

Amateur Wireless,
June 3, 1933

AN ARMSTRONG "SUPER" ONE-VALVER

AUTOMATIC VOLUME CONTROL MADE EASY

Amateur Wireless

and
Radiovision

MAKING THE MOST
OF
CLASS B

Every
Wednesday

3^d

Vol. XXII. No. 573

Saturday, June 3, 1933

BUILDING THE

S.S.3

SUPER-SCREENED

FULL DETAILS
IN
THIS ISSUE



THE
LATEST
IN
SETS

Registered at the G.P.O. as a newspaper



UNBREAKABLE CATKIN VALVES

If you are not already familiar with details of the new UNBREAKABLE CATKIN VALVES, please write to the Marconiphone Company Ltd., 210-212 Tottenham Court Road, London, W.1, for a fully descriptive leaflet.

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Types at present available are: §MS4B. High conductance S.G. . 19/- . §VMS4. Variable-Mu. S.G. . 19/- . §MH4. General Purpose triode . . . 13/6. MPT4. Power Pentode . . . 20/-
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G. Marconi

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Use these lighter evenings to BUILD WITH YOUR OWN HANDS THIS BETTER RADIO SET GREAT LISSEN CHARTS FREE

The NEW ALL-ELECTRIC "SKYSCRAPER"

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

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

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

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

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

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

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- Chassis Kit, complete with three valves £4 9s. 6d.
- Kit complete with Table Model Cabinet £5 5s. 0d.
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COMPLETE WITH VALVES 89%

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To LISSEN LTD., Publicity Dept., Isleworth.

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

NAME

ADDRESS

A.W./8.

LISSEN "SKYSCRAPER" BATTERY DRIVEN OR ALL-ELECTRIC

Lissen have published two fascinating Charts—one of the Battery "Skyscraper" and one of the All-Electric "Skyscraper." So clear and so detailed are the instructions and photographs that SUCCESS is CERTAIN. Ask your radio dealer for the Chart of the "Skyscraper" in which you are interested—or post coupon below.

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



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

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NEWS & GOSSIP OF THE WEEK

THE LATEST IN SETS

THIS week we are giving constructional details of the "S.S.3," our latest and best mains receiver, using the new Catkin valves and iron-cored coils. Not only is it one of the neatest home-constructor sets that has ever been described in a wireless journal, but it is super-screened, is absolutely stable and can put up a remarkable performance. It is a metal-chassis set which will be the envy of your radio friends.

NEW SPONSORED PROGRAMME MENACE

AMONG amateur circles there is much speculation as to who is responsible for the recent Sunday morning's flagrant dis-

regard of amateur transmitters licensing regulations. Apparently someone on the short waves has been sending out musical items and gramophone records interspersed with direct advertising announcements. A local Croydon firm was "sponsored," as was a Croydon theatre, the price of the seats being tactfully mentioned. Of course, all this is strictly against the P.M.G. regulations—someone is obviously going to get their licence suspended before long!

ORGAN'S OFFICIAL OPENING

ON June 16 the B.B.C. will officially start up its wonderful new organ at Broadcasting House. Tests have been carried out to see how far the noises of the organ interfere with work in other studios. Engineers have concluded that when the organ is going at full blast studios 3E, D and B are subject to a certain amount of noise penetration, so it has been decided that broadcasts from this particular group will not be done while the organ is being played in the main concert studio. All the other studios are quite immune from the organ's interference.

WEST NATIONAL TESTS

UNTIL the Chief Engineer returns from the Lucerne meeting, tests of West National will not be started. It is expected that the Chief will be back early in June, when, after his arduous efforts on our behalf at Lucerne, he will tackle the very big problem of supervising the synchronisation of West National with London National on 261 metres. At first the test will be very secret—in fact, they will be done in the middle of the night. Even if all goes well with the synchronisation, it is expected that public-participation tests will be delayed until the middle of July at the very earliest.

FOR OUR "LOOKER" READERS

MAKE a note that on June 20, "Karsavina," the famous dancer, will appear before the television scanner at Broadcasting House. Come along, you pioneer lookers, here's something to look at!

ALSO IN THIS ISSUE

Making the Most of Class B.

New Ideas on Automatic Volume Control.

Building the "S.S.3."

What the Talkies can Teach the B.B.C.

An Armstrong "Super" Short-wave One.

GETTING READY FOR THE NEW PLAN

WE hear that the famous Brussels wavelength-checking station has been completely re-equipped with high-precision instruments. They want to be quite ready for policing the ether when the new wavelength plan comes into operation.

"SONGS FROM THE SHOWS" ENDING

ON Whit Monday the last of the popular "Songs from the Shows" programmes will be broadcast, when an all-star caste will include Dorothy Dixon, Nelson Keys, Anona Wynn, Olive Groves, Reg Purdell and George Baker. Some show!

HENRY'S AMERICAN TRIP

DAILY Press rumours about Henry Hall's proposed American trip have been somewhat premature and in many cases inaccurate. It appears that Henry is not making any definite plans until Jack Hylton comes back to this country again in just over a week's time. Hylton is to be Henry's companion on the trip, and although it will be primarily a holiday for both of them, a series of visits will be paid to American dance-music "kings."

BETTER THAN PARIS!

WHEN our Correspondent tackled Henry about American dance music and the possibility of hotting up the B.B.C. Dance Orchestra in Louis Armstrong style, Henry would not commit himself. He does not want to upset the "sweet music" enthusiasts in this country, nor prejudice his position with the American hot-style music creators before he is in sight of the Statue of Liberty! He has plenty of time in which to state a policy, as he will not sail till the end of August, and will be away for the whole of September.

THE NIGHTINGALE BROADCASTS



Songs from Pangbourne Woods! The song of the nightingale has been broadcast as usual this year and here B.B.C. engineers are connecting up the telephone wires with the microphones hidden in the Pangbourne Woods, the home of the birdies!

NEXT WEEK: HOW TO GET PRACTICAL RESULTS UNDER 10 METRES

NEWS & GOSSIP OF THE WEEK —Continued

MORE FOR THE EMPIRE

C. G. GRAVES, the Empire Service Director, has been doing useful work behind the scenes. One result is the new idea of increasing the length of the Empire programmes from June 11 onwards. An extra period, from 11 a.m. to 1 p.m., and from 11.30 to 1 p.m. on Sundays will be given on an omnidirectional aerial. This extra two-hour session every day will be taken up by light items, chamber music and so on. The wavelength at first will be 19.8 metres, subject to alteration later. In some parts of the Empire this session will come at breakfast time, and in others it will be a light nightcap just at bedtime!

A, B, AND C

THE engineers working on the Empire transmissions and results have drawn up a new code for classifying the Empire reports. "A" reception areas are those in which the best possible results are obtained, B and C being successively less successful. All reports received at Broadcasting House from all over the Empire are now graded in this way, and the scheme, which is actually far more detailed, is a great help in deciding which aeriels, wavelengths and transmission times are best suited to any one area.

MORE TALK!

AN immediate result is that owing to the exact knowledge of the fine results obtained in certain areas, less "light" material is to be broadcast to the Empire. More solid programmes, containing talks of value to the Dominions, are to be included in the transmissions to those areas in which the "A" reception is obtained. Dominion listeners are clamouring for really authoritative radio talks and bulletins from the home country!

FIRE!!

FROM the North Regional station on June 3 there will be a most exciting broadcast called "With the Rochdale Fire Brigade." Rochdale seems to be in the news these days. This popularisation of the local fire brigade follows Gracie Fields' successful attempt to put over the Rochdale Hunt!

JUNE DANCE MUSIC

A DEPARTURE from the normal dance-music schedule will be made later this month when, on June 13, the Casani Club Orchestra will take the place of the usual Lew Stone period of late dance music. Harry Roy has the June 5 and June 19 dates and Sydney Kyte June 12 and June 26. The rest of the schedule remains as before.

ANOTHER LIGHT ENTERTAINMENT RECRUIT

ERIC MASCHWITZ has taken on Brian Michie, the blonde giant of Broadcasting House who has so successfully superintended the Effects Department, as one of his assistant producers. It may be remembered that Michie took over the effects job from Denis Freeman who himself has developed into a very promising young producer. Best of luck, Michie, in your new job!

"PEPPING-UP" GRAMOPHONE-RECORD CONCERTS

A NEW drive to brighten up the B.B.C.'s gramophone-record programmes is now in process. Starting on June 26 and continuing throughout the summer until September, special gramophone-record concerts will be broadcast during the early part of the day's programmes. Regimental marches and other specialised types of records will be featured. A very interesting series will be devoted to "Rhythm in Music," tracing the development of rhythm from the tom-tom to the methods of Stravinsky, on the one hand, and Duke Ellington on the other. Still another series will be called "Conductors of the World," wherein such famous conductors as Toscanini and Harty will be included in gramophone concerts of their conducted works. The idea is to give listeners something by record that they cannot possibly hope to have at that time of the day in flesh and blood.

SOME FINE SETS

ARE you trying to decide which set to build? Solve your problem by glancing down the blueprint list on page 820. Here you will find a wide range of sets of all kinds, from

"ones" to "sevens," embracing all the latest circuits. And if it's portables, amplifiers, or add-on units you are after, then you'll find those in the "A.W." range too. Apart from the "S.S.3," described this week, there is the "Class-B Three" (A.W. 386), the "Up-to-the-Minute Three" (A.W. 384), "Everybody's Home Radiogram" (A.W. 381), "B.B.C. National Two" (A.W. 377), "Melody Ranger Two" (A.W. 388) . . . and dozens more, circuit details and blueprint numbers of which are given in the list this week. You will find that it pays to have an "A.W." print when you start building a new set, as it cuts out all the worry.

DENMARK'S BLACK LIST

DENMARK has always been considered to be an ideal country for radio listeners, as the percentage of listeners to population is higher in Denmark than elsewhere, also the Danish officials give listeners the chance to ballot for their favourite programmes when taking out a new licence. But now a Danish black list appears on the horizon. They have just been working out licence statistics and find that over £4,500 was paid last year in fines by radio pirates who were caught!

TESSIN'S TESTING TROUBLES

IF your set goes up to 680 metres, you may have heard the first tests of the new Tessin station, this wavelength, formerly owned by a relay near Lucerne, being adopted for the initial tryout. As Tessin is working with 15 kilowatts, too much interference is experienced and so it is trying to find a new space in the ether. Another dog fight for the International Broadcasting Union to settle.

MAKING THE ANNOUNCERS MORE DEXTEROUS

TO make the most of the new gramophone concerts the B.B.C. is training its announcers to effect dexterous changes from one record to another so that absolute continuity is maintained. This will be essential when they broadcast complete gramophone-recorded operas, as apparently they intend to do during the summer. No extra gramophone commentators are to be brought into this new scheme. Chris Stone and the announcers with their new-found dexterity will do the job between them.

DUKE ELLINGTON IS COMING

HOT dance-music fans will be glad to hear that when Duke Ellington makes his long-promised visit to England he will broadcast from a B.B.C. studio on June 14 from 8 to 8.45 in the main evening programme. He has sixteen players in his band and the figure he has demanded—and is apparently going to get—for his studio visit, would certainly make the mouths of other dance-band leaders water. Still, there is only one Ellington.

"HIGH SPOTS" FOR THE SUMMER

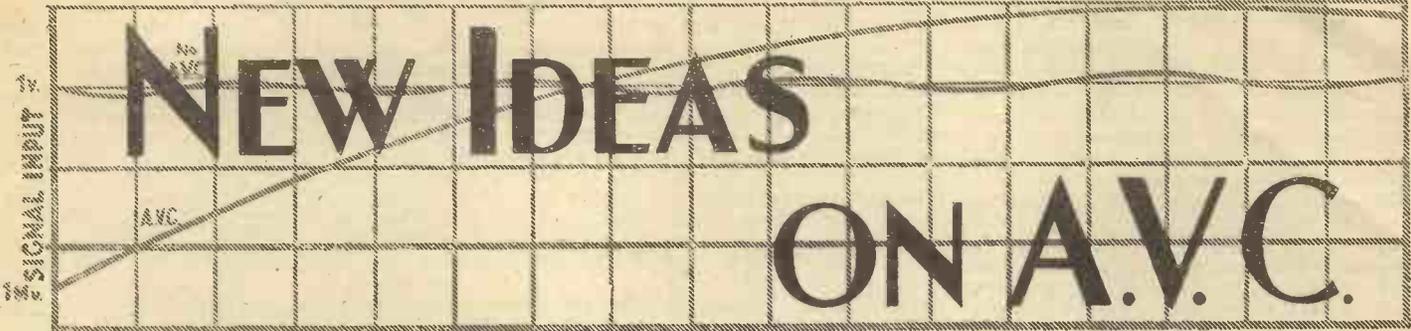
WE shall have Jack Hylton in the studio again in July, and in the same month Geraldo will give us a characteristic show. Looking rather far ahead, there will be a relay from the Windmill Theatre in the autumn. And when Eric Maschwitz takes over one of his first scoops will be the microphone appearance of Evelyn Laye in her first radio production. Ray Noble will also give an hour of variety. Another high spot will be the broadcasting of *The Desert Song*. Still another stunt is broadcast crazy variety.



Sir John Reith at the Bonar Law Memorial College, after giving a lecture and discussion—but not entirely about the B.B.C.!

THE UP-TO-DATE EXPERIMENTER

The graph shows the effect of A.V.C., all voltages between 1 millivolt and 1 volt giving the same output



AMPLIFICATION FACTOR

To many experimenters, automatic volume control is at present a complete mystery. Our breezy contributors, "The Experimenters," unveil the mystery of this important new development and point out which arrangements are likely to be widely adopted during the next season

"A.V.C."—THREE letters you will see a great deal of in coming months! Let us translate them: Automatic Volume Control. From which you may reasonably deduce that this new system provides you with a method of keeping the

Secondly, most of the foreign stations tuned in and, indeed, some of the more distant home stations tend to wax and wane in signal strength, so that unless a frequent adjustment is made on the manual volume control full enjoyment of the programme is impossible owing to the variation in the strength from minute to minute.

Thus we have a theoretically perfect balance in the set's action with respect to the incoming signal. Yes—but what about practice? Very far short of perfection—at least, until the present time. To put it bluntly, A.V.C. has been very largely a snare and a delusion, partly because suitable valves have not been available in this country.

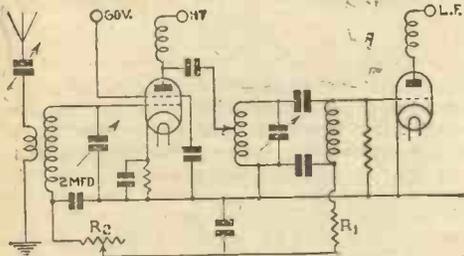


Fig. 1.—Simple circuit for automatic volume control, with resistance feeding back voltage from detector to control the amplification of the high-frequency valve

volume level without manual operation of the volume control. Actually, there is a lot more in A.V.C. than this, but it's not a bad elementary start.

LOUD VOLUME ON ALL STATIONS

Two very common aspects of modern wireless reception have dictated the development of A.V.C. For one thing, the dozens of stations that can be picked up on the average set after dark vary enormously in their initial strength, so that in addition to altering the tuning knob to change the station, you invariably have to alter the volume control as well, either increasing the amplification or decreasing it.

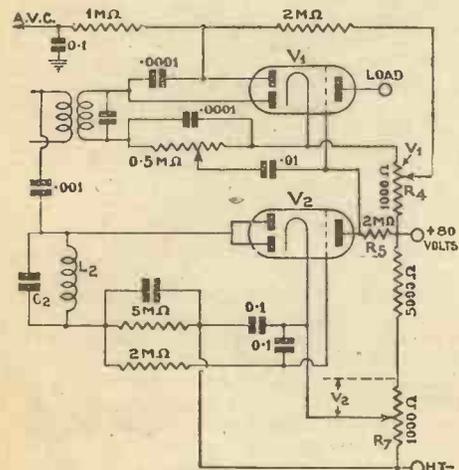


Fig. 3.—Two double-diode-triodes connected up to give quiet automatic volume control

NEW DOUBLE-DIODE VARIABLE-MU FOR DETECTION!

As exclusively announced last week, the Cossor DDPen valve has been developed to solve most of the snags of automatic volume control. The most important feature of the valve is that under normal conditions, as the grid base widens automatically so the signal increases, and conversely decreases as the input decreases. This is ideal for automatic volume control, as the amplification increases as the grid base narrows, thus providing greater amplification on weak signals and less on strong. This is the only valve on the market that will do this automatically. The great levelling effect of this valve is clear from the fact that a constant output is obtained for all inputs from .1 millivolt to 1 volt!



Cossor DD'Pen

A.V.C., in its most perfected forms, will overcome both these reception drawbacks, but perhaps we ought to emphasise right away that you must have plenty of high-frequency amplification to play with to get the maximum control.

All A.V.C. circuits are fundamentally similar. The underlying idea is for the incoming signal to be amplified by the high-frequency stage or stages and passed on to the detector circuit; this voltage is so adjusted that it gives the required loud-speaker volume. Any excess of voltage over this pre-determined value is by-passed back to the high-frequency stages.

This is done with a resistance network, the voltage drop across which is used as grid bias, which, when applied to the high-frequency stages, controls their amplification. It's a sort of see-saw effect. As the signal increases beyond the required limit the high-frequency amplification automatically drops, owing to the increase in the negative bias; on the other hand, as the signal decreases the bias is decreased and the amplification increases up to the pre-determined limit.

Now let us get down to brass tacks. The first and the simplest circuit limits the input of the detector valve—just that and no more. Fig. 1 shows this idea. Very simple to work, as all you have to do is to boost up the volume control to give the maximum signal strength on a weak station, when the grid-input limiting action will take care of any excess voltage. The result is a fairly level output volume.

When you realise that nothing special is needed for this very simple circuit you may well be inclined to give it a trial. The snag is that the control action is not very marked unless the signals are fairly level in the first place, although this simple arrangement certainly has the advantage that the sudden "blare" of a strong local signal is avoided, owing to the signal-input limiting action.

Very briefly, the only additional parts you require are a high-frequency choke, two fixed condensers, a fixed resistance and a variable one. The total cost, even if you buy them new, should not be more than 7s. 6d.

Voltage from the high-frequency stage is tapped off after the grid condenser of the detector is passed through a high-frequency choke, which is inserted to by-pass any high-frequency, which prevents it from getting back to the preceding circuit. If it did this there would be instability because the high-frequency would be fed into the grid circuit of the high-frequency valve, a form of feedback that would cause a riot!

(Continued on next page)

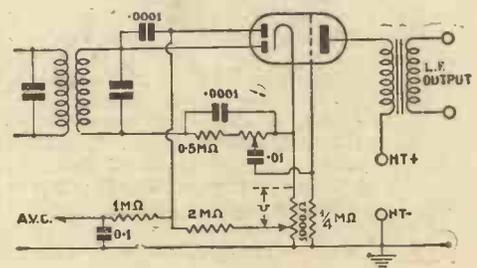


Fig. 2.—Double-diode-triode valve used in circuit to give half-wave rectification and delayed automatic volume control

“NEW IDEAS ON AUTOMATIC VOLUME CONTROL” (Continued from preceding page)

The rectified current, which is, of course, on the grid, flows through the fixed de-coupling resistance to the variable resistance, and so sets up a voltage across it. This voltage can be adjusted to limit or vary the amplification.

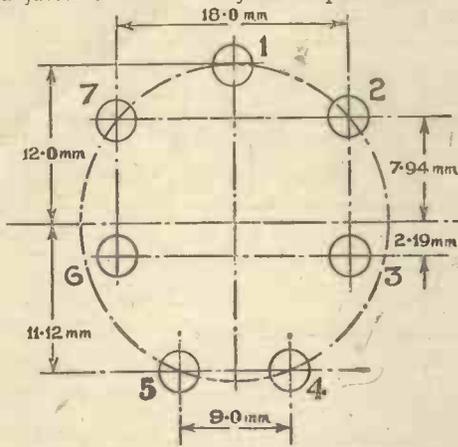


Fig. 4.—Base connections for double-diode-triode in the Marconi and Osram ranges

So much for the elementary circuit. A second circuit, which we are not dealing with, consists of a separate A.V.C. valve. Instead of taking the grid feed-back to the high-frequency stages directly, it goes through an A.V.C. valve. This has the advantage of amplifying

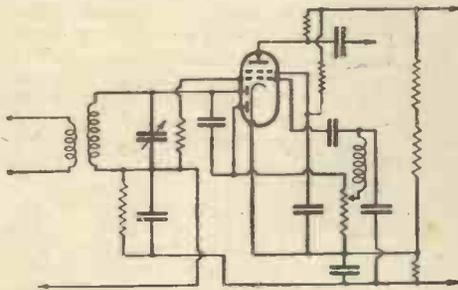


Fig. 5.—With the new Cossor DD/Pen valve automatic volume control is obtained with this simple circuit

the grid-bias voltage if it is insufficient, and is particularly useful where there is only one high-frequency stage—where the normal feedback grid voltage would not give good control over the single stage. But the expense of the extra valve and the great alterations to the existing circuit puts this idea out of practical politics, in our opinion.

Now we have to consider the use of a special type of valve to give almost perfect automatic volume control without using additional valves. Where an existing set needs converting, this new type of valve can be used without much alteration.

We have been experimenting with the double-diode-triode in various forms, and we have found that when using a single double-diode-triode there are always some snags. Fig. 2 is a circuit using one double-diode-triode and this we found fairly good, but the control efficiency was certainly not one hundred per cent. Between stations, where there is no signal, there is no bias applied and the amplification rises to its maximum. This means that all the hundred and one noises in the background rise to an unbearable extent, causing very great background mush.

A second fault is that on very powerful local stations the transferred bias voltage is hardly sufficient to reduce the amplification enough for full control. To overcome both these snags we decided to experiment with two double-diode-triodes, so that we could make use of the amplified A.V.C. method and at the same time suppress the irritating between-station noises.

