

**AN INTERVIEW WITH SENATORE MARCONI.**

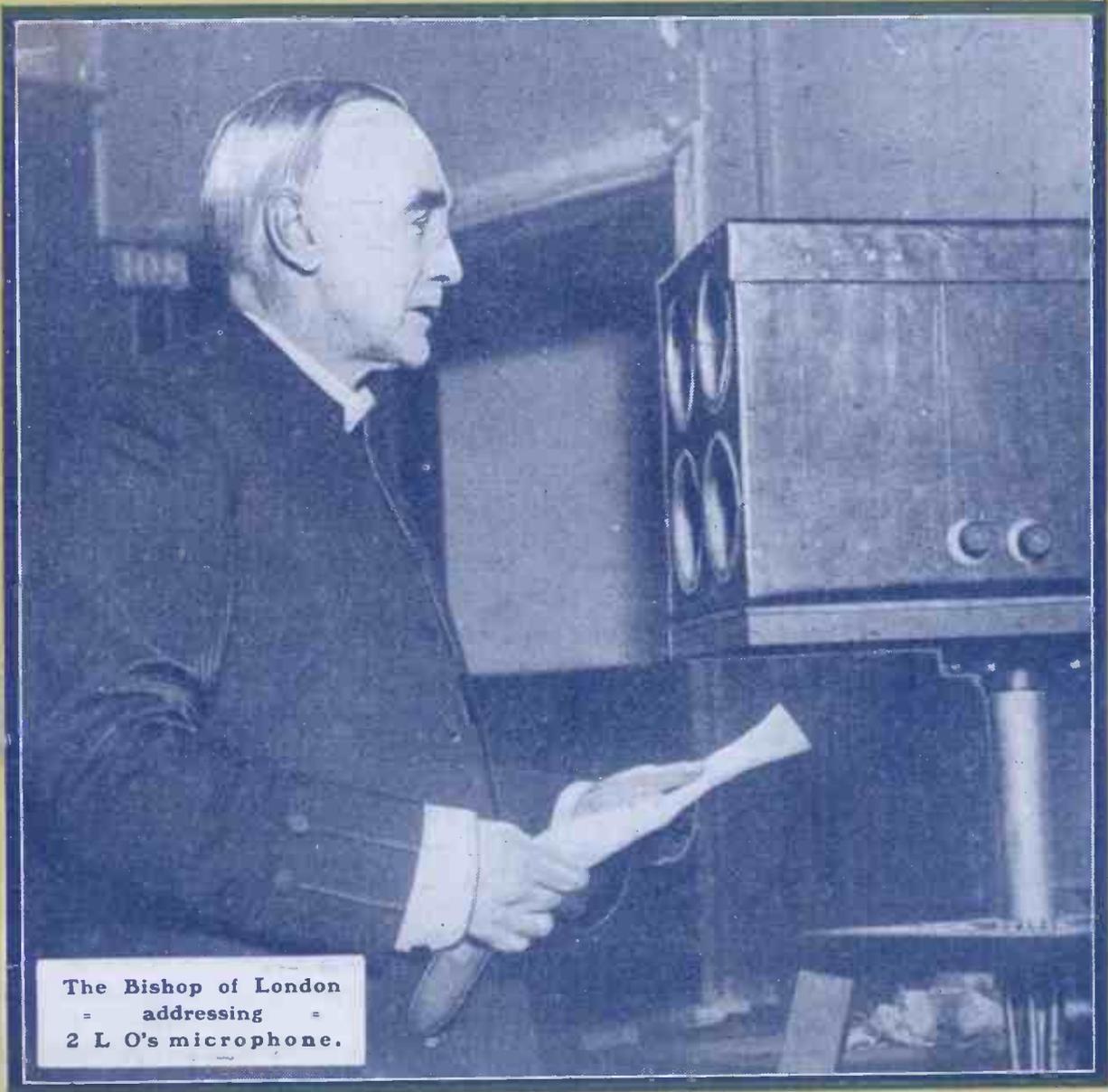
# Popular Wireless

PRICE 3d.

No. 58. VOL. III.

SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.Sc.

July 7th, 1923.



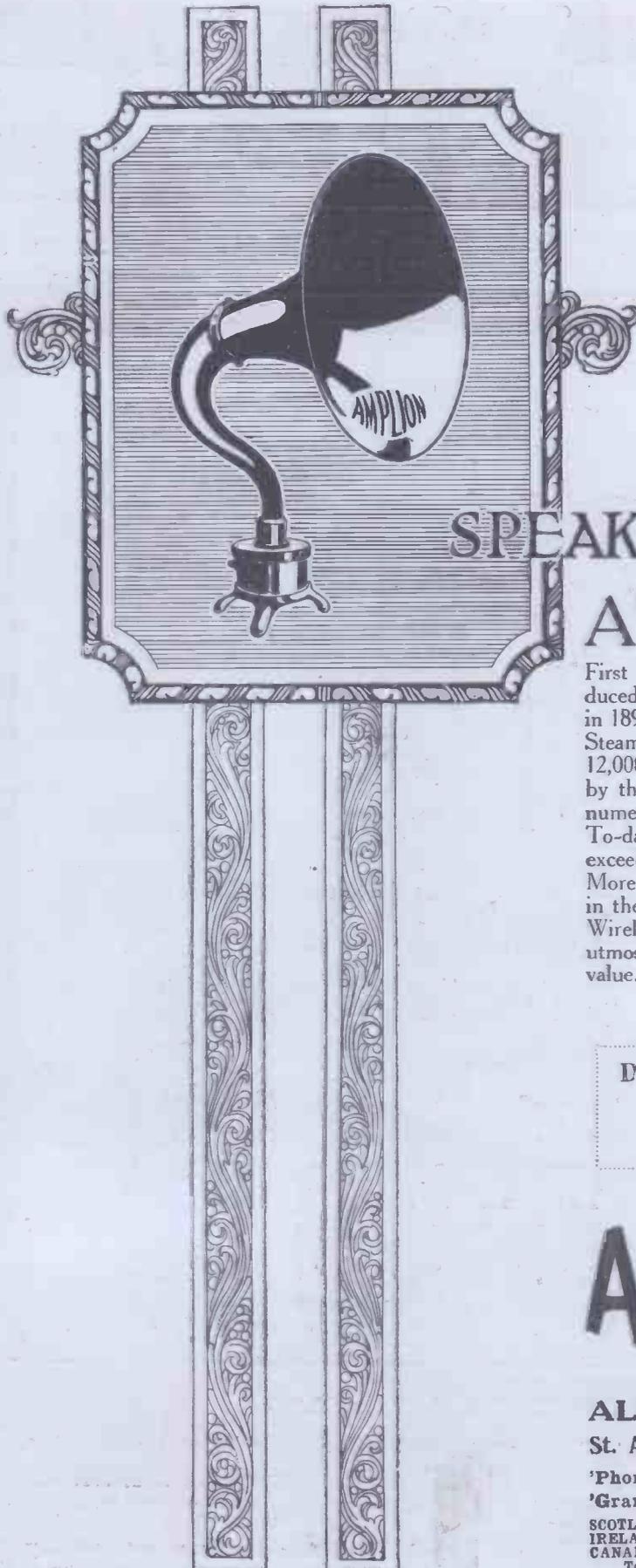
The Bishop of London  
= addressing =  
2 L O's microphone.

### FEATURES IN THIS ISSUE.

The Prince of Wales Broadcasts.  
The Amateur Aerial Mast.  
Latest News from 2 Z Y.

Construction of a Twin Detector Crystal Set.  
Novel Method of Making Wireless Lables.  
Miss Alma Taylor "Discovers" Wireless.

—And articles by Sir Oliver Lodge, F.R.S., and Lt-Col. Chetwode-Crawley.



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# POPULAR WIRELESS

July 7th, 1923.

SCIENTIFIC ADVISER, SIR OLIVER LODGE, F.R.S., D.Sc.

[Every Friday.]

## TOPICAL NOTES AND NEWS.

### Queen Alexandra Listens-in.

WHILE the Queen was on an evening cruise last week, a special wireless concert was broadcast. This transmission was arranged by Messrs. W. A. C. Smith, Ltd., of Glasgow. Powerful loud speakers were used for reception.

\* \* \*

### Aberdeen Broadcasting Station.

I AM given to understand by the B.B.C. that they have officially approved of the erection of a station at Aberdeen, and engineers have left for the North for the purpose of selecting a site. It will be about two months before broadcasting will start from the new station; work will commence almost immediately.

\* \* \*

### A Broadcasting Station for Brussels.

I HAVE it on good authority that the Société Belge Radio-Électrique is prepared to erect a station at Brussels and provide an appropriate service for Belgium without charge.

\* \* \*

### P.M.G. and S.B.R.E.

THE Société Belge Radio-Électrique is, I believe, somewhat related to our B.B.C., and a question in respect of this was asked in the House last week. The question was to the point of how Belgium can be supplied free with broadcasting while an English company requires a substantial share of fees and tolls?

\* \* \*

### Suggestions.

MR. ARTHUR BURROWS tells me that he will, without doubt, receive over 1,000,000 postcards with suggestions from listeners-in, judging from the pile already received in response to his invitation for constructive criticisms of the broadcast programmes!

\* \* \*

### Snakes!

UNCLE LESLIE, who broadcasts every Thursday on subjects connected with the Zoo, told me that after giving a talk on "Snakes," he received a letter from a listener-in next morning describing a snake he had caught in the garden, and asking advice concerning the feeding of his captive. The description the boy gave made Uncle Leslie uneasy, and he immediately arranged with the B.B.C. to

broadcast a message that evening telling the boy not to feed that snake—it was a viper.

"WIRELESS REVIEW AND SCIENCE WEEKLY" is THE authoritative journal of wireless and popular science. No. 7 will contain many most interesting articles written by leading authorities, and will be on sale at all bookstalls and newsagents on Tuesday, July 10th, price 3d.

**ORDER YOUR COPY NOW!**

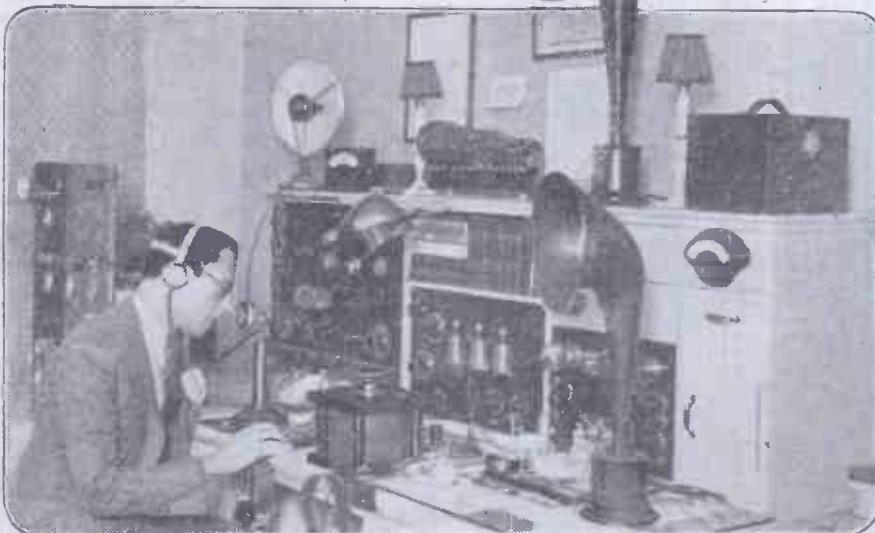
### Marguerite Leahy.

MISS MARGUERITE LEAHY, the beautiful film actress, was delighted with her first experience of broadcasting. Although she appeared to be nervous at first she soon became quite at home with the microphone, and told me that she would welcome a further invitation to broadcast should an opportunity occur.

\* \* \*

### Wireless in Villages.

BETWEEN Potters Bar and Hatfield and slightly off the main road are several small isolated villages all well within "crystal range" of



This amateur wireless station cost over £1,000 to install. The owner, Mr. George Freisinger, a wealthy American, spared no expense in making the station complete in every detail.

2 L O. Passing through these quaint little hamlets during the week-end, I was agreeably surprised by the number of aerials that are attached to both the small old-fashioned cottages and the larger country houses.

\* \* \*

### By the Wayside.

COMING back through Cuffley and so to Enfield, I stopped for a while at the King and Tinker Inn, which is

supposed to be the oldest wayside "house" in the country. To my great astonishment its time-worn oak-panelled interior was positively vibrating with such familiar words as "high-frequency," "crystal detectors," etc., apparently originating from an excited group of farm labourers. I proceeded on my journey.

\* \* \*

### Very Considerably "Wireless."

THE above might sound "tall," but would I be believed were I to mention that I once came across a very, very old and very, very dirty Arab in a ditto, ditto village way up the Nile carefully constructing a crystal receiving set? I am sure I shouldn't, but it is quite a fact. "Telephoon Midoon Silik (Wireless)," he muttered, as he grinned up at me. It was apparently very literally "Wireless"—he was winding the coil with lengths of rattan cord.

\* \* \*

### An Arab's "Library."

OF course, investigation was necessary, as this incident occurred during the 1919 risings of the natives. We discovered that although the "rattan" carefully covered quite good "litzendraht" the other details of construction were pitifully shaky. It was, however, quite a good attempt to "tap" information from passing aeroplanes using wireless. In the natives' "hut" was found copies of Shakespeare's "Twelfth Night," Poe's "Tales of Mystery and Imagination" (in French), a book on economics in Egyptian, and, of course, the "Kuran."

\* \* \*

### Call Signs for Receivers.

AN Australian correspondent informs me that in his country call signs are allotted to both receiving and transmitting amateur stations. This same writer also makes reference to the Monday

night concerts transmitted from the Marconi station on 1,000 metres, and suggests that a shorter wave-length would be more useful.

\* \* \*

### Not an Overworked Ether.

APPARENTLY there is but little ether activity in Australia, and the telephony tests carried out by the police prove very disappointing in their brevity.

(Continued on page 738)

**NOTES AND NEWS.**

(Continued from page 737.)

Two or three amateurs, however, can now and again be heard transmitting interesting, if not perfect items.

**A Point of View.**

HE considers the lot of a European or American wireless amateur an extremely happy one, and suggests that the "grumblers" and "moaners" should spend a holiday in a country where telephony, even apart from concerts, is of such rarity that its occasional and rather shaky advent produces many acclamations of pleasure.

**Energetic Wales.**

MAJOR CORBETT SMITH, the director of the Cardiff broadcasting station, tells me that the performance of the whole of Beethoven's C minor Symphony, broadcast recently from the Cardiff station, aroused the widest interest and appreciation. By the way, Major Corbett Smith has promised to write regular articles for POPULAR WIRELESS. This is decidedly good news.



Miss Jesse Kenney, the first woman to pass the new examination in Wireless Telegraphy. Miss Kenney thereby obtains possession of a 1st class P.M.G. certificate.

**America's Dull Emitters.**

DR. LEE DE FOREST (whose photo is on this page) told me recently that the dull emitter valve was a great favourite in the States. "It's only one dollar more than the ordinary tube," he said. I wonder why our D.E.R. valves are so dear.

**So Simple.**

THE doctor also told me of one way they have "over there" of making these valves. "We simply place a piece of magnesium on the plate, exhaust the valve, and cook up the plate as usual. This causes the magnesium to vaporise—and there you are.

**Increased Emission.**

WHEN the valve cools, the magnesium vapour condenses over everything, and the filament, grid, plate, and inside of the tube are coated with metallic magnesium. The presence of magnesium vapour and the metallic coating greatly increases the electron emission," said Dr. Lee de Forest.

**Where is Capt. P.P.?**

WHEN Capt. P. P. Eekersley left his famous little home in the East (Writtle), subsequently to "Two Emma Tock's" final and deeply regretted "closing down," and joined the B.B.C., we all had great hopes that we should frequently hear his cheery voice through 2 L O's microphone.

**Not Even an "Uncle."**

POSSIBLY the worthy captain is too busily engaged in the engineering side of the business—remember, he is Chief Engineer—no light task when eight or so large examples of a new science are to be watched and "wangled," but it does seem surprising that he does not appear just a little more often as an "uncle." How the kiddies would love him!

**The B.B.C. Programmes:**

I WAS very glad to hear the appeal issued from 2 L O for criticisms of their programmes. It is to be hoped that the 100,000 post cards that were asked for will be forthcoming.

