

Amateur Wireless,
June 4, 1932

19 Hulton 609
FOR HIKER, CYCLIST OR MOTORIST

OUR LIGHTEST AND MOST COMPACT PORTABLE

Amateur Wireless

Every
Thursday 3^d

and
Radiovision

Vol. XX. No. 521

Saturday, June 4, 1932

The HIKER'S
2

MOST
EASILY-
CARRIED
PORTABLE
YET!

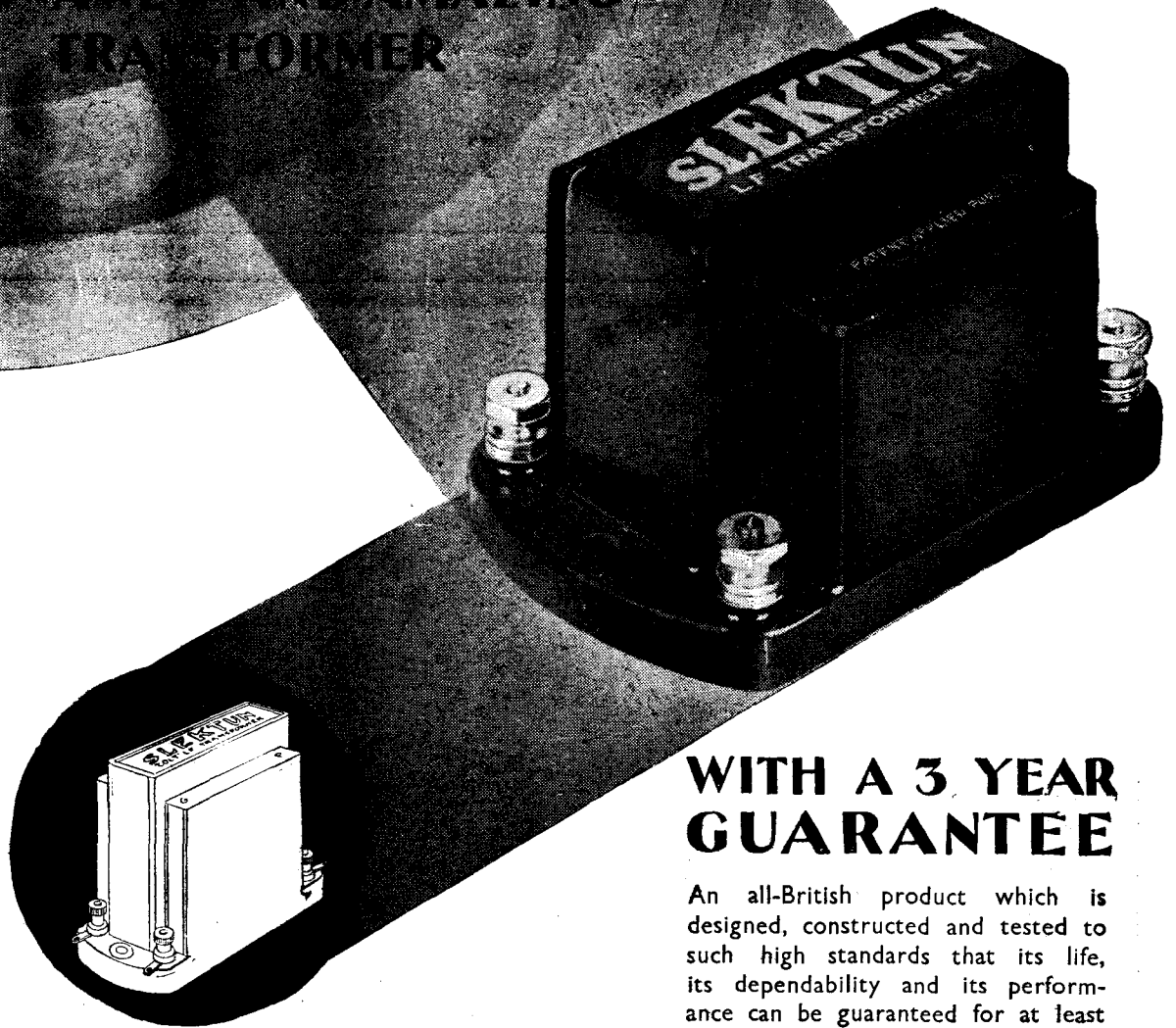
The illustration shows a man and a woman walking away from the viewer. The man is carrying a large rectangular box on his back, which is the portable radio device. The woman is carrying a smaller bag. The background is a simple landscape with a horizon line. The text 'The HIKER'S' is written in a large, stylized font at the top, and '2' is written in a very large, bold font to the right of the radio device. Below the radio device, the text 'MOST EASILY-CARRIED PORTABLE YET!' is written in a smaller, bold font.

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

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NEWS & GOSSIP OF THE WEEK

A NEW "A.W." RECEIVER

A Set for Hikers

"A.W." OFFERS this week an excellent companion for cross-country tramps! It is a little self-contained set which can be strapped on the back and will give B.B.C. reception, no matter where the hike may end. Full details are in the middle pages this week.

"A.W." IN SCOTLAND

At the Falkirk Station

WHEN the new Falkirk station was given its informal opening, "A.W." representatives went up to Scotland at the invitation of the B.B.C., and a special article on the Scottish Regional transmitter is given on page 947. The presence of a high-power station midway between Glasgow

and Edinburgh will revolutionise Scottish broadcasting and, incidentally, provide a strong signal in London. The umbrella type aerial of Falkirk radiates well.

I.B.U. MEETING AT MONTREUX

STARTING on June 1 is the annual meeting of the International Broadcasting Union, attended by B.B.C. representatives including Admiral Carpendale and Mr. Noel Ashbridge. At this meeting the usual routine matters are being discussed, and it is expected that final comments on the forthcoming Madrid conference will be made.

WONDERFUL NEW "MIKE"

At Broadcasting House

AFTER hearing the new Western Electric microphone recently at Broad-

casting House, a senior B.B.C. musician remarked: "This has transformed wireless reproduction from a copy to the real thing!" So great is the enthusiasm for the new "mike," which is of the condenser type, that it was hastily rushed over to No. 10 studio for last Sunday's concert. Did you notice the improvement?

BETTER BROADCAST QUALITY

SINCE the change-over from Savoy Hill to Broadcasting House took place there has been a great improvement in the quality of the transmissions, largely on account of the better acoustics, but also through the extensive use of condenser microphones, which are now used almost all the time for musical items.

VAL ROSING'S ABSENCE

HENRY HALL'S broadcasts during the last week have been done without Val Rosing, the new band's vocalist. He has been down with tonsillitis, and during his absence, Jack Plant, of the Savoy Orpheans, has deputised; so has Frank Wilson, the trumpeter.

ULTRA-SHORT TRANSMISSIONS

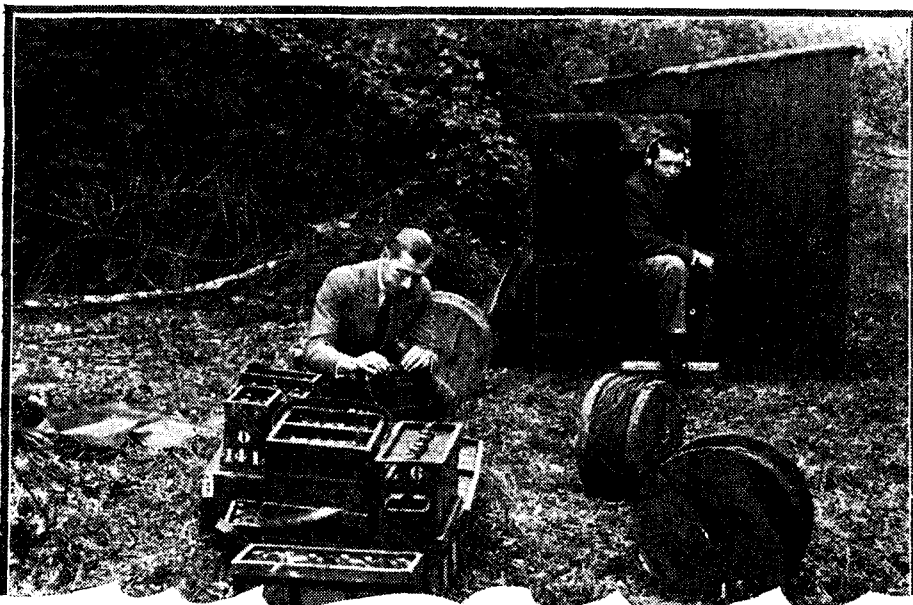
On Seven Metres

ALREADY the aerials for the 7-metre transmitter are on top of Broadcasting House. These are of the half-wave type, consisting of vertical wires suspended between a short horizontal span. The transmitter is also getting on, and is now ready for power and circuit tests. Questioned as to the probable date of test transmissions, the short-wave expert said: "We shan't be long now!" On the contrary—ultra short!

ECHO ANSWERS NO!

SO good are the acoustics of the new studios at Broadcasting House that up to the present not one of the seven small echo studios has been utilised. Apparently the amount of echo, or more accurately reverberation period, is just right without the need for artificial echo.

READY FOR THE BIRDIES!



B.B.C. engineers busy fixing up the microphones for the nightingale broadcast from Pangbourne, in Berkshire

NEXT WEEK: AN ALL-ELECTRIC TWO AT A REMARKABLY LOW PRICE!

NEWS & GOSSIP OF THE WEEK — Continued

THOSE FIVE LIGHTS

VISITORS to Broadcasting House have commented on the five coloured lights above each studio door. Each has a definite message. Red means transmission in progress; blue means that a rehearsal is going on; green is a cue light, warning the occupants of the studio that their turn is next; white means that the control room is calling; and finally yellow means that the studio is booked.

ALDERSHOT TATTOO

A Good Outside Broadcast

YEAR after year B.B.C. engineers have had to lay new cables under the arena for the relay of the tattoo at Aldershot. But this year, thanks to precautions taken last year, the existing cables will serve. They consist of armoured cable buried a foot or more in the ground, and tests show that after a year they are still as good as when first laid.

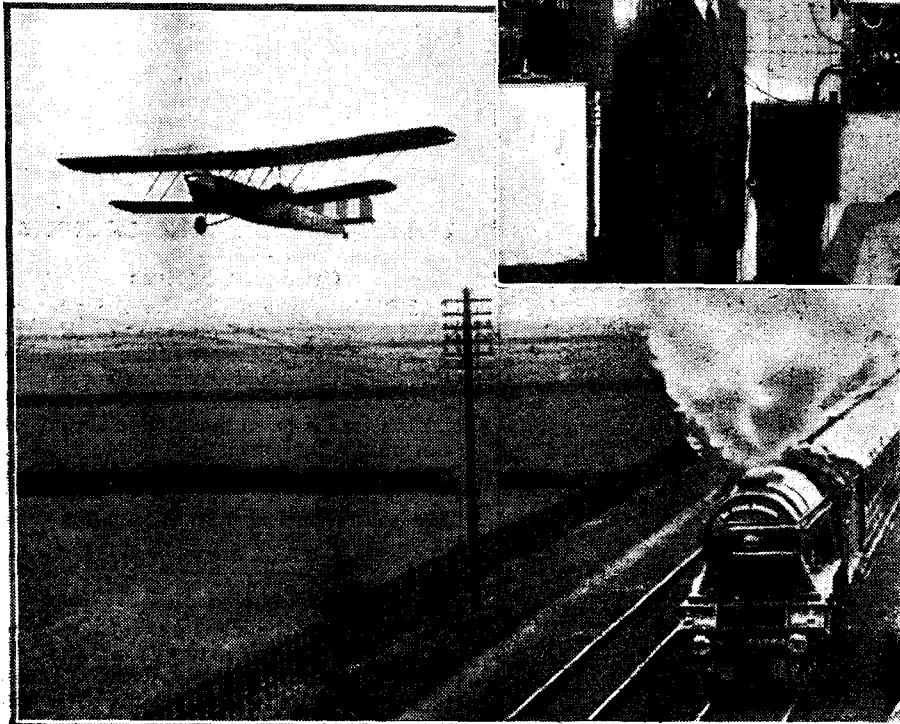
TELEVISION AT THE B.B.C.

From the New Studios

REGULAR transmissions of Baird television will shortly cease from the B.B.C. during the moving of the apparatus from No. 10 studio to Broadcasting House. The small BB studio in the basement has been appropriated for television experiments, which will be carried out by B.B.C. engineers.

MUSIC HALL PROGRAMME

JACK FRYER, one of the B.B.C.'s oldest producers, is trying out the music-hall idea in a special programme to be broadcast from No. 10 studio on June 11.



As described in an accompanying paragraph radio conversation was recently possible between the "Flying Scotsman" and an Imperial Airways air liner. (Inset) the transmitter in the train

IN THE NORTH

Droitwich Tests

TESTS of sites around Droitwich have now been completed by B.B.C. engineers, who are at the moment comparing their field-strength measurements before making a final choice. The new site will accommodate the super-power long-wave National station, as well as a 50-kilowatt transmitter for Midland Regional.

TRAIN AND PLANE RADIO

A New Record

WHILE "A.W." representatives were testing reception conditions in Glasgow last week-end, they saw the giant Imperial Airways liner *Hevacles*, in which passengers flying up to Renfrew were able to speak by wireless to the Flying Scotsman. Two-way conversation between train and aeroplane was achieved for the first time. Automatic volume control was used, so that there was practically no fading. It is understood that secret tests were made for several weeks before the final demonstration.

RADIO AIR DANCING

ANOTHER kind of adventure in the air is being carried out by Flight-Lieut. Turner Hughes, who is flying a Comper-Swift aeroplane in Sir Alan Cobham's air display, which is now touring the country. By means of a short-wave set in the plane, Turner Hughes can listen to music broad-

cast from the ground and make the machine loop, roll, and spin in time with the aerodrome dance band!

A CRYSTAL-WORKED SPEAKER

Doing Without Magnets!

IN a new Midget set which has been produced by Newark engineers, a crystal-operated speaker is used. Vibration of rochelle salt crystals when under voltage strain is used to work the speaker diaphragm. This is a very old radio principle now coming to light again and it will be interesting to see if the American engineers have managed to get more volume out of this type of speaker than was possible in the old days in laboratory experiments.

A ROYAL INSPECTION

PROBABLY in July, there will be a Royal inspection of Broadcasting House; it is hoped that His Majesty the King will be present, with other members of the Royal Family. Meanwhile, three days in June are being set aside for visits by 600 members of the House of Commons.

TOO MANY S.O.S. CALLS?

Cutting Them Down

THE B.B.C. is rather concerned with the great increase in the number of S.O.S. messages it is called upon to broadcast, and we understand that the whole question of special service broadcasting is under review.

The trouble is that the various minorities catered for by the many special bulletins are apt to become extremely vocal when any attempt is made to curtail such broadcasts. But the axe is in the air!

AN "O.B." DAY

SATURDAY afternoon, June 25, will provide listeners with a succession of high lights in outside broadcasts. First, an eye-witness account of the Test Match, England v. All India, by Howard Marshall, will be relayed from Lord's Cricket Ground. A running commentary on the Shelsley Walsh Hill Climbing Trials follows; then a commentary on the sailing of M.V. *Georgic* will be relayed from Liverpool, via North Regional; next comes the popular annual event, a running commentary on the Royal Air Force Pageant from Hendon and finally a commentary by Captain H. B. T. Wakelam and Colonel R. H. Brand on the All-England lawn tennis championship meeting at Wimbledon.

A recital of organ music by modern German composers is to be played by Herbert Westerby on the organ of the Grosvenor Hall, Belfast, on June 17.

Percy Fletcher's suite, "Sylvan Scenes," is to be played by the Belfast Wireless Orchestra in a concert of light music which will be broadcast on the afternoon of June 16.

"A.W." VISITS The NEW SCOTTISH REGIONAL

This station, the latest in the B.B.C. Regional Scheme, is now working on 376.4 metres during programme hours

At the invitation of the B.B.C. our special Commissioner visited the new Westerglen station last Friday. This description of the latest addition to the Regional Scheme will interest listeners all over the country

THE new Scottish Regional Station, when it gets into its full swing, will revolutionise wireless reception in Scotland, and so I accepted the B.B.C. invitation to visit the Westerglen transmitter with more than usual interest. Also, as this is the third 60-kilowatt in the B.B.C. Regional Scheme chain I was anxious to

of the engineers that the actual improvements are of a minor nature, and the main outline of the twin transmitters I recently saw at Westerglen is the same as that of the two preceding stations.

The station is built of local grey stone, striking a characteristic note. The station plan is roughly that of Brookmans Park.

The aerials, of course, are vastly different. There are only two masts. Each supports an umbrella type of aerial consisting of three cables stretched from the top of the masts to points near the ground. There are the usual twin feeder lines running out to each aerial, and the familiar little white stone huts at the foot of each mast, housing the aerial coupling transformer.

The site is about 500 feet above sea level. The masts are 500 feet high. It is not to be wondered at that there is a good signal. Red lights glow at night above the

rooms, store rooms, offices and test rooms as at the other two stations.

At the moment only the Regional side of the transmitter is working; that is, the set of panels and control desk on the right of the hall approaching from the entrance. The familiar tall windows of the London station transmitter hall are missing. The room is lighted from a dome in the roof, and the engineer in charge said that this reduced dazzle and eye strain.