This brings us to Fig. 3. Here we have rather a more elaborate circuit for producing quiet, delayed and amplified A.V.C. In theory this should be perfection with this type of valve. The circuit uses two double-diode-triodes and is the logical successor to Fig. 2.

The detection and the delayed A.V.C. are exactly the same as before, except for the way the grid bias is produced for the three-electrode section of the first double-diode-triode. If you look at the circuit you will see that the bias is obtained from two sources. A small automatic bias due to the valve anode current flows through R_4 and a large additional bias when anode current flows through R_5 , which is a high resistance.

When the set is “off tune” or the station is silent, you do not get any voltage developed across the tuning circuit. So you naturally do not get any bias on the grid of valve v_2 , because when there is no signal there is no

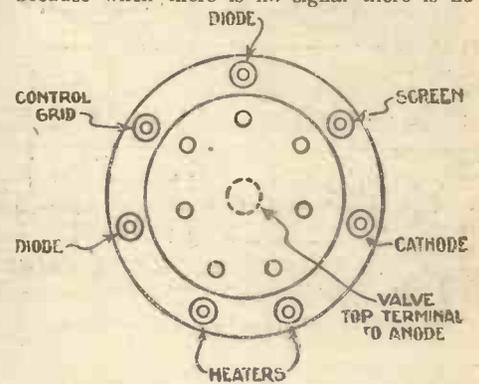


Fig. 6.—Base connections for the Cossor DD/Pen valve

voltage in the coil and so there is nothing to rectify and there is no low-frequency current to flow through the bias resistances.

All this means is that v_2 , which takes a fairly large anode current, will apply a high bias to the grid of v_1 , and there will not be any current flow or signal output to the power valve. Directly a station is tuned in or resumes its programme, and when the voltage exceeds the value of the voltage given by v_2 —seesaw action again!—half-wave rectification takes

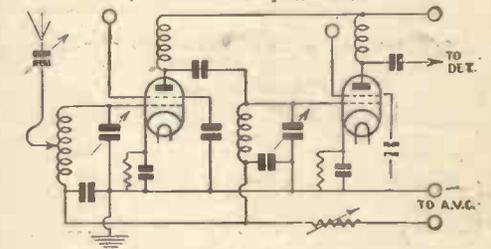


Fig. 7.—Suitable high-frequency amplifier circuit for use with the automatic-volume-control circuits suggested in these pages

MONTE CENERI (Radio Tessin), the new Swiss Regional transmitter, has already been on the air on 678.7 metres, but, in view of interference with the shipping band, is carrying out further tests on different channels to find a more suitable wavelength. Both 720 and 750 metres are to be tried. Whether the station will eventually work in that portion of the band is still a matter for conjecture, as decisions taken at the Lucerne Conference may affect a large number of transmitters and especially the new arrivals on the ether.

Spain appears to have opened a new station lately, of which the broadcasts have been heard in France; it is a 200-watter situated at Santiago—or, rather, Santiago de Compostela, to give it its full name. If you want to find it on the map, look for a point about half-way between Corunna and Vigo in the north-western corner of Spain. As it is in the old Galician region, it styles itself Radio Galicia, its official letters being EAJ4. A wavelength of 368.1 metres is shared at present with Bolzano, Helsinki, and Kharkov. Although little mention is made to-day of Santiago (Spain), it possesses a great history; in the twelfth century as a pilgrimage it rivalled Rome and Jerusalem.

After having carefully memorised the musical interval signals adopted by many of the European studios, we shall now be called upon to forget the old melodies and to recognise new ones, as many alterations are being made. In

OUR LISTENING POST
By JAY COOTE

addition to those already mentioned in this column last week, bear in mind that from June 1 Heilsberg will abandon its two notes and will play the first bars of an East Prussian folk song (“Wild flutet der see”); also Langenberg has decided to abandon the pseudo cathedral bells in favour of an old Westphalian melody dating from the seventeenth century, and a somewhat longer tune (“The Old Nightwatchman’s Call”) for opening and closing the programmes.

Frankfurt, by the way, to which I referred recently, will be easily identified, as in the signal you will recognise an abbreviated edition—two bars only—of the “Wacht am Rhein” (“Watch on the Rhine”). Hamburg likewise shortly intends to do away with the metronome and the morse H.A., and Budapest, to whose silver-toned bells we are now accustomed, will

DON’T GUESS—USE A BLUE-PRINT

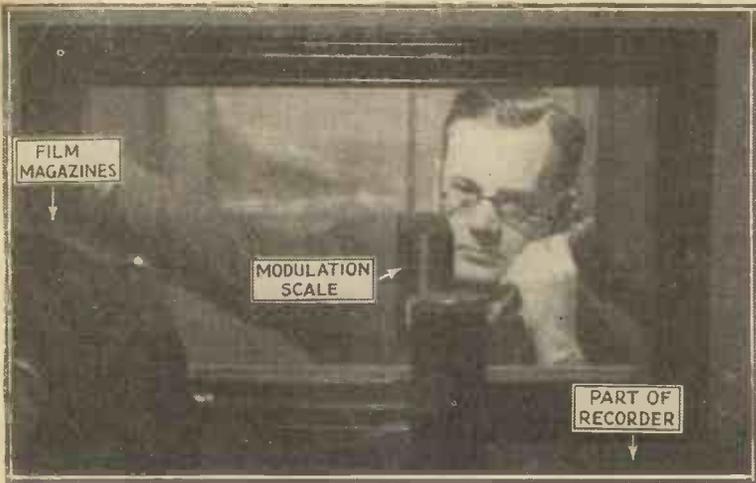
Full-size blueprints for every size of set are available post free from the “A.W.” Offices

furnish, in exchange, a strictly Magyar musical theme. Pécs, the 1.5-kilowatt relay of Budapest on 209.8 metres (1,429 kilocycles), was formally opened on May 14, and now works daily in common with Miskolc and Magyarovar. Pécs, however, which you will find on pre-war maps as Funkkirchen, is well heard. When you have located Radio Normandie, and below it Königsberg and the Swedish relays, you will doubtless find a fairly powerful signal right at the bottom of the medium-wave band. You may log it as Pécs.

Notwithstanding the fact that the French State appears to have bought Radio Paris, the PTT still propose to erect a powerful transmitter to replace Ecole Supérieure. The site of the new station is Villebon-sur-Yvette, on a hill about twenty-four miles from the capital. The power of the new plant is to be 120 kilowatts and, so far, the wavelength to be used is the one on which Paris PTT now operates (447.1 metres). Work on this station is to be started immediately, and if all goes well it will be brought into action at the beginning of next year. Looking through some French provincial papers last week, I came to the conclusion that the average French reporter knows even less about wireless than does his British colleague. In a Grenoble daily I saw a reference to the “3-kilowatt wavelength” of the local transmitter; in a Lille “early edition” I picked out the news that the Soviet were soon to possess the largest station in the world (500 kilometres).

WHAT the "TALKIES" can TEACH the B.B.C.

By BAYNHAM HONRI



Talkie and balance control. The author views the modulation scale of the recorder through the window of his sound-proof listening room

THE B.B.C. has a most go-ahead research department. It always has had. And the department has tried to work to the policy dictated by the chief engineer. In the early days he drew a straight line. "That is the ideal voltage-frequency curve—work to it!" he (more or less) said.

Well, of course, in the early days of broadcasting this was almost an impossibility. To start with, the known methods of calibrating the response of microphones were very unreliable. (As a matter of fact, they still are!) Transformers were peaky

average of a number of such tests.

It all sounds very "Heath Robinson" in the light of modern methods of testing, but I can't help thinking that some of these "brute force and ignorance" tests might still be used—for detecting dud pianos, for instance.

THE LOUD OLD DAYS

It will be realised that as no particular range of frequencies modulated more deeply than others, very heavy modulation could be made without overloading the transmitter. The result was, of course, an extremely loud signal, and, of a quality entirely suitable for the bassless horn loud-speakers of the time. This will probably explain the legendary strength of some of the early B.B.C. stations. One often hears reminiscences of "How I received Glasgow on one valve," or "Plymouth used to come in at 'phones-on-the-table strength on my crystal set." In short, the first B.B.C. broadcasts were very definitely louder for their power than they are now.

"EQUAL AIR PRESSURES"

But with the advent of bigger and better loud-speakers, it became apparent that the equal audibility policy could no longer be maintained and that a change would have to be made to a system in which equal air pressures on the diaphragm of the micro-



At "phones-on-the-table" strength

phone produced equal voltages on the transmitter. Actually, this meant that higher voltages would be produced on the

transmitter for the extreme bass and treble, with a reduction on the middle range of frequencies; and the apparent overall volume on old-type receivers and loud-speakers grew steadily weaker as a consequence.

Let us examine the final results of the B.B.C.'s steady adherence to this policy, as heard on a modern high-quality receiving set:

MUSICAL TRANSMISSIONS: First class.

SPEECH: Sometimes excellent, other times boomy.

SPEECH WITH MUSICAL BACKGROUND: Music usually "thin" or, alternatively, interfering with the intelligibility of speech.

SPEECH QUALITY

What is wrong with the B.B.C. speech quality when it isn't up to scratch? Well, announcers and others will talk in a low, intimate tone close up to the microphone, and the majority of loud-speakers reproduce them at a higher level of volume than the original sound. The result is a boomy over-magnification of chest tones and, in some instances, of sibilants also. With

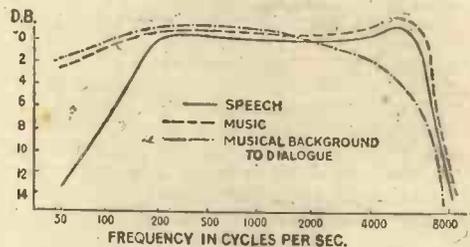


Mr. Honri, who devised the dramatic control panel and direct-superimposed mixers when he was at the B.B.C., suggests this control lay-out for two studio channels, based on his talking-picture experience

and bad, and loud-speakers were in the stage of car trumpets fitted to telephone receivers. The B.B.C. went to a lot of trouble to avoid the use of transformers, though they had to be used on the inputs and outputs of amplifiers in connection with lines.

"EQUAL AUDIBILITY"

A system of testing through microphones in conjunction with transmitters (the complete broadcast chain—sending end) which gave equal voltages on the transmitter for equal sound volumes in the studio was devised. It consisted of playing a special test roll on a rather woolly toned and, therefore, not-so-harmonic, player-piano and adjusting things so that the voltages set up on the transmitter by each individual note were approximately the same. The piano, which was in the studio, gave equal loudness to each note up and down the



Typical talkie curves. (From output of microphone to recorder galvo)

louder voices and the same degree of modulation in the control room, the trouble is reduced. But one cannot help thinking that the trouble might be entirely avoided by treating talks microphones on quite a different basis from music microphones. This, in fact, is precisely what talking-picture engineers have been doing for some time. "Cut the bass on speech—it's cleaner and more intelligible" is their slogan. Moreover, in both talkie and gramophone work, this virtual return to the old B.B.C. "equal audibility" curve allows much more volume of speech to be got on to the film or disc.

But what about speech transmissions that are already good, you may ask. Would not bass-cutting filters injure their quality? The answer is that boomy-chest tones (and slushy sibilants) are negligible on loud speech and, therefore, the means of their removal makes no difference.

MUSIC AND SPEECH

In radio plays, musical extravaganzas and other items, also in talking pictures
(Continued at foot of next page)

SIMPLIFIED RADIO METAL WORK

In nearly every modern set there is a certain amount of metal screening. The work involved in cutting and drilling the soft metal used is very easy. Practical hints and facts are given in this article

METAL-COATED paper is now often used for eliminating actual metalwork in building a set.

But that's no reason why you should be afraid of the simple job of cutting and drilling the soft aluminium generally used in radio metalwork.



Thin sheet aluminium for screens or baseboards should be cut with a hacksaw between a "sandwich" of plywood or scrap wood so that a clean sawcut edge results. Fretsaw holes in thin metal sheet should be cut in the same way with two pieces of scrap wood as a support, the hole being cut through metal and wood

Nuts and bolts of all types are used in large engineering work and are made of bright steel, brass and black iron. In wireless set construction, however, bolts and screws of an instrument nature are generally used, and are most frequently of brass.

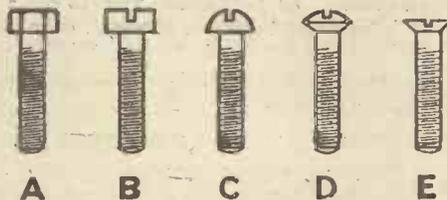
Now that there is so much metalwork in sets, however, small steel screws are frequently used, and it will pay constructors to know something about the various types of screws and bolts used in set construction.

Steel screws are not generally used in metalwork which is close to coil fields as the steel may make a difference to tuning range. The larger type of bolt, however, is used in heavier work, such as clamping transformer laminations and in the mounting of mains parts. Five types of screwhead which you may find used in radio work are shown by the accompanying diagram. There are several interesting points about these which are worth noting.

A is the ordinary hexagon-head type of bolt which you find used in the heaviest work. A spanner must be used to hold the head of such a bolt, whereas with the other four types shown the heads are slotted for a screwdriver.



When drilling small holes in metal brackets and supports, keep the drill vertical and do not exert too much pressure on it. A nail can be put in the wooden board on which the metal piece is being drilled to prevent it turning under the drill

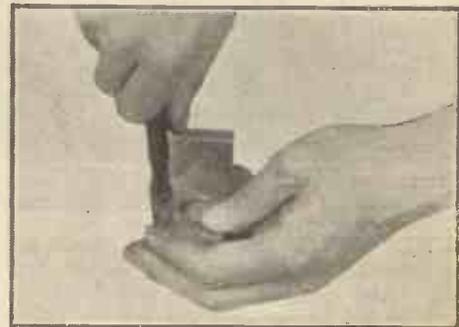


Here are some of the typical bolts and screws frequently used in radio metal work. They are described in the accompanying article

B is the cheese type of screwhead found in all sizes in radio work, while C, the button type, is not so frequently used.

D is a countersink type of head, while E, another countersink head, is most frequently used in radio work.

Heavy woodwork in radiogram cabinets is sometimes clamped together with black iron coachbolts. These have round heads without a slot and they are prevented from turning



Holes in soft metal can easily be countersunk by hand, using a rose bit or a drill several sizes larger than that used for making the hole. The burr left on the reverse side after drilling can be removed in the same way

by having a square piece under the head which bites into the wood as the nut is tightened. The square part of the shank is usually very large so that they will not pull through. It is a mistake to use the ordinary button-type of bolt in ordinary woodwork, although if a flat washer is used to prevent the head pulling through, it is suitable.

In large bolts there are many types of thread, sizes and depths of cut, but in wireless work the most popular standard is the B.A., which has been universally adopted for electrical work.

It is often handy to know the correct size, clearance and tapping drills to use with popular B.A. sizes.

The full diameter of 0 B.A. is .236 in. A 1/4 in. clearance drill should be used or a 9 or 10 tapping drill. The diameter of a 2 B.A. is .185 in. and a 10 or 11 clearance drill should be used. 25 or 26 tapping drills are suitable. The diameter of 4 B.A. is .142 in. and 26 or 27 clearance drills and 33 or 34 tapping drills must be used.

The photographs on this page show various simple radio metalwork jobs which any amateur can tackle.

"WHAT THE TALKIES CAN TEACH THE B.B.C."

(Continued from the previous page)

It is frequently required that music shall form a background to dialogue. On its face value, this seems fairly simple, but in talking pictures the directors insist on super-intelligibility of speech with or without music, coupled with the request that music shall be as loud as possible. Here the difficulty is that the intelligibility of speech is dependent on the upper frequencies, and these will be masked and interfered with by the higher harmonics of the music, unless it is very weak.

If the music is reduced in volume, the practical effect is to remove the bass and result in a "thinness" of quality.

Talkie engineers take the bull by the horns and remove the undesired range of

frequencies in each case. They reduce the bass response on speech slightly more than usual and cut down the "top" of the music. Now, speech stands out from the music and is highly intelligible, even when the music is loud, and if a weaker musical background is required, it no longer acquires that objectionable thin quality.

In the matter of control, the B.B.C. engineers have to use a modulation indication meter that no talkie engineer would tolerate for a minute. It is a device known as a "programme meter," and it gives a reading in decibels of the volume of the transmission. Extremely ingenious and useful as it may be in dealing with sustained notes or taking curves of apparatus, its response to sudden sounds is like that of a mountainous valley yielding up its echo!

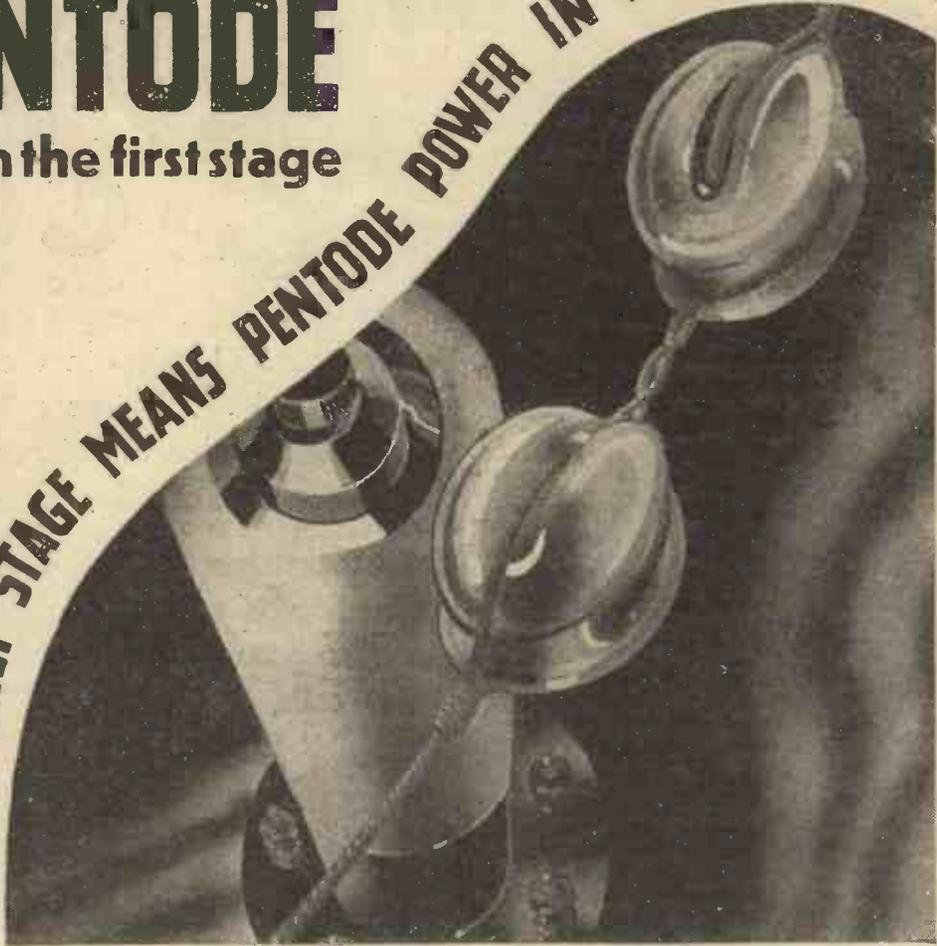
By way of contrast, consider the tuned mirror galvanometer modulation indicator

of the talkie engineer. A solid light beam vibration on a scale indicates instantaneously the volume of sound and at the same time lighter density "shadow peaks" above the solid beam indicate the maximum peak voltages reached. The extremely accurate readings that can be obtained from such an instrument will be appreciated when it is stated that the stud tappings of the volume control knob have to be very small (1 D.B.) to do justice to it. Ordinarily, steps of 2 or 3 D.B. are considered sufficiently fine.

The B.B.C. balance and control department has been receiving a good deal of criticism lately. Personally, I think they do their work well considering the narrow limits in which they carry on. Give them the finer control potentiometers, better modulation meters, equaliser and tone controls of the talkie engineers, and they will turn out a better transmission.

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Screened **PENTODE**
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Mention of "Amateur Wireless" to Advertisers will Ensure Prompt Attention

On Your Wavelength!

“SQUIGGERS”

THE success of the Catkin—which is, of course, a smaller edition of the early cooled-anode transmitter—takes one's mind back to some of the troubles which faced the designers of the first high-powered metal valves. One particular form of nuisance was known as “squiggers”—a name which on its merits deserves a place in any dictionary of radio terms. At all events, “squiggers” were prone to occur whenever a heavy-duty valve was being tried out on a transmitting circuit. They are really parasitic oscillations caused by voltage swings on the anode during modulation, and are generally manifested by violent discharges here, there, and everywhere inside the valve. Nowadays this kind of thing seldom happens, because designers have learned to fit special corona rings and shields inside the valve in order to curb any tendency to “fireworks.”

MORE PATENTS

USEE that Philips Lamps, Ltd., and the Mullard Valve Co., have combined their various patent rights, and are offering licences to radio manufacturers at a fee of 1s. 6d. per valve holder. Nearly sixty patents are involved covering improvements ranging from the pentode valve to electrolytic condensers. I am afraid I don't know very much about these matters; but the more one sees of radio patents, the more one wonders how inventors manage to keep on turning 'em out. The next time I hear anyone say that there is really nothing new under the sun I shall be tempted to lead him gently, but firmly, round to the Patent Office Library, and leave him to try his teeth on some of the latest stuff they've got there.

SOME TRANSFORMER!

WE have heard so much recently about valve development that, by way of contrast, I should like to mention that the very latest thing in I.F. transformers has just been installed at the Barking Power Station. Although not exactly intended for wireless reception—not even on a super-het—it works on very much the same lines as the little fellows that are, and I therefore take off my hat to its designer.

Actually, the Barking transformer is the largest of its kind ever made in this country, standing some 18 ft. long by 10 ft. deep and weighing over 75 tons. It is designed to handle an input of 75,000 kilowatts at 12,500 volts, stepping the latter up to 33,000. Naturally, this generates some heat, and a constant circulation of no less than 6,000 gallons of oil is required to keep the monster cool when on full load.

