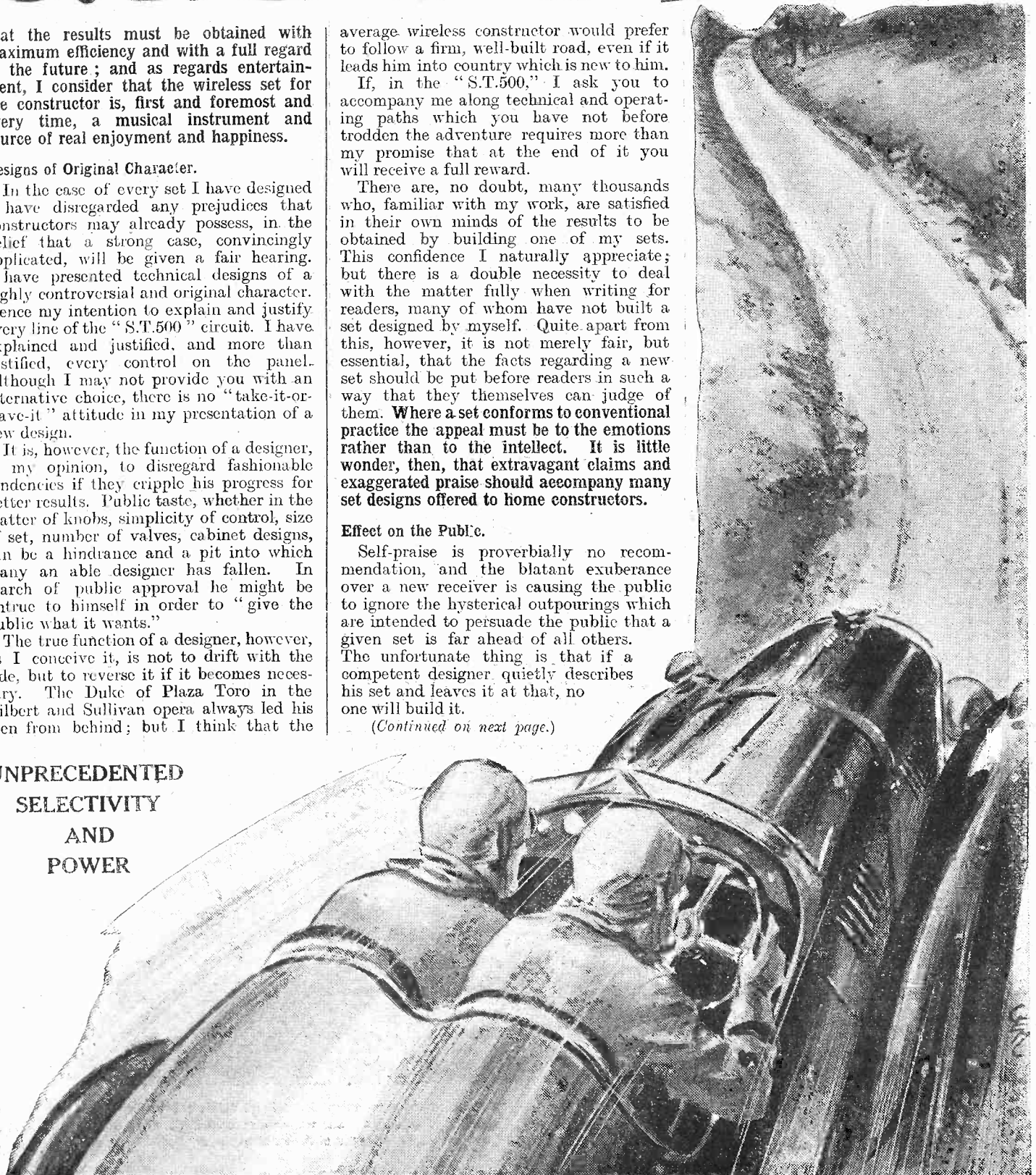
There are, no doubt, many thousands who, familiar with my work, are satisfied in their own minds of the results to be obtained by building one of my sets. This confidence I naturally appreciate; but there is a double necessity to deal with the matter fully when writing for readers, many of whom have not built a set designed by myself. Quite apart from this, however, it is not merely fair, but essential, that the facts regarding a new set should be put before readers in such a way that they themselves can judge of them. **Where a set conforms to conventional practice the appeal must be to the emotions rather than to the intellect. It is little wonder, then, that extravagant claims and exaggerated praise should accompany many set designs offered to home constructors.**

Effect on the Public.

Self-praise is proverbially no recommendation, and the blatant exuberance over a new receiver is causing the public to ignore the hysterical outpourings which are intended to persuade the public that a given set is far ahead of all others. The unfortunate thing is that if a competent designer quietly describes his set and leaves it at that, no one will build it.

(Continued on next page.)

**UNPRECEDENTED
SELECTIVITY
AND
POWER**



Multiple Controls—The Reason for S.T.500 Success (Continued from previous page.)

The public has been fed on the drug of over-praise to such an extent that it at once will notice any restraint and regard it as weakness.

My own experience leads me to believe that, although public taste is often wrong, public judgment is usually right. In other words, if both sides of a case are presented adequately and fairly the public will usually make a correct decision. Where, perhaps, I have departed most in the presentation of a new design is in stating a case and leaving the decision to the constructor.

Build It For Technical Reasons.

In offering the "S.T.500" I have no intention of paying elaborate compliments to my own design; and if I or the Editor make any general statements I suggest that they be ignored. Unless I can convince you that the set should be built for technical reasons fully discussed, then it were better that you should not build the set.

I have had literally hundreds of letters from wireless amateurs who have written expressing gratitude for having roused their flagging interest in what was once a fascinating hobby. They say that I have added life and colour to an occupation which had become stale and uninteresting.

These letters astonished me as an expression of a state of mind which I had overlooked. My object in designing multi-control receivers was simply to produce better sets for the incorporation of new

"S.T.500"—8 MILES FROM MOORSIDE EDGE.

Dear Sir,—The "S.T.500" is the finest set I've ever heard. It's great—"streets" ahead and "sights" better than any set I've heard, had or seen. Perhaps I ought to introduce myself. I'm 24 years old, but the germ bit when I was 12 years old, so you see I consider myself an "old hand."

I've had all sorts of sets—"P.W.'s" and "W. Constructor's." I've grown with them, and learnt much from the two mentioned papers.

However, I graduated and became a proud owner of the "S.T.300"—it's still a fine set. I made the "300" as soon as it was published.

The "S.T.300" did good and excellent service. Then out came "P.W." with the "500"—just what I wanted. I ordered the necessary components for converting "S.T.300" to the "500." They came dribbling in one at a time, and as I fitted each component I noted the change in quality and selectivity.

The "S.T.500" is now complete, and almost represents the millennium.

I have retained the '00004 aerial coupler, since I am very near Moorside Edge.

The set has been demonstrated to one or two wireless friends and simply astounded them. I can listen with pleasure to Zeesen with a silent background, when both Daventry and Radio Paris are kicking it out. A straight all-mains 3 v. and many other well-known makes fail hopelessly at this test in Littleborough.

Yours faithfully,

ERIC S. ALLETSEN,

29, Todmorden Road,
Littleborough, Lancs.

P.S.—The aerial reaction is a "gift from the gods"; the tone control perfect.

inventions involving some slight sacrifice as regards simplicity of operation.

The general feeling amongst the world's amateurs and enthusiasts is that radio has become too stereotyped, and that the better minds have no opportunity of getting better results. The last year has shown a renaissance in technical matters. We have had iron-core coils, new valves and Class B amplification.

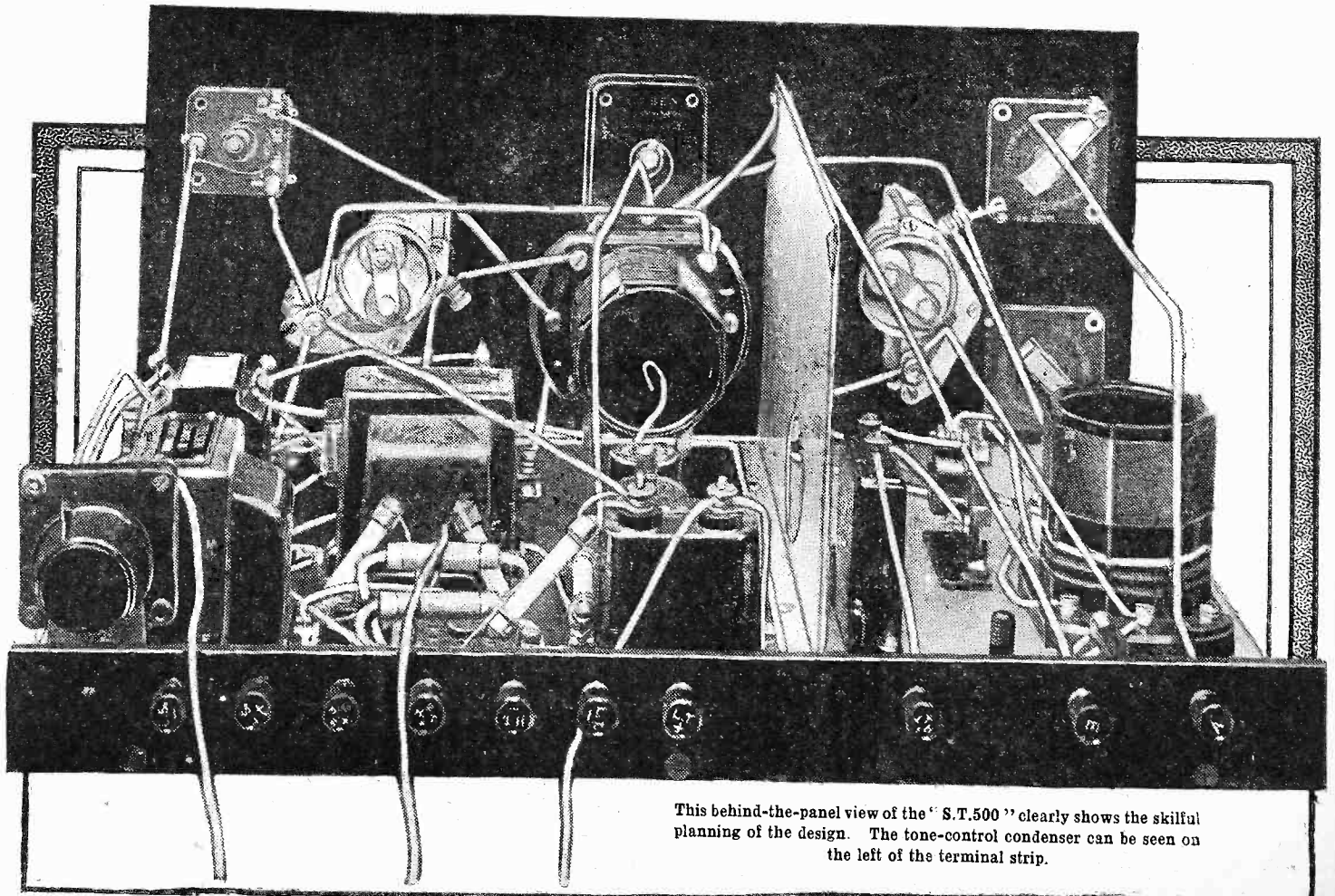
Most of the developments are of greater interest to the set manufacturer than the constructor; but Class B amplification unquestionably is a god-send to the home constructor. Once more it puts him on top. The fight between home construction and factory construction is once more "on."

Home-Construction Research.

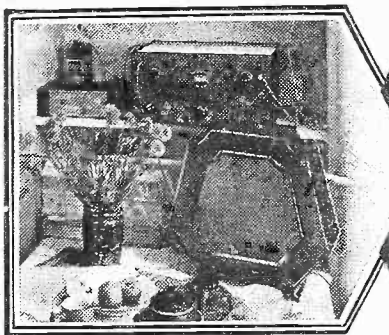
Up to 1926, when my laboratories produced the "Solodyne," the first modern screened one-knob receiver, and the "Elstree Six," the set a man could build at home was not merely a cheaper receiver than he could buy, but a better one. The highest-paid technical staff in the country was engaged in the research and design work purely on behalf of the man who made his own set.

It was at this time that I retired from radio journalistic work and confined myself purely to private professional work. But it was the introduction of the mains valve which gave such an enormous fillip to the set-manufacturing industry. The

(Continued on page 528.)



This behind-the-panel view of the "S.T.500" clearly shows the skilful planning of the design. The tone-control condenser can be seen on the left of the terminal strip.



The £.S.D. of LOUDSPEAKER RESULTS

In a previous article on this subject the difference in cost between Class A and Class B amplification was established. In this contribution the economics of loudspeaker reproduction are gone further into

By MARCUS G. SCROGGIE, B.Sc., A.M.I.E.E.

THE price of milliwatts isn't quite so easy to ascertain as the price of petrol. For one thing, when a petrol can is empty, it is empty (do you agree?) But nobody can say when a battery is empty. Strictly speaking, I suppose it is so when it gives no more current at all. But long before that stage is reached it is quite useless for running a receiver. Just when it does become useless depends on how bad you can stand your reception.

Then the price of batteries per milliwatt (over a given period of time) varies with the maker, and even more so with the size—there is a reduction for quantity!

The Average Cost.

But an average figure for the ordinary small H.T. battery is 1,000-milliwatt hours per penny. So going back to our 500-milliwatt pentode, which you remember required to be fed with 1,500 milliwatts H.T., it is easy to calculate that the running cost so far as H.T. is concerned is three-halfpence per hour.

It is rather interesting to compare this with power from the mains. A thousand-milliwatt hour is, of course, one-watt hour. And 1,000-watt hours is one-kilowatt hour. And one-kilowatt hour is nothing more or less than a Board-of-Trade unit. The price of a unit may be anything from a fraction of a penny to nearly a shilling, according to the district—a state of affairs that the public would not tolerate for a moment with bread or butter or with anything that they can understand.

But at the worst, and even admitting that in a mains-driven set a proportion of the unit is wasted in the rectifier, the case is much brighter than it is for battery drive, which by a glance at the figures above is seen to cost 1,000 pence per unit—£4 and more.

How Many Milliwatts?

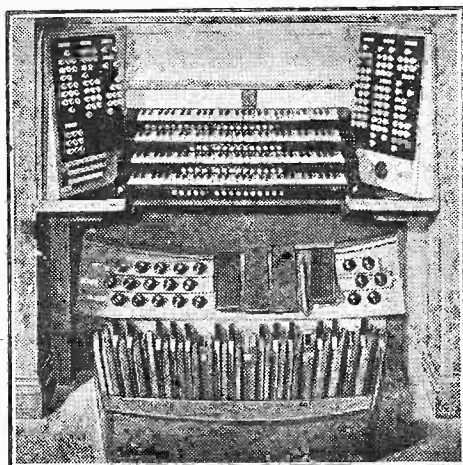
In comparison the mains user can feel happy to play about with as much power as he likes, so long as the set doesn't cost him too much to buy or make.

Having now had "the economist in the witness-box" and heard his evidence, we can take a look at some more of the circumstances that affect the power that it is necessary—or at any rate desirable—to have on tap. We have already seen that because the ear can easily get used to a considerable background of noise—just as the iris of the eye closes up when a light is shone on it—the volume from a loudspeaker seems to melt away in noisy surroundings. On the other hand, it is astonishing how easily a faint sound can be heard in a dead-

quiet room—the latter experience is so rare these days that we can easily forget it.

Then we have also seen how a "thin" type of programme, such as a piano solo, requires a very high maximum power to give a satisfactory volume without bad

A NEED FOR POWER



"It is well known in actual experience that organ music, of all things, sounds really satisfactory only when piles of watts are being expended on it."

distortion. A 500-milliwatt stage is about the least for a rather pale imitation of a piano even in favourable circumstances; 2,000 milliwatts can make nearly as much noise as a real piano (domestic model), but with enough distortion to worry a listener who likes good music; while 5-watts output is none too much with which to try to imitate the real thing. Of course, all these figures are affected by the other considerations; they are rough estimates for fairly average living-room conditions.

Plenty of Noise.

"Thick" programmes, that have plenty going on all the time, and particularly in the upper and middle registers, give a much greater impression of volume for a given power-handling capacity. This is especially so if the music is *legato* rather than *staccato* or percussion. Apparently, then, an organ would be ideal. But it is well known in actual experience that organ music, of all things, sounds really satisfactory only when piles of

watts are being expended on it. That is partly due to the fact that the original is very loud, and in fact requires thousands of watts to drive it; so a faint shadow of it is hardly likely to satisfy. But another interesting point is that, while a few milliwatts of a high note make a considerable impression on the ear, it requires *hundreds of times as many* to impress the ear with a low-pedal note.

What happens when you try to hear the pedal notes on anything less than several watts output is that, though they aren't loud enough for you to get much "kick" out of them, they create such a commotion in the last valve that the poor high notes get all rattled as well, and the result—is familiar to all.

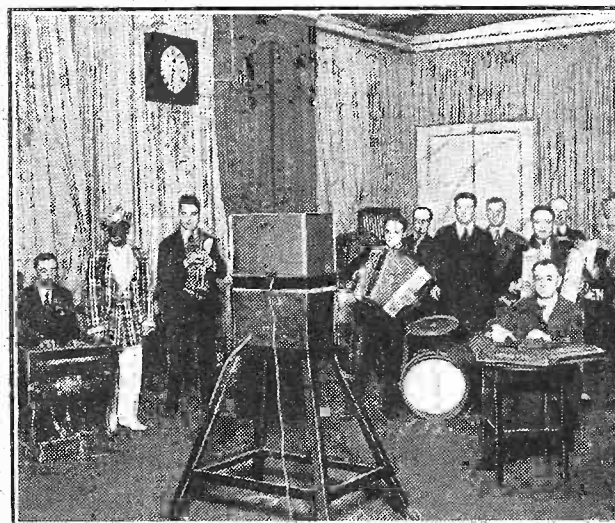
Easily Reproduced.

Speech, although of the staccato type of sound, is not much trouble, for there are no very low frequencies in it—except perhaps when Jetsam (or is it Flotsam?) is on the ether—and nobody wants to hear the human voice as loudly as Foden's Band, even although the B.B.C. apparently think we do.

The effect of the size of the room is probably quite obvious. A portable set may sound very impressive in a modern maisonette, but would fail to provide adequate entertainment in the Albert Hall. What is less obvious, but far more important in practice, is the sort of room and the sort of

(Continued on next page.)

AN IMPRESSION OF VOLUME



"'Thick' programmes, that have plenty going on all the time, and particularly in the upper and middle registers, give a much greater impression of volume for a given power-handling capacity."

THE £ s. d. OF LOUDSPEAKER RESULTS

(Continued from previous page.)

things in it. It is universally known that a feeble source of sound is capable of putting up a satisfying performance in a bathroom—look at all those who do it!

If you retort that a bathroom is a small room (usually), try your voice in an empty swimming bath. And then go, bursting with pride, into a well-draped hall of equal size and packed with fat people on plush-seats, and see if you can repeat the performance.

An Interesting Comparison.

Even professional singers who could take an audience of several thousands in their stride used to wilt away in the tiny studios of the early B.B.C. Absorption! So do not be afraid of taking your modest receiver into the stately baronial halls of your aristocratic friends, with their oak panelling (the halls' panelling) and hard, uncomfortable furniture. But beware of the rooms, even if small, that are full of things—particularly things like chairs that are good enough to sleep in, curtains, rugs, and stout, Victorianly-dressed ladies. The B.B.C., concert hall had to be fitted with special seats so that the introduction of an audience would be offset by the reduced area of upholstery exposed to the sound waves.

It is remarkable how the milliwatts seem to melt away in such surroundings, the

quality goes all dead, and in trying to bring up the volume to an adequate level the power valve is hopelessly overloaded, and you begin to look for serious faults, not suspecting the external conditions.

There is one item on our list that has not

all the resources of the output stage are of no avail unless the loudspeaker uses them to advantage. The motor engineer is rather stupid about this, too, for instead of telling us how much power can be delivered to the road wheels, he is content to give the power of the engine itself—and not often even that in terms that mean anything.

We are left to guess how much is wasted in between—gear box, clutch, differential, etc. But we do know it is nothing like 98 per cent, or the car would soon go up in flames.

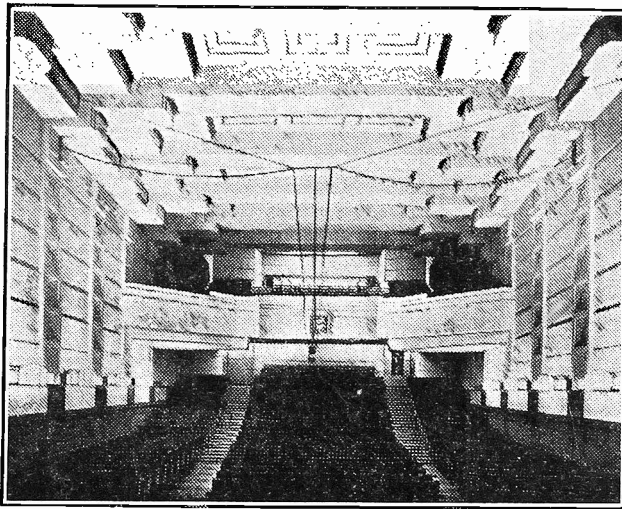
Wasted Energy.

But for every 100 milliwatts delivered by a power valve, only about 2 or thereabouts are actually used as sound. Distressing, isn't it? Clearly, if your loudspeaker is 4 per cent efficient it can make as much noise with 100 milliwatts as a 2-per-cent speaker can with 200 milliwatts. So anybody who can produce a 50-per-cent speaker to go in a small wireless set (instead of being about as big as an elephant)

is in for a prosperous time.

Of course, the matter of how effective the speaker is depends very closely on the type of programme. But, then, wireless is so beautifully complicated.

THE EFFECTS OF ABSORPTION



Just as a singer's voice appears stronger in an empty theatre than in a full one, so the apparent strength of a loudspeaker varies with the number of people in a room and the type of furnishing.

yet been considered—the loudspeaker. To be sensible, instead of talking about milliwatts we should be talking about millibars or something that states the actual amount of sound radiated by the loudspeaker. For

AT wireless stores and woodworking shops, numerous loudspeaker frets can be obtained, but have you thought of designing one for yourself? Don't let this frighten you, even if you have no knowledge of drawing and design.

Perhaps some of you have plain baffle-boards with a circular opening that would undoubtedly be improved by a decorative front. The following gives you simple instructions for making it more ornamental.

Take a square piece of card, large enough to cover the aperture of your loudspeaker, and draw lines faintly with a pencil, from corner to corner. Then, with a sharp pocket knife, cut partly through the card. Bend the card away from the cut, placing corner to corner, as illustrated in Fig. 1, A to A; then over again (B to B), and you

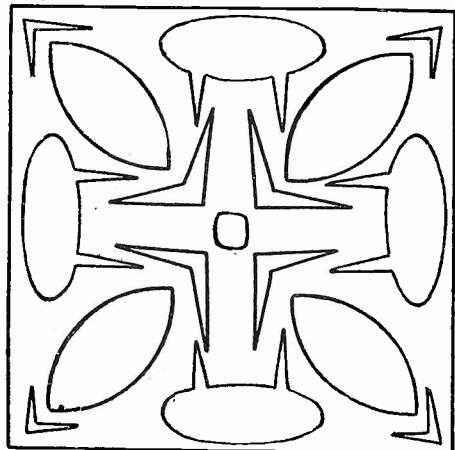


FIG. 3

When the card is opened out after the cutting, a symmetrical and attractive design will appear.

FRETS WITHOUT FRET

A simple method of designing attractive loudspeaker frets

have a triangular shape, as illustrated in the last figure of that diagram.

Draw semi-circles, triangles and points as illustrated in the second diagram, or according to your own fancy. Now cut through all the card until every pencilled section has been dealt with; and on opening your card again you will have something quite new and pleasing in fret designs (Fig. 3).

Next colour the card with oak or mahogany stain and clear varnish both sides, as

this will tend to stiffen the card. Whilst this is drying, cut out four strips of card with diagonal ends, the longest sides being about half an inch larger than the square fret. Stain and varnish these in the same manner and leave to dry.

Now tack your fret in position and with small panel pins attach the strips round the fret, making sure you make neat joints at the corners, as shown in Fig. 4. If you wish to make a more thorough job you can stretch thin silk behind the fret.

For readers who prefer to make an actual woodfret and yet are unable to design their own, the same method can be used, but thin paper must be employed. When you have cut your pattern, paste the design on your wood and, when dry, cut out.

E. A. B.

WORKING OUT A DESIGN

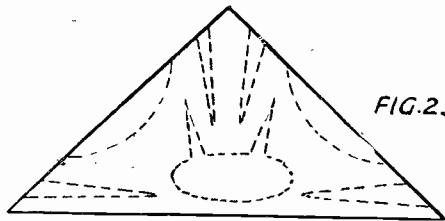


Fig. 1 (below) illustrates the method of folding the card, while (above) in Fig. 2, are shown typical cuts that could be made.

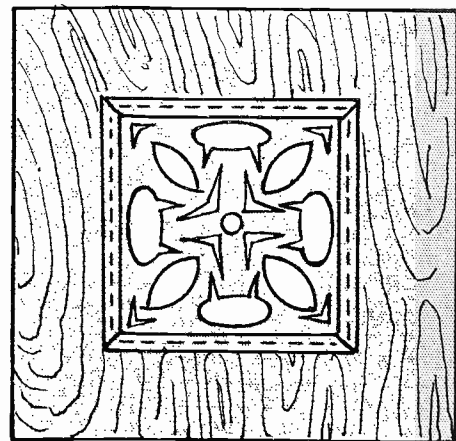
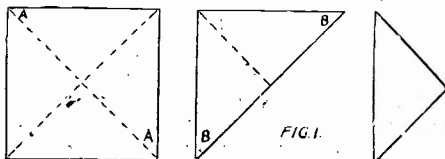


FIG. 4.

The design can be transferred to a piece of wood, which, after being suitably finished, is fixed to the baffle-board.

ECKERSLEY EXPLAINS-



PEOPLE often ask why an "earth" connection is called an earth connection when it obviously does not connect with the earth.

For instance, wireless apparatus is used to allow anyone in an aeroplane to talk to the ground stations, and hence to anyone on the ground. Nothing in the aeroplane can be connected to the earth, but the wireless apparatus still has a terminal labelled "earth."

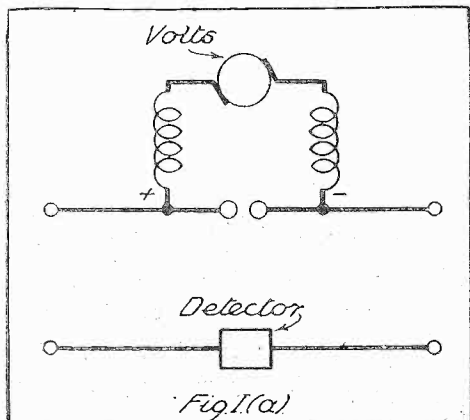
The explanation is that in the beginnings of wireless communication it was found essential for efficiency to connect to the earth. This earth connection was made by burying plates or wires in the earth itself.

The question may still remain in your mind: why is it necessary to have an earth? Well, really it isn't necessary at all. The earth only increases the efficiency of a wireless system. When Hertz first signalled without wires he used antennae which consisted of two rods symmetrically placed about the source of sending oscillations. Neither was earthed.

The Hertz Oscillator.

He showed that in order to send out waves he had to establish a difference of potential between two (transmitting) rods and then by interconnecting these suddenly by a spark make oscillatory currents flow between them. The first wireless, then, was explained as follows:

WITHOUT AN EARTH



Transmission and reception can be carried out by means of rods; two at the transmitter and two at the receiver, no earth connection whatever being employed.

Look at Fig. 1 (a). The two rods were connected to a source of (lots of) volts. If we put the process into slow motion we see that gradually one rod becomes charged positively and the other negatively. We've got lots and lots of volts, and the process continues and continues until, at last, a spark takes place between the spark balls.

This spark is a white-hot mass of flaming gas. It has only a resistance of a few ohms. The current pours through it, and the positive charge goes surging into the part which was formerly negatively charged, and vice versa. (This is as good an explanation as any other, and I won't have purists talking about electrons!)

Creating Wireless Waves.

But the swapping of charges is so enthusiastic that a moment after one rod has been positive and the other negative, then the vice-versa condition takes place, and the one which has been plus becomes minus, and the one which has been minus becomes plus.

Our Radio Consultant - in - Chief deals this week with a subject which often puzzles many listeners, namely, why "earth connections" sometimes have nothing whatever to do with the actual ground. Included in his discourse is a particularly clear explanation of how the Hertz oscillator works.

plus, because the charges surge and overshoot the equilibrium condition.

So when the spark takes place, the current oscillates up and down between the rods; there is an oscillatory discharge. This creates wireless waves in the ether.

A similar pair of (receiver) rods will be appreciably charged one way and then the next, and any "detector" placed between them can tell that these charges are taking place and that some transmitter is sending out waves.

If the length of the rods is varied, if their inductance and/or capacity is varied, the length of the wave sent out is different. If the receiving system is to be made sensitive to the waves the length of its rods must also be adjusted or the inductance and/or capacity of the receiving rods must be varied to bring them into tune with the frequency of the waves (proportional to the length of the waves) sent out.

Elementary Tuning.

The lengthening and shortening of the rods is what to-day we call tuning, and is done most simply by altering the inductance and/or capacity of the aerial. No earth is concerned in all this.

But it was found, notably by Marconi, that if, instead of two rods, one rod was done away with and the spark joined between the remaining rod and earth (i.e. some conducting thing buried in the earth), then the waves were stronger as sent out, and easier to detect when gathered in— Fig. 1 (b). The earth is not, thus, an

essential to communication, but it is helpful in certain cases.

My brother, T. L. Eckersley, showed, about 12 years ago, that you could make a very efficient transmitting system by using a screen of wires close to the earth instead of an earth. The Writtle sending station used an earth screen.

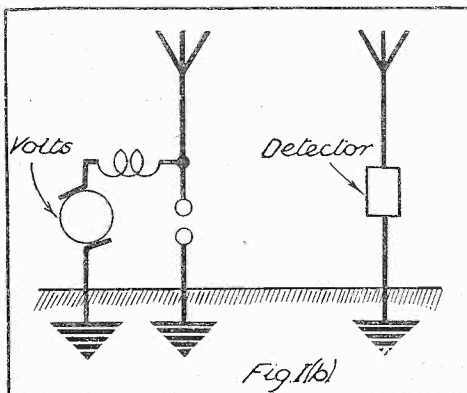
When you use wireless in an aeroplane all the metal parts look like one of Hertz's rods and the trailing aerial like the other. So we call the metal of the aeroplane the "earth." When you find that your many-valved set works just as well with or without an earth you have probably got a combination of two effects.

Effect of Capacity.

Any "earth" has resistance, and when you eliminate it there is less resistance in the system, and so it is more sensitive for this reason. But where is Hertz's other rod? Well, the currents find their way to surge up and down not directly between aerial and earth, but via the capacity of your set to earth.

A metal chassis, a main's transformer,

A MORE EFFICIENT SCHEME



The system shown here is really the same as that in Fig. 1a, but one of the rods at both the transmitter and receiver have been replaced by an earth connection.

and then the mains make quite an efficient earth for high frequencies. High-frequency currents go through a condenser easily.

The real value of an earth, a true earth, is, in some cases, to hold down the potential of earthed and earthy parts of circuits. This stops instabilities.

(Continued on page 531.)

THE MIRROR OF THE B.B.C.

By O. H. M.

U.S.A. TO HEAR THE KING

The N.B.C. and the Holy Land—Attacks on Dr. Boulton—A New Saturday Feature—Ridgeway's Return.

LAST Christmas there was some ill-feeling in the United States because the B.B.C. declined to allow the Christmas Day broadcast to be relayed outside the British Empire. This year the grievance has been met. When His Majesty gives his message from Sandringham, about 2.15 p.m. London time, every transmitting aerial in the British Empire and in the United States will be putting out his message. Both the N.B.C. and the C.B.S. are planning to clear their programmes for this occasion.

The P.M.G. on the Post Office.

Sir Kingsley Wood is down to broadcast a special talk on the Post Office at 9.20 p.m. on December 27th. I hear that he will have a good deal of new information to impart, and will deal particularly with the work which Sir Stephen Tallent is taking on.

The Bethlehem Bells Bother.

I have just heard of a kind of comedy of errors that nearly deprived British listeners of the relay of the Bethlehem bells, which is to be the special feature of the Christmas Day programme this year. Here is the secret history of the incident: About two years ago the N.B.C. originated the idea of a world broadcast of the bells of Bethlehem, and invited the B.B.C. to co-operate. The B.B.C. declined, without giving a reason, but the objection probably was based on reluctance to dramatise a sacred reminiscence.

Anyway, the N.B.C. was left to its own resources and tried last year to carry out the project for America. But the authorities in Palestine turned down the idea, possibly because the B.B.C. was not involved. This year, however, when the N.B.C. raised the project afresh, Broadcasting House accepted it with enthusiasm: so much so, indeed, that it forgot all about

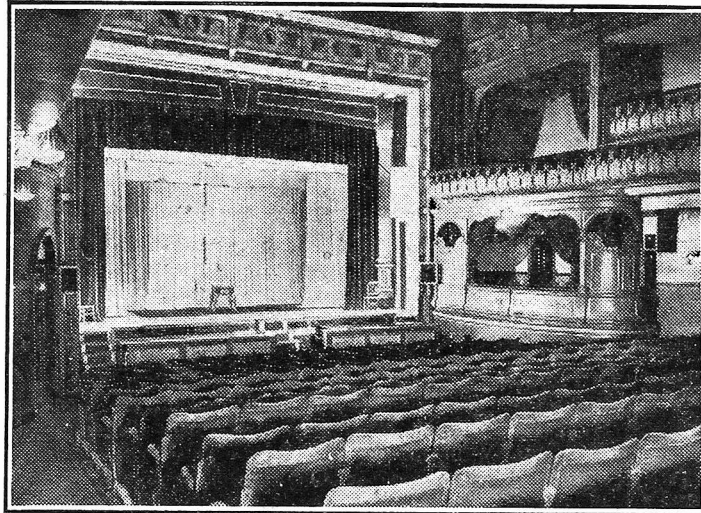
the N.B.C. and proposed at first to put the bells of Bethlehem into a special programme designed for British listeners only.