**A Chance for All.**

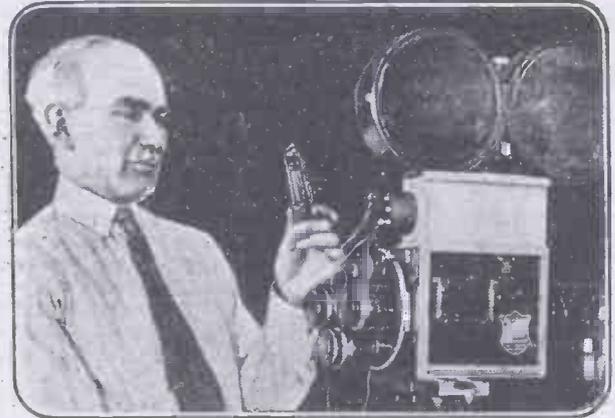
THOSE who have been bemoaning some of the recent efforts that have reached us through the ether will now have a chance of helping by some constructive criticism, instead of just holding up their hands in horror. It is no use saying certain items are poor without suggesting some better alternative, and listeners in who have a "grouse" should let 2 L O know what they prefer. It is the only way we shall improve our nightly concerts.

**Summertime Wireless.**

A SPECIAL feature on Summer Time Wireless will be appearing in POPULAR WIRELESS in a week or so's time. Describing the many ways of utilising the warm weather which we now enjoy, this series of articles gives details of construction of two simple portable receivers.

**Wireless Picnics.**

THE erection of temporary aerials in the open will prove an easy matter to those who read this series, and amateurs who construct their apparatus on the lines laid down in the articles will be able to spend many an enjoyable wireless picnic, or evening on the river, with their sets.



Dr. Lee de Forest, the man who "put the grid in the valve," at work on his wonderful new system of "talking pictures."

**Ellen Terry Appeal.**

THE appeal made by POPULAR WIRELESS for the Ellen Terry Blind Home has had wonderful support, and donations are coming in from readers all over the country. This does not mean that no more are wanted, of course, for I want to make this a very special effort, and look to all our readers for support. Miss Terry has promised an autographed photo of herself to everyone who sends 10s. or more.

**Send to "Ariel."**

DON'T forget that all contributions should be sent to "Ariel," C.o. "The Servers of the Blind League," 3, Upper Woburn Place, W.C.

ARIEL.

**BROADCASTING TRANSMISSIONS.**

Regular transmissions of news and concerts take place daily from the following stations. Full details appear in the daily press.

London	2 L O	369 metres
Birmingham	5 I T	420 "
Manchester	2 Z Y	385 "
Newcastle	5 N O	400 "
Glasgow	5 S C	415 "
Cardiff	5 W A	353 "

Other stations of interest to listeners in Great Britain are:—

Eiffel Tower	FL	2,600 metres	Throughout the day.
Radio-Electrique, Paris	S F R	1,780 "	5.5 to 6 p.m.
School of Posts and Telegraphs	—	450 "	8.45 to 10 p.m.
			7.45 to 10 p.m.
			(Tuesdays and Thursdays.)
The Hague	P C G G	1,050 "	4.30 to 7.30 p.m. Saturdays.
			3 to 5.40 p.m.
			(Sundays.)
			8.40 to 9.40 p.m.
			(Mondays and Thursdays.)

## AN INTERVIEW WITH SENATORE MARCONI.

This great wireless pioneer describes the result of his latest experiments and expresses his opinion on the subject of wireless television.

SENATORE MARCONI is once more in England after a two months' cruise in his yacht, the "Elettra," in connection with his investigations into the possibilities of directional wireless. The great inventor looked very bronzed and well when I saw him the other day at Marconi House and was very enthusiastic as to the results that had been obtained during his tests.

I handed him copies of POPULAR WIRELESS and "Wireless Review," and asked what he thought of the latter.

"It's very well got up," he answered. "Of course, as I've been away I have not seen it before, so cannot give any opinion as to the articles that have appeared, but it strikes me as a very well arranged paper."

### Disadvantages of Television.

I then explained that "Wireless Review" was offering a prize for an article showing how wireless television was to be accomplished, and asked the great inventor what view he had upon that branch of wireless.

"I really don't know much about it," he confessed. "You see, I have been following up another branch, that of the directional possibilities of wireless waves, and have had no time to probe the mysteries of television. As a matter of fact, I do not think either television or wireless television will be accomplished in the near future, though I have no hesitation in saying that they will be discovered at some time or other. As regards the land line, I don't feel too sure that television would be an advantage," Senatore Marconi said, laughing. "For I rather think that on the majority of occasions on which we use the telephone we would rather not be seen. Especially must this be true of the fair sex in the early mornings, as far as I can judge from what I hear."

"But with regard to broadcasting?" I queried.

"Ah, in that case, wireless television would undoubtedly have great possibilities, but I think it will be some time before it reaches such perfection that it can be applied to the nightly operas and concerts. With regard to the operas it would, of course, be a great advance."

Discussing the more mercenary side of the subject, Senatore Marconi said, "It certainly holds great possibilities with regard to the transmission of scenes and photographs from one side of the world to the other. Our daily papers would benefit greatly by being able to obtain pictures of happenings in America, for instance, red hot on the same day as the events."

I then remarked upon the advent of Dr. Lee de Forest's invention, the "Phono-

film," and suggested that this, too, would have a very bright future.

"Yes," agreed Marconi, "I should say that the commercial future of the 'Phonofilm' is full of chances, but I must confess that as I have not followed the subject, I really know nothing about it, and cannot give any definite opinion. You see," he went on, "you do not have much time for branches of wireless other than those which you are investigating for yourself."

I acknowledged the force of this remark, and asked what success he had had on his recent cruise.

thence to Capablanca. Tests were carried out all the time, and results were obtained up to 2,000 miles, using far less power than is usually used to communicate from London to Paris. I hope to go for another cruise in July, or if I do not go, for it is very tiring, the two gentlemen who assisted me, C. S. Franklin and M. G. Mathieu, will probably undertake the tests."

### Higher Speed of Transmission.

"What outstanding features are embodied in this new development?" I asked the Senatore.

"Well, roughly, we are making use of wireless waves of much smaller wave-lengths than we did previously, and this has enabled us to direct the messages. The focusing of the waves naturally saves a great deal of power, because the power that is usually wasted in broadcasting the waves in all directions can be brought to bear on the one concentrated beam, with the result that the waves do not become attenuated so soon. Another point that we discovered during these tests was that these smaller waves lend themselves to a far greater rate of transmission than is usually possible in telegraphy. The waves can be transmitted at three or four times the normal speed, and it now rests with the mechanical part of the sending apparatus as to whether these speeds can be used commercially.

"Though the apparatus that is used for the transmission of these very short waves is of a somewhat novel and special character, it will not entail any really great expense for stations to be fitted for this new type of telegraphy. The benefits, of

course, are fairly obvious. Transmission of messages will be more speedy, and less power—only a small fraction of that now used—will be needed to cover the same distance as previously. The effect of both these advantages will be felt by the general public in the reduction of tariffs that it will be possible to make. Also as messages will be sent faster and cheaper, the news services of the press will also benefit. Altogether, the new system should prove beneficial in every way.

"Wireless is a very fascinating subject," concluded Senatore Marconi, "for you never know what new phase you are likely to hit upon, and we have only begun to understand its possibilities as yet."

As I left I glanced at the small museum where the earliest attempts to harness the ether are recalled by unwieldy condensers, and crude detectors, and I wondered at the remarkable speed with which this latest science has developed.



Senatore Marconi and his wife examining the log book of one of the huge American generating stations.

"We have been very successful," Senatore Marconi said enthusiastically, "and results have been obtained that constitute a great step in wireless telegraphy."

Upon my request for details as to his investigations, Marconi said he could not give any definite description of the apparatus.

### Further Tests.

"It is a question of patents," he explained; "the tests were of a novel nature, and at present I cannot give full details of the apparatus or methods used. Briefly, I may say that owing to the tests carried out during the last two months, it appears to be possible to transmit over long distances with only a fraction of the power that is usually necessary. As you know, I sailed in my yacht, the 'Elettra' about two months ago, and we first of all went to the Cape Verde Islands. Here a few tests were carried out, and then we pushed on to Gibraltar and

## HOW MISS ALMA TAYLOR "DISCOVERED" WIRELESS.

In an interview with a special representative of "Popular Wireless" this beautiful cinema-star recounts the story of her radio activities.

**I**T was at the famous Hepworth studios at Walton-on-Thames that I was introduced to Miss Taylor.

I was looking out of the window, expecting a majestic lady with a typical cinema face to sweep dramatically into the office. My surprise was, therefore, an extremely pleasant one when a most charming girl jumped off her bicycle and appeared before me—almost before I had time to collect my thoughts.

Miss Taylor has delighted too many readers of POPULAR WIRELESS to need the compliments that are trying persistently to run off my pen, so I will endeavour to confine myself to reporting her views upon wireless.



Miss Alma Taylor.

"I just love it," she said. "I have only had my set about a month, and I wouldn't be without it for anything. I spend nearly every night from six until twelve, and sometimes one o'clock in the morning, listening-in."

"One o'clock in the— What kind of set is it, Miss Taylor? A crystal or val—"

"A two-valve set," she replied proudly. (And I thought there was a touch of indignation in her voice at the mere suggestion of a crystal set.)

"Does it re-generate—does it ever upset other people?"

### Headphones Preferred.

"No," she replied, laughing. "Not so far—at least, nobody has complained about it. What worries me is that I wish I knew more about it. I know what inductance means, but there is such a lot to learn."

"What do you like listening-in to best?"

"It is all so interesting. I like the concerts, and—well, everything. No, I've not heard the SOS yet—that must be exciting. But after everything else is shut down, I like listening to the experimental stations. I think I like that best of all. There is a man a few miles from here who broadcasts, and about eleven or twelve

o'clock at night he begins experimenting, and I find that most interesting. I have tried to pick up the stations he talks to, but have not succeeded as yet."

"Have you a loud speaker?"

"No. They sound so much like a gramophone. You only seem to get the real thing with the headphones. I slip those on, and often I don't take them off until one o'clock in the morning. And then there are the time signals. It is all so fascinating."

### A Funny Experience.

"Do you have any difficulty in tuning—can you pick up the different stations quite easily?"

"Oh, no, no difficulty at all. I am told my receiver has a coarse adjustment, but it is quite satisfactory. One thing I cannot understand: the afternoon is the worst time of all. There is sometimes a difficulty then."

"I had rather a funny experience one night a few weeks ago. Whilst I was listening-in, every now and then there was a bang. It did not interfere much with reception, but the next day someone told me that there had been a thunderstorm a few miles off. Had I known it at the time, I should have had my headphones off pretty quickly, I can assure you!"

"Will you tell me, Miss Taylor, why you went in for wireless, and how you set to work about it?"

"Well, to begin with I was interested and thrilled when a friend of mine told me all about his set. Of course, I wasn't clever enough to make mine myself like lots of people do. So I bought a two-valve set, which cost £15, including two head-pieces and wire for the aerial; but I had to buy the battery and two more head-pieces and several little tools to work with before I could get it started.

### What the Garden Said.

You can imagine how I felt buying these, because, of course, I know so little about it, and thought they would see this and laugh at me. They always laugh at girls if they try and do anything except sewing; don't they? However, I got through all right and hurried home to begin the great adventure. It didn't take as long to do as I thought it would, and we had it working and got right into the Marconi House children's stories. Oh, dear, it was exciting! So much so, in fact, that since then (weeks ago) I have spent all my time away from the studios on it, and, oh, my poor garden! It has been left all by itself so much that this afternoon it told me straight out that it was time I got over this wireless nonsense and helped it to get itself straight. So I said I would, but it is so wonderful and thrilling to hear the Paris concerts. And then there are all the people experimenting after 11 o'clock at night. Really, I believe I like that part best of all, and sometimes I get into bed (having decided I must go to sleep at my

usual time before all this happens), and I cannot resist it. I hop out and run down to hear what's going on.

### "A. T." Closing Down.

"There is another great joy about it for me, and that is, my mother loves it so much, especially when they are broadcasting any of the theatres. Oh, and it's really the most joyous thing to watch my little kiddy friends' faces when they troop in to listen-in at the children's stories! One day I really must take a picture of them, with their little faces agog with interest and wonder, and mouths wide open as if to hear through that! Such scowls when I dare to say, 'Who's that—Uncle Arthur speaking?' He is my favourite uncle, you see.

"Now I think you must be tired of listening-in on this, so A. T. will be closing down now until—"

Just at that moment there was a crash, and then the sound of three explosions. The driver of a motor-car had apparently mistaken the hedge and railing bounding the studio grounds for something else, and the car had smashed right into them, breaking off the front wheels and bursting three tyres. Miss Taylor disappeared like a hare, and we found her shortly afterwards inspecting the damage and reviewing the situation with the eye of a connoisseur.

### Really Genuine Interest.

Undoubtedly it would have formed an excellent subject for the camera.

When next readers of POPULAR WIRELESS see this brilliant young cinema star on the films, they may try to picture her with her headphones on, and may feel a thrill of pride that there is a "wireless" tie of sympathy between them and this charming and dainty little lady who delights so many hundreds of thousands, and to whom our gratitude is due as one of the leading artists who, by her superb acting and superior talent, is helping to maintain the prestige of British film productions. Those who have witnessed "Comin' Through the Rye," and other plays in which she has taken a leading part, will speedily realise the truth of this statement.

To Miss Taylor wireless is more than a passing whim. She takes a very real and genuine interest in it, and, I venture to think, will soon know as much about the technical details as any other amateur reader of this paper—perhaps more.

Readers are invited to submit the results of their experiments in the form of short constructive articles. If accepted for publication they will be paid for at our usual rates.

# THE AMATEUR AERIAL MAST.

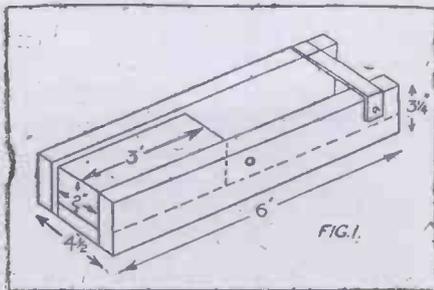
A design that should prove useful to all desirous of obtaining the greatest efficiency in aerials.

THE motto of the amateur who owns an outside aerial should be "Excelsior," but, judging by the amateur aerial masts which one sees while going about, he has not adopted it. So seldom do they look properly designed for their duty that when a good one is noticed it is immediately remarked how well suited to its work it appears to be. The writer has used for years, with quite satisfactory results, ordinary pine or deal wood, cut to a section of two inches square, and up to thirty feet in one length, or fifty feet or more in two lengths; there is nothing to beat it if properly stayed. For the stays use light single bronze wire of No. 20 S.W.G. at intervals of 20 ft. up the pole and a good spread at the ground level, and this will be ample.

Assume, for example, that you want a pole 40 ft. high in your back garden. Procure two good pieces of 2 in. by 2 in., each 23 ft. to 25 ft. long, free from knots and other doubtful places. Plane them up square. The piece intended for the bottom half of the pole can have just the sharp corners planed off, but not more than that should be done. Starting from the bottom of the top half, take off the corners uniformly all the way up the pole till, from being quite square at the base, at the top the section is octagonal—that is, all the eight sides thus formed will be equal on the faces. This will give a fine tapering effect when erected without detracting from the strength of the pole. The addition of a cap on top to prevent the wet soaking in to the end grain is desirable.

### Firm Setting Essential.

The poles should first be planed up as described and given three coats of good lead paint, and then laid aside for a week for the paint to harden. The "tabernacle" (Fig. 1) can then be made. If the pole is to be set in the ground, four pieces of hard wood—preferably oak—should be prepared. Two pieces, forming the sides of the tabernacle, are 6 ft. long, 1½ in. thick, and 3½ in. wide; another piece of the same length and thickness but only 2 in. wide, and still another 2 in. by 2 in. and 3 ft. long. These should all be square at the

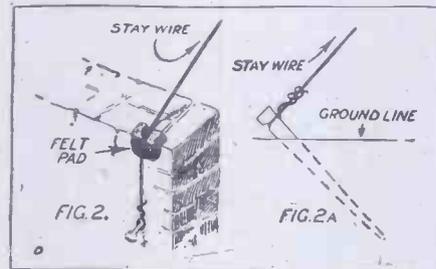


edges, and after nailing together in the form of a trough the three 6-ft. pieces, with the 2 in. wide piece forming the bottom of the trough, and the 2 in. by 2 in. piece at one

end of the trough, the whole given a dressing or two of creosote. This tabernacle is set upright in the ground and well tramped down, forming the socket of the pole when erected. If it is possible to set it in concrete so much the better. It should be remembered that the main stresses on such a stayed pole are vertically downwards upon the base, and though a firm setting for the tabernacle into which the pole sits is desirable, it is not necessary to overdo this matter.