LET'S BE WISE

IT is sincerely to be hoped that our wireless manufacturers will give earnest heed to the state of affairs now prevailing in America. Over there the tendency for the last few years has been for firms to compete with one another by producing lower and lower priced receiving sets. We expect prices to come down as manufacturing processes become more perfect and as sets are made in larger and larger numbers. But the American price war has gone very much further than this. Quality of reproduction has been sacrificed in order to obtain cheapness, whilst low-priced sets have become cranky, crotchety things, short-lived, and liable to frequent breakdowns. The inevitable result of this insane striving after cheapness is that wireless sets are getting a bad name over there and that those firms which thought they had found a gold mine by catering for the cheap market now find themselves in difficulties.

SO FAR AND NO FURTHER

THE truth is that there are price limits below which reasonably good sets cannot possibly be turned out. Further price reductions can be obtained only by using less well made and less reliable parts and by sacrificing quality in reproduction. I sincerely hope that we shall see no such folly on the part of our own makers, though I must confess that already I am wondering whether sets are not becoming too cheap over here. Our best firms have adopted a sensible attitude and it is almost certain that they will maintain it. But there are others which seem to have their feet already upon the slippery path. If you had ever examined the internals of some very cheap sets of practically unknown make, you would realise what poor value they are at any price at all. You should just see some of the components that they contain! I could tell some queer tales of intervalve and output transformers whose cost is measured in pence rather than in shillings and whose primary inductance may fail to

reach double figures in henrys. And as for the resistances and condensers, well . . . ! You cannot make a silk purse out of a sow's ear, and the components used in cheap-jack sets are very definitely of the sow's ear variety.

SOUND BUSINESS

IN previous years manufacturers have tried to keep most of their novelties as closely guarded secrets until the opening of the Exhibition at Olympia. I always doubted the soundness of this policy, for what generally happened was that information somehow leaked out some time before the exhibition. The public then went to Olympia eager to purchase the new thing, only to find that the smallest trickle of supplies was available. There is nothing more exasperating than to go with the money ready in your pocket and then to be told that you will have to wait several weeks for delivery. This year different methods have prevailed. There will, of course, be “surprises” at Olympia—I could tell you of two or three already—but the first five months of 1933 have given us Q.P.P., class B, the iron-core coil, and the Catkin valve, amongst other things. The releasing of these innovations in this all-the-year-round way is a thoroughly good thing, for it keeps interest in wireless alive during what used to be considered the off season. It is very satisfactory, too, to see that several firms have already brought out their new sets, whilst others are on the verge of so doing. Business is kept going and seasonal unemployment greatly decreased by this policy.

THE NEW CLASS B

IAM very glad to see the coming of the economy type of class-B valve, which will undoubtedly meet a felt want. Most people do not require more than half a watt of output, at the very outside, from their sets for ordinary listening, and a valve which will handle this comfortably with a filament current of .2 ampere at 2 volts and an average drain

ARTISTES IN THE WEEK'S PROGRAMMES



On Your Wavelength! (continued)

on the H.T.B. of no more than 4 or 5 milliamperes will exactly meet their needs. Within the next few weeks quite a crop of these valves will make their appearance, for types about to be produced are the Marconi, the Osram, the Mazda, the Mullard, the Ferranti, and one or two others as well. Not the least of the advantages of what I call the B minor valve is that a general purpose or first L.F. valve is all that is required as driver. Besides reducing the initial cost, this keeps down the drain on the H.T.B. still further and makes for really economical working. The bigger class-B—or B major—valve will, of course, remain a most useful component for those who want larger output. The two will not, I think, wage war upon one another: they will simply stand side by side, catering for different markets.

THE FLYING SQUAD

NO one knows very much about the British police wireless service, which is as it should be; but almost every day evidence is forthcoming of its value and efficiency. I had a personal experience of this the other evening, when my car was stolen from outside the house of a friend whom I was visiting. Another friend arrived and expressed surprise that I was still there, as he had noticed my car being driven away when he was about twenty yards from the house. The police were immediately telephoned and, I understand, coded wireless messages were sent to flying-squad cars within a couple of minutes. At any rate, my car was quickly "picked up" by a patrol, and the thieves abandoned it before getting two miles away—fortunately, without damaging it. On the way home, however, I was stopped by two isolated patrols that evidently had no wireless equipment aboard and had not yet received news of the recovery of the car. Only on producing proof of ownership was I allowed to proceed.

SUMMER-TIME RECEPTION

THE old idea that long-distance wireless reception was pretty well hopeless in summer time should be finally exploded this year. There is no question that the number of Continental stations receivable this summer with genuine entertainment value will be far greater than was the winter tally only two or three years ago. As an instance of the way in which stations are coming in, I may mention that on the evening before this note was written I found that excellent reception was obtainable from more than thirty foreigners. Some of the more distant and less powerful stations no longer make regular appearances in our records, but there remains a fine body of stalwarts which show little or no signs of declining strength. On the long waves, for instance, Radio Paris, Zeesen, and Warsaw are always ready to oblige when required, and Motala is well heard more often than not. Nuisance though he is in many ways, one

cannot deny that the giant Luxemburg station provides consistently good reception.

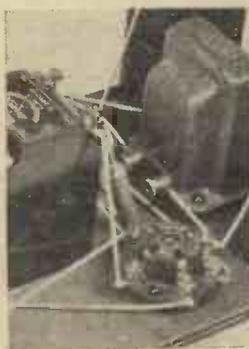
Coming to the medium band stations that we may regard as certainties throughout the summer are Brussels No. 1 and No. 2, Florence, Prague, Langenberg, Rome, Stockholm, Katowice, Strasbourg, Milan, the Poste Parisien, Breslau, Gothenburg, Hilversum, Heilsberg, Turin, Gleiwitz, Triests, and Nurnberg. This means that, taking the two wavebands together, there are well over a score of thoroughly reliable Continental stations to provide alternative programmes should the fare from the home transmitters fail to please. Actually, the number is likely to be still greater, since Bisamberg and not a few other new high-powered stations will shortly come into operations. A pretty good prospect, I think. Don't you?

WHAT WILL THEY DO?

THE Lucerne Conference is perhaps the most important that has ever taken place in the history of broadcasting. In comparison with its task, those of previous conferences have been almost child's play. The last big one of the U.I.R. for wavelength allocation purposes was that at Prague, four years ago. At that time there was not a single medium-wave station using more than about 15 kilowatts and very few with an output rating higher than 2 or 3. The Prague Plan worked pretty well for a time, but it has more or less broken down now, owing to the coming into operation of so many giant stations rated at from 50 to 100 kilowatts. An entirely new wavelength scheme is to be submitted to the Conference by the U.I.R. An enormous amount of work has been put into drawing it up, and it is to be hoped that it will be successful.

FOR STABILITY

Here's a small grid leak of about a quarter of a megohm connected between the grid socket of an L.F. valve and the grid terminal of the transformer. A grid stopper



like this is very handy for stabilising the set and preventing stray H.F. from getting into the L.F. side. It is also a good tip for preventing parasitic oscillation in a push-pull stage

NEW WAVELENGTHS, NEW STATIONS

IT seems likely that much more attention will be paid to what we may call the geographical distribution of wavelengths. At the present time there are numerous stations fairly close to one another geographically which work as wavelength neighbours. The idea of the new plan is that stations using adjacent channels shall be separated from one another by as many miles as possible. This should do a great deal to help.

We have, though, to consider that the Lucerne Plan, whatever it may be, must take into account, not only existing stations, but also those now building or projected, the majority of which are designed for big output power. It seems likely that the wavelengths of most stations will be changed and that all of those below a certain minimum power will be required to work on common wavelengths. Matters are made easier, to some extent, by the extension of the medium-wave band up to 600 metres. The portion between 500 and 600 metres is still very "sparky" and wavelengths in this region will be allotted to stations situated so far from the sea that ship and shore morse interference should not be troublesome.

THINGS THAT MUST BE DONE

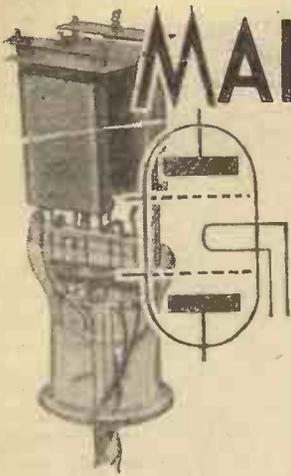
SO far, so good; but there are several other matters which must receive attention if the new scheme is to have any hopes of success. The first of these is wavelength wandering, which is usually indulged in by small and unimportant stations. But small as they are, their wobbles create havoc. Radio-Vitus is a good example. This little station cannot possibly be required in Paris, for with Radio-Paris, the Eiffel Tower, the Ecole Supérieure, and the Poste Parisien on the air there cannot be many who ever listen to its transmissions. Radio Vitus has for some time past been using a different wavelength every night and it has interfered with numbers of important stations. This kind of thing must be stopped. What is required is an international agreement that stations shall be compelled to keep within, say, 100 cycles of their allotted channel or go out of business.

MODULATION

THE next point is the use of deep modulation for speech transmissions which leads to that distressing form of interference known as sideband splash. All stations increase the modulation depth when speech is being transmitted. This is utterly unnecessary and should be stopped.

Lastly, the number of stations in any country and their output power should be limited to the minimum that will supply a reasonable broadcasting service within its borders. Many countries are over-provided with wireless stations and others are using unnecessary power.

THERMION.



MAKING THE MOST OF CLASS B

In order to give readers working assistance with the new class-B valve types, we have been carrying out some important experiments, to discover which system is best for the amateur. The results of these experiments are given below

BY now you all know what class-B amplification means, but many of you are probably still in doubt as to how to make the

most of this new development. In brief, class-B amplification enables you to obtain mains-set quality and volume from high-tension batteries. What you probably do not fully understand is that there are already four types of valves on the market, each with distinctive characteristics.

PD220. We are giving you in this article the results of our experiments with these four valves, with the appropriate circuit we consider most suitable for each valve type.

The Cossor and Ferranti valves will both give up to 2 watts undistorted output, but this great power will be obtained only when the class-B valve is preceded by a small power valve as a driver with a one-to-one and two-to-one driver transformer. We assume that the optimum load with 120 volts is 8,000 ohms. In this way we arrive at an average anode current of 8.5 milliamperes for the class-B valve, or 11 milliamperes with the driver valve; the standing, rest or quiescent current being only 4 and 6.5 milliamperes respectively.

Although this circuit is ideal for driving a moving-coil loud-speaker for family use, we advise you to sacrifice the peak output of 2 watts to 1 1/2 watts if you are specially keen on long-distance reception, as this will overcome the snag in the amplification decreasing according to the grid-input decrease. If you do not prepare yourself for this sacrifice you

be, which is, of course, the reverse of what we really want.

If you use a moderately high impedance driver valve of, say, 10,000-ohms impedance, with a three-to-one or even a four-to-one driver transformer, and at the same time provide a load of 20,000 ohms, this will reduce the total consumption to something around 7 milliamperes. What is still more important, the amplification of the valve will remain practically constant over a wide range of signal input values.

Although we give the Fig. 1 circuit chiefly for use with the Cossor 240B valve, we can assure you that from our brief experiments with the Ferranti HP2 this valve can be used in exactly the same way. With this circuit you must make sure that parasitic low-

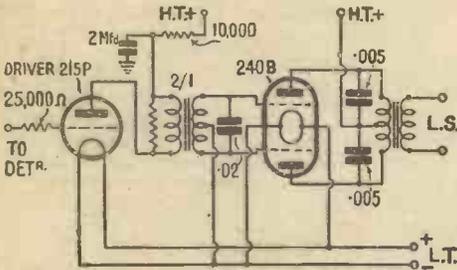


Fig. 1—Suggested circuit for use with either the Cossor 240B or the Ferranti HP2 valves

Let us first of all explain the different valves now on the market. There is the Cossor 240B and with similar characteristics the Ferranti HP2. Secondly, there is the Mullard PM2B, thirdly, the Mazda PD220, and fourthly, there is likely to be in the near future a valve similar to the Mullard PM2B available in the Marconi and Osram ranges.

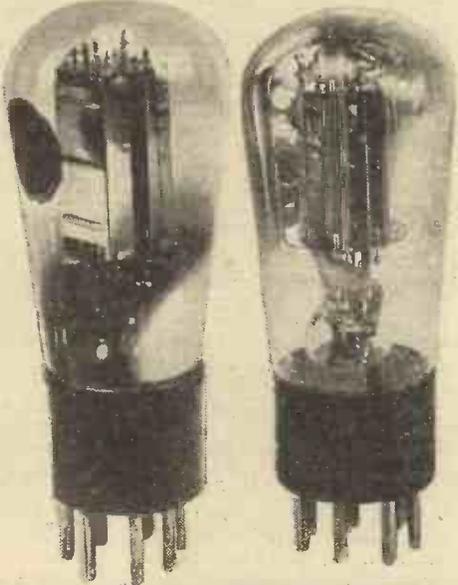
Two Methods

Broadly speaking, you can take it that there are two distinct ways of making use of the class-B system. Firstly, where a high output is wanted and by high we mean as much as 2 watts undistorted power; secondly, where only a moderate output is wanted. For this second condition the total low- and high-tension consumption can be considerably reduced, and the overall sensitivity levelled up. As a result of our experiments we feel that one of the troubles of class-B in actual practice is that the magnification factor decreases when the input is small. In fact, the decrease varies as the square of the input, so in a set dealing mainly with weak signals the ordinary pentode valve would probably give a greater average output than a class-B valve.

Three Circuit Types

After much experiment we have now segregated the various circuits into three distinct types. Firstly, those that provide the maximum possible power output from powerful stations. Secondly, those that give a moderate output, mainly used for economical working. Thirdly, those that provide the maximum amplification of weak signals rather than maximum power output.

For our experiments we have made use of the four existing valves, namely Ferranti HP2, Cossor 240B, Mullard PM2B and Mazda



The Ferranti HP2 and the Mazda PD220. In order still further to save current a small bias of .5-volt can be used with the Mazda PD220. The Ferranti HP2 is designed for high sensitivity

will find that while the loud stations—that is the locals—are louder than usual, the weak stations may be much weaker than they need

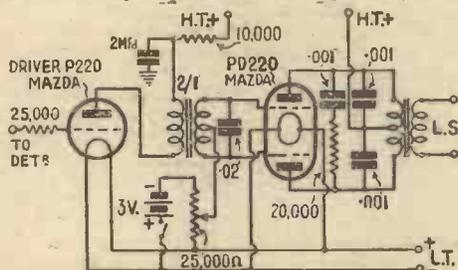


Fig. 3—The Mazda PD220 valve can be worked to advantage with this circuit. Note slight negative bias is needed

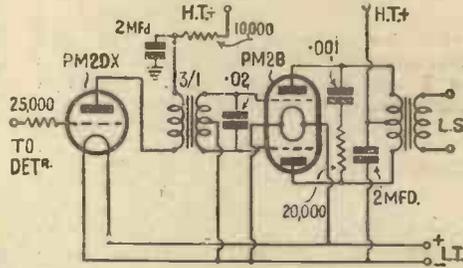


Fig. 2—For the Mullard PM2B valve, and similar valves when available in the Marconi and Osram ranges, this circuit is recommended

frequency oscillations are eliminated, otherwise there will be distortion. The usual method of doing this, with grid-stopper resistances, cannot be applied here because it is essential to keep the resistance of the grid circuit under 200 ohms.

A suitable stabilising arrangement consists of two condensers across the anodes, capacities between .01 and .04 microfarad being suitable.

We also advise you to connect a 50,000-ohms resistance across the primary of the driver transformer to prevent voltage surge in the succeeding grid circuit.

The Purpose of the Driver

You may be wondering what is the connection between the driver valve preceding the class-B valve and the power output. We have deliberately refrained from going into the technical details of class-B theory, as we want this to be a practical article. Still, a few notes at this point will be helpful.

The output of the class-B valve depends on the output of the driver valve. Similarly, the driver output, though not to the same extent, depends on the driver input. The class-B valve's amplification factor rises and falls according to the rise and fall of its input.

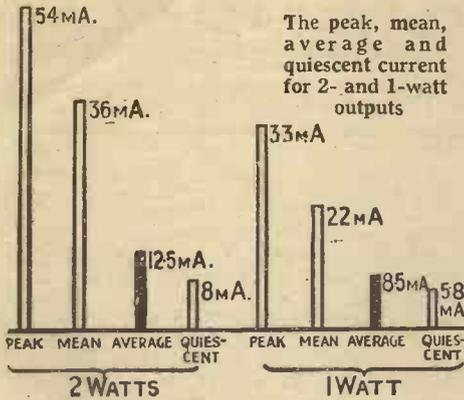
Due to its small amplification factor, the driver valve must be provided with an adequate input, otherwise the required driver output wattage will not be obtained. You will appreciate the force of this advice when we remind you that the output of the class-B valve will not be increased by raising its anode voltage. With a 240B or HP2 valve an output from the driver of about 75 milliwatts is needed to give a final power output of 2 watts, and an average of about 35 milliwatts is needed to give 1 watt output.

(Continued on next page)

“MAKING THE MOST OF CLASS B”

(Continued from preceding page)

Now consider the Mullard PM2B. This valve is designed to meet a different need from the preceding valves. For this reason the Fig. 1 circuit values are not suitable. Fig. 2 shows the circuit we recommend for a Mullard PM2B and for forthcoming Osram and Marconi valves



The peak, mean, average and quiescent current for 2- and 1-watt outputs

of similar type. This valve has been designed for a relatively low power output and for much more economical running than is possible with a 2-watt valve. The makers' contention is that 1 watt is quite sufficient for normal domestic use. For short-wave or portable sets the PM2B is admirable, as the standing current is only 2 milliamperes, rising to 5.2 milliamperes with a lightly modulated signal.

To obtain the maximum output of this valve, which is 1.25 watts, the driver valve should be of the PM2DX type, with a bias arranged so that the anode current is not more than 2 milliamperes. The intervalve transformer should have a two-to-one ratio and the output transformer could be a standard type so long as it had a fairly low primary resistance.

Matching

It is essential to match the loud-speaker to this valve very closely. The optimum load for working the PM2B is 4,000 ohms. Therefore, each half of the primary winding must have an impedance of 4,000 ohms. In class-B amplification only one valve operates at once, so that the total primary must have twice the number of turns and therefore an impedance of four times, that is 16,000 ohms.

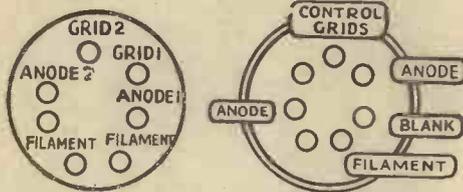
To find out the correct ratio the square root of 16,000 ohms must be divided by the loud-speaker impedance. Oscillation may occur in this circuit as in the Fig. 1 circuit, so to prevent this possibility we suggest a 20,000-ohms

resistance in series with a condenser of .01 microfarad shunted across the whole primary of the output transformer. This has a double action, in that it stops oscillation and so prevents distortion, and acts as a form of tone control by cutting high notes.

Where a reasonably low output is sufficient for volume requirements, as much as 950 milliwatts can be obtained by using a three-to-one



The Cossor class B 240 3 is designed to give the large output of 2 watts



Numbered valve holder and connections for class B

transformer, with a PM1HL as a driver valve. To some readers 950 milliwatts may seem very small compared with the 2,000 milliwatts of the Cossor 240B, but to gain some idea of the relative value of this lower output we have only to remind you that the ordinary small power valve of the triode type gives only 150 milliwatts!

Fig. 3 shows the circuit we recommend for the Mazda PD220, which gives a maximum power of 2 watts. The important point to

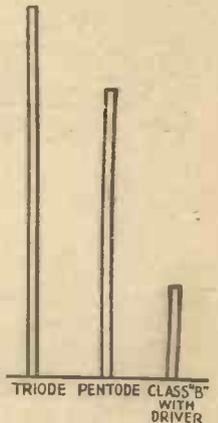
note here is that although the characteristics are similar to the PM2B, a slight negative bias is needed of about .5 volt, which can be obtained by means of a potentiometer across a small battery.

The advantage of this is that the already low standing anode current is still further reduced, thus making the valve specially useful in portable sets. As with the 240B, this PD220 can be used in two different ways. Firstly, with a power-valve driver and secondly with an ordinary low-frequency valve. Another point you might note is that whereas to obtain the 2-watts output of the Fig. 1 circuit you need a total anode current of .55 ampere; with the Fig. 3 arrangement giving 1 watt the total filament current is only .3 ampere. You must decide for yourself whether the extra power output is needed and if so whether you can spare the extra filament-current consumption.

With a power valve for the driver stage we can obtain as much as 2 1/2 watts output, but with a low-frequency valve as driver only 1.4 watts. The optimum load for both power output conditions is 16,000 ohms. A very creditable point is that with 1.4 watts the quiescent current of the output and driver valve is only 3.2 milliamperes, rising to an average of 7 milliamperes on full load.

Note that with this Mazda valve pin No. 5 should be connected to low-tension negative and not to low-tension positive, in order to make the slight negative bias correct. In this circuit also we have to overcome parasitic low-frequency oscillations. To do this a .002-microfarad fixed condenser should be connected between each anode of the B valve and low-tension negative. The leads should be very short and, unlike the normal leads, should be metal covered.

You will find this valve very sensitive, 35 milliwatts input being sufficient to give quite a reasonable power output. Unlike the other valves we have mentioned, the anode load can be kept at 16,000 ohms for both circuits. If greater output is required the anode current of the driver valve must be increased and so, consequently, is its anode dissipation.



The average current taken by three classes of output valves when the undistorted output available is the same in each case

BATTERY-OPERATED short grid base variable-mu H.F. pentodes are now available. This type of valve lends itself very well indeed to short-wave working, particularly if automatic volume control is required. The amplification factor, as compared with a normal high-efficiency screen-grid valve, is enormous; so we shall be able to look forward to quite an appreciable economy in H.F. amplification.