It must be said for the B.B.C. that as soon as the oversight was noted plans were changed to enable the N.B.C. not only to share credit, but also to provide the North American continent with the thrill to which their enterprise has entitled them.

Fatigue of the B.B.C. Orchestra.

There is much loose talk about the fatigue of the B.B.C. Orchestra. Part of

THE NEW STUDIO OF THE B.B.C.



The famous warehouse studio (No. 10) is to be done away with, and so the B.B.C. have leased St. George's Hall, seen above. This theatre was famous as the home of Maskelyne's Magic.

this is due to hostile propoganda from those who would like to see the B.B.C. driven out of public concerts. This effort, of course, must be opposed, if only for the reason that the standard of symphony performance in broadcasting requires

successful public performance. There is, of course, some justification for the suggestion that the B.B.C. Orchestra is hardly at the top of its form after the strain of the summer promenade season.

I believe the B.B.C. will meet this point in due course, possibly by the provision of a smaller alternative Symphony Orchestra. For the moment, however, those who gain their music from the microphone—and they are, after all, practically the bulk of the population—should not fail to recognise that "root-and-branch" attacks on Dr. Boulton and his magnificent orchestra are not justified.

"In Town To-night."

The new Saturday night programme feature which begins on November 18th, under the title of "In Town To-night," looks like being one of the most attractive things the B.B.C. has done for a long time.

Briefly, the idea is to present up-to-the-minute items of what is going on in London, such as tit-bits from new stage performances, interviews with and broadcasts by notable people who have only just arrived in town, new songs, perhaps a "surprise item"—in fact, anything which can only be arranged so late that it cannot be included in the published programmes.

Sir John Reith will be returning from his American trip towards the end of the month. He might easily come on as a "surprise item" if he has any misgivings!

"Red Tabs."

Val Gielgud's "Red Tabs" is next in the series of great plays in the Radio Drama Festival, and two broadcasts will be given to it on Friday and Saturday, December 1st (Continued on page 532.)

THE success which seems consistently to dominate the progress of Messrs. Lissen is no more than they deserve.

It must have been obvious many times in my notes that I have great admiration for any firm that has the courage to assume the rôle of pioneers in an industry which, on account of the rapidity with which fashions change, is to an extent hazardous. And Lissens, in every sense of the word, are pioneers.

Following the well-deserved success which they have achieved in other lines, they now seem to be well on the way to scoring another hit with their car-radio outfit.

It remains to be seen whether car radio

OUR POSTCARD SERVICE

Applications for trade literature mentioned in these columns can be made through "P.W." by quoting the reference number given at the end of the paragraph. Just send a postcard to G. T. Kelsey, at Tallis House, Tallis Street, E.C.4. Any literature described during the past four weeks may be applied for in this way—just quote the number or numbers.



The LINK BETWEEN

BY G.T. KELSEY

Weekly jottings of interest to buyers.

will ultimately become universally popular, but at least it is certain that Lissens will benefit tremendously from being one of the first in the field.

Personally, from my own experiences, I feel that there is quite a future for car radio, but only for certain types of installations. In this connection I am firmly convinced that Lissens are on the right track. I consider that theirs is an ideal scheme, and I shall be delighted to arrange for

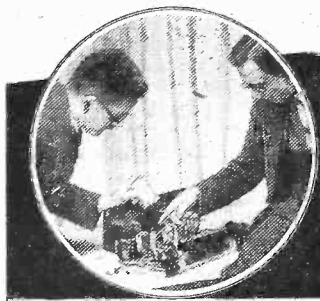
full details to be sent to any interested reader making application in the usual way through our postcard literature service. (No. 63)

No Light Matter!

Night work means "light" work—at least, it does as far as the power station is concerned. And when the current fails at two o'clock in the morning in a busy factory compelled to work night shifts in order to keep pace with "S.T.500" orders, etc., it is very definitely no light matter!

My friend Mr. Graham Farish tells me that such was the unfortunate experience one night recently in his factory at Bromley. To make matters worse, the defect was one which could not be remedied immediately, and in consequence the staff had to wend its way home in the early hours of the morning, but not before enjoying a cup of tea by candlelight. That is just typical of the interest which Mr. Graham Farish takes in his staff.

(Continued on page 532.)



RADIO STEP-BY-STEP

OUR SPECIAL SUPPLEMENT for BEGINNERS

Aerial Resistance.

IN transmission particularly this is a very vital factor. The term actually means the resistance of the aerial offered to High-Frequency Electrical Currents. It comprises (1) Dielectric Loss Resistance. This is occasioned by the setting up of voltages across insulating materials in close proximity to the aerial. In a receiving aerial there might be considerable Dielectric Loss if, for example, an insulated wire were used and this was run over the surface of a wall or roof.

(2) Ohmic Resistance of the wire. However thick the wire, it will have some ohmic resistance, for there is no such thing as a perfect conductor. This factor has no serious bearing on reception in average conditions, though when a bad contact occurs in the connection between the wire and a terminal, or there is a partial break in the wire itself, then it may interfere with reception.

CHANGING DIRECTION

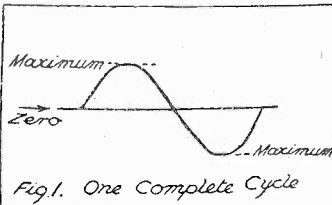


Fig. 1. One Complete Cycle

A special feature of alternating current is the fact that it fluctuates in strength as well as changes its direction. This was fully explained in last week's issue under the heading "What Is A.C.?"

(3) Radiation Resistance. This is of great concern to the transmission engineer. It is, however, a fictitious resistance. It is the resistance which would be required to absorb the same amount of power as is used in the creation of radio waves; and when this Radiation Resistance is large as compared with the Dielectric and Ohmic Resistance, the aerial is an efficient one, as a moment's thought will show.

Alternating Current.

There are two kinds of current—"Direct," which maintains its flow through the circuit in the one direction, and "Alternating," which is continually changing in direction. From zero it rises to maximum

in one direction, then falls to zero and rises to maximum in the other direction, finally to fall to zero again, after which the whole operation, or "cycle," as it is termed, is repeated. (See Figs. 1 and 2.)

The number of repetitions per second is termed the Frequency, and sometimes Perio-

and "Earth" must not be confused. The first two are for circuit connections to the radio set or domestic appliances, and "Earth" is for connecting to protective metal coverings on such devices as vacuum cleaners and so on.

This "Earth" point can also, of course, be used for a radio-

house may be 200 volts; but with a simple and inexpensive transformer the voltage can be reduced to 4 for working electric bells or to other values for other purposes.

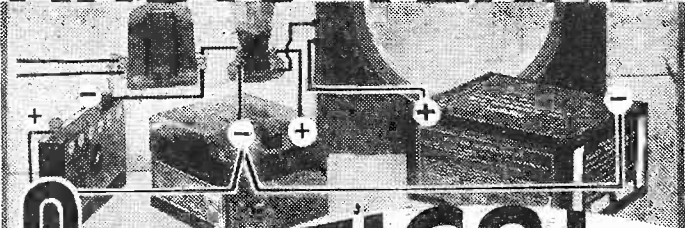
With D.C. low-voltage apparatus can be worked only by reducing the current by means of power-dissipating resistances, and that, of course, is wasteful.

A.C. can actually be stepped up in voltage by means of transformers, and this fact is taken full advantage of in radio.

However, it is frequently necessary to rectify it; in other words, to change it to D.C., as in the operation of radio valves. But this can be done after the voltage has been satisfactorily adjusted.

As Alternating Current is always changing in value, it is measured by its average or Root Mean Square value. This then gives in Amperes the current which would be required with D.C. to provide the same heating effect. The R.M.S. is approximately .707 of the peak value of the A.C.

RADIO TERMS



A PRACTICAL REVIEW

By G. V. DOWDING, Associate I.E.E.

odicity. Now, it is of practical importance to note that in an electrical supply of, say, 50 cycles the current changes its direction 100 times per second, for in each cycle there are two changes of direction.

It is a simple matter to discover whether or not a house is wired for A.C. by examining the meter. On this, usually engraved on a small brass plate, the voltage and other details of the supply appear. If there is the word "Frequency," or "Periodicity," or a small sign, ~, followed by a number, then it is certain to be A.C., and the Frequency will be denoted by the number.

Many of the wall sockets now used have three terminals generally marked "Live," "Neutral" and "Earth" (or similarly). "Neutral"

set earth connection. You will note that the socket for it is longer and of greater diameter than the mains ones. This is to ensure, first, that the wrong pin cannot be inserted in it; and, second, that the earthing connection is made before those to the mains, and broken after the mains are disconnected.

Alternating Current obeys Ohm's Law, but subject to special qualifications as compared with Direct Current. For example,

Impedance replaces Resistance, and is in part composed of Ohmic Resistance, and the Capacity and Inductance in the circuit contribute to it. (These terms will be explained in detail later on.)

The great advantage of A.C. over D.C. is that it can easily be transformed to any desired voltage. The supply to a

THE CURRENT FLOW

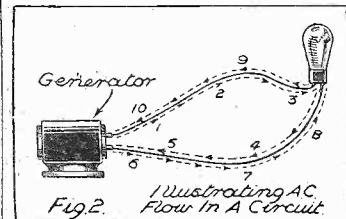


Fig. 2. Illustrating A.C. Flow in A Circuit. The arrows and numbers show how A.C. current flows to and fro in a circuit consisting of a generator and electric lamp.

Ammeter.

An instrument for measuring current in Amperes. Ammeters either work on the thermal principle (in which case the indicating movements are caused by the effect of the heating of a metal strip or wire) or are electro-magnetic in action. There are three electro-magnetic types: (1) Permanent Magnet, (2) Moving Iron, (3) Electro-Dynamotor.

(A Milliammeter is exactly the same in principle, but is designed to measure Milli-amperes, i.e. thousandths of an Ampere.)

The moving-iron type of Ammeter (or Milliammeter) is the most popular, because of its inexpensive nature. (See Fig. 3.)

(Continued on next page.)

A POPULAR TYPE

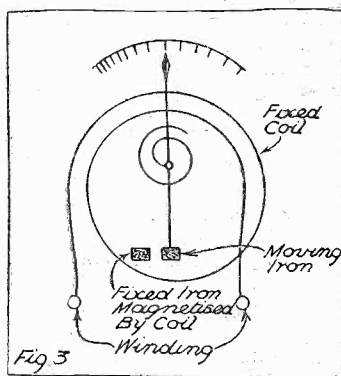


Fig. 3

One of the most popular instruments for measuring current is the moving-iron ammeter, because of its inexpensive construction.

Special Beginners' Supplement—Page 2.

LAST WEEK we described how the current flowing along a wire depends on the pressure, showing that for a given length of wire (assuming the resistance to be the same) an increase in pressure will produce an increase in current. Thus it is evident that current and pressure (voltage) are closely related. A current cannot flow unless there is a voltage to drive it.

Electrical Energy.

This brings us to the question of electrical energy. What causes an electric lamp to glow brightly when the switch is pressed? The answer is that



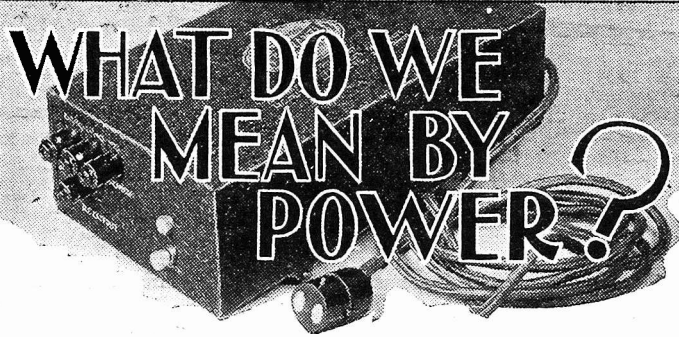
AN ANALOGY

When a man lifts a weight he is doing work, the power expended being equal to the number of lbs. lifted multiplied by the distance the weight is moved in feet and the time taken in minutes.

the energy flowing through the filament of the lamp bulb does work in overcoming the resistance (this is analogous to friction) offered by the filament (the filament is that portion of the lamp which glows and gives off light).

Released as Light.

The electrical energy, in doing work (trying to force a current through the filament), renders the filament luminous. Part of the energy is transformed into heat, and part—the greater part



—into light. The filament does not burn away because the supply of oxygen is shut off by the vacuum existing in the lamp bulb.

But the fact that work can be done by electricity flowing through a wire tells us very little unless we know something about the time taken to do the work.

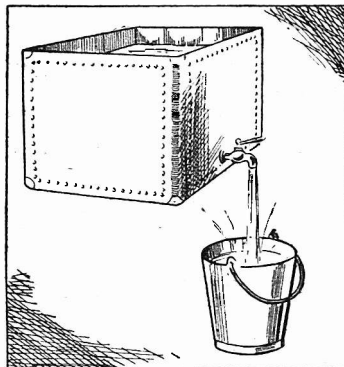
Take, for example, two men moving a heavy weight. One of them manages to lift it but does so with an effort. It takes him an appreciable time to move the weight through a distance of, say, one foot.

The other man has no such difficulty. He picks up the same weight and moves it through the same distance in a fraction of the

time taken by the first man. Obviously the second man is much stronger than the first. He is far more powerful.

Power is simply the rate of doing work.

A COMPARISON



The water-tank forms a good analogy for current flow. The amount of water passing the tap in a given time is equivalent to amperes of electricity. Power is amperes flowing multiplied by pressure or driving force (volts), and is expressed in watts.

If a man raises a weight of 100 pounds one foot into the air in one minute, he is doing work at the rate of 100-foot-pounds per minute.

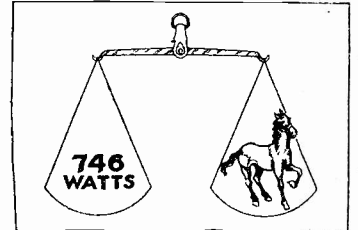
He would do the same amount of work if he were to raise twice the weight through a distance of six inches in the same time or fifty pounds through one foot in thirty seconds.

Therefore power, or rate of doing work, can be expressed in terms of foot-pounds-per-minute, i.e. weight multiplied by distance multiplied by time. But to get

things right we must adhere to our units of feet, pounds and minutes. One horse-power is equivalent to 33,000 foot-pounds-per-minute of work.

In electricity power is pressure multiplied by current, the pressure being volts and the current amperes (often called amps.). Electrical power is expressed in watts; thus 100 volts multiplied by 10 amperes is 1,000 watts.

ONE HORSE-POWER



Electrical power has its equivalent in mechanical power. One mechanical horse-power is equal to 33,000 foot-pounds of work per minute. This is the same as 746 watts of electrical power.

But to refer to thousands of watts, as would be the case when speaking of a large amount of power, is rather cumbersome, so engineers have got over this by calling 1,000 watts a kilowatt. One and a half kilowatts is simply 1,500 watts.

Volts multiplied by amperes, as you will remember from last week, takes into consideration driving force (pressure), the amount of electricity (coulombs) and time (seconds), so that mechanical and electrical power are very similar.

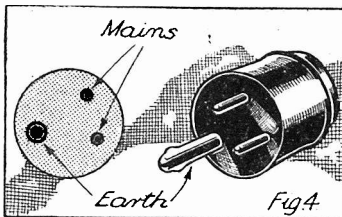
It is, in actual fact, quite easy to convert watts to horse-power because there are 746 watts in one electrical horse-power.

RADIO TERMS

(Continued from previous page.)

As the ammeter is a measurer of current, it is connected in series, so that all the current flowing in the circuit passes through it. A simple series connection is illustrated at

THREE CONNECTIONS



Some wall plugs and sockets have three connections. The one marked earth is for joining to protective metal coverings on devices such as vacuum cleaners, etc.

Fig. 5. Practical notes on the choice of Ammeters and other electrical measuring instruments will appear under the heading "Meters."

Ampere.

The practical unit of Current.

It is not a quantity measurement pure and simple, but is the unit of rate of flow, and can be compared with "gallons per second" in water engineering. Coulomb is the unit of quantity (think of this as the gallon), and one Coulomb flowing in one second equals one Ampere.

Ampere-Hour.

This is one of those convenient portmanteau terms. It is quite self-explanatory, providing you know what an Ampere is. If an accumulator is capable of providing one ampere of current for one hour (a small accumulator that would be, by the way), then that accumulator has a capacity of 1 Ampere-Hour. A 20-Ampere-Hour accumulator should be able to deliver 1 ampere for 20 hours, 1/2 ampere for 40 hours, and so on, although there are certain practical limitations which will be discussed when we come to the subject of Batteries.

The Ampere is, then, an electrical unit of quantity used for rating the capacities of accumulators.

Amplification Factor.

This indicates the maximum voltage amplification that can be given by a valve, and is the ratio of the change of anode voltage to the change of grid voltage that will provide the same anode-current change.

Supposing, for example, changing the anode volts from 100 to 110 altered the anode current from 8 to 9 milliamperes. That would be a 1-milliampere anode-current change. You then find the grid-volt change needed to result in a similar anode-current variation.

If it were 2 volts, then the amplification factor of the valve would be 10 : 2, and that is 5.

This amplification factor is based on the static characteristic of the valve and takes no account of working conditions. Therefore it must not be regarded as a direct indication of the "goodness" of a valve.

Replacing one valve for another having an amplification factor twice as great does not necessarily mean that, in practice, twice the amplification will result.

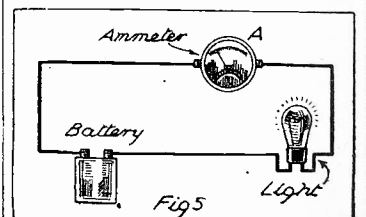
Amplifier (H.F.).

There are both high-frequency and low-frequency amplifiers. The former are usually styled H.F. units. They are not used nowadays to the extent they used to be. Their popularity was greater during that period when the screened-grid H.F. valve began to be universally used.

In fact, the H.F. unit bridged the gap between obsolescence and up to dateness for all those having detector L.F. types of sets.

Its object is, of course, to amplify the energy before it is rectified by the detector valve.

JOINED IN SERIES



An ammeter is connected in series with the source of supply, as shown in the above diagram.

Special Beginners' Supplement—Page 3.

PRESSURE, current and resistance are closely inter-linked. In our previous articles we have shown how current is dependent upon the voltage or electro-motive force and also how the resistance of a wire affects the flow of current.

So far we have not used the word *conductor*. A conductor is a material which permits the flow of an electric current. Thus any material, such as a length of copper wire, is referred to as a conductor. There are also non-conductors of electricity.

These are materials which offer a very high resistance to the flow of electricity and are known as *insulators*. We mention this point because the words conductor and insulator will be used very freely in this series, and it is as well for the beginner to become acquainted with their meaning at this early stage.

Adding Resistance.

Now, resistance can be incidental or deliberate. That is to say, it can be the inherent property of a conductor, because every conductor—however good it is—possesses resistance to some extent.

Alternately, the resistance can be deliberately inserted in the path of the current. This is often done for special reasons and is common practice in radio.

A poor conducting material is a high resistance; hence it is quite easy to choose a suitable material and to insert it in a circuit so that it impedes the flow of current.

TAKING TAPPINGS

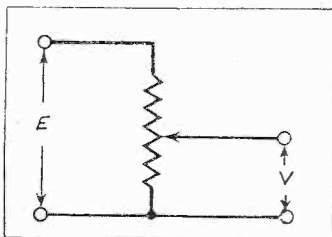


Fig. 1. One method of obtaining a desired voltage is to connect a resistance across the source of voltage (E). Then by means of a slider or plug and sockets the desired voltage (V) can be tapped off.

The unit of resistance is the ohm, and the law relating pressure, current and resistance is known as *Ohm's Law*.

Extremely Useful.

It is a very simple Law, but one which is of the greatest value to electrical and radio engineers.

By its use we are able to find out:

- (a) How much current will flow when the voltage and resistance are known.
- (b) What voltage will be needed to drive a given current through a known resistance.
- (c) The resistance offered to the flow of current provided

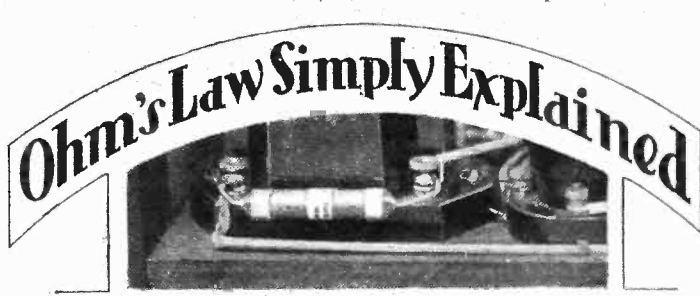
the value of the current and the electro-motive force are known.

Ohm's Law says that the current in amperes is equal to the electro-motive force (pressure in volts) divided by the resistance in ohms. It is usually expressed in the form $I = \frac{E}{R}$. I stands for current (always in amperes), E for electro-motive force (in

volts) and R for resistance (in ohms). There is one thing that you should remember when dealing with any calculations involving current. It is this: The current flowing is the same in every part of the circuit. That means that if you have a length of wire (a conductor) connected to a source of electricity, such as a battery, the value of the current will be the same in every part of that wire.

There is no decrease in one part and increase in another. Now let us see how we can apply Ohm's Law to simple calculations.

It is useful to employ small diagrams in connection with any little problems in resistance, current or voltage. They are a great help and enable one to picture in one's mind what is happening.



There is one thing that you should remember when dealing with any calculations involving current. It is this: The current flowing is the same in every part of the circuit. That means that if you have a length of wire (a conductor) connected to a source of electricity, such as a battery, the value of the current will be the same in every part of that wire.

There is no decrease in one part and increase in another. Now let us see how we can apply Ohm's Law to simple calculations.

It is useful to employ small diagrams in connection with any little problems in resistance, current or voltage. They are a great help and enable one to picture in one's mind what is happening.

There is no decrease in one part and increase in another. Now let us see how we can apply Ohm's Law to simple calculations.

It is useful to employ small diagrams in connection with any little problems in resistance, current or voltage. They are a great help and enable one to picture in one's mind what is happening.

It is useful to employ small diagrams in connection with any little problems in resistance, current or voltage. They are a great help and enable one to picture in one's mind what is happening.

It is useful to employ small diagrams in connection with any little problems in resistance, current or voltage. They are a great help and enable one to picture in one's mind what is happening.

How They Are Drawn.

Resistances are normally represented by a zigzag line like those we show in the figure. If the line has an arrow passing through it, it means that the resistance is variable. A potentiometer is depicted like P in the diagram.

The best method of explaining Ohm's Law is to give practical examples. Suppose we do this now. Take, say, a battery which has a voltage of a 100 (an ordinary dry H.T. battery, for instance). Let us assume that the resistance of the conducting wire to which its terminals are joined is 25 ohms.

Ohm's Law tells us that the current in a wire is 3 amperes and the resistance of that wire 10 ohms.

Ohm's Law tells us that the current in a wire is 3 amperes and the resistance of that wire 10 ohms.

Ohm's Law tells us that the current in a wire is 3 amperes and the resistance of that wire 10 ohms.

An Example.

The voltage is equal to the current multiplied by the resistance, and in this case is three times ten, or 30 volts.

($E = IR$; i.e. $E = 3 \times 10 = 30$.)

We can now express Ohm's Law another way, this time to find the resistance. Suppose we have a battery of 100 volts available and we discover (after measurement with a suitable meter) that the current is 2 amperes.

The Law says that resistance equals volts divided by current (amperes). Thus we have one hundred divided by two, which equals 50 ohms.

($R = \frac{E}{I}$; i.e. $R = \frac{100}{2} = 50$.)

Ohm's Law is particularly useful in radio for working out voltages which are developed across resistances. In Fig. 2 we show a battery giving E volts joined to two high resistances which have been deliberately inserted in the conducting wire.

One of these resistances is shown as R and the other as R₁. Now, the current will be the same through R as through R₁. We can assume for the purposes of explanation that it is one-hundredth of an ampere. We can also assume that R has a resistance of 1,000 ohms and R₁ 2,000 ohms. E, the voltage of the battery,

we will say is 30 volts—an easy value to work with. To find out the voltage (v.) developed across the resistance R (it is called the voltage drop) we multiply 1,000 by the current, which is one-hundredth of an ampere. The answer is 10 volts. ($V = IR$; i.e. $1,000 \times \frac{1}{100} = 10$.)

Similarly for R₁, we have V₁; the voltage drop equals 2,000 multiplied by one-hundredth which is 20 volts. ($V_1 = IR$; i.e. $2,000 \times \frac{1}{100} = 20$.)

Ohm's Law is utilised in practice to a very large extent. In radio it is employed for finding the values of voltage-dropping resistances. For example, suppose there is a voltage of 200, whereas the correct voltage for certain valves in the receiver is, say, 120.

Fractions of an Ampere. We can easily find out from the makers of the valves what current they will consume at the voltage in question (120 volts). We then divide the voltage to be dropped, viz. 80 volts in this case, by the current in milliamperes, and multiply the answer by one thousand. This gives the value of the resistance required.

A milliampere is a thousandth of an ampere, and the H.T. current consumed by valves is expressed in milliamperes, because this is much more convenient than saying a hundredth or some other fraction of an ampere. A hundredth of an ampere is 10 milliamperes.

But in working out examples of Ohm's Law it is essential

VOLTAGE DROP

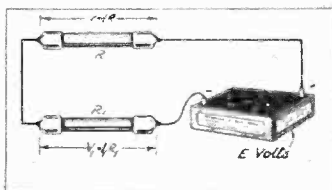


Fig. 2. When two resistances are joined so that the current flows through each in turn, voltages will be developed across them. The magnitude of the voltages will depend upon the value of the resistance and the current flowing.

DIFFERENT TYPES

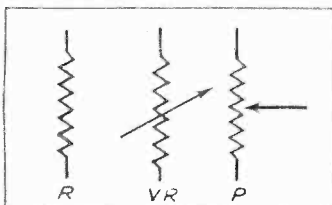


Fig. 3. In a theoretical diagram a resistance is represented by a zigzag line, as in R. VR is the method of showing a variable resistance, and P a potentiometer.

A SIMPLE CIRCUIT

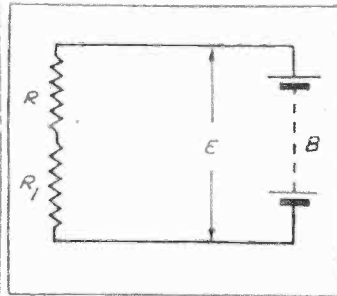


Fig. 4. This shows how the Fig. 2 arrangement would be depicted in the form of a theoretical diagram. B is the battery, R and R₁ are the two resistances.

to keep the units correct. They must be volts, ohms and amperes.

Hence, if the current should happen to be in milliamperes, it must be divided by 1,000 to bring it to amperes.

Multiply by a Thousand.

In the case of the example for finding the resistance to drop a certain voltage, multiplying the answer by 1,000 after dividing by the number of milliamperes is the same as bringing the milliamperes to whatever fraction of an ampere they happen to be before dividing into 80.

SHORT-WAVE NOTES

BY W. L. S.

All the interesting news and views of current short-wave practice.

THE "D J B Mystery" remains unsolved, although two or three readers have had different attempts at it. The most ingenious idea is that of "G. E. C." (Sheffield), who suggests that the big, steady station in the middle was W 8 X K, and that the little wobbly ones on either side were, respectively, D J B himself and W 2 X A D, all relaying the same programme!

It Might Happen.

I should be inclined to turn this down, because I have never yet found a night on which W 8 X K was strong and steady while W 2 X A D was weak and wobbly! But D J B certainly *does* broadcast to America sometimes, and such a thing might easily happen.

V. I. E. (Liverpool) suggests that it is the well-known phenomenon that sometimes occurs when a transmitter goes out of adjustment and radiates a series of "squiggles." Maybe; but there are generally more than two of the extraneous carrier-waves. So we won't worry about D J B any more.

The Story of Y V 2 A M.

I had hoped to illustrate this page with a picture of Y V 2 A M, the station that was not allowed to be "amateur" and had to become "broadcast." Unfortunately, the photograph was not quite good enough for reproduction. The story, though, is quite interesting.

Two young fellows in Maracaibo, Vene-

zuela, wished to instal an amateur transmitting station, purely for communication with other "hams." But the Venezuelan Government stepped in and *restricted* them (my italics!) to broadcast work.

The result is that Y V 2 A M is now operating as a low-power broadcast station in the 40-metre amateur band. All short-wave fans in this country are asked to look out for these transmissions, on 42 metres, between noon and 3 p.m. on Sundays. Unfortunately, this is about the worst possible time to try to hear *anything* on 40 metres, thanks to our Continental friends,

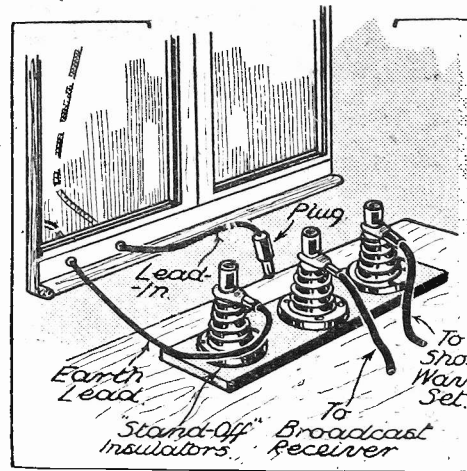
London, S.E.17, to whom I am indebted for this brief description of his friends' adventures.

A Real Enthusiast.

N. P. (New Milton, Hants.) wants, among other things, two issues of "P.W." filled completely with short-wave articles! Very nice for those who like them; undoubtedly, but you must remember, N. P., that we are still a mere handful compared with the hosts and hosts of broadcast listeners.

As it is, "P.W." caters quite generously

CHANGING OVER THE AERIAL



IT often happens that short-wave enthusiasts want to have at their disposal a ready means of changing over their one aerial from the short-wave set to the broadcast receiver, with a third position for "earthing" it.

An easy and efficient way of doing this is to do away with the usual double-pole double-throw switch and to use plugs and sockets instead. The lead-in is terminated in a banana plug, and three sockets—short-wave, broadcast and earth—can be mounted on a strip of ebonite.

Alternatively, "stand-off" insulators, with sockets fitted in their tops, can be used. This makes a very neat job of it. Naturally, there is no limit to the amount of switching that can be done in this way.

some of whom have strange ideas about modulation. But during a lull in the gramophone and vocal exhibition one might possibly hear something interesting.

Reports may be sent to me or to Mr. G. Edwards (G 2 U X), 159a, Hillingdon Street,

for the short-wave man. We can't expect to trespass too much on the other folk's preserves.

Your note about the separate reactor valve is interesting, as I happen to be playing with that very circuit at the present moment.

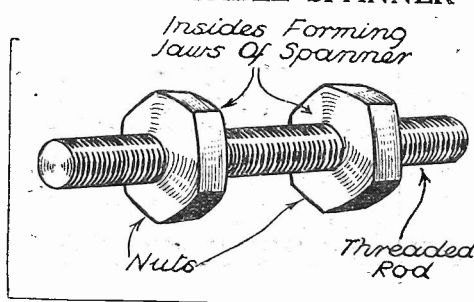
IMPROVISED TOOLS.

THE average constructor does not usually possess a kit of tools suitable for every wireless requirement, but in quite a number of cases excellent substitutes can be improvised by using other tools and parts available.

For instance, the sharp sides of the tang of a file can be utilised for reaming a hole in an ebonite or wooden panel, and the point of the tang can be used as a substitute for an awl to make the necessary holes in a baseboard for starting wood screws.

Similarly, an adjustable spanner can be quickly made by means of a threaded rod and two nuts, as shown in the accompanying sketch. One nut is fixed into position

AN ADJUSTABLE SPANNER



Two large nuts on a threaded rod can often be used to undo other nuts.

OVERCOMING DIFFICULTIES

Valuable tips for the home constructor and experimenter.

and the other is turned until the distance between them is equal to the width of the nut to be tightened.

The inside surfaces of the nuts then form a spanner and the "gadget" makes quite a good emergency tool in the absence of the genuine article.

PREVENTING VIBRATION.

TROUBLES due to box resonance are often experienced when a speaker is mounted in a cabinet. These can be largely overcome by adopting one of the special forms of cabinet baffles.

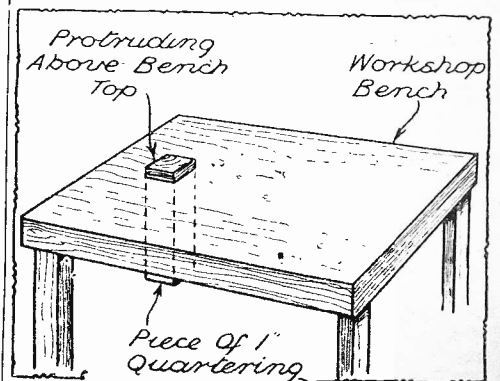
In some cases a rattling effect is caused by the mounting rim of the speaker vibrating and so rubbing against the baffle. This can be prevented by placing a ring of felt or sponge rubber between the speaker mounting rim and the baffle. The fixing bolts or screws will pass through this rubber, but they must not be tightened too much.

FITTING A BENCH STOP.

MOST workshop benches are provided with a suitable bench stop, but in some instances where this is not included one can very easily be fitted with the aid of a 1-in. wood chisel and a piece of 1-in. quartering.

A hole 1 in. square is first of all cut in the bench top, as shown in the diagram. The quartering is now inserted until the portion above the bench top is sufficient to meet the individual requirements of the constructor. When not in use the quartering can be lowered into the bench.

SIMPLE TO ARRANGE



Making a stop for your bench.

BETTER

FROM
BEGINNING
TO
END



Post the coupon below for full details of all Marconi valves.



VP21 The first variable-Mu H.F. battery Pentode

There is a 'better' valve—a Marconi valve—for every stage in every set. For the H.F. position of battery sets, for instance, there's VP21, the exclusive Marconi H.F. pentode, particularly suited to the new iron-cored coils, but also giving remarkable range and selectivity in an ordinary circuit. VP21 is also an extraordinarily good frequency changer in superhets - - - **15/6**

B21 The unique 'Class B'

For the output stage—there's B21, the valve for 'Better Class B'. B21 operates with grid bias, uses *two* grids in each half and has rigidly interlocked electrodes. It gives better quality, higher sensitivity, and absolute accuracy of matching - - - **14/-**

Valve Department
The Marconiphone Company Ltd.,
210 Tottenham Court Road,
London, W.1.