### Question of Anchorage.

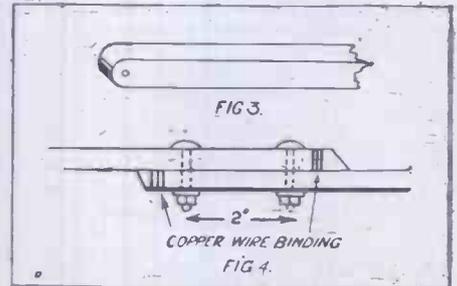
The anchorage of the stays is more important. If you are anchoring on to a wall or a fence, see to it that the pull of the stay does not act so as to pull directly on the nail as though to pull it out. It can generally be arranged to carry the wire over a corner which will ease the stress on the nail (Fig. 2). A block of wood or stone buried in the ground makes a good anchor, although a good stout oaken peg driven athwart the strain is by no means to be despised as a stay anchorage (Fig. 2A). The



tabernacle should be fitted and tried on to the base of the pole before either is set up, and worked round to see whether the pivot bolt at the base would cause it to jam. The ½ in. pivot bolt, 5 in. or 6 in. long through the sides of the tabernacle and through the side of the base of the pole at about an inch from the end, will form a hinge or pivot upon which the pole can be swung up into the vertical. The base of the pole should be rounded off to allow of this being done (Figs. 1 and 3).

The side stays can be made off while the pole is lying on the ground, with the base of the pole in position, taking care that the anchorages are at right angles to the pole on either side so that the angle which the stays make with the pole is not altered in putting the pole up. Then with one person

lifting the pole off the ground into the air with a long clothes-prop, and another pulling on the back stay as soon as it is well off the ground, the mast can be easily erected. As soon as the pole is nearing the vertical, the man who had the prop should discard it for

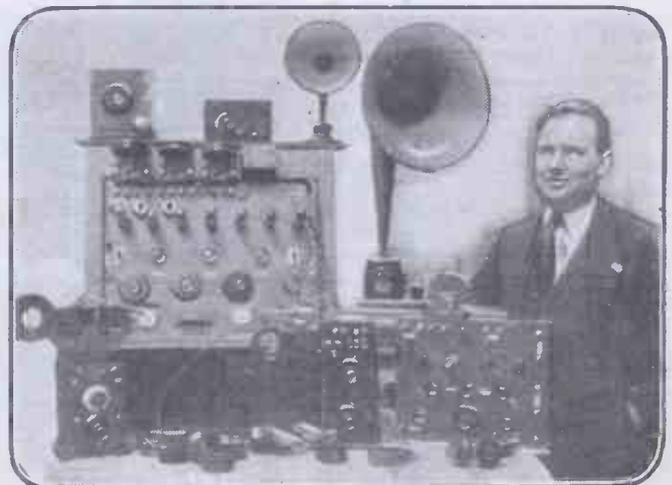


his hold on a stay in the same direction to prevent the pole going over too far. A metal strap (Fig. 1) will retain the pole in the tabernacle.

If a convenient tree is available, the pole made as described may be lashed to it, and the making and setting of the tabernacle avoided; but it rarely happens that the tree is so upright that the pole can be lashed direct on to a limb without some form of packing to secure the uprightness of the pole. Remember to keep the butt of the pole clear of the ground, else the wet will creep up and soon rot the pole.

### Bolting Sections Together.

If, as we have indicated before, the pole is made in two sections, they should be bolted together with an overlap of at least 3 ft., with the holes for two ½ in. cup-head bolts drilled 2 ft. apart, and the ends of the two poles bound round with copper wire to prevent splitting before tightening up the nuts (Fig. 4).



The efficient receiving station assembled by Mr. J. E. Major, of Swinton.

## NOTE CONCERNING THE SPECIFICATION OF TRANSFORMER AND OTHER COIL WINDINGS.

BY SIR OLIVER LODGE, F.R.S., D.Sc.

In this article our Scientific Adviser shows how inadequate a description of a coil can be if only its resistance is given.

IT appears to be customary for instrument makers to specify their transformer and other windings by inscribing on them the resistance. That is probably because the resistance is so easily ascertained and verified. But it is not a good mode of specification, and may lead to misunderstanding. What we want to know about a transformer is the number of turns of wire in both primary and secondary, so as to give the transformer ratio, and so as to enable us to calculate the self-induction of each coil, and the mutual induction between them. These, of course, can be ascertained by experiment, even when the transformer contains iron. But some estimate could be made of them if the number of turns and the other dimensions were known. Resistance gives no information at all.

### Resistance an Unwanted Factor.

The same is true of telephones and galvanometers. These windings too are usually specified by resistance. And there must be a temptation to wind them with badly conducting wire, or even some material not copper, in order to get the high resistance more easily. It ought therefore to be widely known that high resistance is no advantage at all. So far as it goes, it is a defect. Resistance is unavoidable in a coil wound with a great length of fine wire. But nobody wants resistance for its own sake. Resistance is only of value when heat is desired, as in a heating coil or a lamp filament. For all ordinary instruments the less the resistance the better. High resistance should only mean that a great number of windings have been crowded into a compact space, and the tacit assumption is that the highest conductivity wire has been used. If not, then a specification in terms of resistance is misleading. Number of turns of wire ought to be recorded on an instrument, because that cannot subsequently be ascertained. Any one can ascertain the resistance, if they want it, without trouble, by means of a Wheatstone bridge. Either the diameter of the wire, or the total length of wire used, should also be recorded. Either of these quantities involves the other, if the number of turns and the mean radius of the coil is known.

### Regarding Insulation.

Resistance is only an easy short-hand method of specification, to discriminate one coil from another, if they have all been made in the best possible way; but without this guarantee the specification of an instrument's "resistance" may be misleading, and might lead a workman to imagine that high resistance was a desideratum to be obtained in any manner he chose, instead of an unavoidable condition inseparable from the other data and the properties of material.

I believe that wire as thin as No. 45 gauge can be coated with enamel as an initial insulator. If so, such wire or something rather less fragile ought to be very serviceable. And

whether that wire should be wound compactly, or how far the turns should be separated from each other—either by air or by other harmless material—is a question of compromise which can be best ascertained by practical experience. If the shortest length of wire is employed, by winding it in the shape to give maximum self-induction, I doubt if it is necessary to separate the turns much; though, of course, some insulation beyond the enamel is required. For although compact winding will give more capacity, as well as more self-induction, the reduction in the length of wire, due to the adoption of the best shape, will give a diminution of capacity—probably as much diminution as separation of the turns would give, since this would necessarily involve the employment of a greater length of wire.

## MIDLAND NOTES.

A RECEIVING set for the use of the inmates of the Highbury Hospital, a Moseley (Birmingham) institution for wounded ex-service men, has been presented by the General Electric Company. The presentation on behalf of the G.E.C. was made by Mr. Thomas, of the Alexandra Musical Society, and in acknowledging the gift the hospital principal said it was the best the hospital had received. The evening concluded with a wireless concert from 5 I T.

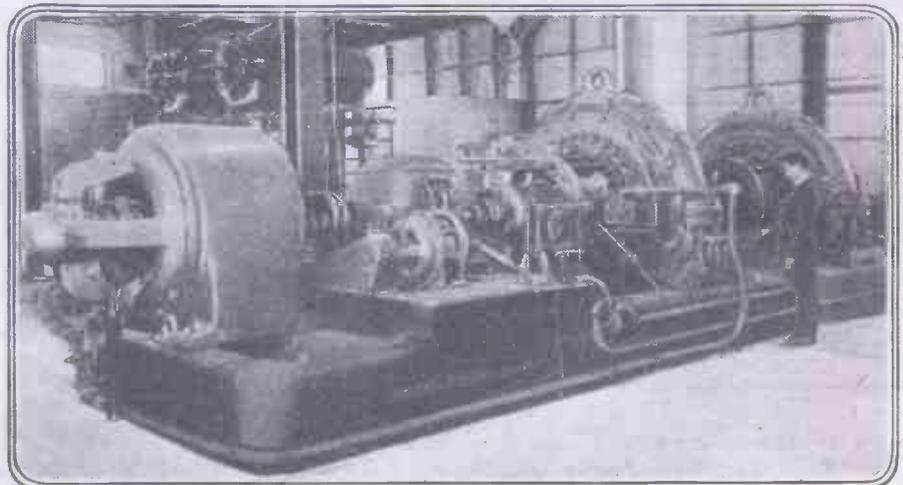
THE Station Director at 5 I T has received from a Mr. Henry New, of 1419 East Hewson Street, Philadelphia, U.S.A., a letter in which he describes how he picked up an orchestral trio at 7 a.m.

on April 12. "I did not get the call signs, as I had to go to work," he wrote, "but obtaining a London 'Times' for that date, he found that it was Birmingham." 5 I T verifies his statement, and thus it has been established that an American listener-in, using, so he explains, only two tubes (valves) of his set, which is a three-tube honeycomb coil set, has heard Birmingham over a distance of roughly 3,000 miles.

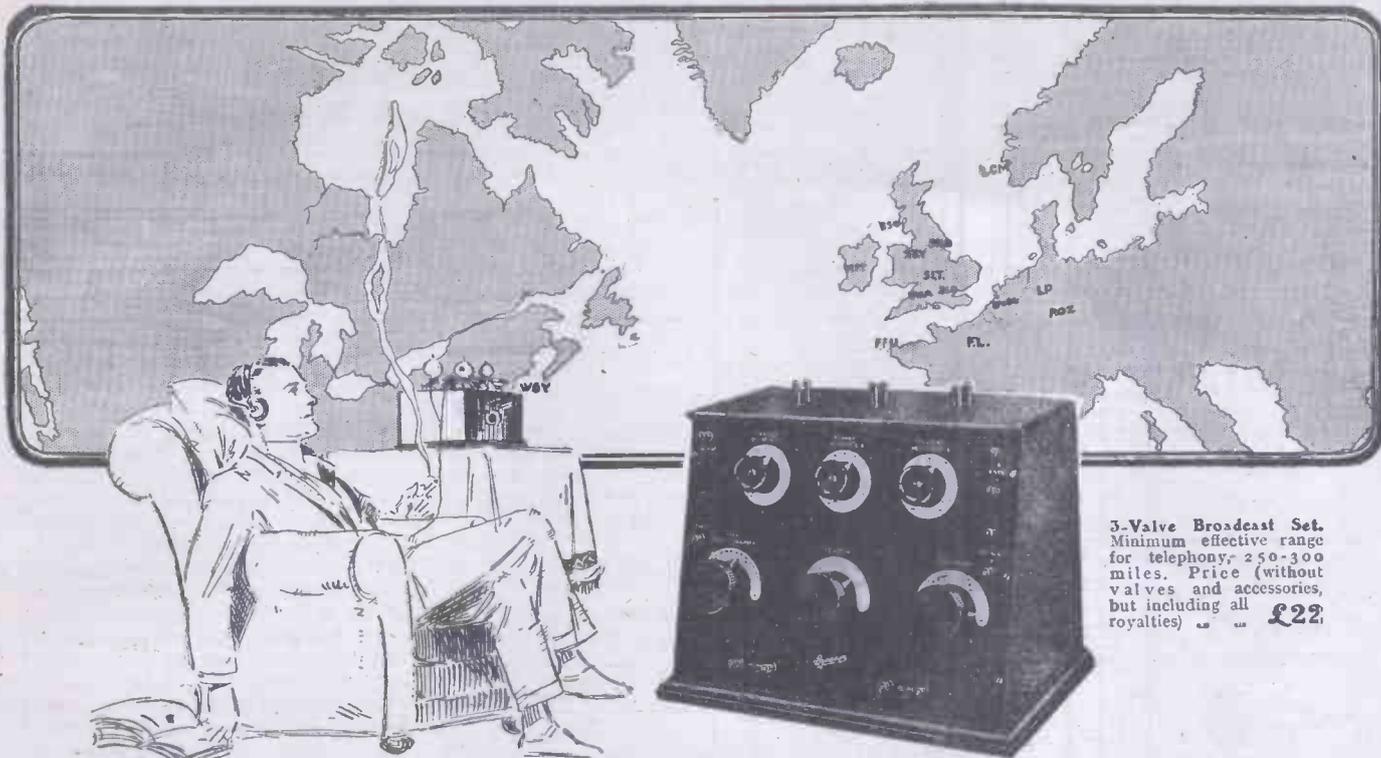
WHEN the Chief Constable's Association recently held their annual conference at Birmingham they were entertained by a wireless concert from the Birmingham Broadcasting Station. The concert room was situated in the Victoria Law Courts in the heart of the city, and here a well-known Birmingham wireless firm—Messrs. Cooke and Whitfield Wireless, Ltd.—had installed a loud speaker working off a three-valve H.F. detector, with a two-valve amplifier, a frame aerial being used, all the apparatus having been manufactured by the Western Electric Company, Ltd. The reception was fully successful, and the audience was thoroughly appreciative.

DR. RATCLIFFE (20 X), president of the Birmingham Experimental Wireless Association, and one of the best known Midland wireless men, recently carried out some interesting experiments in conjunction with one or two other Birmingham amateur transmitters. During an amateur transmission by 2 K O he placed a recording dictaphone against his loud speaker, and when he changed over to speak he mystified other listeners-in by re-transmitting the gramophone record as well as the conversation that 2 K O had just sent out. In this direction of "bottled radio," as the doctor calls it, he suggests there are great possibilities.

ANY city provides, these days of radio enthusiasm, many interesting examples of ingenuity on the part of amateurs. Some of the aerials which meet the eye are weird and wonderful. Others are strictly standard and orthodox. It is hard, however, to select the category under which the effort of a certain Birmingham amateur comes who has found support for the free end of his aerial by tying it to a G.P.O. telephone post. Only a Post Office Lines Inspector would be capable of expression.



Two of the 200 kw. H.F. alternators employed in the "Radio Central" station of America.



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# H.R.H. THE PRINCE OF WALES AT BIRMINGHAM.

A special report of a "red-letter" day in the Midlands from our Birmingham Correspondent.

**W**IRELESS in the service of Royalty has long been suggested as a real means of *rapprochement* between the King and his people. Its usefulness has already been many times demonstrated by the Prince of Wales and his Royal brother, and a signal honour in the history of wireless was secured for the Birmingham broadcasting station when 5 I T broadcast the Prince's Birmingham speech.

It was a true red-letter day, as much in the history of radio-telephony in the Midlands as it was a red-letter day in the history of Birmingham civic affairs. Wireless was pressed into service for the advantage of the people more than it had ever been before.

The Prince of Wales received and replied to an address of welcome in the actual presence, in the Birmingham Town Hall, of an audience of 2,400, largely composed of the élite of the Midland metropolis. But because on the table before him there stood a little microphone, connected up with the broadcast station at Witton, three and a half miles distant, because the wireless shops of the city, almost without exception, turned their loud speakers towards the ears of the crowds in the street, because every listener-in who was not viewing the life in the city thoroughfares was listening-in at home, the Prince's voice was heard in all the principal places in many Midland cities and villages, and even in home-steads deep in the countryside.

Thus wireless in the Midlands has received a great impetus, and its popularity has been more than ever enhanced.

It was only three days before the event that it was known that the speech would be broadcast. The time was not great enough for many new wireless sets to be installed. The telephone land-lines were connected up with the Town Hall, and the microphone and microphone circuit installed the previous day; and after the ordinary wireless concert had ceased, then the Town Hall apparatus was tested.

## Preparations.

Listeners-in of that date will remember the impromptu concert that ensued, without either chapter or verse. First there were a few scrappy items of incongruity, and then the ballad of the immortal Mary who had a little lamb was recited, while a former Shakespearean student with a poor memory recalled what the noble Antony said about the equally noble Cæsar. That the test was satisfactory was demonstrated the next day when, precisely at 10.5, the microphone circuit was opened, and one heard the Birmingham Town Hall, one heard the voice of Birmingham, a voice that was full of a great greeting of loyalty to the Royal visitor.

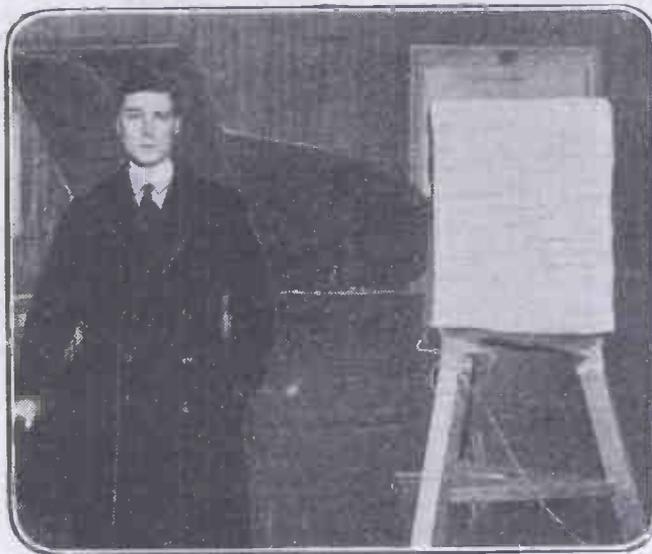
Far away from the city, I listened to the

voice of Birmingham, and I was as truly present at this tremendous welcome to the Prince of Wales as any other person, even though he sat in that great gallery or the east and west galleries in the Town Hall, which happened to be so crowded.