Normal H.F. pentodes will be available shortly and these valves have their uses, but more so in the detector position. To obtain even a small percentage of the maximum gain, the external impedance must be relatively high as compared with the valve impedance. This immediately rules out the use of a transformer directly in the anode.

To overcome this difficulty a parallel-fed transformer with a resistance in the anode circuit is very satisfactory and a very fine performance is possible with valves of this kind. A short-wave receiver embodying these two innovations with a good L.F. stage should be capable of bringing in stations from all over

SHORT-WAVE NOTES

By "SHORT-WAVER"

Week ending May 24

the world at sufficient strength to be of good entertainment value.

The conditions at the moment, while not being very good, are certainly consistent, which is something to be thankful for as we can rely upon certain stations being picked up with reasonable regularity.

A friend of mine—G2KT—who is an enthusiastic amateur, tells me he can pick up and converse with ZL4AO in Dunedin, New Zealand, at sufficient strength for him to hear his signals from the loud-speaker in the garden. This says something for the efficiency and reliability of short waves.

Some of the more familiar short-wave stations do not appear to be quite as good as they were this time last year, although, fortunately, others are coming in to take their

places. One of the most notable failures this year is undoubtedly W2XAD, who, so far, has not been at all reliable, and I consider myself to be very fortunate to be able to put him on the speaker once a week. Of course, this may be due to the change in schedule, as now he has only an hour each evening for three days a week, which is not very much.

W3XAL is reasonably consistent, but does not reach the peak volume that it did a couple of months ago. During Sunday afternoon, W8XK on the 19-metre band was coming in at a good r8 and was completely clear of GSE, which was r9 at the same time. There has been quite a lot of trouble as regards selectivity on the short waves, particularly between the Empire stations, but a few overtures to the people concerned have partially overcome this.

GSB, which used to be very badly jammed by OXY, Skamleback, was a good example of this, but through the courtesy of the Danish authorities they have now moved their wavelength right up into the 49-metre band, so overcoming this interference.

OUR BROADCAST CRITIC

SUMMER PROGRAMMES



BEATRICE HARRISON

TENNYSON'S remark that in the spring a young man's fancy lightly turns to thoughts of love seems (in effect) to be true of summer broadcasting which, as the days get hotter and the nights longer, certainly turns lighter in its fancy. I have noticed that there are more light shows at this time of the year. A very good idea, too.

I was interested to learn from the announcer of the broadcast by the White Coons' Concert Party that Mr. Will C. Pepper originated the show as far back as 1889, and that Harry S. Pepper (so well known to listeners) is his son.

In many respects I thought the show a good one, but I must admit I thought some of the dialogue below standard. Even Stanley Holloway let some weak lines go through. A pity, because he was very amusing in other parts of the sections for which he was chiefly responsible. There it is—the same thing over again—there is not sufficient care taken with fully half these light shows.

Another broadcast coming under the above heading was one called "Memories of the Lyric Theatre, Hammersmith," in which excerpts from *The Beggar's Opera*, *The Duenna*, *Midsummer Madness* and *She Stoops to Conquer* were given. Here I thought there was every sign of care in the production, which was excellently carried through, besides being eminently suitable for a summer evening.

The Frederick Hartley Novel Quintet again succeeded in giving half an hour's good entertainment which they devoted to a few famous theme tunes from films of recent years. The programme was designed for film fans. I am not one, but I enjoyed the broadcast, nevertheless.

Tickets, Please, which purported to be a modern fairy story with music, seemed to me to be a case of love's labour lost. The production was very good indeed, but I thought the play rather weak. Still, it may have suited some people, though I take leave to doubt it.

I wonder how you enjoyed the Westmorland Farmhouse comedy and whether you understood the dialect better than I did. I think it is faintly amusing to have these rough-and-ready shows occasionally because dialect is always worth listening to; so long as they are short—shorter than this one was—they may find response. Personally, I liked the noise of the animals better than anything else.

I listened to the New Trix Sisters complete with Helen the Second. As I never knew Helen the First I am not in a position to make comparisons. I thought both Josephine and Helen sang well—they certainly sang *together*—but I thought they might have sung better songs. I am sure vaudeville artistes would do well not to under-rate the intelligence of their public.

I liked Norman Williams, and hope he will sing again in vaudeville, but the same remark applies in his case.

Gillie Potter gave us an extraordinarily fine running commentary on the Hognorton Hunt at the point-to-point meeting at Little Twitting. I loved the part where the horse fell down and a dear old clergyman helped it to its feet again. I think Mr. Potter should write a biography of Lord Marshmallow and his charming son Twister.

Medvedeff's Balalaika Orchestra with Vera Forina (soprano) and Nadejin (bass) offered an attractive Russian programme. We can do with more of these native programmes. They make a welcome change.

PROGRAMME POINTERS

It is hardly within my province to tell the B.B.C. producers their business, but I really must point to the bad results I have frequently heard—lately more than ever—that can only have resulted from the position of the actor with respect to the microphone. I think it is acknowledged at Broadcasting House that when you stand too near the microphone your sibilants will hiss unpleasantly if you raise your voice ever so little. Two actors in one play this week raised their voices—ever so much—with the result that I am sure hundreds of knobs were twisted and turned to avoid this unpleasant effect. The whole illusion is so quickly spoilt, and our thoughts so quickly wander from the mental scene of a play to the studio, where we know actors are standing in groups of three or four round the microphone, with the rest seated somewhere nearby waiting for their cues—all following scripts—that we do not want suddenly to be reminded of such a scene by faults of this kind. Please can something be done about it?

I enjoyed the microphone version of Robert Louis Stevenson's "The Bottle Imp." Very ingenious story. I thought it made good broadcasting because it was adaptable as to the scenes, which were many in number, but which did not tend to lose the thread of the story. The native voices were cunningly represented by a high-pitched tone and peculiar inflection.

The fine singing of Frida Lieder as Isolde in *Tristan and Isolde* was surely one of the events of the Covent Garden Opera season. The first act of this opera makes better broadcasting than either of the other two because the scene (where Tristan's ship sails from Ireland to Cornwall) is definite and clear. The musical acclamations of welcome as the ship sails into port and the end of the act showed how really fine the opera chorus is. A brilliant performance.

The first part of the last act of *Siegfried* was perhaps not quite so happy—I mean from the broadcasting point of view. You really do need to see it to appreciate it, but I, personally, was very pleased with the love duet between Siegfried and Brunnhilde at the end. I did not hear the announcement, but if the singers were Lauritz Melchior and Florence Austral (as advertised) I am inclined to think they must have set down their performance amongst the best they have ever given.

I reviewed the first of the concerts of the second week of the London Musical Festival in last week's issue. I heard the Wagner section only in the second of this week's concert. The *Siegfried Idyll*, which was substituted for two other items, seemed to me a little too brilliant. I was brought up on Richter's way of doing it (he was Wagner's own pupil) and that may have biased me a little. The *Mastersingers* overture, however, left little to be desired. The majesty of the closing bars was something I shall not forget for long enough.

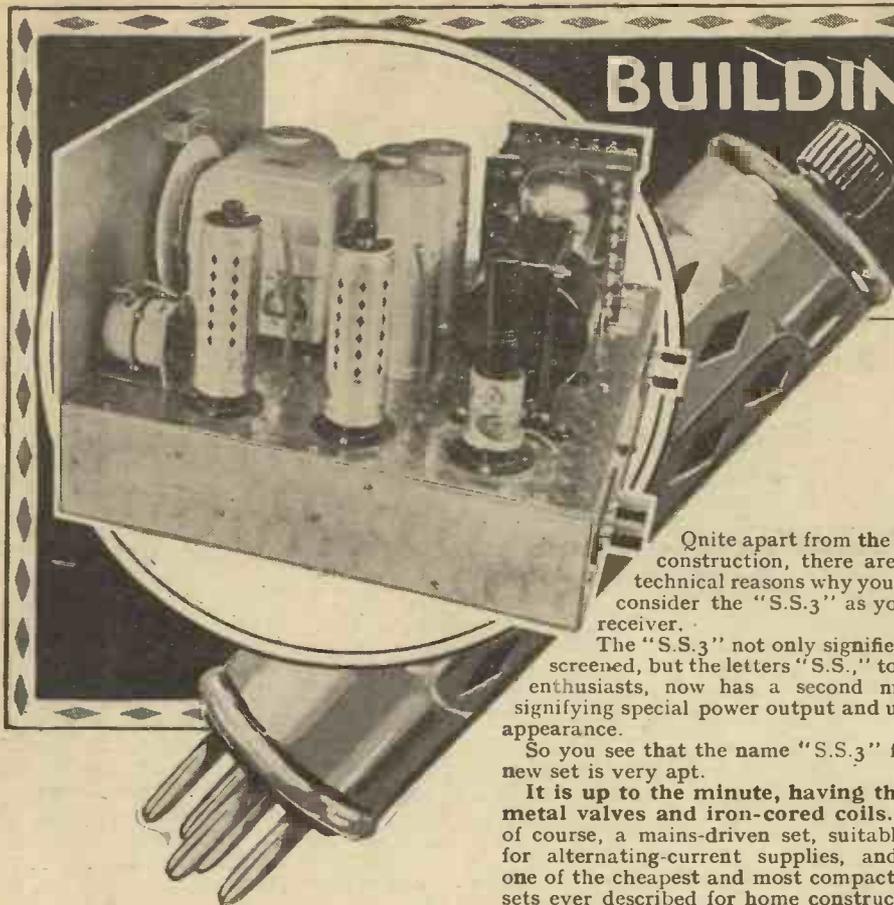
Probably many of you will agree with me that a 'cello sounds well through a loud-speaker. I think we can do with more recitals by good 'cellists—of whom Miss Harrison is one. Her little group of Lalo, Delius, Rimsky-Korsakov, and even the *Harlequin* by Popper (which is sheer tripe musically) appealed to me as having been thoughtfully played.

WHITAKER-WILSON

BUILDING

The S.S.3

Constructional details of the valve receiver of which full details were given in last week's issue.



Quite apart from the simple construction, there are sound technical reasons why you should consider the "S.S.3" as your new receiver.

The "S.S.3" not only signifies super screened, but the letters "S.S.," to sports enthusiasts, now has a second meaning signifying special power output and unusual appearance.

So you see that the name "S.S.3" for this new set is very apt.

It is up to the minute, having the new metal valves and iron-cored coils. It is, of course, a mains-driven set, suitable only for alternating-current supplies, and it is one of the cheapest and most compact mains sets ever described for home constructors.

"A.W." pioneered the metal-chassis idea with a successful series of "star" sets. We showed how the home set-builders could experience the success gained by commercial set-builders with an all-metal chassis.

The "S.S.3" is the latest style of all-metal receiver.

It scores because its circuit is so efficient. It has no band-passing and therefore no tuning complication. There is no need to resort to band-passing with its consequent necessity for accurate trimming in order to get sharp tuning.

The remarkable selec-

tivity of the "S.S.3" is due to the iron-cored coils and the efficient two-circuit tuning system. The aerial-circuit selectivity of the iron-cored coil is sufficient to justify dispensing with band-passing.

When you look at the photographs of the "S.S.3" you will be amazed at the neatness which has been arrived at in design.

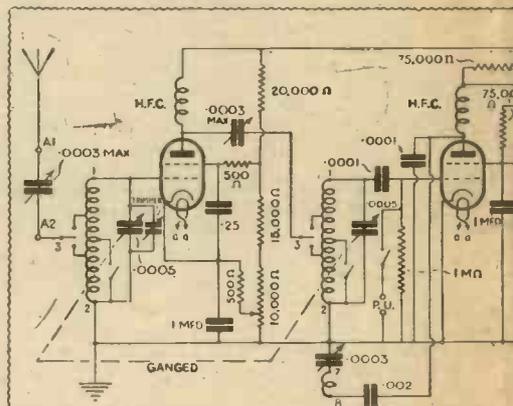
All the small parts and the short wires, which it is always difficult to keep tidy, are kept underneath the chassis.

THE "S.S.3" is an easy set to build because it has all-metal chassis construction.

You can either buy your kit of parts complete or you can buy the components separately and the specified chassis, resting assured that there will be a minimum of metal work and that you will be able to have the whole set wired up in an evening.



The basis of the receiver is a circuit consisting of variable-mu H.F. stage coupled by tuned-grid method to a screen grid detector which in turn is coupled to the power pentode output



THE CIRCUIT

CHASSIS

1—Aluminium, 12 in. by 11 in. by 2½ in., and with panel by 8 in. (Sovereign).

CHOKES, HIGH-FREQUENCY

1—Screened (Goltone, Kinva, Wearite, Bulgin).
1—Small screened (Bulgin, Wearite, Kinva).

CHOKES, LOW-FREQUENCY

1—Smoothing (Ferranti, type B1, Lissen, Igranic, Bulgin, Telsen, Lotus, Goltone, R.I.).

COILS

2—Dual-range iron-cored with coupling rod (Varley).

CONDENSERS, FIXED

5—Small of the following capacities: .0001-mfd. (2), .002-mfd., .01-mfd. (2) (Lissen, Dubilier, T.C.C., Telsen, Goltone, Farish).
2—2-mfd., 3 1-mfd., 1 .25-mfd. (Lissen, Dubilier, T.C.C., Graham Farish).
2—8-mfd., electrolytic (Dubilier, T.C.C., Hellesen).

CONDENSERS, VARIABLE

1—.0005-mfd., two-gang panel-operated trimmer (J.B., "U", British Radiophone, Polar, Utility).
2—.0003-mfd., max. pre-set (British Radiophone).

FUSES

1—Twin type baseboard-mounting (Belling-Lee, Bulgin).

HOLDERS, VALVE

3—Five-pin and one four-pin for chassis mounting (C.B., Bulgin).

RESISTANCES, FIXED

1-watt, of the following values: 1 300-ohm, 2 500-ohm, 1 1,500-ohm, 1 20,000-ohm, 2 25,000-ohm, 2 75,000-ohm (Dubilier, Eric, Claude Lyons).

S.S.3

The special metal-
first details were
issue

USES THE
NEW METAL VALVES

A CHEAP
AND COMPACT
MAINS SET

REMARKABLE
SELECTIVITY OWING
TO THE IRON-CORED
COILS

Only the main parts, the valves, tuning condenser, iron-cored coils, power transformer and so on are on the top of the metal box-shaped chassis.

Unlike many metal-constructed sets, there is a panel carrying the few controls and switches.

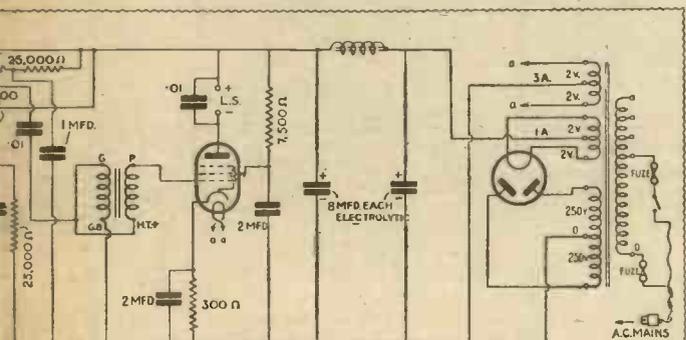
The combined volume and reaction control, a big feature of this set, the main tuning control and the wave-change switch are actually above the chassis box, while the on-off and pick-up switches are

underneath. This fact, however, cannot be seen from the front of the panel, which bears a neat symmetrical appearance.

HOW THE CIRCUIT WORKS

The theoretical circuit appears a little complicated at first sight, but you must remember that this shows all the wiring and details in full.

Even the wiring plan which is reproduced here does actually make the construction appear to be more difficult than it is. But when you start wiring you will realise that the job of building the "S.S.3" resolves itself only into the bolting down of a few components and put-



LIST AND COMPONENTS

RESISTANCES, VARIABLE

Combined 10,000-ohm potentiometer and .0003-mfd. reaction condenser (British Radiophone).

SUNDRIES

2—Chassis mounting strips with plug and socket connections, one marked A1, A2, E, and the other L.S.+, L.S.—, pick-ups (2) (Clix types A & B), connecting wire and sleeving (Lewcos), 2 ft. of screened sleeving (Goltone, Lewcos), 4 doz. 6B.A. 3/4-in. bolts and nuts (any radio shop), length of mains twin flex (Lewcos).

SWITCHES

2—On-off toggle type (Bulgin, Claude Lyons, British Radiophone, Wearite, Utility).

TRANSFORMERS

1—Low-frequency (Lissen, "Hypernik," Varley, Ferranti, R.I., Telsen, Igranic, Bulgin).
1—Mains, with secondary windings—250-0-250-volt, 60 m/a; 4 volts 3 amps, C.T.; 4 volts 1 amp, C.T. (Igranic type No. X29, Heayberd, Ferranti, R.I., Parmeko, Wearite, Varley).

ACCESSORIES

Cabinet (Peto-Scott).
Loud-speaker (W.B. "PM4" Igranic, Rola Celestion, Epoch, Amplion, Blue Spot).
Aerial (Electron).
Earth (Graham Farish "Fit").
Down Lead ("Receptru").

ting on the minimum number of wires.

All the bias resistances and decoupling arrangements are shown in full and you can see from the theoretical circuit how each valve gets its bias and is efficiently decoupled.

The aerial and detector grid-tuning circuits are ganged and there is a trimmer across the aerial section of this two-gang condenser. The trimming adjustment, however, is not nearly so delicate as it is in the case of an ordinary band-pass circuit. There is a series aerial condenser, still further to aid the selective tuning of the coil.

The coupling through to the detector circuit is an efficient arrangement and is based on a considerable amount of experimental work which the "A.W." Technical Staff has done with Catkin metal valves.

Variable bias applied to the grid of the screen-grid Catkin (bias automatically obtained by a voltage drop, of course) enables the best high-frequency working point of the variable-mu valve to be obtained.

Voltage is dropped by fixed resistances for the screening grid of this valve and the anode circuit in which there is an efficient high-frequency choke is coupled through a variable condenser to the tuning-grid circuit of the detector.

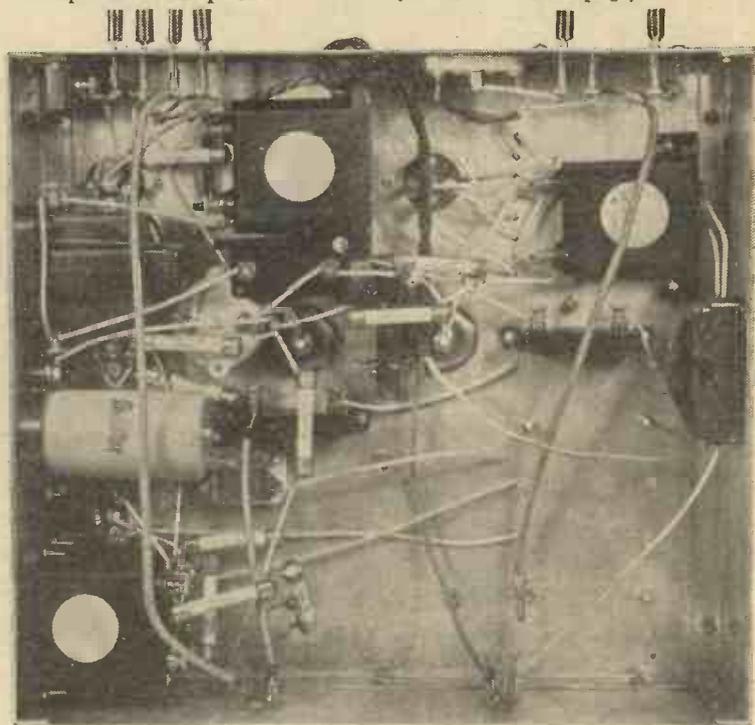
This coupling condenser is arranged not to have too large a value, for selectivity, and so that there is no noise introduced into the "S.S.3," by external interference.

There is no trimmer across the condenser which tunes the detector-grid coil. As only a two-section ganged condenser is used it is necessary to have a trimmer across only one section—that in the aerial circuit.

You can use the "S.S.3" with a pick-up, there being sockets on the small strip at the back of the chassis box for connection to a pick-up and external volume control.

The right-hand switch, looking at the set from the front, cuts the pick-up out of circuit when not required. It is connected, as a

(Continued on next page)



This is an underneath view which shows clearly the arrangement of the components in the hollow base

"BUILDING THE SUPER-SCREENED 3" (Continued from preceding page)

matter of fact, directly across a 1-megohm grid leak in the detector circuit.

In the anode of the detector circuit there is a high-frequency choke, decoupling resistance and the coupling resistance of the parallel-feed system. On the other side of the high-frequency choke is the .0001-microfarad bypass condenser, .0003 reaction condenser, reaction coil and the .002-microfarad safety condenser.

A screen-grid detector is used in the "S.S.3," this being the first time that a set has been described with a Catkin valve used as a screen-grid detector.

The advantages of an iron-cored coil are numerous. For one thing, the screen-grid detector does not exert so great a load upon the tuning circuit and therefore there is not the same amount of triode detector, either leaky-grid or anode-bend.

The remarkable selectivity of the iron-cored coils is therefore not impaired, and the sensitivity of the screen-grid detector adds still further to the "S.S.3"'s remarkable performance.

There is a parallel feed to the pentode output valve, a Catkin pentode being used, of course. The parallel-feed coupling condenser has a value of .01 microfarad, which our tests have shown to be the best value for this type of coupling with the specified components and valve.

The bias for the pentode stage is obtained by a 300-ohm resistance in the cathode lead shunted by a 2-microfarad condenser. A 7,500-ohms resistance and a stabilising condenser of 2 microfarads are in the screen-grid circuit, whilst there is a .01 condenser across the speaker output terminals of the pentode.