Please send me full details of 'better' Marconi valves for every stage.

Name

Address

P.W. 18/11/33.

MARCONI VALVES

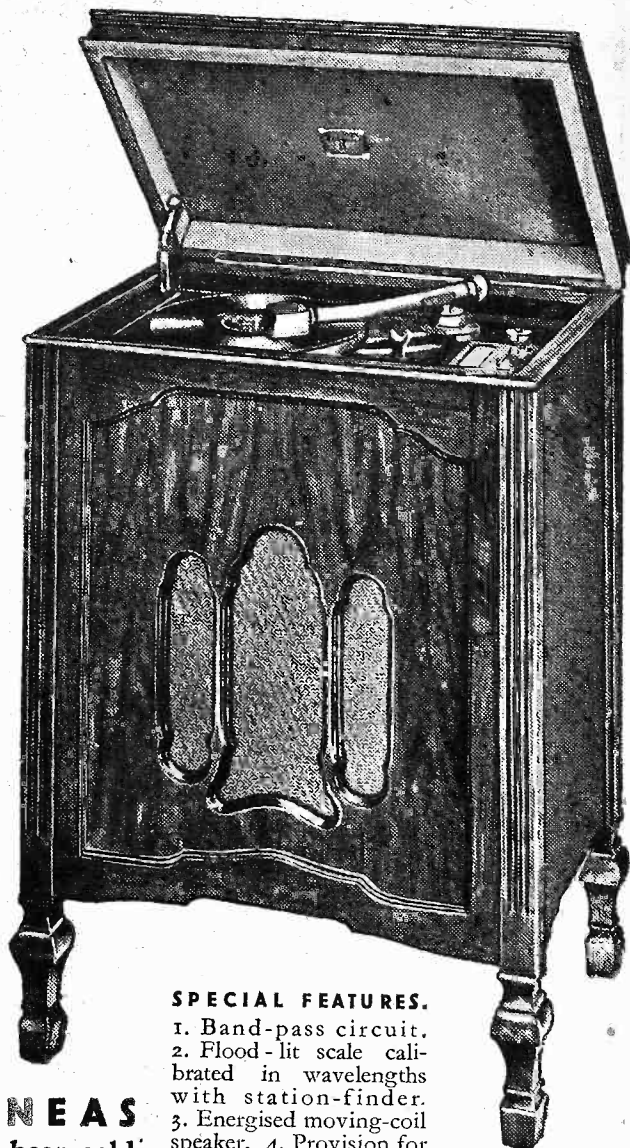
*The choice of
the experts.*

COLUMBIA create RADIOGRAM SENSATION!

A Standard COLUMBIA RADIOGRAM

FOR **23** GUINEAS

Hundreds of these instruments have been sold in the past few weeks. Hundreds of people are enjoying for the first time the delights of a luxury radiogram — combining both radio and gramophone in one cabinet — all the worthwhile stations, plus electrical reproduction of your own records. And the reason why they are buying this model is simply that never before have Columbia made such an instrument at such a price. Have you got yours yet? If you have promised yourself a radio-gramophone 'some day,' NOW is your chance to get it! Remember that this model, No. 620, is a standard product of the Columbia factory — proved by 1093 tests. Ask to hear it! Write for literature.



SPECIAL FEATURES.

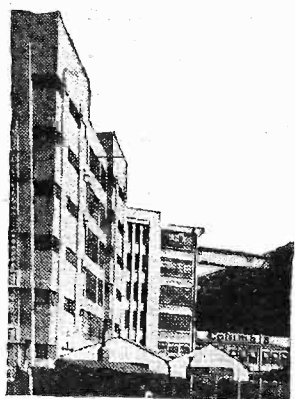
1. Band-pass circuit.
2. Flood-lit scale calibrated in wavelengths with station-finder.
3. Energised moving-coil speaker.
4. Provision for additional speaker.
5. Pick-up with reversible head, for easy needle-change.
6. Universal automatic brake.
7. Volume control common to both radio and gramophone.
8. Induction motor.
9. One knob tuning with induction gear.
10. Three aerial tapplings.
11. Mains aerial device.
12. Low running costs.

-AND FOR THOSE HOMES WITHOUT ELECTRICITY

A NEW BATTERY RADIOGRAM with all-mains performance

AMAZES THE EXPERTS! Embodying the new principle of Constant Quality Amplification (C.Q.A.) this new Columbia Model No. 1003 demonstrates for the first time that a Battery Radiogram can be the full equivalent of an all-mains instrument in its volume and quality of reproduction. Ask to hear the Columbia C.Q.A. Battery Radiogram. Price 20 GNS. or by hire purchase.

The Columbia Graphophone Co., Ltd., (Dept. P.W. 181133)
Clerkenwell Rd., E.C.1



EUROPE'S LARGEST
RADIO FACTORY
IS YOUR PLEDGE
OF COLUMBIA'S
RELIABILITY

Columbia

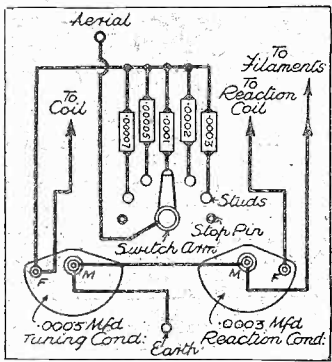
RADIO AND RADIO-GRAMPHONES



A TUNING TIP.

THE following idea, which I have fitted on to my panel, works very satisfactorily. It comprises an old switch arm and five studs, with two stop pins attached to studs.

I am using five fixed condensers of different capacities; they are: .00007-.00005, .0001, .0002 and .0003. When I tune in on Stud No. 1 I get the local station well down the dial, about 20° giving me a choice of stations further up; then, by turning switch arm to Stud No. 5, I get the local 50° or 60° higher up, allowing me to tune in Arhlon, North Regional and others, which I could not get when using one condenser in series.



An idea for obtaining variable selectivity.

I can also make contact with two studs, bringing the switch arm between them, getting various readings. I can set the switch arm on any stud and know just exactly where stations come in. On Stud No. 2 I get two or three stations below Radio Normandie, which I also get on same stud very clearly. My set is a three-valve battery-operated, and my aerial is a spring mattress.

I have been a constant reader of your paper for years, and hope that this little wrinkle will prove worthy of your attention.

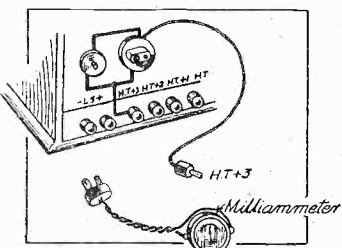
ADDING A MILLIAMMETER.

IT is often desired to connect a milliammeter in the anode circuit of the last valve of a set to trace overloading, etc., and I have found the following device very useful:

A two-pin plug and socket of the non-reversible type and a small tumbler switch are required. The socket portion is screwed to the back of the cabinet, and the H.T. max. positive lead is removed from the terminal on the set and connected to one side of the socket.

The other side of the latter is wired to the vacant H.T. positive terminal. It will be seen that the socket is wired in series with the H.T. supply to the last valve.

The tumbler switch is also screwed to the back of the cabinet and wired in parallel across the socket. The two



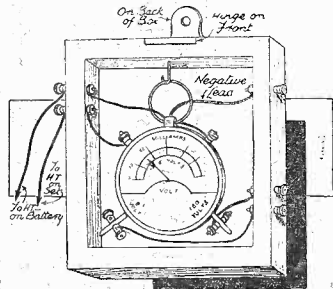
A simple method of testing for valve overloading.

terminals of the milliammeter are connected by pieces of flex to the plug portion.

If the plug is inserted in the socket and tumbler switch opened the milliammeter will register the anode current of the last valve; when the reading has been taken the switch can be closed and the set functions in the normal manner. If the needle of the milliammeter kicks downwards the flexes leading to the plug should be reversed.

HANDY FOR TESTING.

THE sketch below will be found quite the thing for anybody who has one of those voltmeters that one



Always handy when required.

cannot fix on the set. I have made a box with a glass front (which can be fitted up if required). The meter is hung

ing end to the outer side of the condenser spindle—i.e. close to the panel.

After replacing the dial, leave 1/4 to 1/2 an inch of the thread as it is, and blacken the remainder with ink. Being close to the panel, the blackened part of the thread is practically unseen, and the short white part stands out clear and thin against the panel.

A HANDBRACE GRINDER.

THE ordinary handbrace when gripped in the vice forms a very useful tool. It can be used for tapping small nuts and also holes in small jobs. It can be used for polishing small jobs such as valve legs, terminals and for lacquering.

Small jobs can be filed up as in a lathe. But if you have a geared handbrace, obtain a small emery or carborundum wheel and mount it on a small spindle which will suit the brace chuck. If the wheel is about six inches in diameter a good speed can be obtained and many small jobs can be ground up.

FITTING A PICK-UP.

PROCURE two valve bases, take out the four pins of one of them, and in the holes left by the pins insert four sockets.

Drill an eighth of an inch hole through the middle of both bases and insert a bolt to keep them together. Before bolting them together wire up as follows: plate pin to plate socket, filament to filament, pins to sockets; the grid pin leave blank.

ONE GUINEA FOR THE BEST WRINKLE!

Readers are invited to send a short description, with sketch, of any original and practical radio idea. Each week £1 is. will be paid for the best Wrinkle from a reader, and others will be paid for at our usual rates.

Each hint must be on a separate sheet of paper, written on one side of the page only. Address your hints to the Technical Editor, "Popular Wireless," Tallis House, Tallis Street, E.C.4, marking the envelope "Recommended Wrinkles."

Will readers please note that the Editor cannot, in any circumstances, guarantee to return rejected Wrinkles, and that payment for published hints is not made until ten days after they appear?

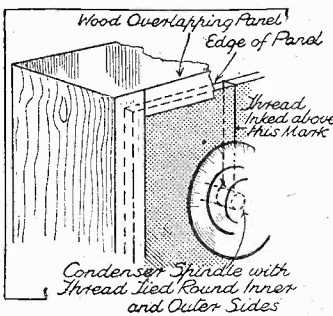
The best Wrinkle last week was sent by Mr. J. Cuttle, 75, Russell Road, Buckhurst Hill, Essex.

on a cup hook, and all terminals from meter are connected by wire to phone terminals screwed on to the box.

I have this meter fixed on to the wall above the set, so I can quite easily see if the set is working O.K. For testing batteries you only need two flex leads which are joined to the requisite terminals on the meter.

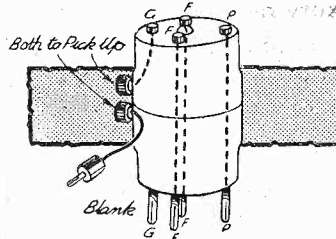
"HAIR-LINE" TUNING.

A GOOD method to effect "hair-line" tuning, with the advantage of not damaging the panel, is as follows:



This scheme will help you in locating the various stations.

Tie the end of a thin piece of white thread to the inner side of the condenser spindle, carry this thread over the top of the panel and tie the remain-



Plug it in your detector valve holder.

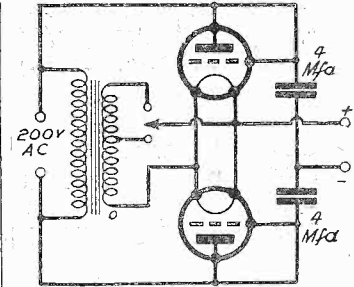
Drill two holes in the side of the base which has the sockets and insert two terminals. Join one of the terminals to grid socket. And to the other terminal fix a length of flex with a wander-plug for giving detector valve 1 1/2-volts grid bias.

When made take out the detector valve from set, insert adaptor in holder, then put valve in the adaptor.

TRY THIS RECTIFIER.

A VERY useful circuit for obtaining D.C. from A.C. mains is shown in the figure. This circuit is only suitable for energising moving-coil speakers of the high-resistance type, as no transformer is connected between the mains and the D.C. output.

The valves used are any old ones that may come to hand; the transformer is an ordinary bell type, costing about



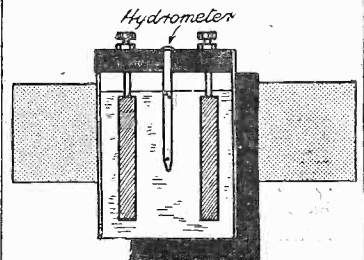
For mains-energised moving-coil loudspeakers.

3s. 6d. If the valves are 2-volters they should be connected in series and the 4-volt tapping on the transformer secondary used (this is generally very clearly marked); if 4-volt valves, connect in parallel and use the same tapping.

The condensers should be of the high-voltage-working type and of 4-mfd. each.

AN L.T. INDICATOR.

OWNERS of those small accumulators containing two or three plates only can easily fit this simple indicator:



Providing a visual indication of the state of your L.T.

Obtain a small "three-ball" hydrometer (this costs only a few coppers) from any wireless trader. Empty the acid from the accumulator into a jar or other receptacle. A hole is then bored in the pitch or composition top of the accumulator just large enough to take the glass tube of hydrometer.

Fix this in with a little secotone so that the top of it is just level with the surface of the top of the container. Wash out the accumulator, replace the acid, drop the three balls into the tube and you have a charge indicator which is easily read, unbreakable and always there when you want it.

LOUDSPEAKER FRETS.

HAVING been experimenting with a number of different speakers on baffleboards or in cabinets, I have often wanted some silk, etc., to place behind the fret and keep dust off the cone, etc.; but as the workfolk generally kept the workbox locked up I had to devise a scheme to save journeys to drapers to buy odd pieces.

This scheme will even save troubling to cut fancy frets in your baffleboard: Obtain a piece of ordinary lace curtain, of close mesh, large enough to cover the circular or square aperture in the baffle, and fasten it by drawing pins over a piece of stiff brown paper and keep it taut and flat.

Then paint it with ordinary gold or aluminium paint and leave it to dry thoroughly. The varnish or spirit in the gold paint will make the piece of curtain dry stiff, and if the curtain is "patterned" the result is very pretty.

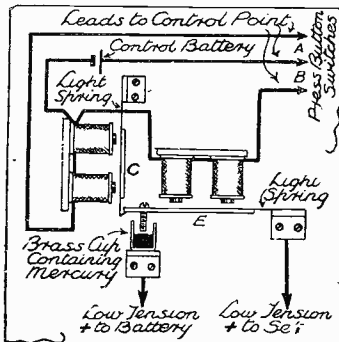
(Continued on next page.)

RECOMMENDED WRINKLES

(Continued from previous page.)

A REMOTE CONTROL.

HERE are details of a remote-controlled switch for operating a wireless set from some distant point. The diagram explains itself. Two old electric bells will supply nearly all the parts, or they can be made separately. The resistance of each pair of coils is 15 ohms; hence, using a 6-volt control battery, the consumption is only 4 amps. Three wires are run to the control point; if the loudspeaker is in same room as control the speaker leads may be utilised.

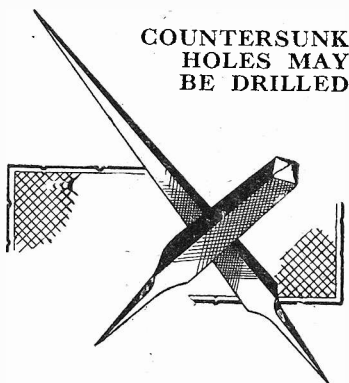


For switching your set at a distance.

To switch the set on, press button A. This causes the left-hand pair of coils to become magnetised and they momentarily attract the armature C, thus allowing the armature E to fall and make contact with the mercury. To switch off, press button B. This lifts the armature E clear of the mercury, and it is held in this position by the armature C with which it automatically engages. As current only flows when either switch is pressed the consumption is very low.

GLASS PANELS.

HERE is a tip for those readers who would like a glass panel to their set: Obtain a piece of glass of the required size and $\frac{1}{8}$ in. or $\frac{3}{16}$ in. thick. Make a paper template the size of the panel and mark the holes required on this. Next get a small three-cornered file and grind the sides of this down until it comes to a sharp point, as illustrated below.



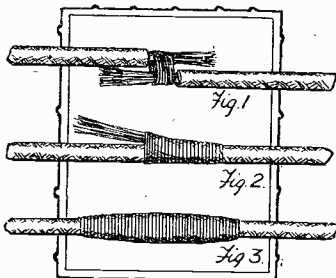
COUNTERSUNK HOLES MAY BE DRILLED

Home-made tools for drilling glass.

Put the glass on a flat surface with a sheet or two of paper underneath; put on the template and mark the centres of the holes with point of the file. Very little pressure is required if the file is sharp. Now get some turpentine and powdered camphor and apply a little of each on the place to be drilled, and drill with the file. Keep applying the turpentine and camphor as it dries up. Do not rotate the "drill" too quickly and don't press too hard. Holes may be countersunk by the same method with a file broken in two and one end ground as shown. Any kind of brace will do.

A GOOD JOINT.

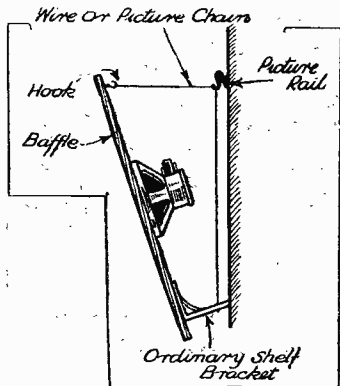
HERE'S a joint for stranded wire that is really neat. Every single strand makes good contact with both wires, and it will stand as much pulling as the wire itself. Lay the two pieces of wire together, overlapping about 2 in. Take a single strand and bind it tight round both wires (Fig. 1). Follow down with all strands, binding them one at a time, and tighten with pliers. You then get the same effect as in Fig. 2. Now do the same the other side, and you get a joint that is a joint.



An ideal method of ensuring good connections between stranded conductors.

SUSPENDING YOUR SPEAKER.

TWO ordinary hooks are screwed in the baffle about 6 ins. from the top, and then two ordinary shelf brackets are fitted about 6 ins. from the bottom. Then I fixed some picture chain from the brackets to the screws, and at a convenient place fastened it to two hooks in the picture moulding. This enables the speaker to be kept away from the wall.



It hangs on the wall like a picture.

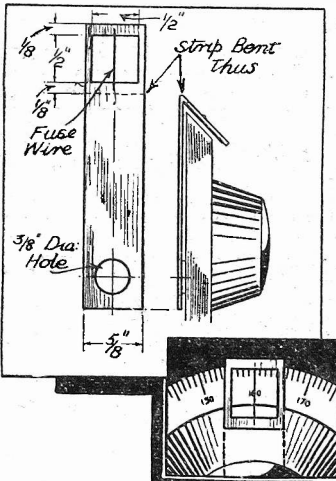
A WATER-SPOUT AERIAL.

I KNOW it is against ordinary practice, but a temporary aerial I had to rig up has astounded me by the results, and, if anything, I am greatly surprised to find quality has improved, and this is the verdict of the household. My aerial pole will not be re-created. As alterations were being made in the garden, my aerial (iron mast) had to be taken down for a while. Wondering whether to get a temporary strut screwed up to the top of bedroom window to get "height," I noticed that a downspout passing down the wall near my aerial lead-in was fastened to wood staples, about 6 in. from the house wall, and with the length of roof gutter formed a "T" of about 40 ft. I therefore clamped a piece of copper round the pipe near the window and screwed the lead-in wire to the circular copper band. When I first tried it, the weather was fine, and had been so for some days, but I was surprised to find that by some means or other the quality had improved (energised moving-coil speaker), and also less reaction was required on foreigners: Downspout finishes about a foot from ground. In fact, the set appears 30 per cent louder. Then, again, in wet weather there is no loss through leakage by the downspout being so near to the house, and thus causing leakage to earth. The above wrinkle may be a boon to flat dwellers who do not want to fit up

an inside aerial round the ceiling, but want the effect of an outside aerial. There is nearly always a downspout near windows.

BETTER DIAL READING.

SOME people find difficulty in getting a fine reading on the new type of slow-motion knob now generally favoured by designers, such as used on the "S.T.500." Procure a piece of tin or brass about $\frac{1}{8}$ in. thick and cut a strip about 4 in. long by $\frac{3}{8}$ in. broad. Pierce a $\frac{1}{8}$ in. hole at one end.

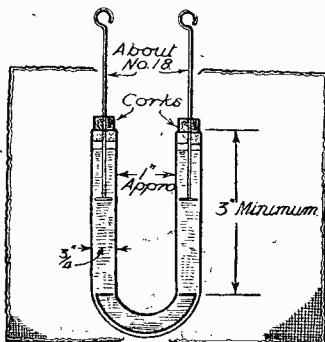


It provides very accurate tuning.

Remove knob from set and secure this strip below the fixing nut of condenser. Replace knob and mark a line where the circumference cuts the strip. Remove strip from panel and make an aperture about $\frac{1}{8}$ in. square, $\frac{1}{8}$ in. away from this line, and cut strip off $\frac{1}{8}$ in. away from side of square hole. Fix a strip of fuse wire across aperture, with the length of the strip, replace strip on panel and then replace knob and bend the strip over at mark where it cuts circumference. This is an excellent hair-line visor for an awkward control and saves scratching the polished ebonite panel.

LIQUID RESISTANCES.

LIQUID type resistances can be conveniently and cheaply made by most amateurs. Obtain a glass U tube, four or five inches in depth and $\frac{1}{2}$ -inch diameter. Solder two electrodes of thin copper, say $\frac{1}{16}$ -inch diameter, on to the ends of stiffish tinned copper wires. The wires may be run through corks which are to fit into the top ends of the U tube, and should be arranged to slide up or down for adjustment purposes.



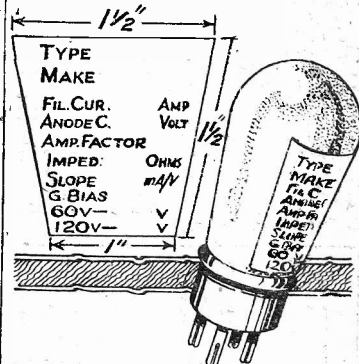
Strip of Copper Foil $\frac{3}{16}$ Wide To Short Circuit Bend if Required. You can make variable resistances of any value.

The sketch shows the apparatus in simple form. Mount the tube in any suitable way for convenience. The liquid mixture will depend on the ohmic values of the resistances required. As a guide, mix one grain of salt in a gallon of distilled water. This solution will give a resistance of about 6,250 ohms for every inch of liquid between the electrodes in a tube of $\frac{1}{2}$ -in. diameter.

The above mixture can, of course, be diluted or strengthened so that resistances may be obtained from quite low values up to a megohm or more as required.

A NEAT VALVE LABEL.

THE trouble and annoyance experienced when the type letters on a valve have become indistinct may be overcome by gumming a slip of paper on to the glass part of the valve, as shown in the accompanying sketch. The characteristics, etc., should be written on the paper before gumming; and as the hand will not touch it when inserting or withdrawing the valve from its socket, it will not become finger-marked, as would a strip gummed around the base.



All the particulars you need are always available.

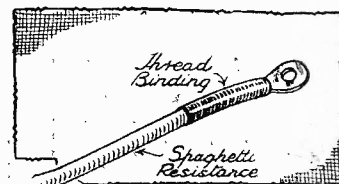
EMERGENCY CONDENSERS

VERY often a condenser of small value is required for a temporary job, and nine times out of ten the experimenter has to waste valuable time hunting in his junk box for one near the required value. Here is a wrinkle for making condensers out of quite commonplace articles. The materials required are: a common lead pencil, tinfoil from a cigarette packet, paper, and some bare wire.

The tinfoil is wrapped round the pencil and paper of any description, or any other insulating material is wrapped round the foil. The whole is then surmounted by another layer of foil which is tied in position with string or even an elastic band. The two sheets of foil are the two plates of the condenser, and depending on what material is used for the dielectric the capacity is approximately 0001-mfd. per 1 in. of length. There are many variations of this idea. For instance, the outside piece of foil could be replaced by bare copper wire wound round the pencil; but if this is done it is necessary to ensure that all turns are in intimate contact. This can only be done by soldering. If more time is spent on their manufacture good, permanent, and efficient condensers can be made on these lines.

STRENGTHENING SPAGHETTI.

SPAGHETTI resistances may be considerably strengthened at their weakest point—that is, where they enter the metal ends—by binding these ends for about an inch, half of this distance on the metal and half on the covering with stout thread or twist, which may be found in any work-basket.



Binding thread round the ends strengthens them considerably.

This will take the strain and prevent an abrupt bend when carelessly placed under a terminal and screwed down.

BRITISH
RADIOGRAM

B.R.G.

PROVED

KIT FOR THE
S.T. 500

READ WHAT THIS
SATISFIED CUSTOMER
writes :

Liverpool.

Dear Sir,

I feel that you deserve more than a little praise for the wonderful S.T.500 Set I now have, assembled from a B.R.G. Kit of Parts. After reading what Mr. John Scott-Taggart said about it in "Popular Wireless," I came to the conclusion that the S.T.500 was ideal for my purpose and, upon the recommendation of a wireless expert, I purchased your Kit from Mr. _____, a shop in this City. I connected it up and think you will be pleased to hear that I have already received more than 30 stations at full loudspeaker strength. My expert friend was surprised that such a good performance could be obtained with a set assembled at home. I am recommending your firm to all my friends. Please send me the B.R.G. Accumulator for it will come in as a useful spare when my own is being charged.

Yours faithfully,

J. B.

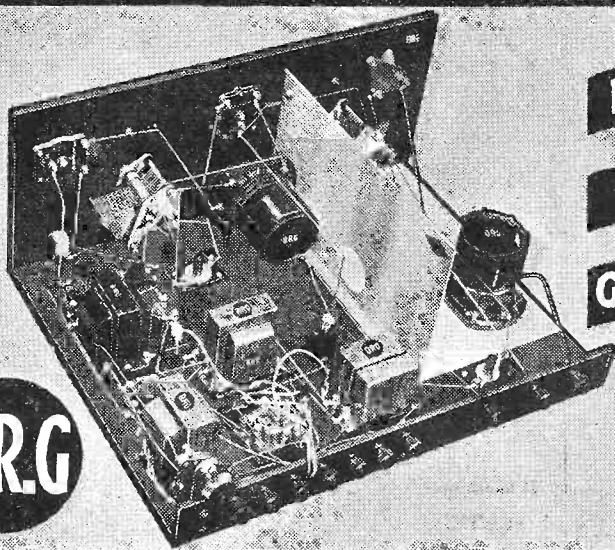
DEALERS! B.R.G. are the largest **WHOLE-SALE** stockists of Mr. John Scott-Taggart's **First Specified Parts.**

Immediate Delivery. Two trade references with initial order for ledger account

READ THIS
AMAZING S.T.500
OFFER

Every Sealed **B.R.G.** S.T.500 Kit contains a coupon which entitles you upon request to a **B.R.G.** **B.R.G. Guaranteed** Long Life 2-volt Accumulator.

B.R.G.



MATCHED
TESTED
GUARANTEED



B.R.G. KITS ARE OBTAINABLE
FROM EVERY DEALER.

In cases of difficulty, write direct to:

BRITISH RADIO GRAMOPHONE CO. LTD. PILOT HOUSE, CHURCH STREET, STOKE NEWINGTON, N.16.
WHOLESALE DISTRIBUTORS FOR PILOT AUTHOR KITS, SPECIFIED METAPLEX BASEBOARDS AND TELSEN PRODUCTS.

COMPLETE KIT

£4-10-0

Excluding Valves and Cabinet

COMPRISES: High Grade Tested Components, including Colvern, W.B., Graham Farish and Erie; all Terminals, Connecting Wire, Plugs, Screws, Metaplex Baseboard, Ready-drilled Ebonite Panel and Terminal Strip with **S.T. 500** issue of "Popular Wireless," and Full-Size Blue Print.

COLVERN COILS AS SPECIFIED

ANOTHER B.R.G. S.T. RADIO KIT

Important Notice

The M-O. VALVE COMPANY Limited,

who are the Manufacturers of "Catkin" Valves and Registered Proprietors of the Trade Mark "Catkin", No. 535589 and also the Registered Proprietors of Letters Patent No. 378994 give notice to all whom it may concern that in an Action in the High Court of Justice (Chancery Division) between The M-O. Valve Co. Ltd., Plaintiffs, and Super Radio Company (Bradford) Ltd. of 39 Bank Street, Bradford, and the Super Radio Company of 2 Bank Street, Bradford, Defendants (1933, M. No. 2966), upon Motion for an Injunction, the Plaintiffs and the Defendants agreeing by their Counsel that the Motion should be treated as a Motion for Judgment and consenting to that Judgment, the Court granted to The M-O. Valve Co. Ltd. on the 10th October, 1933, an **Injunction** for the life of Letters Patent No. 378994 restraining the Defendants from infringing such Letters Patent by advertising, offering for sale or selling valves manufactured pursuant to the said Letters Patent at prices below the prices fixed by the Plaintiffs.

The Court also awarded The M-O. Valve Co. Ltd. **Costs** and directed an enquiry as to **Damages**.

THE TRADE AND PUBLIC ARE WARNED

that "Catkin" Valves are manufactured under certain Letters Patent (including the said Letters Patent No. 378994) the property of The M-O. Valve Co. Ltd., and such Valves are only licensed for resale in accordance with the conditions of the Limited Licence particulars of which are printed on every carton. Any sale of such a valve in breach of these conditions constitutes an infringement of the Letters Patent and renders the seller liable to an action for damages.

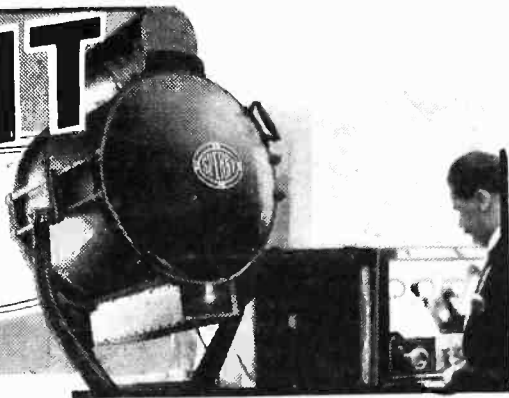
Announcement of The M-O. Valve Co. Ltd.,

Electra House, Victoria Embankment, W.C.2.

Proprietors: THE GENERAL ELECTRIC CO. LTD. AND MARCONI'S WIRELESS TELEGRAPH CO. LTD.

SEARCHLIGHT RADIO

By
G. S. MARLEY

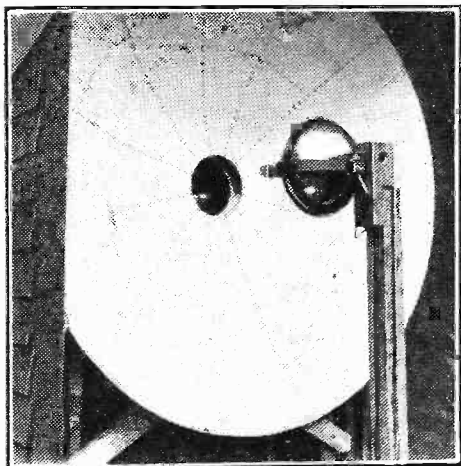


Transmission on a wavelength of about '6 of a metre is receiving a great deal of attention at present, but do you know that this wave was used as long ago as 1888? That is but one of the interesting facts our contributor reveals in his absorbing article on micro-waves, as they are termed.

IN some respects radio is getting back to where it was in 1888. That may sound rather incredible to those who imagine that it started about the time of the War. Yet one of the "newest" developments (in fact, one of those blazed abroad by the daily Press as a "New Wireless Wonder") is actually in essence the very oldest, going back nearly half a century.

Every year recently has seen tracts of shorter and shorter wavelengths opened up and put into service, and the tendency is to think of them as regions where, as the Irishman said, "the hand of man has never left his footprints." Ten years ago 100-metre transmission was something of a novelty; this year 5-metre working is common. But Marconi's experiments have resulted in 0.6-metre wireless being adopted as a standard method for certain duties—a frequency of 500,000 kilocycles per second!

A SOLID REFLECTOR



The cross-Channel telephony transmitter, which was installed for communication from Dover to Calais at the beginning of this year, operated on a wavelength around 18 centimetres and employed this solid-type reflector. It is interesting to compare it with the open type for '6 metre shown on the next page.

These micro-waves, as they are called, are reflected like beams of light from a searchlight; and it was just in that very way that Hertz, nearly 50 years ago, demonstrated that wireless waves are similar to light, only of relatively long wavelength.

This type of communication must not be confused with "beam" wireless, which

has been in use for a number of years for trans-oceanic work. It is true that reflectors are used in the beam system, but they work on an entirely different principle from, say, the parabolic reflector in a motor-car headlight, and really constitute a special type of aerial, requiring a large expanse of ground for erection. The micro-wave reflector can be carried about in pieces and set up in an hour or two; one was shown on the Post Office stand at Olympia this year.

A "Herring-Bone" Aerial.

It is a parabolic reflector, but instead of a continuous metal surface such as is necessary for concentrating light (which has a wavelength of only about 0.0005 millimetre), a sort of herring-bone is used, formed of a number of straight copper tubes about a foot long, supported by a copper "backbone" bent into a parabola. The whole thing is supported on a teak and glass-tube framework, and could be got into an ordinary room.

This sort of reflector is effective only when the wavelength is considerably smaller than the reflector's dimensions. If, for example, the same thing were attempted on the ordinary broadcast wavelengths, say 300 metres, the reflector would require to be at least a mile high; which would involve serious practical difficulties!

But micro-waves have the advantage that the cost of the aerial system is almost negligible compared with that needed for a long-wave station, or even a beam transmitter with its elaborate arrays of suspended wires. Moreover, it is quite easy, if necessary, to move the reflector about; in fact, it is a true radio "searchlight" and can be "shot" in any desired direction. The radiation in other directions is so small that secrecy is practically assured. And, of course, it is obviously a tremendous economy in cases where reception is wanted only at one point. By contrast, the ordinary method is like filling a glass by flooding the whole house.

Two Main Reasons.

You may ask why, if this ultra-short wave reflector system was known in 1888, it is only just being turned to good account in 1933. There are two main reasons. The first is that it was supposed that the range was limited to visual distance. And for such ranges there are usually other more convenient ways of communicating from point to point.