Ample Checking Equipment

Scottish Regional is being subjected to stringent tests. At each control desk there are the main meters showing the water-flow, main H.T. voltages, drive and modulator voltages. A reading of all the main indicators is taken *every hour*, while the transmitter is working, and full entries are made in a log book. Each of the big water-cooled valves I saw, has its own H.T. volts and grid bias meters. The need for these was explained by the fact that when these valves become "soft" after many hours' working, the reading on the local H.T. meter will drop, and the fault will be indicated at once.

There are the usual precautions against breakdown, and against the operators getting fatal electrical shocks. In every valve stage except the last, spare valves can be brought in simply at the touch of

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The transmitter hall at the new Scottish Regional station

make comparisons between Brookmans Park, North Regional and Westerglen.

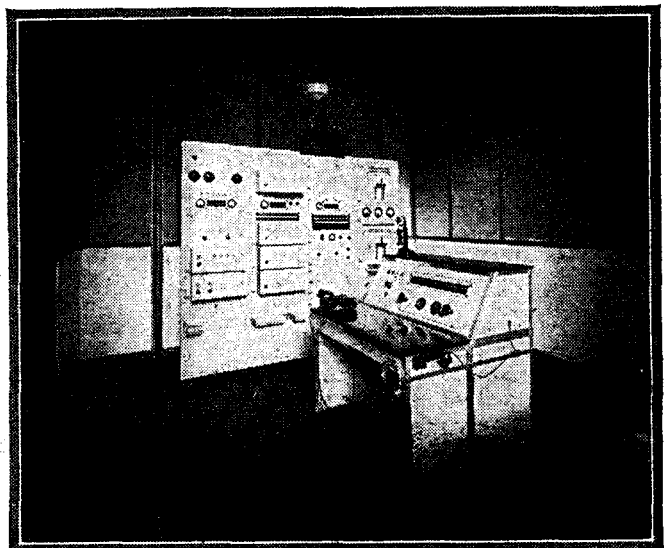
B.B.C. engineers spent many months in the district trying out possible radiation centres with the travelling van transmitter, and they have certainly chosen a good site at Westerglen. The new station is on very high ground overlooking the busy town of Falkirk. There are certainly more houses in the immediate neighbourhood than there are at Slaithwaite or Potters Bar, and these people will already be experiencing a wipe-out unless special methods are adopted. The station is about thirty miles out of Edinburgh, and is about half-way to Glasgow, though not in the direct path.

The Most Up-to-date Station

In every way the latest B.B.C. "baby" is an improvement on the London and Northern stations, as the B.B.C. has, of course, gained much experience in the actual working of the existing centres. It is nevertheless a tribute to the foresight

masts as a warning to aircraft. Four pillars of insulating material keep the masts above earth potential, as this avoids mast "shadow" which creates a directional effect. Before going into the station building I was shown the valve water-cooling arrangements which are like those at Brookmans Park, it not being considered necessary to construct a huge water pool as was done at Slaithwaite.

The main building comprises the engine room, battery room, machine room, and transmitter hall. In addition there are the same type of control



The control desk and amplifiers in the control room

WHAT IT IS FOR

The Differential Reaction Condenser

THE reaction condenser is only a part of the complete reaction circuit in the usual coil-and-condenser arrangement. Looking at Fig. 1 you will see that the reaction condenser is connected in series with the reaction coil across the anode and earth. The reaction coil is coupled by a fixed degree to the tuning coil, and the amount of high-frequency current flowing through the reaction system is controlled by the setting of the reaction condenser.

It will be appreciated that when the plates of the reaction condenser are out of mesh—minimum capacity—the current flowing through the reaction system is practically nil. But for various reasons we must see that some of the high-frequency current is by-passed to earth, irrespective of the reaction requirements.

For this reason there is usually an additional capacity fitted between the anode and earth, as indicated by the fixed condenser of Fig. 1. With this in circuit there is always sufficient anode by-pass of high-frequency current to earth to ensure good detection.

Which brings us to what the differential reaction condenser is for. Look at Fig. 2, which shows this special type of condenser in circuit. The main function of the differential is to provide the

constant anode by-pass without the need for a separate fixed condenser.

In fact, the differential reaction condenser is really two condensers, consisting of two sets of fixed plates and a common set of moving plates. The condenser is so built that as the moving plates come out of mesh with one set of fixed plates, they go into mesh with the same amount with the remaining set of

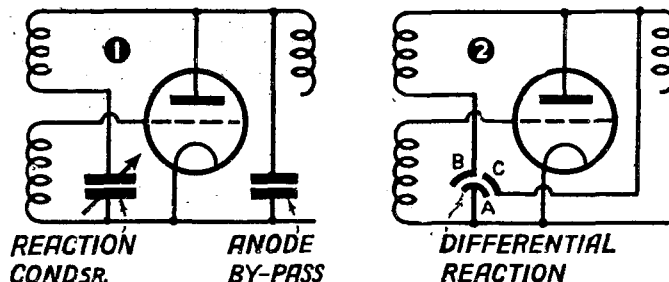
reaction condenser. The moving plates are connected to earth, one fixed-plate connection goes to the reaction coil and the other fixed-plate connection goes to the anode.

It is easiest to consider the differential as two separate condensers, one being the anode by-pass CA and the other being the reaction condenser BA. As the plates A engage with the plates B, the reaction condenser capacity is increased, and more current will flow through the reaction system. At the same time, though, the plates A will be coming away from the plates C, so that the anode by-pass capacity will be decreased.

Actually the by-pass of high-frequency current to earth will be constant, because what is lost through CA will be made up through the coil and BA. Conversely, when the reaction capacity BA is reduced, thus reducing the amount of reaction applied to the tuning coil, the anode by-pass capacity CA will be increased.

The usual capacity for a reaction condenser is between .0001- and .0003-microfarad, and these values may be used with the differential type of condenser. While a .0001-microfarad might give ample reaction, this might not be enough for efficient anode by-passing.

HOTSPOT.



These two circuits show the main function of reaction and anode by-pass circuits used with the detector. Fig. 1 shows how a normal type of reaction condenser is used with a fixed by-pass condenser. Fig. 2 shows how a differential type of reaction condenser obviates the need for the fixed condenser.

fixed plates.

This means that the capacity of one condenser circuit can be decreased by the same amount the capacity of the other condenser circuit is increased. Such a condition is eminently useful in a reaction circuit, as can be seen from a study of the Fig. 2 arrangement.

Here is shown one of several possible ways of connecting up a differential

“A.W.” VISITS THE NEW SCOTTISH REGIONAL

(Continued from preceding page)

a switch control. In some of the panels this single switch is time-lagged, and brings in the filament, grid and high-voltage circuits in their proper order, giving the filament of the reserve valve time to warm up before the working H.T. voltage is switched on. The panels are interlocked so that no electrically live parts can be touched while the power is on. Immediately the interlocking switches are turned off, the safety doors can be opened. All the main condensers are automatically “shorted” and discharged, too, so that even this danger is removed.

Above the hall are the emergency studio and test room. Special cables connect the station with Glasgow and Edinburgh, so that the studio will normally be used only for testing. The apparatus testing room is now being fitted out. It will have a relay receiver for use on the National programme from 5XX if the landlines break down and cathode-ray oscillograph testing apparatus.

Before going through to the machine and Diesel engine rooms I asked the engineer why the B.B.C. had installed generating plant when the high-voltage cables of the grid system run right by the Westerglen site, and it would have been possible to

take an A.C. supply direct. The effective answer came that taking into account all overheads, running costs and depreciation of plant, the B.B.C. can manufacture its own power for only approximately $\frac{3}{4}$ d. a unit! Furthermore, with Diesel engines and D.C. generators it is possible to have storage batteries and a consequent means of preventing breakdown for an hour or more.

Big Oil Engines

Four heavy-oil engines give the power for the whole station. These provide the heating as well as the electrical power and lighting, for the exhaust gas is used to heat a small water boiler! These huge engines drive 230-volt direct-current generators, and in another part of the building this 230-volt supply is stepped up or down by rotary converters for each circuit. In the battery room there are 2,000-a.h. storage batteries which are capable of taking over the job of running the whole station.

The big water-cooled valves want 12,000 volts H.T.! That has been a problem, because while it is easy to build a dynamo giving this voltage when the current is small, there are apt to be sparks flying when a current of 16 amperes or so is wanted! The engineers have overcome this difficulty by building each machine in four sections with four separate commutators. Each handles 3,000 volts above the next, so that the risk of “shorts” is

practically nil. The machines, of course, are immense. There are three of them, one being for each transmitter, and the third as a spare. Little pipes run from parts of each machine to meters near the safety railings which surround them. These are remote-reading thermometers which tell if the bearings are running hot. The remote readings are necessary because the safety gates cannot be opened for the control man to get at a generator without the power energising supply being automatically cut off.

A chat with an Edinburgh B.B.C. Station official told me what plans are in store when Scottish Regional is in full programme operation in a week or so. The service area of Falkirk will enable the B.B.C. to shut down the Glasgow, Edinburgh and Dundee transmitters. Westerglen was working on 376.4 metres on the occasion of my visit, and I am told that the National will be on 288.5 metres. Westerglen is now working with its normal power, but I saw that there was one valve spare in each of the final push-pull sections.

Altogether Westerglen impresses one as a job thoroughly well done, and as a natural development of the experience gained with the two preceding stations. B.B.C. engineers who have worked during long and tedious hours to get Westerglen going according to schedule deserve to be congratulated.

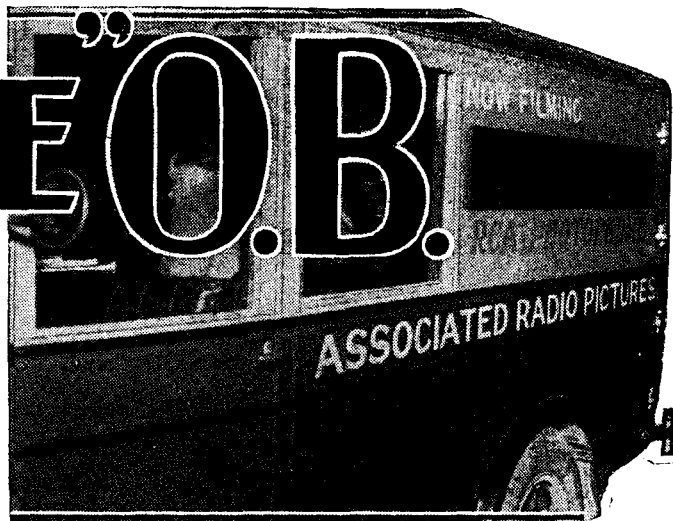
The "TALKIE" O.B.

Here is an account, by a cinema engineer, of how an outside talkie film is made by means of special portable recording equipment

NIGHT has fallen, and Limehouse lies wrapped in its enveloping folds. The pitter-pat of Oriental feet has ceased, and the only sound borne on the still air is the murmur of the river as it swirls its oily way past the mysterious and gloomy craft moored to the shore. Not even the measured beat of the police patrol can be heard, and quiet, profound and eerie, reigns over all. Suddenly, the uncanny stillness is disturbed by an alien noise—the unwonted silence of that sinister spot is broken. Away down the river, in the distance can be heard the "chug-chug" of a motor-boat. The policeman standing in the shadow of a doorway pricks up his ears. The noise does not sound like a police-launch, and he is curious to know whence it comes. Moving to the edge of the wharf, a strange sight meets his eyes.

lost to view. What he had just seen, and failed to recognise at first, was—a Talkie O.B.

Let us follow this strange assortment down the river. Round that bend, where we had lost sight of them, we find them halted. "O.K., boys?" asks one on the second boat. "O.K. for me," says an individual who seems to be nursing the machine-gun—only it isn't a machine gun we see—it's a movie camera. "O.K. for sound?" calls the first man to someone else. "O.K." comes the reply. Coming nearer, we see and understand all. The "policemen" are actors all "made-up," and looking just like the real thing. In



Checking the modulation in the truck. The back of the power panel can be seen through the window

than the rest of the outfit, let us find the recording engineer, and talk to him—or rather persuade him to talk to us.

We find him just emerging from the van in the centre boat, and as operations seem to be temporarily suspended, he is quite ready to explain things to us.

"This," he begins, "is the part of a talkie which corresponds to the O.B. in the broadcast programme. As much of the picture as possible is shot in the studio. It is a very expensive undertaking to shoot exteriors, and all possible shots—even apparent exterior scenes, are done inside, on the "floor." Sometimes, however, we come across scenes that cannot be faked on a "set"—such as this one we have just done. We are doing a down-river chase by river police of some criminals, and this includes a great amount of dialogue with a river background."

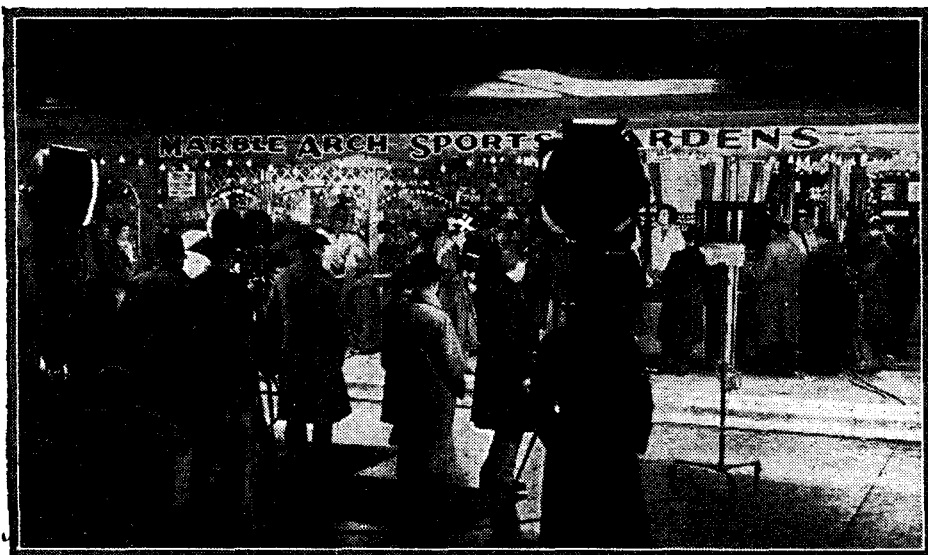
Compact Amplifiers

"On occasions such as this, we use, of course, a special portable recording equipment. This is really a replica of the apparatus used in the studio, mounted in special vans, or trucks, as we call them. These particular trucks—which are of American origin, are made as small as possible as is compatible with the amount of gear to be fitted in them.

"The trucks are very handy, and in spite of their weight are exceedingly fast—they will do 60 m.p.h. if necessary, with perfect safety for the delicate apparatus inside! Look inside this one—the recording truck. You will see there is an amplifier rack, containing the amplifiers—two sound recording machines (one for emergency use), a power control panel, and a complete set of spares of everything. Six microphones are carried in special compartments, and 6,000 feet of film in magazines, to say nothing of portable amplifiers, microphone tripods, and a host of accessories. All these things are stored away in their appropriate places, ready for use when wanted. The power for driving the recorder and the picture cameras is supplied from the power truck, which is over on the other boat.

"At the back of the truck are six iron drums of cable. These are used for connecting the microphones and camera

(Continued at foot of next page)



AN EXAMPLE OF A TALKIE "O.B." Note the assistant (x) carrying the microphone, in the centre of the picture. He follows one of the principals in a "tracking" shot, keeping just out of the range of the camera. The use of the "concentrator" or directional microphone was impracticable in the shot. On a similar occasion, the microphone was carried under the assistant's arm, out of sight, and he was actually in the picture, mingling with the crowd

In the middle of the river, bathed in a glaring white light is a launch, packed with policemen. Behind the launch is a second craft containing more men—strange men, all silent, gazing with terrific concentration at the launch in front. Heavens! Is that a machine-gun in the second boat—and what is that in a third vessel bringing up the rear? The policeman on the wharf is just about to turn and run to the nearest 'phone, when a smile breaks over his face. His manner relaxes, and he follows with interest the strange procession till it passes round a bend in the river and is

the second boat are the director, camera men, sound recording engineers, and property men. They are all perched up on top of what appears to be a van—yes, so it is. It is a van—it must have been slung on to that boat—they certainly couldn't drive it along the gangway very easily! In the third boat is a second van, similar to the first, and now we see what we missed before—there is a thick rubber-covered cable connecting the two vans. Inscriptions on the sides of the vans tell us that they house all the sound-recording apparatus, and as this intrigues us more

Some Notes on Present-

day Short-wave Conditions

Around the Short-wave Dial



DURING the past few weeks, reception conditions on the short waves have shown a tremendous improvement; at the time of writing, it is quite correct to say that conditions are better than they have been at any time since last summer. The American stations have increased in strength and a few days ago, the writer heard the old short-wave favourite—W2XAD—at a greater strength than at any time during the last six months. W1XAZ, at Boston, working on 31.36 metres, has also been excellent. This station is on the air every night and generally provides a good alternative to the programme material heard from the WGY stations. Faint signals have also been heard from what is presumed to be W3XAU at Philadelphia on 31.28 metres. The commercial telephone station at Sydney, VLK, on 28.8 metres, has also been heard fairly well in the early mornings.