From my window I could see mile upon mile of undulating country, and in the distance the Malvern Hills. But at 10.5 that morning the country vista was forgotten. First there came the familiar warning from 5 I T, and then the Town Hall circuit was switched in, and in a sudden buzz of sound could be heard the drone and throb of the great organ.

## Sounds of Cheering.

The announcer intimated that the Prince was crossing the great square from the Council House, and, knowing it well, I was able to imagine the scene of brilliance; I was able, though the announcer did not describe it, to picture the procession of



H.R.H. The Prince of Wales and the broadcasting microphone.

Royal guest and civic dignitaries, led by the city's mace-bearer.

The fainter cheering without grew into the heavier hurraing that indicated that the Prince had entered the historic building, and as it died away there was a quick silence across which sounded the sharp utterance of the Lord Mayor, whose voice was easily recognisable.

Then there came the address of welcome—pompous, as all such addresses are—and to this there succeeded the Royal speech. It was the first time I had heard the Prince of Wales speak, but my impressions, I find, agreed with those of many others who heard him.

For broadcasting, his voice must be particularly suitable, if the Birmingham broadcast is the occasion for judging. Using the headphones, it sounded strikingly melodious, while for charm of accent, purity of diction, ease of stressing, it cannot be easily equalled. Each word

was distinct; each word was as audible as though I had been sitting either in the body of the Town Hall or in one of the galleries.

There were the punctuations of applause, and then the calm, clear voice went on again. I missed nothing. The newspapers proved that to me, for as I listened-in so I took a shorthand note on the pad beside me, and my transcript varied not one word from the full reports of the speech which the earliest paper, reaching me some six hours later, contained.

But I heard more than just the Prince's speech. With a copy of the programme, I should have been able to have drawn a word-picture of the event in that great hall. Without one, I did not know a great deal less.

I heard the Lord Mayor request permission from the Prince to present various citizens. As name after name came through the receiver, so I was able to recall many of the Birmingham public figures whom I had seen and heard so often before. That the Prince had moved was obvious from his inaudibility. He had left the vicinity of the microphone, and so one of the difficulties of out-of-the-studio broadcast work had been experienced.

But still there was much to hear. There was the murmur of the multitude in the streets without, recurrent shouts, sharper, shriller sounds—it may have been the noise of horns—and ever and anon bursts of singing. Then this was drowned in the cheers of the audience. "Three cheers for his Royal Highness!" someone demanded.

The function had ended. There was that indeterminate buzz as of an audience moving and the rise and fall of the organ notes.

There was a sudden silence. The station closed down. The Prince had spoken to the Midlands, and we had heard.

## All too Short.

As my eye caught the view of the country again, I thought how for the listener-in that great day in Birmingham could have been prolonged. Perhaps it will come soon. Not only will the announcer describe the scene in a great city hall, not only will those speeches be heard, but wireless will gather its story of all that happens in the city streets, announcers will describe the events as they fill the fitting minutes, and we who are afar will yet be present through the ever-magic ear and voice of radio.

## NEXT WEEK

An article of particular interest to Cardiff listeners-in will appear in POPULAR WIRELESS.

# APPLIED ELECTRICITY.

By E. A. GATEHOUSE, A.M.I.C.E., A.M.I.E.E.

A resumé of an interesting broadcast lecture dealing with a subject which should be of extreme interest to all amateurs.

I AM going to talk, not on the subject of electricity as applied to broadcasting, about which many of you know a great deal more than I, but upon the many uses to which electricity has been put in everyday life. To do this I must unfortunately take you abroad, for, though many uses of electricity have been commenced in this country, other countries are ahead of us. Firstly, let me deal with the subject of high pressure voltages. Those of you who have the advantage to possess a valve set, know that you need two batteries, one of 4 to 6 volts, the other of anything from 50 to 100 volts. The latter being commonly known as the "high tension" battery.

Now in speaking of high-tension voltages, we generally mean an enormously higher pressure than this. In power transmissions the tremendous voltages are employed of 6,000, 11,000, 20,000, or even 33,000 volts. In Japan a voltage of 150,000 has been used, and in America one of 220,000, or nearly a quarter of a million volts. You must not assume, however, that we are very far behind the times, for in Canada enormous power has been transmitted over a distance of several hundreds of miles, equal to a land-line from London to Aberdeen.

In America experiments have been carried out employing transformers in which enormous voltages of one million, or even up to one and a half million volts\* have been attained, and from which a spark fourteen feet long has been projected. Those who have a valve set have noticed the little spark that is made sometimes when connecting the high-tension battery, and from this you may be able to form some idea of the spark that would span fourteen feet (across a fairly large room). It is unlikely, however, that any practical use can be made of such voltages at present. The problem of insulation presents a difficulty of enormous proportions.

## Farming by Electricity.

A great deal of attention has been drawn to the power stations at Niagara. The water power from these famous falls provide one million horse power, while the other stations still in the course of construction will, it is estimated, supply another half-million horse power. Those now in existence supply 275 separate municipalities. The water power sources of Canada are not nearly utilised to the full. Those stations which have been constructed supply a total of about three million h.p., and only the fringe of the resources has been touched. It is estimated that another thirty-five million h.p. is available.

\*Since Mr. Gatehouse delivered the above lecture, news has come to hand with regard to the successful production by the G.E.C. of America, of an electrical pressure of no less than TWO MILLION volts. This, however, can hardly be included in the category of "applied" electricity, for, as Mr. Gatehouse says when mentioning pressures of such a nature, "it is unlikely that any practical use can be made of such voltages at present."—EDITOR.

With regard to electrical ships. In America there are several merchant vessels equipped with generators, while in this country there is only one, though there are more on order. America has twenty electrical ships in construction, or ready for service. The power available for these ship stations is 150 thousand volts, or equal to twice the amount required to run the whole of the underground railways of London.

Electricity has also been applied to farming. Agriculture by electrical means has had little trial here owing chiefly to the fact that power lines have not been laid very far into the country districts. In Germany and France, however, it has found more favour. There are 600,000 machines in America by means of which sowing, reaping, binding, etc., are carried out by electricity. There are 9,000 farms in America where electrical machines are in use for milking cows. Haymaking has been done by electricity, and crops have been made to grow by electrical discharges.

## In Medicine.

Electrically operated incubators have been constructed which deal with 10,000 eggs at once. It is, of course, heated by electricity, and is opened once a week to insert fresh eggs and to take out the live chicks. In the

Spalding district of England the bulb-growers have adopted the use of very powerful electric lights, by means of which blooms have been obtained well in advance of their natural time. In the medical world electricity has been found useful in many ways. Chiefly for the treatment of ulcers and similar growths.

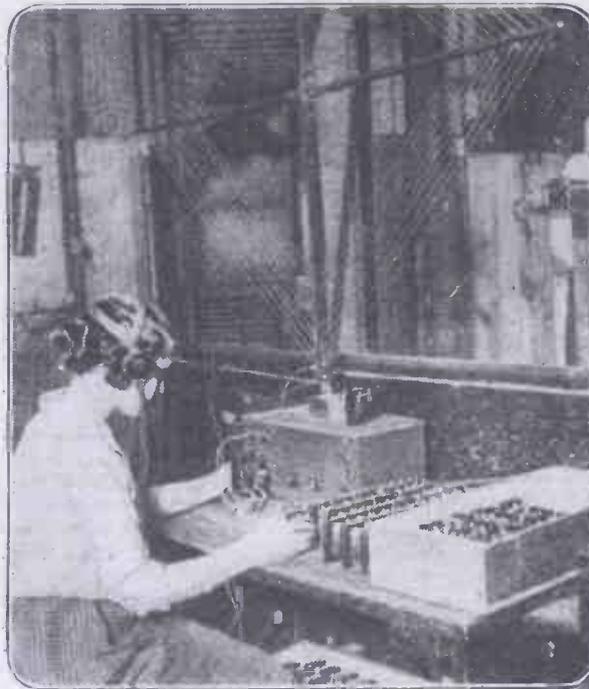
In this treatment, a solution is made containing electrical ions, small particles of atoms that may be considered as small electrical charges. In ulcers and kindred growths the bacteria lies beneath the surface of the skin, and simply painting the part with the ion solution will not affect them. If, however, an electrical current is passed through the body, it takes with it the ions, and thus enables them to exert their beneficial qualities. Deathermy also utilises electricity for the elimination of internal growths. By means of the currents the temperature of the growth is raised until it coagulates, and a healthy growth substitutes itself.

## Electrical Domestic Arrangements.

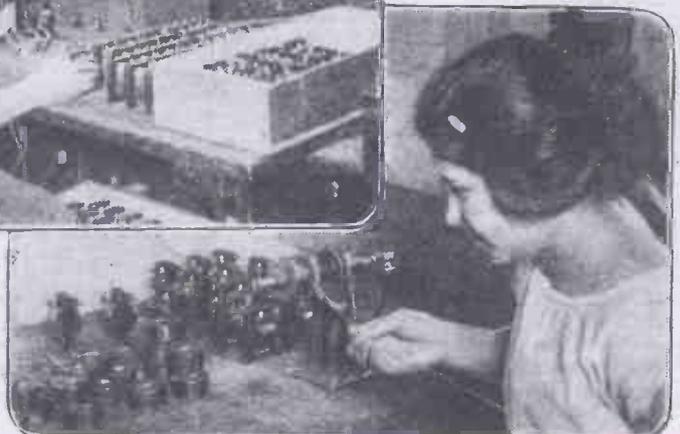
If any ladies have endured me so far, perhaps the next point will interest them. The materials of which curtains, chair-covers, etc., are made, often fade in the sunlight, and it is the aspiration of every dye manufacturer to produce a fadeless dye. When you consider that it generally takes about a year for a dye to show signs of fading, it will be seen that it is a very long time before a manufacturer can tell whether he has produced a fadeless dye or not. The use of lamps which possess the fading properties of sunlight make the fading test for dyes much more rapid. Some shops have installed daylight lamps by means of which patterns can be matched by night as well as by day.

In America nearly every house has an electrical clothes washing machine, and manufacturers estimate that they have sold over two million.

Cooking by electricity also forms a feature of everyday life out there. You will find that instead of two separate water-taps, one for hot water and the other for cold, there is a single tap with an attachment by regulating which, water of any desired temperature up to boiling point may be obtained.



Winding transformers in a large wireless factory. The top photograph shows the testing table, where with a frame aerial and a standard receiver they are tested for efficiency in transformation.



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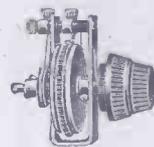
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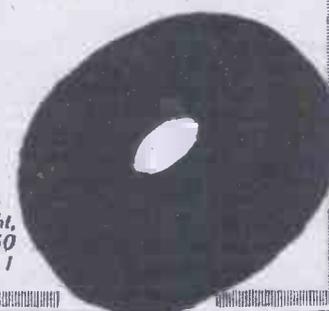
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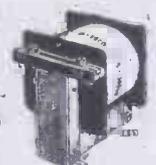


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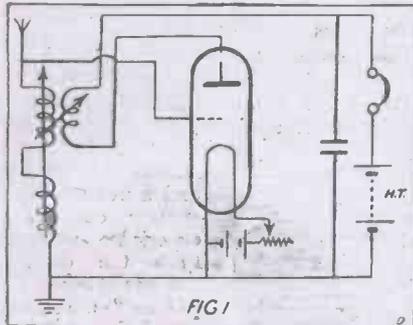
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## NOVEL CIRCUITS FOR INTERCHANGEABLE PLUG-IN COILS.

Showing how a three-coil holder can be employed as a variometer, thus doing away with the necessity of employing a variable condenser.

**I**NTERCHANGEABLE multi-layer coils have come into use recently for several reasons. They can be very easily used in reaction circuits, and also they are each wound to give the highest efficiency on their own particular wave-length. Since, however, these coils are not adjustable, a large variable condenser is necessary to vary the wave-length. This



considerably reduces signal strength for the following reason.

The total energy of a charged condenser circuit is given by the equation  $E$  (energy) =  $\frac{1}{2} C^2$  where  $C$  = capacity and  $V$  = voltage.

This gives us the equation  $V = \sqrt{\frac{2E}{C}}$ ; from which it follows that by decreasing  $C$  we increase  $V$ .

### Variometer Tuning.

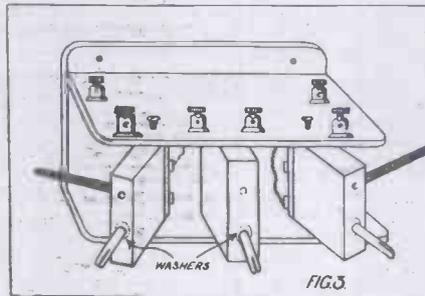
A crystal or valve is a voltage-operated receiver, so that it is obvious that loudest signals will be obtained with least capacity. Those who are only desirous of receiving broadcasting, would find it worth while to wind coils and adjust them so as to be in tune with their local station without using a variable condenser. A vernier condenser might be used for close tuning, and should be connected across the coil. But those experimenting amateurs who wish to "search the ether," would find it impossible to have separate coils for each station. The advantage of a low capacity circuit can,

however, be preserved without using many coils by the following methods.

A tuning-stand with three coil-holders will be required. This may be either bought, or can be quite easily made according to the directions given later. The set is connected up as in Fig. 1. The reaction coil  $R$  on the right is as usual, and so is the A.T.I. in the middle. The left-hand movable coil, however, is connected in series with the A.T.I., but so that the windings are in opposite directions. Thus by tightening the coupling between them their combined inductance is decreased, lowering the wave-length. Very close tuning can be obtained in this way by altering the coupling of the two coils, but a vernier condenser may be added if desired. For longer wave-lengths the coils may be connected with windings in the same directions, in which case tightening the coupling will increase the wave-length to which the set is tuned.

### Coil Holders.

A few hints on making holders for plug-in coils will not be out of place here. The ebonite blocks into which the coils fit are perhaps the only parts which require ex-

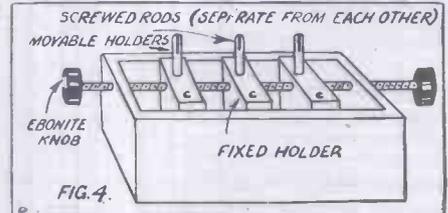


planation. Three pieces of ebonite  $\frac{1}{2}$  in. by  $1\frac{1}{2}$  in. by 1 in. will be required, 3 sockets for valve legs, and some  $\frac{1}{8}$  in. brass rod. Drill 2 holes through the face of each block—one  $\frac{1}{8}$  in. in diameter and the other just such a size as will allow the valve leg to just go inside it; 2 in. of  $\frac{1}{8}$  in. brass rod are taken, and a slot  $\frac{1}{2}$  in. deep is cut longitudinally down one end, and a brass washer is soldered  $\frac{3}{4}$  in. from that end, while a thread is cut about  $\frac{1}{4}$  in. from the other end. This rod is placed in the  $\frac{1}{8}$  in. hole, and a piece of  $\frac{1}{2}$  in. ebonite is screwed to the back to keep all together. Fig. 2 will make all this clear. Bearings for the movable holders are made by drilling small holes at the top and bottom into which screws pass from the supporting framework. Handles of ebonite are fixed to the movable holders by passing screws through the blocks into the end of the rods. Fig. 3 shows the finished holder, which may be fixed to a base board or screwed to the side of the valve cabinet.

### Micrometer Adjustment.

Fig. 4 shows a rather better form of holder. The ebonite blocks are the same as before except that they have a  $\frac{1}{8}$  in. square hole in the middle into which fits a  $\frac{1}{8}$  in. brass rod

along which the holders slide. They are moved along by screwed rods which are turned by knobs each end. This gives very fine adjustment. Details of construction will not be given, but the dimensions can easily be decided. The screwed brass rods



are sold for making up condensers, and the ebonite knobs are made to fit.

Of course, by using two coils only along these lines an excellent variable inductance will be obtained, which will give very fine tuning without a variable condenser.