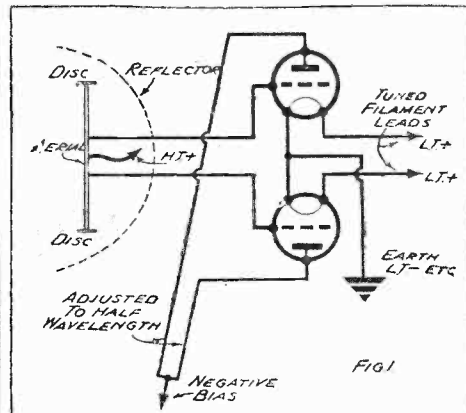
Recent tests up to nearly 200 miles seem to show that the theory has gone wrong somewhere. You remember that until Marconi received signals across the Atlantic it was confidently declared to be quite impossible to communicate more than about 60 miles on any wavelength. It looks as if history has repeated itself once again.

Improved Methods.

Then—and this is probably why the foregoing fact has only just been discovered—the early methods of generating and receiving signals were very crude and feeble, and more modern methods have hitherto been inapplicable.

You see, the ordinary valve, with all the persuasion in the world, cannot be hustled to generate much more than 200,000 kc. per second—the electrons simply cannot cross from filament to anode quickly enough—and so quite another type

TUNED WIRING IS USED



In order to allow the two valves (which are joined together in a sort of push-pull circuit) to oscillate, the connecting leads have to be tuned in accordance with the wavelength in use.

of valve is used, although even yet there is a good deal of disagreement as to exactly how it works. Still, it does work; and that is the main thing.

It is not very efficient as valves go. Only about 5 per cent of the power supplied to the filament and grid finds its way out as useful radiation. The filament is rather a heavy one, taking 4 amps., and the grid is made positive and connected up to the aerial. The anode, on the other hand, is relatively idle and is given a negative bias.

Great trouble has been experienced in getting a valve to stand up to the fierce electronic bombardment of the grid while
(Continued on next page.)

SEARCHLIGHT RADIO

(Continued from previous page.)

turning out enough power to be useful. The radiation is only $1\frac{1}{2}$ watts—rather a contrast to the thousands of watts from broadcasting stations—and to get more a number of units must be coupled up together.

Research is still proceeding, and will probably solve the problem of combining efficiency and long life in a higher-powered valve. Even the present valves are not happy unless a constant blast of cold air is fed on to them from a motor-driven blower. The power for the valves comes from batteries.

Special Arrangements.

As you may imagine, the ordinary coils and variable condensers are useless at these wavelengths. Strange to say, the wavelength is controlled by the voltages applied to the filament and grid. In order to oscillate at all, however, the leads to all electrodes must be tuned by making them of a certain definite length. Two valves are joined together in a sort of push-pull circuit (Fig. 1).

The aerial is only a few inches long, with discs at each end not much larger than pennies. This aerial system can be adjusted to the focus of the reflector, just like the lamp bulb in a motor-car headlight (which, by the way, consumes somewhere about the same amount of power as the transmitter).

In contrast to these somewhat unconventional arrangements, the control panels are mounted in very businesslike vertical rack formation, with meters for checking the valve operation, numerous rheostats and potentiometers for critically adjusting the supply voltages, and amplifier and telephone equipment for linking to the ordinary land line or for local speaking as required.

The system is particularly suitable as a wireless link in a telephone system where a

line or cable would be more expensive. There are islands separated by comparatively narrow but very deep channels, where the cost of a cable would be unreasonable, and ordinary wireless also very costly, and not secret without the use of special elaborate equipment.

To check the wavelength another little rod-and-disc aerial is mounted in the path

necessary to keep a signal in tune. On a 0.6-metre wave a change in wavelength of one part in 50,000 is 10,000 cycles per second—enough to make a beat note go practically out of audibility. And, of course, ordinary valve circuits are quite impossible, just as they are at the transmitting end.

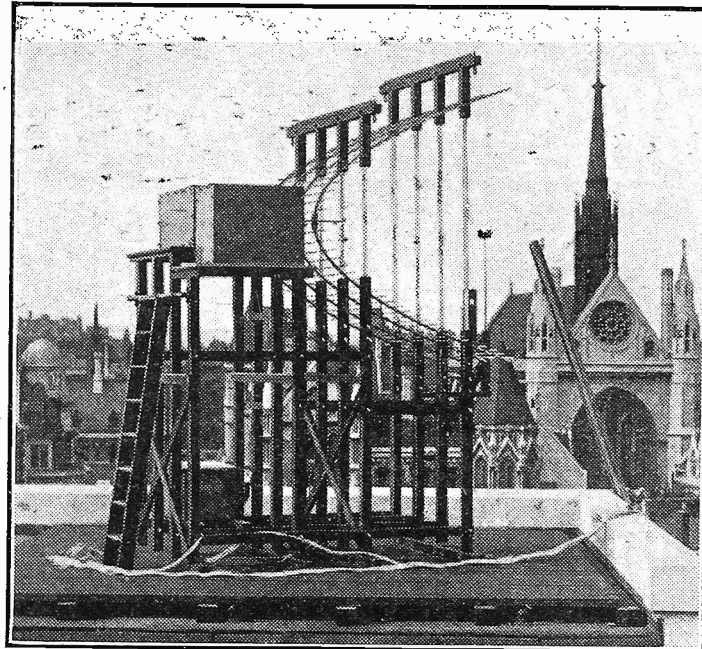
So the receiver is very much the same as the transmitter, and the super-regenerative system is used partly because it is the only one that can be made to work at all effectively, and partly because it is less selective. The latter might hardly seem an *advantage*, unless it is remembered that the question of interference, either "man-made" or atmospheric, does not arise.

How It Works.

Oscillation of the receiver is quenched and restarted about 10 million times a second by feeding a local 30-metre wave to the valve; and as the growth of oscillation in these circumstances is dependent on the distant signal, reception is obtained and can be amplified up in the usual way.

To emphasise the insignificance of the selectivity problem it may be noted that between 0.5 and 0.6 metres there is room for 100 times as many channels as the whole broadcast waveband! And that takes no account of the relatively short range and the beam concentration which would enable unlimited stations to work independently on the same wave if they wanted to.

THE AERIAL SYSTEM FOR MICRO-WAVES



At the focal point of the parabolic "open-work" reflector the short transmitting aerial with its round disc ends can be seen. This particular aerial system has been erected on the roof of the new Marconi building on the Embankment.

of the beam emerging from the reflector. When the wavelength resonates with this a large amount flows to and fro in it and heats up a thermo-junction, which gives a deflection on a milliammeter.

The receiver, too, is very different from what we are accustomed to. Those of you who do short-wave work know very well that one of the chief difficulties is the extremely fine adjustment of wavelength

BY taking a few simple precautions against accidental damage you can avoid a good many radio troubles and, at the same time, cut down costs by minimising the need for replacements.

Valves are obviously the most vital items in a set, and also, perhaps, the most vulnerable. As they are comparatively expensive to replace, especially so in the case of the more elaborate types such as screen grids, pentodes, etc., it behoves you to avoid exposing them to any risks that may impair their efficiency or shorten their lives.

Removing Valves.

Mechanical damage can be avoided by exercising reasonable care in handling the valves. Beginners may need to be reminded that one should always make a point of gripping the moulded base or cap of a valve (other than the catkin type) when withdrawing it from its holder, especially if the valve pins are a tight fit in the sockets. Pulling the valve out by means of the glass bulb may loosen the cement securing the glass to the base, and break the internal connections to the legs.

Similarly, in the case of screen-grid valves the lead to the terminal on top of the valve

AVOIDING RADIO RISKS

By B. WILLIS.

Some practical hints on safeguarding your set.

should be so arranged that it is not liable to be jerked or tugged accidentally, as any such strain may easily pull the terminal mount off the glass bulb and sever the concealed wire.

The high-tension battery is, of course, another vulnerable accessory that can be ruined very easily by momentary carelessness unless suitable precautions are taken. Fuses afford a cheap and simple means of safeguarding an expensive battery against the sometimes disastrous consequences of "shorts," etc.

Separate Fuses.

If there are several positive H.T. leads going to intermediate tappings on the

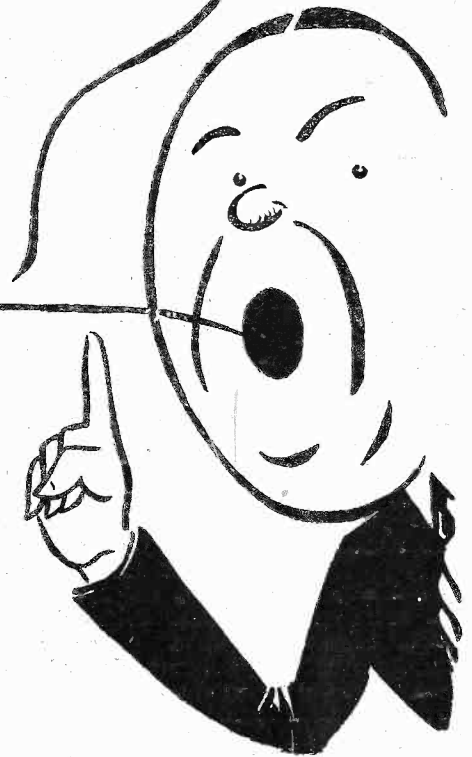
battery it is usually worth while to insert a separate fuse in each, to prevent damage to a section of the battery in the event of a "short" occurring between two of the positive leads. Where, however, no tappings at intermediate voltages are in use, the usual single fuse in the H.T. negative lead is sufficient.

Of course, one should never pull out the G.B. wander-plugs while the set is in operation; it should always be switched off before making any adjustments to the grid bias. But an equally important point to remember is that any accidental breakage in the grid circuit that results in the interruption of grid bias will have exactly the same consequences as the deliberate removal of a G.B. wander-plug.

A Safety Condenser.

To avoid blowing out fuses through reaction condenser plates "shorting" the H.T. supply to earth, it is generally advisable to connect a fixed condenser (say .002 mfd. or more) in series with the reaction condenser. If the latter is of the differential type the "safety" condenser should be so placed that it safeguards both sections of the differential.

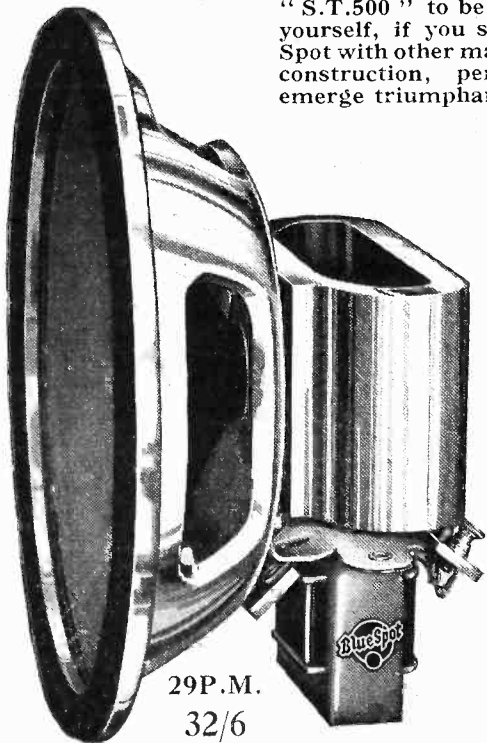
Don't Forget—
Blue Spot Speakers are
SCOTT TAGGART'S
FIRST CHOICE
for his S.T. 500



NOT only did Scott-Taggart place on record his high opinion of Blue Spot Speakers by choosing them **FIRST AND FOREMOST** for his "S.T.500" (the STAR set of the year), but he also recommends Blue Spot Speakers for his other set—"S.T. SUPER." Such is the reward of quality.

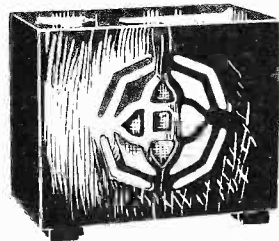
Blue Spot put their faith in deeds rather than words. They designed Blue Spot Speakers to be the last word in the science of modern sound reproduction. They set the seal of quality on their achievement by using the very best materials and a standard of construction which is the highest in the industry.

The result is there for all to hear in a range of speakers unequalled on every point. Follow Scott-Taggart's advice if you want your "S.T.500" to be a real success. Check up for yourself, if you so desire, by comparing Blue Spot with other makes. On any test—appearance, construction, performance—Blue Spot will emerge triumphant.



29P.M.
32/6

S.T. 500
will operate
SEVERAL SPEAKERS
 Make the most of your S.T.500. Instal Blue Spot Speakers in your Dining Room, Kitchen, Bedroom, etc., and have music everywhere.



22 P.M.
(29 P.M. Movement) 45/-

MOVING COIL SPEAKERS
 29P.M. 32/6 45P.M. 45/- 99P.M. 59/6

available in cabinet form and without transformer if desired.

OTHER TYPES 12/6 - 42/-

CLASS B
 66RB 30/- Cabinet 44RB 42/-



See advt. on page 519.

THE BRITISH BLUE SPOT COMPANY LTD

BLUE SPOT HOUSE - 94/96 ROSOMAN STREET - ROSEBERY AVENUE - LONDON - E C 1
 Telephone: Clerkenwell 3570. Telegrams: "Bluspot, Isling, London."
 Distributors for Northern England, Scotland and Wales: H. C. RAWSON (Sheffield and London) Ltd., 100 London Road, Sheffield; 22 St. Mary's Parsonage, Manchester; 177 Westgate Road, Newcastle-upon-Tyne; 37, 38, 39 Clyde Place, Glasgow.

CUT COUPON FOR CATALOGUE
 No. P.W.89.S.
 To receive a free copy of illustrated catalogue featuring ALL Blue Spot Products, write your name and address in the margin, cut out and post in open envelope (3d. stamp).

THE LATEST PENTODES

Recently the various valve manufacturers have been particularly active in producing new types of valves. The latest additions to this list include some pentodes which are here reviewed

By K. D. ROGERS.

DURING the last few months we have heard a great deal about the battery H.F. pentode, but it is only within the last week or two that it has become generally available to the public. So far only one type is obtainable—the VP21, from the factories of Marconi and Osram (price 15s. 6d.).

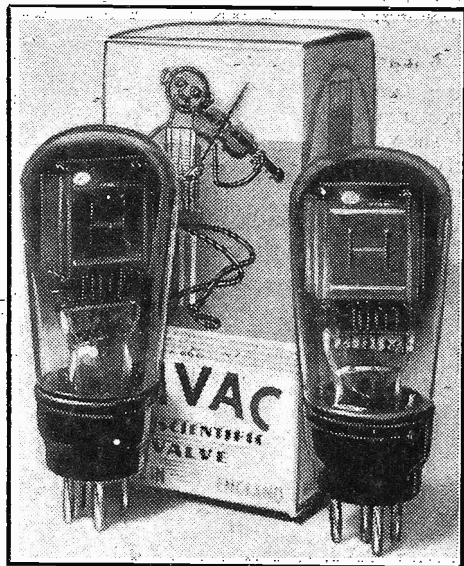
The valve is designed specially for use as a bias-controlled amplifier, being of the multi- μ variety, or as a detector. It has a mutual conductance of 1.1 at minimum bias, falling away to .008 ma./V when the bias is increased to about -9 volts.

Useful in Superhet. Circuits.

In order to make the valve as useful as possible the various electrodes, and even the metallised bulb covering, are brought out to separate pins, so that individual connections can be taken to the three grids, anode and filament of the valve. In this way it is particularly useful as a mixer valve in superhet. circuits, for the suppressor grid can take an active part in the circuit, if desired, instead of being anchored to the filament of the valve.

The separation of the electrodes necessitates the use of six pins, so that the valve is fitted with a standard seven-pin base, similar to that used on the Class B valves, and one of the pins is left vacant.

FROM HIVAC'S FACTORY



Here are two new Hivac pentodes. On the left is the Z.220, a battery valve in the 2-volt class, giving an output of 750 milliwatts, while on the right is the Y.220, which is a similar valve but delivers a smaller output, namely, 500 milliwatts.

The normal H.T. potentials are required—namely, 150 volts maximum for the anode and about 60 volts for the screened grid.

The screen voltage is fairly critical, having a large effect upon the mutual conductance and anode current of the valve. For instance, if the screen volts are 60 the mutual conductance has a maximum of

about 1.1 and the valve's anode current is about 2.8 milliamps. If the screen voltage is dropped to 50 the mutual conductance drops to .9 ma./V, while the anode current is lowered to 1.9 milliamps. The anode potential is kept at 150 volts, of course, while the screen current is of the order of .7 and .4 for the two cases.

The makers recommend that a minimum bias of .5-volt negative be used when the valve is employed as an H.F. or I.F. amplifier to avoid grid current, the whole of the bias necessary for the control of the valve being obtained from a 9-volt battery.

With each valve is supplied the usual card giving the chief characteristics and also the connections to the seven-pin base, so that those who think of going over to the H.F. pentode in sets that at the moment have multi- μ S.G. valves will be able to make their connections right away as soon as they have substituted for their four-pin valveholder a seven-pin one.

Increased Amplification.

The change from the S.G. to the pentode should result in increased amplification in most sets, but care will have to be taken in some that the increased mag. does not cause instability due to insufficient screening between anode and grid circuits.

In using the H.F. pentode for ordinary amplification the suppressor grid and the coating terminals of the valve holder are connected to the negative filament terminal.

In the course of development work on universal mains receivers we hear that Tungsram have found that a demand exists for H.F. pentode valves of lower efficiencies than those (H.P.2018 and H.P.2118) previously introduced, and accordingly they have released two such types in the H.P.1018 and H.P.1118, which have 10 v. 0.18 a. heaters.

The Grid Goes to the Top.

The first-mentioned valve has "straight" characteristics, while the second is of the multi- μ type, with a working grid base of about 52 v. Both are suitable for use in receivers such as midgets, where space is limited, for they have greater stability than the original valves. Following American practice, the grid connection is taken to the top terminal in each case, and this is claimed still further to increase stability.

The H.P.1018 is designed for a maximum anode voltage of 250, a screen voltage of 150, and, with the correct G.B. of -3 v. applied, passes a normal anode current of 2.3. The amplification factor is above 1,500, the A.C. resistance is 1.5 megohm, and the mutual conductance is 1.25 a/v. In the case of the variable- μ pentode, the maximum anode and screen voltages are 250 and 125 respectively, whilst the anode current at minimum bias is 10.5 m/a. The maximum slope is given as 1.64 ma/v.

A very useful size of L.F. pentode has just been released by Hivac in the Z.220.

It is a 2-volt battery valve with a mutual conductance of 2.2, an optimum load of 7,600 ohms and an anode current maximum at 150 volts H.T. of 18 milliamps. But it gives the useful figure of 750 milliwatts A.C. output, which should be very valuable to battery-set owners who favour a pentode output valve.

For the Small Battery User.

When used with an economiser it takes an average H.T. current of but 12 milliamps, so that it then comes within the scope of a double-capacity dry battery. The bias required is -9 volts at 150 volts H.T. and -7.5 at 120 volts.

Released with the Z.220 is a smaller brother pentode, the Y.220, which has an output capacity of 500 milliwatts, with an

H.T. current consumption of 11.5 at 150 volts H.T. The optimum load at 150 volts H.T. and -4.5 volts grid bias is 12,000 ohms. The mutual conductance of the valve is 2.2 ma./V. Used with 120 volts H.T., the anode current is only 9 milliamps, well within the requirements of the small H.T. battery user.

THE VP 21



The VP21 was the first battery H.F. pentode to be released. It should prove a very useful valve.

Another pentode I have received for test is the Mazda A.C.2/Pen, an indirectly heated A.C. valve of astounding powers, of which I shall be writing more later on. At the moment it will suffice to appease your curiosity if I state that from a grip input peak voltage of three the valve will provide an undistorted output of 3,400 milliwatts!

SHORT-WAVE COILS

Useful particulars regarding the coil sizes required to cover various wavebands.

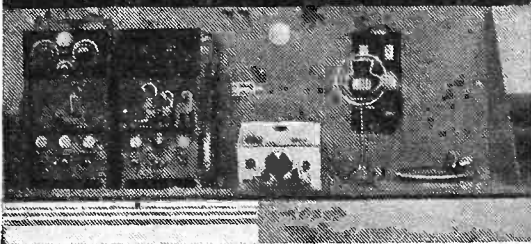
READERS who are in the habit of constructing their own coils will find the following table of assistance when they turn their attention to the short waves.

The number of turns refer to the grid and reaction coils respectively, and the waverange, which is approximate only, is for a variable condenser having a capacity of 100 micro-microfarads (.0001 mfd.).

Waverange	Turns	Turns
18 to 30 metres	4	4
30 to 60 metres	9	6
60 to 120 metres	20	10

The diameter of the coils should be 2½ in., and the spacing between turns about ⅜ to ½ in. F. B.

AN ALL-BAND



SHORT-WAVE RECEIVER

Designed and Described by F. BRIGGS.

This inexpensive, easy-to-build short-wave receiver covers all wavelengths between 16 and 200 metres, and among its outstanding features is a particularly pleasing reaction control. The original model is now being exhibited in the radio section of the Science Museum at South Kensington, where it forms part of a complete amateur transmitting and receiving station lent to the museum by "Popular Wireless."

A SUCCESSFUL short-wave receiver differs in many respects from an ordinary broadcast receiver. Its requirements are far more critical, for, as a rule, it has to deal with transmissions coming from great distances—in fact, from the very ends of the earth.

The fascination of listening to programmes direct from New York, South Africa or even Australia has to be experienced to be appreciated. Then you can listen to amateurs talking to fellow-amateurs in far-off countries. In fact, the wealth

The short-wave receiver described in this article possesses all the features that go to make a good set. It is enclosed completely in a steel cabinet, thus ensuring that it is efficiently screened. This in itself is a most desirable feature, as it provides an entire freedom from hand-capacity effects.

It covers a waverange from approximately 16 to 200 metres, the various bands being covered by means of a number of plug-in coils. Although the use of plug-in coils may at first sight seem crude, it is actually the ideal arrangement for the shorter waves, as it precludes all chances of dead-end effects.

the centre of the whole outfit, the cover being removed.

The transmitter proper is located on the extreme left, and it comprises a crystal-controlled oscillator which drives a 10-watt power amplifier. It is designed for operation on the 160-metre amateur band.

Amplifying Speech Currents.

The modulator, which is really a large low-frequency amplifier, is situated alongside the transmitter. This part of the installation is used only for telephony transmissions, and serves to amplify the speech currents up to sufficient magnitude to modulate the carrier-wave. The output valve in this amplifier is a D.A.60, and is capable of giving an undistorted output of 10 watts. It has 500 volts on its anode.

The microphone can be seen to the right of the receiver and just in front of the switchboard which controls the various circuits, including the electric gramophone motor on the extreme right. Accumulator-charging arrangements are also included in this board.

In the near future it may be possible to give a detailed description of the station for the benefit of those who are interested.

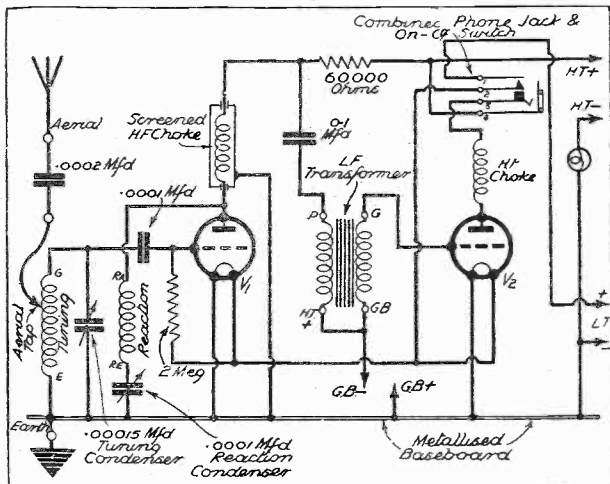
For Headphones or Speaker.

Now, getting back to the receiver, a glance at the theoretical circuit diagram will show how simple an arrangement it really is. Two valves only are employed—a detector and an output valve.

The set was primarily designed for use with headphones; but by employing a small power valve in the last stage good loud-speaker reproduction can be enjoyed from

(Continued on next page.)

A STRAIGHTFORWARD CIRCUIT



Simplicity is the keynote in the design of most successful short-wave receivers, and the lack of complications in this latest set is evident from the above diagram. Note that a parallel-fed transformer is employed, thus obviating any risk of threshold howl.

General-Purpose Set.

The set is actually a general-purpose short-wave receiver that will appeal to the novice and experienced amateur alike. In addition to covering the usual short-wave broadcast bands, it will tune in the 20-, 40-, 80- and 160-metre amateur bands, from which many enjoyable hours of listening can be obtained.

The original receiver is now being exhibited at the Science Museum, South Kensington. It is shown as the receiver of a complete amateur short-wave station which has been lent to the museum by POPULAR WIRELESS.

No doubt many readers

of interesting things below the 200-metre mark is so vast that even the hardened enthusiast finds it full of thrills.

One of the essentials of a successful short-waver is that all the controls must be really smooth in operation. For instance, the reaction must be free from all "ploppiness," for it is upon the efficient use of reaction that the success of the set depends.

Good Vernier Control.

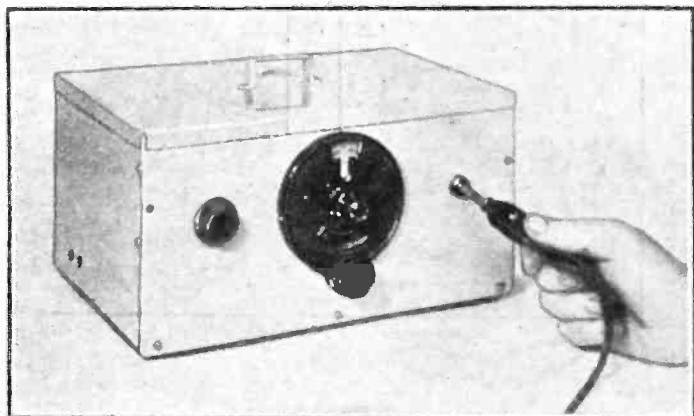
Tuning is also quite sharp, a fraction of a degree on the tuning dial being sufficient to bring quite a powerful transmission in and out again. Therefore a good vernier control is almost indispensable.

So what it really boils down to is that a short-wave set has to be much more carefully designed and built than an ordinary broadcast receiver, and, provided the various little points referred to are carried out, you will never give up the short-wave game.

who are interested will be going along to see it, so perhaps a few words about the apparatus will not be out of place. It should provide a means of spending quite an enjoyable afternoon, for the radio section of the museum contains a most interesting and instructive collection.

In the heading to this article you see a photograph of the complete station as it now appears at the museum. You should easily be able to recognise the receiver, which is situated in

SEE IT AT THE SCIENCE MUSEUM



The finished receiver has a very business-like appearance. It is completely screened, being enclosed in a special steel cabinet, and the low-tension is automatically switched on and off by the insertion and withdrawal of the phone plug.

AN ALL-BAND SHORT-WAVE RECEIVER

(Continued from previous page.)

the more powerful transmissions. Full details regarding the types of valves to use are included in a special list on this page.

This is a most useful feature, as it assures that there is no chance of the set being left switched on. Withdrawing the phone plug automatically turns the L.T. supply off.

The feed from the aerial comes through a small fixed condenser having a capacity of .0002 mfd. Then, by means of a crocodile clip, the desired number of turns can be tapped off to provide the right amount of coupling.

This receiver is completely free from threshold howl, by virtue of the fact that a parallel-feed arrangement has been provided for the L.F. transformer. Absence from threshold howl is very important

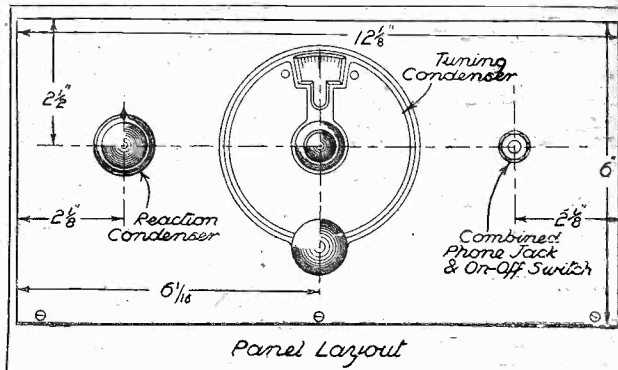
HERE ARE THE VALVES WE RECOMMEND

Make	Detector	Output	
		Headphones	Loudspeaker
Mullard	P.M.1H.L.	P.M.2D.X.	P.M.2A.
Mazda	H.L.210	L.210	P.220
Cossor	210H.F.	210L.F.	210P.A.
Marconi	H.L.2	L.210	L.P.2
Osrain	H.L.2	L.210	L.P.2
Tungsram	P.D.22)	L.G.210	
Hivac	H.210	L.210	P.220

You will probably have noticed that no on-off switch is provided on the set. The reason for this is that the set is automatically switched on when the phone plug is inserted in the jack seen on the right-hand end of the front panel.

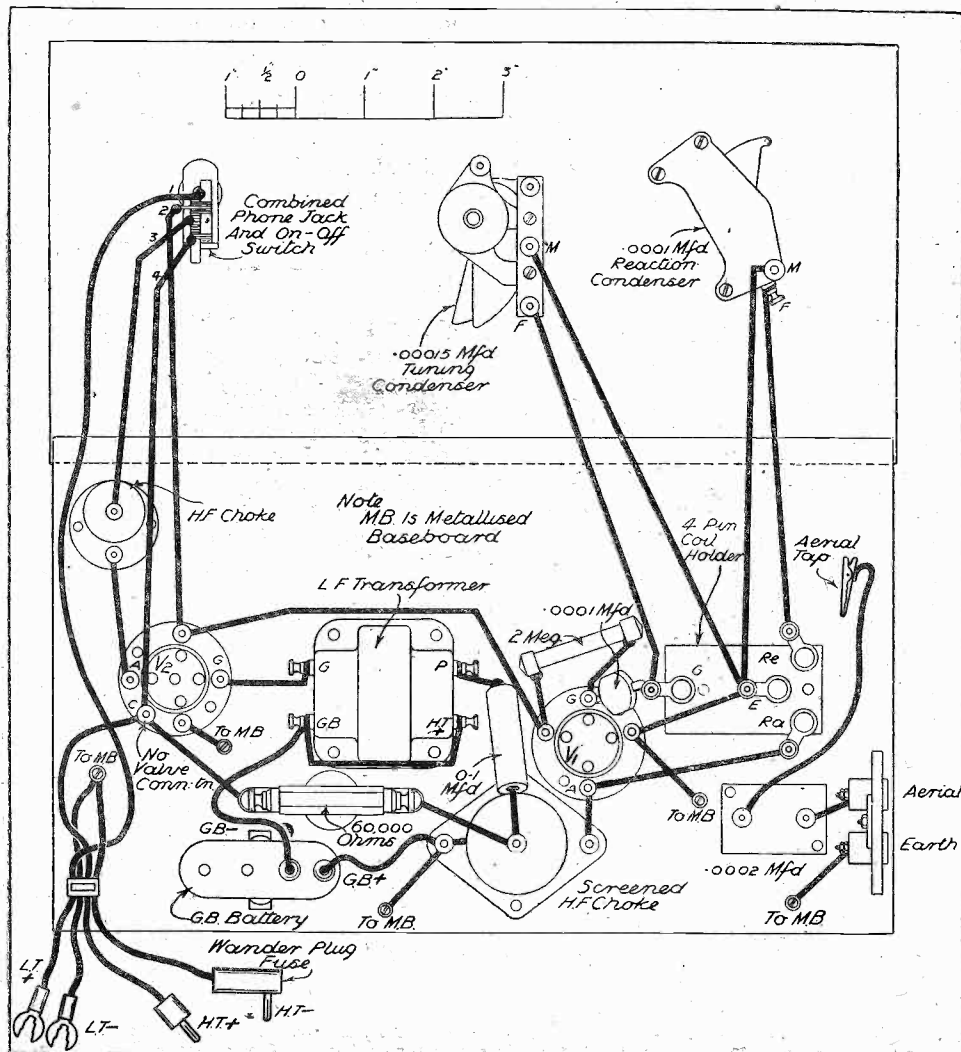
The reaction control is situated on the left-hand side of the front panel. It takes the form of a small variable condenser with a capacity of .0001 mfd. in series with the reaction coil. The control is delightfully smooth.

SIMPLE CONTROL IS A FEATURE



The operation of the receiver will not present any difficulties, as there are but two controls on the panel, the reaction condenser to the left and the tuning dial in the centre. The metal cabinet ensures against any hand-capacity effects.

MAKE THIS YOUR GUIDE WHEN WIRING UP



It is important that this layout should be followed accurately, since it is upon the correct placing of the components that the lengths of the various wires depend. In all short-wave receivers it is highly advisable to keep certain leads as short as possible.

where sensitivity is concerned, because this effect usually takes place just prior to oscillation, namely when the set would otherwise be in its most sensitive state.

Another common short-wave fault that has been obviated is head-capacity effects. This is generally caused by H.F. getting back into the phone cords, and in this set it has been prevented by the inclusion of a short-wave H.F. choke in the anode circuit of the output valve.

Employs a Metallised Baseboard.

There is nothing very difficult about the construction of the receiver. It follows normal lines, a metallised baseboard being used to take all the earth returns. Follow the original closely and you will not have any trouble.

SUGGESTED ACCESSORIES

- HEADPHONES.—B.T.H.
- LOUDSPEAKER (if required).—Rola, W.B., Blue Spot, Marconiphone, R. & A., Celestion, G.E.C., Ferranti, Atlas, Amplion, Ormond.
- BATTERIES.—H.T. 120 volts: Ediswan, Lissen, G.E.C., Ever Ready, Marconiphone, Pertrix, Drydex, Hellesens, Block.
- G.B. 4½ volts: Siemens, Pertrix, Lissen, Hellesens, Ever Ready.
- L.T. 2 volts: Ediswan, Block, Oldham, Exide, Lissen, G.E.C.
- AERIAL AND EARTH EQUIPMENT.—Electron "Superial," Goltone "Akrite," Radiophone "Receptu" down lead, Bulgin lightning switch, Graham Farish "Filt" earthing device.

It is strongly advised that you buy the panel (and cabinet, if desired) from Messrs. Burne-Jones. It will then be already drilled to take the specified components.

Care should be taken, however, to see that the paint is carefully scraped away where the panel components make contact. This applies to the tuning and reaction condensers.

The Headphone Jack.

There is one panel component that should not be earthed, however, and that is the headphone jack. This should be insulated from the panel very carefully by an ebonite bush, otherwise the H.T. will be shorted.

You should also make sure that the panel

(Continued on page 516.)