According to the *New York Sun*, the WGY relay stations are now working on a new schedule, for the summer months. W2XAD on 15.330 kilocycles operates daily, except Saturday and Sunday, from 9 to 12 p.m. B.S.T., and on Saturdays and

Sundays transmissions are from 7 to 12 p.m. W2XAF on 9.530 kilocycles, is on daily from 11 to 5 a.m. W2XAD uses an aerial system directed towards Europe, whilst W2XAF is now using an aerial system directed towards South America. The effect of this directive aerial system on the W2XAF transmitter is to cut the signal strength down by about half in England. The directive aerial is apparently not always in use, however, as this station is still occasionally heard at excellent strength.

Directive Effects

The writer has found that the directive aerial is apparently in use on the occasions when the strength of this station's transmitter is approximately equal to that of W1XAZ. On the occasions when W2XAF is greatly louder than W1XAZ, it can be assumed that the directive aerial is *not* in use. This year, apparently for the first time, the two transmitters, W2XAD and W2XAF, will both be on the air at the same time for one hour daily—from 11 to 12 p.m. B.S.T.

The European stations have also been showing up very well lately. The German

Kurzwellensender has recently been heard coming over at enormous strength on his lower wave of 19.737 metres. Reception of this wavelength is apparently much clearer than that of the longer wave transmitter, modulation being very much better. This station is apparently working occasionally simultaneously on both wavelengths.

Of the Russians, Moscow RW59, on 50 metres, has been his usual self, and those who have heard the strength of this station's transmission will know what that means; REN, on 46.6 metres, has also been very good at times and another station, presumably RW3KAA at Leningrad, on 36 metres, has also been quite good, though rather distorted. The mysterious interference which effectively jammed most of the transmissions from the RW59 station has now apparently ceased.

And so, after about six months of very poor and unreliable reception conditions below 50 metres, it now appears as though things are going to be considerably brighter, and it is quite possible that we are in for a summer of really good short-wave conditions.

THE TALKIE "O.B."

(Continued from previous page)

motors to the truck. All connections are made with multi-pin plugs, so that to connect up the apparatus for use does not take more than a few minutes. For exterior work of this nature, it is often impracticable to have to sling microphones over the players, as is done in the studio, and the microphone boom, or derrick, is too cumbersome to bring with us. In this case, we use a directional microphone. This is nothing more than a very large saucer-shaped structure, measuring up to 6 feet in diameter. It is parabolic in section, and is exactly like an enlarged motor head-lamp reflector. In the centre of this, and at the focal point of the parabola, is mounted an ordinary condenser microphone facing the reflector.

The working range of these directional microphones is considerable. Using the largest of them, it is possible to pick up the ticking of a man's wrist-watch at 20 ft! All that it is necessary to do with this collector is to mount it on the top of the truck, on a special support, by means of which it can be swivelled round, and the sound is picked up from wherever it is desired.

Let us now have a look at the second truck—the power truck. In here is a petrol engine, complete with self-starter. This engine drives two generators, one giving about 18 volts, and the other about 130 volts. These are used for charging batteries. A bank of accumulators, totalling 110 volts, is used for driving the motor alternator which supplies power for the machines. This alternator runs in a

silence cabinet, and is started up with an automatic starter. If desired, the petrol engine may be used to start it, the driving power afterwards being taken from the batteries. Thus, for working, a cable is connected between the two trucks, the alternator is started up, and we are off. The power for the picture lighting is provided by a separate power truck, which, in the case of to-night's work, is operating on the shore. All the power for lighting is direct current, and that for driving the motors is alternating.

"It is possible to drive the recording trucks along, with the microphone on top, and the cameras mounted on the tail-board of the recording truck, and record and photograph a moving object. For instance, if you saw the film *Sally in our Alley*, you may remember that at the beginning of the picture you see a horse and trap moving along a country lane, with Sally and her boy friend sitting talking in the trap. The dialogue in this case was recorded by means of these trucks.

"Another 'O.B.' which we did recently was one in a 'Fun Fair,' near Marble Arch. In the picture, *The Sign of Four*, the hero and heroine spend some time in the fun fair, and the girl is eventually kidnapped there. We took all our apparatus down to the fair, and worked there several nights, with a special crowd of extras. The sound trucks were left out in the street, with cables running into the fair. Here are two pictures taken on that occasion, one of the recording truck, showing an engineer watching the modulation during the shooting of a scene, and

the other showing the interior of the fun fair, with the special lights that had to be rigged up. In this picture, one of the recording staff is mingling with the crowd, and carrying a microphone.

"On the whole," concludes our informant, "this business of exterior sound shooting is fraught with very many difficulties—we have far more preparations to make, with the cameras and lights, than the B.B.C. have with its O.B.s.—and, as I have said, it is only embarked upon when no other course is open to us. Last summer we had to spend two weeks on the Grand Union Canal, near Watford. There, the business of recording dialogue spoken on the boats was greatly simplified by the use of the directional microphone. Incidentally, our experience on that picture showed us that when using this microphone near water, great care was necessary to avoid some unpleasant distortion, caused by the reflection of the sound waves from the surface of the water.

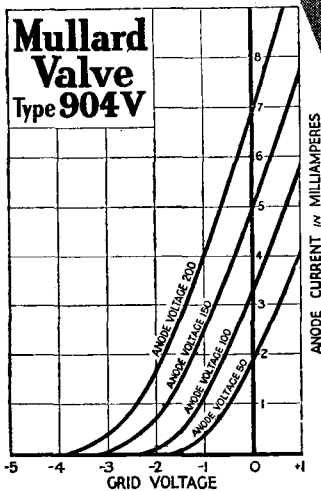
"Well, things seem to be moving again, so I suppose I must get busy once more."

Our informant smiles and disappears into the sound truck, and we regretfully say good-bye. Anyway, it's late and cold, and it's more comfortable in bed than standing about by the river at this time of night. Let us leave these strange people, and go home to bed. In a few months time, we shall see and hear at our local cinemas just what has been done to-night, and we shall be surprised to find that one complete night's work takes exactly one minute on the screen!

W. H. SWEENEY.

904V

RIGID UNIT CONSTRUCTION



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Heater Voltage 4.0V
 Heater Current 1.0A
 Maximum Anode Voltage 200V

CHARACTERISTICS.

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 Grid volts 0 2.2 mA/V
 (b) At anode volts 200,
 Grid volts 0 3.0 mA/V

PRICE 13/6

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- More accurate tuning
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- Better quality.

The 904V, with its rigid unit construction, is non-microphonic.

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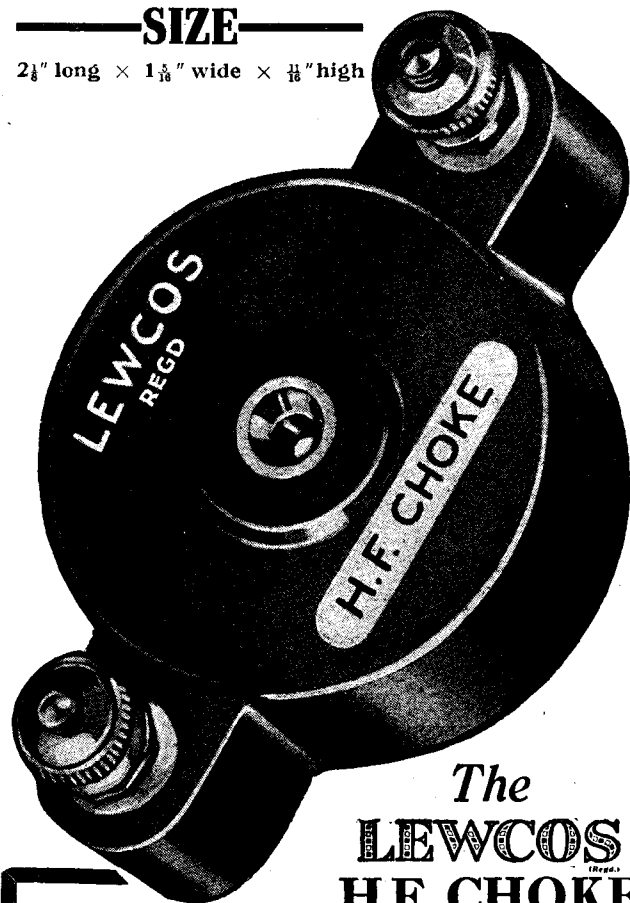
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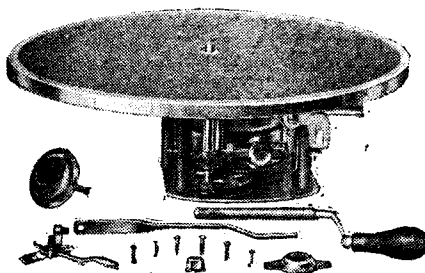
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Oh Your Wavleness!

THE VARIABLE-MU VALVE AND CROSS MODULATION

THE development of the variable-mu valve has been rather interesting. When this type of valve was first marketed it had a considerably lower mutual conductance than the ordinary screen-grid valve. This was partly because difficulty was experienced by the manufacturers in obtaining an easy graduation from the high-sensitivity characteristics around the normal working portion of the valve to the low-sensitivity tail on which the valve works when the bias is increased.

Any sudden change in the characteristics may give rise to rectification, and this produces the nasty effect known as cross modulation. Although the valve is not really made in two separate units, it behaves as if it were two valves connected in parallel, but the characteristics of each must be so arranged that they join up neatly and give a smooth progression from one to the other.

INCREASED SENSITIVITY

THE early valves could only approach this ideal with a comparatively low maximum sensitivity and the mutual conductance was of the order of one or a little more. These valves are quite useful for super-heterodyne sets, and multi-stage receivers where a large gain per stage is not required, but there was an immediate demand for a better valve for simple sets having only one stage of high-frequency amplification. Under these circumstances the difference in performance when using a multi-mu tube and an ordinary screen-grid valve was so marked that the manufacturers were forced to make a more sensitive type, having a maximum slope of between 2 and 3. This has now been done by several of the valve makers, and the valves are quite satisfactory in use. In ordinary sets using relatively inefficient tuning circuits, the difference between a valve having a sensitivity of 2 and one of 3 is barely noticeable, and the modern high slope variable-mu valve can be used in a simple receiver without danger of any serious loss of the signal strength, while on the other hand it presents the very useful advantages of smooth volume control and improved selectivity.

SHRILLS AND SQUEAKS

IT is quite a troublesome point to decide who has "normal" hearing and who has not. Quite apart from the mysterious faculty which distinguishes "the man that hath no music in his soul" from the rest of us, certain people seem to be deficient in what might be called frequency-range, particularly as regards the higher notes. For instance, it is

well known that the cry of the bat or the voice of the cricket is too shrill to be heard by everyone, and I suppose there are similar limitations at the lower end of the scale.

I was forcibly reminded of this the other day when listening to a new radiogram just installed by two brothers as their joint possession. They tried it out on some favourite records, but unfortunately the whole effect was spoilt, so far as I was concerned, by a persistent squeak from the pick-up, which, after a time, became a sheer agony. Yet, believe me, neither of the proud owners could hear it, nor would they be persuaded it was there. So I left it at that!

"MONITORING" A RADIO-PLAY

THE transmission of wireless drama is by no means so simple an affair as some listeners might imagine. Usually the "action" of the play is divided up between three or four different studios. One is devoted to the principal actors and the main dialogue, a second to incidental music, a third to off-stage effects, whilst a fourth is occasionally brought in to add special depth or resonance to certain passages, and so on. The various rooms are all linked up to a central control-panel, which is "monitored" by the producer, who fades one in and another out in proper sequence, and generally regulates the dramatic "atmosphere." As soon as one studio is out of action, a loud-speaker is automatically switched in to enable the performers there to keep in touch with what is going on elsewhere. Altogether quite an elaborate and tricky business.

WHEN CARRIER MEETS CARRIER

IT is, unfortunately, a common occurrence, even on a selective set, to get Mühlacker in the background of the London Regional programme. But there is rather a peculiar sequel to this which can be observed when the conditions are favourable. During short intervals in the Regional programme, when the carrier wave is not cut off, Mühlacker still remains in the far distance. But if the Regional shuts down, so that its carrier wave is no longer present, then Mühlacker suddenly jumps in strength, even if the tuning of the set is left exactly as it was.

The explanation is to be found in the effect of the Regional carrier on the detector valve. When both carriers are present, the stronger one "swings" the grid bias to and fro, so that the valve is only able to rectify the weaker programme intermittently, instead of continuously. This, of course, causes Mühlacker to fade away more than it otherwise would, though it comes back with a bump when the disturbing cause is removed.

OH! THOSE EXTRA VALVES

DURING the present season alone I have answered literally hundreds of letters from people who wanted to know how to add a valve to their existing sets. The desire for a little more sensitiveness or a little more power is quite understandable, but many people don't realise that adding a valve means rather more than just providing simply an extra valve holder and a high-frequency or low-frequency circuit to accompany it. The addition of a valve to a set is often a difficult business, since it may mean entirely altering the whole design. If you feel that you must add a valve, by far the best way is to build a separate high-frequency unit. An excellent design was published some time ago by AMATEUR WIRELESS, and I believe that particulars are still available. Unless you have a pretty good knowledge of wireless and are prepared to pull the set pretty well to pieces and re-design it, I would strongly advise you against trying to work another valve into your present cabinet. I have seen many a good set ruined in this way.

A WAY OUT

THERE is another way out of the difficulty which can sometimes be used. If the set whose distance-getting powers and volume you want to increase has only one low-frequency stage and uses a triode power valve for the output, it is often possible to substitute a pentode with but slight alterations in the wiring. The pentode, though, is rather a queer valve to work and has little ways of its own. I would certainly recommend that it should not be used without a choke-filter circuit, and if your present loud-speaker is designed for ordinary valves, you will require a special output transformer to enable it to do itself justice with a pentode. Properly used and given a fair chance, the pentode is capable of enormous amplification and any shrillness in the reproduction is very easily suppressed. Simply wire straight from the anode of the valve to earth a small condenser, and a variable resistance in series. The condenser may have a value of about .002 microfarad and a 50,000-ohm variable resistance is suitable. The effect of this combination is to reduce the relative strength of the high notes and, therefore, to make the bass more in evidence.

THE CONQUERING SUPER-HET

JUST about a couple of years ago, when the super-het. was thoroughly unpopular in this country, I wrote in these columns that I was quite sure that if a first-rate modern design were produced it would make a very wide appeal amongst listeners. Well, "A.W." brought out such designs, and I needn't tell you about the enormous popularity that they

On Your Wavelength! (continued)

have achieved. I have always been a believer in the super-het, and to-day I am a stronger supporter of it than ever. In fact, I will go so far as to prophesy that the super-het is the receiving set of the future. Nobody who has used an up-to-date "super" of the best kind would ever want to go back to the straight receiving set.

SOME WHY'S

THE super-het can give the selectivity that will be required on the broadcast band within the next couple of years. How many people realise that before that time, practically every individual wavelength between 250 and 550 metres will be occupied by a station with a rated power of at least 40-50 kilowatts. But that is what will happen, and many of the stations are already under construction. With the super-het, genuine knife-edge selectivity is obtainable and such selectivity can go hand in hand with fine quality. Next, though, is the question of simplicity of operation, and here the modern single-dial super-heterodyne stands almost in a class by itself. You have absolutely nothing to do but turn the knob and bring in the stations. One last reason why I believe so strongly in the future of the super-het is that it is eminently adapted for automatic volume control.

STILL GOING STRONG

IT is amazing to find how many really old sets are still in use and giving, in suitable localities, a pretty good account of themselves. In the last week or two I have come across half a dozen receivers built between four and seven years ago, all of which are doing extraordinarily well. Naturally, you cannot use an old set with any satisfaction in a locality close to a high-power twin station, for unless the set is something of a miracle its selectivity will not be adequate for modern conditions. But in the remoter parts of the country, where selectivity is not such a problem, old sets continue to pull in stations and to provide their owners with nightly entertainment. As a matter of fact, some oldish sets of the H.F., detector, and L.F. variety, with tuned-anode coupling between the detector and the H.F. valve, are much more selective than you might think. If the aerial is separately tuned and the coupling between the aerial coil and the grid coil is variable, the tuning is marvellously sharp, and quite wonderful things can be done with sets of this kind. Though you never see it nowadays, there is a lot to be said for the old triple-holder with swinging plug-in coils.

A SPOT OF BOTHER

THERE has, I see, been a little trouble between the G.P.O. and some of the people who run local broadcasting-on-tap services. In certain cases, finding that the B.B.C. programmes were a trifle dull or that the home stations were

silent, enterprising concerns have indulged in a little wired broadcasting on their own account. It is reported that relays of local events have also been given. Praiseworthy though such efforts may be in some ways, they unfortunately don't fall within the scope of the licences granted to such concerns, for any kind of broadcasting in this country is the monopoly of the B.B.C.

LONGER SHORT WAVES BEST

SOME time ago I wrote in these notes that, owing to the decline in the number and size of spots on the sun's face and to the fact that we are approaching a sunspot minimum, it seemed likely that reception at great distances would gradually deteriorate on wavelengths between about 16 and 30 metres, whilst at the same time improving upon wavelengths above 30 metres. I prophesied that before very long 45 metres might be the best of the short wavelengths and that eventually there might be a return to 60 metres or so as the best distance-getter amongst the wavelets. This certainly has been borne out by fact. Only on exceptional days now is much to be made of ordinary transmissions using wavelengths much below about 30 metres. The optimum wavelength is, in fact, increasing, and everything points to 45 metres as being about the best of the short wavelengths before very long. I think that ere the end of this summer we are very likely to find 60 metres a wonderful wavelength for long-distance short-wave wireless.