## A COMPACT CONDENSER.

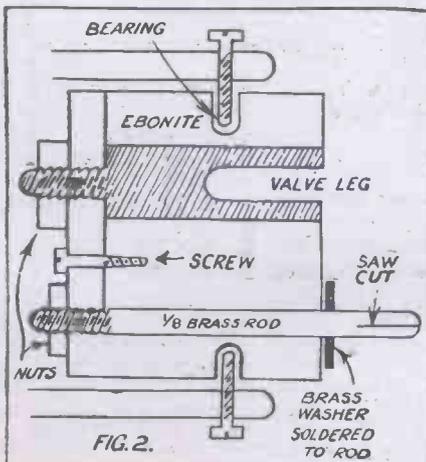
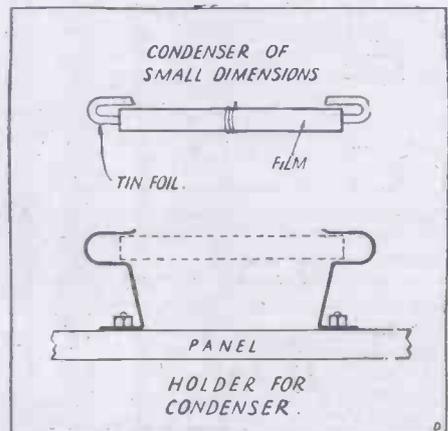
**I**T is always the aim of the experimenter and constructor to produce a set which will occupy a small space and yet be efficient. The following method of constructing condensers and holders has met with great success.

**Condenser.**—The dielectric is made with film negatives; they are first soaked in soda and water to remove the film. For plates, either copper foil or tinfoil can be used. The outer coverings are like the dielectrics. Lay one negative down, put the foil on top projecting over one side; put the dielectric on top; next, put the other foil, projecting over the other side; now another negative, and roll up tightly, tying with cotton in the centre. Bend the ends of the foil over.

**Holder.**—A piece of thin springy tin cut by scissors to the shape shown in the sketch; the holders are held firm under the terminals between which the condenser is to be fitted, thus making wiring unnecessary.

Cut the negatives and foil to any desired length, but try to arrange the length so that the condenser stretches from terminal to terminal, and makes good spring contact with the holders.

As a guide to capacity a square inch overlap gives about .0005 mfd.



# ON THE FARM.

By C. G. GIBBONS.

Our contributor spends a delightful week-end in the country, and obtains further recruits to the ranks of the army of listeners-in. His experience is well worthy of repetition by other amateurs possessing "friends in the country."

IF our neighbours were displaying an interest in our operations it is probable that we caused some speculation amongst them. Whether our true intention was revealed to them I hesitate to say; there was ample scope for guesswork, however. A coil of aerial wire, sundry insulators, accumulators, and a H.T. battery no doubt evinced the "radio" atmosphere, although the "set" itself, box-like and polished, was probably non-committal. Our personal kit was contained in a small haversack slung across my back, balanced by the valve box, unmistakably ex-Disposals Board.

"Ready to move off, sir," said I, with mock severity, to my companion, who, touching his cap in reply, "slipped in the clutch."

Absolved from the responsibility of driving, and refraining from talking to the "pilot" while he negotiated the thoroughfares leading to outer London, I began to review the venture on which we had started—the outcome of an idea which had been spontaneous, and prompted, doubtless, by a spell of fine weather.

"Do you think we could spend the week-end out of town, and take the 'set' with us?" my friend had suggested.

## Getting to Work.

The novelty of the proposal made an immediate appeal. From the radio aspect it presented a unique opportunity of collecting some interesting data in a new locality, and the prospect of a change of air was one not to be missed. We had decided on a little hamlet in Bucks as our rendezvous, being certain of accommodation at the home of a farmer who had billeted me for a period in the old war days. In selecting our "gear," we had given due regard to the limitation of space provided by my friend's motor-cycle combination—our "transport."

And thus, on the broad highway, we had set out.

The journey proved uneventful, but thoroughly enjoyable. The majesty of a "super" aerial seen on the wayside developed a voluble argument on the relative values of single and multi-wire antennae, but my companion's efforts to enable me to hear fully his opinion compelled me to remark, jocularly—more or less "Keep your eyes on the road; we mayn't get an opportunity otherwise to test your theory."

Our arrival at the farm synchronised with the serving of tea, and after mutual intro-

ductions and a much-needed wash, we satiated an appetite that fifty miles of the open road had given us. "How soon will you have the 'wireless' working?" "Shall we hear some broadcasting?" "How many valves do you use?" "Have you heard America?" were a few of the inquiries soon levelled at us, and we realised that, during the "broadcasting" hours at least, we should not lack an audience.

Our survey for a suitable "mast" for the aerial found luck with us. Facing the window of the room allotted us stood a tall tree, and with the aid of a ladder my colleague started to demonstrate the "fine art" of aerial erection.

The attachment at the house end was

it's quite clear." "No, the other side to your ear!" "Oh, how splendid, never imagined it like this." "Lovely music!" "Sh, I can hear something else." The "something else" was a "Morse" station trespassing on broadcast wave-lengths, the mention of which was the prelude to a catechism on the "code" and the "distance between the crests of waves."

## In the Throes.

The London station came in strongly, with a directional aerial to augment it. The ease with which we were able to "tune-in" the various broadcasting centres, excepting Glasgow and Cardiff, both conspicuous by their absence, was a feature of the evening, and a welcome one.

Our customary experience was to have the distant stations hurriedly "tuned" during a 2LO interval, promptly "swamped" by the mighty bellow of the local station, practically "on our doorstep," immediately he resumed transmission.

The use of the reaction coil in boosting up our reception of the Radiola concert brought the inevitable "What happens when you move that?" "Now just you listen to this—from Paris—we'll tell you the 'business' in a minute," said my friend, not in evasion of the question, but in a desire to give the excellent French transmission the hearing it deserved. Silence till, "Can you understand what he is saying, Jack?" and "Do be quiet!" indicated that an announcement was being made.

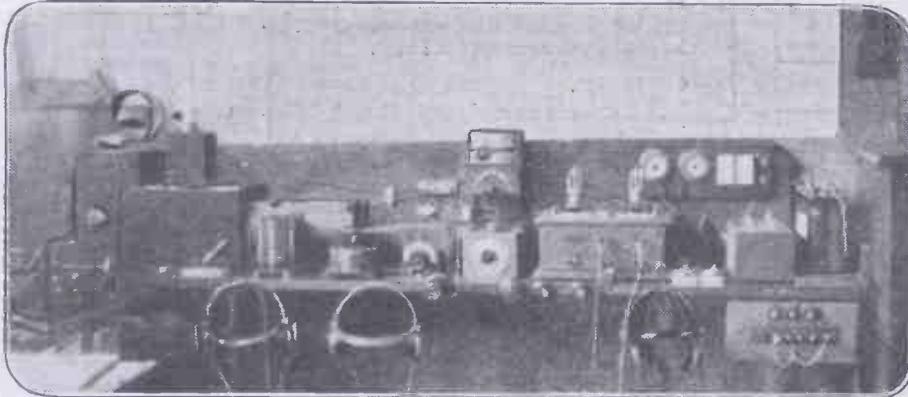
## Left Behind—By Request.

A remark, "Oh, what's this whistling-noise?" caused me to take a 'phone, bent on investigation, and to hear the unmistakable wail which denoted the "super" mis-user of reaction. In this instance, a description of what had occurred was easily given, free from technicalities.

Prior to an adjournment for supper we turned to the more serious side of wireless, and "searched" the ether for that most energetic of radio stations, FL, discovered working with customary energy on 8,000 metres, and nearer home, Leafield, famed for harmonics, Ongar and Devizes.

Then Morpheus asserted his claims, and at midnight we retired to bed—satisfied.

Our homeward journey was made with one item of equipment less than on the outward trip—the aerial remained aloft, by request of the household.



6 DW, the experimental 10-watt station owned by Sir Stanley Johnson, M.P., and operated by his son, Mr. D. H. Johnson.

simplicity itself, although our embryo "steeplejack" suggested that I could advantageously have made use of the chimney stack in the centre of the roof, but I had no desire to be an exponent of "surefootedness."

The problem of an "earth" had been settled at first glance. On the pathway, and almost beneath the window, was a brass tap from the main water system, and to this we clipped our "lead." The aerial looked encouraging with its eighty feet span and an average height of thirty feet, the latter figure being also the length of the "earth"—not altogether desirable, but unavoidable.

## Developing the "Fever."

The imminence of "listening-in" aroused not a little excitement amongst our friends, who, with but one exception, had not previously made acquaintance with broadcasting. Donning the 'phones brought an inward hope that all would be well, but the first movement of the aerial condenser justified our faith in a "tuned anode" circuit. We had expected London—we heard Newcastle. Hastily separating our 'phones into single earpieces, we handed them to our expectant audience with the injunction "not to pull on them."

"This is the Newcastle orchestra." "Yes,

# MONOPOLY IN WIRELESS.

By Lt.-Col. CHETWODE CRAWLEY, R.M.A., M.I.E.E. (Deputy Inspector of Wireless Telegraphy, G.P.O.).

An interesting account of the conditions and considerations governing policies of control by an acknowledged authority on the subject.

**H**OW far the wireless communications of any particular country should be controlled by the State is a matter which can only be settled by consideration of the conditions, not only in that country, but in other countries. It is the importance of this latter international aspect which makes the problem more complex in the case of wireless than in the case of ordinary telegraphy, this importance being due to the fact that wireless channels of communication, unlike channels directed by a wire, are liable to interference, one from another. On the other hand, this very disability of wireless shows at once that State control of some sort or another is essential for the purpose of obtaining the necessary international co-operation, just as it is essential, though to a much less extent, in the case of cables. For land lines, State ownership, though obviously not essential, has been adopted all over the world, with one outstanding exception, the United States of America, where control is in the hands of private enterprise.

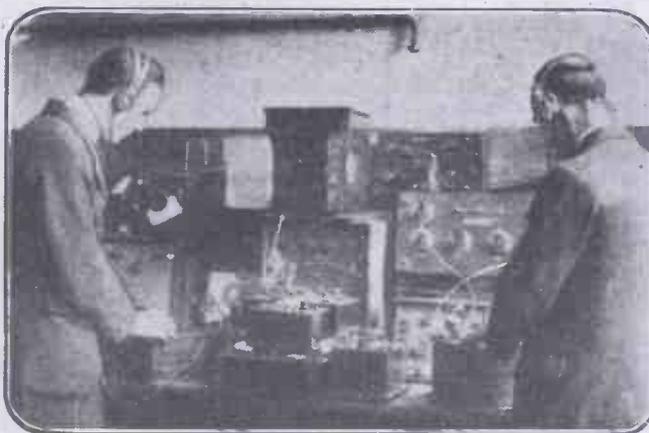
In Great Britain the telegraph system for the first twenty-five years was controlled by various commercial companies, but from experience thus gained it was decided, largely from military considerations, that the system should be owned and operated by the State. This was finally provided for in the Act of 1869, by which the inland telegraph system was made a Post Office monopoly, the actual transfer taking effect in the following year, and all other countries, with the exception of the United States of America, as mentioned above, have followed our lead.

## Work of the Convention.

Our cable communications, on the other hand, are partly State owned and partly in the hands of private enterprise, but on account of their international aspect there is necessary a close liaison between the cable companies and the State—that is to say, there is a certain amount of State control.

Wireless signalling as a commercial proposition may be said to have commenced on June 3rd, 1898, when Lord Kelvin sent his first paid message by wireless from the Needles station in the Isle of Wight, but it was not until 1906 that the first International Convention was held for the regulation of wireless communications throughout the world. This Convention laid down the rule that stations were bound to inter-communicate irrespective of their ownership or the systems with which they were fitted, and framed definite regulations governing the wave-lengths to be used and the methods to be employed for calling up, answering, transmitting telegrams, accounting, etc. The next International Convention, which

was held in 1912, amplified the provisions of the 1906 Convention. Meanwhile, the Post Office, which, by the Act of 1904, had become the Statutory Authority for wireless telegraphy, had acquired, and was operating, all our commercial stations for communication with ships, so that State control of these communications was an accomplished fact. In most other countries similar arrangements were made, though in some, notably again in the United



Passing B.B.C. sets in the testing department of the London G.P.O.

States of America, State control was much less complete.

The two International Conventions dealt only with wireless communications between ships, and between the shore and ships, and as, owing to the war, no International Convention has been held since 1912 there are, at the moment, no regulations governing point-to-point wireless communications. The need for such regulations has become very apparent during the last few years, and arrangements are now being made for holding an International Conference next year in order to draw up a new Convention, which will, of course, deal with point-to-point and aircraft communications, in addition to ship communications; in fact, it is intended that this forthcoming Conference should deal with all forms of electrical communications—viz., telegraphs, cables, and wireless.

## Not an Accepted Policy.

In this country, the fact that the State exercises, at the shore end, a monopoly, so far as ship and shore communications are concerned, has given rise to little comment, but there has been much controversy during the last few years as to the advantages and disadvantages of a monopoly in the case of point-to-point signalling, especially in connection with schemes for our imperial wireless communications. At the present time, the stations which work with the States, Canada, and some Continental countries are in the hands of the Marconi

Company; those which work with other Continental countries, and with Egypt, are in the hands of the Post Office. As regards imperial communications, the Commonwealth Government has arranged for the formation of a company, in which the State holds a majority of shares, to erect and operate an Australian station; the Canadian and South African Governments have arranged for the erection and operation of their stations by private enterprise, and the

New Zealand and Indian Governments have the matter still under consideration. The Home Government has decided to erect and operate a large station in England for imperial communications, in addition to the Post Office station at Oxford, which is used primarily for communication with a similar station worked by the British Post Office in Egypt, and has under consideration the erection of a station at Singapore.

In most other countries some of the large stations are worked by the State, and others by private enterprise; for instance, the United States of America have fifteen large stations, nine worked by the Government and six by private enterprise, and France has four and one respectively, of those being erected in her

exclusive colonies.

It is clear, therefore, that a State monopoly is not the accepted policy for long-distance point-to-point wireless communications, and how far State control or competition is advisable is now being considered by all countries in the light of their own special needs and experiences.

## Unfettered by Patent Rights.

In long-distance wireless, however, the trouble is to avoid a monopoly of some sort or another, and to dispense altogether with State control is impracticable.

In wireless signalling, different wave-lengths must be allocated to different stations, so that messages sent from any particular station will be received at its communicating station, and will not interfere, by jamming, with the reception of other messages at other stations. This allocation of wave-lengths, which necessitates international agreement, means some form of State control, or, alternatively, an international commercial monopoly, which, even if possible, would have all the disadvantages of the ordinary private monopoly.

As regards the British Empire, the disadvantages of a commercial monopoly of long-distance wireless stations were pointed out by the Technical Committee which was presided over by Lord Parker in 1913, and again, more fully, by the Imperial Wireless Telegraphy Committee of 1919-20, which

(Continued on page 752.)

## LATEST NEWS FROM 2ZY.

From Our Manchester Correspondent.

IT used to be a figure of speech, "What Lancashire thinks to-day England says to-morrow." At its best it was but an ancient political shibboleth, but it was passed into the mind of the British public and repeated so often that the people, or at any rate the unthinking portion, accepted it as a positive truth.

Now, wireless waves have changed all this. Manchester, the stronghold of materialism and bread-and-butter politics, is no longer able to voice the views of the country twenty-four hours ahead.

It has to take its place in the parlour with the rest of the world, and discover in enjoyable company what is actually going on. The mentor's mantle has been dropped.

Over 3,000 wireless licences have been issued in Manchester up to date. The subject is discussed on tramcars, railway trains, and in choirs and places where they sing. Enthusiastic societies are springing up everywhere.

The headquarters of the British Broadcasting Company will shortly be removed from Trafford Park, where they are at present housed in the general building of the Metropolitan Vickers Co., Ltd. A site has been found in the very heart of the city, in Dickenson Street, near the great Corporation electricity power station. Permission has been obtained from the City Council to erect aerials and other apparatus. It would not have been surprising had the College of Technology objected to this enterprise, but they have taken the right view and cordially acquiesced. It only remains now for the London headquarters of the company to give the scheme its sanction.

### Aerials Crossing Streets.

Much good work has been done from the Trafford Park premises, but they have had their inconvenient side. They are at least four miles from the centre of the city, and artistes have found it difficult to fit in their arrangements and get there in time, and more difficult still to get away at night. High hopes of the change are entertained and will be realised.

At the last meeting of the City Council the Highways Committee proposed to give sanction to a request to place a wireless aerial over a street. One councillor pointed out what he considered the danger of this concession.

"If," he said, "you are going to allow private citizens to have wires across the street, in a few years a great many of the city's streets will be completely crossed by them. There is no need for aerial wires of this description, and I hope the Council will be careful not to set a precedent of this description."

The chairman of the Committee, Alderman Turnbull, explained that the Council had already approved of hundreds of those wires crossing the streets. The present application was on a par with those already granted. The item was referred back to the Committee for further consideration and report.

### Relayed Opera.

Such an objection calls for the comment that the Manchester Corporation by its system of overhead tramway wires has done all that could be done to destroy the beauty of the streets. Whatever is done in the way of wireless enterprise cannot spoil the picture. There is every reason for hoping that the Council will be in a reasonable mood when the proposal next comes before them.