"No Tears with a PILOT AUTHOR KIT"



The Pilot Kit SERVICE was founded in 1919.

S.T.500

PILOT AUTHOR KIT EXACT TO SPECIFICATION



See the PILOT on the carlon. It's a real guarantee.

For detailed list of Parts SEE OUR PREVIOUS S.T.500 ANNOUNCEMENTS Oct. 21st and Oct. 28th issues, or sent upon request by return of post.

S.T.500 CONVERSION KITS



YOURS FOR 5/-
BALANCE IN 8 MONTHLY PAYMENTS OF 5/-

CONVERTS YOUR S.T.400 into the new S.T.500

Comprises: 1 Peto-Scott Baseboard; 3 G.F. 0005 mfd. Condensers; 1 J.B. 0001 preset; 1 J.B. 0005 preset; 1 Telsen Driver Transformer; 1 Telsen Output Choke; 1 G.F. 7-pin valve holder; 2 Dubilier 5,000-ohm 1-watt Resistances; 2 Dubilier 10,000-ohm 1-watt Resistances; 1 G.F. 250 Ohmite Resistance; 2 T.C.C. 0005-mfd. Condensers; 1 G.F. 0005-mfd. Condenser; 1 Lissen 00005-mfd. Condenser; 1 T.C.C. 1-mfd. Condenser; 1 B.R.G. Bracket; Wire, screws, flex, etc. WITH COPY OF "POPULAR WIRELESS," 21/10/33. AND BLUE PRINT. CASH or C.O.D. Carriage Paid, 42/-, or 5/- Deposit and 8 monthly payments of 5/3.

H.P. TERMS: Complete Kit with Valve—12 monthly payments of 5/3.

CONVERTS YOUR S.T.300 into the new S.T.500

Cash or C.O.D. 51/- Carriage Paid. Or 6/- Deposit and 9 monthly payments of 5/6. H.P. TERMS: Complete Kit with Valve—12 monthly payments of 6/-.

S.T.500 STRUCTAKIT



CASH or C.O.D. 7/6
Post Free.

Comprising Peto-Scott Baseboard with Metaplex Section; Ready Drilled Panel and Terminal Strip;

"S.T.500" Screen; B.G. Mounting Bracket with Free copy of Popular Wireless, and OFFICIAL BLUE PRINT IMPORTANT Parts, Kits, Miscellaneous Components or Accessories for Cash, C.O.D. or H.P. on our own System of Easy Payments. Send us a list of your wants. We will quote you by return. C.O.D. orders value over 10/- sent Carriage and all Post Charges Paid.

CASH — C.O.D.

£ 5 - 5 - 0

OR YOURS FOR

9/6

Balance in 11 monthly payments of 9/6.

KIT "A" Comprising Mr. John Scott-Taggart's Kit of FIRST SPECIFIED Components, including Telsen "Class B" output Choke, Peto-Scott Metaplex Baseboard and Ready-drilled Panel and Terminal Strip. Less Valves and Cabinet. With FULL-SIZE Blue Print and copy "Popular Wireless," Oct. 21st. Cash or C.O.D. Carriage Paid **£5-5-0** or 12 monthly payments of 9/6.

ALL KIT AND FINISHED INSTRUMENT PRICES INCLUDE BATTERIES.

"S.T.500" Battery Equipment:

120-volt Drydex, Orange Triangle, Triple Capacity; 9-volt Drydex G.B. Battery and Peto-Scott 2-volt 45 amp. L.T. Glass-cell Accumulator. Cash or C.O.D. Carriage Paid, **£1-11-3**; or add 3/- to First and each Monthly Payment.

KIT "B" As Kit "A" but including 4 Specified Valves. Cash or C.O.D. Carriage Paid. **£7-10-3** or 12 monthly payments of 13/9.

KIT "CT" As Kit "B" but including Peto-Scott Specified Walnut Table Cabinet. Cash or C.O.D. Carriage Paid **£8-9-9** or 12 monthly payments of 15/6.

KIT "CC" As Kit "B," including Peto-Scott Specified Walnut Console Cabinet. Complete with Baffle Baseboard Assembly, but less Speaker. Cash or C.O.D. Carriage Paid **£8-18-9** or 12 monthly payments of 16/3. If Peto-Scott Permanent Magnet Speaker required add 15/- to Cash Price or add 1/3 to each monthly payment.

FINISHED INSTRUMENTS

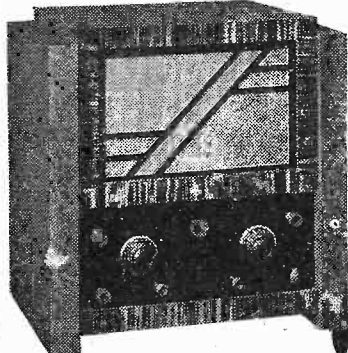
"S.T.500," complete in Peto-Scott Walnut Table Cabinet, exact to Mr. John Scott-Taggart's FIRST Specification. Aerial Tested. Complete with Valves. Cash or C.O.D. Carriage Paid. **£10-0-0** or 12 monthly payments of 18/3.

"S.T.500," complete in Peto-Scott Walnut Console Cabinet, exact to specification. With Peto-Scott Moving-Coil Speaker. Complete with Valves. Ready to Play. Aerial Tested. Cash or C.O.D. Carriage Paid. **£11-5-0** or 12 monthly payments of 21/-.

PETO-SCOTT S.T.500 CABINETS

EXCLUSIVELY SPECIFIED BY MR. JOHN SCOTT-TAGGART

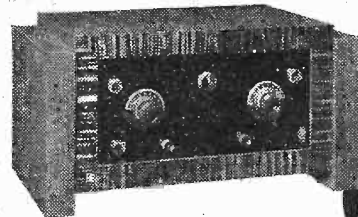
Console Model. An outstanding example of cabinet craftsmanship. Hand French polished. Veneered Macassar and Walnut finish by experts.



Regd. Design No. 787.010

Cash or C.O.D. 25/- Garr. & Packing 2/6 extra. Deposit and 4 monthly payments of 6/- (including carriage and packing). Baffle-Baseboard assembly, 3/6 extra.

25/-



Regd. Design No. 78.011.

19/6

Original design Table Cabinet with Veneered Macassar and Fine Walnut Finish. Hand French polished. Constructed of the finest wood by London's leading craftsmen. Cash or C.O.D. 19/6. Carriage and Packing 2/6 extra.

or 6/- Deposit and 3 monthly payments of 6/-. (Including carriage and packing.) Send to-day for copy of 1934 Cabinet Catalogue.

PETO-SCOTT CO. LTD. 77 CITY ROAD, LONDON, E.C.1. Telephone: Clerkenwell 9406/9. Tel.: Holborn 3248.

Dear Sirs,—Please send S.T.500 KIT "A" S.T.500 KIT "CT" or CASH/C.O.D./H.P.: S.T.500 KIT "B" S.T.500 KIT "CC" with/without SPEAKER. for which I enclose £.....s.....d CASH/H.P. Deposit

NAME..... ADDRESS..... P.W., 18/11/33.

ANY ITEM SUPPLIED SEPARATELY—ORDERS OVER 10/- SENT C.O.D. CARRIAGE AND POST CHARGES PAID

AN ALL-BAND SHORT-WAVE RECEIVER

(Continued from page 514.)

makes metallic contact with the body of the box, otherwise you will have an unearthed screen around the set, a most undesirable state of affairs. The same remarks apply to the lid of the set.

There is nothing more liable to cause bad crackling in a short-wave receiver than bad contacts. So make assurance doubly sure by attending to these points. Also make certain that all the wiring connections in the set are really tight.

Keep the Grid Leads Short.

If you prefer, there is no harm in soldering most of the joints. The best scheme is to obtain a number of small soldering tags, and then fix them on the ends of the wires. It is not advisable to solder direct on to the terminals, as the heat of the iron is liable to damage the components.

Remember that with a short-wave receiver it is most important to keep the detector grid lead as short as possible, and also the wires between the tuning condenser and the coil. The inductance and capacities being dealt with are so small that the effect of a piece of wire a few inches long can be quite considerable, so follow the wiring diagram carefully.

There is one further point that should be mentioned, and this concerns the valve holder for the output valve. You will notice that it is of the five-pin variety.

Using a Pentode.

The reason for this is so that you can use a pentode output valve if you wish. It is already wired for the purpose, the extra terminal being taken to H.T. plus.

If you do wish to use a pentode it should be employed only with a loudspeaker. Normally, however, the small power valve should be quite sufficient. The type of pentode recommended is the Marconi or Osram P.T.2, or the Mullard P.M.22A. The Mazda and Cossor equivalents being Pen. 220 and 220 H.P.T. respectively.

There are any amount of interesting things to hear with a receiver of this type. Schenectady W2 X A D on 19.56 metres is one of the most entertaining on the lower band, and can be tuned in late in the

afternoons. At times he will provide quite good loudspeaker reproduction, even on a small two-valve receiver like the one being described.

Then there is Pittsburg W8 X K on 19.72 metres, in fact a whole-host of transmissions originating from all parts of the world all around the 20-metre mark. Also a large number of amateur transmissions.

If you inspect a list of short-wave stations, you will see for yourself the long list from which you can select your stations. Of course, you must not expect to be able to tune in any station at any time, that would be asking too much. Different parts of the world come in best at certain times

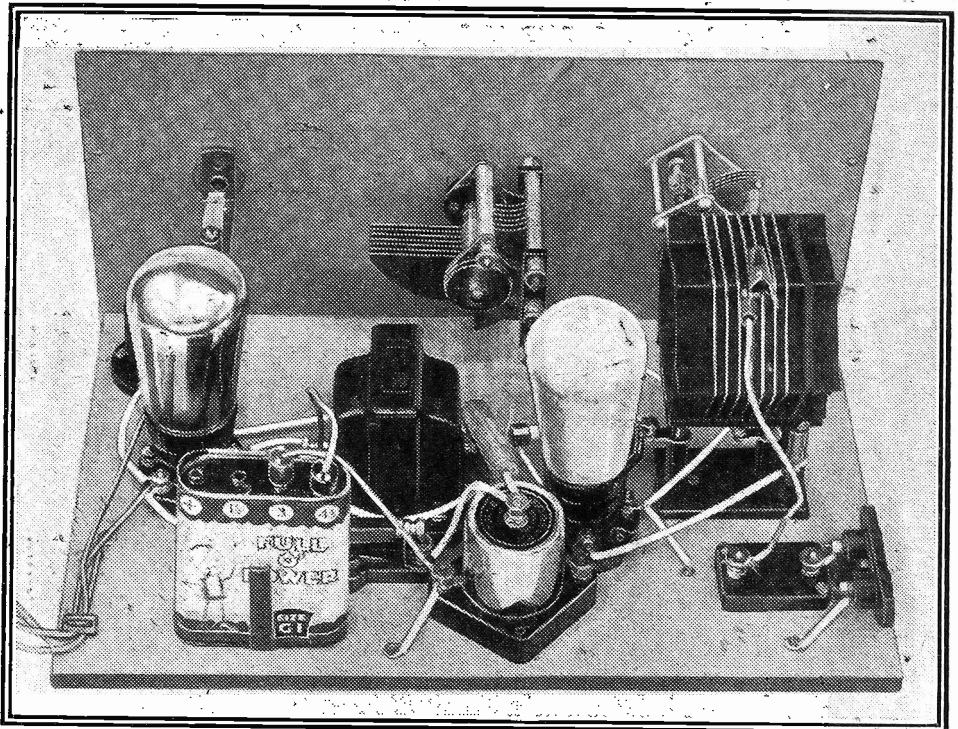
150 and 170 metres on Sunday mornings. The largest coil will be the one for this band. The operation of the set is perfectly straightforward. But for best results searching should be carried out with the set right on the edge of oscillation.

Some Hints on Tuning.

If it is oscillating too strongly the carriers will be comparatively weak, and therefore easy to miss, so the nearer you can keep it to the "just-not-oscillating" point the better. Tuning will, of course, be quite sharp, so turn the dial very, very slowly.

And don't forget to pay that visit to the Science Museum at South Kensington,

A BEHIND-THE-PANEL VIEW OF THE RECEIVER



This photograph illustrates the inside of the finished receiver. The detector valve is on the right, while the output stage is to the left. Note that the crocodile clip on the grid coil is located about half-way from the grid end: this will normally be the best position.

of the day. And then, wavelength is a very important factor. As a rule it can be considered that anything below about 25 metres is a daylight wave, while those transmissions above this figure come in best after dark.

If you would like to hear a few of your local amateurs, you should listen between

where the original set can be seen. As I said before, you will find it as part of a complete amateur transmitting station in the radio section.

The museum is open to the public between the hours of 10 a.m. and 6 p.m. every week-day, and between 2.30 p.m. and 6 p.m. on Sundays.

ALL THE PARTS YOU WILL REQUIRE ARE INCLUDED IN THIS LIST

Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer.	Component	Make used by Designer	Alternative makes of suitable specification recommended by Designer.
1 Metal panel, 12½ in. x 6 ins.	Magnum	—	1 60,000 - ohm resistance, with horizontal holder	Graham Farish "Ohmite" 1½ watt	Dubilier
1 Metaplex baseboard, 12 ins. x 7 ins.	Peto-Scott	—	1 Screened H.F. choke	Telsen W.342	Graham Farish
1 Metal cabinet	Magnum	—	1 S.W. H.F. choke	British Radiogram	Bulgin, Igranic
1 Coil holder	Bulgin SW.3	—	1 L.F. transformer	Lissen "Hypernik"	R.L., Igranic, Telsen
1 Set short-wave coils	Bulgin SW.2, 3, 4, 9 and 10	—	1 Jack	Igranic, No. P.65	—
1 4-pin valve holder	W.B.	Benjamin, Telsen, Lissen	1 Plug	Igranic, P.40	—
1 5-pin valve holder	W.B.	Telsen, Lissen, Benjamin	1 Insulating washer for above	British Radiogram	—
1 Vernier dial	Igranic Indigraph (Cat: VINIL)	—	1 G.B. battery clip	Bulgin No. 3	—
1 .00015 mfd. tuning condenser	J.B. short-wave	—	1 Twin plug strip	Bulgin, P.30/AE	—
1 .0001-mfd. reaction condenser	Polar No. 4	—	3 Wander-plugs	Goltone	Belling & Lee
1 .0001-mfd. fixed condenser	Dubilier 665	T.T.C., Igranic	1 Wander-fuse	Belling & Lee	—
1 .0002-mfd. fixed condenser	T.C.C., type S	Telsen, Dubilier, Lissen	2 Accumulator tags	Belling & Lee	Goltone
1 1-mfd. fixed condenser	T.C.C., type 250	Eric	1 Crocodile clip	Bulgin Nickel	—
1 2-meg. grid leak, with wire ends	Dubilier 1 watt	Goltone, Lissen, Igranic	3 yards 18 S.W.G. tinned copper wire	Goltone	—
			2½ yards insulated sleeving	Goltone	—
			Flex, screws, etc.	Peto-Scott	—

G.E.C. H.T.

Quality and power
consistently maintained
throughout long life

120 volt
144,000 milliwatt hours
GUARANTEED

PRICES:
60v: 5/6. 99v: 9/-.
108v: 10/-. 120v:
11/-. 150v: 14/-.
60v. Triple
Capacity: 12/-.
108



ASK FOR
G.E.C. H.T.
TO-DAY

Sold by all Wireless Dealers
MADE IN ENGLAND

A TRIAL MEANS YOU'LL ALWAYS USE G.E.C. H.T.

Advt. of The General Electric Co. Ltd., Head Office and Public Showrooms: Magnet House, Kingsway, London, W.C.2



FROM THE TECHNICAL EDITOR'S NOTE BOOK

TESTED AND FOUND?

A NOVEL H.T. BATTERY

It often happens that certain cells of an H.T. battery depreciate much more rapidly than others. Indeed, this is inevitable in certain cases, quite apart from any irregularity in the lasting qualities of the cells themselves.

It is obvious that if, say, a 90-volt tap is serving all the valves except the power valve, which takes a full 120, those cells which provide the final 30 volts do less work than the others.

Such unevenness of discharge can be countered easily by the Precision Unit Cell H.T. Battery, made by Watson & Henderson, Ltd., of Gateshead.

This comprises a substantial case fitted with separate 1½-volt cells, which, because they are connected together by ingenious snap connections, can easily be replaced as and when they are discharged.

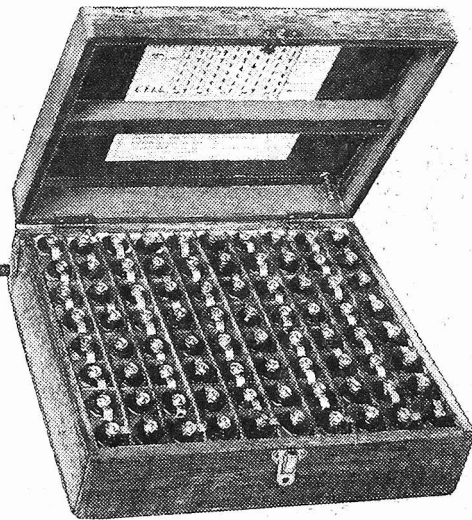
Another ingenious feature is the voltage selector which obviates the use of wander-plugs and provides a convenient method of quickly selecting desired voltages.

It is a scheme that deserves close consideration on the part of constructors. I have examined and tested a sample battery and find it to be a sound proposition.

IGRANIC FIXED CONDENSERS

It is extremely difficult, if not quite impossible, to classify the components of any radio set in an order of importance. It is true that troubles caused by faults in some are often more noticeable than the evidence of failings of others.

For example, a badly designed coil may result in a complete scrambling of long-wave stations by medium-wave stations, whereas the breakdown of a



The Precision Unit Cell H.T. Battery, in which individual cells can be replaced as this becomes necessary.

grid leak might evince itself in only a barely perceptible distortion.

But for a first-class performance every part of the set has to be beyond criticism.

Simply because fixed condensers sometimes appear almost haphazardly to be sprinkled over a circuit, some constructors may jump to the conclusion that they are in the nature of refinements and that they need not necessarily be chosen with the care of the other components.

This is quite wrong. Probably every one of those fixed condensers has got a well-defined and important duty to do. I say "probably" because I think at times even some set designers tend to fall into the evil habit of regarding the relatively inexpensive fixed condenser as a kind of finishing touch, to be dropped in there and clipped on here as the momentary fancy—and not too much thought—dictates.

This is probably the most widely read review of new apparatus appearing in radio journalism to-day. Instead of presenting test reports on dry as dust conventional lines, "P.W.'s" Technical Editor discusses the various components from practical points of view, and incidentally manages to crowd in an enormous amount of interesting and useful information of a general nature.

"It's only a by-pass," is the sort of remark one hears about the underrated fixed condenser. Certainly a "by-pass" condenser may not find an important place in the theoretical conception of the essential principles of a circuit, but in practice it can easily be a most vital component.

Upon its "humble" shoulders may rest the responsibility of keeping the set free from instability or hum. A major fault in its construction could, perhaps, cause a battery to be short circuited and ruined and an expensive team of valves to be destroyed.

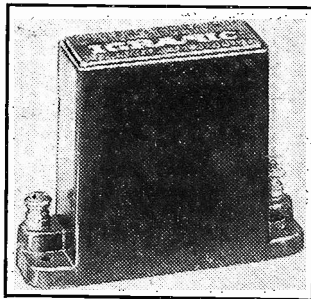
If you bear this in mind I am sure you won't be tempted to buy "any old make," but will make sure that the fixed condensers you do purchase have the brand of a reputable, trustworthy concern.

All the foregoing remarks are due to an Igranic fixed-condenser which I am holding in my left hand as I pen these very words, which are written subsequently to my testing the article in our Research Department.

While I was doing this I was interrupted by one of our engineers who was quite burning with indignation about another fixed condenser (not Igranic) which had let him down badly in an experimental mains outfit!

The particular Igranic fixed condenser under review was found to be perfectly satisfactory in every way, and I'd have no hesitation in using it in my own set—could I say more than that? It is a 2-mfd. of non-inductive construction. It is often vital that a fixed condenser in the H.F. stages of a set should be non-inductive. The old "Mansbridges" sometimes possessed quite a lot of inductance due to the methods employed in their construction.

Modern high-efficiency sets demand strict attention to such details as this, whereas at one time it



One of the Igranic range of fixed condensers, which are reliable and well made.

The greatest thing in the film industry, says the expert, is the story. I agree; and it's the same with radio-drama. Compton Mackenzie's "Carnival" was a conspicuous success; and this success was largely due to the fact that it was a good story. I cannot believe that it was all due to the excellence of the cast, because each of the preceding plays in this festival series was just as well cast.

It could be argued, of course, that the play was made by the way it was produced. This is more likely, perhaps, for there were evidences of very clever and careful work by Val Gielgud. He allowed not the smallest interruption in the continuity of the story, and with so many events this might have been thought inevitable. Never have I appreciated the effects of music in radio-drama more than I did in "Carnival." It was a long play, too, and most critics deplore the long play. "Carnival" wasn't a minute too long. It gripped me for the whole 110 minutes it was in progress. It is this fact that persuades me to believe that it is mainly the story that places "Carnival" so high in the list of broadcast plays.

I think instinctively of "The Green Goddess,"

would have been almost laughable to suggest that one should look out for inductance in a condenser.

But the admittedly not large inductance of an ordinary large-capacity condenser can seriously upset some of our present-day circuits if such an inductance happens to appear in the wrong place—as by the very nature of things it is liable to do.

However, it is easy to avoid such trouble—the Igranic Non-Inductance Fixed Condenser points the way.

A MAGNAVOX SPEAKER

Though most of us, I think, are apt to consider the moving-coil principle as being the very epitome of modernity, it was actually invented in 1898 by P. W. S. Scientific Adviser, Sir Oliver Lodge. So as a principle it is as old as wireless itself.

As a matter of fact, Magnavox moving-coil loudspeakers were being made over twenty years ago. Therefore it is not surprising that, with such a long tradition of development behind it, the Magnavox stands well to the forefront to-day.

But it is still cause for wonder that you can now buy for the competitive price of 37s. 6d. a permanent-magnet Magnavox, complete with input transformer and all ready for fixing into a cabinet or on to a baffle. That certainly is Progress with a capital P, and provides a clue to the overwhelming popularity of this type of instrument. It is within the reach of all and is no longer the rich man's luxury. Benjamin Electric, Ltd. make the Magnavox, and recently they sent me one of their Senior models, the type 252, which retails at £3 3s.

One of the things that tends to make one uneasy in the case of many "M.C." speakers is the almost light-hearted manner in which the question of matching is dismissed.

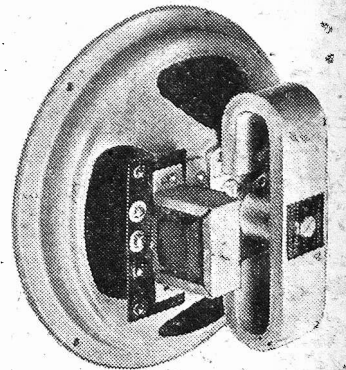
Good matching between the speaker and the output valve of the set is extremely important. The Magnavox incorporates a fine scheme for enabling this to be done by even non-expert listeners.

Its transformer has a number of screw terminals, and each is provided with a coloured disc. The instructions for matching, therefore, do not necessitate a bewildering number of ratios, but merely refers to colour combinations: blue-red for this type of valve, black-white for that type of valve, and so on.

Six methods of connection are possible, including Class B and push-pull circuits. So all operating conditions can be well met.

The speaker on test gave impressive results, and on that difficult treble range it retained excellent brightness and attack.

But it almost seems superfluous to make remarks like that about a Magnavox!



Magnavox M.C. speakers have been made for 20 years. Here is one of the latest senior models.

THE LISTENER'S NOTEBOOK

Frank comments on recent programmes and on microphone personalities of the moment.

which was broadcast some time ago now. In most respects this play bore no resemblance to "Carnival," but it had at least one feature in common with Compton Mackenzie's play—it was a good story.

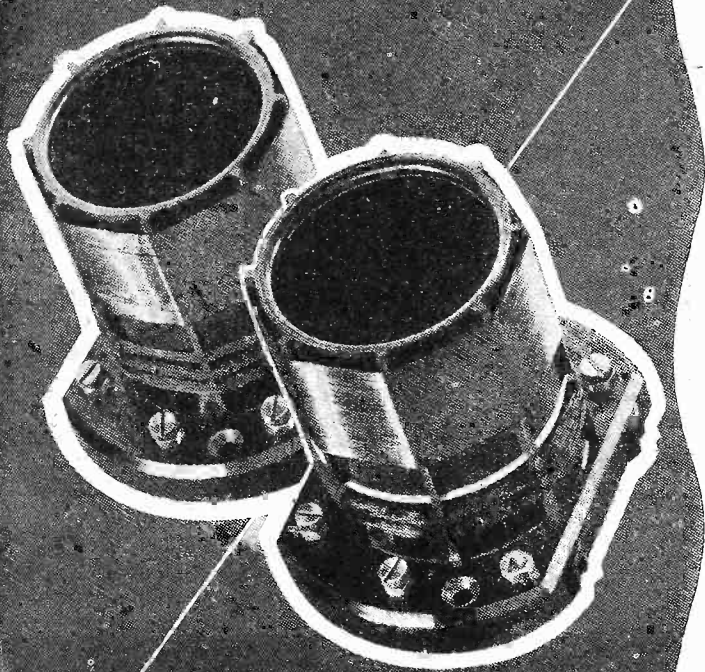
Since the programme builders have let us know some of the difficulties of their job I've been more sympathetically disposed towards them, though I can't always accept their arrangements without a frown. I frowned horribly, for instance, when I had to switch over from the Lionel Tertis-Solomon recital on the Regional to hear Mr. S. P. B. Mais on the National.

You see, I wouldn't miss Mais for worlds. He is one of the biggest events of the week, in my estimation. Solomon is just as big an attraction, too, and I wouldn't miss him for worlds either. But the B.B.C.'s arrangement forbids me to listen to them both in their entirety.

It was all the more irritating because it could have been so easily avoided. If the B.B.C. chamber

(Continued on page 531.)

SCOTT TAGGART



USED THEM!

Get the same results as ST himself

Every Colvern coil is tested and guaranteed to give the same results that Scott-Taggart got in his original S.T.500. This is made possible by working to the very highest standard of engineering precision. If you want to make sure of the finest results, then be sure to insist on the finest coils—Colvern. Write to-day for Colvern's latest booklet.

COLVERN S.T.500 COILS 8/- PER PAIR.

Colvern Limited, Mawneys Rd., Romford, Essex.

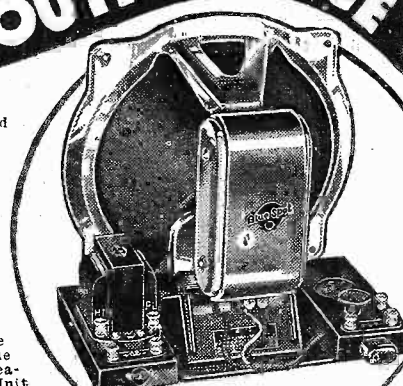
COLVERN

SPECIALISE IN COILS!

THE NEW BLUE SPOT CLASS 'B' OUTPUT STAGE

ONLY **3/6** DOWN

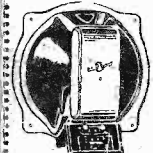
For all standard and all recent types of Blue Spot M.C. Speakers, 66R Units and Cabinet models. This new Class B Unit can be fitted in a few seconds, in the case of Blue Spot Speakers simply by means of bolts which bind unit and speaker together as a complete rigid unit. The assembly will then fit inside any Blue Spot Speaker cabinet. Among the features are TONE CONTROL to match Unit with Set, Provision for Grid Bias for Class B valve when required, and EXTENSION SPEAKER PLUG. The complete unit is of superior manufacture throughout and being made of metal is practically unbreakable.



Blue Spot 45 PM fitted to Class B Output Stage

SEND FOR IT ON 7 DAYS' TRIAL

Send only 3/6, if satisfied pay further 5/- at once, then 8 monthly payments of 5/-. (Cash in 7 days, 43/6.) WITH OSRAM B21 VALVE, but without Speaker. Sent carefully packed and Carriage Paid.



BLUE SPOT SPEAKERS

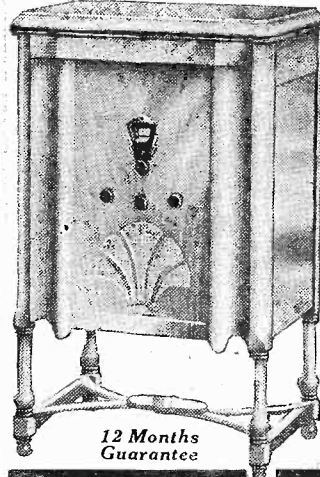
Model 45 P.M. Send 2/6 for 7 days' trial, if satisfied, further 5/- at once, then 6 monthly payments of 7/6. (Cash in 7 days, 45/-)

Model 29 P.M. Send only 2/6; if satisfied, further 5/- at once, then 6 monthly payments of 5/-. (Cash. 32/6.)

Only **2/6** DOWN

E. J. HERAUD, Ltd., Dept. P.W. 24, NUMBER ONE, EDMONTON, LONDON, N.18
Phone: TOTtenham 2256. Satisfaction or Money Back Guaranteed

Branches: 78/82, Fore St., Edmonton; 77, West Green Rd., Tottenham; 34, St. James St., Walthamstow; and 139, Hertford Rd., Enfield Wash.



12 Months Guarantee

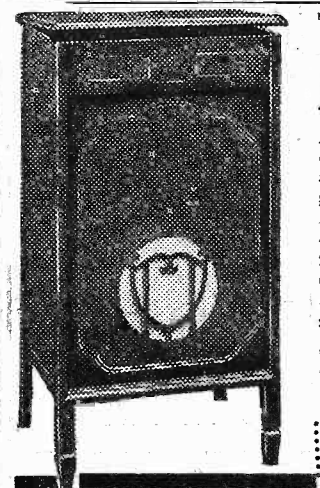
STILL FURTHER REDUCED Owing to Tremendous Increase in Sales.

THE GLORIOUS ROYAL 4 Valve RADIOGRAM now 5 Valve SUPERHET

only **17 GUINEAS!** **14 Gns.**

A.C. All Mains Variable- μ screened-grid valve, power grid detection and corrected Pentode output, and Mazda Valve rectification. Receives signals 200-2,000 metres. Magnetically coupled band-pass tuning with illuminated calibrated dial B.T.H. Mains-excited Moving-coil Speaker Line Voltage Regulator with safety fuse incorporated Garrard Electric Motor, Automatic stop B.T.H. pick-up. Special gramophone tone corrector. Walnut cabinet. Triple gang condenser controlled by single knob. The finest value in the world. Honestly worth double. (Also D.C. Model, 16 gns.) Write immediately for illustrated booklet, and particulars of 3 days trial.

ROYAL RADIO CO., 5, Buckingham Rd., South Woodford, E.18. Phone: BUCK 2736



The 'POPULAR' Radiogram Cabinet

An attractive but inexpensive Radiogram cabinet that will house most sets with ample room for speaker, batteries and gramophone motor.

Automatic stop, baffle board, base board and shelf. Finished shaded walnut **75/-** Send coupon for free Camco Cabinet Catalogue or see complete range in our showrooms.

Carrington Mfg. Co. Ltd., Showroom: 24, Hatton Garden, London, E.C.1.



Hol. 8202. Works: S. Croydon.

Name.....
Address..... 33 P.W.



MAGNAVOX SPEAKER

is
HALF the BATTLE!

Modern circuit design demands the utmost sensitivity from your speaker. Because of the high flux density across the gap of its moving coil the Magnavox P.M. speaker is particularly sensitive and the most suitable to these requirements.

This speaker is designed for operation with every type of set and for the purpose of accurate connection is fitted with a multi ratio transformer; the tappings of which are brought out to screw terminals, each denoted by a coloured disc. Soldering tags are also provided. The complete speaker is supplied in a sealed dust-proof bag having a front of artistic gold silk gauze.

STANDARD MODEL (TYPE 254) £1. 17. 6.
SENIOR MODEL (TYPE 252) £3. 3. 0.

Magnavox speakers are manufactured and sold by

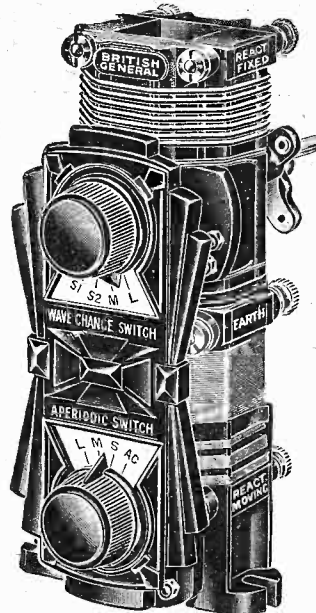
BENJAMIN

THE BENJAMIN ELECTRIC LTD., TARIFF ROAD TOTTENHAM, N.17

CONVERT YOUR SET INTO AN ALL WAVE SET

for **9'6** only **9'6**

All wavelengths from 14.5 to 2,000 metres covered by this British General All-Wave Tuner.



Free wiring diagrams showing how you can build or convert your set supplied Free. State circuit when ordering.

From all dealers or direct from the manufacturers:

BRITISH GENERAL

MANUFACTURING CO., LTD., Brockley Works, London, S.E.4

Why is GROSVENOR the longest-lived battery in the World?

Firstly The zinc cells are the cause of 99% of battery failures. By the Grosvenor MERCURY process, these vital cells are guarded—scientifically protected against corrosion and deterioration.

Secondly So long do these MERCURY-protected cells last that Grosvenor fill them with extra chemicals to use them up. Every Grosvenor battery is crammed to the limit with this abundant extra long-lived power.

That is why it is no idle claim, but a scientific certainty that Grosvenor are the longest-lived batteries in the world—the batteries that give you more for your money. Insist on Grosvenor next time, and test this for yourself!

**NEXT TIME
PLUG INTO
THE BATTERY-**

GROSVENOR Mercury Batteries are made for every Radio need, from 5/6 to 20/- Ask also for Grosvenor Miscanthite Electric Torches, strong and attractively coloured, from 1/-.



-THAT GIVES YOU MORE

GROSVENOR ELECTRIC BATTERIES LIMITED,
2-3, White Street, E.C.2. Telephone: METropolitan 6866 (3 lines).