CONSTRUCTION BOOMING

IN some previous years there has been rather a dead season in wireless from about the end of March until well into September. Last year, AMATEUR WIRELESS electrified everyone by boldly launching a super-het in the off season and making a huge success of it. This year there has been practically no lull in constructional activities, and almost everyone I meet seems to be engaged either in altering an old set or, better still, in building a new one. I always say myself that this is the best time of year for constructional work, for when distant stations are at their weakest you really can test the sensitiveness of the apparatus that you build. Wireless ought to be an all-the-year-round hobby, and there is every sign that it very soon will be. We have, though, to reckon with that queer business, fashion, which regulates so many of our doings. Has it ever occurred to you how extraordinary it is that hoops make their appearance at one particular season and disappear very shortly? Tops, again, are fashionable with youngsters in March and April, but go clean out in May. I cannot see, myself, why you shouldn't whip a top or bowl a hoop just as well in any month of the year; but there it is. Anyhow, the old idea that summer wireless was pretty well useless is rapidly breaking down, and that is all to the good.

7-METRE POSSIBILITIES

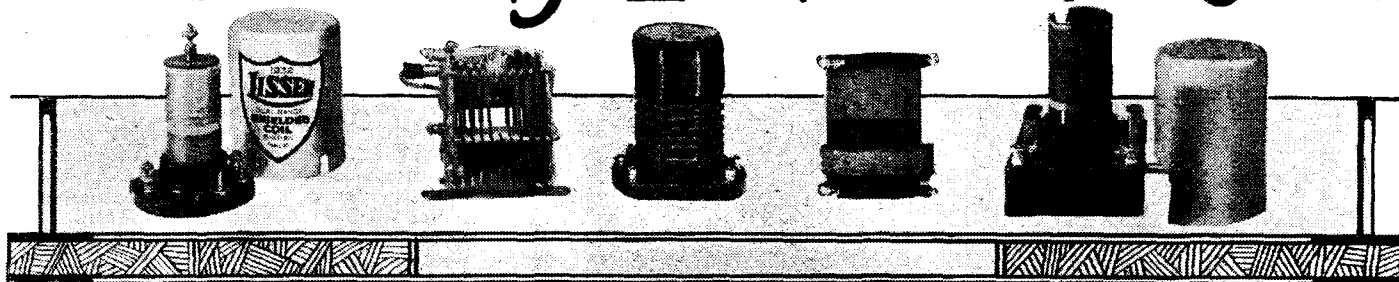
IT was suggested some time ago that, with their very limited range, 7-metre transmitters offered a possible way out of Europe's present wireless difficulties. On either medium or long waves a transmitter in Norway can very easily cause a heterodyne with one in Italy or Spain. The long and medium waves, in fact, know nothing of international boundaries, and there is no known means of preventing them from causing trouble in countries far from that in which they originate. But suppose that in, say, this country it was decided to scrap the high-power regional stations and to install in their stead a multitude of 7-metre transmitters. What would be the result? Each area would be adequately served by its own little transmitter, relaying the central programmes, but no station in this country would cause interference with any other, home or foreign. If the whole of Europe adopted the idea, heterodynes would cease to exist. I am afraid, though, that it is too good to be true, since literally thousands of transmitting stations would be required in this country alone, and the cost of the necessary balanced land lines with their associated amplifiers would be prohibitive. Nor has it yet been definitely established that 7-metre waves do not crop up again some hundreds of miles away from the transmitter, having indulged in a super-skip.

NOW THEN, SWITCH MAKERS

THERE are some excellent radiogram switches on the market. You know the kind of thing that I mean: it's a three-position switch lettered "Radio," "Off," and "Gram." Most of them are well designed and do their job most effectively—except for one small, but rather important, point. Most sets nowadays have a high-frequency stage, of which, of course, no use is made when the gramophone department is in operation. What we badly want is a radiogram switch so designed that in the "Radio" position all valves are in action, whilst when it is turned over to "Gram" the high-frequency stages are automatically put out of action. There are two objections to leaving H.F. valves running. The first is that you are wasting both current and valve life; the second, that if the local station is very powerful, it may show a tendency to break through, even though the connection between the grid of the detector valve and its tuned circuit is severed by the switch. You can, of course, get rid of this by detuning, but one of the strong points of a good radiogram is that you leave the set tuned to the local station and can then go over in a moment from wireless to gramophone records or vice versa. There is very little difficulty about designing a switch of the kind suggested, and I am sure that any manufacturer who puts one on the market will do a roaring trade amongst home constructors.

THERMION.

The DESIGN of LONG-WAVE COILS



J. H. Reyner B.Sc., A.M.I.E.E. discusses the special considerations which govern the design of long-wave coils

THERE is quite a wide variation in the form of long-wave coils used for tuning in modern receivers. The coil or portion thereof intended to tune over the broadcast band is nearly always a simple single-layer solenoid. It has become generally accepted that this form of construction is the most efficient, and the actual design of the short-wave section is usually determined by other considerations, such as overall dimensions permissible.

Many Types

When one comes to examine the long-wave coil, however, there is considerable variation. One coil will be wound on a large diameter former in a number of slots. Another coil will be on quite a small former again with a slotted winding, running to as many as eight or ten slots. More recently there has been a tendency to somewhat simpler forms of winding, a plain bunched winding being arranged between two cheeks, as for example in the Harris Mascot coils, while in some of the manufactured sets one often finds coils little more than one inch diameter wound with quite fine wire, often embodying a honeycomb weave.

Solenoids are not in very great favour, although one occasionally finds them, sometimes of the single-layer variety, and sometimes with two or three layers. Out of all this array, which is the most satisfactory for modern conditions? In order to obtain data on this subject, I recently made a number of tests and some of the results of these experiments will prove interesting.

H.F. Resistances

The high-frequency resistance of a large number of different types of long-wave coil was measured, at a wavelength of 1,500 metres, which is in the middle of the customary long-wave band. It is well known that the effective resistance of a coil at radio frequencies is considerably greater than its simple D.C. resistance, owing to the presence of circulating currents in the wire of the coil itself, and also in the insulation between the turns, both of which absorb energy from the circuit. This additional loss occurs on the long waves as well as on the broadcast band, but not quite to the same extent. However, it is necessary definitely to measure the resistance at the frequency in question because the effective resistance is still several times as great as the high-frequency resistance, even at 1,500 metres.

The first coil tested was one which was known to have a good performance on the long waves—the Lotus dual-range coil. This coil is representative of quite a number of modern coils, and has a long-wave winding in slots on a bakelite former 2 in. in diameter. It proved to have a resistance of a little over 35 ohms. Now in order to interpret this one must obtain one's bearings. The important factor in a coil is the ratio of its resistance to the inductance. In this case the inductance is 2,100 microhenries, giving a ratio of R/L of .016 ohms per microhenry. How does this compare, for example, with a short-wave coil?

At 400 metres a typical fairly small-diameter solenoid would have a resistance of about 6 ohms. Assuming an inductance of 180 microhenries this gives us a ratio of R/L of .033 ohms per microhenry. The long-wave coil just considered, therefore, is distinctly better than the average short-wave coil.

Long-wave Coil Efficiency

In point of fact if the performance on the long waves is to be similar to that on the short waves, and if we assume an inductance of 2,000 microhenries, which is an average figure, then we can afford between 60 and 70 ohms high-frequency resistance in the long-wave coil. It is because our long-wave coils are often above par in this respect

that circuits are found to be more difficult to stabilise on the long waves, and that the performance generally is rather better in many cases than on the short-wave band.

The process which seems to be adopted is to reduce the efficiency of the long-wave coil to a value comparable with that on the short wave, so that the circuit is more or less of the same sensitivity on both wavebands. One cannot help feeling, however, that the trend of design is not as happy as it might be in this direction. A partial cheapening of the long-wave coil construction could perhaps be tolerated, but surely with a little more thought, the efficiency of the short-wave coils might reasonably be improved somewhat, so that the efficiency on both wavebands would still be comparable, but generally of a higher level than it is to-day.

However, to turn to the actual construction of long-wave coils, we have seen that the commonly used methods of winding in slots is quite an efficient construction. An even better construction is the triple-honeycomb formation adopted by the Igranic Company in their plug-in coil, and the standard 200 plug-in coil of this firm's manufacture has a high-frequency resistance of under 30 ohms. Both the forms of winding so far considered have been sectionalised. What is the result where a one-slot winding is used?

Some Experimental Tests

To test this, a coil was wound with 170 turns of 34 gauge wire, on a 2-in. former in a slot ¼ inch wide. A random winding was used, and the resistance proved to be 70 ohms. This is distinctly less efficient than the slotted winding, having in fact only 50 per cent. of the efficiency, but at the same time it is just on the border line of our limit, if we are content to have a long-wave circuit which is not more efficient than the medium wave.

The process was carried a little bit farther by winding a coil on a small primary bobbin, only 1½ in. outside diameter and ⅝ in. inside, the actual winding space being ¼ in. wide. This gave a resistance of 90 ohms, which is rather too great to give satisfactory results.

A single-layer solenoid wound with comparatively fine gauge wire was next tested, and that was found to have a high-frequency resistance of over 100 ohms, thereby showing that solenoid construction on a

(Continued at foot of next page)

SEPARATE SCREENING

Here is a good idea for big sets which are difficult to keep stable. Put



each high-frequency stage in a separate screening box, the valve and its coupling coil being grouped.

The Story of Broadcasting House

FIRST plans for Broadcasting House were laid down four years ago when it was realised that the B.B.C.'s activities were raising the Corporation to outgrow its Savoy Hill accommodation.

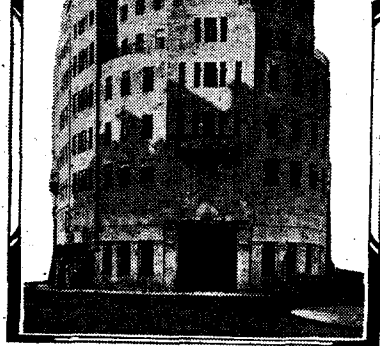
Almost at the same time the German Broadcasting Company embarked on a new Broadcasting Headquarters in the Berlin suburbs at Charlottenburg. The Reichs building, quite different in conception from our own Broadcasting House, was finished over a year ago. Those who have seen both affirm most definitely that although Germany has a larger principal Broadcasting House, the new B.B.C. building is in advance in technique.

Early Experiments

A further piece of history is that the Manchester Broadcasting House, opened two years ago, was the subject of much experimenting in ideas which have subsequently been incorporated in the London building.

Broadcasting House stands on the site of Foley House, built by a distinguished architect who was a contemporary of the Adam Brothers. The B.B.C. sent experts over Foley House before it was demolished and many of the old mantelpieces and fittings were sent to the Victoria and Albert Museum.

Then along came the great army of excavators, scaffolding experts, concrete mixers, and pneumatic drills. An architectural inferno was started which has only been quelled now



that the final decoration of Broadcasting House is complete.

Members of the B.B.C. staff had some satisfaction in that while the builders of the new Broadcasting House were making things uncomfortable for other Regent Street residents with their riveting machines and noisy drills, the demolition experts in connection with the Hotel Cecil and the Kingsway tram tunnel were making the same sort of noise outside Savoy Hill. Now, with most of the staff installed in Broadcasting House, all is again peace and quiet.

Practically every listener is aware of the ingenious scheme devised by the architect Lt.-Col. G. Val Myer, F.R.I.B.A., to insulate the studios from outside sounds, and how they were built in a tower surrounded by the offices.

The foundations caused a great deal of trouble because of traffic vibration and subsoil water. A huge tank constructed of brickwork had to be erected to take the whole strain of the building. This was covered with asphalt and so Broadcasting House literally floats like a ship on the subsoil water. Its external appearance also bears a striking resemblance to a ship. As with all new buildings it has been subjected to criticism on aesthetic grounds. Various considerations, such as height, imposed by the London Building Act (which affected the height

on the Portland Place side), and the three-sided mutual-covenant with residents on the Langham Street side (which resulted in the building being sloped back from above the fourth floor) all made it very difficult to make the building pleasing to the eye. Noted architects are agreed that Lt.-Col. Val Myer has made a very good job. He has worked in conjunction with Mr. M. T. Tudsbury, Civil Engineer to the B.B.C., and Dr. M. J. Rendall, as collaborators in artistic matters.

The architect himself is responsible for the design of the big concert hall studio and other noted architects and designers have been responsible for the decoration schemes of various studios.

Mr. Raymond McGrath and a special decoration committee have suggested designs and Mr. McGrath has been responsible for advising the B.B.C. on the treatment of the twenty-one other studios.

Mr. Eric Gill, the noted sculptor, is responsible for the groups, "The Broadcaster" and "Prospero and Ariel," which decorate the main entrance and the entrance hall. Mrs. Philip Trotter of the Warren Gallery designed the "Library Scheme" of one of the talks studios in a modernised Empire tradition. M. Chermayeff, the decorator of the Cambridge Theatre, was responsible for the military bands studio decoration.

Londoners should realise that in Broadcasting House they have not only a world-famous collection of studios, but a building of architectural merit.

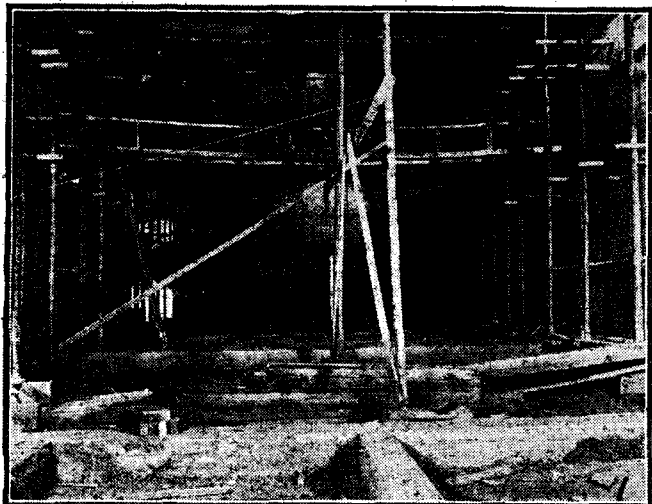
Some Remarkable Figures

Several amazing figures have come to light since the building was finished. For instance, it is estimated to weigh 24,000 tons and the length of the corridors is approximately one mile. When you have occasion to visit the studios and walk round some of the galleries outside the studio well, you will appreciate this point.

There are 1,250 stairs (but you will use the lift!) and 800 doors.

An idea of the utility of the twenty-two studios can be gauged from the fact that the central tower alone, when fully occupied, accommodates 1,700 people (including the concert hall, of course) and 134 tons of air an hour are pumped into the studio tower.

As one looks at the building from the steps of the Queen's Hall, the entrance hall is at the corner facing down towards Oxford Circus. Above this is the big Council Chamber and above this again is Sir John Reith's suite of offices with a balcony above the entrance.



The huge concert hall studio in Broadcasting House, at an early stage. The visitors' balcony at the far end is just taking shape

"THE DESIGN OF LONG-WAVE COILS"

(Continued from preceding page)

small diameter former is not very satisfactory. This is principally because D.C. resistance is high to start with, being 32 ohms in the particular case just considered. On the other hand another solenoid 2 in. in diameter and 3 in. long wound with 32 gauge wire proved to have a resistance of only 25 ohms, which shows that if one can afford the space to use a fairly bulky coil, the simple solenoid is quite efficient.

One point which was brought out in these tests was the danger of using cotton-

covered wire, unless the coil is well doped, or impregnated. Some coils which were tested were found to have a resistance of over 200 ohms. When they were baked out, however, this fell to a little over half its original value. Cotton is rather hygroscopic and absorbs moisture readily. Particularly on the long wavelengths the loss in the insulation of the coil and the wire is more important than the conductor resistance. Consequently any moisture in the insulation puts up the effective resistance considerably, and it is desirable to dope the coils for this reason. It may even be found that a former which is quite satisfactory

for the broadcast band introduces unreasonably large losses on the long waves.

One may sum up the test, therefore, by saying that the slotted winding is most efficient where compactness is required. Bunching the winding together tends to increase the resistance considerably, but that this may perhaps be tolerable in view of the fact that it is quite easy to wind a long-wave coil rather too good for normal requirements. Honeycomb winding is very satisfactory provided that it is also sectionalised, and presumably a long-wave coil built up on pancake formers would also be very good, although this was not tried.

Our Broadcast Critic

TALKS ABOUT

A ROMANTIC COMEDY



YVETTE D'ARNAC
A popular broadcaster

FAME IN A NIGHT proved to have considerable broadcasting value; it was one of the best shows of the year. The great point about it was that it had a definite plot, well worked out. I noted in the programme that the book and lyrics were by Denis Freeman, but that there were additional lyrics and music by Mark Lubbock.

I thought the music very suitable and not unattractive, the waltz, for example, was a very good tune. The additional lyrics were, in my opinion, not wanted. I may be wrong, but I take it that they consisted of all the songs not actually in the plot. Considering the play was about a young composer it seemed to me to be a pity to drag in extra songs. The music essential to the plot of the play was that supposedly written by Peter, the young composer.

This is another case of a production being spoilt by unwanted music. The plot was held up. That is one of the worst possible dramatic faults. The sooner the B.B.C. dramatic officials get over this mania for music in everything the better. At the moment they seem to have "rings on their fingers and bells on their toes."