The mains section of the "S.S.3" circuit is shown at the right. A full-wave valve rectifier is used and this section of the set is quite separate from the main receiver circuit. Eight-microfarad electrolytic condensers provide efficient smoothing, but, nevertheless, there is nothing expensive in the mains side of the circuit.

supplied ready drilled, and then all that is necessary is to bolt the valve holders and components in position and wire up.

Those who are making their own metal chassis for this set or buying it ready drilled and using separate components, should note the recommended components specified for the "S.S.3."

A full list of components is given in the accompanying panel. The first-mentioned components are those actually used in the set illustrated and described. It will be realised that in choosing your own alternatives, allowance must be made for the metal chassis mounting. If you are using a ready-made chassis, then the specified components will fit without re-drilling the mounting holes, otherwise a certain amount of cutting and re-drilling may be necessary to fit parts other than those

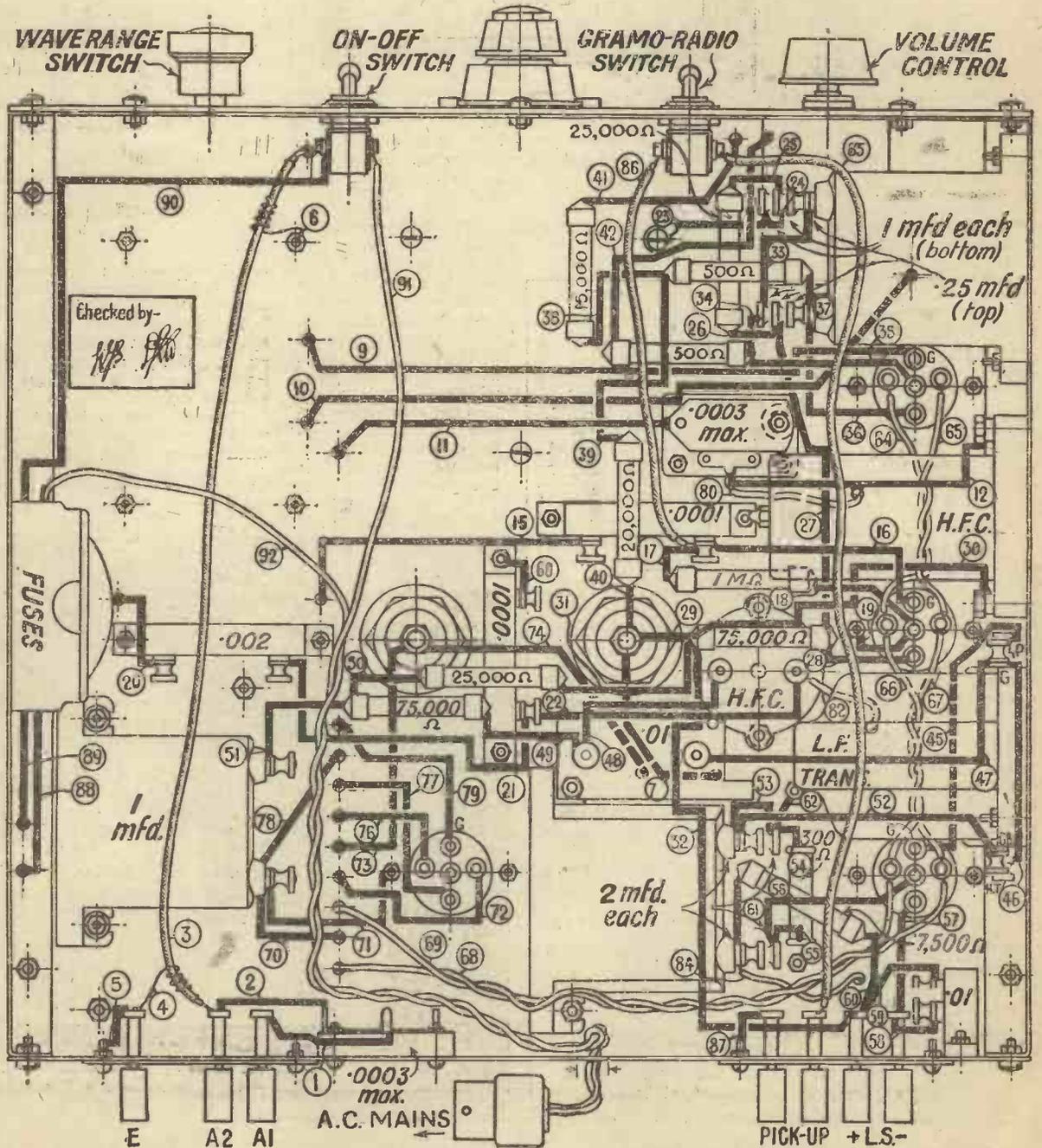
specified. As you can see from the photographs, the finished appearance of the "S.S.3" is extremely professional.

It is just like the metal chassis incorporated in most good-quality commercial sets.

Manufactured sets are always wired up from a master blueprint and you will do well to follow this practice.

You can obtain a full-size blueprint of the "S.S.3" from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4. It costs 1s. 6d., post free. Simply ask for print of the S.S.3.

A wiring diagram of the "S.S.3" is given here. This also is exactly to scale, but you will find it much easier to wire up from the full-size print. The scale drawing given here, however, can be compared with the photographs to give a good idea of the complete layout.



STARTING TO BUILD YOUR "S.S.3"

If you buy a complete kit of parts for your "S.S.3" you will probably have the chassis and front panel

The more complicated part of the wiring is under the base, but it will be quite clear from this large-scale drawing. Details of upper side of the base are on page 808. Full-size blueprints of both diagrams can be supplied for 1s. 6d.

THE OSRAM 'CATKIN' VALVE

IS A REVOLUTIONARY CHANGE
IN THE TECHNIQUE OF VALVE
DESIGN AND CONSTRUCTION.
IT IS THE COMMENCEMENT OF
A NEW ERA IN VALVE USAGE

Osram (CATKIN) Valves

FOR A.C. MAINS RECEIVERS

Metal instead of Glass

Made in England. Covered by World Patents

The characteristics of OSRAM 'CATKIN' VALVES are the same as the glass types they replace, so that they can be utilized in any existing mains sets employing equivalent glass valves. A better all-round performance, however is assured, due to unique features in the construction of the valve. Study this sketch carefully.

TYPES AND PRICES

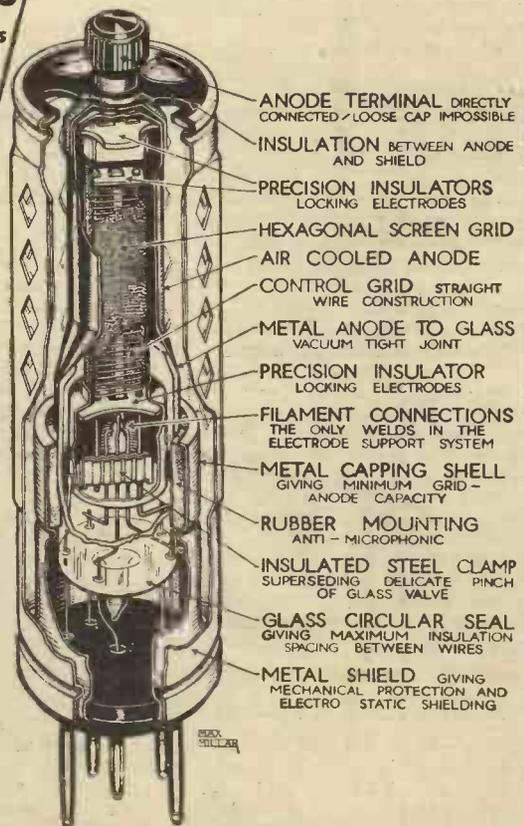
- MS.4B High Efficiency Screen-Grid Valve PRICE 19/=
- V.MS4 Improved variable mu Screen Grid Valve PRICE 19/=
- MH.4 High Magnification Detector Valve PRICE 13/6
- M.P14 Power Pentode Valve PRICE 20/=

FOR A.C. MAINS RECEIVERS

Sold by all Wireless Dealers

WRITE AT ONCE for folder O. V. 6572 which gives full particulars of OSRAM 'CATKIN' VALVES sent POST FREE.

(METALLIZED TYPE)



A complete breakaway from the usual method of making wireless valves with a glass bulb has been accomplished by the introduction of the OSRAM 'CATKIN' VALVE. Not only has metal been substituted for glass, but the electrodes have been greatly strengthened by a packed and rigid assembly. Special features of the OSRAM 'CATKIN' valve include

1. FAR GREATER STRENGTH.
2. GREATER UNIFORMITY IN CHARACTERISTICS.
3. FREEDOM FROM MICROPHONICITY.
4. SMALLER SIZE
5. PERFECT SCREENING

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

"BUILDING THE S.S.3"

(Continued from page 806)

The first job when you have your kit of parts and blueprint is to check off the components, making sure that you have everything necessary.

either two or four bolts, so that the sunken sockets do not short-circuit to the baseboard. In the same way, the socket strips for the aerial, earth and speaker and pick-up connections must be mounted so that the sockets do not touch the metal.

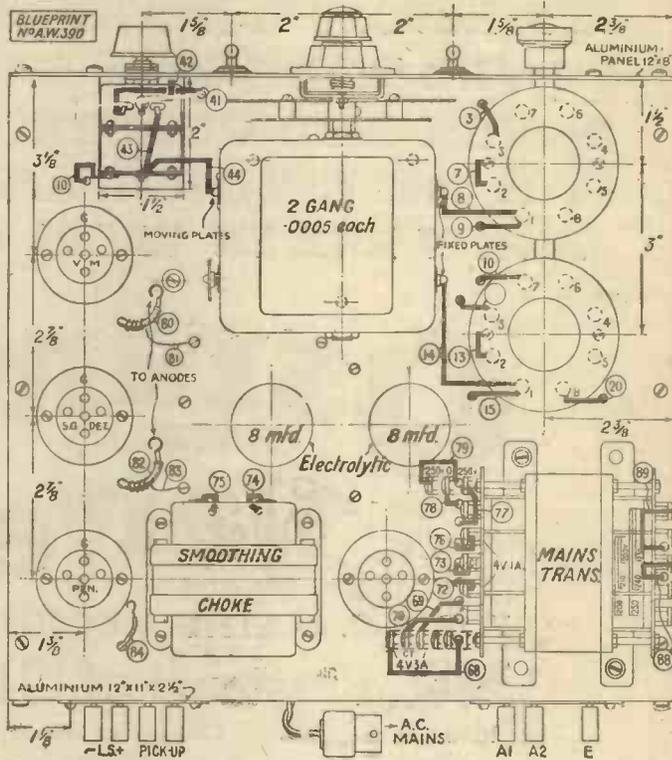
Electrolytic condensers, valve holders, power

On the other side of the chassis box, however, is mounted the fuse block and the mains input to the power transformer. This can be mounted and wired up at an early stage in the construction. It will be seen that the mains input flex is connected not only to this fuse box but to the on-off toggle switch on the metal



Here is the layout and wiring diagram of the upper side of the base, which as will be observed, is very simple to follow

Here the finishing touches are being put to the mounting of the heavy parts on the chassis. The smoothing choke is being bolted down



If the valve holders are not already fitted, then these and other small parts can be given a preliminary trial in their correct positions, to see that the mounting holes correspond, and so on.

When you have checked up see that the chassis is correctly drilled for the kit of parts you have ready for the construction, then the main components can be mounted on the top of the chassis.

The panel can be fixed to the front of the chassis and the coils, tuning condenser, valve holders and power transformer mounted in place.

In all probability you will prefer to buy your metal chassis ready drilled, but if you want to cut and drill it yourself from fairly stout-gauge aluminium, you should follow the measurements given on the wiring plan or full-size blueprint. As the wiring plan is to scale you can, if necessary, gauge the drill holes from this.

In some kits the necessary bolts and washers are supplied and in fixing the parts in position it is necessary only to note that no accidental electrical contacts are made. The valve holders, for instance, must be fitted exactly into position as shown, being secured with

transformer and so on being mounted on top of the box-shaped chassis, you will find your "S.S.3" looking almost complete, so far as external appearance is concerned. It is the detail work, however, and the mounting of the small parts underneath the box which demand care.

Moreover, if you are not working with a ready-made chassis, then you must see that the holes are drilled in the correct positions for the wires which pass through from the "top storey" to the underneath. There are a number of wires from the secondary of the power transformer which pass through the under-chassis wiring and components. All these holes should be drilled sufficiently large so that the wire in its insulated sleeving can be passed through without short-circuiting or risk of it being chafed. This point will be dealt with in the wiring instructions later.

As you can see from the photographs, it is not possible to mount all the under-baseboard parts at once, some of the valve-holder wiring must be completed before one transformer, the high-frequency choke and some fixed condensers can be mounted on the side of the chassis-box, underneath.

panel front, the left-hand switch, looking at the "S.S.3" at the front.

The metal work in the "S.S.3" is of the simplest possible nature, as you can see. Even the heaviest parts are fixed only by screws or small bolts secured with nuts, clamped down on to the washers. A screwdriver and a pair of pliers are all that you need, provided that you buy the metal chassis ready cut and drilled, which is the plan we recommend.

The wiring demands care, but can be followed quite easily from the wiring plan which is given here in large scale or from the full-size blueprint. In next week's issue the wiring will be described in detail and practical hints will be given on completing and operating the "S.S.3".

Owing to the great interest taken in this new-style receiver, arrangements have been made for it to be on view at various centres. The actual set illustrated and described here can be seen in the Radio Department windows of Messrs. Selfridge & Co., Ltd., Oxford Street, London, W.1. London readers should certainly take this opportunity of seeing the "S.S.3" the latest and best production of the "A.W." Technical Staff.

USE A BLUEPRINT!

EVERYBODY can build a set with the aid of one of the "A.W." full-size blueprints. Prints have been prepared for every type of set, from crystal sets to big superhets, and in the "A.W." range you are bound to find just the outfit you need.

That is the beauty of the whole scheme. A full-size print is prepared for each new set described in AMATEUR WIRELESS and the result is a comprehensive series of up-to-date receivers illustrated practically and pictorially by the prints.

An abridged list of blueprints is given this week, but it must be realised that this is only a short résumé of all the prints available. There

are literally dozens of two-, three- and four-valve sets, while portables, amplifiers and miscellaneous units, such as trickle-chargers, short-wave units and voltage regulators are included in the wide range.

No matter what type of set you have in

WHEN YOU BUY THE PARTS FOR THAT NEW SET

order a copy of the "A.W." full-size blueprint for it. A list of prints available is given on page 820

mind, you are sure to find it dealt with in an issue of "A.W." and the full-size print will be available from the Blueprint Department.

The blueprints are inexpensive, costing only one shilling each for three valves. They are proper engineering blueprints on stout paper and they not only show the wiring, but are useful for panel drilling and baseboard mounting. The prints reduce the job of building a set to child's play and there is no reason why, in view of the wide range of the "A.W." blueprint service, anyone should be deterred from building his own set at home on the score of complication.

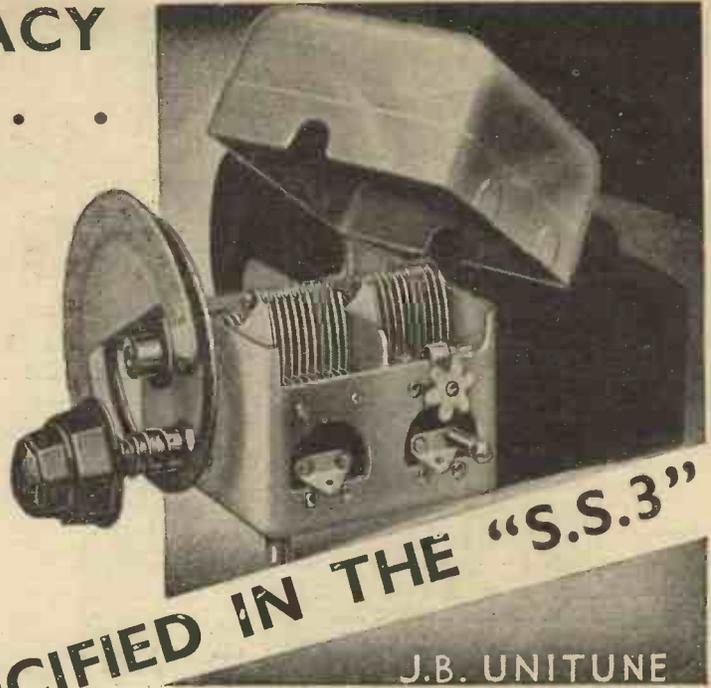
Blueprints can be obtained on application post free from the Blueprint Department, 58-61 Fetter Lane, London, E.C.4.

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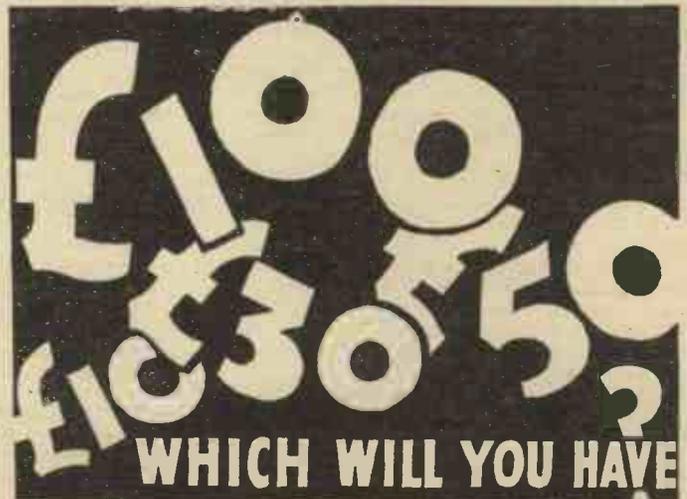
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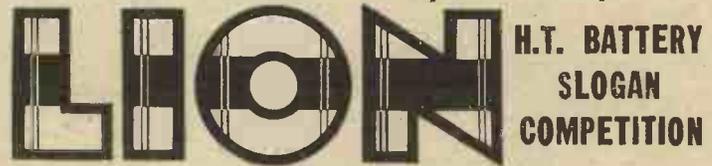
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The records reviewed below are a careful selection of the best of the recent issues. It will be noted that criticism is chiefly devoted to the treatment of the music and quality of recording rather than the actual composition

ORCHESTRAL

Caprice Viennois and O Star of Eve, 2s. 6d. BRUNS 1470
Modern orchestration by Wayne King's Orchestra. Not quite as Kreisler and Wagner wrote, but very commendable examples of the new school of rhythmic arrangement of real music.

The Clock in the Black Forest and The Clock is Playing, 2s. 6d. H.M.V. B4371

Two pleasant little things to go with the cakes by Dol Dauber's Orchestra. Very nicely played. Things you want to hear again.

The Teddie Bear's Picnic and The Fairies-Gavotte, 1s. 6d. BRDCST 3298

By the Commodore Orchestra. Just two of those tuneful, straightforward pieces that make you feel "good," whether at the cinema or not.

The Maid of the Mountains, 1s. 6d. WIN 5544
Commodore again. Very well done indeed. Much more satisfying in the long run than the previous record. There's some splendid music here.

Capriccio Italien (Tchaikovsky), 7s. DECCA-POLYDOR LY6066-7
A most merry, satisfying affair, this. It is full of harmonious passages with stirring trumpets and burbling waters. The performance (by the Berlin State Opera Orchestra) and the recording are alike magnificent. There is a sonority about the whole piece which is distinctly memorable.

Le Jeune Henri (Me'hul), 4s. DECCA-POLYDOR CA8148
This appears to be a very brisk hunting scene with horns, hounds in full cry and all that. Very stirring. A brisk bit of playing by the Lamoureux Orchestra.

Storm Music (Ivan the Terrible) and Tumblers' Dance (The Snow Maiden), 6s. H.M.V. DB1698

Never was a piece more aptly named than the first title of Rimsky-Korsakov's. No cinema organ and film combined can equal the picture drawn by it. The second is better known—a characteristic piece. The L.S.O. give a magnificent performance of each.

A Russian Fantasy, 2s. DECCA F3471
A thoroughly delightful and beautifully played pot-pourri by Livschakoff's Dance Orchestra. The range is wide, but quite within the scope of these very skilful players.

The Marriage of Figaro (Overture) and Dance of the Apprentices and Entrance of the Masters (Meistersinger), 6s. COL LX232

Two pieces of terrific contrast, these, Mozart and Wagner. This record serves to show the versatility of the British Symphony Orchestra, who put up a fine performance of each. Bruno Walter conducts. The last piece is most impressive, with great volume and satisfying roundness of tone.

Fledermaus Fantasy, 2s. 6d. COL DB1052
The clever "Bohemians" play this. There is so much delightful music in the "Bat" that this record will serve as a foretaste to those who are unfamiliar with it. The playing has real "snap" throughout.

BAND

March of the Peers (Iolanthe) and Behold the Lord High Executioner, 1s. 6d. BRDCST 3299

An exceedingly attractive record. Nobody need cavil at a military band playing these. The Welsh Guards' Band and a good male chorus provide an enjoyable performance between them.

Blaze of Glory and Festjubil, 1s. 6d. REGAL-ZONO MR876

This is another of those terrific massed brass band records, one of which finds a place in each Regal-Zono monthly list. It is every bit as good as its forerunners; in fact, the first march is, I think, the best yet. Without question, a marvellous eighteen-pennyworth.

Radelsky March (Strauss) and Racocsky March (Berlioz), 2s. 6d. COL DB1087

The first is really splendid, both as to tune and performance. Definitely a high light in marches. The second is well known of course, but I do not like the "arrangement" a great deal. The B.B.C. Wireless Military Band are the performers.

Marching With Sousa, 4s. COL DX455
One of the best the Grenadier Guards have ever done. Neither

band nor composer need comment. In this record each matches the other so perfectly, and the recording is so faultless, as to make a record to keep for all time.