Manchester is interested in the decision of the opera company's artistes to continue their transmission both individually and collectively. The experimental transmission given a week or two ago of the "Valkyrie" by the London station, relayed over the land line by other stations and transmitted into the ether, was a great success, and was distinctly heard in this locality, even with crystal sets. Every item was remarkably clear and of tip-top musical quality.

Now, whatever its critics may say, Manchester is a great musical centre. It can refer you to its support of the Hallé Concerts and the Brand Lane Concerts, and opera here blooms as a fine flower where on stony ground elsewhere it only makes a fitful appearance. You need no higher justification of wireless in Manchester, therefore, than that it broadcasts the best of music.

The great wish is expressed that when the National Opera Company comes to Manchester in the autumn arrangements will be made to have a listeners-in night—a night of nights for Manchester folk, a night that will whet their appetite for music more and more.

mended an Imperial Wireless Chain, erected, owned, and operated by the State, though they were careful to point out that "a State monopoly of this kind could not preclude private enterprise in other spheres of wireless activity. Wireless companies could still have an important sphere as manufacturers, and in providing and operating ship stations, and they might, if desired be granted concessions on suitable conditions for long-distance communications between British territory and foreign countries."

### A Momentous Decision.

This policy of a State-owned Imperial Wireless Chain was agreed to at the Imperial Conference of 1921, with reservations by Australia, but, as we have seen, development commenced on rather different lines, with the result that the Prime Minister made the following announcement in the House of Commons last March:

"The policy to be adopted with regard to imperial wireless communications has recently been under review by the Imperial Communications Committee, under the chairmanship of the First Lord of the



Dancing on the lawn to the strains of wireless music; a vision of summer delights to come.

Admiralty, and the recommendations of that committee have now been approved by the Government.

"In view of developments in the science of wireless telegraphy, and other circumstances which have arisen since the late Government decided upon the policy of a State-operated wireless chain, it is not considered necessary any longer to exclude private enterprise from participation in wireless telegraphy within the Empire.

"The Government has therefore decided to issue licences for the erection of wireless stations in this country for communication with the Dominions, Colonies, and foreign countries, subject to the conditions necessary to secure British control and suitable arrangements for the working of the traffic.

"At the same time, the Government has decided that it is necessary in the interests of national security that there should be a wireless station in this country capable of communicating with the Dominions and owned and operated by the State. A station of this kind will therefore be erected as early as possible, and it will be available for commercial traffic as well as for service messages."

## MONOPOLY IN WIRELESS

(Continued from page 751.)

sat under the chairmanship of Sir Henry Norman. Lord Parker's committee pointed out that "the Government is not fettered by considerations arising out of patent rights, but can use any patent on fair terms under Section 29 of the Patents and Designs Act, 1907," and contrasted this fortunate position with that of a private company which might find it difficult, if not impossible, to make use of the best arrange-

ments because of the existence of patent rights.

Sir Henry Norman's committee pointed out that there are only a limited number of wave-lengths available for long-distance communication, and was of opinion that "in order to secure efficient working, an imperial system, by whomsoever provided, must be protected from interference from other sources, and must, therefore, be a practical monopoly," and, again, regarded "the inclusion of virtually all civilian wireless activity in the hands of one commercial company as likely to be deeply prejudicial to research and progress." For these reasons, mainly, the committee recom-

## A NOVEL METHOD OF MAKING WIRELESS LABELS.

THE following method of making name-plates or labels for the panels of wireless apparatus should commend itself to amateurs on account of its simplicity, its cheapness, and the unlimited range of titles it allows. The appearance of the finished labels compares very favourably with the "ivorine" tabs sold for such purposes, and, being of celluloid with the colouring pigment at the back, they are, indeed, more durable than the commercial article, the filling of which has a habit of dropping out.

Briefly, the labels herein described consist of small rectangles of photographic film upon which a negative is printed of the lettering required. After development the lettering, which is transparent film surrounded by dense black, is backed with white filling, white paper, or other coloured pigment, and stuck to the ebonite or wooden panel with seccotine.

### Exposing the Film.

The materials required are a photographic printing frame ( $\frac{1}{4}$ -plate is a useful size), a piece of unexposed roll-film, some one-solution developer, some fixing solution (hypo, 4 oz.; water,  $\frac{1}{2}$  pint), and a piece of draughtsman's tracing cloth or paper of fine texture and as transparent as possible.

The procedure is as follows: The required lettering is neatly printed on the cloth or paper with a pen and Indian ink. Quite a large number of captions may be got upon a piece of paper  $4\frac{1}{2}$  in. by  $3\frac{1}{2}$  in., and the "positive" so-made will, of course, suffice for any number of copies, that may be required. This positive is placed in the printing frame with the lettering facing towards the back of the frame and away from the piece of clear glass which has been first put in the frame to support it. The piece of sensitive roll-film is next put in, sensitive side to the lettering. This must be done in a dark room, and from this point on till the fixation of the negative is complete, every care should be taken that the film is not exposed to actinic light, and as little as possible to so-called non-actinic light.

It is very important that the contact between the film and the positive should be as intimate as possible, and a pad of several thicknesses of paper may be interposed between the film and the back of the frame to ensure this if necessary. The frame and its contents are now exposed to a good light, say, that from an inverted gas mantle. A full exposure should be given (10 or 15 secs. at 1 ft. distance will not be too much), as the object is to produce as "contrasty" a negative as possible.

### Fixing the Labels.

The film is now developed in the usual way by immersion in the developer, and development is carried as far as it will go without "fogging" the lettering. If the paper "positive" was well made and the lettering filled in solid with good black ink, the resulting negative, after being fixed and cleared in the hypo, should show the lettering as clear, transparent film, the surround being a dense opaque black.

After drying, the film is ready to be cut up into labels. This is best done with a sharp knife and a straight-edge, as a much neater finish can so be obtained than by the use of scissors.

In order to show up the lettering distinctly, the back, or dull side, of the film must be painted, or, as previously suggested, white paper may be stuck on. If pigment is used, it may be Chinese White, mixed with a little gold size. Or an effective alternative is formed by aluminium paint or gold paint.

The labels may be fixed to the panels by any good adhesive of the seccotine variety or by means of celluloid varnish. Before applying the adhesive lay the label on the panel in the exact position it is to occupy, and, with a needle point, prick small holes at the corners of the rectangle. When the adhesive has been applied (only the mini-

mum quantity essential should be used) and has reached a state of partial drying known as "tackiness," the label should be gently laid in position, *not with the fingers*, but by means of a pair of tweezers or the points of a draughtsman's pen. The pricked holes will form a direct guide, and it only requires a steady hand to lay the label right on the spot at once, thus obviating the unsightly smearing of the panel with adhesive, as is only too easy if comparatively clumsy fingers are used.

### Another Method.

Those who possess, or have access to, a decent typewriter, will find that very neat "positives" can be printed on such; but in order that the characters may have sufficient density and solidity for the photographic process described, it should be observed that a good black ribbon is in the machine, and, as a further precaution, a piece of carbon paper, carbon side to the positive, should be interposed between paper and the roller or platen of the machine. This will print the characters on both sides of the paper, ensuring a satisfactory density.

## A TWIN DETECTOR CRYSTAL SET.

By "RADIOGRAPH."

WHAT is the best form of crystal detector? We read that radio waves can be converted into sound by means of a vast variety of elements, ranging from diamonds to knitting-needles, and consequently there are possibilities that some progressive experimenter may discover unfamiliar elements or combinations of elements that may materially influence the value of crystal sets.

Readers may be interested to know that with the set described later I have tried as many as ten combinations of crystals during an orchestral performance from 2 L O without losing a single bar of the music.

*Preparing the Working Drawing.*—As I was desirous of constructing my experimental set without waste of time and of producing something worthy of a valve amplifier at a future date, the preliminaries consisted of making a complete working drawing, details of which are reproduced in the accompanying illustrations. The drawing was also very valuable in helping me to determine the character and dimensions of the materials required for construction, for with the exception of the condenser vanes all the components were home-made from pieces of scrap.

*Drilling the Panel.*—The positions of the holes were marked off on the reverse side of a  $\frac{1}{4}$ -in. panel ( $\frac{1}{2}$  in. would be better), and before doing anything else the holes at the corners were drilled. A piece of mahogany of the same dimensions as the panel, but  $\frac{3}{8}$  in. thick, was then cut out, and the panel was supported on the latter by means of four brass pillars, to be seen in the photograph, Fig. 1.

### The Tuning Coil.

By thus fixing the panel with the reverse side uppermost, the drilling operations were rendered quite easy, the holes being made with an ordinary small wheel brace.

*Inductance Coil and Former.*—As no suit-

able ebonite tube was available for the coil former, a piece of round wood cut from a disused curtain pole was used. This was covered with a piece of scrap 810 x 90 motor inner tube, over which the double-covered cotton wire was wound. The former was marked off into twelve equal divisions, a single tapping being taken from the first ten divisions; and the last two being divided into ten equal parts; thus providing coarse and fine tuning. A brass bracket was fixed at each end of the former by wood screws, the bent ends being held to the underside of the panel by small bolts.

### The Change-over Switches.

*Connections from Coil to Switch Studs.*—Bare copper wire of 20 gauge was employed for the "coil to switch" leads, and the end of each lead was hammered flat at one end, these ends being bent round the bared portions of the coil where the tappings were required and soldered. Small brass tags were soldered firmly to the opposite ends, thus forming excellent contact with the nuts on the ends of the switch studs.

*The Three Selective Switches.*—The third knob, situated between the coarse and fine tuning switches, introduces either of the detectors into the aerial circuit at will, so that one can change over without interrupting reception at the 'phones. As there is nothing out of the ordinary in connection with the switch construction, no time need be wasted in describing it; but perhaps mention may be made of the connection between the switch spindles and their leads. The springs, made from thick copper wire, used for pressing the laminated switch arms down upon the contact studs, press against contact tags fixed to the underside of the panel. Small bolts are used for securing the ends of the wire to these tags in preference to sealing the connection with solder, the same method being employed in the

(Continued on page 754.)

# A TWIN DETECTOR CRYSTAL SET.

(Continued from page 753.)

case of the moving portion of the variable condenser.

**Variable Condenser.**—The variable condenser has 7 moving and 8 fixed plates, thus providing a capacity of .00025 mfd., and is supported from the panel by the three spindles of the fixed plates. The lower bearing for the moving spindle is formed in an ebonite bridge piece.

### Connecting Up.

A piece of 1/8-in. ebonite was cut into circular shape and bevelled off at the edge to make the condenser scale, the graduations being marked off with an ordinary protractor. After the figures had been stamped a little white lead rubbed into the depressions showed the figures up quite clearly, and by marking the panel at the various points to indicate the duties of other switches and terminals, the panel assumed quite a professional appearance.

**A Convenient Form of Detector.**—The detecting element should be capable of easy substitution. The idea is shown in Fig. 3, which shows the crystal gripped by a claw removed from its holder, where it is secured normally by a push-in fit. The contact between the crystal and the claw is absolute, and the adjustment is capable of accommodating crystals of all sizes. When it is desired to use two different crystals in combination, I fit another small claw on the spindle in place of a cat's-whisker, so that numberless combinations can be tested.

**Wiring Diagram.**—Straggling wires are a real bugbear to the wireless experimenter, so in connecting up the parts care should be taken to arrange the leads in a neat and symmetrical manner, such as that indicated in the wiring chart. The lead from the aerial terminal, A, is taken to the spindle tag of the fine-tuning switch, T, where it branches off to the spindle of the detector switch, D S, the connection being made through the switch arm to whichever detector is required.

The opposite sides of the detectors are connected together, and are joined to one 'phone terminal P1. From the earth terminal, E, a lead goes direct to the 'phone terminal P2, and from thence to the fixed side of the variable condenser, C2. From the opposite side of the condenser, C, a lead goes to the centre of the coarse-tuning switch, and except for the 'phone condenser shunted across the 'phone terminals this completes the simple circuit.

### Excellent Results.

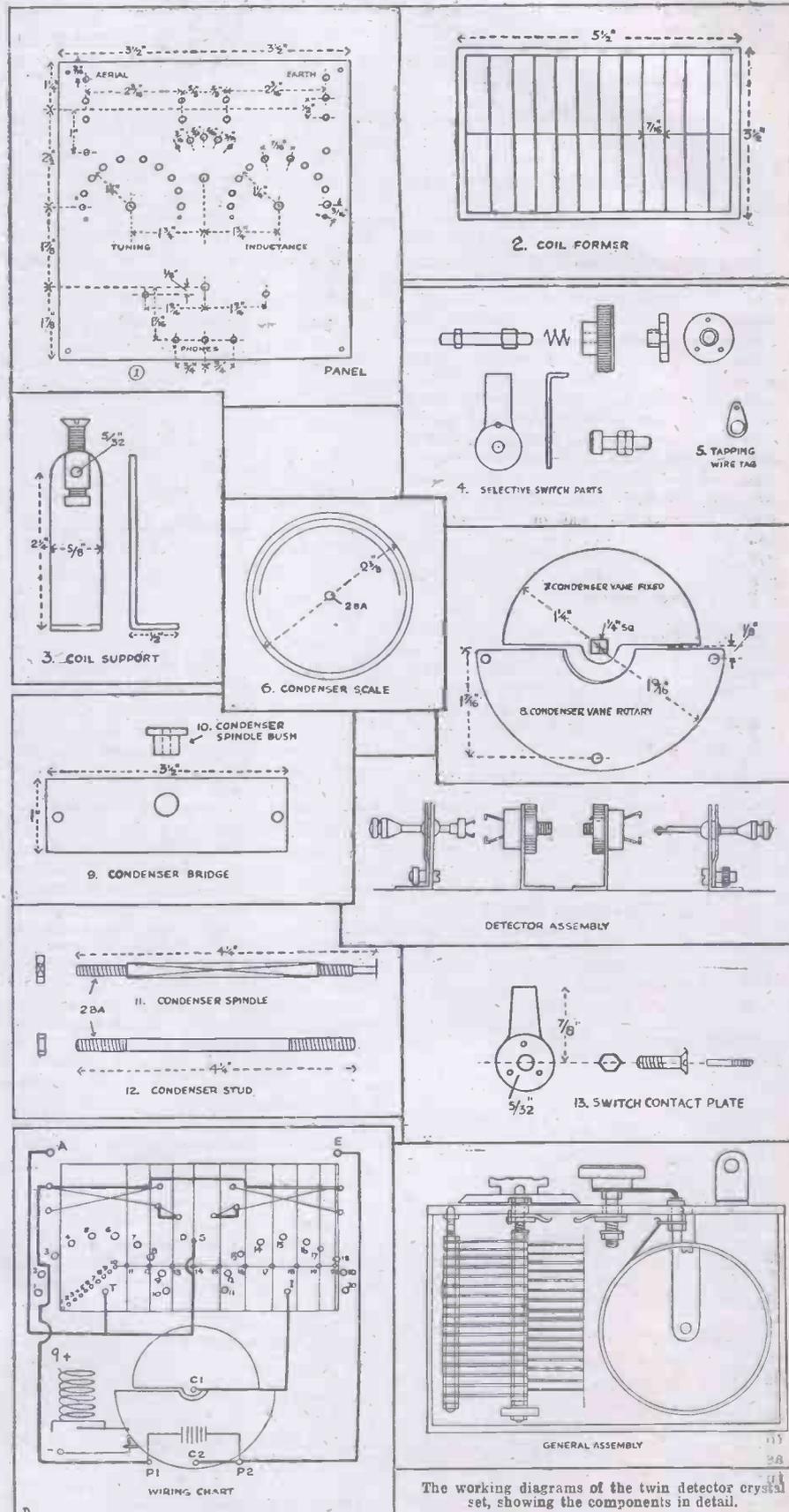
**Additional Features.** When completed, the instrument was found to give excellent results on short-wave reception, but its capacity did not permit of receiving telephony from the Croydon aerodrome, so that an extra fitting was added, to permit of introducing honeycomb coils in the aerial circuit. The improvement enabled the aerodrome messages to be picked up very distinctly, whilst a coil of larger capacity rendered the Eiffel Tower time signals quite clear.

All the well-known amateur stations within reasonable range are perfectly audible, and conversations from Scotland Yard to cars on the road were heard when these experiments were in progress.

The set should give every satisfaction if

the instructions are carried out carefully and attention is paid to the small details of construction. It is because of carelessness

in small matters that a great many sets give only mediocre results instead of doing all that is claimed for them.



The working diagrams of the twin detector crystal set, showing the components in detail.

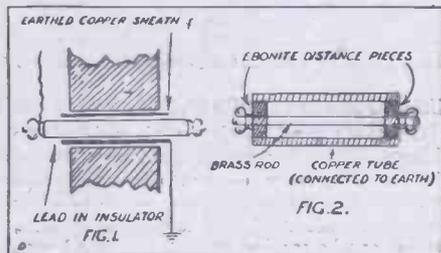
A Twin Detector Crystal Set. The diagrams are grouped in the above manner in order to permit the constructor to have the general details of construction before him as he builds the set without the necessity of jumping from point to point. A full size working drawing should be prepared if possible, as this will greatly facilitate matters.