FITTING A CLOCK TO YOUR RECEIVER



THOUGH time plays so important a part in reception, it is curious that there has never been any general trend towards fitting radio sets or "radiograms" with timepieces. It is true that in many households there are already too many clocks and watches—all, maybe, at variance!

Yet a clock which is immediately adjacent to the receiver is very useful, both for broadcast-programme purposes and also for serving as the standard timepiece of the household (being, of course, checked and set by the "pips").

The Most Attractive Type.

If it is possible to embody a timepiece, the receiver is given a unique utility. Many kinds of compact clocks may nowadays be purchased. With little, if any, modification these may either be mounted in the form of an external addition or, more ambitiously and effectively, sunk into the face of the receiver.

Perhaps the most attractive form of clock—attractive because simple, electrical

An electric clock is a very useful accessory for any radio set; and below details are given of the best ways of fitting this valuable "extra" to your receiver.

By G. E. MOORE, A.M.I.E.E.

second. In choosing a synchronous-motor clock it is necessary, as in the case of all one's domestic appliances, to stipulate the pressure in volts. But it is also necessary to ensure, first, that the supply is of alternating current and, second, that it is 50 cycles.

Erratic Timekeeping.

There is a third proviso, worthy of special explanation. The pulsations (or speed, if you care to regard it so) of the supply may not be maintained exactly at 50 by the electricity undertaking. And thus it may be found that the timekeeping of the clock may be erratic or consistently fast or slow. If, however, the electricity supplier is "time-controlling" the pulsations, then the clock will prove to be an excellent timekeeper.

It should, however, be remembered that in the generating station endeavours can only be directed at keeping the average frequency (that is, speed and "time") correct. Further, some kind of ordinary clock, itself sometimes at fault, must act as the standard, and may periodically be checked and set by the broadcast time signals.

The purchaser of a clock, therefore, should inquire as to whether his A.C. supply is time-controlled. This will give him considerable assurance that he will get perfectly satisfactory results. As time goes on it is certain that results throughout the country will become better still, especially as the electricity will be derived from a common source—the national "grid."

Mounted on the Set.

Those electricity systems which are not of 50 frequency or are not maintaining the 50 cycles per second accurately will come into line. Should a 50-cycle supply be available, the writer suggests that a clock may in any case be bought, but the foregoing remarks must be borne in mind.

The electric clock may, of course, be put into service by connecting it to a near-by plug-point with as little loose flexible wiring as possible.

Both in this country and abroad it has, of course, been possible for a year or so now to obtain receivers which embody electric clocks. This, however, rather limits one in various ways. The writer's course has been to mount his clock upon the set, as is shown in the photograph.

The clock is fitted with the usual bakelite case, while the receiver is a Ferranti band-

pass in mahogany; thus the complete arrangement, being all-insulated, is shock-proof.

The rear cover of the clock was removed. After stuffing a cloth within the case, to shield the internal parts, three holes were bored through the base—one for the wires and two for the fixing screws.

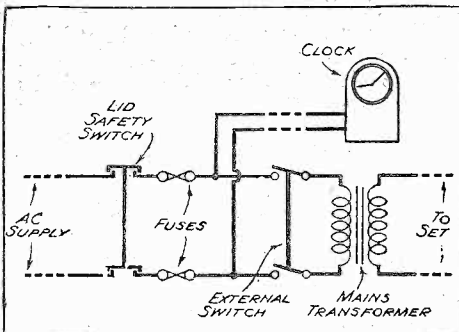
A wiring hole was also bored through the receiver's lid, and the clock was then screwed in place. Part of the flexible wire supplied with the set was then pushed through the lid and the clock cover replaced.

Inside the lid the flex, secured by small insulated staples, passed to the hinge side of the lid; then by a loop to the body of the receiver, and thence to the internal supply point. Thus, with this arrangement, no accessible clock wiring is employed.

Properly Safeguarded.

Supply to the receiver must, of course, be maintained. Many sets are, as a rule, controlled by the switch mounted upon them. If, as in the writer's case, the receiver is immovable and the supply circuit to it permanently installed, the scheme is quite satisfactory; but where the receiver, though normally standing in the same position, is supplied by flexible means, every care must be taken that the loose insulated wires are as short and inaccessible as possible and kept in good order—for it

HOW TO WIRE IT UP



Above you see one method of connecting an electric clock to a receiver. Another scheme is to connect it to the mains side of the safety switch with its own pair of fuses, so that opening the lid or the blowing of the receiver fuses will not stop the clock.

and requiring no winding or other maintenance—is the synchronous-motor clock, costing not a great deal more than an S.G. valve.

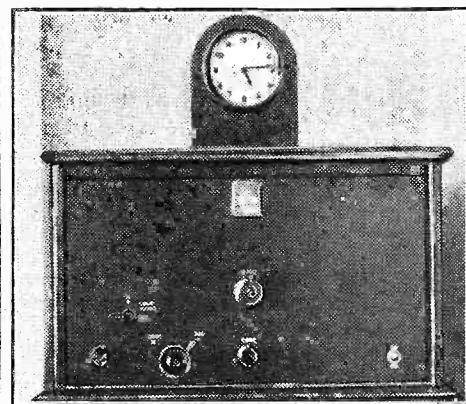
The fingers in this clock are steadily moved by an uncomplicated train of gears, the motive power being that of an extremely small electric motor that takes about $\frac{1}{50}$ th the energy of a moderately sized domestic lamp.

Watch the Supply.

The motor rotates at a steady speed; its speed in terms of time is not fixed and maintained by a mechanism such as a governor, but by the pulses or alternations of its alternating-current supply. It is "synchronous" with the supply pulsations.

These pulsations, in technical parlance, are stated as frequency, or cycles per

ALWAYS ACCURATE



With a controlled A.C. supply accurate time is always available. This is a great boon, especially when it is desired not to miss certain items in the programmes.

must always be remembered that the cores are alive.

There is one special advantage in this arrangement. An electric clock, to be properly safeguarded, should be protected not by the ordinary fuses of the domestic installation, but by fuses which (electrically speaking) are much smaller.

The protection within a receiver fitted in the recommended fashion with its own fuses is much more suitable for the clock than the ordinary fuse.

ARIEL CONTINUES HIS RUNNING COMMENTARY ON RADIO

(Continued from page 491.)

his opinion that the Echometer will (1) record the presence of herring when swimming in shoals, (2) give the exact depth at which the shoal is moving and (3) give some idea of the density and extent of the shoal.

So successful was this skipper in his use of the Echometer, and such was his confidence in it, that he says: "If we do not see the fish upon the machine it is useless to put out the net." My italics!

I Acknowledge a Gift.

SOME anonymous well-wisher has presented me with a book entitled "A Handbook of Wine." And whilst I thank him for giving me anything at all I fail to trace the connection between wine and these Notes, which are written strictly on the coffee-wagon.



If the idea is that wine would brighten up my pages I reply that I should require not books, but bottles. But there! Maybe my patron is short-sighted and thought that the book is all about *wire*—a very dry subject!

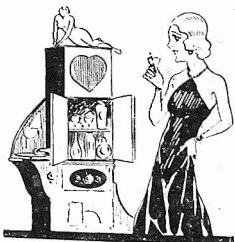
Two Great Inventions.

MY paragraph about record-changers, in which I expressed the wish that someone would invent a device for changing records from one side to the other, brings a letter from a Bristol reader who says that in 1929 he invented and patented that very thing and sold the patent to one of the leading gramophone companies.

Hi! Why is it not on the market? Which is the guilty party? Another attractive invention, for the signalling of Morse by an operator ignorant of the code, was exhibited recently, at the Central Hall, Westminster. I wish I could have a gadget to enable me to speak French!

French Radio News.

THIS year's Paris Radio Salon brought no novelties to light. Observers state that the sets shown exhibited a more marked tendency to uniformity than heretofore, and that their sizes were reduced. Practically no battery sets were shown, and one-knob sets appeared to be considered as *le dernier cri*.



In the company of a large array of "midgets"—American influence?—there was a mighty *ensemble* consisting of a cocktail bar, table, gramophone and radio receiver.

Progress of a Society.

I AM glad to say that the Radio, Physical and Television Society (Sec., Mr. F. J. Bubear, 67, Nassau Road, Barnes, S.W.13), which I paragraphed some weeks

ago, has experienced a considerable increase in its membership, but new members are still cordially invited.

I note that amongst the forthcoming lectures before this society are two entitled "The Spectrum of Radiant Energy" and "The Measurement of Light"—good, meaty subjects, if faith! The society meets on the second and fourth Fridays each month at 72a, North End Road, West Kensington.

The "S.T.500."

IN the face of the convulsions of nature which have almost lifted the paving-stones of Tallis Street over this "S.T. 500" business, I may well hesitate to intrude my feeble, flippant pen and ask what you think of our last few numbers.

Speaking for "Ariel's" department, I can only register admiration, tinged with envy, of the journalist with the S.T. output—and such an output! I believe that he writes in his sleep. I do myself sometimes, but I cannot remember what I have written when I wake up.

Ha! whenever the component makers think that they have a quiet five minutes, "P.W." comes along with a stick of dynamite and spoils the dream.

SHORT WAVES

THAT EXPLAINS IT.

In a recent broadcast programme ballot in America only fourteen people voted in favour of political speeches.

It appears that no other politicians voted.

— "Sunday Pictorial."

"Something new in the way of music is announced for Wednesday, when the Victorian Police Band will broadcast," states a provincial paper.

This should be an "arresting" performance.

"Programmes of this kind are not accepted if they are of a sufficiently high standard."—Reported statement by the B.B.C. A cynic says he has long suspected this.

"Sir, I would like to marry your daughter."

"What is your occupation?"

"Radio announcer."

"Take her. You're the first man who ever said 'Good-night' and meant it!"

BRIGHTON'S "B.P.C."

Oh, what a thrill in the kitchen to-day

At beautiful Brighton-by-Sea!

Cooks say that coppers are good as a play,

And press them to supper and tea.

For every one carries a radio set,

With wonderful music to spout.

"Walk in!" is the cry of the cooking

coquette

Who was once all agog to walk out.

"Answers."

Watch Your Step.

VERILY the ice upon which the public speaker treadeth is almost as thin as that on which the writer of weekly running commentaries disporteth himself.

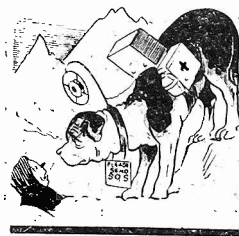
When the Lord Mayor of Manchester, at the opening of the Radio Exhibition in that city, said that wireless poles look like a regiment of drunken soldiers he meant to convey the thought that the poles, as usually seen in perspective down a vista of back gardens, give one the impression of a row of soldiers which, usually associated with the idea of perfect alinement, had fallen from

that lofty ideal and, in short, had gone skee-wiff.

Believe me or believe me not, but an ex-serviceman had to write to a newspaper to say that he resented the remark as unworthy of his Lord Mayor. By Heckmondwike!

The Highest Station?

THE St. Bernard monks who are going to found a hospice in the Himalayas are reported to have arrived at their destination after months of painful travel.



They are now in the Si-La Pass at an altitude of 13,000 ft., and as the Marchese Marconi has presented them with a wireless station the question arises whether it is not the highest in the world.

However that may be, I can imagine that some of our ultra-short-wave friends will consider the monks' opportunities for long-distance working with envy.

A Lusitania Memory.

A SAD reminder of the Lusitania disaster is provided by the recent death of poor Leith, who was the chief wireless operator of that ship when she was torpedoed and sunk by the Germans. The then assistant operator, who was relieving Leith for lunch, escaped also, and is, I believe, very much alive to-day.

Unless my memory has played me false, this young man had the nerve to take a snapshot of the sloping and disordered decks before he saw about finding a spot of dry land.

The film was slightly spoiled by sea-water, but enough of the scene was left for publication. By the way, I lost sight of H. S. Bride, sole survivor of the Titanic wireless staff, after the war. Where is he?

A Bad Egg.

THE latest radio story from America is a very bad egg, and I should have thought that even an American editor would shy at it. The yarn concerns a



Washington listener whose body is so affected by radio waves that within two minutes of his radio set being turned on his face becomes grey, his head twists from side to side and the tendons of his neck stand out like "steel cords," whilst his eyes take on a glassy stare.

Very, very sad! Any kind of cords would do, but steel ones are preferred! Now, surely the youngest "fan" knows that we are all under the influence of radio waves during every second of the day, even if the nearest receiver is a thousand miles away, and that set has nothing to do with the matter!

ARIEL.

WHY NOT GET YOUR MONEY'S WORTH . . . ?



Why not buy a longer-life battery if it doesn't cost you any more? Why buy any other, when the Hellekens Hi-Life battery gives you 50.2% longer life, the extra life that no other battery can give you?

An impartial test by a famous British set-maker has produced these figures, has proved that even our own figures were conservative.

For over 40 years Hellekens have produced the finest batteries in the world. That experience has produced this amazing result and has enabled them to manufacture, in the Hi-Life range, a battery with 50.2% longer life, 50.2% greater power, 50.2% higher capacity, and yet costing not a penny more. In other words, a battery that gives you one-third for nothing.

BRITISH MADE BY **11/-** BRITISH LABOUR

11/-
20 VOLTS

HELLESENS

HI-LIFE BATTERY

Hellekens Limited, Morden Road, South Wimbledon, S.W.19

Arks

MICRION

40%
SUPERIOR BY
COMPARISON
with OTHER COILS

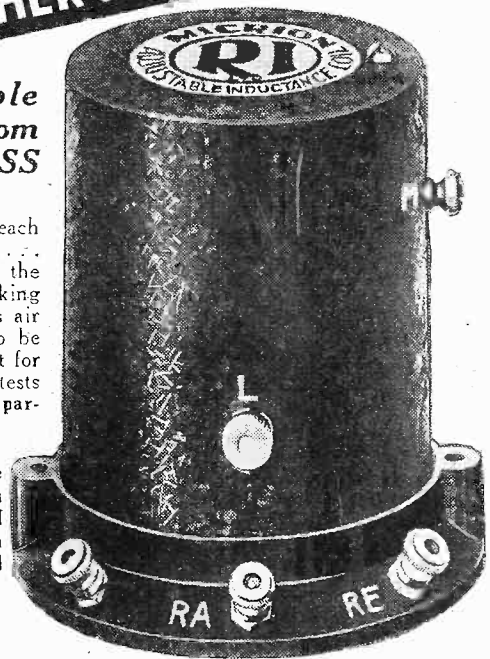
The Only
DUST IRON
COIL WITH
MICROMETER
ADJUSTABLE
INDUCTANCE

(on both medium and long wavebands)

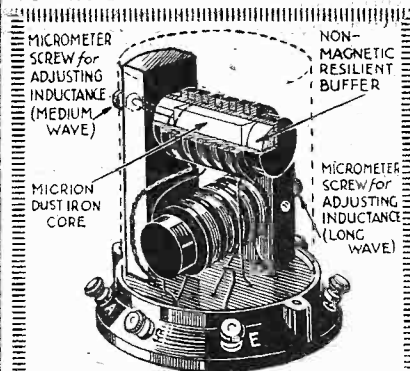
A Remarkable Test Report from the "WIRELESS WORLD."

The inductance of each section can be varied . . . for accurately matching the coils in the set under working conditions . . . enables air and "Micrion" coils to be used in the same circuit for single dial tuning. Our tests show the coil to be a particularly efficient one, and definitely better than a first grade air coil of the familiar screened pattern . . . the "Micrion" coil is about 40% better on the medium waveband and of the order of 30% on the long waves.

Oct. 27th, 1933.



The chaotic state of wavelengths and the difficulties of reception under present broadcasting conditions has emphasized the need for vast improvement in the tuning systems of most receivers to-day.



Showing the internal construction of MICRION and how the micrometer-adjusted inductance functions.

IMPEDANCE TUNING

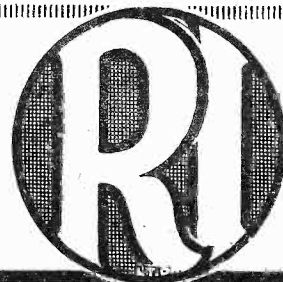
the entirely new system used in the "MICRION" gives every receiver knife-edged selectivity and greatly increased range.

The great feature of the "Micrion" Coil is that the position of the cores within their respective bobbins may be altered and so enable the coils to be accurately matched within the receiver under working conditions.

Further, in most receivers the "Micrion" Coil can be substituted for the existing coils without costly and difficult alterations to the circuit and without changing the calibration readings.

"Micrion" Adjustable Inductance Coil. List No. B.Y. 36. 2 1/2 ins. diameter. 3 ins. high

12/6



Advt. of Radio Instruments Ltd., Croydon, Surrey (Thornton Heath 3211)

RADIOTORIAL



The Editor will be pleased to consider articles and photographs dealing with all radio subjects, but cannot accept responsibility for manuscripts or photos

Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article.

All Editorial communications should be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless reception. As much of the information given in the columns of this paper concerns the most recent developments in the radio world, some of the arrangements and specialities described may be the subjects of Letters Patent, and the amateur and the trader would be well advised to obtain permission of the patentees to use the patents before doing so

QUESTIONS AND ANSWERS

IMPROVING STRENGTH OF RECEPTION WHEN INDOOR AERIAL IS USED.

L. W. F. (Strood).—“Quite by chance I have discovered that I can get far better strength of reception from my set by a small modification, which involves the altering of the aerial connection.

“Please tell me if there is any objection to this—which seems out of the question, considering that I have been using the method to my complete satisfaction for two or three weeks—and also explain why it is not generally adopted.

“It seems to me that if people only knew the benefits of the method everybody would

do as I have done. It is easy enough. I simply remove the aerial clip (attached by flex lead to aerial terminal) from its recommended coil-unit terminal and fix it instead to the unit's G. terminal, which remains connected as before to grid of valve, etc.

“Result, *twice the volume*, which is a big consideration where an indoor aerial is used, as in my case.”

“P.W.” PANELS, No. 144.—PARIS, EIFFEL TOWER.

Eiffel Tower was one of the world's first high-power wireless stations. Its transmitter is underground, and is controlled by the French Government.

Under the reorganisation of French broadcasting it will probably be used almost entirely for official purposes, leaving Radio Paris as the chief long-wave programme provider.

The wavelength used for broadcasting is 1,446 metres, and the power 13 kilowatts. The name is generally announced as “Tour Eiffel.” Distance from London, 214 miles.



● To handle a Graham Farish Component is to realise in some degree the meticulous care taken in their making. But you must compare results to appreciate the inner superiority that lies behind their huge success. And, you may depend on it, that superiority is unmistakable. Would every expert designer of every wireless journal prefer and praise them otherwise?

Constant Quality, Constant Price

ADVT. OF

GRAHAM FARISH LTD.,

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

better than when relying on the ear for the dial reading. And as the number of stations is simply amazing I feel that the only hope of getting them identified is to do the job properly and get them drawn out on paper.

"If you are not this week giving an illustrated article on how to do this perhaps you can explain by words. I've got the general idea, but am not quite sure of the proper way to set about it."

Drawing up a tuning chart is a most interesting business, and it enables you to identify with certainty dozens of stations that would otherwise remain unknown.

All you need is a wavelength list of Europe's stations, some graph (squared) paper, a sharp pencil and an india-rubber. Be sure to make a large chart, as greater ease and accuracy are obtained by this means.

Two sides of it must be marked out as the framework, one covering the range of dial readings and the other the range of wavelengths. On a typical set for medium waves these might be respectively 0 to 100° and 200 to 550 metres.

If the paper is large and the squares on it are small you can arrange the marking so that every degree on the dial is represented by a line up and down the chart, commencing in the left-hand corner with 0 and finishing near the right-hand corner with 100.

Similarly, the wavelength scale can be marked up at the side of the chart, 200 metres being at the bottom and 550 at the top.

Each across-the-chart line then represents one (or two) metres, according to the number of metres you have to fit into a given number of lines on the chart.

When this framework of the chart is filled in the next step is to draw the tuning curve. For this you need as many accurately taken dial readings as possible.

What you have to do is, first, to note the exact dial reading of a given station and place a dot on the line that represents that number of degrees of the dial. This dot must also correspond exactly with that station's wavelength, as ascertained from the list of stations.

London Regional, for example, may come in at 50 degrees, so the dot for London Regional must go on the 50 up-and-down line, and also on the line corresponding to 356 metres, because that is the wavelength of this particular station.

In the case of London National, if the dial reading were 15, the dot would go at the point where the line representing 15 degrees crosses the line representing 261.6 metres (i.e. a little more than half-way between the 261- and the 262-metre lines). And so on.

When a number of dial readings, accurately taken, have been transferred to the chart in this way it will be seen that the dots for the various

your curve showed up the discrepancy. But as wavelength wandering is comparatively rare this particular cause will trouble you but seldom, if at all.

In the former event—wrong dial reading—the remedy is obvious.

The final step in making the tuning chart is to pencil in the curve lightly, joining up all the dots. When this has been done every degree on the dial is linked with its appropriate wavelength by means of the curve.

Thus the "What-station-was-that?" problem is solved completely. If you know the dial reading of a station, but not its name, you simply ascertain from the curve what wavelength that dial reading covers, and your station is the one working there.

Similarly, if you want a particular station you first determine from the list of stations the wavelength upon which it works, and then you see from the chart what dial reading corresponds exactly to that.

Adjust the dial carefully to that reading, apply the final touches to the set (reaction, etc., if used, not forgetting to retune very slightly to compensate) and out of the welter of surrounding transmissions you find you have picked out the very one you wanted. Good old tuning chart!

DO YOU KNOW—

the Answers to the following Questions ?

There is no "catch" in them; they are just interesting points that crop up in discussions on radio topics. If you like to try to answer them, you can compare your own solutions with those that appear on a following page of this number of "P.W."

- (1) Of the total population of the British Isles, about what proportion has taken out licences for radio reception ?
- (2) Which European country has the unenviable distinction of having the smallest proportion of licensed radio listeners ?
- (3) About how many actors and actresses do you think are registered with the B.B.C.'s Productions Department for radio plays ?
- (4) If a biasing resistance of 500 ohms has to carry a current of 30 milliamps, what voltage is developed across it ?

stations have all spread themselves out into a sweeping curved line across the chart. Not quite straight, perhaps, but in the form of a curve, with only a very gentle deviation from the straight.

If any dot falls unexpectedly out of line with the others you can be fairly sure that something is wrong—either that dial reading has been carelessly taken and is inaccurate or else that station is working off its allotted wavelength.

In the latter event, of course, you can do nothing, except to pride yourself upon the ease with which

THE "S.T.500"—DRIVER AND CLASS B VALVES.

A. E. J. (Hayes, Kent).—"I am now all agog to begin on the 'S.T.500.' I suppose the Class B output could not easily be changed over to use an ordinary output valve or a pentode.

"And if it has got to be Class B, is it absolutely essential to keep to all the parts mentioned in the article? For instance, could I use a different transformer for the driver valve?"

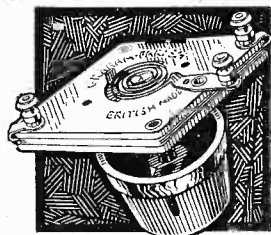
"I am sure many of your readers must be wondering the same thing, and don't know whether a small alteration would make a little or a lot of difference to results."

It is certainly not advisable to attempt to substitute an ordinary output stage, using a power or a pentode valve, for the Class B output of the "S.T.500."

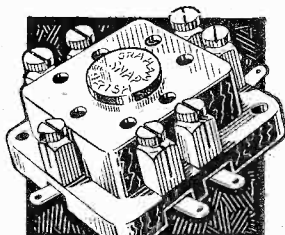
For satisfactory working of a Class B stage it is essential that the combination of the driver valve, Class B valve and driver transformer be correctly arranged.

(Continued on next page.)

GRAHAM FARISH PRODUCTS



LITLOS DIFFERENTIAL CONDENSER
Price 2/- each



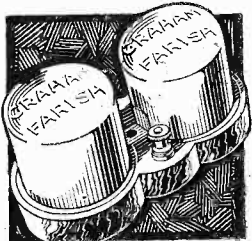
VALVE HOLDERS . . . from 6d.



TUBULAR CONDENSERS . . from 1/-



Baseboard PRESET CONDENSER 1/-



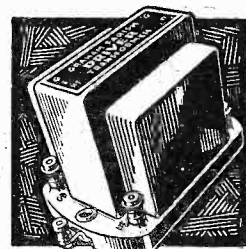
L.M.S. CHOKE 4/6



NON-INDUCTIVE CONDENSERS
1/2 mfd. 1/8 1 mfd. 2/-
1/2 mfd. 1/9 2 mfd. 3/-



FILTRITE PERCOLATIVE EARTH . . 2/6



DRIVER TRANSFORMER . . 8/6

RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

If any deviations from the original "S.T.500" specification are made the driver transformer ratio must be suitably chosen for the particular driver and Class B valves. Information on this point can be obtained from the catalogues of the makes of the transformer it is intended to use or direct from the valve makers.

It should be noted that Class B valves, other than the B.21 originally specified, do not require grid bias.

MAKING YOUR OWN MAINS UNIT FOR CLASS B.

F. L. (Streatham, S.W.).—"Realising the importance of using only the approved apparatus, I want to be sure that even if I

IS YOUR SET BEHAVING ITSELF?

Perhaps your switching doesn't work properly? Or some mysterious noise has appeared and is spoiling your radio reception? Or one of the batteries seems to run down much faster than formerly?

Whatever your radio problem, may be remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers its unrivalled service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do. On receipt of this an Application Form will be sent to you post free immediately. This application will place you under no obligation whatever, but, having the form you will know exactly what information we require to have before us in order to solve your problems.

LONDON READERS, PLEASE NOTE: Inquiries should NOT be made by phone or in person at Fleetway House or Tallis House.

build the 'S.T.500' exactly as described by Mr. Scott-Taggart I am not going to use a wrong mains unit.

"The one I had in mind was the 'Class B Mains Unit,' which you gave details of in POPULAR WIRELESS dated September 23rd. Is this suitable?"

An A.C. or a D.C. mains unit may be used to supply the "S.T.500" with H.T., providing it is of a type having particularly good voltage regulation and is capable of giving a maximum output of 50 milliamperes. In your own case a unit such as the "Class B A.C. Mains Unit," described in POPULAR WIRELESS for September 23rd, 1933, is suitable, as are some specially designed commercial mains units.

For the man on D.C. supply a suitable unit is the "D.C. Class B H.T. Unit," which was described in "The Wireless Constructor" for November, 1933.

IS AN OUTPUT FILTER AN IMPROVEMENT WHEN A MOVING-COIL LOUDSPEAKER IS USED?

W. M. S. (Much Hadham, Herts.).—"Being specially keen on the quality of the reproduction, my question may be a bit unusual. But I am out for the very best results I can get, so I want to know if an output filter is an improvement when a moving-coil loudspeaker is used.

"To be quite candid, I am very pleased with the results I already get, but if I can better them I want to 'go the whole hog.' And it occurs to me that an output filter is one well-known method of improving quality of which I am not taking advantage.

"Mine is a _____ loudspeaker, with its own transformer, and I have nothing but praise for it. Nevertheless, I should not mind running to a choke and condenser if you think that will be advisable.

"Perhaps I ought to add that as the set and loudspeaker are used quite close together in the same room, there will be no effect of long leads to consider, so it is simply a matter of quality. And, as I say, I do not mind the expense if you think there would be any improvement."

We don't think so, W. M. S. In fact, we disagree with your statement that an output filter is one method of improving quality of which you are not taking advantage.

For there are two kinds of output filter in general use—one employing an L.F. choke with condenser coupling, and the other employing an output transformer of suitable ratio.

Your moving-coil loudspeaker, you say, embodies its own transformer. And presumably you are using the correct output valve for it, with the transformer's terminals arranged to suit, if variable ratios are available for the different types of output valve.

Such an arrangement constitutes a very efficient output filter. And to add a choke and condenser

THE ANSWERS

TO THE QUESTIONS GIVEN ON PAGE 525 ARE GIVEN BELOW.

- (1) Between 10 and 11 per cent.
- (2) Spain. The proportion of listeners to the total population of Spain is only about 2 per cent.
- (3) Approximately five hundred actors and five hundred actresses are available, giving the producers a choice of four or five alternatives for every part they may wish to present.
- (4) By Ohm's Law $V = I \times R$. So if $I = .03$ amp. and $R = 500$ ohms the voltage, V , will be 15.

DID YOU KNOW THEM ALL?

arrangement would be gilding the lily and spoiling a good job through over-enthusiasm.

Having got a good set and a good loudspeaker, properly matched, the best way you can ensure good quality is to watch voltages and current consumption closely, by means of a good voltmeter and milliammeter (or by using a good combination instrument) which will keep a check on these for you.

And don't forget the tip given in "Eckersley Explains" regarding the advisability of hearing bands, etc. at first hand, whenever you can, and comparing results critically.

Igranitor TUNING COILS

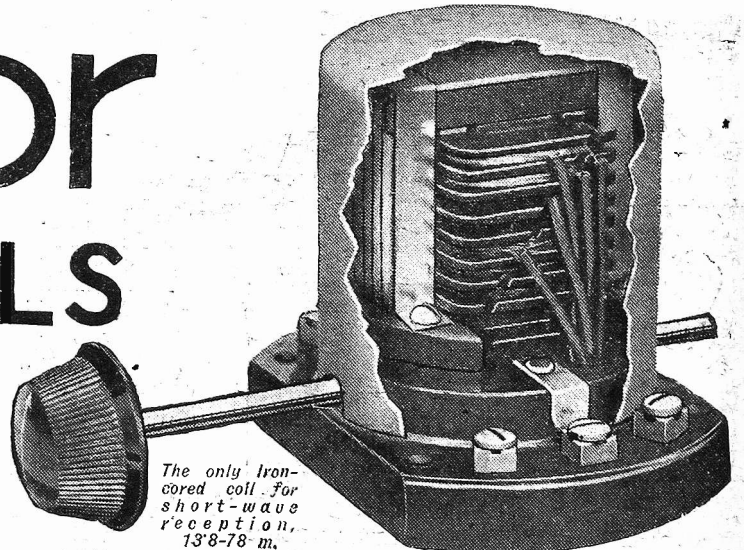
FOR

RANGE · SELECTIVITY
AND EFFICIENCY

MADE IN FIVE TYPES

1. Broadcast Dual Range Coil (Type A). Range 210-510 metres and 850-2,200 metres. 10/6
2. Broadcast Dual Range Coil (Type H.F.). Similar to type A, designed to couple H.F. Amplifier to detector valve. Types A and H.F. are matched to same standard so that type A can be used in aerial circuit with type H.F. between the H.F. and the detector, and gang the tuning condensers. 10/6

Write for fully illustrated catalogue No. R.215. Igranitor Electric Co., Ltd., 149 Queen Victoria Street, E.C.4.



3. Broadcast Dual Range Band-Pass and H.F. Coil Unit. Three coils as type A coil, but arranged as Band-Pass and H.F. on one base. 33/-
4. Short Wave Dual Range Coil. With core and windings specially adapted for short waves. Range of 13.8 to 78 metres covered when coil is tuned by .0002-mfd. Condenser. 12/6
5. Super Heterodyne Band-Pass Intermediate and Oscillator Coil. In circular metal housing with insulated terminal board. Oscillator Coil similar to Broadcast Dual Range types, but with Switch to cover necessary wave ranges. Super Heterodyne Set, of one I.F. and one Oscillator Coil, 21/- Super Heterodyne Set, of two I.F. and one Oscillator Coils, 33/- Oscillator Coil 10/6

NOW READY.

146 Pages
Special Matter.

COLLINS' WIRELESS DIARY 1934

A vital Annual for all Wireless users

All information has been prepared by Experts.

LEAF 5 1/2 x 3. THREE DAYS TO PAGE.
From 1/3 to 7/- each.

FROM ALL BOOKSELLERS and STATIONERS.

COLLINS'

LONDON CLEAR-TYPE PRESS GLASGOW

Have a Capstan - you'll like it better



10 FOR 6^d
20 FOR 11 1/2^d

CC426

Issued by The Imperial Tobacco Co. (of Great Britain and Ireland), Ltd.



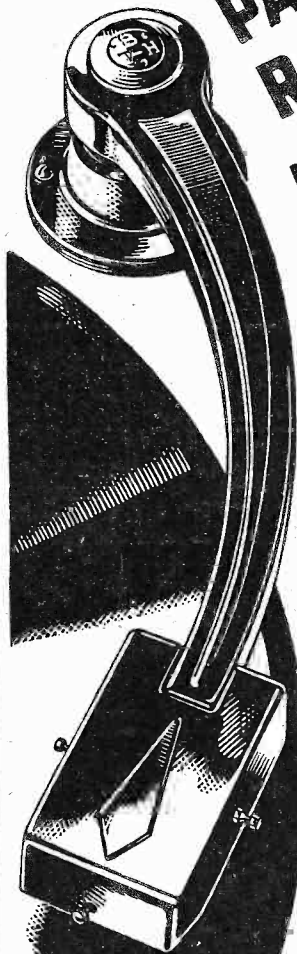
Patrons of
Electric Lamps
By Appointment



Manufacturers
and Patrons
of Electric Lamps
By Appointment

EDISWAN

Hear
PAUL ROBESON'S
records as they
were meant
to be heard



The greatest coloured singer the world has known, and artist to his finger-tips—Robeson has moved the hearts of millions. Hear the exquisitely unmistakable timbre of his voice when you play his records. Play them with a B.T.H. Pick-up. It's easy to fix in place of your old sound-box and tone arm. Then all you have to do is connect it to the "P.U." terminals on your set.

The "Senior" model for the connoisseur—the "Minor" model at 21/- for the man wanting good reproduction at a reasonable cost.

with a
SENIOR



37/6
COMPLETE WITH
VOLUME CONTROL

PICK-UP



The Edison Swan Electric Co. Ltd.
155 Charing Cross Rd., London, W.C.2

GOOD RADIO DEALERS RECOMMEND EDISWAN

W.224

WHAT S.T.500 BUILDERS SAY

"VOLUME IS TREMENDOUS"

From G. J. Millard, 65, Beech Grove, Acomb, York.

"I feel I must write and tell you how delighted I am with the 'S.T.500.' I built both the 'S.T.300' and 'S.T.400,' and managed to refrain from writing of my appreciation, but this was impossible after the first evening with the new set!

"The 'S.T.300' was good; the 'S.T.400' was better; but the 'S.T.500' is in a different class altogether. The sensitivity, quality, and volume is tremendous, while the selectivity is as good as you have claimed it to be.