The two short plays broadcast successively on the Wednesday night interested me from the dramatic and broadcasting point of view. *The P-Boat* was quite thrilling, and the sound effects extraordinarily good. This play kept the listener's attention focused on the mental vision of a patrol boat; one knew that the speakers were all officers on the boat itself. Consequently visualisation was a simple matter. I point to the value of plays that have a definite setting such as this.

Till Tomorrow was quite as easy to follow. There again it was because the scene was confined to a room in an inn in a small town in Argentina on a summer night. The characters were clearly defined—another essential to success. Above all, I appreciated the good English that was spoken throughout; it is a welcome change to hear a play broadcast in standard English rather than in dialect.

I listened to a good deal of vaudeville this week, making notes of some of the dialogue. I have long come to the conclusion that successful patter, comic dialogue, or whatever you choose to call it, can only result from careful work on the part of the comedians. Dialogue that will not bear writing down and being read in cold blood, so to speak, is not the kind, generally speaking, that makes for success.

The exception (to what I believe is a rule that should be obeyed) is the type of dialogue broadcast by Clapham and Dwyer. The construction of their performances is plain enough. Dwyer gives a lecture on some subject and Clapham "rags" it. In this case it is not actually what Clapham says—though his points are generally good—it is certainly the way he says it; the hesitation, particularly when he gets so tied up that he does not seem to know what he is trying to convey, is more than half the fun. Leonard Henry's style is also somewhat dependent on his voice, and that amusing chuckle of his. Apart from these instances, and possibly those of one or two more comedians, the lines themselves must be good.

Julian Rose was very funny the other night. He *does* assume a Jewish style, but that does not make half the fun in his

case. His lines were thought out well at the beginning; one could have read typescript of all he said and have laughed just as much as if one had heard him from the studio.

A name indistinctly announced was Ernest Butcher, but I think it must have been he. I liked his songs; when he finished by broadcasting a very well-produced top G, I came to the conclusion that he ought to use his voice to better advantage. Why not sing *all* his notes as well as he did that one?

That reminds me that Anne Croft has a good voice and is capable of singing in the accepted music-hall style. I rather felt that she was tried by the special nature of the studio walls. She sang sharp in the "Chocolate Soldier" waltz, and I feel sure that her voice sounded all wrong to *her* (as she sang) on account of the deadness of the studio.

All singers will have to take the greatest care in these new studios. They will have to realise that things are not what they sound, by any means; if they will comfort themselves with the thought that there is no need to strain and that the engineers in the control room will "tone them up" if they seem too weak, they will not spoil their transmissions. Miss Croft sang so well otherwise that I feel she will not mind my citing her case.

PROGRAMME POINTERS

It is now some time since the Surprise Items were given up; I never heard why they were given up, so far as that goes. I appeal for them to be revived. There is much to recommend the principle of giving people pleasant surprises. To the best of my recollection some of the most outstanding broadcasts came under that heading. Apart from that estimable condition of things it must often be possible to get into communication with singers, players, and speakers who may not be available if requested to broadcast in the ordinary way. Time has to be allowed for these things; the programmes go to press well in advance of their performance. I suggest the hour of ten o'clock on Saturday evenings as being good to set apart as a gap in the programmes to be filled, perhaps, at the last moment. I think the principle of regular features has proved satisfactory in every way; the B.B.C. itself thinks so from all accounts. I feel increasingly that if the hour I have suggested—or some other convenient time—were specially reserved for a Surprise Item it would be very popular. I should like the illusion kept up and to hear the announcer say: "Ladies and Gentlemen—the Surprise Item of the Week," giving the name of the broadcaster and the items (or subject) afterwards. We are all babies at times, we like to be surprised.

Jay Laurier broadcast for the first time on the Saturday evening. He began by a tactical error. There was a burst of laughter from the audience *before he began*, and between each verse of his first song; it must have been at something he did. That is bad *broadcasting*. Comedians must realise that the unseen audience is the *real* audience. It is not policy to amuse forty people at the expense of forty thousand. Mr. Laurier must not do that again.

Leslie Hutchinson seemed to me to be one of the few singers of light songs who takes the trouble to *sing*. The adenoidal voices (of which every critic on the London press has complained recently) are spoiling most dance-themes and light songs generally.

Gracie Fields is a constant surprise to me. I like listening to those perfectly atrocious notes she lets off in some of her songs, only to be quite caught by the beauty of her voice when she chooses to use it properly. It is a wonder to me that she has not damaged it. Great person, Gracie!

WHITAKER-WILSON

THERE are plenty of portable sets for motorists and for people to whom weight is not a great consideration. Hikers and others who want to take a set with them on a tramp are not so fortunately placed, for in the past a set that has worked well has been rather heavy.

Here is a solution to the problem. The Hiker's portable which you see here is ideal for those cross-country tramps when every ounce of unnecessary weight is a burden and when, on the other hand, an unreliable set is a positive nuisance.

By ingenious arrangement of the parts, the overall size of the Hiker's portable has been reduced to roughly 10 in. by 10 in. by 6 in.

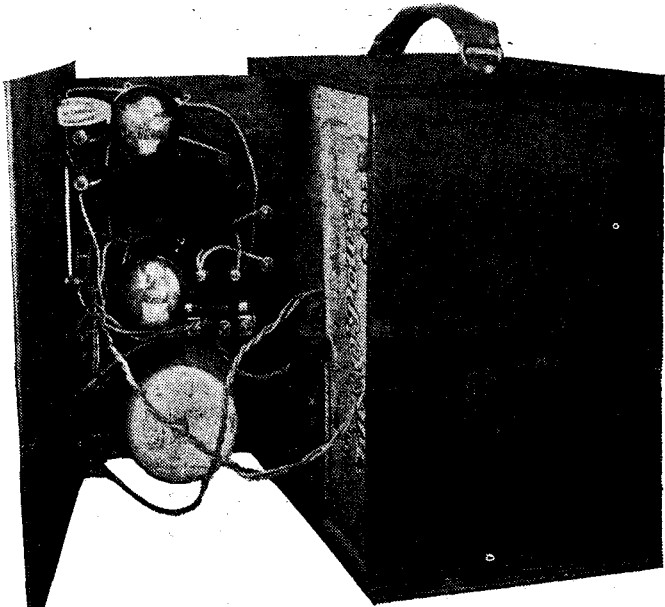
The weight, including all batteries and everything ready for the set to work, is

IDEAL FOR HIKER, CYCLIST OR MOTORIST

about 13 lb. It is convenient in shape, so that it can be carried by the handle at the top or strapped to the back. It is rigidly made so that the parts cannot work loose, the batteries jolt about, or the acid get spilled. The set is all complete, including high-tension, low-tension, and speaker (the need for grid bias is obviated in an ingenious manner) and only two short leads are needed for aerial and earth.

What the Set will Do

On test we have found that within a reasonable distance of a main station about 20 feet of flex thrown over a tree branch makes a good aerial. One should try to get a satisfactory earth connection to a water tap or, when in the country, by a spike stuck in the ground. In many cases it is possible to work without an aerial when a good earth is available.



This photograph shows the assembly arrangement which allows of the set being particularly compact



The earth terminal is then left disconnected and the earth wire taken to the aerial terminal.

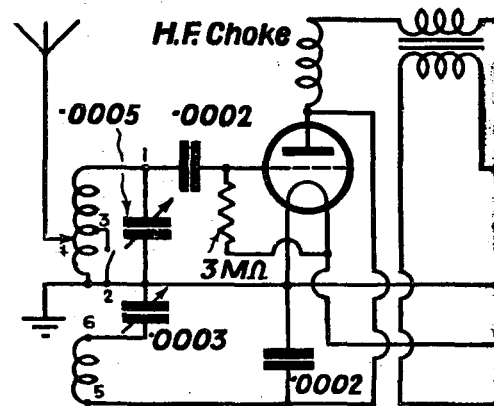
The set does not need to be open in order to work it. The container, of plywood, is screwed together, so that it is necessary to unscrew one side only when the accumulator is taken out for recharging. The box carries the high-tension battery and accumulator, the speaker being on the fret which forms one side of the container.

The facing side carries some of the set components and is screwed to a right-angle baseboard which carries the main parts, such as the valve holders, low-frequency transformer and tuning coil. This side of the cabinet, complete with right-angle bracket, is removed in order to get at the back.

Low cost is a feature which will appeal to many intending constructors; a full list of parts is given in the accompanying table. The photographs of the set make the general construction quite clear, but full details can be obtained from the wiring plan. A full-size version of this is obtainable, price one shilling post free, from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

It is advisable to have the blueprint because it will be a great help in mounting the parts on the cabinet side and bracket, and the wiring up.

Just look at the circuit before you start the constructional work as it will give you a good idea of the way in which space has been saved. An efficient tapped tuning

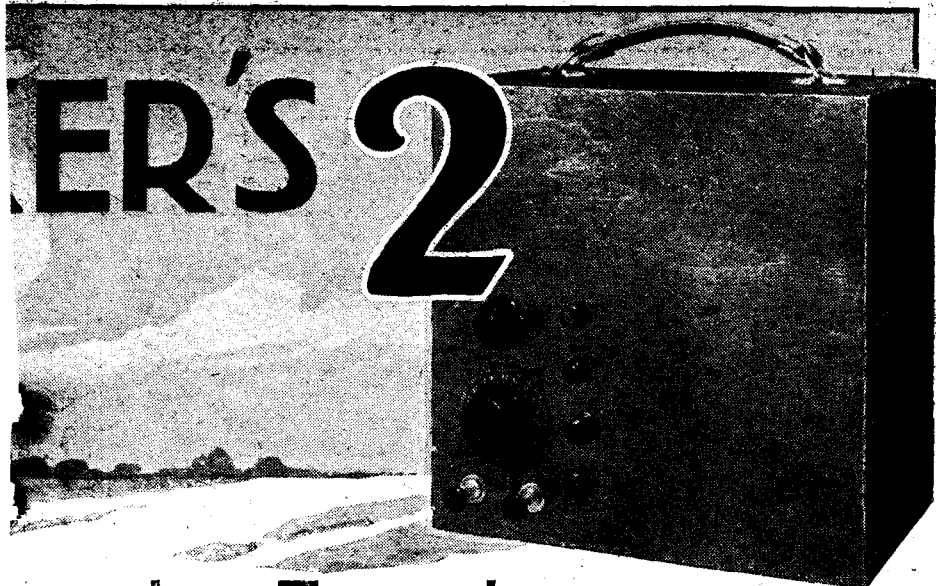


The circuit of "The Hiker's"

coil is used and a light screen over this prevents induction troubles, without appreciably adding to the weight. Midget type solid dielectric condensers are used for tuning the grid side of the coil, and for reaction. As a matter of fact a .0005 mfd. condenser is used for the main tuning, while the reaction condenser is a .0003-mfd. job.

A small grid condenser on which the leak is carried in clips, cuts down the space allotted to the detector components. There is a small H.F. choke in series with the primary winding of the L.F. transformer. The transformer, incidentally, is compact and light in weight, owing to the special core used.

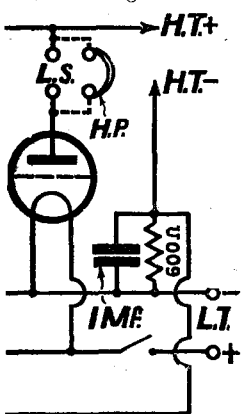
Take a look at the photographs of the set again and you will see that there is no grid bias battery for the power valve. Automatic bias is obtained by a dropping resistance of 600-ohms in the negative lead to the H.T. battery. This is shunted



ER'S 2

Speaker Two-valver of Minimum Weight and Size

by a 1-mfd. condenser and the voltage drop across the resistance provides the necessary bias for the power valve specified. This arrangement not only saves weight and space, but means that there is one less battery to bother about.



A refinement in the set is the provision of separate terminals for an extra speaker or pair of phones. The set's own speaker is connected all the time, of course, but where signals are very strong, and an external speaker is called for, the provision of these terminals makes it

unnecessary to alter the set's wiring. Also, if the set is worked in a locality where signals are very weak and at barely loud-speaker strength, it may be better to use 'phones, so that two or three can listen in comfort.

The Cabinet

You can easily make the set container out of plywood, or it may be bought ready made. Do not make the mistake of using plywood which is too thin, for otherwise the box will not stand the knocking about it is sure to get while in use in hiking.

The blueprint (or the wiring plan reproduction) shows you how the parts are mounted on the cabinet front and on the right-angle bracket. It is really essential to get the parts mounted exactly as shown, for otherwise when the bracket is mounted to the cabinet front, the parts will not fit in.

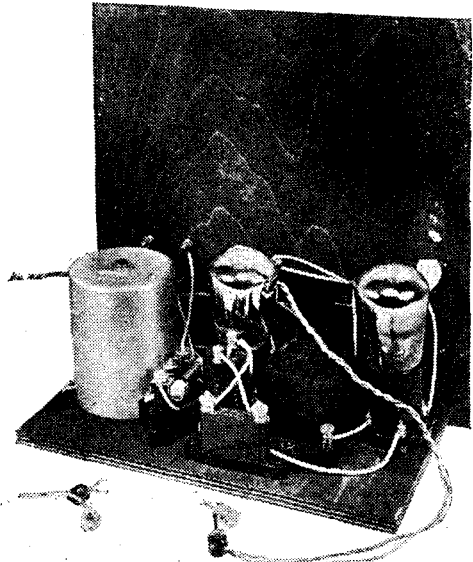
The cabinet front should be drilled first and the components mounted. The blueprint will show you the correct positions. The terminals for the loud-speaker and earth are mounted direct on the plywood, but to ensure maximum efficiency, ebonite washer insulation is provided for the aerial terminal. When you have clamped up the terminals and mounted the tuning and reaction condensers, you can screw the rest of the parts down to the right-angle bracket, before this is attached to the cabinet front.

Making the Connections

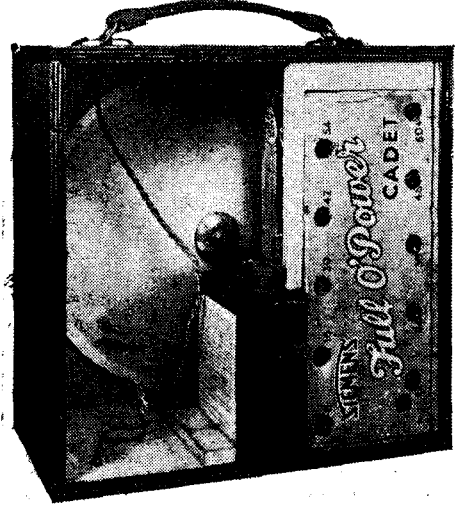
The valve holders, tuning coil, low-frequency transformer, H.F. choke and fixed condensers have to be mounted.

Now you can start the wiring. Flex is used largely for the connections inside the set to the batteries and loud-speaker, but the connections between the rest of the components should be done with rigid wire enclosed in insulating sleeving. It is

- ### COMPONENTS
- .0005-mfd. bakelite dielectric variable condenser (Polar "Compax," Lissen, Magnum).
 - .0003-mfd. bakelite dielectric reaction condenser (Lotus, Polar, Lissen, Magnum).
 - Small ebonite dial (Lissen).
 - Dual-range coil (Lissen).
 - Two small valve holders (W.B., Telsen).
 - Two on-off push-pull switches (Bulgin "Junior").
 - High-frequency choke (Peto-Scott).
 - L.F. transformer (Lissen "Torex," Varley, Selectanet, Lotus, Igranic, Climax).
 - .0002-mfd. fixed condenser with series-parallel clips (T.C.C., Lissen, Telsen, Dubilier).
 - .0002-mfd. fixed condenser (T.C.C., Lissen, Telsen, Dubilier).
 - 1-mfd. fixed condenser (T.C.C., Lissen, Telsen, Dubilier).
 - 3-megohm grid leak (Dubilier, Lissen, Telsen).
 - 600-ohm spaghetti resistance (Lissen, Lewcos, Tunewell, Bulgin, Varley).
 - Four small terminals marked: Aerial, Earth, Phones+, Phones- (Belling-Lee, Bulgin, Clix).
 - Two spade terminals marked: L.T.-, L.T.+ (Clix, Belling-Lee, Eelex).
 - Two wander plugs marked: H.T.-, H.T.+ (Clix, Belling-Lee, Eelex).
 - Connecting wire and sleeving (Lewcos).
 - Small cone loud-speaker mounted on plywood frame (Ormond, type R461/9).
 - Quantity of plywood to make a cabinet 10 in. by 10 in. by 6 in., with a baseboard and fret.
 - Leather handle.
 - Silk for loud-speaker fret.
- ### ACCESSORIES
- 2-volt accumulator (C.A.V., type 2NS9).
 - 60-volt high-tension battery (Siemens "Cadet").
 - Aerial (Colvern "Selectanet").