# PRACTICAL IDEAS FOR THE AMATEUR

## A LEAD-IN TIP.

A USEFUL lead-in tip which will tend to improve signals on crystal and non-reacting circuits, is to surround the lead-in insulator with a sheath of copper foil connected to earth. The reason for this is as follows: At the point where the lead-in comes through the house there is a capacity to earth.

This capacity has for a dielectric the walls of the house, including any metal-work embedded therein, and this being a bad dielectric is sufficient to introduce quite considerable losses into the circuit. With the copper sheath the capacity to earth (which is inevitable) has only an ebonite dielectric, and the loss is appreciably less. Still better results can be obtained by using a lead-in insulator of the type shown in Fig. 2, where the dielectric is air.



## CONTROL KNOBS.

THE following is a simple idea for making efficient and attractive control knobs for detectors, condensers, switches, etc.

Procure a few pennyworths of soft soda glass tubing of about  $\frac{1}{8}$  in. bore, from any chemical dealer—certain wireless stores also sell it for leading-in tubes.

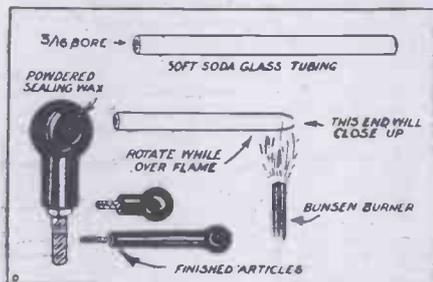
Cut it into convenient lengths, say 6 in., by making a nick in it with the sharp edge of a file, and pulling, not bending it until it snaps.

### Neat Appearance.

Heat one end of this piece in the blue flame from a gas ring (or a bunsen burner if available), rotating the tube between the fingers meanwhile. The glass will soften and the end close up.

At this stage remove the tube from the flame, and, still rotating it, blow lightly at the cool, open end. A bulb will form, the size of which may be determined at the user's discretion. Allow the bulb to cool slowly, then, using the file as before, cut the bulb from the blowing tube at the desired point.

Fill the bulb with some powdered sealing wax and gently warm until the wax melts. Into the molten wax insert a previously



warmed piece of screwed brass rod as sold by all wireless dealers, and allow it to set.

The advantages of these knobs are their low cost, of about  $\frac{1}{2}$ d. per knob; the perfect insulation; glass and sealing wax (which is principally shellac; the good appearance and the mechanical strength. Try dropping one.

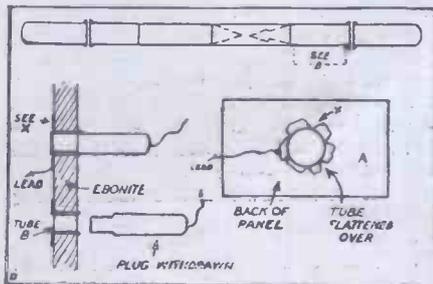
## A NEAT PLUG SYSTEM.

A PLUG system that is not only cheaper than the usual terminals, but is neater and more convenient to use, can be made as follows.

Procure from any stationer's some fluted brass pen and pencil cases—they only cost 2d. or 3d. each—and two plugs can be made from each. A glance at the diagram will show you the type of case.

### Mounting the Sockets.

Remove the pen-nib and pencil, and you will have a long tube and two tops. Now cut the tube in the centre and trim each half down to the required length—that is the width of the panel plus a  $\frac{1}{8}$  in. (see B). A hole should be drilled in the panel to take the tube. Push the tube through the hole. The panel should be turned face downwards.

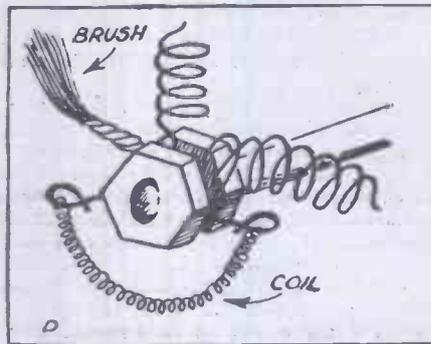


on the bench (a flat surface) so that the end that you cut sticks up about  $\frac{1}{8}$  in.

Now ram a tapered punch into the tube, which should split in two or three places, and carefully tap the edges over flat (see Fig. A). The outside wire is connected to the plug and the inside to one of the pieces of flattened brass at A.

## ALTERNATIVE CRYSTAL CONTACTS.

SEVERAL types of contact may be carried at once on an ordinary detector arm, allowing of instant changes when desired. Note the coil-contact, composed of a single strand from a coarse flex. After cleaning, it was coiled on an ordinary pin, removed, and shaped. The supporting arms may be a continuation of the coil-wire, but it is better to use a loop of stouter gauge, as shown in the sketch. This "whisker" is excellent where soft pressure is necessary and the sensitive spots are difficult to hold with a sharp point.



## A FEW HINTS.

TO increase the capacity of a variable condenser fit a fixed condenser in parallel, the fixed condenser being disconnected by a switch when not in use.

Old photographic plates should not be thrown away as they are very useful in the construction of fixed condensers.

Don't fix a galena crystal in heated metal, as the heat impairs the sensitivity of the crystal. The crystal should be held in the cup with three screws.

A lead covered roof will make a good capacity "earth," and it is very advisable to adopt it as such in cases when the aerial passes over it.

By the following method, old dry cells may be turned into very serviceable wet batteries. The dry cells usually consist of a 3-inch sheet on the outside, followed by the paste, and then the carbon rod in the centre, surrounded by a bag containing Manganese Dioxide. Carefully remove the zinc casing, and clean it thoroughly; afterwards placing it in a jam jar with the bag in the middle. Fill the jar with Sal-ammoniac solution and thus you will get a cheap wet battery of about  $1\frac{1}{2}$  volts.

# SHIELDING.

The effects of shielding are so great, and the subject so important, that all amateurs should carefully read the following article.

A QUESTION often asked by amateurs is, "How can copper, a non-magnetic substance, shield portions of a wireless receiving set from the magnetic field of another portion of the set?" The answer and explanation will show how very important the placing of metal plates, such as condenser vanes, become when viewed from the shielding point of view.

Ordinary magnetic shielding is the shielding of a compass needle from a steady magnetic field, and it can only be done by surrounding the compass needle by a magnetic substance such as iron. Figure 1 shows this shielding, the compass needle coming to rest in any position.

## A Complete Screen.

With electro-magnetism it is a different matter; the magnetic field is increasing and decreasing in value, which induces E.M.F.'s in neighbouring coils. A shield of magnetic material would shield the circuits all right, but copper will do equally well, for the following reasons.

If a copper sheet is placed in front of a coil through which alternating currents are flowing, the increasing and decreasing flux will induce an E.M.F. into the copper sheet, which causes current to flow in circles round the sheet, setting up a flux which is in direct opposition to the flux from the coil, and therefore cancelling it. This is seen from Figure 2. On the right-hand side of the sheet the flux will be at zero. By totally enclosing the circuit to be screened in a copper case, no alternating flux from outside can penetrate through. The currents circling in the sheet are called eddy currents.

## Variation in Tuning.

For demonstration purposes a thin sheet of copper can be placed close to a coil in a transmitting oscillatory circuit, and the eddy currents will be so great as to completely melt the copper sheet.

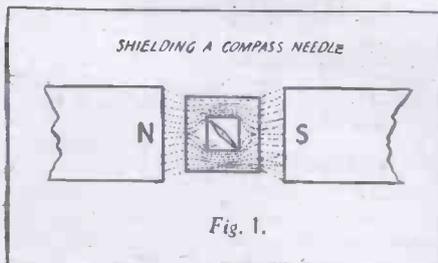
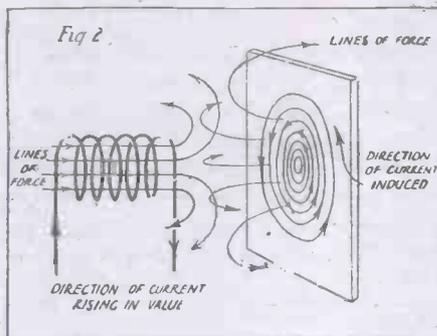


Fig. 1.

The vanes of condensers, either movable or fixed, which are placed near to coils in a wireless receiver, will have eddy currents produced in them, and as eddy currents are a source of loss of power, the efficiency of the receiver is decreased; the tuning of the receiver is also altered.

Some experimenters have used a copper plate for tuning purposes, by varying its position between the primary and secondary circuits; but from the foregoing, it is seen

that it is equivalent to weakening the coupling and also altering the value of inductance by setting up an opposite flux, like the rotor of a variometer.



## OUR WIRELESS NEPHEWS AND NIECES.

By UNCLE JOHN.

(John Hope Fellows, A.M.Jun., I.E., G.I.LoCo.E., Editor of "Locomotive News")

IT is an amazing thing that, although I have lectured many hundreds of times and to hundreds of children and Boy Scouts on railway topics, I have never, until I was invited to become "Uncle John" at 2 LO, experienced such tremendous enthusiasm as I have found with our great family of nephew and niece listeners-in.

My method has been to compile a sort of syllabus, and to talk to these kiddies upon topical subjects dealing with railways and locomotives, and so on up to the present time, when I am talking to them about the new grouping system of our railways.

## What Would Happen!

And here comes a very amusing thing. I have always indulged the children with competitions on the various subjects I have spoken to them about, and I must say that recently they have nearly beaten me. Some time last week I set them the following competition:

What are the new names for the following railways?

- (1) Great Eastern Railway.
- (2) London and South Western Railway.
- (3) Great Western Railway.
- (4) Midland Railway.

Marvellous to relate, although the questions included one "trick" question, without the apparent aid of adults, I only received nine failing letters out of a total of something like seventy or eighty entries.

What a dilemma! Anyway, they all received a postcard of a locomotive each, and I know they were all satisfied.

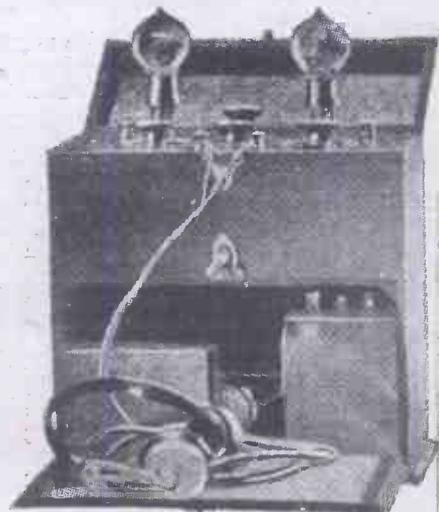
The great fact, though, that I have noticed is that they are tremendously accurate and keen in their letters, and retain great personal affection for all the various uncles. I really do not know what would happen to the postbags and the clerical staff at 2, Savoy Hill, if either Uncle Caractacus, Uncle Rex, or Uncle Jeff were to cease talking to them. I think the B.B.C. clerical staff would have a nervous breakdown in dealing with the pitiful inquiries. On my part, I can only say that I, too, have a very deep affection for all the great number of kiddies I have never seen, but talk to on railway and locomotive subjects.

## THE R.F.H. SETS.

THAT a four or five-valve instrument is not necessary for all-round work can be proved when it is stated that with an R.F.H. two-valve B.B.C. set (which makes use of inter-valve reaction) the following big stations can be heard at Birmingham: Glasgow, Birmingham, Cardiff, London, Newcastle, Manchester, The Hague, Paris (Eiffel Tower, Radiola, and The School of Posts and Telegraphs), and Königswusterhausen. The distances of these stations from Birmingham range from 75 miles to over 600 miles, while all of the stations except Glasgow and Königswusterhausen can be heard on the loud speaker with a three-valve instrument.

## Useful Portable Set.

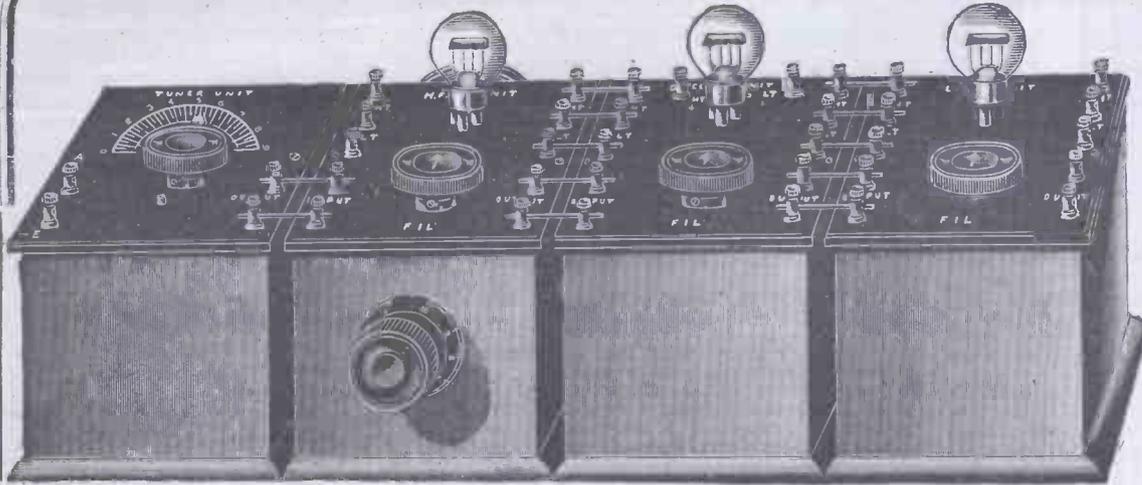
In their new catalogue they illustrate fifteen different models, from the crystal to the four-valve cabinet set, which also incorporates a gramophone. An interesting design is the knapsack two-valve model, which can be carried on the back as a knapsack, and which is a most useful, convenient and highly efficient set for scout companies, schools, club parties, motorists, tourists, etc. It should be mentioned that local stations can be cut out easily, and more distant stations received, as the instruments are all tested to receive the various broadcasting stations from the works at Birmingham while the Birmingham station is broadcasting with full power at a distance of only three miles.



The R.F.H. two-valve "Knapsack" receiver

# Simplicity and Efficiency

The "RE-ECHO" Unit System connects so easily.



WHY not purchase a Receiving Set capable of receiving all the British and Continental Wireless Concerts at one-fourth the cost of an expensive multi-valve set. You can build up your "Re-Echo" Unit Set to the equal of an expensive 4-valve set for a quarter the cost.

EVERY Unit is mounted in real Mahogany case 4 $\frac{1}{2}$ x6 $\frac{1}{2}$ . Ebonite with matt finish and lacquered brass fittings.

This system used as a 4-valve set is capable of receiving all the British Transmissions as well as Continental Concerts.

PRICES:

Detector Unit ..	£1 : 10 : 0	
L.F. Unit ..	£1 : 14 : 6	
H.F. Unit ..	£1 : 2 : 0	(Transformer extra)
Tuned Anode Unit ..	£1 : 4 : 0	(Coils extra)
Variometer Tuner ..	16 : 0	
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## FLEWELLING "SUPER" RECEIVING CIRCUIT

give wonderful results because our '006 mf. condensers are supplied in sets of 3, of exactly equal value.

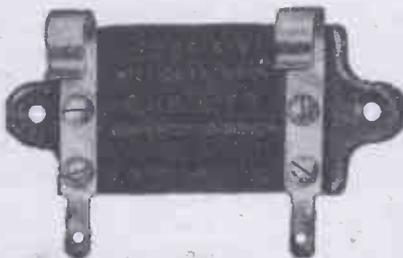
Experimenters should make up this powerful, inexpensive and easily worked circuit with this Dubilier set of 3 fixed condensers as they ensure the very best possible results being obtained.

PRICE 9/-

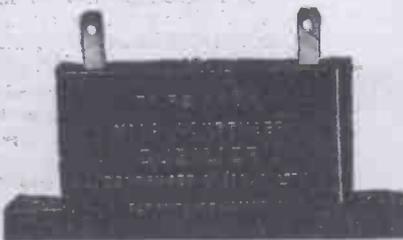
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# Wireless Club Reports

The Editor will be pleased to publish concise reports of meetings of Wireless clubs and associations, reserving the right to curtail the report if necessary. Hon. secretaries are reminded that reports should be sent in as soon after a meeting as possible. Reports sent in cannot appear in this paper in less than ten days after receipt of same. An asterisk denotes affiliation with the Radio Society of Great Britain.

#### The Southampton and District Radio Society.

The above society spent a very interesting evening at their headquarters on Thursday, May 10th, the subject for discussion being wave-metres.

Dr. McDougall exhibited a buzzer wave-meter he had made, the construction and working of which he described in detail.