INSTRUMENTAL

Quartet in C minor (Brahms, Op. 51 No. 1), 24s. COL LX228-231

Undoubtedly this is the big instrumental event of the month—this performance by the Lener String Quartet. Like many compositions of this kind, the commencement is somewhat vaguely formed. But it soon settles down and takes shape into very beautiful music. The Romanze, which takes up both sides of the second record, is a lovely plaintive thing and quite the gem of the piece. The remainder alternates between placid and disturbing passages, the latter typical of Brahms. The whole work is for the connoisseur, but the second record is for everybody.

VOCAL

My Darling and Sweetheart, 2s. 6d. BRUNS 1467

That very delightful tenor, Eric Baker, at the top of his form. The first is a real gem—beautifully sung with a most pleasing piano, and then orchestral, accompaniment. The second song is poor, but as the first is so very good, this does not matter.

Sue, Sue, Sue and I'se a'Waitin' For Yer, Josie, 1s. BRDCST 946

These need no introduction. For old times' sake, G. H. Elliott sings them in his very bright style. They're good.

Sanctuary of the Heart and Salut d'Amour, 1s. 6d. BRDCST 3295

Ballad lovers will like this record. Arthur Vivian has a rich baritone, and he gets the utmost out of each. A chorus assists.

Il Bacio and For You Alone, 2s. IMP Z142

By Gretle Vernon, soprano. An amazing two shillingsworth. This singer has a powerful and very flexible voice, but is apt to try tricks against the music and words at times. Perhaps the description "nightingale" encourages this. Nevertheless, it's all quite astonishing, these two in Italian and English.

On With the Motley and La Donna è Mobile and Questa o quella, 1s. 6d. BRDCST 3296

All in impeccable English by Francesco Vada (tenor)! The three are competently sung.

Great is Jehovah (Schubert) and Know'st Thou the Land, 4s. H.M.V. C2535

Miss Essie Ackland's superb contralto is heard with great power in "Die Allemacht," of which she gives an impressive rendering. I don't like the song from Thomas's "Mignon" quite so much—it doesn't move one as it should. But it's a glorious record this, criticism apart.

The Two Grenadiers and The Hidalgo, 4s. DECCA-POLYDOR CA814

Somehow the first does not sound like Schliussius. Perhaps it's because he sings Schumann's great song in a trifle higher key than one would expect from him. Never mind; it is well sung; his diction is admirable as usual, but I really prefer Scheidl's fire in the old Polydor. The second is more typical—another Schumann of lighter character. The accompaniment is pianoforte.

Siciliana (Cavalleria Rusticana) and Lebwohl, Mein Blütenreich (Madame Butterfly). DECCA-POLYDOR PO5007

The singer is Julius Patzak, tenor, of the Munich National Theatre. He has a glorious voice and both titles are most enjoyable. Distinctly a high-light.

In Santa Lucia and More Beautiful than Ever, 1s. 3d. STERNO 1150

Another most attractive record by that magnificent bass, George Doshier. This singer, whose forte is the popular type of song, is quite in the "star" class.

MISCELLANEOUS

Pancake Tuesday Throughout the Empire and Crazy Commentaries, 1s. 6d. H.M.V. B4375

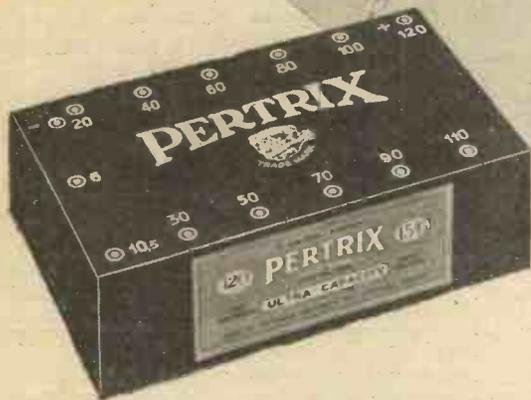
Two clever skits on radio items by Max Kester.

Marigold (Mayerl) and Musette (Peter), 1s. 6d. REGAL-ZONO MR878

Here are two rather more uncommon numbers quite well played by Fred Hartley's Quintet. A very good, cheap record.

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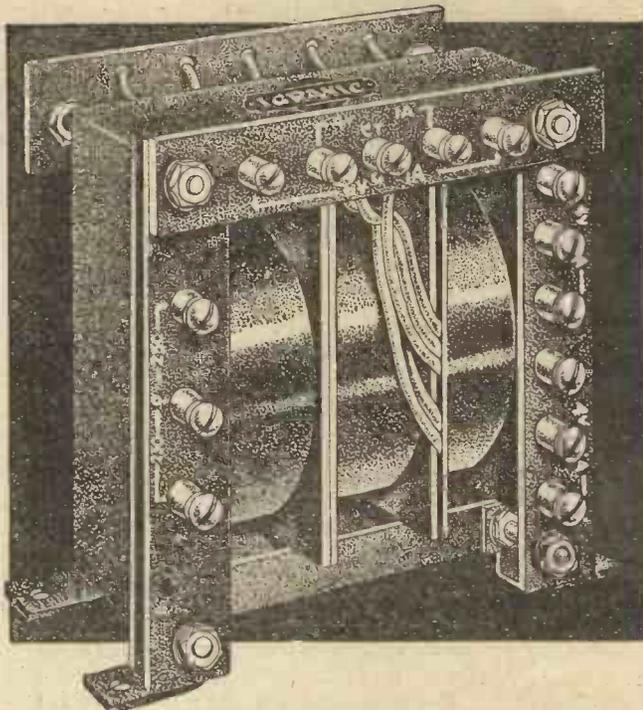
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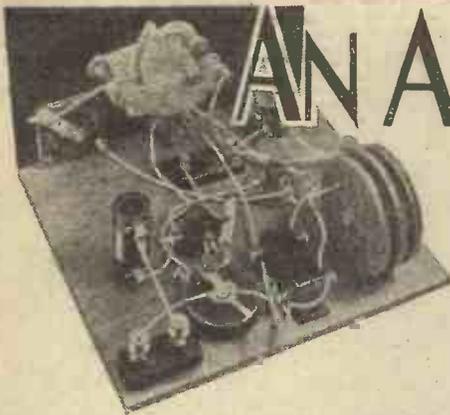
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Don't Forget to Say That You Saw it in "A.W."

FOR THE SHORT-WAVE ENTHUSIAST



AN ARMSTRONG "SUPER" ONE

Here's a fine idea for short-wave enthusiasts—a simple one-valver working on the Armstrong super-regenerative principle

HAVE you heard of Armstrong super-regeneration?

If you are a newcomer to radio, the name may vaguely suggest some kind of super-hot circuit. But if you have been a radio fan for upwards of ten years you will remember the principle of super-regeneration as introduced by Major Armstrong, of Columbia University, just about the time the B.B.C. was being started.

What Super-regeneration Is

The idea, without delving too deep into technicalities, is to make use of the property of reaction, without causing the set to go into oscillation.

When the Armstrong super was first brought out it was used on medium-wave sets only (short-wave reception then being confined practically only to the laboratory), and American amateurs using Armstrong supers with rigid frame aerials put up amazing results all over Canada and the States.

It never became really popular for broadcast reception, though, for a characteristic of an Armstrong super worked under conditions at that time was a high-pitched whistle all the time reception was going on.

But now in short-wave sets there is an entirely new field for Armstrong super-regeneration. The "A.W." Technical Staff has made up the simple one-valver shown by the accompanying photographs, using an Armstrong super circuit.

Get a technical enthusiast talking about super-regeneration and he will glibly discuss "negative resistance," quenching frequency, and so on! All of which does not help you very much to understand what is really, after all, a very simple idea.

Take any set with a smooth reaction control and tune in a distant station. Slowly turn the knob, so increasing reaction, and you will find that volume increases right up to the point at which the slight whistling noise is heard, which denotes that the set is on the point of going into oscillation. If the set "plops" into oscillation, then you have a poorly designed reaction circuit, but that is not of importance at the moment.

The main point is that increasing the reaction effect up to the point of oscillation reduces the high-frequency losses in the tuning circuit, so that you get greater volume right up to the point of oscillation.

Then, as the reaction knob is turned a little further still (disregarding the "negative resistance" facts talked of by the highbrow experts), the reaction circuits start to oscillate.

Major Armstrong reasoned that if you could in some way increase reaction just over the threshold point of oscillation, then you would be able to get a much greater increase of sensitivity without the set going into oscillation. For many years the experts considered this impossible, but Major Armstrong devised a very clever and really simple scheme.

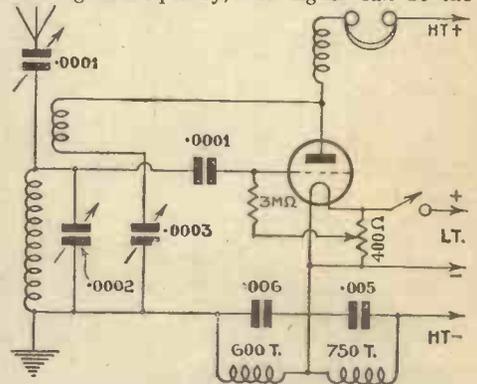
In addition to the ordinary reaction circuit, there are two large coils coupled together; so that the set oscillates not only at the normal signal frequency, but also at another and lower frequency, which in some cases is just audible. Hence the high-pitched whistle of early Armstrong supers.

This whistle is known as the quenching frequency, as it has the effect of "breaking up" reaction just at the threshold of oscillation at signal frequency.

The result is that by handling the ordinary reaction control very carefully on an Armstrong super you can go over the threshold of oscillation, getting an enormous increase in sensitivity without actually having the set oscillating.

For various reasons, the best quenching effect is obtained when the quenching

whistle is almost audible, but this depends largely on the signal frequency. The higher the signal frequency, the higher can be the



The main part of the circuit is that of a good short-wave one-valver. The Armstrong super coils, with their shunt condensers, are connected on the earth side of the grid circuit. Suitable condenser values to produce a quenching frequency either just audible or above the average audible range, are given in the accompanying article

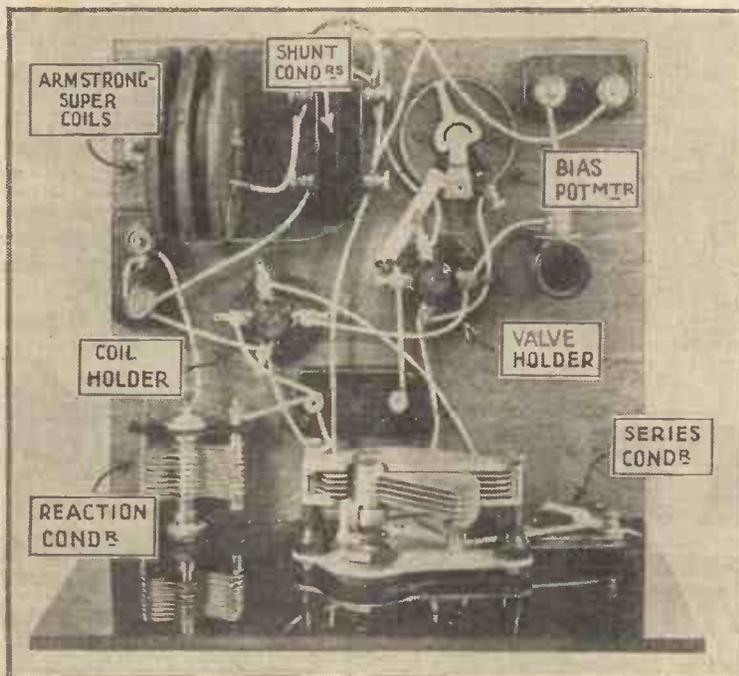
quenching frequency. In a modern short-wave set the quenching frequency for an Armstrong super circuit can be in the neighbourhood of 7,000 to 10,000 cycles, mostly above audibility.

The Armstrong super arrangement is extraordinarily simple. In addition to the ordinary one-valve short-wave circuit, all you need are a couple of large coils and fixed condensers to produce the quenching frequency.

The accompanying photographs show the simple one-valver which has been made up. It has a straightforward circuit with a series aerial condenser, plug-in short-wave coil, and a potentiometer giving control of bias on the detector grid. It is a really good short-wave "one"

The Quenching Coils

The quenching coils and condensers which you can see at the right rear corner of the set, looking from the back, are wound on spools made from scrap plywood. One of the accompanying photographs shows the coils in the process of winding. Three large plywood discs, approximately 3 in. in diameter, should be cut from this plywood to form the "flanges" of the bobbins, while two
(Concluded at foot of next page)



This lettered photograph will provide all the necessary details for the construction of the Armstrong-super regenerative short-wave one-valver

"NEW IDEAS ON A.V.C."

(Continued from page 794)

place and a negative D.C. voltage develops across R_8 and is applied to the grid of V_2 , which prevents the flow of anode current and releases the bias on V_1 . The potentiometers R_7 and R_4 are adjusted to give the wanted delay to the suppressor action and A.V.C. respectively.

So much for the theoretical action of this Fig. 3 circuit. Now for a few practical points. May we remind you that a double-diode-triode valve consists of a double-diode, that is two electrodes—anodes—with a common cathode and a heater. A diode is a two-electrode detector giving half-wave distortionless detection. With a double diode one half is used as a half-wave rectifier; the other half is used to give A.V.C. grid-bias volts.

Embodied in the same valve is a common or garden triode for low-frequency amplification, its heater and cathode being common to the diodes.

The base is queer looking, indeed! It has seven terminals, one of which is left blank—No. 2 actually. Remember that unlike conventional valves, the grid is taken to the terminal on the top. Fig. 4 gives the contacts of this valve holder and the way the seven pins are arranged round it.

Obviously, from this you will realise that you cannot simply take out the normal valves

of your set and put in a double-diode-triode. Structural alterations must be made.

There are still one or two snags about this system, which makes it difficult for the amateur to get really perfect results. Firstly, the output from a diode detector is negligible, and even after it has been amplified by the triode section of the double-diode-triode, it is still essential to use an intermediate low-frequency stage to boost the signal to the power valve.

Now we come to the new Cossor double-diode-pentode which is an entirely original type of valve for A.V.C. This valve has many advantages. Firstly, the pentode section of this valve gives an output large enough to load the power valve, without the use of an intermediate amplifier. Secondly, the valve can be used with a novel circuit, which gives in practice almost 100% efficiency.

For example, in practice a station that is initially very weak, such as Madrid, which we will assume applies only 1 millivolt to the

input of the set, and a powerful signal such as North Regional, giving 1 volt, would both sound equally loud—always assuming the high-frequency stages are efficient.

We must impress on you that this new valve, the Cossor double-diode-pentode, is not supposed to amplify, although there may be a signal strength increase.

Fig. 5 shows the circuit we used with the Cossor DDPen and the special base connections at Fig. 6. Fig. 7 shows a conventional high-frequency stage, which can be coupled to any of the circuits we have shown. With the Cossor DDPen the efficiency depends more on the valve than on the circuit arrangement. The point of great interest is that the pentode section has a variable grid base, which means that it will handle practically any signal amplitude, widening to take the stronger signals, thus reducing the maximum amplification; on the other hand, with a weak signal the grid base narrows, and the amplification factor increases, thus giving us the perfect A.V.C. action.

From the experiments we have tried it is obvious that the DDPen will be the final solution to perfect A.V.C.



Marconi and Osram DD/T

The Experimenters

"AN ARMSTRONG SUPER 'ONE'"

(Continued from preceding page)

smaller discs, 1 in. in diameter, are needed for the centre core on which the wire is wound. When you have cut the wood, clamp the five pieces together with a small brass pole.

Wind 600 turns of 38 D.S.C. wire in one slot and 750 turns of the same gauge wire in the second slot in the same direction



It is quite a simple matter to wind the quenching coils by hand as shown above

The accompanying circuit diagram shows how the two coils are connected together and in the grid side of the one-valve circuit.

To tune these two coils to the required oscillation frequency there are fixed condensers shunted across each.

These have a critical effect on the quenching frequency.

If you want to get a good quenching oscillation and do not mind the note being just within the limit of audibility, then use .006 microfarad condensers across each coil. If you have .005 condensers shunted, then the quenching will not be

COMPONENTS FOR THE ARMSTRONG SUPER "ONE"

- CHOKE**
1—High-frequency (Igranite type CHORT, Lissen, Wearite, Bulgin, Goltone).
- COILS**
1—Set short-wave four-pin plug-in (Lissen).
- CONDENSERS, FIXED**
1—.0001-mfd. (Lissen, Dubilier, Goltone, Graham Farish, Sovereign, T.C.C., Telsen, Ferranti, British Radiophone).
1—.005-mfd. (Lissen, Dubilier, Goltone, Graham Farish, Sovereign, T.C.C., Telsen, Ferranti, British Radiophone).
1—.006-mfd. (Lissen, Dubilier, Goltone, Graham Farish, Sovereign, T.C.C., Telsen, Ferranti, British Radiophone).
- CONDENSERS, VARIABLE**
1—.0002-mfd. short-wave tuning (Utility, type W187, Polar, British Radiophone, J.B.).
1—.0001-mfd. max. series aerial (J.B., type 1054, Lissen, Ormond, Ready Radio, Polar, Utility).
1—.0003-mfd. reaction (Graham Farish, Lissen, Lotus, Peto-Scott, Ready Radio, Telsen, Magnum, Ormond).
- DIAL**
1—Slow-motion (Utility, type W181, Lissen, Igranite, Telsen, Polar, J.B., British Radiophone).
- HOLDERS, VALVE**
2—4-pin holders (Lissen, W.B., Clix, Telsen, Benjamin, Wearite, Bulgin).
- PANEL, BASEBOARD**
Ebonite panel, 9 in. by 6 in. (Goltone, Becol, Peto-Scott, Danipad, Trelleborg).
Baseboard, 9 in. by 8 in. (Peto-Scott, Camco).
- PLUGS, ETC.**
2—Wander plugs, marked H.T.+, H.T.— (Belling-Lee, Clix, Eclex).
2—Spade terminals, marked L.T.+, L.T.— (Belling-Lee, Clix, Eclex).
- RESISTANCES, FIXED**
1—3-megohm grid leak (Erie, Graham Farish, Dubilier).
- POTENTIOMETER**
1—100-ohm (Lissen, Sovereign, Igranite).
- SUNDRIES:**
Piece of wood for coil former, 6 in. by 6 in.
Bracket for mounting coil former (Peto-Scott).
2—Terminal blocks (Lissen, Telsen).
Connecting wire and sleeving (Lewcoos).
2 oz. 38 D.S.C. wire (Lewcoos).
- SWITCHES**
1—Push-pull filament (Bulgin Junior, Lissen, W.B., Wearite, Benjamin, Ready Radio, Telsen).
- ACCESSORIES**
120-volt H.T. battery (Lissen, Drydex, Ediswan, Ever Ready, Fuller, G.E.C., Pertrix, Siemens).
2-volt accumulator (Lissen, Exide, Fuller, Ever Ready, Pertrix, Block).
Cabinet (Peto-Scott, Camco).
Aerial wire (Electron).
Earth (Graham Farish "Filt").
Shielded Downlead ("Receptru").

quite so effective, but the note will be above the range of the average ear.

As the fine results you can get from a short-wave Armstrong super depend largely on critical reaction control, you will find that this short-waver requires careful handling, but the results will repay this.

Make several trials of various H.T. voltages and move the arm of the baseboard "pot" with a pencil or insulated handle screwdriver, until you get smooth oscillation and find that the set is "supering" properly.

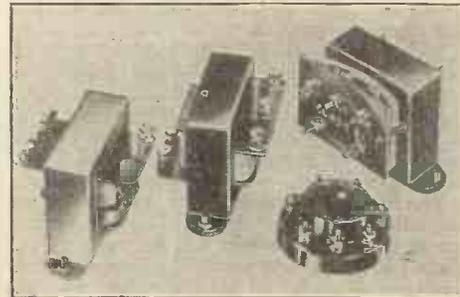
NEW CLASS-B COMPONENTS

GREAT enterprise is being shown by the manufacturers in the production of efficient and low-priced components for class-B circuits. The accompanying photograph shows some new parts in the W.B. range and we have had an opportunity of trying out samples of these class-B components sent us by Whiteley Electrical Radio Co., Ltd., Radio Works, Victoria Street, Mansfield, Notts.

The components shown in the photograph are, from left to right, the driver transformer, class-B output transformer, seven-pin valve holder and class-B output choke.

The ingenious system of the choke and transformers can be seen, and it must be emphasised that these are really well-made little jobs.

Prices are very reasonable, consistent with



good quality. The driver transformer costs 9s. 6d. and the output transformer 7s. 6d. The special class-B output choke costs 10s. 6d.

The seven-pin valve holder sells at 2s. 3d. Technical details of these components can be obtained free on mention of "A.W."

WHAT OUR READERS THINK

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

An Aerial Tip

SIR,—I was very interested in the article "Replacing a Fallen Aerial" in a recent issue of AMATEUR WIRELESS, as I have been in the same sort of difficulty myself, and I have thought that perhaps the idea that came to me to avoid so much trouble in the future may be of use to others and be found the better plan.

I do not use a pulley, which, as one is not continually pulling the aerial up and down, is unnecessary, nor even an insulator, but a thick screw-eye, screwed into the pole with the eye horizontal. This I find gives a sufficient bearing for the lanyard and does not chafe it. Then, in addition to the lanyard and not attached to it in any way, I pass a stout string through this screw-eye, long enough for the ends to be tied together to form a loop of a convenient length to be easily reached from the ground, so that, when a new lanyard is required, the end of it can be attached to some part of this loop and be pulled up by it through the screw-eye and down to its fastening, leaving everything as neat as before. I have had a lanyard break since adopting this dodge and found it no trouble at all to run up a new one.

I advise that the string should first be soaked in boiled linseed oil and dried to make it tough and waterproof and, as there is no strain on it, it ought then to last a very long time in all weathers. Care should also be taken that the string loop does not touch loosely any stay-wire fastenings which would be likely to chafe it in the wind.