The actual receiver is constructed on ordinary lines

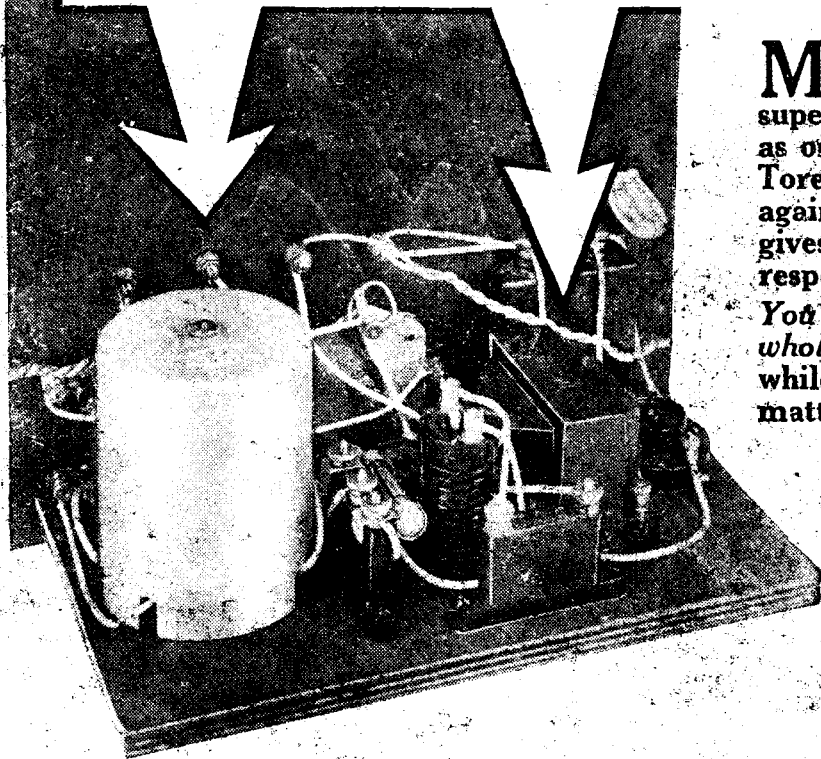


Here is a view showing batteries and speaker

not a good plan to do the whole of the wiring with flex, as it is so difficult to prevent loose ends of the fine wire from fraying out under the terminal clampings.

When wiring the tuning coil, remove the cover by undoing the clamping nut at the top and place the leads so that when the cover is again put over the coil, the wires can pass out over the U-shaped slots at the base. When you have done the wiring, connect up the flexes to the batteries, and take two wires (making sure that the polarity is correct) to the loud-speaker unit. The wire from the terminal which is connected directly to high-tension, should be connected to the positive speaker terminal. The speaker unit is mounted on the fret front of the set container, and the

LISSEN IN THE HIKER'S 2



MUCH in little, this Hiker's 2! The Lissen Dual Range Coil makes "it super-selective, as efficient on the long as on the medium waves. The Lissen Torex Transformer—used again and again as the basis of the best sets—gives it fine quality output and faithful response.

You could, with advantage, build the whole set of Lissen parts—it is worth while using your own judgment in this matter.

LISSEN DUAL RANGE SHIELDED COILS

LISSEN TOREX TRANSFORMER

THIS Lissen Torex Transformer makes a big cut in the cost of any set without sacrifice of quality. It is a high-grade silicon steel core transformer, giving remarkably even amplification over the whole band of audible frequencies. A neat, compact component; its moulded bakelite case is hermetically sealed and completely insulates the windings. Proof against shorting, leakage, or moisture. **PRICE**

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1/6

LISSEN FIXED GRID LEAKS

It is of utmost importance that resistances should be unvarying in value and free from defects which may cause parasitic noises. Lissen Resistances have been tested by exposure to rain and sun, and they remain constant and silent in use always. All values.

1/6

THESE new Lissen Dual-range Shielded Coils are of almost universal utility. You can use them as Aerial Tuning Coil, as Tuned Anode Coil, as Tuned Grid Coil; they are laboratory matched for ganging, so that you can use them for bandpass tuning if you want to.

No longer is it necessary to buy new coils for every new circuit you build . . . just buy one set of these Lissen Dual-range Coils and you can adapt them to any circuit.

The selectivity is of the very highest order, and "break-through" on the long-wave band is almost entirely eliminated. Shielding is particularly complete, with shielding cover and shielding disc supplied. Full diagrams are enclosed with every coil, together with instructions which will enable you to make the fullest use of the coils in many circuits.

PRICE, complete with Shield

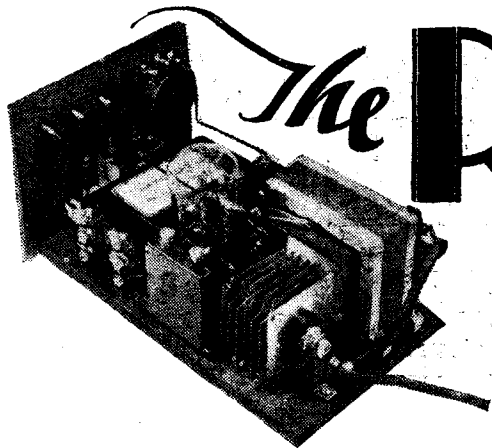
Each

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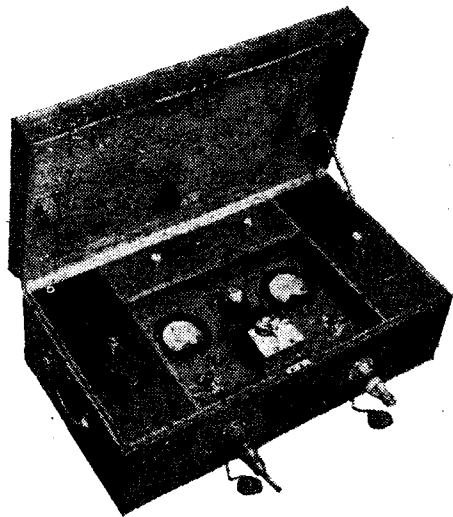
The RAYCRAFT KIT for Mains Operation

Makers: Audiovisor, Ltd. Price: 10 guineas.

SOME time ago amateurs were given the first opportunity to try out the wonders of light control, by means of the Raycraft kit, consisting of a special selenium cell, a one-valve amplifier, and a suitable projector lamp, which could be worked either from the mains or from a four-volt accumulator.

The one-valve amplifier was worked from ordinary batteries, consisting of a filament accumulator and a 120-volt high-tension battery. Now the makers have introduced an all-mains kit, and also modifications for those wanting to convert existing kits into mains operation.

Full details are given in the second



A commercial edition of Raycraft—the Audiovisor used for race timing

edition of the Raycraft Book, price 6d. In this it is explained how light control can be utilised to do many seemingly miraculous stunts, such as opening doors, timing races, lighting street lamps, and counting and sorting articles.

The Raycraft Bridge

It is also shown how an invisible ray, as produced by inserting a filter in the projector, can be used as a burglar alarm. For the benefit of those unacquainted with the system, it should be explained that the Raycraft Bridge is, in fact, a highly developed form of selenium cell, so made to eliminate the disadvantages of the earlier forms of selenium cell.

Mounted in a special way, and sealed in a glass envelope, the new type of cell is secure from atmospheric changes, and its bakelite case further protects it from

mechanical shocks. The price of the cell is 27s. 6d.

The one-valve amplifier, which can now be obtained for battery or mains operation, is designed for home construction. It amplifies the current changes produced by variations in light affecting the cell. The amplified currents are then strong enough to work the Raycraft Relay, which might be termed the link between the light source and the mechanical device it is desired to control by the light.

Relays

Various relays are available, different types being needed according to the mechanical device involved. The standard relay is very sensitive, and costs £2 10s. A Raycraft counter is now available for the moderate price of two guineas.

We have been testing out the A.C.-mains set which is housed in a strongly-built wooden cabinet. This is designed for all supplies between 200 and 250 volts, and employs a Mullard 354V valve, which gets its high-tension from a metal rectifier, and its low-tension from a four-volt winding on the mains transformer.

At one end of the cabinet are terminals for the connection of the Raycraft Bridge and the Raycraft Relay, together with a simple re-setting switch and the variable resistance control knob.

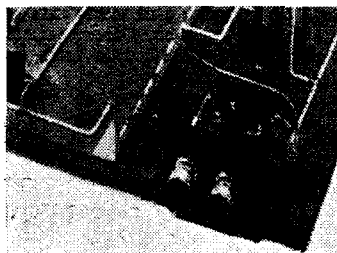
Uses for the Raycraft Apparatus

The new A.C. and D.C. sets can be used in just the same way as the original battery model, with, of course, the great advantage that all batteries are eliminated.

The introduction of secondary relays has considerably enlarged the scope of the applications of the Raycraft Bridge, since

AERIAL END ARRANGEMENT

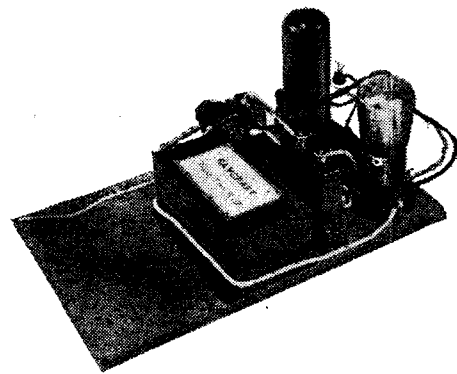
The arrangement of the set at the aerial end is of the greatest importance. Here is a good scheme with the aerial



terminal taken through the compression type condenser and to the plug-in type coil holder, with as short leads as possible.

to a great extent the light control was limited by the amount of current flowing through the original relay. Now it is possible to operate with currents up to 4 and 5 amperes, by connecting one of the secondary relays to the terminals of the small relay in the set.

There are so many uses to which this interesting device can be put that we recommend readers to get the new edition of the Raycraft book, and read all about them. One of the latest and most practical uses we have come across is in connection with garages. At night the light from a car's headlamps will operate a Raycraft and so ring a bell to bring the assistant to the petrol pump—without the car-driver leaving his seat! This is just one of the



The Raycraft bridge and relay with amplifying valve

many examples of the Raycraft in action. There are dozens more, all effective and quite inexpensive.

Full details are obtainable from Audiovisor Ltd., of 28 Little Russell Street, London, W.C.2.

HIGH-GRADE REPRODUCTION

PERCUSSION instruments, such as the drum, cymbal, or xylophone, are particularly difficult to reproduce faithfully. Most of their characteristic quality depends upon the presence of high overtones, some of which are not even persistent, mixed with the fundamental frequency. Such high-pitched transients, as they are called, are situated at the outer edges of the side-band frequencies, away from the central carrier, and are the first to be cut unless the receiving circuits are properly designed to handle them. One advantage of using a band-pass input is that it will pass all the essential side-band frequencies required to give true musical reproduction.

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

PERCY W. HARRIS ON AUTOMATIC VOLUME CONTROL

IN America automatic volume control has been introduced in a number of receivers. Various methods are employed but in the main the idea is to control grid bias on the high-frequency stages by means of a change of voltage set up across the resistance in the anode circuit of the detector in such a way that the stronger the current in the detector plate circuit the more the bias on the high-frequency stages. This has the effect of limiting the maximum signal strength and by means of a manually operated volume control the maximum strength is set to whatever is desired. After this setting is made one can run all over the dial without that irritating crash of noise which comes when tuning unexpectedly over a powerful station.

Early Disadvantages

Quite unexpectedly, when sets including this feature were placed on the market complaints began to come in from customers

one reaches the "edge" of the tuning of a powerful station the volume control is turned down so that it is not too loud when tuned in at maximum strength. As the signal rises to a maximum rapidly, if the volume control is arranged to give not too loud a signal at the maximum setting nothing will be heard on either side, but if when approaching a local station a set is turned up to its full sensitivity, one can hear the station over quite a wide span with a tremendous powerful overloading effect in the middle.

Volume Control and Sensitivity

Now think what happens in a set with automatic volume control. Between powerful stations and over all parts of the dial where there are no stations audible, the set is automatically turned up to its maximum sensitivity and will bring in every scrap of static and mush that can be heard. As soon as one approaches the "skirts" of a powerful station it will be

probably not search over much of the dial with a set turned up to full sensitivity and if he did he would hear just as much mush. On approaching a powerful station he would almost unconsciously turn down the volume control to avoid blasting effects and would never, when passing over this region, gradually adjust the volume so that it kept uniform over the whole band. He would simply turn it down till he had passed the station range.

All the same, automatic volume control has many valuable features, and I predict that it will soon become universal. It is one more important simplification in the handling of a wireless receiver, and while it may have disadvantages, the advantages in general use more than outweigh them.

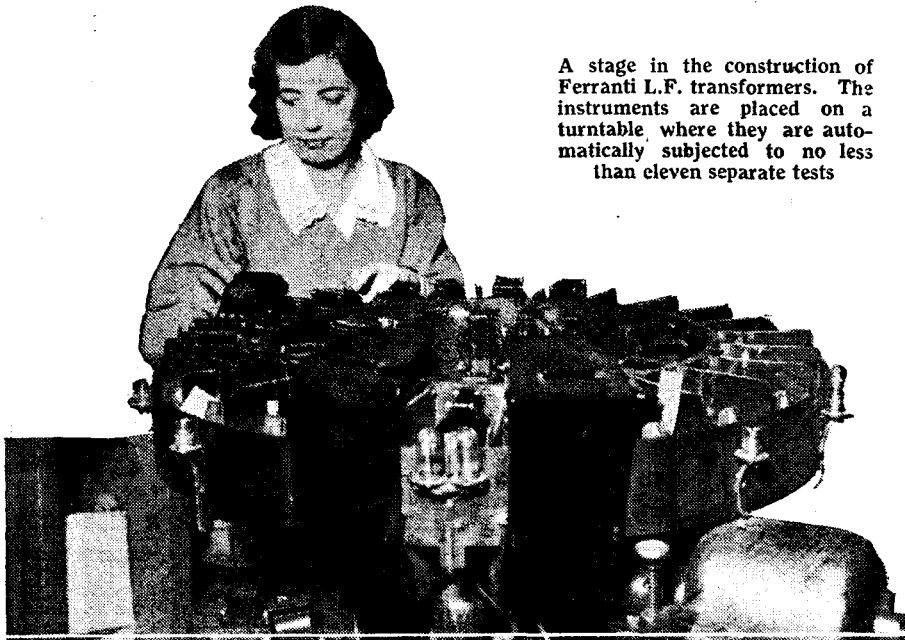
The experienced listener who likes to get the very best from his set prefers to have the tuning of the various stages under his own personal control just as he will like to arrange the volume and other adjustments to suit what experience has taught him will be the best operating conditions.

MAINS VALVES AND BATTERY OPERATION

The other day I came across a man who is using mains valves for battery operation. It sounds strange at first, but when you come to think of it in some circumstances there may be a distinct advantage in doing this. Mains valves are much more efficient, the mutual conductance being as high as 7.5 in some cases and in practically any kind of circuit three mains valves will give a better signal than three of the best battery valves. The disadvantages are the one-ampere heater current for each valve and the larger plate current which is generally required.

In this particular case the three amperes filament current did not worry the user at all, as he had an accumulator-charging station connected with his business and there was always plenty of battery power available. For H.T. he used high-tension accumulators, again having facilities for charging. He said the set was quieter, much more efficient and gave better quality than he had been able to obtain before with battery valves, the total consumption being in the neighbourhood of 30 milliamperes with the particular A.C. valves he was using.

This is the first case I have come across where mains valves are used for all-battery operation, although I had previously heard of mains valves being utilised with only the heaters operated off A.C. Some readers may find it worth while to substitute mains valves for battery valves with a simple 4-volt transformer for the heater current, using high-tension batteries, as before, for the H.T. supply. This dispenses with the necessity for an accumulator with its frequent charging, without going to the expense of running a set with all-mains operation. By carefully choosing your valves it is possible to find examples which will not take too heavy a current from your H.T. batteries. Look up the catalogues and see if you are likely to be interested.



A stage in the construction of Ferranti L.F. transformers. The instruments are placed on a turntable where they are automatically subjected to no less than eleven separate tests

that the receivers were flat in tuning and very noisy compared with ordinary sets. Actually they were no more noisy and no flatter in tuning than receivers without automatic volume control, but in their operation they certainly gave the impression of being so. When one is tuning a receiver without an automatic volume control it is usual to operate the tuning dial and the volume control simultaneously, keeping the volume well down to avoid the crashings which occur in passing loud stations and only turning it up to the full (or setting the receiver at its maximum sensitivity) when searching for a particular station which is known to be weak. As soon as

heard quite well, and as one turns more and more towards the maximum tuning point the strength will be automatically kept down to the required volume by means of the automatic feature. We thus find that on approaching a powerful station the signal comes in quite well and remains at the uniform strength on that portion of the dial over which it would be heard when the set is turned up to its maximum. Powerful stations thus appear to "spread" owing to this limiting effect, which is really cutting off a very tall and deep curve at its base.

If the user were handling a set without automatic volume control he would



A Programme Point

SIR,—May I be allowed to differ with the "Programme Pointer" in a recent issue? In it you suggest that the B.B.C. should invite "singers" of operatic standard to sing the choruses with the B.B.C. Dance Orchestra. Now, sir, in my opinion, diction is the chief thing in singing. Who could have clearer diction than Sam Brown of Ambrose's or Al Bowey of Roy Fox's Band? *And they don't wobble!*

As I write, a soprano is supposed to be singing "Love's Old Sweet Song." Had it not been for the words "Just a song," she might have been singing in Chinese!

Admitted, there are good and bad dance-band vocalists, but for every bad one there are ten or more horrible classical ones. So please leave your singers "down to opera standard" to their wobbling Italian.

—W. W. (Southampton).