The hon. sec. also had on view a Townsend wave-meter, and an instrument of his own construction, both of which he also clearly described.

Intending members should communicate with the hon. sec., Mr. P. Sawyer, 55, Waterloo Road, Southampton.

#### Hackney and District Radio Society.\*

The weekly meeting of the above society took place at its clubroom at the Y.M.C.A., Mare Street, E.8, on Thursday, May 17th, the chair being taken by Mr. E. Cunningham, vice-chairman of the society.

There was no formal business before the meeting, and the opportunity was seized of holding a round-table conference with regard to the various difficulties in the society. Some dissatisfaction was expressed at the fact that the society's set had not yet been completed, and a ding-dong discussion took place between the various members of the technical committee—who are in charge of the set—and other members of the society.

Finally, it was decided that the technical committee—whose duties, hitherto, nominally consisted of the charge of the set and the arrangement of the programme—should now confine itself solely to the construction, maintenance, and improvement of the set. It was also decided to place the programme arrangements on a more satisfactory basis; and on the motion of the chairman of the society, who arrived late, seconded by Mr. Bell, it was decided to form a programme or publicity committee. Some twelve nominations were received for the composition of this committee, and it was decided that the election should take place two weeks hence.

The chairman announced that the next meeting of the society would consist of "Waist-coat Pocket Lectures," a feature which was tried with great success some weeks ago. Messrs. Jenkins, Bell, A. H. Phillips, and Elman promised to give pocket lectures. The meeting then concluded.

Hon. sec., C. C. Phillips, 247, Evering Rd., E. 5.

#### Redhill and Reigate Radio Society.

On Thursday, May 17th, Mr. H. W. Pope, A.M.I.R.E., gave an extremely interesting lecture on "Telephones and Loud Speakers" to a good attendance of members. After briefly describing the development of the telephone, Mr. Pope gave his audience several useful methods of determining polarity of telephones, and emphasised the necessity of having them connected to the correct poles of the battery.

The question of high resistance versus low resistance was also discussed, the lecturer favouring low-resistance 'phones, especially where a long lead between the 'phones and the set is required.

Hon. sec., Mr. C. W. Johnson, 111, Station Road, Redhill.

#### Radio Association Eastern Branch.

At a meeting held on May 31st, at Radio Rendezvous, Manor Park, Broadway, Prof.

P. M. Baker, B.Sc., A.M.I.E.E., A.M.I.E.M.E., gave an instructive lecture, and was greatly appreciated.

Hon. sec., W. E. Victor Bullimore, 2, Haig Road, Plaistow.

#### London County Council White Hart Lane Estate Welfare Association. Radio Section.

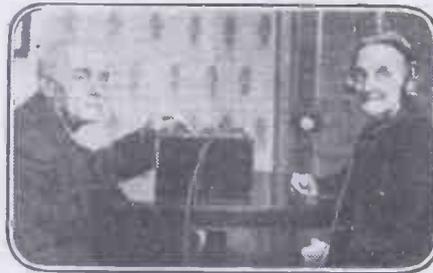
At our meeting, held on Monday, June 11th, at Risley Avenue Schools, a very instructive lecture and demonstration was given by one of the members—Mr. Sheen—on the various methods of tuning.

The society is now seeking affiliation to the Radio Society of Great Britain.

Hon. sec., E. L. Wing, 142, Roundway, Lordship Lane, N. 17.

#### The Stratford-on-Avon and District Radio Society.\*

At a meeting of the society held on Monday, June 4th, at headquarters, a new circuit was



These two old people, Mr. and Mrs. Shearman, of Poplar, celebrate their golden wedding by listening-in.

tested. The results achieved on the circuit certainly justify the description "super-sensitive." On Tuesday, The Beggar's Opera—broadcast from the Lyric Theatre, Hammersmith—was received on the loud speaker with great strength and clearness.

Hon. sec., E. W. Knight, 117, Park Road, Stratford-on-Avon.

#### Raynald Wireless Club.

A meeting of the above club was held recently at which an interesting lecture on "Loss of Insulation on Aerials" was delivered by Mr. G. H. Brown.

Hon. sec., Mr. F. E. Baker.

## ROMEO AND JULIET.

A Tragedy in five acts.

By WILLIAM SHAKESPEARE.

To be broadcast from the London station (2 L O) at a date not fixed at the time of going to press.

THE tragedy of the youthful lovers, Romeo and Juliet, is perhaps one of the best loved and the most beautiful of all Shakespeare's plays. The story is written round the two chief families in Verona, the Capulets and the Montagues.

An ancient feud existed between these noble houses, which at the time when the action of the play takes place, had grown to such alarming proportions that a servant of the House of Montague could not meet a Capulet servant without a passage of fierce words and often bloodshed.

The old Lord Capulet, who was Juliet's father, gave a great feast to which all comers were made welcome provided they were not of the House of Montague. Romeo, however, went masked, and there he met Juliet, when they instantly fell in love, each unconscious of the identity of the other. Romeo was, however, recognised by Tybalt, a nephew of Capulet's, who swore he would be avenged for the vile intrusion of a Montague.

#### The Friar's Potion.

When Romeo and Juliet discovered each other's names, it did not serve to diminish their love, but rather to increase it, and here we have the famous balcony scene where they exchanged their vows of love after Lord Capulet's feast. Romeo then consulted a holy friar who had been a friend of both Houses for many years, and asked him to arrange his immediate marriage to Juliet. On the day of the marriage, two friends of Romeo's, Benvolio and Mercutio, were walking in the streets of Verona, where they were met by a party of Capulets, headed by Tybalt. A quarrel ensued, in which Mercutio was killed by Tybalt, and Tybalt by Romeo. The result of this was that Romeo was ordered to be banished from Verona immediately.

Romeo took refuge in Friar Laurence's cell, frantic with grief, and deaf to the philosophic consolations offered by the good Friar. At length the Friar persuaded him to take leave of Juliet and fly to Mantua, during which time the news of their marriage should be announced, and probably a reconciliation made between the two families. Romeo left Verona before daybreak, and this was the beginning of the tragedy. Capulet proposed that Juliet should marry Count Paris, a gallant young nobleman, and declined to accept her refusal. In her extreme difficulty, Juliet consulted Friar Laurence, who advised her to consent to marry Paris, and the night before the marriage was to take place he would give her a potion to drink which would render her, to all appearances, lifeless for 48 hours.

#### Tragedy Causes Reunion.

She obeyed the Friar's instructions, and the news of Juliet's supposed death, travelling with all the customary speed of evil tidings, reached Romeo at Mantua, before the Friar's messenger could arrive to tell him that his beloved wife was lying in the tomb for a few hours only.

Romeo bought a deadly poison and set out for Verona, determined to swallow it after he had had a sight of Juliet in her tomb. When he arrived at the tomb he found the young Count Paris. A duel was fought, in which Paris was killed. Then Romeo took his last farewell of his beautiful lady and swallowed the poison.

Juliet presently awoke out of her trance, and seeing her dead husband by her side, quickly drew a dagger and stabbed herself.

The whole tragic story was told to the Capulets and the Montagues by the Friar, and the two families, through the sorrows of their respective children, at last became united.

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Inductance Tubes wound 24 Enamel, 12" x 4" ..	3	6
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Insulating Sleeving ..	per yd.	0 5
Knobs, Ebonite, 2 B.A. Bushed ..	0	4
Terminals, War Office, with nuts ..	per doz.	1 6
Telephone, " ..	2	0
Valve Holders, screwed legs and nuts ..	1s.,	1 6
Fixed Condensers ..	each	1 3
Variometers, silk wound, Ebonite dial and knob ..	4	6
Transformers, Intervalve ..	12s. 6d., 14s., and 16 6 ..	2 6
Basket Coils, our own line ..	set of 6	2 6
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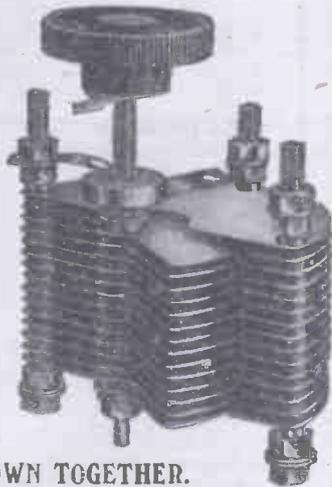
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·0002	13	2/6
·0001	7	2/3
Vernier	3	1/9



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T.M.C., 4,000 ohms, stamped B.B.C.	24/6 pair.
(Phones supplied by T.M.C. themselves, taken from expensive sets to clear.)	
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- Twin Flex, 12 yds., 1/9. By post, 2/- dozen.
- Switch Arms, 10d., 1/-, 1/3, 7/8. Post, 6d. each extra.
- Rotax Accumulators, 4 v. 40 amp., 17/- Carriage, 2/- each.
- Fixed Condensers. Good value. 11d., 1/3. Post, 6d. each extra.
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- H.T. Batteries, 15 volt, 2/6. Carriage, 1/- each.
- Ebonite Valve Holders, 10d., 1/-, 1/3. Post, 6d. each extra.
- Basket Coils, “Qojah,” set of 7, 5/- By post, 6/- set.
- Basket Coils, 2/4 and 3/- set of 6. Post, 6d. extra.
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- Perikon Detectors, enclosed with 2 crystals, 2/4. By post, 3/3.
- Perikon Detectors, suit expensive set, 3/9. By post, 4/6.
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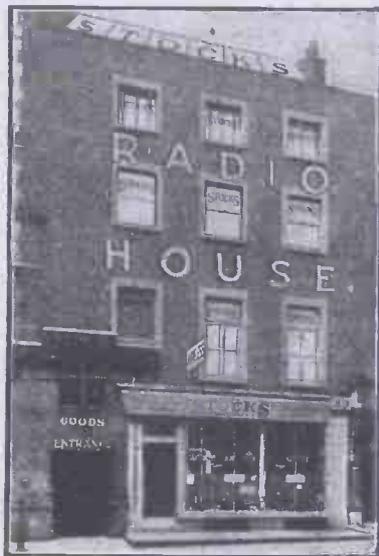
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Crystal Detector Parts, in envelope ...	doz.	9/-
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Pointers, 6d. doz. ....	gross	4/6
Slider Rods, 6 in. and 9 in., 3/- doz.; 12 in. ....	gross	3/3
Indoor Rubber Aerial, 23/36 .....	yard	2d.
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Insulated Steeving .....	doz.	4/6
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Contact Studs, Nut and Washer ...	gross	4/-
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Nuts, 2 BA, 2/-; 4/5 BA, 1/6; 6 BA, 1/5; Washers, all BA's .....	gross	6d.
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# RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 760.)

C. C. A. (Liverpool).—Do the words "Diplex" and "Duplex" both mean that a station can send and receive at the same time?

This is a question that frequently arises in various forms, and it must be admitted that the similarity in the spelling of the two words is so great that confusion is inevitable. Diplex indicates the capability of one station, wireless, line, or cable, to receive or transmit two messages simultaneously, while "Duplex" working consists of one station transmitting and receiving simultaneously. Diplex, one direction, two messages, Duplex "two" directions, two messages, is the euphonic method adopted by some students in memorising the meaning of these two words.

D. N. (Bournemouth).—I have constructed the Flewelling circuit which appeared in "P.W." dated May 5th, but find that when receiving telephony I cannot get rid of the whistling sound in the 'phones. How can I accomplish this?

We are afraid that it is impossible to entirely eliminate this whistling, which, however, can be brought to a minimum by careful manipulation of the variable grid leak. It can be brought to such a high note that it is hardly noticed, and seems almost of sufficient frequency to reach inaudibility.

"OLD STAGER" (Holyhead).—As I am near the sea and get plenty of Morse, I intend making experiments with a "magnetic detector." What is the principle involved in this? How does the coherer work?

The magnetic detector was constructed with an endless loop, formed of fine iron wires wound together and made to revolve by slow clockwork in front of the poles of a pair of horseshoe-shaped permanent magnets. Round the moving iron wire at one point were arranged two small coils, one in circuit with the aerial and one in circuit with the telephones. The high-frequency oscillations from the aerial assisted the magnetisation of the wire, which, in turn, induced a current in the coil in circuit with the telephones, and thus the Morse code transmitted became audible.

The coherer was primarily a glass tube loosely filled with a mixture of metallic filings, which would not conduct much electric current if placed in series with a cell and a galvanometer, but if an electric spark was made near it, the conductivity suddenly increased. This effect was due to rapid oscillations taking place through the filings. At its best this device as a detector of wireless signals was slow and uncertain in its action, and we do not advise its use if satisfactory results are expected.

W. R. (Norwich).—In the case of calculating the wave-length of an aerial and coil when there are two condensers in series with the aerial, but in parallel with one another, how is the calculation effected?

The usual formula still holds good—namely,  $\lambda = 1885 \sqrt{L \times C}$  where L and C are in microhenries and microfarads respectively. In this case, however, C is the resultant capacity of the whole aerial circuit, taking into consideration the capacity of the aerial, the capacity of the two condensers and the capacity of the tuning coil and earth. The capacity of an average aerial system can be taken as about .002 to .003 mfd., including the self-capacity of the tuning coils and the earth wire. In the case of the two condensers, you must calculate their resultant capacity (C), and then again calculate the resultant capacity of the whole system. The two condensers are in parallel with one another, and so their combined capacity will be the sum of their individual capacities. Thus, if the two condensers are .0005 mfd. and .0001 mfd. respectively, the resultant capacity will be .0006 mfd. Now, this .0006 mfd. is in series with the aerial circuit, whose capacity will be about .0003 mfd., if it is fair-sized aerial about 25 ft. up.

To find the total capacity of the aerial system we must calculate the resultant capacity of the condensers and of the aerial, in series with one another. Thus we have .0006 mfd. in series with .0003 mfd. This will not give .0009 mfd. as is so often thought, but will give an answer far below this. The formula to use for working out this is  $\frac{1}{K} = \frac{1}{K_1} + \frac{1}{K_2}$

when K is the resultant capacity and K<sub>1</sub> and K<sub>2</sub> the respective values of the two capacities. We therefore have  $\frac{1}{K} = \frac{1}{.0006} + \frac{1}{.0003}$  which works out to give  $\frac{1}{K} = \frac{1}{.0002}$  so that K = .0002, mfd.

(Continued on page 764.)



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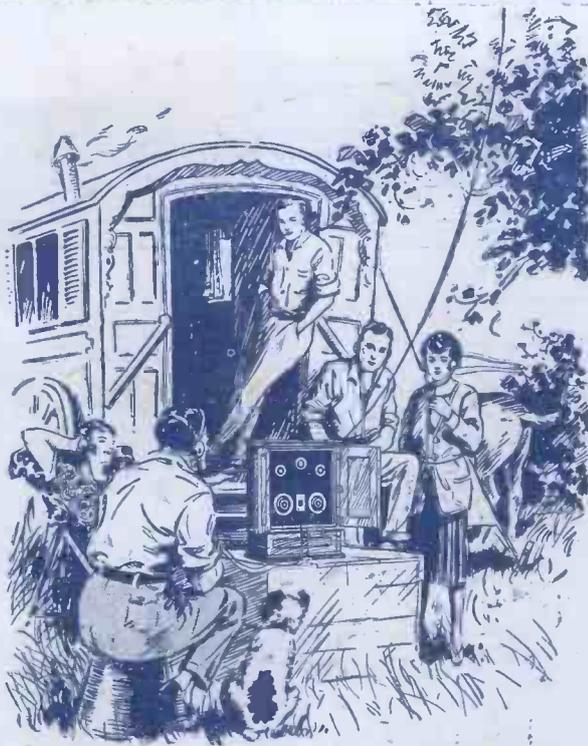
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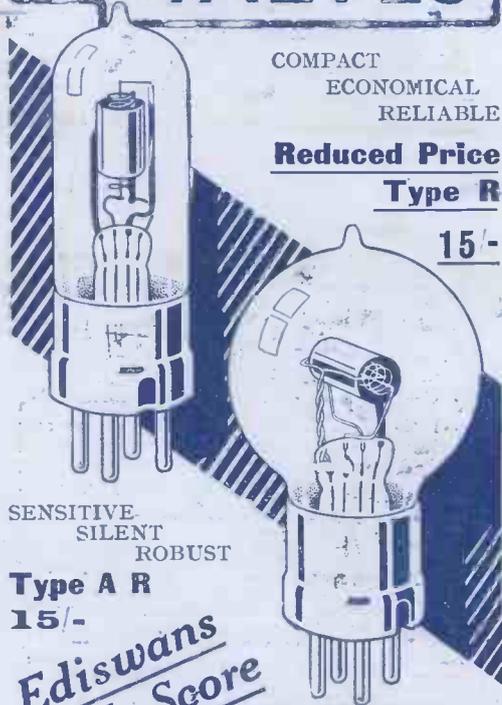
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