"It is indeed a thrill to tune in a very weak signal to the same volume as an ordinary S.G. set would give, and then 'turn up the wick' with aerial reaction, until full loud-speaker strength is obtained.

"Just one point which I think will interest hundreds of 'S.T.300' and 'S.T.400' users. I am supplying H.T. through an Ekco K.25 eliminator, and there seems to be no trace of voltage instability. Constructors who use this particular unit, therefore, need not hesitate about building their new sets.

"As the receiver is installed in a large radiogram cabinet, I put the tone-control condenser on the panel in the position previously occupied by the 'S.T.400' reaction distributor. The results on records, by the way, are as excellent as on radio.

"In conclusion, allow me to thank you for producing this wonderful design. You have

once again kept faith with all your followers, and newcomers to the ranks will realise what they have missed through not building your sets before."

[I am pleased to note the remarks about the mains unit, although I definitely prefer readers to use an H.T. battery. The excellent results obtained by this reader on this particular model are, however, of considerable interest to others possessing this model.—J. S.-T.]

"THAT WORD IS THANKS!"

From J. Foster, 11, Lexington St., W.1.

"I have just finished and tried out the 'S.T.500.'

"Whilst countless more able pens than mine will sing its praises, there is just one word of appreciation that I, a humble follower of truth, and knowing it when I have found it—can sincerely offer to 'P.W.' and to J. S.-T."

"That word is Thanks!"

"A WONDERFUL AFFAIR"

From W. Burnett, 39, St. Helen's Road, Westcliff-on-Sea, Essex.

"Your 'S.T.500' is really a wonderful affair. Never have I heard the foreigners come bounding in as they do on 'S.T.500.'"

"WHAT BEAUTIFUL TONE!"

From T. Gee, 61, Army Street, Clapham, London, S.W.4.

"I must thank you for the change I have just carried out on my 'S.T.400' as I am very pleased with your latest design. I was an S.T.300 enthusiast—and what results! Then on to your 'S.T.400' and, 'Oh! Boy,' some circuit! But I guess the 'S.T.500' is 'IT' and what beautiful tone and volume!"

MULTIPLE CONTROLS—THE REASON FOR S.T.500 SUCCESS

(Continued from page 494.)

perfection of the indirectly-heated valve left the home constructor miles behind. It would almost seem as though he gave up the struggle.

We are all familiar with the great gap in civilisation between the fall of the Roman Empire and the Renaissance. For hundreds of years civilisation was submerged. Learning was of no account. Cruelty and barbarism were rampant. There was no order, no art, no spiritual life. Only in secluded quarters was the flame of civilisation kept burning. False ideals flourished; quackery, witchcraft and magic swept over Europe.

The idea may be far-fetched, but to me it seems that—except in isolated places—there was no progress in improving the standard of reception during the years 1927 to 1930. The set manufacturers forged ahead, but the average movement of technical efficiency on the part of home constructors was backward.

Vast numbers of the older wireless experimenters gave up wireless as a hobby; but their ranks were filled by new enthusiasts who were encouraged to regard simplicity as the be-all and end-all of wireless-set design. The era of this false simplicity is over. May it never return!

J. S.-T.

All builders of the S.T.500 should read the important note on page 536.



THE OLD LADY NOTE—

"Don't sauce me! You'd be a battered old hag yourself, Amelia, if you hadn't been rejuvenated in those new Symphonic valves of Tungstram's!"

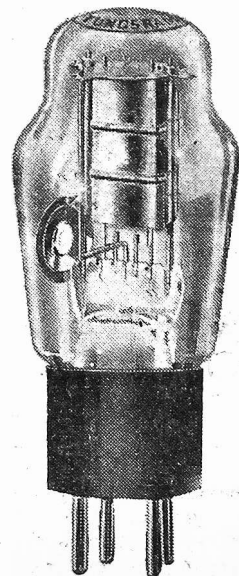
REJUVENATE YOUR SET with TUNGSRAM'S new SYMPHONIC valves

New life for old "mains" sets! Tungstram's new Symphonic valves—now released after months of unceasing research. No alterations to your set needed. Just plug in these Symphonic valves—the increase in volume, quality, and sensitivity, will astonish you. Ask your dealer or write our Technical Department.

THE SYMPHONIC A.C. RANGE INCLUDES

Symphonic Screen Grid	AS 4120
Symphonic V/M Screen Grid	AS 4125
Symphonic H.F. Pentode	HP 4100
Symphonic V/M H.F. Pentode	HP 4105
Symphonic Detector	AR 4101
Symphonic Multi Grid Output	APP 4120

Ask your Dealer or write our Technical Dept.



TUNGSRAM

BARIUM VALVES

TUNGSRAM ELECTRIC LAMP WORKS (GT. BRITAIN) LTD., 72 OXFORD STREET, LONDON, W.1

ROUND THE RECORDS

A review of some of the more outstanding of the recently released records, of special interest to all users of radiograms or pick-ups.

I AM writing this a few days after a certain musical play was introduced to London theatre-goers—"Gay Divorce"; but though the play may be fresh to the audiences who have crowded the foyer at the Palace, I'll warrant the music was not, except perhaps to the first-nighters. In fact, it is already almost hackneyed, thanks to the gramophone and broadcasting.

I can never make up my mind whether the pre-release or simultaneous release of the star musical numbers of a show detract from that show's box-office returns, or whether the "plugging" they often receive results in quickened interest. Probably they act as valuable "trailers."

"Night and Day."

If so, then "Gay Divorce" ought to be one of the most successful shows extant, for its almost annoyingly haunting "Night and Day" has already received full attention from dance band, crooner, light orchestra and pianist. It has been "canned" and broadcast in a variety of ways that immediately label it a "hit," and no uncertain one at that.

Apart from the broadcasting of it by Henry Hall, Harry Roy, Lew Stone and others, I have so far come across excellent recordings by Paul Whiteman (H.M.V. 12-inch), Leo Reisman (H.M.V.), Scott Wood (Regal-Zono), Val Rosing (Rex), Leslie Hutchinson (Parlophone), The Comedy Harmonists (H.M.V.), Richard Tauber (Parlophone), Morton Downey (Broadcast), Ambrose (Brunswick), Fred Astaire (Columbia). No doubt we shall soon have others, and by the time you read this the list will be very much longer. "Night and Day" is a "hit," and it has hit very hard. It has been plugged vigorously since the word "go" on November 1st.

"Dinner at Eight" is being pushed as much as, if not more than, "Night and Day," but I doubt if it will become the craze of the latter.

Other Good Numbers.

As a matter of fact, we seem to be having quite a glut of good numbers, with a variety that is unusually wide. Thus we have such diversity as the two already mentioned, "The Last Round Up," "Who's Afraid of the Big Bad Wolf" and "The Wedding of Mr. Mickey Mouse."

Of these I like best Ambrose playing "The Last Round Up" (Brunswick), Jay Wilbur and Henry Hall in "The Wedding of Mr. Mickey Mouse" (Rex and Columbia) and Lew Sylva in "Who's Afraid of the Big Bad Wolf," on Rex.

For those who like plenty of band let me prescribe the massed dance-band recording of "Don't Blame Me." "Isn't it Heavenly," "Lazybones" and "Call it a Day," on Decca. Here we have the united efforts of the bands of Jack Hylton, Lew Stone, Ambrose and Roy Fox. It is a very

(Continued on next page.)

S.T.500

SAVE MONEY WITH THIS EASIBILT COMPLETE KIT - DIRECT FROM THE FACTORY

This saves you up to 33% on the cost of building your S.T.500. Build with complete confidence an N.T.S. EASIBILT CONSTRUCTOR KIT. In addition to these advantageous features, every component part is matched, tested and fully guaranteed. Complete down to the last screw with FREE FULL-SIZE BLUE PRINT AND COPY OF "POPULAR WIRELESS," OCTOBER 21, 1933. See our previous Full Page Advertisements in Oct. 21st and Oct. 28th issues of "Popular Wireless."

GUARANTEED MATCHED AND TESTED PARTS

KIT No. 1 CASH OR C.O.D. **£3-15-0** OR **YOURS FOR 6/9**

Comprising Kit of matched parts as listed, including ready-drilled Panel and terminal strip, S.T.500 Screen, Peto-Scott Metaplexed Baseboard and "Class B" Output Choke. With Free Full-Size Blue Print and Copy of "Popular Wireless" Oct. 21st. Less Valves and Cabinet. Cash or C.O.D. Carriage Paid. **£3:15:0** or 12 monthly payments of **6/9**

KIT 2 As Kit 1, but including 4 specified valves only. Cash or C.O.D. Carriage Paid **£6:0:0** or 12 monthly payments of **11/-**

KIT 3 As Kit 2, but with Peto-Scott Specified Table Cabinet, Cash or C.O.D. Carriage Paid **£6:19:6** or 12 monthly payments of **12/9**

KIT 4 As Kit 2, but with Peto-Scott Specified Console Cabinet. Cash or C.O.D. Carriage Paid **£7:8:6** or 12 monthly payments of **13/6**

If Permanent-Magnet Moving-Coil Speaker required, add 15/- to Cash Price, or 1/3 to first and each monthly payment.

Balance in 11 monthly payments of 6/9

● **FREE FULL-SIZE BLUE PRINT** and copy of "Popular Wireless" S.T.500 issue with every EASIBILT KIT.

● Miscellaneous Components, Accessories, etc., etc., supplied CASH, C.O.D., or H.P. on our own Private System of Easy Payments. Any item advertised in this Journal sent C.O.D. If value over 10/- sent all C.O.D. charges paid.

S.T.500 CONVERSION KITS

S.T.400 into S.T.500

Comprises 1 P.S. Baseboard Metaplex section, 16" x 12"; 3 N.T.S. -0005-mfd. reaction condensers; 1 N.T.S. -0001-mfd. preset cond.; 1 N.T.S. -00005-mfd. preset cond.; 1 N.T.S. Class B driver trans.; 1 N.T.S. Class B choke; 1 N.T.S. 7-pin v.h.; 2 N.T.S. 5,000-ohm 1-watt resist.; 2 N.T.S. 10,000-ohm 1-watt resist.; 1 N.T.S. 250-ohm 1-watt resist.; 2 N.T.S. -005-mfd. tubular cond.; 1 N.T.S. -0005-mfd. tubular cond.; 1 N.T.S. -0005-mfd. fxd. cond.; 1 N.T.S. 1-mfd. Mansbridge cond.; 1 N.T.S. bracket for -0005-mfd. reaction cond.; wire, screws, flux, and copy of "P.W.," 21/10/33.

Or 5/- Deposit, balance in 6 monthly payments of 5/-. If Class B valve required, add 14/- to Cash Price or 2/3 to each monthly payment.

S.T.300 to S.T.500, Cash or C.O.D., Carriage Paid, 37/6. Or 5/- down and 7 monthly payments of 5/-. If Class B Valve required, add 14/- to Cash Price, or 2/- to each monthly payment

CASH OR C.O.D., CARRIAGE PAID

32/6

Strict Privacy Guaranteed—We deal with you direct

NEW LISSEN SKYSCRAPER FOUR ALL-WAVE CHASSIS MODEL, in Sealed Carton. Cash or C.O.D. Carriage Paid, **£5/12/6**. Balance in 11 monthly payments of 10/3.

NEW LISSEN 7-VALVE SUPER-HET CHASSIS KIT, in Sealed Carton. Cash or C.O.D. Carriage Paid **£3/17/6**. Balance in 11 monthly payments of 16/6.

BLUE SPOT 45 P.M. MOVING-COIL SPEAKER with input Transformer. Cash or C.O.D. Carriage Paid, **£2/5/0**. Balance in 7 monthly payments of 6/-.

NEW BLUE SPOT 99P.M. PERMANENT MAGNET MOVING-COIL SPEAKER. Complete with tapped input Transformer. Cash or C.O.D. Carriage Paid **£2/19/6**. Balance in 10 monthly payments of 6/-.

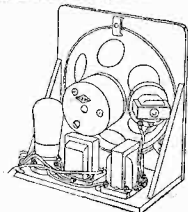
'CLASS B' SPEAKER AND AMPLIFIER

7 Times the Volume

Without Class B amplification your present Battery Set is obsolete. Realising this, we have produced a marvellous self-contained Unit, comprising guaranteed Peto-Scott Class B Moving-Coil Speaker, Class B Transformer and Output Choke, B.V.A. Class B Valve. Gives 7 times the volume... with mains quality and power. Low H.T. consumption. **SIMPLE TO CONNECT. JUST PLUG IN** the amazing 5-WAY Automatic Connector and get better Radio NOW. We have made it easy for you to buy.

In Walnut Cabinet:

6/- with order and 11 monthly payments of 6/6. Cash or C.O.D. Carr. paid 69/6.



Already Mounted on acoustic Baffleboard, as illustrated, and complete with B.V.A. Class B Output Valve. **5/- WITH ORDER**. Balance payable in 11 monthly payments of 5/6. Carriage Paid to your door. Cash or C.O.D. Carriage Paid **59/6**

W.B. TYPE P.M. 4A NEW MIGROLODE PERMANENT MOVING-COIL SPEAKER, with switch controlled multi-ratio input Transformer. Cash or C.O.D. Carriage Paid, **£2/2/0**. Balance in 7 monthly payments of 5/9.

ATLAS C.A.25 ELIMINATOR for A.C. mains, Class B and Q.P.P., four tapings: 60/80, 50/90, 120, 150 volt, 25 m.a. Cash or C.O.D. Carriage Paid, **£2/19/6**. Balance 10 monthly payments 6/-.

New Times Sales Co.

56, LUDGATE HILL, LONDON, E.C.4.

Dear Sirs:

(a) Please send me.....

(b) I enclose Cash/Deposit.....

NAME.....

ADDRESS.....

P.W., 18/11/33

PIX

INVISIBLE AERIAL

AN INSIDE AERIAL THAT'S AS GOOD AS AN OUTSIDE AERIAL—

AT THE SAME HEIGHT



2/

DOUBLE LENGTH **3/6**

PRESS IT AND IT STICKS ANYWHERE

A revolutionary idea in aeri-als. You just unroll it and press it up in position around the room or anywhere you like. No danger whatever from lightning, reduces static interference — increases selectivity. Obtainable anywhere.

BRITISH PIX CO. LTD., LONDON, S.E.1 THE BEST AERIAL FOR FLATS.

EASY TERMS

The very latest Radio Sets, Loud-speakers, and Kits supplied on the lowest monthly terms. Strict Privacy. Prompt delivery. All Carriage Paid. Price List FREE.

New BLUE SPOT CLASS B OUTPUT STAGE (just released) including Osram B.21 Valve. Cash price, 43/6 or 5/- with order and 8 monthly payments of 5/4

	Cash	With	Monthly
	Price	Order	Payments

New LISSEN SKYSCRAPER ALL-WAVE 4 KIT, with valves	112/6	10/-	11 of 10/3
As above, but with Cabinet EXIDE W.H. HIGH TENSION ACCUMULATORS (120 volts, 5,000 M/A). The cheapest and best high-tension supply where mains are not available	75/-	7/-	11 of 7/-
New ATLAS MODEL CA25 H.T. ELIMINATOR, output 25 milliamps	59/6	5/-	11 of 5/6

Estd. 1925 **THE LONDON RADIO SUPPLY COMPANY** Phone: National 1977
11, OAT LANE, NOBLE STREET, LONDON, E.C.2

The ONLY MAINS UNIT GOOD ENOUGH FOR **Class B**

CONSTANT OUTPUT 130 v. AT ALL CURRENTS UP TO 55 milliamps TAPPINGS: 60 80 v. S.G.; 80/100 v. DET., 130 v. POWER

IDEAL FOR S.T. 500

Built for those who want really high quality. Model B.A.55 for A.C. Mains **88/6d.**

Cut out this advertisement to-day and send for illustrated folder and regulation curve—FREE.

THE BRITISH MAINS UNIT COMPANY CROMWELL HOUSE, HIGH HOLBORN, W.C.1

ROUND THE RECORDS

(Continued from previous page.)

fine recording, and considering the number of instruments is remarkably crisp.

To get on to something different, have you heard the Rex recording of "Sandy Powell the Film Star"? It is a double-sided ten-inch disc of the popular comedian whose ideas never seem to run out. Goodness knows how many things he has "been" in his time—fireman, plumber and so forth. Now he is a film star acting with a lady who is excellently caricatured and of whose identity you are left in no doubt.

A Great Favourite.

Here is a story of the inimitable Gracie Fields—that is of special interest. Last year's "Gracie's Christmas Party" record is still a favourite in many homes, and thousands will be glad to have another festival record from the same artiste.

As before, Gracie has gathered the Fields clan together before the microphone, necessarily some two months before Christmas, to prepare another fireside character record.

The incident took place in the H.M.V. studios at St. John's Wood, where Tommy and Betty Fields, Gracie's brother and sister, her father and mother and the famous comedienne herself were assembled.

"We are a very sentimental family," said Gracie, "and whatever happens we are always together at Christmas. We sit round the fire in the evenings and sing old favourites in harmony, and I thought it would be a good idea if we recorded these just as though they were taking place at home. We always wish we could invite all the old friends from Rochdale down to Telscombe for Christmas, but, as we have so many, it is impossible. This year, however, they will be able to be with us through a gramophone record."

The recording manager explained that it was originally intended that the recording should actually take place down in Miss Fields' home at Telscombe. As it was thought, however, that an orchestral accompaniment would be of benefit, it was decided that a studio recording would be preferable owing to the difficulty of accommodating an orchestra with the recording gear in an ordinary living-room.

Recording a Kiss.

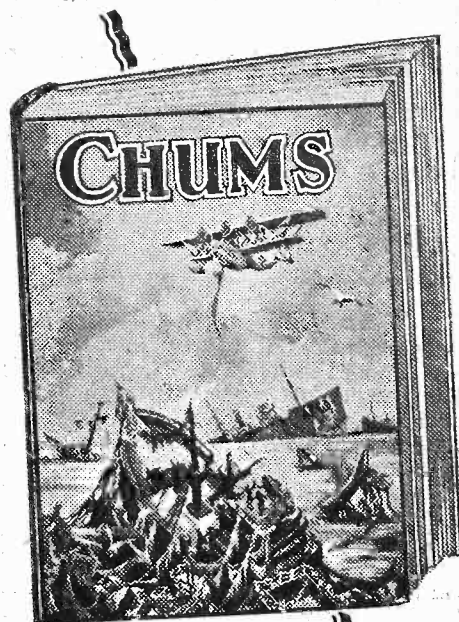
Betty, Tommy, mother, father and Gracie all grouped themselves round the microphone. The red lamp flickered and the recording started. The family greeted each other, and Gracie gave her mother a kiss.

This simple action produced complications. The buzzer sounded; the recording engineer popped his head out of his little room. "It sounded like a thunder-storm," he said; "you are too close." A few kissing rehearsals took place, and in a couple of minutes the recorded kiss had been brought to perfection.

After a short discussion about the plum pudding, mother started off by singing "My Mother's Name was Mary," and all the family joined in for the first chorus.

At last it was all over, and the wax blank was carefully sent off down to Hayes to undergo the plating process. In due course we shall see the imprints of the record in the gramophone dealers'—and it will be sure of a most ready sale.

K. D. R.



A Regular Book for a Regular Fellow!

CHUMS ANNUAL is a regular book for a regular fellow. It contains nearly 800 pages of gripping fiction and articles. And its pictures—there are hundreds of them—are all first-class; so are its beautiful coloured plates. **CHUMS ANNUAL** is good—boys will never tire of reading it. If you're in doubt what to give this year, the problem is easily solved if you get this splendid book.

On Sale at all Newsagents and Booksellers.

CHUMS ANNUAL

12/6

THE LISTENER'S NOTEBOOK

(Continued from page 518.)

concert had been at 8 p.m. and the Leslie Sarony hour at 9, then all would have been O.K. I expect to be told that it isn't as easy a matter as this. To which I reply, "Then it should be."

Quite obviously the B.B.C. themselves consider the Mais talks one of their biggest things this autumn. Therefore from the start they should have seen to it that nothing else of exceptional interest clashed with him.

Without being disrespectful to Leslie Sarony, I think it would have been less of a sacrifice to have to forgo his hour (or a portion of it) than it was to miss some of Solomon. And this only because these light musical programmes are so plentiful.

This is a bit hard on Leslie Sarony and his concert party, as they are a particularly bright crowd. No concert party wants a better pair of comedians than Leslie Sarony and Arty Ash. There's more than a spice of originality about them.

The show was remarkable for the number of funny songs heard over the air, I should say, for the first time. I shall be very surprised if we don't hear more of that number, "When the old black sheep went Baa!"

An old-world type of song—"Dolly Varden"—was another gem, while the two sketches, or quickies, as the compère preferred to call them, should be reproduced in many family circles this Christmas. I liked Hazel Shelley, too; her step-dancing might easily make the Eight Step Sisters Nine. A very good show, well compered, and comparing well with the best concert-party performance yet put on.

One of Mr. Mais' greatest difficulties, I should say, is his having to squeeze a week's doings into a talk lasting only 20 minutes. There must be many things he has to leave unsaid, for he couldn't accelerate even one word more per minute without risking a crash. One thing he never omits. He never fails to mention the colour of his landscapes. He must have a wonderful eye for colour.

One hears on all sides appreciative remarks about the season's talks, especially from the younger generation. Admittedly, present talks do reach a very high standard, which may account for their popularity.

But there is also the fact that listeners are becoming more expert in the art of listening. In the case of the younger generation I wonder how far the broadcasts to schools are responsible for this progress.

I once looked on the studio audience with great disfavour. Many critics do so still. But mine is a real conversion. Radiolympia opened my eyes. Ever since those epoch-making performances I've thought a good deal about the question, and I've discovered that the measure of my enjoyment of a variety or a music-hall hour is determined by the size of the audience present.

As the quality of each bill is pretty much the same, that side of the question doesn't come into the argument. A variety with no audience is as dull as ditch-water to me. A relay from a theatre is my ideal, of course, for there you have the audience par excellence.

ECKERSLEY EXPLAINS

(Continued from page 497.)

It is useless to imagine that with valve sets there is much to be gained by making a very elaborate earth; a good one will do. It is useful, however, to see that the earth (if it must be used) is good. In a great number of cases, and particularly with battery-operated sets (where the absence of mains may mean an absence of capacity effect to earth), the earth is essential.

With crystal sets or where there is little or no retroaction you must make a very good earth. A waterpipe makes a very good earth provided you can join the wire to the pipe properly. A plate, say, 3 square feet, buried vertically in the moist ground, is good.

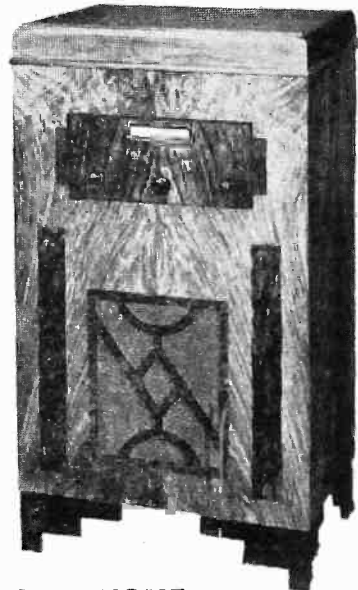
Leave the tip of the plate above ground so that the joint—wire to plate—is always visible and not easily corroded. The long copper tubes driven into the ground are good. Keep it all wet. No experimenter ought to be without a good earth.

CONVERT YOUR S.T.500 TO A MAGNIFICENT RADIOGRAM

1934 WALNUT ADAPTAGRAM

THIS amazingly popular Peto-Scott Cabinet has brought the joys of the Radiogram to thousands of British Homes. Built by master-craftsmen of the piano trade. Real inlaid walnut, mortised, tenoned, French polished. With motor-board, ready to take your set, speaker and power equipment. Comes to you with plain front, drilled to your own specification or vignettted to take panels, 14 in. by 7 in., 16 in. by 7 in., 18 in. by 8 in. Baseboard depth, 14 in.

YOUR S.T.500 FITS HERE



MODEL "A" Cash or C.O.D. Carriage **63/-** and packing 2/6 extra.

YOURS FOR 8/3

Balance in 11 monthly payments of 5/9 (Carriage Paid).

Baffle board, 3/6 extra.

Oak or Mahogany no extra.

MODEL "B." Standard 1934 Adaptagram with Double Spring Motor, 12 in. Plush-Covered Turntable, Automatic Stop, B.B.G. Tone-arm with Pick-up, and Volume Control Complete—Automatic needle cup. **6 GNS.** Cash or C.O.D. Carriage Paid, ... or 12 monthly payments of 12/- Carriage Paid.

MODEL "C." Standard 1934 Adaptagram Cabinet—Collaro Induction Electric Motor with Tone-arm, Pick-up, Volume and Control in one Unit, 12 in. Plush-covered Turntable, Automatic stop—Automatic Needle Cup. **7 GNS.** Cash or C.O.D. Carriage Paid, ... or 12 monthly payments of 13/9. Carriage Paid. D.C. Model Prices on application.

THIS COUPON BRINGS IT TO YOUR HOME

PETO-SCOTT CO. Ltd., 77, City Road, London, E.C.1. Telephone: Clerkenwell 9406-7
West-End Showrooms: 62, High Holborn, London, W.C.2. Telephone: Holborn 5248.
Dear Sirs,—Please send me CASH/C.O.D./H.P. ADAPTAGRAM MODEL A/B/C for which I enclose £..... d. CASH/H.P.
NAME.....
ADDRESS..... P.W. 18 11/33.

Send for free copy of 1934 Peto-Scott Cabinet Catalogue. Also details of how to convert your present battery set into a powerful "Class B" Radiogram.

DIRECT FROM OUR FACTORY

FLIX

OF THE UTMOST IMPORTANCE

The quality of your reception can easily be ruined (particularly when working on SHORT WAVES) by poor or faulty contact at G.B., H.T. or L.T. points.

Secure perfect and silent contact when building the "ALL-BAND" SHORT WAVE RECEIVER.

as described in this issue.

FIX FLIX "MASTER" PLUGS.

For H.T. and G.B. batteries and general plug and socket work. Suitable for use with all sockets with internal diameters from $1\frac{1}{2}$ in. to $5\frac{3}{2}$ in.

FIT FLIX
Non-Corrosive
SPADE
TERMINALS

Large - - 2d.
Small - - 1½d.

"A MATTER OF CONNECTION"

Clix interesting New Folder "P" gives details of over 30 Perfect Contact Components. Write for a copy now.

Cheapest PERFECT Contact

LECTRO LINX LTD., 79a, ROCHESTER ROW S.W.1



"We're Fluxite and Solder—the reliable pair; Famous for Soldering—known everywhere!"

The Set is now working—just like NEW! Without Fluxite and Solder—What WOULD you do?"

See that Fluxite and Solder are always by you—in the house—garage—workshop—anywhere where simple, speedy soldering is needed.

ALL MECHANICS WILL HAVE

FLUXITE

IT SIMPLIFIES ALL SOLDERING

All Ironmongers sell Fluxite in tins; 4d., 8d., 1s. 4d., and 2s. 8d. Ask to see the FLUXITE POCKET SOLDERING SET—complete with full instructions—7s. 8d. Ask also for our leaflet on HARDENING STEEL with Fluxite.

FLUXITE LTD (Dept. 324), Rotherhithe, S.E.16

FOR ALL REPAIRS!

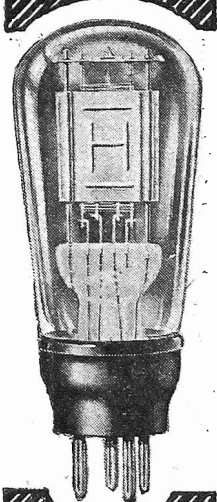


HIGH IN QUALITY

"A DRASTIC TEST"

A member of the Radio Society of Great Britain who uses HIVAC valves for Short and Ultra-Short Wave work, said:—

"The HIVAC H210 was found to be a good detector in another set on a wavelength of 5 metres; rather a drastic test for a comparatively cheap valve. They are very satisfactory."



USE HIVAC FOR The All-Band SHORT WAVE RECEIVER

described in this issue.

"Popular Wireless" recommends the

HIVAC

- H 210 - - - - 4/6
- L 210 - - - - 4/6
- P 220 - - - - 6/6

HIVAC VALVE GUIDE
"P" puts you right when selecting the valves for any type of battery set.

LOW IN PRICE

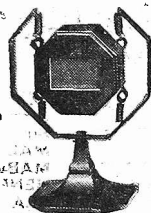
HIVAC THE SCIENTIFIC VALVE

HIGH VACUUM VALVE CO. LTD., 113-117, FARRINGDON RD., E.C.1

Electradix Bargains in REISZ MICROPHONES

Genuine Eisel-Reisz Microphones at Bargain prices. A \$5 Microphone of incomparable quality and wide frequency response range at sacrifice price of 55/-.

Handsome stand for table P.A., 15/-. Matched Transformer, 7/6. It is painting the lily to catalogue the beautiful sound qualities of these famous mikes, and the many hundreds we have supplied to private users, Cinemas, home grammo recorders and transmitters is proof of their high quality. Special cushion mounting in this make only. Limited number at 55/-.



EISEL REISZ

55/- ONLY.

RADIO TRANSMITTERS. Hand microphones of the new Lafone-Reisz pattern hitherto not released to the public are now available at a bargain price. Made with the famous Lafone granules, the "hush-hush" mixture that makes the silent background quality. Rigidly tested for pure response to speech and music, the Lafone-Reisz Hand Model is the only one of its kind and is ideal on the air. Complete Microphones for all purposes in stock, 25 models.

Electradix are always in front with the latest and best. Send for our Complete Catalogue, "P," 4d., or Bargain Sale List, post free, and you will save money.

THE DIX-ONEMETER. The ideal of multi-range, moving-coil meters. Built to first-grade British Engineering Standard. 50 ranges on one meter. Measures Microamps to 20 amps, millivolts to 1,000 volts, 50 ohms to megohms. Six terminals. Two clear scales, mirror, and knife-edge pointer for accurate reading. Complete in case, 60/-.

THE DIX-MIPANTA VEST POCKET TESTER. A wonderfully versatile moving-iron multi-range meter for service on A.C. jobs. No projecting terminals. THREE ranges of volts: 0-7.5, 0-150, 0-300. Used for MILLIAMPS reads 0-125 mA., and 0-75 mA. In black bakelite case. Measures only 2 1/2 in. by 2 1/2 in. Complete in case with pair of test leads and plugs. Leaflet "P" gives full information, 19/6.

S. G. BROWN'S BATTERY SUPERSEDER makes H.T. from your L.T. 2-volt battery, rectified and smoothed. 3 tappings. A boon to those who are not on the mains. Reduced from £3/15/-. New and Guaranteed 37/6.

LESIDX CHARGERS. We have 25 models to offer and build special types to special requirements. Three popular sizes are the AC109A for 36 cells at £10/9/-, the AC106 for 108 cells at £12/10/-, and the Lesidx Super Six for 200 cells at £32/7/6. Ask for Charger Leaflet "P".

ELECTRADIX RADIOS. 218, UPPER THAMES ST., E.C.4. Phone: City 0191

THE LINK BETWEEN

(Continued from page 498.)

As a matter of passing interest, I am assured by Mr. Graham Farish that, despite the over-night delay, a big spurt was put on the next day, and within twelve hours the lost time was entirely made up. Constructors of the "S.T.500" (and who isn't?) need therefore have no fears of a possible delay in the delivery of G.F. parts. The position is entirely normal, and supplies have not been interrupted despite the delay. Good work, G.F.!

Cossor's Latest.

I can remember the time—and not so very long ago—when the superhet method of reception was a matter for great controversy. But what a very different story presents itself to-day!

What with the advent of new valves and new circuits, the superhet has now emerged as one of the few types of sets that can really be said to fulfil the modern requirements of high selectivity and sensitivity plus simplicity of operation.

These thoughts have been brought to mind by a leaflet which has just come to hand from Messrs. A. C. Cossor, and in which is described their range of superheterodyne receivers.

There are two of them, the model 635 for A.C. mains and the model 634 for battery operation, and, knowing the high quality of all products bearing the name of Cossor, I am amazed at the extremely modest prices at which they are offered.

The battery model, which employs Class B output and single-dial tuning, and which is supplied complete with valves and a permanent-magnet-type moving-coil speaker in a pleasingly modern walnut-finished cabinet, costs only £13 10s.

The price of the A.C. version, which, of course, is also inclusive of valves, speaker and cabinet, is 14 guineas, a figure which in many cases is appreciably lower than one would have had to pay twelve months ago for a quite ordinary three-valver.

Those of my readers who are interested in complete receivers would no doubt welcome further details of these two fine sets, and I am therefore going to make the descriptive literature available under our postcard scheme. (No. 64)

After-Sales-Kit Service.

I have always been keen on the kit method of buying parts for the construction of a set, simply because, apart from the question of convenience, there are few kits these days which do not carry with them a guarantee of performance.

The kits which are now being offered by Messrs. Marcus Overton Radio, Ltd., are no exception to the rule. A guaranteed performance plus after-sales service are the two principal features of these new "Ace" sealed kits; and Mr. Marcus, who has for many years been connected with home constructors' kits, will be personally responsible for the prompt dispatch of every order.

All inquiries relative to these new kits should be addressed to 62, Borough High Street, London, S.E.1.

THE MIRROR OF THE B.B.C.

(Continued from page 498.)

and 2nd, respectively (National and Regional).

The Drama Director of the B.B.C. will not produce the play himself, but has entrusted this work to Howard Rose. "Red Tabs" was first broadcast in 1930. Another play, with which some listeners are already familiar through previous broadcasts, is Dulcima Glasby's "Obsession," which will be heard on Monday and Tuesday, November 20th and 21st, respectively.

Philip Ridgeway's Popularity.

While most artistes are willing to take as many engagements as the B.B.C. will offer them, our old friend Philip Ridgeway is in the position of having to ask the Corporation to postpone his next booking.

Throughout the summer Philip did excellent business with his Parade entertainment at the seaside resorts up and down the country. Even then he was well fixed up for some months ahead, but thought it would be all right to accept a broadcast engagement for next January.

Now he finds that his show is in such demand that he has asked to be allowed to put it off until the end of May.