"Dusting the Heavise Layer"

SIR,—With reference to the paragraph entitled "Dusting the Heavise Layer" in AMATEUR WIRELESS of April 30, the following observations made at my short-wave radio station G5CV may be of interest to you.

Two-way communication with U.S.A. and Canada was regularly maintained on the 14MC (20-metre) band up till April 9, when, for a period of 12 days, no contact was made, and very few transatlantic stations were heard. Even the powerful commercial stations working at either end of the band were weak and often inaudible.

On April 12, however, I was in communication with CE7AA, situated right in the south of Chile, near the Magellan Straits. He reported conditions extraordinarily poor. A few days later both ZS2A of South Africa and VK2BR of Australia were worked, and my signals were reported so loud that I was able to "put over" telephony in each case.

The above results rather tend to show that the effect, if any, of the immense cloud of ashes, most likely carrying an

WHEN SUBMITTING QUERIES

Please write concisely, giving essential particulars. A Fee of One Shilling (postal order), a stamped addressed envelope, and the coupon on the last page must accompany all letters. The following points should be noted.

Not more than two questions should be sent with any one letter.

The designing of apparatus or receivers cannot be undertaken.

Modifications of a straightforward nature can be made to blueprints, but we reserve to ourselves the right to determine the extent of an alteration to come within the scope of a query. Modifications to proprietary receivers and designs published by contemporary journals cannot be undertaken.

Readers' sets and components cannot be tested at this office. Readers desiring specific information upon any problem should not ask for it to be published in a forthcoming issue, as only queries of general interest are published and these only at our discretion. Queries cannot be answered by telephone or personally.

Readers ordering blueprints and requiring technical information in addition, should address a separate letter to the Query Department and conform with the rules.

electrical charge, was to lengthen the "skip" distance, for the above stations were situated in the extreme South. Although there was nothing strange in working Australia, for this station has recently worked many VK's, it was the first time that I have worked CE7 and ZS2. Cape Town, Africa, is also difficult to reach from London. You will note that the above dates coincide very nearly with the volcanic eruptions in South America.

—P.D.W. (London, W.)

Mains Hum in All-A.C. Receiver

SIR,—I have been trying, for the past three months, to eliminate mains hum in an all-A.C. receiver, and must now own myself beaten. The set is a perfectly straightforward one incorporating two S.G. valves, a detector and a super-power valve. I have tested each valve for anode-current consumption and these are working just under the makers' specified figures. My mains unit rectifier is capable of supplying about 10 milliamperes more current than that being consumed by the valves. I have introduced additional smoothing, both

by condensers and by a further smoothing choke, but I have failed to get rid of the hum. I have even considered trying an electrolytic large-capacity condenser in the smoothing circuit, but do not wish to go to the expense if it is not likely to give the desired results. Can you suggest some possible causes for the trouble.

—R. W. (Hitchen).

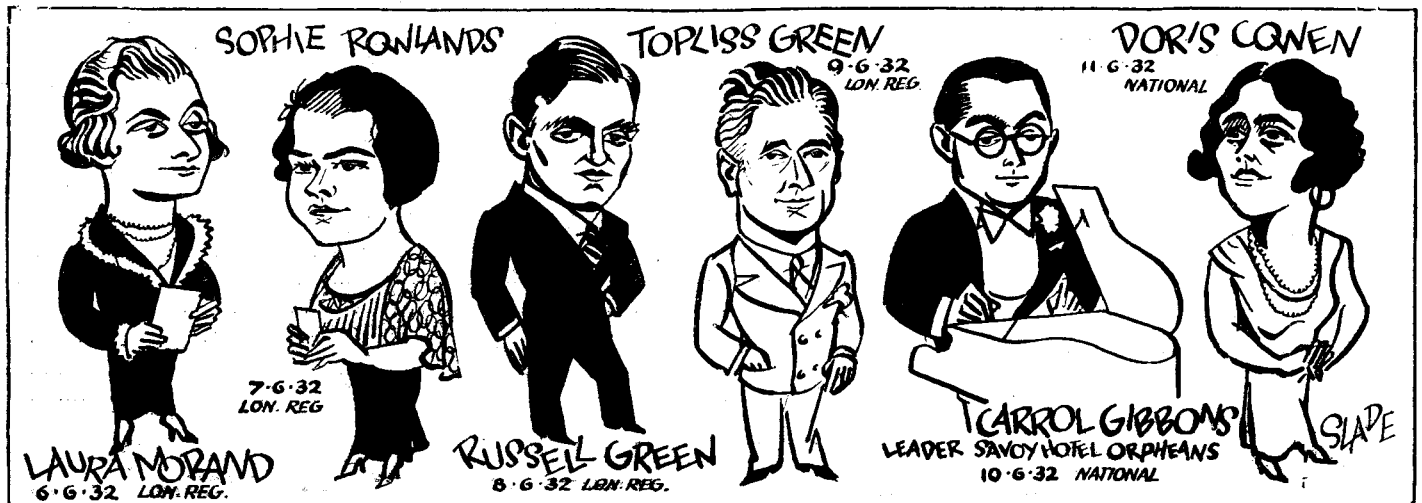
If you are getting direct interaction between your mains transformer, smoothing choke, or inter-valve L.F. transformer, any of these faults might conduce to your difficulty. Furthermore, if your mains transformer or smoothing choke has loose laminations in the core, you will have some difficulty in getting rid of hum. We suggest you try altering the disposition of your iron-cored components with respect to each other and if this does not cure the hum, we suggest you have your mains transformer tested or replaced. If you reside in a district which has a local sub-station for rectifying the A.C. into D.C., you will need to introduce power-type H.F. chokes between the rectifier of your mains unit and the smoothing circuits. A choke should, for preference, be arranged in each lead, positive and negative, and two 4-microfarad condensers should be arranged on the smoothing circuit side of the H.F. chokes in the following manner. One terminal of each condenser should be connected to the smoothing circuit end of each choke whilst the other terminal of each condenser should be connected together and then taken to earth. This arrangement will tend to obviate modulation hum, should this be the form of hum about which you complain.—Ed.

Automatic Bias

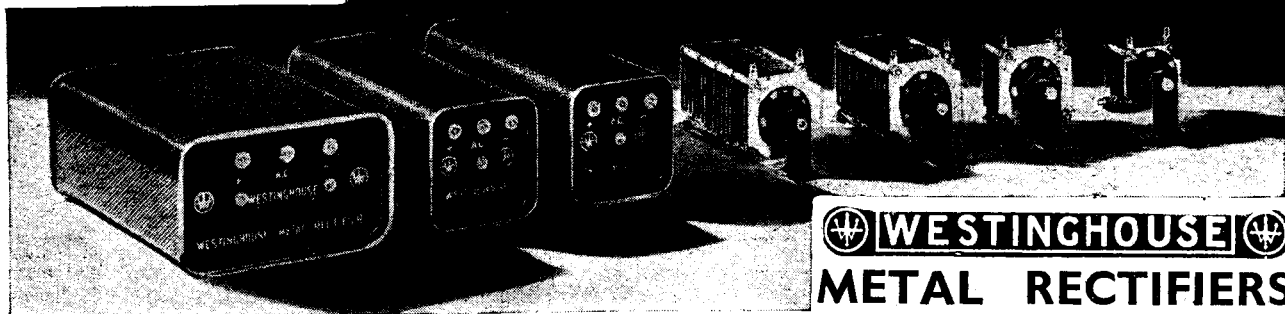
SIR,—I have been reading the recent article on "Scrapping the Grid-bias Battery," and I would like to incorporate this arrangement in my "Ten-station Two," which is giving very satisfactory results. Can you please tell me what alterations are necessary?—W. S. (Croydon.)

You should first disconnect the lead connecting the G.B. terminal on the L.F. transformer to the G.B. battery (wire 22) and also the L.T. lead (wire 18), and the G.B. positive lead (wire 19). Now connect the G.B. terminal on the L.F. transformer to the H.T. lead and to one side of the biasing resistance. Then connect L.T.—to the other end of the biasing resistance. The value of the biasing resistance depends on the particular type and make of valve you are using in the output stage. A Mullard PM2A valve as specified would require a resistance of about 700 ohms, a Cossor 220P would require 800 ohms and so on.—Ed.

PERSONALITIES IN THE WEEK'S PROGRAMMES



NEW!

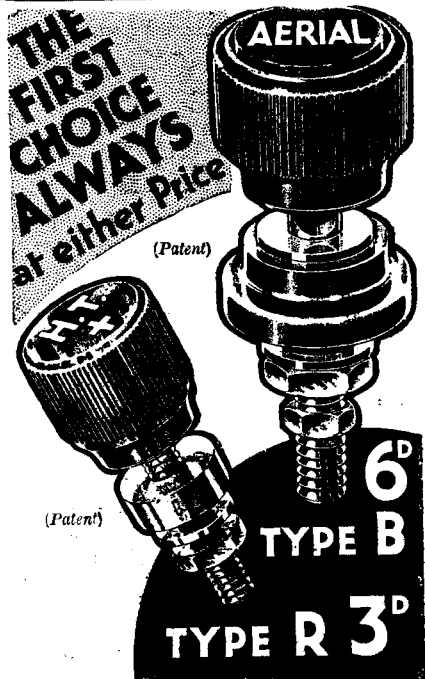


AS from JUNE 1st, 1932, the following NEW Westinghouse Metal Rectifiers will be available for constructors' use, AND THE H.T. 8 WILL BE REDUCED IN PRICE FROM 21/- TO 18/6.

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L.T.1	6.0	0.25	10/6	H.T.9	300	60	21/-
L.T.2	6.0	0.5	11/-	H.T.10	200	100	21/-
L.T.4	6.0	1.0	13/-	H.T.11	500	120	35/-
L.T.5	12.0	1.0	15/-		400	150	

Details of these new units are given in our booklet, "The All Metal Way." Send a 3d. stamp for a copy, marking your application "Dept. A.W."

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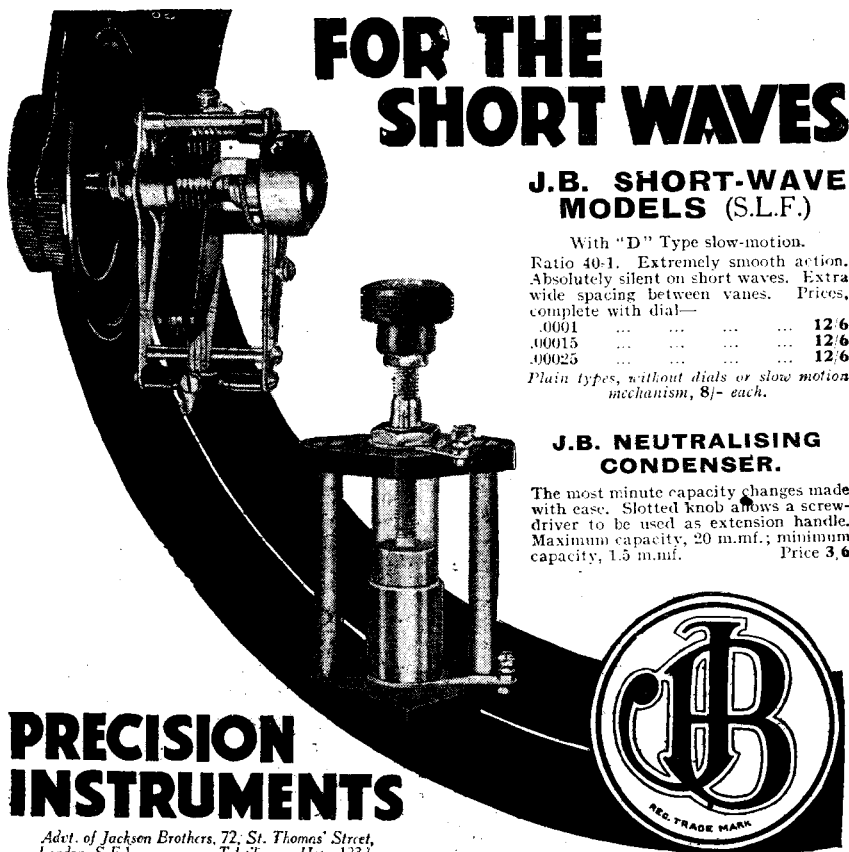
(Patent)

6^D
 TYPE B
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TYPE "B" Non-rotating name. Extra large clamping area. Cross-hole for solid tags or wire. Slot and nut to eliminate soldering. 2 B.A. Stem. Price 6d. each.
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BELLING-LEE TERMINALS

Advertisement of Belling & Lee, Ltd., Queensway Works, Ponders End, Middlesex.



FOR THE SHORT WAVES

J.B. SHORT-WAVE MODELS (S.L.F.)

With "D" Type slow-motion. Ratio 40:1. Extremely smooth action. Absolutely silent on short waves. Extra wide spacing between vanes. Prices, complete with dial—
 .0001 12/6
 .00015 12/6
 .00025 12/6
 Plain types, without dials or slow motion mechanism, 8/- each.

J.B. NEUTRALISING CONDENSER.

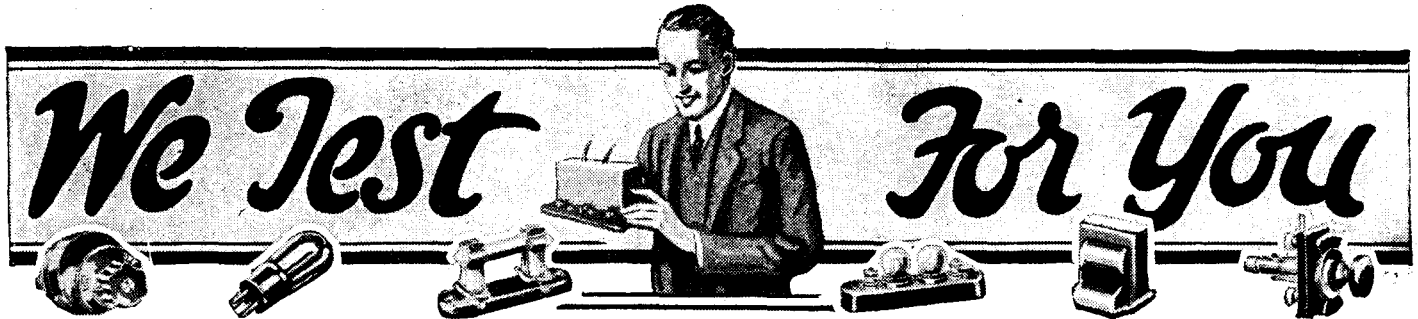
The most minute capacity changes made with ease. Slotted knob allows a screw-driver to be used as extension handle. Maximum capacity, 20 m.mf.; minimum capacity, 1.5 m.mf. Price 3/6

PRECISION INSTRUMENTS

Advt. of Jackson Brothers, 72, St. Thomas' Street, London, S.E.1. Telephone: Hpx. 1337



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



A weekly review of new components and tests of apparatus conducted by J. H. Reyner, B.Sc., A.M.I.E.E.

SHIELDED WIRING

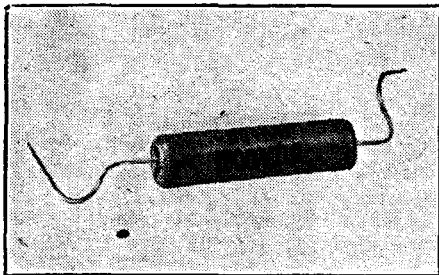
AN interesting type of metal sleeving designed for the shielding of the wiring of radio apparatus is that made by Messrs. Cleary of North Woolwich. It consists of a close spiral of heavy gauge tinned bare wire into which the connecting wire is inserted. The inside diameter of the spiral is .064 so that the overall diameter of the wire used, including insulation, must not exceed this figure. The sleeving appears to fulfil its purpose admirably, and it should be of particular use in all circumstances where a strong cable-like job is required.

Metal wire sleeving has a variety of applications amongst which may be mentioned the shielding of grid and anode leads in receivers which are unstable due to the close proximity of these two, the shielding of gramophone pick-up leads, and the connections between the radio and amplifier sections of a radio-gramophone.

The sleeving can be obtained with or without the connecting wire, and the prices are 3d. and 2½d. per foot respectively.

LOEWE TUBULAR CONDENSERS

WE have tested this week two samples of the new Loewe range of tubular paper condensers, type CO.30, which includes condensers having capacities varying from .0005 microfarad to .02 microfarad. The condensers are provided with wire ends thus making them suitable for



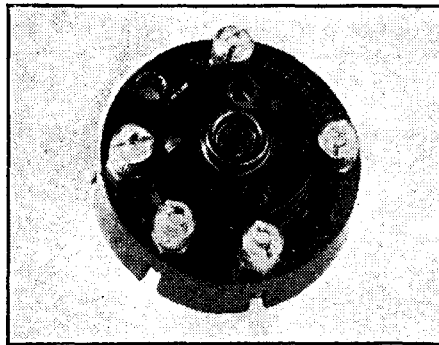
A compact fixed condenser—the Loewe

including directly in the wiring scheme of the receiver. The condensers are enclosed in stiff bakelised paper tubes, the ends of which are specially shaped to protect the cores against damage. The test voltage of these condensers is 1,500 volts D.C., and the insulation resistance about 1,000 megohms. A tolerance of plus or minus 20 per cent. is allowed on all capacity values, but closer tolerances can be supplied to special order. The overall dimensions are 1¼ in. in length and approximately 5/16 in. in diameter.