Stanmore (Bexley Heath).

Worth Noting

SIR,—A peculiar experience I had with the "Mascot 3" may be of some interest to your readers. I built this receiver and from the first night I tried it out until quite recently I had absolutely no trouble. One day I switched it on as usual and found I could get no reaction although the local station came in at normal volume. I examined all the components that I suspected, took out the coils and tested them, and remembering some of "Thermion's" troubles, also tested the valveholders, but everything was O.K.

The things I did not suspect at all were the spaghetti resistances, but I moved them about just in case. Well, things remained as they were, reception of the local, but no reaction. I went over everything several times without result. To leave no stone unturned I took a piece of wire to short-circuit the resistances and immediately on applying it to the 50,000-ohm decoupling resistance to the detector valve, reaction burst through and on removing it, remained. Several weeks later this experience happened exactly as before and short-circuiting this resistance for a second again cured the trouble. About ten days afterwards the receiver ceased to function altogether and I removed the resistance and put in a new one. I have had no further trouble.

Now, if the set had been "dead" at the first time I would certainly have suspected the offending spaghetti, for it carried the H.T. to the detector, but as I was getting good local reception I took it for granted that it would be all right. The removal of

the wire may have caused sufficient heat to join the break in the resistance, but I do not think it is usual for reaction to be affected by a cause like this, while the rest of the set appears all right. The explanation may be simple to your more technical readers, but as "fault finding" is sometimes not so easy in wireless as in other spheres, I pass on the experience.

J. M. (Glasgow).

Short-wave Records

SIR,—Without wishing to raise any form of "Is this a record?" discussion in your columns, I think the following cases of distant reception of low-power stations may be of general interest.

During February, 1931, the Canadian broadcasting station VE9GW was received nightly on the loud-speaker here, using S.G., V., I. receiver. This station then used 25 watts on a wavelength of 49.22 metres.

On August 25, 1931, the New Zealand amateur ZL2CF used only 5 watts on 41 metres and was heard at Finchley at a strength of R5!

Even more interesting to my mind are the several reports of reception in this country of WGGB, using only 100 watts on the medium waveband.

G. F. B. (Tottenham).

The "Wizard"

SIR,—I would like to agree with S. A. (Ilford) *re* the "Wizard." This set is indeed a fine one; volume and selectivity are very good. I use an outdoor aerial and can get forty-five stations worth listening to, and I have received six American stations. I have been a regular reader of AMATEUR WIRELESS for seven years and have tried other sets of "A.W." design with satisfactory results, but the "Wizard" is the winner.

W. G. (Redhill).

IRON-CORED COILS IN THE "S.S.3."

THE remarkable selectivity of our new set, the "S.S.3," constructional details of which are given in this issue, is due to the use of iron-cored coils—yet another up-to-the-minute detail of the set's specification. Suitable iron-cored coils at very low cost have been produced by Varley and the aerial and tuned grid types are used in the "S.S.3."

The use of powdered metal cores is not new to Varley. As far back as 1926 Varley produced some constant-inductance chokes with iron-powdered cores.

The coils are remarkably compact and, of course, both the medium- and long-wave windings have a core of the new iron type, consisting of minute particles of iron embedded in an insulating material. The Varley core is not easily damaged and is protected by a bakelite casing.

The iron-core construction results in an exceedingly compact coil having an overall length of approximately $2\frac{3}{4}$ in. and $1\frac{3}{8}$ in. diameter. It is contained in a screening can having a diameter of approximately $2\frac{3}{4}$ in. To cut down high-frequency losses to the minimum, the medium-wave section is wound with Litz wire, while a special low-capacity wiring arrangement is adopted for the long-wave section. There is an intermediate tapping on the coil so that the aerial does not come direct to the grid end. The switching arrange-

ment in the base changes over the position of this tap, according to whether the medium- or long-wave winding is in circuit. This overcomes the lack of selectivity trouble experienced in coils where the tap position is not changed to correspond with the waveband. An ingenious cam switch in the base



short-circuits the long-wave section and changes over the aerial tap from one point to the other. The wavechange switches of these coils are easily ganged by means of a D-shaped rod and ebonite coupling piece provided. The BP30 aerial or tuned grid with reaction costs 10s. 6d., the BP31 H.F. inter-valve transformer with reaction, 10s. 6d., and the set of three, ganged together 33s. Full details can be obtained on mention of "A.W." from Varley, Ltd., 103 Kingsway, W.C.2.

LECTURES ON CATKINS

RADIO Society secretaries will be interested to know that the Marconiphone Valve Department has arranged for distribution of a lecture on the new Catkin valves. The lecture, which is free on application to the Marconiphone Valve Department, 210 Tottenham Court Road, W.1, takes about forty-five minutes to give and can be extended if required. It may be illustrated by lantern slides which are also available.

Applications for the lecture should be sent in well in advance of the date, so that it may be well studied, and as there is likely to be a rush on this very popular idea, applicants are asked to return the lecture as soon as possible when finished with.

On June 4, the Service in connection with the Forty-First British Christian Endeavour Convention which is being held at Newcastle-upon-Tyne will be relayed to North Regional listeners.

As usual, there will be an eye-witness account for North Regional listeners of the County Cricket Match between Lancashire and Yorkshire, to be played on Whit Monday, June 5, on the Old Trafford Ground at Manchester. The account will be given by A. E. Lawton from the ground itself during the afternoon and intervals will be filled by gramophone records



In My Wireless Den

Weekly Notes: Theoretical and Practical: by W. JAMES

THIS NEW POWER OUTPUT

A "CLASS B" amplifier is one having the output valves so arranged that the normal anode current when no signal is being received is quite small.

Then, when a signal comes in, the current passed by first one valve and then the other is increased. The increase is proportional to the strength of the signal and so it happens that the *average* anode current during, say, an evening's reception, is relatively low considering the output of sound obtained.

Now, while this is satisfactory enough, the matter can be looked at from a different angle. If a battery can supply an average current of so much and have a long useful life, then the volume of sound obtained is much greater with "Class B" than when the normal method is used.

Users of battery sets, speaking generally, require more volume and better quality. "Class B," properly arranged, with its special input and output components, will give this and it is therefore clear that, now the special valves are available, many amateurs will change over.

THAT COUPLING CONDENSER

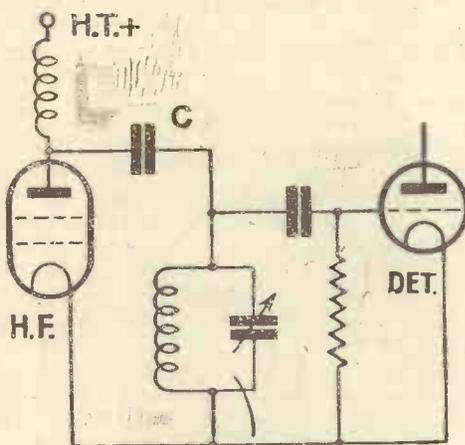
IN a circuit of the type illustrated, which is the popular tuned grid, there is a coupling condenser C.

This condenser has two chief uses. The first is to pass the high-frequency currents from the anode to the grid circuits with the least possible loss.

Secondly, the condenser stops the high-tension from flowing between the anode and grid circuits.

The condenser must, therefore, have sufficient insulation to withstand the high-tension pressure. This takes care of the direct current part of its use.

Now, although the condenser must be large enough to pass the high-frequency currents with the least loss, there is another factor which makes it advisable to use the smallest capacity that will suffice.



TUNED GRID CIRCUIT

This is the popular tuned-grid circuit described in the accompanying paragraph

It will be evident that any low-frequency variations that may appear in the anode circuit, from a mains unit for example, or from the low-frequency side of the receiver, will pass through the coupling condenser to the grid of the detector and hum or motor-boating may be produced.

To avoid this the capacity is made as

small as possible, such as .0005 microfarad and sometimes .0002 is used for these reasons.

"SUPER" OR STRAIGHT?

THERE are two general types of high-frequency circuit, the super-heterodyne and the straight.

At the moment the position of these two is not clear. Good selectivity is an essential. You can get it without doubt with a super-heterodyne circuit.

It is harder to make a straight set as selective, but now that better coils, such as the Ferrocart are available, the problem is easier.

Sharp tuning can be obtained with good tuned circuits. But we require selectivity and magnification. These two must be considered together.

I am hopeful of the straight circuit. Whether it will cost more or less than the super-heterodyne type remains to be seen, but it can definitely be said that by using Ferrocart coils in the correct way, very good selectivity is obtainable.

The tuning is, in fact, very surprisingly sharp and considerable magnification can be obtained with complete stability.

I have been very pleased with the results of recent tests and the development is one of those major ones which comes at not too frequent intervals and causes us to revise our ideas of performance. It is, indeed, surprising to get such fine results from a "straight" set.

SHARPENING IT UP

FLAT tuning may be due to various factors. In the first place, the tuning circuit itself, comprising the coil and condenser, may be at fault; or, secondly, the broad tuning may be due to the way the circuit is being used.

A small coil may, for example, tune broadly in comparison with a larger coil used with the same condenser. But the size of the screen, if one is used, and the position of the coil in the set relative to metal parts is bound to affect the results.

In the aerial circuit, for example, the aerial may be connected to the top of the grid coil instead of to a tapping. Then again, when a tap or a primary winding is provided, too many turns may be included between the tap and earth. To get over this difficulty without altering the coil itself a pre-set condenser may be connected in the aerial circuit.

This will reduce the coupling of the aerial to the tuned circuit and the tuning will therefore be sharper. There is another instance of bad circuit arrangement which often spoils the tuning, and that is to connect a grid-leak detector across the whole of the tuning coil.

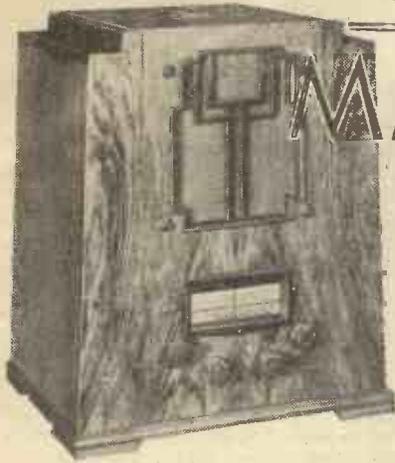
A grid-leak detector passes current in the grid circuit, with the result that a load is placed across the tuned circuit.

To reduce the effect of this load the grid condenser must be connected to a tap on the coil. This has the effect of reducing the load across the full circuit, selectivity is improved, and the signal strength may not be altered at all. Thus there may be a distinct gain by tapping the grid coil. These little points are worth remembering when selectivity is of first importance.



Listening-in at Doncaster Races! Loud-speakers are now a very obvious part of the equipment of the Doncaster race course and are used to broadcast a running commentary on each event for the guidance of spectators

SETS OF THE SEASON



MARCONIPHONE MODEL 272 SUPER-HET

HERE is a red-hot "new season" set—harbinger, I think, of a season of good four-valve super-hets. The Marconiphone 272 is all-electric, works entirely from the A.C. mains, over a wide range of voltages, and stands for all that is latest and best in super-het technique.

From a technical angle the most exciting element of the design is the elimination of side-band splash, second-channel interference, whistles, and other such bugbears of indifferent design. All this has been achieved by the engineering of a circuit that side-stepstrouble at every point, from the constant-peak band-pass input tuning right through to the final indirectly heated power pentode.

There is a screen-grid combined detector-oscillator, coupled by a transformer to the variable- μ intermediate-frequency-amplifier valve, which goes on to the power-grid second detector and so through a triple-compensated auto-transformer stage to the power output. All four valves of this gallant team of Marconi's are indirectly heated, and they get their high-tension juice from a heavy-duty valve rectifier.

FINE APPEARANCE

On that technical specification alone the set would sell well even in "trough-season" days, but we have by no means come to the end of 272's attractions. Technical features will win the heart of the technical minded, but among potential set-buyers such aesthetic considerations as the cabinet work and the layout—not to say simplicity—of the controls often prove deciding factors.

Many who know nothing about the technical "high spots" of this new super-het will be drawn to it because of its essentially dignified cabinet, a modernistic beauty of line picked out with bakelite mouldings for the loud-speaker fret and tuning escutcheon.

I would go so far as to say that 272 sets a new aesthetic standard in radio cabinet work. Get along to your local Marconiphone agent and you will see what I mean!

If in the course of this season's notes I seem unduly flattering, it is because I really am impressed with the tremendous improvement that has taken place in British-made sets. This 272 is symptomatic of the new trend towards a combination of perfect selectivity and near-perfect quality of tone.

EXCELLENT CONTROL

In tone this new table-cabinet set has few equals; at least, in my test experience, which, as you know, is fairly wide. The tone control is one of the best I have handled, emphasising the axiom that a good control of tone is possible only when the general standard of the tone is good without it. That is to say, this set shows how inherently good tone can be made even better under certain reception conditions,

notably when listening to distant stations, by a slight, ever so slight though ever so valuable, cutting of the upper frequencies.

Volume control is by the extreme left-hand knob of a series of four, next being the tone control, then the tuning and lastly—on the extreme right—the combination mains switch and wave-changing and gramophone pick-up.

As soon as you see the set you will be vastly pleased, as I am, with the large easy-to-read tuning scale, which is elaborately—but nevertheless plainly—engraved for all the main medium- and long-wave stations, with a centre calibration in metres to counteract the possibility of stations changing their positions in the waveband.

The station marking has been carried to a

two ends of which indicate the tolerance for the setting of a knife edge pointer. Dead-beat accuracy at last!

Operating this set is a sheer joy. You turn that tuning knob and the pointer moves decisively along the brightly lit tuning scale, locating station after station with miraculous ease. Selectivity with most stations, except with those taking gross liberties with their wavelength assignments, is of 9-kilocycle order, so that without any special ability on the part of the knob-twiddler such feats as the separation of Breslau and Poste Parisien can be performed all along the dial.

GOOD QUALITY

On the long waves the performance is highly creditable. But for the seasonal weakness of Königswusterhausen I should have been able to log the German clear of the adjacent Daventry and Paris transmissions. What I noticed on long waves was the good tone, more "top" being in evidence than with most sets I have so far tried.

The loud-speaker is an improved type of energised moving-coil, fitted, you will be interested to know, with "hum neutralisers." I mention this because on test I found the set particularly free from mains hum background, thus proving a contention I have long had that the final smoothing—in the loud-speaker—has not always been up to the mark in the past.

This loud-speaker, besides giving a rich depth of bass—surprisingly true in view of the limited baffle area of the cabinet—handles with ease the full two watts output of the pentode power valve. With the volume control half-way down such stations as Radio Paris will fill almost the whole house, so there is no lack of reserve power!

Pick-up connection is provided for as a matter of course, and this fitment is very well worth while.

SET TESTER.



A rear view of one of the latest 4-valve super-hets—the Marconiphone model 272—which represents all the latest technique in this class of receiver

remarkably accurate fineness. Under each station name there is a long, thin line, and superimposed on this a short, thick line, the

BRIEF SPECIFICATION

Makers: Marconiphone Co., Ltd.

Price: Not yet decided.

Valve Combination: Super-het sequence of four valves, with fifth valve for mains rectifier.

Power Supply: A.C. mains from 200 to 250 volts.

Power Consumption: 65 watts.

Controls: Tuning, tone, volume, and combination switching.

Type: Table-cabinet super-het, with mains aerial and circuit arranged to dispense with earth if not available.

Remarks: First-class technical and structural design. Outstanding tuning scale that sets new standard in accurate station calibration.

SOLDERING IN YOUR SET

ALTHOUGH there is no need to solder in most sets these days, it is perhaps not realised how much time can be saved and what good electrical joints can be made if you have a small soldering kit. As sets nowadays are generally compact, leaving little room in which to wield a big soldering iron, it will interest set builders to know that Fluxite, Ltd., have introduced a soldering set which contains a special small-space soldering iron with non-heating handle, pocket blowlamp, Fluxite solder and full instructions.

These can be obtained from most wireless dealers and hardware stores. Fluxite, which is a most convenient flux for soldering small joints, is sold separately in tins, the smallest costing only 4d. As a large number of resistances and small condensers are not provided with terminals, but are fitted with soldering tags, there should be many uses for the Fluxite soldering kit in set construction.

In the description of the new Mullard class-B valve, given in last week's issue, the type number was incorrectly given in two places as PM2V. As this may cause confusion with the variable- μ valve it should be noted that the class-B valve type number is PM2B.

**POSTCARD
RADIO LITERATURE**

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

Sale Bargains!

SEE that the Cabaret Electric Co., Ltd., is having a big clearance sale of brand-new tested components, Slektun transformers, speaker units, screened coils, short-wave chokes and so on. Why not drop a line through my service for details? I hear, too, that new sets are being offered at reduced prices, too. **1018**

A Handy Tool

If you go in for extensive set construction, you will be attracted by the mechanical hammer brought out by William Geipel, Ltd. This hammer, known as the Quead, performs many useful jobs and delivers regular and uniform blows at the rate of 1,000 to 1,500 per minute. The standard Quead hammer costs 12s. 6d., and details may be obtained through my Catalogue Service. **1019**

H.T. from Lissen

A handy Lissen folder, copies of which you can get free through my Catalogue Service, gives you dimensions, types and prices of high-tension, grid bias and torch batteries. This is well worth having for if your present H.T. or grid bias runs down you will know at once what type to order as a replacement. The prices of course are very low and the quality excellent, owing to the special Lissen battery process. **1020**

New Blue Spot Pick-up

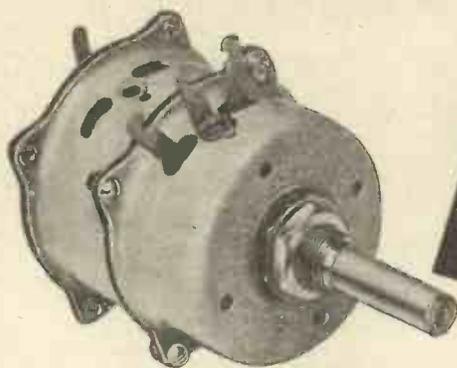
The latest Blue Spot pick-up, model 33, embodies a number of fine technical features, if I am to judge by the illustrated folder just issued in connection with this new radiogram accessory. It gives even response from 30 to 4,000 cycles. It gives tracking as near perfection as possible, has a swivelling head to facilitate needle changing and incorporates a wire-wound volume control. **1021**

Ediswan Thermal Delay Switches

Delay action switches in the H.T. circuit are essential in many mains outfits to prevent the H.T. load coming on until the filaments are at their working temperatures. Two types of vacuum thermal delay switch have been produced by Ediswan and these will be of interest to builders of apparatus incorporating (for example) modern high-efficiency mercury vapour or gas-filled rectifiers. Control of the time delay is effected by putting a rheostat in the heater circuit of the delay switch. **1022**

A. Class-B Four

I have just received a copy of the constructional chart which has just been prepared for a fine class-B four-valver by Ferranti, Ltd. This includes the new Ferranti class-B super-power valve HP2. Arrangements have been made whereby copies of this chart can be sent to readers making application through my Catalogue Service and enclosing a 1½d. stamp. **OBSERVER. 1023**



The DUOVOL

SPECIFIED FOR THE "A.W. S.S. 3"
DUOVOL as Price illustrated above **10/-**
British Radiophone I.F. Trimmer Price **2/-**
Recepter—The new low loss screened lead-in cable (15 ft. length) Price **10/-**
Other lengths at proportionate prices

This well made, neat component comprises a wire-wound volume control and reaction condenser in one. It ensures a smooth progressive advance of volume from minimum to maximum by the turning of a single knob. This smooth and positive action of the Duovol is due to the perfect matching of the component parts. It is another proof of the superiority of Radiophone "matched perfection." Ask your dealer to write for catalogue A.W. 10.

PRICE COMPLETE 10/-



BRITISH RADIOPHONE LTD., ALDWYCH HOUSE, ALDWYCH, W.C.2.

A British Radiophone Product

Specified for the "S.S. 3"

because CLIX Contact Components definitely meet the requirements of receivers of advanced design.



Chassis Mounting VALVEHOLDERS

(Standard Type). Turned Resilient Sockets guarantee full-surface contact without fear of collapse with any valve-pin—solid or otherwise. Sockets move laterally and align with valve-pins making easy entry or withdrawal.

5-pin - - - 9d.
3 required
4-pin - - - 8d.
4 required

Chassis Mounting STRIPS

Strongly made of highest quality insulating material. Turned Resilient Sockets guarantee perfect contact. Terminals for quick and secure connections.

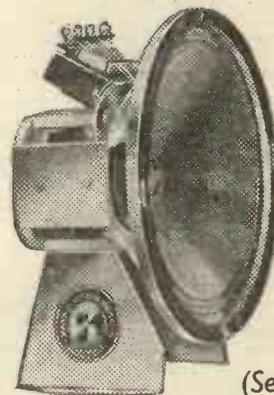
TYPE A, 8d.
TYPE B, 7d.
Solid Pins for above.
All Engravings 2d. each.



CLIX New Folder A/3 on request.

LECTRO LINX LTD., 79a, Rochester Row, S.W.1

SPECIFIED



for the **S.S. 3**

MANSFIELD (Senior) P.M.4.

The designers of yet another leading 1933 set have acknowledged the merit of the revolutionary Mansfield magnetic system. Only a strictly modern moving coil speaker can do justice to the modern set.

The Designers KNOW!

Mansfield Senior PM 4 complete with transformer 42/-

The famous Mansfield speakers are available also for Class-B circuits. Write for 1933 list.



WHITELEY ELECTRICAL RADIO Co. Ltd., Radio Works, Mansfield, Notts.



This party is making good use of a Marconi phone receiver on a river outing

RADIO on the RIVER, by the SEA or hiking through the COUNTRY

See that you have music wherever you go on holiday this Summer. The June issue of Wireless Magazine is packed full with interesting and useful information vital both to set constructors and to every owner of a radio receiver. Get your copy to-day.