Discard that unsightly mast and wires and fit the AIRCLIPSE. The selectivity of your set will be amazingly improved—each programme separately sharp and clear. The AIRCLIPSE is an auto-inductive aerial that filters incoming signals. It is not just another gadget—not a condenser. Fits inside or outside the set in any convenient place. Non-directional. Makes any set "portable."

A delighted purchaser writes: "I have taken down my outside aerial, as the reception I get with the Airclipse is better, infinitely clearer and free from crackle."

The AIRCLIPSE 5/-
AUTO-INDUCTIVE AERIAL

Of all radio dealers or direct from:—
AIRCLIPSE LTD., 182, Vauxhall Bridge Road, London, S.W.1.
Telephone: Victoria 5022

SURPLUS RADIO BARGAINS

LOOK AT THE PRICES

DOUBLE SMOOTHING CHOKES, mounted, sound robust job, 120 m/a., 14/28 henries each. Usual price, 35/-, our price 6/6 each; 9d. postage. Single ditto, 4/6 each.

RESISTANCES, wire-wound, finest quality. 5 watt, 8,000 ohms and 65,000 ohms. Worth 3/6 each. 6d. each, postage 3d.

POTENTIAL DIVIDERS, wound 2 sections. 5 watt; 40,000 and 23,000 ohms; 40,000 and 80,000 ohms; 40,000 and 100,000 ohms; 30,000 and 50,000 ohms. At 1/- each, postage 3d.

Chokes, small iron-cored, 2,000 ohms, for output or choke coupling. 1/6 each, 3d. postage. **A.C. H.T. Eliminators,** 220-v. to 240-v., with 4 tappings. Total output, 150-v. at 25 m/a. For use with PV495. Price, with valve, 35/-; less valve, 27/-.

Wearite Mains Transformers, Rectified output, 500 volts at 60 m/a. Heaters 2-0-2 up to 4 amps. Rectified filament 2-0-2 up to 4 amps. Input 200, 220, 240-v. For use with D.W.3 rectifier. 12/6 each, postage 6d.

Mains Transformers for eliminators. Output 250-0-250 at 60 m/a., 4-v. at 1 amp. State input when ordering. Price 6/6, postage 9d. **14-mfd. Block Condensers,** 750-v. D.C. test 6-4-2-1-1 or 6-2-10-mfd. Block Condensers, 750-v. D.C. test 4-4-1-1-350-v. post 4/- each, postage 6d.

Wire-wound Potential Dividers, 60-watt, wound three sections. 4,500 ohms, 3,000 ohms, 2,000 ohms. 1/6 each, postage 3d.; 5 watt ditto, 20,000 ohms, 20,000 ohms, 20,000 ohms, 1/- each, postage 3d. **Power Pack Chassis,** wired with Wearite transformers, as above, and T.C.C. 4-mfd. Electrolytic condenser, etc. 200, 220, 240-v. input. 20/- each, packing 9d. **Resistances,** 2 separate resistances on 1 tube, 60 watt, 2,500 ohms and 500 ohms. 1/6 each, postage 4d. 3 separate resistances on 1 tube, 2,500 ohms, 1,000 ohms, 80 ohms. 1/- each, postage 3d. 100,000, 200,000, and 300,000 ohms, 1 watt type resistances at 4/6 per dozen, postage 3d. **Leaks** 2-meg., 1-meg., 5-meg. leaks; 001, 0001, 015 fixed condensers, all 3/- per dozen, postage 3d. **Condensers,** 1-mfd. condensers, 250-volt working, 8d. each, postage 2d. 4-mfd. condenser, 250-volt working, 1/6 each, postage 4d. If you cannot call to inspect these and other wonderful bargains, write for free list "P." Goods despatched Cash or C.O.D.

SURPLUS RADIO, HIGH HOLBORN, LONDON, W.C.1.

WE invite readers to support our Advertisers—care being taken to accept only announcements of reputable firms!

TECHNICAL NOTES

Some diverse and informative jottings about interesting aspects of radio.

By Dr. J. H. T. ROBERTS, F.Inst.P.

Tone-Correcting Transformers.

I WONDER how many of you use the so-called "tone-correcting" low-frequency transformers. These, as you know, enable you to "tune" the low-frequency side of the set in much the same way as you tune the H.F. side for the incoming signal wavelength. It is not really quite the same thing, because with the tone-correcting transformer what you really do is to compensate for the tone or quality rather than tune to any actual wavelength.

This brings up the old question about the quality which you can get on the reception of foreign or distant stations. Generally, long-distance reception involves not only sensitivity but (in these days) also a high degree of selectivity. As everyone knows, when you make the set very selective you are apt to cut out sidebands, and with the sidebands goes the quality, particularly owing to the loss of the higher notes. There are all kinds of dodges for reinstating the lost higher register, and really the tone-correcting transformer comes. I suppose, under this heading.

Balancing the Tone.

In this transformer there is a variable resistance which is operated by means of a control knob. By altering the resistance you can diminish the response to the bass register, and so by comparison you emphasise or bring up the higher register.

I have often tried this type of transformer on different sets and got some very good results. The results, however, depend largely on the type of set with which the component is used, some sets showing a much greater improvement with it than others.

If the set is one which relies largely upon reaction, you will generally find much greater improvement by using a tone-correcting transformer. I have also used this transformer with sets of very high selectivity and found a very marked improvement in the quality owing to the partial suppression of the bass and the relative enhancement of the upper register.

In fact, you can juggle about quite a lot with the tone, and can adjust it to give you something to suit your own individual requirements. I should say that some people rather favour a preponderance of bass in the reproduction, as they think that this gives a kind of "mellow" tone, but personally I think it is much more natural when there is a fair amount of the upper register mixed with it.

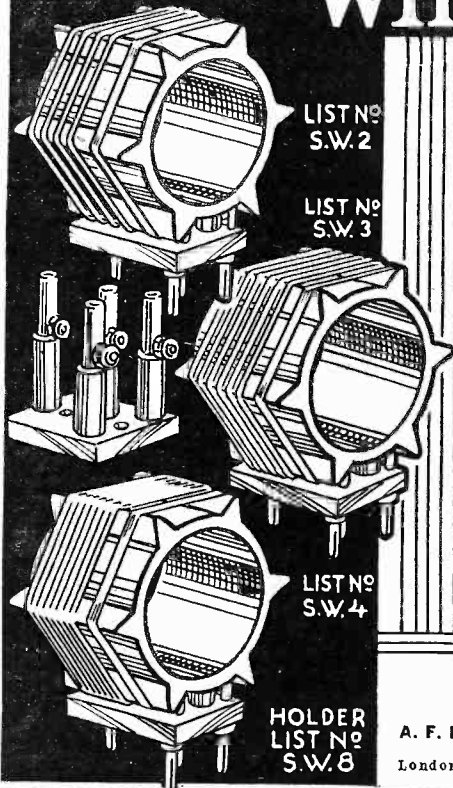
"Mellowness."

The passion for mellowness, amounting sometimes really to boominess, explains why so many people are fond of loud speakers which have this characteristic.

It is all very well to have a sort of giant bass voice booming out of the speaker, but to me it gets very tiring after a time, and, if the truth were known, the voice is really

(Continued on next page.)

SPECIFIED FOR THE Popular ALL-BAND SHORT WAVE RECEIVER



LIST No. S.W.2

LIST No. S.W.3

LIST No. S.W.4

HOLDER LIST No. S.W.8

BULGIN SHORT WAVE COMPONENTS are not adaptations, but specially designed for their work. They have long been regarded as indispensable by experienced experimenters, while ensuring good results to the veriest novice.

DEFINITELY INCORPORATED.

List No.	Description.	Price.
S.W.2.	COIL. 10 to 25 METRES.	4/6
S.W.3.	COIL. 20 to 50 METRES.	4/6
S.W.4.	COIL. 30 to 80 METRES.	4/6
S.W.9.	COIL. 70 to 130 METRES.	4/6
S.W.10.	COIL. 120 to 180 METRES.	4/6
S.W.8.	- COIL HOLDER - -	1/6
P.30.	- TWIN PLUG STRIP -	9d.
C.R.4.	- CROCODILE CLIP -	1 1/2d.

Send for New Catalogue No. 53 "P," containing 80 fully illustrated pages and diagrams. Enclose 2d. postage.



A. F. BULGIN & Co., Ltd., ABBEY ROAD, BARKING, ESSEX
 London Showrooms: 9, 10, 11, Cursitor St., Chancery Lane, E.C.4.
 Telephone: Holborn 2072.

Now Ready!

WHO'S WHO IN BROADCASTING

Edited by Sydney A. Moseley

Radio Stars—their full names—their biographies—their broadcasting and other activities—and, in many cases, sketches in an amusing vein. You must get this book, just out! It's a delightful companion to your home radio entertainments. 3/6 net.

A few of the Famous People described:—

- CHRISTOPHER STONE,
- Sir WILLIAM BRAGG,
- MAURICE COLE,
- MABEL CONSTANDUROS,
- HENRY HALL,
- BEATRICE HARRISON,
- PADEREWSKI, GILLIE POTTER,
- PAUL ROBESON.

PITMAN Order from your bookseller, or send P.O. for 3/10 direct to:—
 Parker Street, Kingsway, London, W.C.2

G.P.O. Engineering Dept. (No experience required.) Commence £4 per week. Age 17-23. Excellent prospects. Free details of entrance Exam. from B.I.E.T. (Dept. 568), 31, Oxford Street, W.1.

EASY TERMS PROMPT DELIVERY

Any Amplion, Blue Spot, Baker, Celestion, Epoch, Ferranti, Gramplan, Igranic, Lamplugh, Magnavox, Ormond, R & A, Rola, Sonochorde or W.B. Speaker supplied.

Send 5/- only

and pay balance by monthly instalments. No references. Entirely private and confidential.

KITS, PARTS, SETS, ELECTRIC CLOCKS ON EASY TERMS.

Send for Catalogue and state requirements to

TURNADGE & PARTNERS, LTD.
 107, Fleet Street, London, E.C.4.

Telephone: Central 1903.

INVENTORS, Your ideas may be worth royalty if submitted to manufacturers—but apply for your PATENT first. Write for my FREE "INVENTORS' POCKET-BOOK," explaining how to patent inventions. Submit particulars in confidence for free expert advice.—EDWIN V. AKE, A.I.M.E., 27, Chancery Lane, London.

RADIO GRAM CABINETS
 as supplied to B.B.C.

65/- Polished 35/-
 Cabinet for 35/-
 No Middle Fronts!

Famous maker offers finest Radio Furniture. As supplied to B.B.C. A Quality and Value impossible to better. Beautifully hand polished! GUARANTEED Piano-Tone Acoustically.

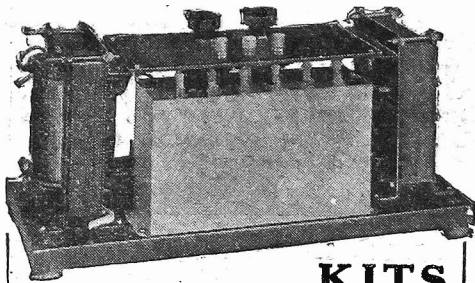
Trial Will Delight You! (Cash or 10/- Monthly.)

LIST FREE! From Makers—

PICKETT'S
 Piano Tone

Cabinet (P.W.) Works, Alblon Rd., Bexleyheath, Nr. London

PLEASE be sure to mention "Popular Wireless" when communicating with Advertisers. Thanks!



KITS for building Mains Units

There is much more satisfaction in building your own mains unit. You know that only the best components are incorporated. You can obtain the exact output required for your receiver. It's cheaper this way... it's an interesting job for a winter evening. Heyberd Assembled Kits are already assembled and mounted—you simply do the wiring. Easy blueprint and instructions provided. The illustration shows the Heyberd Mains Unit Kit, with metal case removed. Here are two fine models:

C.150—Alternative Output 120 or 150 volts at 20 to 25 ma. Two Variable Tappings. PRICE 76/-

C.250—Alternative Outputs 200 or 250 volts at 60 ma. Three Variable Tappings. PRICE 150/-

(L.T. 4 volts 5 amps. and 4 volts 1 amp. supply for A.C. Valves if required, 10/- extra.)

Post Coupon NOW

I enclose 3d. in stamps for 36pp. booklet "MAINS POWER FOR YOUR RADIO," containing hints, tips and circuit diagrams on how to build my own Mains Unit.

Mr.
Address

F.C. HEYBERD & CO
10, FINSBURY ST EC2
One Minute From Moorgate Station.

RADIO SUPPLIES
Send your list of Radio needs for our quotation. Kits, Parts, Sets, etc. Everything in Radio stocked, prompt delivery. 7 days' approval. Catalogue free. Taylex & Standard Wet H.T. replacements stocked.
P. TAYLOR, 9, GROVE ROAD, BALHAM, S.W. 12

Micromesh
THE MODERN VALVE
Literature and prices on request.
Standard Telephones & Cables Ltd.
St. Chad's Place, 364, Gray's Inn Road, W.C.1. Terminus 6255.

TECHNICAL NOTES

(Continued from previous page.)

quite unlike that of the announcer or artiste who is speaking at the studio. Once you get a nice balance of tone you will find that it really never becomes tiring, since it is so closely akin to the natural speaking or singing voice.

Short-Wave Reaction.

One of the commonest complaints of readers is that they cannot properly control reaction. This is very important for working on the medium waves, but is, if anything, still more important if you work on the short-wave band.

In fact, it is no exaggeration to say that the sensitivity of a short-wave receiver depends almost entirely on the proper smooth working of the reaction. If the detector is not working under proper conditions the reaction will be "ploppy."

One of the simplest ways to get over this is to use a lower anode voltage on the detector. This should not, as a rule, be more than 60 volts, and sometimes distinctly less than this value will give you the best results.

A Question of Bias.

If, however, the trouble is not due to the detector voltage, have a look at the positive bias on the grid and try a lower value. Another dodge you might try is to use a higher value grid leak, which will often work wonders. For short-wave purposes the grid leak may be increased to quite a large value, even up to as much as 5 megohms, whilst the condenser to go with it may be, round about .0003 microfarad.

Speaker Effects.

A week or two ago I said something in these Notes about using a moving-coil loudspeaker with its back close to a wall, and about how this tends to interfere with the quality of the reproduction, as well as the volume.

I have had several letters from readers about this, describing similar experiences. I haven't space to deal with them all, but I would like to quote one reader who says that, in using a mains-driven moving-coil speaker in a radiogram, he found that if the cabinet was placed with its back against a plaster wall, reproduction was very muffled, whilst he got a "boominess" on low notes and a curious "piercing effect" in the higher register.

In addition to all this, the reproduction of the high notes was very weak, and it seemed as though some kind of absorption was taking place. When the cabinet was

placed at an angle in the corner of the room, so that there was a good space between the back of the speaker and the wall, there was a great improvement in quality and also a noticeable increase in volume, especially on the high notes

A Useful Sounding Board.

Another interesting thing which this particular reader mentions is that he tried placing the cabinet with its back against one of a pair of large wooden folding doors which separated two rooms, and in this position he got excellent results, better than when the speaker was in the middle of the room. I expect this was due to some kind of resonance set up by the wooden door which acted as a sort of sounding board.

Try Different Positions.

Other readers, as I say, described effects which are in general similar to the above, and it seems pretty clear from experiences

NEXT WEEK

Full details of how to build
TWO FINE SETS

A BAND-PACK 4

AND

THE A.T.B.

ECONOMY THREE

Order Your Copy To-day

of those who have written to me that a great deal depends on the position of the speaker in relation to the wall and even to other objects in the room.

This is a point you are rather apt to forget in the ordinary way, but it is best to try a few different positions and find one which, whilst being convenient, also gives you good reproduction. I have actually come across cases where a speaker was tried in different positions and the results were so different that you would have hardly recognised it as the same instrument.

Sound Patterns.

Those of you who read an article of mine in "P.W." about two months back on

(Continued on next page.)

YOU'LL NEED ME—FOR THAT SERVICE JOB!



THE GILBERT SERVICE TOOL

THE COMBINATION TOOL FOR ALL KIT BUILDERS AND SERVICEMEN.

Comprises—3 Box Spanners for 2, 4 and 6 BA Nuts and 2 Screw Drivers.

All in one and Fits in Pocket like a Fountain Pen.

Retail Price **2/6** Each.

From all Radio Dealers or from the Manufacturers:—

C. GILBERT & CO., LTD., ARUNDEL STREET, SHEFFIELD

SECRETS OF CELESTION SUPREMACY

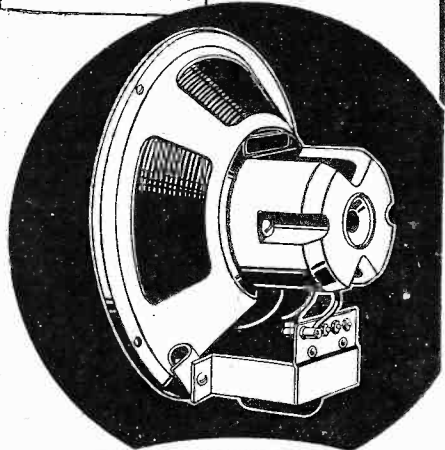
No. 2 Accurately Proportioned Magnets!

The cobalt steel magnets incorporated in Celestion Moving-Coil Loudspeakers are *accurately* proportioned. Large enough to be amazingly sensitive even on small inputs—small enough to reduce magnetic leakage to a minimum. As a result, Celestion loudspeakers are much more efficient than many with magnets of considerably larger external dimensions. It is such *attention to detail* that puts Celestion in the forefront of modern loudspeaker design. The name Celestion stands for high-quality reproduction combined with unflinching efficiency. Celestion speakers can be supplied to match any set or type or output. Ask your dealer to demonstrate, or write for illustrated details.

PPM9 Chassis Model £1-15-0
PPM19 " " 2-7-6
PPM29 " " 3-17-6

Celestion Ltd., London Road,
Kingston-on-Thames.

MODEL P.P.M.19



CELESTION

The Very Soul of Music

**THE FOREMOST NAME
IN SOUND REPRODUCTION**

TECHNICAL NOTES

(Continued from previous page.)

"Loudspeaker Sound Patterns" no doubt wondered whether the arrangement could be used for "percussion" notes, such as those of a piano. A "percussion" note, I should explain, is one produced by a vibrating object, such as a string, which is struck and then left to vibrate freely.

The note from a piano string is a good example of a percussion note, the vibrations dying gradually away. A violin string, on the other hand, gives out a note whilst the bow is moving across it, and it is kept in what is called "maintained" vibration, which is quite a different thing.

Damped Wave Train.

In the arrangement which I described in the article the sound waves were impressed upon a cinema film, and several correspondents have pointed out that whilst this would give the reproduction of *maintained* notes, such as those of the organ, violin and various other instruments, it would not give *percussion* notes, such as those of the piano.

On the face of it this would seem to be so, but I understand from the inventor that he has some special arrangement by which the individual notes are recorded and the film moves forward at the necessary speed, so that actually, if you depress a key when a piano film is being played, you get precisely the same effect as if a pianoforte note were struck.

Can You Improve It?

But, as I said in the article and as I hasten to repeat, the "Film Piano" is not *my* invention, and I described it because I thought it embodied many very interesting possibilities. I should be pleased to hear from other readers who may see ways in which it could be used or improved.

Transformer Surge.

I wonder if you have ever noticed when using a small transformer—or any other similar inductive component for that matter—that if you frequently "make and break" the current you will sometimes, at the "make," get a current which is much greater than the normal current.

This is quite different from the ordinary step-up kick which you get in the secondary, and, in fact, the effect I am referring to occurs in the primary because, of course, that is where you make and break the current.

Safeguard the Winding.

I remember noticing this effect particularly once when experimenting with some small transformers for rectifying purposes. To safeguard the whole outfit I had a small flashlamp bulb in series with the primary as a fuse, and I knew that when things were working normally the current was so small that the filament in this little lamp was scarcely visible.

After switching on a number of times, however, I would suddenly see a bright flash in the lamp and the filament would fizzle out. On putting in another pealamp the same thing would perhaps occur right away at the first shot, or sometimes the lamp would last for a number of times and then would suddenly go the same way.

(Continued on next page.)

PETO-SCOTT EVERYTHING RADIO—CASH C.O.D. or EASY TERMS

We deal with you direct. Strict Privacy—
No Third Party Collections Easy Terms on
orders over £2. Send list for quotation.

.....LISSEN AND TELSEN KITS.....

- NEW SKYSCRAPER FOUR ALL-WAVE CHASSIS MODEL**, in Sealed Carton. Cash or C.O.D. Carriage Paid, **£5/12/6**. Balance in 11 monthly payments of **10/3**.
- NEW LISSEN SKYSCRAPER 7-VALVE SUPERHET CHASSIS MODEL** in Sealed Carton. Cash or C.O.D. Carr. Paid, **£8/17/6**. Balance in 11 monthly payments of **16/6**.
- TELSEN "CLASS B" 4 CHASSIS KIT** in Sealed Carton, less Valves, Cabinet and Speaker. Cash or C.O.D. Carriage Paid, **£3/17/6**. Balance in 11 monthly payments of **7/-**.
- TELSEN 325 STAR KIT**, less Valves and Cabinet. Cash or C.O.D. Carriage Paid, **£1/19/6**. Balance in 7 monthly payments of **5/3**.


- NEW GOSSOR MODEL 341**, S.G., Detector and Pentode, and Balanced Armature Speaker, complete with Cabinet. Cash or C.O.D. Carriage Paid, **£6/7/6**. Balance in 11 monthly payments of **11/9**.

—CLASS "B" ITEMS

- CELESTION "CLASS B" UNIT "B" STAGE 9. COMBINED CLASS "B" UNIT and P.P.M. 9. MOVING-COIL SPEAKER.** Cash or C.O.D. Carriage Paid, **£2/15/0**. Balance in 11 monthly payments of **5/-**.
- CELESTION "CLASS B" UNIT "B" STAGE 19. COMBINED CLASS "B" UNIT and P.P.M. 19. MOVING-COIL SPEAKER.** Cash or C.O.D. Carriage Paid, **£3/7/6**. Balance in 11 monthly payments of **6/3**.
- NEW FERRANTI "CLASS B" SUPER POWER CONVERTOR.** Instantly converts your present set to "Class B." Complete with valve. Ready assembled. Cash or C.O.D. Carriage Paid, **£3/3/0**. Balance in 11 monthly payments of **5/9**.

- NEW BLUE SPOT 29P.M. PERMANENT MAGNET MOVING-COIL SPEAKER.** With input transformer. Cash or C.O.D. Carriage Paid, **£1/12/6**. Balance in 6 monthly payments of **5/-**.

- NEW BLUE SPOT 45 P.M. MOVING-COIL SPEAKER** with input transformer. Cash or C.O.D. Carriage Paid, **£2/5/0**. Balance in 7 monthly payments of **6/-**.



NEW W.B. P.M.4.A. MICROLODE PERMANENT MAGNET SPEAKER complete with switch controlled multi-ratio input transformer. Cash or C.O.D. Carriage Paid, **£2/2/0**. Balance in 7 monthly payments of **5/9**.

- ROLA F6P.M. PERMANENT MAGNET MOVING-COIL SPEAKER**, with input transformer, Cash or C.O.D. Carriage Paid, **£2/9/6**. Balance in 8 monthly payments of **6/-**.

- B.T.H. MINOR PICK-UP AND TONE-ARM.** Cash or C.O.D. Carriage Paid, **£1/1/0**. Balance in 4 monthly payments of **4/6**.

- NEW GARRARD MODEL 202A**, 12-in. Turntable. Electric Motor for A.C. mains. Cash or C.O.D. Carriage Paid, **£2/10/0**. Balance in 8 monthly payments of **6/-**.

- ATLAS G.A. 25 ELIMINATOR**, for Mains. "Class B" and Q.P.P., four tappings: 60/80, 50/90, 120, 150, 25 m/A. Cash or C.O.D. Carriage Paid, **£2/19/6**. Balance in 10 monthly payments of **6/-**.

PETO-SCOTT CO., LTD., 77, City Road, London, E.C.1. Telephone: Clerkenwell 9406/7. West End Showrooms: 62, High Holborn, London, W.C.1. Telephone: Holborn 3248.

Dear Sirs,—Please send me CASH/C.O.D./P.P.

for which I enclose £.....s.....d.
CASH/H.P./DEPOSIT.
NAME.....
ADDRESS.....

E.V.P.W. 18/11/33

LISTEN IN SUBDUED LIGHT



NEW DECORATIVE SIGNAL LAMPS

To receive full enjoyment from Radio Plays, etc., listen by subdued light. This is easily achieved by means of these new electric lamp fittings, which stand near or on top of any receiver. Fitted with B.C. Lampholders for low wattage lamps, they can be easily connected to the mains or to the set if required to act as signal lamps.

Handsome, weighted, walnut bakelite base, translucent screen and choice of three bronze figures as illustrated. Complete with flex and two-pin plug.

COMPLETE
15/-
EACH



A. F. BULGIN & CO. LTD., ABBEY ROAD, BARKING, ESSEX

EASY PAYMENTS

"There's no place like HOLMES."

The first firm to supply Wireless parts on easy payments. Nine years advertiser in "Popular Wireless." Thousands of satisfied customers.

We recommend

EPOCH SPEAKERS

	De. posit.	Monthly Payments
SUPER DWARF P.M. ...	23/6	4/4 5 of 4/4
20th CENTURY P.M. ...	35/-	4/10 7 of 4/10
11-in. SUPER P.M. ...	45/-	4/11 9 of 4/11
B5 P.M. ...	84/-	7/8 11 of 7/8

LISSEN Skyscraper 4 Kit	112/6	10/-	11 of 10/3
TELSEN 325 Star Kit	39/6	5/5	7 of 5/5
EXLIDE H.T. Accu. 120-v.	60/-	6/-	9 of 6/8
ATLAS Eliminator C.A.25	59/6	5/-	11 of 5/6
BLUE SPOT 29P.M.	35/-	4/10	7 of 4/10
B.T.H. Pick-up Vol. Con.	25/-	4/8	5 of 4/8

Parts for any Kit Set. Any make of Speaker.
New Goods Obtained for Every Order.
Send us a list of the parts you require and the payments that will suit your convenience, and we will send you a definite quotation. Anything Wireless.
H. W. HOLMES, 29, FOLEY STREET,
Great Portland Street, London, W.1.
Phone: Museum 1414.

LOUD SPEAKERS REPAIRED, 4/-
(Blue Spot a Speciality, 5/-)
Transformers and Headphones, 4/-, Eliminators, Mains Transformers and Moving Coils quoted for 24-Hour Service. Trade Discount. Clerkenwell 9069.
E. MASON, 44, EAST ROAD (nr. Old Street Tube Station), LONDON, N.1.

PLEASE be sure to mention
"POPULAR WIRELESS"
when communicating with
Advertisers. THANKS!

TECHNICAL NOTES

(Continued from previous page.)

Excess Current.

It appears to be due to surges of current which depend upon the precise point of the alternating current wave which you strike, as it were, when switching on. You might switch on a dozen times and never get this effect, whilst on the other hand you might get it the first time and blow a fuse which is designed to carry a far greater current than the normal for the conditions in which you are working.

Loose Connections.

The burning out of a fuse is not in itself a very serious matter, but what is much more important is the effect on the transformer winding if you do not use a fuse. You will see from this how important it is to use a transformer which is generously proportioned for the work and capable of standing up to a sudden surge like this.

One very important point to note is that if you get a vibrating loose connection in the primary of the transformer, which is giving you a make-and-break effect, you will be very liable to damage the windings sooner or later, so that it is better to have such a break repaired without delay.

S.G. Valves and Selectivity.

The selectivity of a set when using a screened-grid high-frequency stage can often be improved by trying out different values of the bias in the control-grid circuit. As a matter of fact, this method is used in a number of commercial sets.

The value of the bias to be used cannot be stated generally, because it varies a little in different conditions, and it is worth while to try different values for yourself. The usual value of 0.9 volts sometimes does not give you anything like the best results as regards selectivity. You will quite possibly find that if you vary this a little—it may be a little more or a little less, I can't tell you—you will get greatly improved results.

Adjusting the S.G. Bias.

If you are putting in a new screened-grid valve you should certainly try slight variations of the value of this bias, and not just assume that it is the conventional 0.9 or, indeed, any other prescribed value. I have known more than one case where ever such a slight adjustment of this grid-bias value has made a remarkable difference to the selectivity and, for the matter of that, to the sensitivity of the set as well.

S.T.500 CORRECTIONS.

Although all drawings, photographs and the blue print of the "S.T.500" are correct, wire (67) mentioned on page 293 of the Rapid Construction Guide ("Popular Wireless," dated October 21st, 1933), should read:

(67) No. 5 terminal (tighten) on anode coil to anode reaction condenser fixed vanes upper terminal (tighten) F1.

The instructions given for correcting the connections to certain differentials (other than those used) were given in the issue of "Popular Wireless" dated October 28th. On page 339 near the bottom of the middle column, the wire 74 should read 65. At the top of the left-hand column on page 340 wire 74 should also read wire 65.

J. S.T.

MORE STATIONS

are every day crowding each other and making clear reception almost impossible. Don't put up with that annoying background that interferes with the complete enjoyment of your set.



A Pix fixed in your aerial will reduce interference to a minimum on any set, because it sharpens tuning to a knife edge. You will be pleasantly surprised at the number of new stations you can hear clearly. Send us 2/- P.O., try it on your set for a week, if you are not completely satisfied with the result return it to us for full refund.

The British Pix Co., Ltd.
Southwark Street, S.E.1

**2/- FIX A
PIX
FOR BETTER
RADIO**

ENGINEERING OPPORTUNITIES OPENINGS for ENGINEERS

Never before has engineering offered such magnificent chances. With the rise of the depression, the industry is literally teeming with first-class opportunities. Our 250-page Hand-book, "ENGINEERING OPPORTUNITIES," shows where the opportunities lie, and the easiest way to prepare for them. The Hand-book gives details of A.M.I.Mech.E., A.M.I.E.E., A.M.I.C.E., G.P.O., etc., Exams., outlines Home-Study Courses in all branches of Civil Mech., Elec., Motor, Radio and "Talkie," Engineering, Building, etc., and explains our unique Employment Dept.
Send for this valuable Hand-book to-day—FREE!
British Institute of Engineering Technology,
101, Shakespeare House, 29, Oxford St., London, W.1.

**The Paper
for the Boy
of To-day!**

**MODERN
BOY**

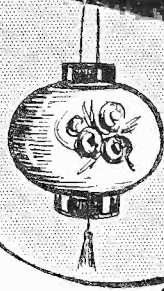
Every Saturday - 2d.

GIFTS THAT ALWAYS PLEASE!

JOLLY GIFT-BOOKS FOR BOYS & GIRLS

If you're buying presents for boys and girls, why not buy books? And if you're buying books, why not read this page? It will help you. It would be difficult to choose a better gift than a book. Toys lose their novelty and are soon cast aside—but books—the RIGHT source of fascination and interest. On the right are listed a few of the books from which you can choose. Most of them contain beautiful coloured plates and pages printed in colours.

NOW ON SALE AT ALL NEWSAGENTS, BOOKSTALLS AND BOOKSELLERS



BRITISH BOY'S ANNUAL - - 5/-

The ideal Annual for boys from ten to fifteen. Contains stories of school, sport, mystery and adventure; useful articles. Bound in cloth with coloured wrapper.

BRITISH GIRL'S ANNUAL - - 5/-

Girls from ten to fifteen will revel in this favourite Annual, with its delightful stories of school life, sport and adventure, and its entertaining and useful articles.

GREYFRIARS HOLIDAY ANNUAL - - 5/-

Stories of school, sport and adventure, also puzzles, articles and poems. Its special appeal is to the manly schoolboy up to fifteen years. Four fine colour plates.

The GOLDEN Annual for GIRLS - - 3/6

A book no schoolgirl up to fifteen years of age must miss. School, adventure, home life and mystery stories, fully illustrated throughout.

BOYS' CINEMA ANNUAL - - 3/6

An all-photogravure film annual, containing thrilling stories, splendid plates of popular stars and illustrated articles. A boys' book for girls, too.

NOAH'S ARK ANNUAL - - 3/6

Boys and girls from four to eight will love the fascinating real-life pictures of animals and the jolly tales about them. Over a hundred pages, with coloured plates.

CHICKS' OWN ANNUAL - - 3/6

A novel book for little boys and girls who are just beginning to read. Printed in large, clear type with all words divided into syllables. Pictures to paint form a special feature.

BUBBLES ANNUAL - - 3/6

For children from six to twelve years. One hundred large pages containing stories, pictures and every variety of feature entertaining to young folk.



New EKCO POWER UNITS

10 POWERFUL FEATURES

- 1 Attractively designed all-insulated Bakelite Case.
- 2 Available for A.C. or D.C. Mains.
- 3 High capacity Electrolytic Condensers ensure absence of hum and provide reserve power for Class B operation.
- 4 New design Power Transformer completely screened by a thick steel case eliminates all outside interference.
- 5 H.T. voltage to intermediate tapings (S.G. and Detector) in three steps enables variable voltage to screened grid detector etc., to be adjusted to correct value.
- 6 Whole output of each Unit can be reduced to approximately three-quarters of the rated value for receivers built for low voltage H.T. batteries.
- 7 Westinghouse Metal Rectification.
- 8 Charging current on new combined units is now .5 amp to fulfil filament current requirements of Class B valves.
- 9 All metal parts are cadmium plated.
- 10 PRICES FROM **37'6**
or by *Easy Payments*



Behind these new EKCO Units lies a wealth of experience unrivalled in British Radio. The leading constructors and designers for over eight years have used and specified EKCO Units. They are more enthusiastic than ever about this new range. Follow their lead and insist upon EKCO.

EKCO RADIO

To: E. K. Cole Ltd., Dept. A.12, EKCO Works, Southend-on-Sea.

NAME.....

Please send me details of the new Ekco Power Units.

ADDRESS.....

when con

Advertisement published every Wednesday by the Proprietors, THE AMALGAMATED PRESS, LTD., The Fleetway House, Farringdon Street, London, E.C.1. Advertisement Offices: Messrs. John H. Lile, Ltd., Ludgate Circus, London, E.C.4 (Telephone: Central 5352). Registered for transmission by Canadian Magazine Post. Subscription Rates: Inland and Canada, 17/4 per annum. Abroad (except Canada), 19/6 per annum. Sole Agents for Australia and New Zealand: Messrs. Gordon & Gotch, Ltd.; and for South Africa: Central News Agency, Ltd. Saturday, November 18th, 1933. S.S.