The samples tested were rated at .004 microfarad, the actual measured capacities being .0037 and .0036 respectively—figures well within the rated tolerance. In use we have found the condensers quite satisfactory, and they can be recommended. The retail price for all values is 6d. each.

NEW BULGIN VALVE HOLDERS

WE have recently received for review two samples of the new Bulgin valve holders. This holder is made in two types, four pin and five pin, and the contacts are constructed of phosphor-bronze, giving a contact length of approximately ½ in. A very firm contact is obtained, resulting in an extremely low contact resistance, a point which may be of some importance when using some of the modern valves having high filament currents.



One of the new Bulgin moulded-type valve holders

The valve holders are built up on moulded bakelite bases, the contacts being completely enclosed by the moulding, thus making it impossible to insert a valve incorrectly. Small, neat terminals are provided on the edge, and these are nickel-plated and slotted to allow the use of a screwdriver for tightening.

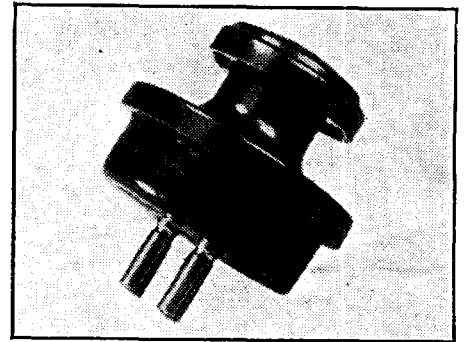
The valve holders retail at 9d. for the four-pin type and 10½d. for the five-pin type.

CRABTREE MAINS PLUG

A VERY important and often neglected part of mains-operated apparatus is the plug forming the connection to the supply. It is essential in the interests of safety and neatness that this link in the radio chain should be of good quality. A very interesting and possibly unique mains plug has just been placed on the market by Messrs. A. J. Crabtree & Co., Ltd.

The main point of interest of this plug is that both poles are fused separately, and

a spare supply of fuse wire is carried in the plug itself. The body is of brown porcelain and the cap which contains the spare fuse wire is of moulded bakelite and



Crabtree mains plug with integral fuses

lined with asbestos. It is rated at 250 volts 5 amperes, is very well made and can be recommended for general use.

TWO-WAY WIRELESS

IN two-way wireless, special provision must be made to allow a listener to "break-in" on the conversation, in the same way as in ordinary telephony. If the transmitter and receiver are close to each other, as they are on a ship or in an aeroplane, the outgoing carrier wave would "paralyse" the receiving circuits if it were kept constantly in operation. One can, of course, use a change-over switch to shut off the local transmitter during reception, and vice versa, but in modern installations this is done automatically by the mere act of speaking.

The local transmitter is normally kept quiescent, but as soon as the listener begins to speak into the microphone, a part of the voice current is diverted into a separate path, where it is amplified and applied to a control valve, which brings the transmitter into action. A delay circuit ensures that the control valve is released a fraction of a second before the main speech current reaches the modulator, so as to prevent the first word from being "clipped."

B.A.R.

The Yorkshire Mimmers will again be in the North Regional programme on June 9.

The Promenade Concert by the Hallé Light Orchestra, conducted by Alfred Barker and broadcast in the North Regional programme on June 6, will be entirely orchestral.

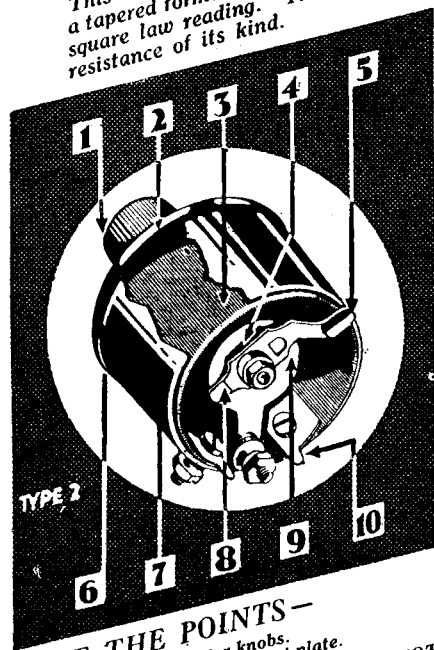
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GET THE BEST OUT OF ANY SET

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This resistance is specially wound on a tapered former which gives a perfect square law reading. This is the first resistance of its kind.



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7. Bakelite case—protects winding.
8. Back self-cleaning contacts.
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Here "Observer" reviews the latest booklets and folders issued by well-known manufacturers. If you want copies of any or all of them **FREE OF CHARGE**, just send a postcard giving the index numbers of the catalogues required (shown at the end of each paragraph) to "Postcard Radiō Literature," "AMATEUR WIRELESS," 58-61, Fetter Lane, E.C.4. "Observer" will see that you get all the literature you desire.

Curing Boom

I HAVE come across many speakers which give poor results because they are not fitted with an effective baffle. A new book, "The Doom of Boom," has just been sent me by McNeill & Co., Ltd., the makers of the Howe Box Baffle kit. I am sure it will interest you if you are in doubt about the efficiency of your speaker reproduction.

773

New Loewe Catalogue

You should have the new 31/32 Loewe catalogue, because it gives revised details of speaker units, pick-ups, multiple valves and, of course, the well-known Loewe condensers and vacuum resistances. This is a useful catalogue for home constructors.

774

Excel Terminals

Useful terminals, wander plugs, and connectors of all kinds, are dealt with in the new Collett folder. Coltags for marking battery leads are very handy and prevent burnt-out valves, owing to an H.T. lead being mistaken.

775

The Lively-O Again

Back in 1929, Oldham introduced the "air-spaced" H.T. accumulator, and I see that the latest Lively-O H.T. units incorporate this method of construction. Why not get the new description literature from Oldham? It may help you out of an H.T. difficulty.

776

Some Junit Parts

Here is a useful folder from Junit. Set constructors will be interested in it. Valve holders, terminal mounts, mains transformers and chokes, switches and complete set chassis; they are all described and illustrated.

OBSERVER. 777

Major J. B. S. Bourne-May will be the commentator for the ceremony of Trooping the Colour in honour of the King's birthday which is to be broadcast on June 4.

Recently the sub-committee of laymen appointed by the Welsh Religious Advisory Council held a meeting at Shrewsbury to advise on the selection of places of worship and preachers for the month's Welsh service

New Times Sales Co

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- ATLAS A.C.188 ALL-MAINS UNIT.** Two variable and one fixed tapings. Trickle charges 2, 4, or 6 v. at .5 amp. Cash Price £6/0/0. 11/-
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Balance in 11 monthly payments of 5/6. order
- EPOCH J.1 PERMANENT MAGNET MOVING-COIL SPEAKER** with 3 ratio input transformer. Cash Price £2/5/0. 4/2
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TRANSFORMERS. Intervall Marconi-Ericsson square type. List 12/6. Sale, 2/8. 810m Power Amplifier type, all new and boxed, 4/9. Both guaranteed 12 months. Western Electric Output Transformer, 2-1 ratio, 2/8. Five Parmeko Big Power Transformers, 25 cycles, 200/250 v. input, with outputs of 4 v., 5.5 v., 7.5 v., and 500 v. each centre tap. List 24/10s. Sale, 45/-.

CHOKES. Big Parmeko 1 amp., 150- B.T.H., med. tap, 12/8. Electramonic Screened, 10/-, Igranic, 8/8. Watley Double, 4/8. Small Eliminator, 1/6.

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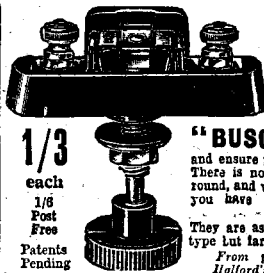
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BROADCASTING STATIONS

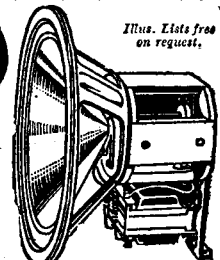
Broadcasting Stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is that of the carrier wave.

Large table listing broadcasting stations worldwide, categorized by country (Great Britain, Grand Duchy of Luxembourg, Germany, etc.) and including columns for Kilo-Metres, Station and Call Sign, and Power (Kw.).

The LATEST ORMOND SPEAKER



After years of patient research, the famous British firm of Ormond have evolved a Permanent Magnet Moving Coil Speaker worthy of their great name, and the well-known Mail Order House of E. J. Heraud is privileged to offer it on easy monthly terms. Remarkable fidelity, high sensitivity, and correct tone balance are outstanding features. It will handle heavy input without distress. The special Magnets are of Darwin Cobalt Steel, and a Speech Transformer is incorporated. The construction is very robust, the whole being mounted as a complete chassis. Size: width 10 1/2 ins., height 11 ins., depth 3 1/2 ins. Sent on 7 days' trial for only 2/6 deposit, if satisfied, pay further 2/6 at once, and complete purchase by 9 monthly payments of 7/6. (Cash Price, 65/-) Send to-day and try this wonderful speaker.



PERMANENT MAGNET



THE ORMOND FOUR POLE ADJUSTABLE L.S. UNIT. No. 1. Capable of handling great volume without chatter. Easily mounted in any cabinet or chassis by 2 screws. On 7 days' approval for 1/- deposit; if satisfied, pay further 3/- at once. Complete purchase by 4 monthly payments of 2/6. (Cash, 12/6)

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MY WIRELESS DEN

Weekly hints—constructional and theoretical — by W. James.

THAT SLOTTED VANE

MANY gang-tuning condensers have a slotted vane in each section. The sections cannot be made in the factory to have equal capacities over the whole range, and so it is necessary for adjustments to be effected in the test room.

The bottom of the framework holding the sections is nearly always open so that the plates can be reached through the bottom as well as from the top.

First, the minimum value is measured and the sections are, if necessary, adjusted to the desired value. Then the moving plates are turned a few degrees and the capacity of each section is tested again. Adjustments are made if necessary, and it is here that the slotted end vanes are so useful as it is so easy to bend a section of a vane.

The testing and matching of the parts of a gang condenser is quite a big job. Sometimes half an hour is spent on one condenser. It is advisable not to touch the sections unless accurate test gear is available. The makers will usually test a condenser for a small sum.

VALVES FOR POWER DETECTORS

When does a grid-circuit detector become a "power" detector? This is a question that cannot be answered without reference to the valve used, how it is used, and to the power stage following it.

You often see the term "power" detector used in connection with a detector that must necessarily deal with weak signals as the stage is followed by a transformer and a valve having a bias of quite small value, such as less than 9 volts. This is a weak signal detector. As such, it usually distorts signals.

A properly designed power detector, on the other hand, distorts but little. It usually deals with strong signals, has a high anode voltage and passes a heavy current. The output voltage of audio frequency will usually fully load a small power valve with only a simple form of coupling, such as a choke or resistance.

A high-ratio transformer is not necessary. Better results may often be obtained from some sets by fitting a transformer of lower ratio between the detector and power valves as this means that the detector must deal with stronger signals before the power valve is fully loaded. In a local-station set, anyhow, a low-ratio transformer is worth trying.

USING UP CONDENSERS

There are times when out of a number of condensers there is not one of the right capacity. You can very often, however, connect two or more of the fixed condensers and produce the capacity desired.

If you join condensers in parallel the total capacity is the sum of the separate values. Thus, with a .0005, a .001, and a

.002 joined in parallel, the total capacity is .0035.

To join condensers in parallel you connect one terminal of each with a wire and then the other terminals with another wire. You can connect two separate 1-microfarad condensers to form the equivalent of a 2-microfarad, and so on.

If you opened a large condenser, such as a 4-microfarad, you would probably find there were two separate condensers of 2 microfarads each in the case, being joined in parallel. The larger condensers are nearly always composed of sections connected together.

CHATTERING SPEAKERS

A moving-coil speaker that is reproducing at fair volume is capable of causing strong vibrations.

You have probably noticed how the walls of a thin cabinet vibrate and, in fact, how a table upon which a set is standing will vibrate with the stronger notes.

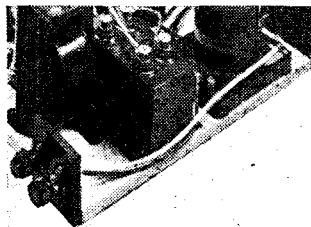
It stands to reason, therefore, that if the loud-speaker is not carefully fitted, the fixing screws may chatter and cause annoyance. It is always necessary to fit a moving-coil loud-speaker quite firmly with the object of avoiding little troubles such as the one mentioned of chattering.

If necessary, the unit should first be fastened to a stout board, this, in turn, being fitted to the cabinet. There is likely to be trouble if the loud-speaker is too near the valves. Sound waves may so affect the valves that noises or howling are heard.

To pack the valves with cotton wool or to adopt some other similar "cure" is not always satisfactory. It is better to place the loud-speaker in such a position that no troubles of this nature are produced and this may want some doing in a compact set. If vibrations through the cabinet or chassis reach the valves, then steps must be taken to break up the vibrations in the cabinet, and perhaps to mount the chassis upon rubber.

AERIAL CIRCUIT WIRING

If the aerial wire from a tuning coil or condenser to the terminal on the baseboard is very long, then take care



it does not come too close to other parts or stray capacity may upset results. The lead shown here is enclosed in stout insulated sleeving.



Protect your set, your home, your family from injury by lightning.

Fit a "GARD" between your aerial and earth. It only takes a minute and protects for all time. No interference with your reception of radio entertainment. Fit a "GARD" now and forget to switch off when lightning plays. "GARD" keeps it outside

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H.T. ACCUMULATORS CORRECTLY CHARGED by Specialists, also complete H.T. and L.T. Hire Services. Express delivery over wide area.—Ancloty Radio, 36, Hindmans Road, East Dulwich. Phone: New Cross 4074. Charging Contractors to Camberwell Council and Official Oldham Service Station.

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A GOOD deal of what is called surface noise, including needle scratch, in gramophone reproduction lies between 3,000 and 4,000 cycles, so that the use of "scratch" filters is liable to lead to a sacrifice of some of the essential musical frequencies between these limits. Recent investigations have shown that the hill-and-dale method of recording—as first used by Edison—lends itself more readily to scratch-free reproduction than the standard laterally-cut sound track. For this reason we may yet see a reversion to the earlier type of record. B.A.R.

Mr. Packwood, of Castle Bromwich whose announcement appeared recently in **AMATEUR WIRELESS** under Box 58, is requested to communicate with the Advertisement Department, **AMATEUR WIRELESS**, 58-61 Fetter Lane, London, E.C.4.

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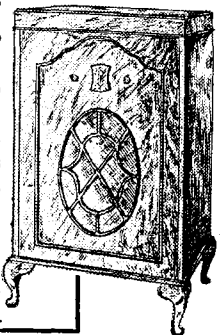
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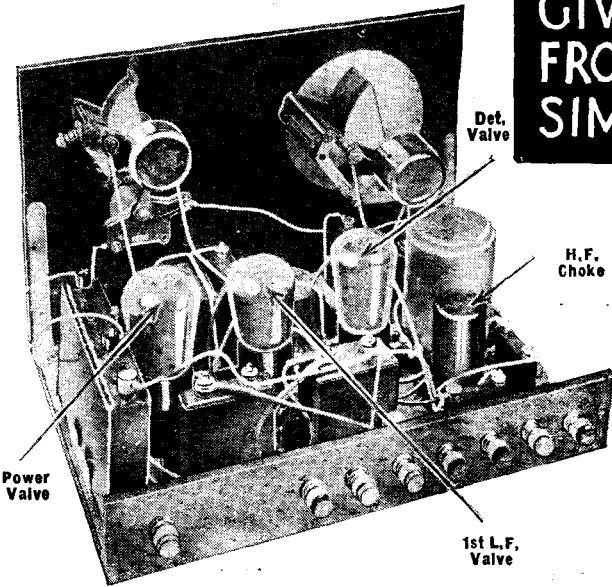
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- Double Band-pass Three (SG, D, Trans) WM262
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Station	Dial	Station	Dial				
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Kalundborg	85	Nürnberg	59	Brussels	108	Stockholm	143
Moscow	106	Trieste	65	Brno	110	Rome	145
Motala	113	Leipzig	71	Strasbourg	112	Beromuenster	150
Warsaw	123	London National	73	London Regional	115	Langenberg	155
Eiffel Tower	128	Paris	78	Mühlacker	117	North Regional	157
Daventry National	138	Heilsberg	79	Toulouse	125	Prague	159
Zeesen	146	Bratislava	81	Frankfurt	127	Florence	163
Radio Paris	153	North National	92	Midland Regional	131	Brussels	165
Hilversum	168	Poste Parisien	103	Söttens	133	Vienna	167



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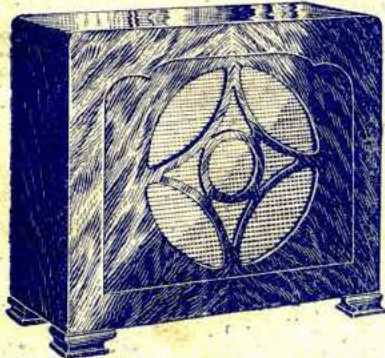


"Bo, you talk so much you's jes' like a loud speaker"

"Yeah—A Blue Spot Loud Speaker"

"An' why should you liken yo'self to a Blue Spot Speaker, Midnight?"

"Cause Ah'm always worth listenin' to, fellah."



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