SOME CONTENTS OF THE JUNE ISSUE

FOR THE CONSTRUCTOR THE JAMES CLASS-B SUPER, by W. James, and RESULTS ON TEST; "W.M." CLASS-B MAINS UNIT, by the "W.M." Technical Staff; THE SIMPLE-TUNE THREE, by the "W.M." Technical Staff; THE WELCOME PORTABLE WITH CLASS-B OUTPUT STAGE, by the "W.M." Technical Staff.

TECHNICAL FEATURES VALVES TO USE IN YOUR SET; THE MAINS UNIT, by Percy W. Harris, M.Inst.Rad.E.; "DOUBLE-DUTY" VALVES; THE NEW METAL VALVES AND HOW TO USE THEM; A CLEAN BREAKAWAY FROM TRADITION, by F. E. Henderson, A.M.I.E.E.; A NEW IRON CORE FOR TUNING COILS, by Paul D. Tyers; TESTING YOUR SET—STEP BY STEP, by S. Rutherford Wilkins; SQUELCH I by P. Wilson, M.A.; A MIDGET TRANSMITTER, by L. S. Kaysie; TESTS OF NEW APPARATUS.

GENERAL ARTICLES GUIDE TO THE WORLD'S BROADCASTERS, by Jay Cootie; WORLD'S BROADCAST WAVELENGTHS; SHOULD THEY LISTEN AS THEY BROADCAST? by Irene Scharrer (in an interview); THE RESISTANCE-COUPLED STAGE, by W. James; HOW TO RECOGNISE THE FOREIGNERS, by J. Godchaux Abrahams; MUSIC FROM ELECTRIC CURRENTS; INTERESTING JOBS AT BROADCASTING HOUSE, by Kenneth Ulliyett; SET REPORTS FROM OUR READERS; NEWS OF THE SHORT WAVES, by Kenneth Jowers.

GRAMO-RADIO SECTION MOTOR VIBRATION; DISSECTING THE ORCHESTRA; PER-CUSSING INFANTS; RECORDS REVIEWED, by Whitaker-Wilson and Chopstick.

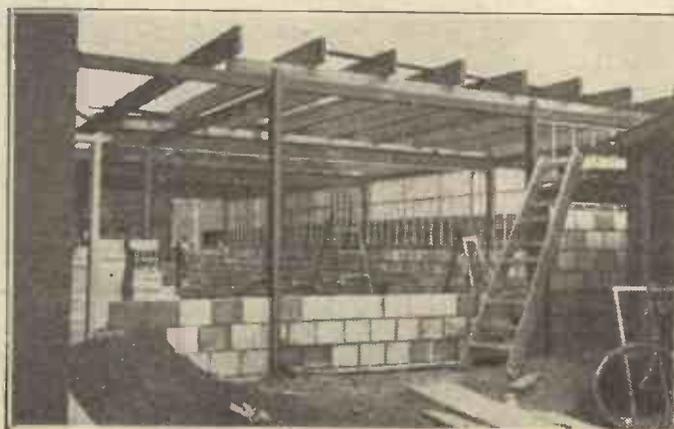
WIRELESS MAGAZINE

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PRICE 1/-

BROADCASTING STATIONS

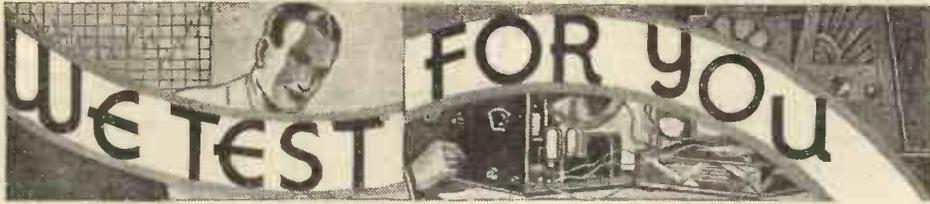
Broadcasting Stations classified in order of wavelengths. For the purpose of better comparison, the power indicated is that of the carrier wave.

Kilo-Metres	Station and Call Sign	Power (Kw.)	Kilo-Metres	Station and Call Sign	Power (Kw.)	Kilo-Metres	Station and Call Sign	Power (Kw.)
13.97	21,470 Daventry (GSH)	15.0	268.9	1,115 Salonica	1.0	455.9	658 San Sebastian (EAJ8)	3.0
16.88	17,770 Daventry (GSG)	15.0	269.8	1,112 Bari	20.0	456.7	657 Agen	0.5
19.68	15,243 Paris	10.0	271.4	1,105.5 Rennes	1.3	459.6	652.7 Beromuenster	60.0
19.73	15,200 Konigswusterhausen	8.0	273.7	1,096 Turin (Torino)	7.0	465.8	644 Lyons (PTT)	15.6
19.82	15,140 Daventry (GSF)	15.0	276.5	1,085 Heilsberg	60.0	472.4	635 Langenberg	60.0
25.20	11,910 Paris	10.0	279.9	1,071.6 Bratislava	14.0	476	630.2 Simferopol	15.0
25.28	11,865 Daventry (GSE)	20.0	281	1,067 Copenhagen	0.75	480	625 North Regional	50.0
25.4	11,810 Rome (ZRO)	15.0	282.2	1,063 Lisbon (CTIAA)	2.0	480	625 Ivanovo-Vosnesensk	20.0
25.53	11,750 Daventry (GSD)	20.0	283.6	1,058 Innsbruck	0.5	488.6	614 Prague	120.0
25.60	11,725 Paris	10.0	283.6	1,058 Berlin (E)	0.5	495.8	605 Trondheim	1.2
30.0	10,000 Madrid (EAO)	20.0	283.6	1,058 Magdeburg	0.5	500.8	599 Florence	20.0
31.19	9,620 Lisbon (CTIAA)	2.0	283.6	1,058 Stettin	0.5	501.7	598 Gorky	10.0
31.3	9,585 Daventry (GSC)	20.0	284.3	1,055.2 Radio Lyons	1.0	509	590 Astrakhan (RV35)	10.0
31.38	9,560 Zeesing (DJA)	8.0	286	1,049 Montpellier	0.8	509.3	589 Brussels (No. 1)	15.0
31.55	9,510 Daventry (GSB)	20.0	288.3	1,040 Bournemouth	1.0	518.6	578.5 Vienna	120.0
31.6	9,494 Poznan SRI	0.5	288.3	1,040 Scottish National	50.0	525	572 Riga	15.0
32.26	9,300 Rabat	0.5	291	1,031 Viipuri	13.0	532.9	563 Munich	60.0
40.3	7,464 Radio Nations	20.0	293	1,022 Koscice	2.5	539.9	555.6 Palermo	3.0
45.38	6,611 Moscow	12.0	293.7	1,021.5 Limoges (PTT)	0.7	542	554 Sundsvall	10.0
46.6	6,438 Moscow	12.0	296.1	1,013 Hilversum	20.0	550.5	545 Budapest (1)	18.5
48.2	6,220 Rome (ZRO)	9.0	298.8	1,004 Tallin	11.0	555.5	542 Tampere	1.0
49.4	6,073 Skamleback	0.5	301.5	995 North National	50.0	559.7	536 Kaiserslautern	1.5
49.4	6,073 Vienna	0.5	304.3	986 Bordeaux (PTT)	13.0	559.7	536 Augsburg	0.3
49.59	6,050 Daventry (GSA)	20.0	306.8	978 Zagreb	0.75	562.9	532.9 Wilno	22.0
49.6	6,048 Vienna (UOR2)	2.0	307	977 Falun	0.5	562	533.7 Freiburg	0.2
49.83	6,020 Zeesing (DJA)	10.0	308.8	971.3 Vitus (Paris)	1.0	566	530 Hanover	0.3
50.0	6,000 Moscow	20.0	309.9	968 West Regional	50.0	569.9	526.4 Grenoble (PTT)	2.0
58.31	5,145 Prague	0.5	312.8	959 Cracow	2.0	574.7	522 Ljubljana	7.0
80.0	3,750 Rome	9.0	313.9	955.6 Genoa (Genova)	10.0	583.6	514 Tartu	0.5
202.3	1,483 Liege (Exp)	0.2	315.8	950 Marseilles	1.6	678.7	442 Geneva	0.5
202.7	1,480 Kristinehamn	0.25	318.8	941 Naples (Napoli)	1.5	719.4	416.6 Moscow (RV2)	20.0
206.3	1,454 Seraing	0.2	318.8	941 Sofia (Rodno Radio)	1.0	720	416.6 Tessin (tests)	20.0
207	1,450 Liege (Wallonie)	0.3	319.7	936 Dresden	0.25	743	404 Samara	10.0
209.8	1,429 Miskolcz	1.25	321.9	932 Goteborg	10.0	749	401 Ostersund	0.6
209.8	1,429 Magyarovar	1.25	325	923 Breslau	60.0	779.2	385 Petrozavodsk	20.0
209.8	1,429 Pecs	1.25	325.8	913 Poste Parisien	60.0	824	363.6 Sverdlovsk	50.0
211.3	1,420 Newcastle	1.0	331.6	904 Milan Sizioso	50.0	824.2	364 Rostov (Don)	35.0
213	1,403 Antwerp	0.4	335	896 Poznan	2.0	833	360.1 Heston Airport	5.0
214.3	1,400 Aberdeen	1.0	338.2	887 Brussels (No. 2)	15.0	840	357.1 Budapest (2)	3.0
215.4	1,393 Chateleau (EL)	2.0	341.3	879 Brunn (Brno)	35.0	848.7	353.4 Rostov (RV12)	20.0
217.1	1,382 Konigsberg	0.9	345.2	869 Strasbourg (PTT)	11.5	857.1	350 Leningrad	100.0
217.1	1,382 Brussels	0.25	348.2	861.5 Leningrad RV70	10.0	882	340 Saratov (RV3)	20.0
218	1,373 Salzburg	0.5	348.8	860 Barcelona (EAIJ)	8.0	897.5	320 Khar'kov (RV4)	20.0
218.5	1,373 Plymouth	0.2	352.1	852 Graz	7.0	967.7	310 Alma Ata (RV60)	10.0
220.1	1,363 Beziery	0.5	355.9	843 London Regional	50.0	986.9	304 Sverdlovsk	60.0
220.3	1,364 Binche	0.1	358	838 Tiraspol	10.0	1,000	300 Moscow	100.0
222.3	1,354 Liege (Coite)	0.15	360.6	832 Muhacker	60.0	1,034.5	290 Kiev (RV9)	100.0
223.2	1,344 Swedish Relays	—	363.6	825 Algiers (PTT)	16.0	1,060	283 Scheveningen-Haven	10.0
224.4	1,337 Cork (6CK)	1.2	365.5	820.7 Bergen	1.0	1,061	282.7 Tiflis (RV7)	100.0
225.9	1,327.3 Fecamp	10.0	367.5	816.2 Bolzano	1.0	1,073.5	279.4 Oslo	60.0
227.4	1,319 Flensburg	0.5	367	817.4 Fredrikstad	0.7	1,083.9	276.7 Minsk (RV10)	100.5
230.6	1,301 Malmo	1.2	368.1	815 Helsinki	13.2	1,101	272 Moscow Popoff	40.0
231.6	1,294.3 Kiel	0.25	369.1	815 Seville (EAJ5)	1.5	1,153.8	260 Kalundborg	7.0
235	1,283 Lodz	2.2	368.1	815 Santiago (EAJ4)	0.2	1,171.5	256 Tashkent (RV11)	25.0
235.5	1,274 Kristiansand	0.5	368.8	813.4 Radio LL (Paris)	0.8	1,190.5	252 Luxembourg	150.0
236.2	1,270 Bordeaux (S.O.)	3.0	372.2	806 Hamburg	1.5	1,200	250 Istanbul	5.0
238	1,260.3 Nimes	1.0	376.4	797 Scottish Regional	50.0	1,200	250 Reykjavik	16.6
238.9	1,256 Nurnberg	2.0	381.7	789 Lvov	16.0	1,234.5	243 Boden	0.0
240.1	1,249.5 Stavanger	0.5	384.6	787 Radio Toulouse	8.0	1,255	239 Vienna	3.0
242	1,238 Belfast	1.0	385	779 Stalino (RV26)	10.0	1,266	237 Bakou	35.0
244.1	1,229 Basle	0.5	389.6	770 Leipzig	75.0	1,304	230 Moscow (T.U.)	100.0
245.9	1,220 Berne	0.5	395.5	758.5 Bucharest	12.0	1,354.4	221.5 Motala	30.0
245.9	1,220 Cassel	0.25	398.9	752 Midland Regional	25.0	1,380	217.4 Novosibirsk	0
245.9	1,220 Linz	0.5	399	752 Vladikavkas	10.0	1,411.8	212.5 Warsaw	120.0
245.9	1,220 Swansea	0.12	403.8	743 Sottens	25.0	1,445.7	207.5 Eiffel Tower	13.5
245.9	1,220 Schaerbeck	0.25	408.7	734 Katowice	16.0	1,481	202.5 Moscow (RV1)	500.0
247.7	1,211 Trieste	10.0	413	725 Athlone	20	1,538	195 Ankara	7.0
249.1	1,202.5 Juan-les-Pins	1.0	416.4	720.5 Radio Maroc (Rabat)	6.0	1,554.4	193 Daventry (Nat.)	30.0
250	1,200 Prague (Strasnice)	5.0	419.5	715 Berlin	1.5	1,600	187.5 Irkutsk	10.0
250	1,200 Radio Schaerbeck	0.3	424.3	707 Madrid (EAJ7)	3.0	1,620	185 Norddeich (KVA)	10.0
250.9	1,196 Barcelona (EAJ15)	6.0	425.5	705 Madrid (Espan.)	2.0	1,634.9	183.5 Zeesing	60.0
253.1	1,185 Gleiwitz	5.0	429.8	698 Belgrade	2.8	1,685.3	178 Khar'kov	25.0
255.1	1,176 Toulouse (PTT)	0.7	435.4	689 Makhatch-Kala	100.0	1,725	174 Radio Paris	75.0
256.7	1,168 Horby	10.0	435.4	689 Stockholm	55.0	1,796	167 Lahti	54.0
259.3	1,157 Frankfurt-a-M.	17.0	441.2	680 Rome (Roma)	60.0	1,875	160 Huizen	8.5
259.3	1,157 Treves	20.0	447.1	671 Paris (PTT)	7.0	1,920	156 Blaj	0.75
261.6	1,147 London National	5.0	450.1	666.5 Danzig	0.5	1,935	155 Kanas	7.0
263.8	1,137 Moravska-Ostrava	11.0	452	664 Madona	25.0	2,450	122.4 Skopje	20.0
265.7	1,129 Lille (PTT)	1.3	450.3	666 Klagenfurt	0.5	2,625	119 Konigswusterhausen	20.0
267.2	1,123 Nyiregyhaza	6.25	453.2	662 Odessa	10.0	2,650	113 Hausen (press)	20.0
267.4	1,122 Valencia	6.0	453.8	661.3 Milan Vigentino	7.0			15.0



A Wireless Factory in the Making

The photograph shows the new factory now in course of construction for the well-known firm of A. F. Bulgin, Ltd. All the most modern plant for the manufacture of components and speakers is being installed

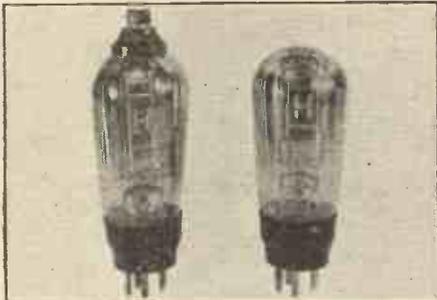


A Weekly review of New Components and Tests of Apparatus
Conducted by J. H. REYNER, B.Sc., A.M.I.E.E.

HIVAC VALVES

A NEW range of non-ring valves which has recently made its appearance on the market is that manufactured by the High Vacuum Valve Co., Ltd., the valves having the trade name of "Hivac." This week we have tested two samples from this range, a variable-mu screen-grid battery valve, known as the VS210, and a general-purpose valve known as the L210. In the case of the latter valve the construction, which is easily visible through the lightly gettered bulb, is quite normal.

In the case of the screen-grid valve, however, the construction is a little unusual. The anode of the valve is actually in two halves,



Two of the new Hivac valves; left, the new screen-grid valve which has an unusual construction

these being completely encased in a special screening box of gauze. There are two of these assemblies mounted side by side, the grid and filament being mounted in between. The sides of the screening boxes facing towards the grid and filament are, of course, composed of a very close mesh wire net. It will thus be seen that in this case the anode is encased within a screen where as the more normal procedure is to place the grid and filament within the screen. Very low inter-electrode capacity is claimed from this construction.

The valves were tested in the usual way. In the case of the L210 valve the amplification was found to be 16, the mutual conductance 1.15 milliampere/volt, and the anode impedance approximately 14,000 ohms; the rated values being amplification factor 10, mutual conductance 1.2 milliampere/volt and impedance 8,600 ohms. In the case of the screen-grid valve the mutual conductance at zero grid volts was .86 milliampere/volt, this dropping to .03 at -14 volts grid bias. The anode impedance at zero grid volts was approximately 140,000 ohms; the rated values for this valve were mutual conductance 1 milliampere/volt, this dropping to .075 for the same range of voltage as above, and the anode impedance 110,000 ohms.

It will be seen that the valves are reasonably close to their ratings and in practice we have found them entirely satisfactory, the complete absence of any microphonic trouble being very noticeable.

The retail prices of the valves are 4s. 6d. for L210, and 10s. 6d. for the VS210, which is a very good value for money.

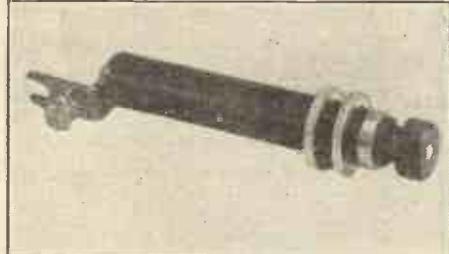
WEEDON EVER-DAMP EARTH

FAR too little attention is normally paid to the earth connection to the radio receiver. This connection is of course just as important as the aerial and should be kept in as good condition as the latter. Several devices have been put on the market recently to improve the efficiency of this portion of one's equipment and we have received for test this week an "Ever-Damp" Earth made by the Weedon Power Link Radio Co. This earth consists of a small rectangular copper container, some 4 in. by 3 in. by 1/2 in. The container is perforated and inside is placed a packet holding some deliquescent chemicals. As is well known, these chemicals have the property of attracting moisture to themselves. Thus around such an earth as this a permanently damp region is formed, so ensuring a very good earth connection.

This earth retails at 2s. 6d., complete with some 5 ft. of connecting wire.

"COP" AERIAL TERMINAL

READERS will recall that some time ago we reported on the Pressland Cop lead-in tube. Another Pressland component which we have now received for test is the Pressland Cop Aerial terminal. This "terminal," which



The new Pressland "Cop" Aerial Terminal, incorporating a series condenser

is approximately 3 1/2 in. long, is intended to replace the existing aerial terminal on the receiver. It consists essentially of a small variable condenser with a very low minimum, and which at the other end may be completely shorted out. The control is similar to that employed in the case of the lead-in tube referred to above and consists in driving a plunger in and out of the body of the terminal. The condenser is formed between the metal lining of the body and the metal plunger, the dielectric being a thin sheet of insulating material. When the plunger is forced right home the condenser is shorted out and the aerial is thus direct on to the tuning inductance of the receiver. The terminal is arranged for single-hole fixing and should take very few moments to fix. The maximum capacity of the sample tested was .00015 microfarad, and the minimum approximately .00001 microfarad.

The retail price is 2s.

Lydia Carmichael is the soloist in a mid-day chamber concert broadcast in the North Regional programme on June 8.

On June 9, there will be a relay to the North Regional from the Floral Pavilion, New Brighton, where the "Super Optimists" are playing in "Pleasure on Parade"

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AMPLION cone speaker unit in beautiful walnut domed-top cabinet, 7/6 complete. Primary (input) 200/220/240 v. A.C., 40/100 cycles. Secondary (output) 300-0-300v., 60 m/a., 2-0-2v. 4 amps., 2-0-2v. 1 amp. each 10/-.

ERICSSON 2-1 (suit 3-1) L.F. Transformers. Listed 17/6, each 3/3.

AMPLION Spkr. units. Over 75 per cent. reduct. Each 2/3.

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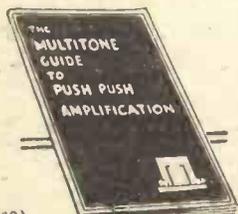
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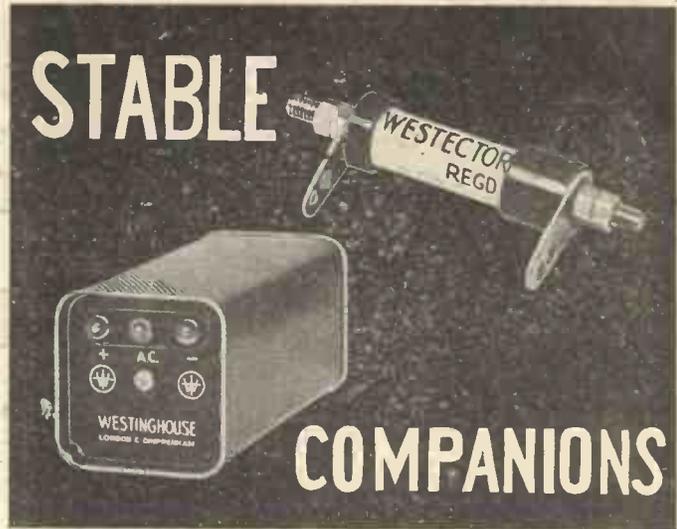
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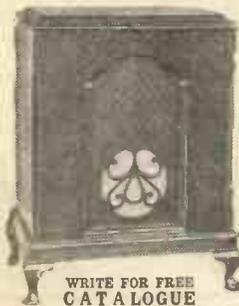
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